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The Anti-Patent: A Proposal for Startup Immunity

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The controversy surrounding the current implementation of the patent system is well known. Some question whether the system has become entirely dysfunctional and creates disincentives to innovation, particularly as the law operates within some industries. Moreover, early stage companies, particularly those just beginning to gain success, are particularly vulnerable targets for lawsuits. Notably, these same companies can be rich sources of important technological innovation.

Because the U.S. has always had a patent system, it is impossible to understand the intended and unintended consequences of eliminating this form of intellectual property protection even in a limited manner. As economist Fritz Machlup stated in 1958, “[i]f we did not have a patent system, it would be irresponsible, on the basis of our present knowledge of its economic consequences, to recommend instituting one. But since we have had a patent system for a long time, it would be irresponsible, on the basis of our present knowledge, to recommend abolishing it.”¹ The current one-size-fits all patent system locks companies into the system, even for those that might prefer to leave it.

This paper proposes an entirely new, limited immunity for a small sector of innovative organizations that wish to operate outside the patent system for a limited period of time. Specifically, this article proposes the outlines of program for a voluntary class of “patent free” startups and emerging companies. This allows the grantee to obtain immunity from all patent assertions during the allotted time period. As a true opt-out, start-ups are precluded from obtaining patents during the opt-out period. Instead, the inventions created by these entities pass to the public domain. Because the program is voluntary, it will permit each entity to balance the benefits against the burdens of the patent system and make and individualized determination whether to “go patent-free” for a limited twenty-year term. Further, this piece considers the risks that a startup might encounter by engaging with this proposed program.

¹ Fritz Machlup, SUBCOMM. ON PATENTS, TRADEMARKS, AND COPYRIGHTS OF THE S. COMM. ON THE JUDICIARY, 85th Cong. *An Economic Review of the Patent System* 80 (Comm. Print 1958).

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I. Introduction

The U.S. patent system, in place continually since its initial enactment in 1790, has become a fixture of the American economy. The concept that "[a] strong intellectual property system supports and enables the innovation that is the lifeblood of our economy" is a well-engrained maxim among governmental decision makers.² One of the foundational assumptions of the U.S. patent system is that "IP rights play a large role in generating economic growth."³ In the words of the former U.S. Patent & Trademark Office Director David Kappos, "Our national love affair with invention has produced the strongest patent system in the world by any and all measures" and that same system "substantially undergirds a great innovation-based economic engine."⁴ It has been thought that patents are necessary to correct the market failure inherent in knowledge-based assets.⁵ Intangible information can be costless for rivals to reproduce and, absent some form of protection or reward, it has been posited that "the inventor will therefore be at a market disadvantage relative to rivals, and will possibly be dissuaded from investing" in research and development.⁶

This view stridently advocates the necessity of patent laws as a critical path to encourage knowledge creation and economic growth.⁷ Research has

² Office of the Press Secretary, Fact Sheet: Executive Actions: Answering the President's Call to Strengthen Our Patent System and Foster Innovation, The White House (2/20/14) available at <http://www.whitehouse.gov/the-press-office/2014/02/20/fact-sheet-executive-actions-answering-president-s-call-strengthen-our-p>; see also, e.g., Pres. Richard M. Nixon, *Special Message to Congress on Patent Reform*, (Sept. 27, 1973) (observing that the nation's "creative history" is based in part on the patent laws that have "enormously stimulated our progress and prosperity.") [reference: <http://library.cqpress.com/cqalmanac/document.php?id=cqal73-867-26369-1226186>]; Committee on the Judiciary, Subcommittee on Patents, Trademarks, and Copyrights, *To Promote the Progress of Useful Arts: Report of the President's Commission on the Patent System*, 90th CONG. 1ST SESS. (Feb. 2, 1967) (summarizing the committee's conclusion that the patent system "continues to provide an essential incentive for the conduct of research and the investment of capital"); Economic and Statistics Admin. & U.S. Patent & Trademark Office, *Intellectual Property and the U.S. Economy: Industries in Focus*, i (March 2012) (stating, "Protecting our ideas and IP promotes innovative, open, and competitive markets, and helps ensure that the U.S. private sector remains America's innovation engine").

³ *Id.* at v.

⁴ David J. Kappos, *Investing in America's Future Through Innovation: How the Debate over the Smart Phone Patent Wards (Re)Raises Issues at the Foundation of Long-Term Incentive Systems*, 16 STAN. TECH. L. REV. 485, 497-98 (2013).

⁵ See generally Kenneth J. Arrow, *Economic Welfare and the Allocation of Resources for Invention*, THE RATE AND DIRECTION OF INVENTIVE ACTIVITY: ECONOMIC AND SOCIAL FACTORS, 609, 613 (NBER 1962).

⁶ Nancy Gallini & Suzanne Scotchmer, *Intellectual Property: When Is It the Best Incentive System?* in INNOVATION POL'Y AND THE ECON., VOL. 2, 51, 53 (Adam B. Jaffe, et al. eds., 2002).

⁷ WILLIAM NORDHAUS, INVENTION, GROWTH AND WELFARE: A THEORETICAL TREATMENT OF TECHNOLOGICAL CHANGE, 8-9 (1969) (discussing the assumption that

observed a positive correlation between research and development spending, innovation, and growth in the gross domestic product.⁸ As described in a 1945 report by the National Patent Planning Commission, an ad hoc body commissioned by President Roosevelt:

Research is . . . affected by the patent laws. They stimulate new invention and they make it possible for new industries to be built around new devices or new processes. These industries generate new jobs and new products, all of which contribute to the welfare and the strength of the country.⁹

Patents are viewed as an important mechanism to stimulate the creation of technical solutions because they create a valuable incentive, in the words of economist Fritz Machlup, "[t]o make it worthwhile for inventors and their capitalist backers to make their efforts and risk their money, society must intervene to increase their profit expectations."¹⁰ It has been said that patents are intended to provide incentives to innovate through the restriction on the use of newly created knowledge.¹¹ Under this view, innovators can charge for the use of that knowledge, and thereby obtain a return on their research and development investment.

The U.S. Court of Appeals for the Federal Circuit (hereinafter, the "Federal Circuit"), which is largely responsible for implementing the Patent Act in the courts, has affirmed this principle by maintaining that a patent's pecuniary rewards are a key component toward encouraging invention. As the Federal Circuit has explained, "the encouragement of investment-based risk is the fundamental purpose of the patent grant, and is based directly on the right to exclude."¹² In this same vein, this court explained "[T]he Patent Act creates an incentive for innovation. The economic rewards during the period of exclusivity are the carrot. The patent owner expends resources in expectation of receiving this reward."¹³

technological advance is linked to economic growth); ADAM B. JAFFE & JOSH LERNER, INNOVATION AND ITS DISCONTENTS: HOW OUR BROKEN PATENT SYSTEM IS ENDANGERING INNOVATION AND ITS PROGRESS, AND WHAT TO DO ABOUT IT, 7 (2004) (observing that for centuries "the granting of patents has been an important tool to encourage innovation, and the economic growth and improvement in living standards that new technologies provide").

⁸ WILLIAM J. BAUMOL, THE FREE MARKET INNOVATION MACHINE, 51-52 (Princeton University Press 2002).

⁹ VAAANNEVAR BUSH, SCIENCE THE ENDLESS FRONTIER: A REPORT TO THE PRESIDENT (1945).

¹⁰ Machlup, *supra* note 1, at 21.

¹¹ See, e.g., Joseph E. Stiglitz, *Economic Foundations of Intellectual Property Rights*, DUKE L.J., 1693, 1696 (2008).

¹² Sanofi-Synthelabo v. Apotex, Inc., 470 F.3d 1368, 1983 (2006).

¹³ King Instruments v. Perego, 65 F.3d 941, 950 (Fed. Cir. 1995).

A contrasting perspective questions whether patents act as incentives in fact. Economist Adam Jaffe has noted a "disquieting" lack of evidence to support the proposition that stronger patent laws have any significant impact on innovation.¹⁴ As he explains, one possible interpretation of the relevant data suggests "that patents are not central to appropriating the returns to R&D in most industries."¹⁵ Legal scholar Robert Merges expresses similar doubts, stating, "[t]ry as I might, I simply cannot justify our current IP system on the basis of verifiable data showing that people are better off with IP law than they would be without it."¹⁶

Merges' misgivings about the utilitarian justification for patents echo those of economist Fritz Machlup.¹⁷ Machlup recognized that no empirical evidence or theoretical argument confirmed or refuted any beneficial effect of the patent system on the state of technological advance.¹⁸ Acknowledging that it "seems very likely" that firms would continue to research, develop and innovate without a patent system, Machlup explained that "no firm could hope to maintain its position in the industry if it did not constantly strive to keep ahead of its competitors by developing and using new technologies."¹⁹ Faced with a conflict between competition and patents as the primary drivers of invention and invention, Machlup provided this equivocal conclusion:

If we did not have a patent system, it would be irresponsible, on the basis of our present knowledge of its economic consequences, to recommend instituting one. But since we have had a patent system for a long time, it would be irresponsible, on the basis of our present knowledge, to recommend abolishing it.²⁰

¹⁴ Adam B. Jaffe, *The U.S. Patent System in Transition: Policy Innovation and the Innovative Process*, 29 RES. POL'Y 531, 540 (2000).

¹⁵ *Id.* at 554 (Jaffe 2000).

¹⁶ ROBERT P. MERGES, JUSTIFYING INTELLECTUAL PROPERTY, 3 (2011). Merges' observation may be read as a disclaimer of the classic utilitarian justification for intellectual property, and not advocacy in support of abandoning such rights altogether. After stating that the data supporting the existence of IP rights is "maddeningly inconclusive," Merges argues that rights-based justifications support governmental support for IP rights).

¹⁷ Fritz Machlup was responsible for the 1958 foundational study of the patent system at the request of the Senate Subcommittee on Patents, Trademarks, and Copyrights. Machlup, *supra* note 1, at 79.

¹⁸ *Id.*

¹⁹ *Id.* at p. 78; see also WILLIAM J. BAUMOL, THE FREE MARKET INNOVATION MACHINE, 50 (2002) (noting that "It is competitive pressures that force firms to run as fast as they can in the innovation race just to keep up with the others").

²⁰ Machlup, *supra* note 1, at 78.

Other data casts doubt for the necessity of patents in all technology fields. One survey of over 1,000 early stage technology companies reported that the patents are not a strong incentive to create, develop and commercialize technology.²¹ Despite the fact that the patent system exists to foster new technologies, "startup executives report that patents generally provide relatively weak incentives to conduct innovative activities."²² This survey points to a variety of other methods used by such companies to secure a competitive position, including first-mover advantages, superior products, implementation or marketing capabilities, secrecy, and other forms of intellectual property such as trademarks.²³

Several examples demonstrate that invention, innovation, and technological improvement occur without patents. Notably, several key technologies over the past century have emerged without impediment through the assertion of patents covering fundamental building blocks.²⁴ These included fields that are encompassed within computing, software, the Internet, and biotechnology.²⁵ The lack of patents in these technology areas was due to accident, rather than by design.²⁶ Although created fortuitously, this circumstance created a safe harbor against a shut down threats. In turn, entities were able to experiment, create follow-on improvements, and innovate.

Others have analyzed the heavy transaction costs that patents impose on innovators. On this point, legal scholars James Bessen and Michael Meurer assert that, in some contexts, "patents very likely provided a net *disincentive* for innovation."²⁷ In *The Case Against Patents*, economists Boldrin and Levine level a powerful critique at the patent system, arguing, "it is fair to say that the sector-level, national, and cross-national evidence fail to provide any clear empirical link from patents to innovation or to productivity."²⁸ Specifically, Boldrin and Levine

²¹ Stuart J.H. Graham et al., *High Technology Entrepreneurs and the Patent System: Results of the 2008 Berkeley Patent Survey*, 24 BERK. TECH. L.J. 1255, 1285-87 (2009) (hereinafter, the *Berkeley Patent Survey*).

²² *Id.* at 1285-87.

²³ *Id.* at 1289-90.

²⁴ Mark Lemley, *Patenting Nanotechnology*, 58 STAN. L. REV. 601, 606 (2005). Lemley notes "the patents that were obtained and enforced in these fields tended to cover implementations of or improvements to the basic building-block technologies. If patents were granted on the basic building blocks, it was often only after decades of litigation over inventorship." *Id.* at 613.

²⁵ *Id.* at 613.

²⁶ Lemley, *supra* note 24 at 620 (observing that "the fact that previous enabling technologies were not generally patented may be thought a happy accident for innovation").

²⁷ JAMES BESSEN & MICHAEL J. MEURER, PATENT FAILURE: HOW JUDGES, BUREAUCRATS, AND LAWYERS PUT INNOVATION AT RISK, 141 (2008) ("during the late 1990's, the aggregate costs of patents exceeded the aggregate private benefits of patents for United States public firms outside the chemical and pharmaceutical industries.").

²⁸ Michele Boldrin & David K. Levine, *The Case Against Patents*, 27 J. OF ECON. PERSPECTIVES 3, 7 (2013).

argue that, despite increased number of issued patent numbers since the 1980's, there has not been a corresponding increase in research and development investment, or "any additional surge in useful innovations or aggregate productivity."²⁹ They argue that patents are rarely used as incentives to bring forth new inventions, but rather become weapons as a technology matures to compensate for failing profits, prevent new entrants from gaining a foothold, and encourage rivals to exit the field.³⁰ These scholars maintain, "[w]hen an industry matures, innovation is no longer encouraged; instead, it is blocked by the ever-increasing appeal to patent protection on the part of insiders."³¹

Some engaged in the creation of patentable technology have expressed concern about the patent system's effect on their respective fields.³² These include objections by software programmers, who, according to one source, have "mostly been opposed to patents on software."³³ Another comes from a Nobel-prize winning biologist, who stated that "the tools for manipulating genomes should be in the public domain," because "it is actually the case that monopolistic control of this kind would be bad for science, bad for consumers, and bad for business, because it removes the element of competition."³⁴ Two leaders in the synthetic biology field performed a survey to determine the key technologies used by other researchers.³⁵ Due to the cross-disciplinary nature of that field, these researchers stated "[t]he extent to which innovation in synthetic biology, and biotechnology more generally, may be impeded by broad foundational patents that cannot be licensed or patent thickets remains unclear," which creates uncertainty at the foundation of that art's practice.³⁶ Kent Walker, Google's Senior Vice President and General Counsel, has written that patent litigation involving low-quality software patents "threatens to stifle innovation."³⁷

The question of whether the patent system as a whole is beneficial is

²⁹ *Id.* at 4.

³⁰ *Id.* at 11 (these authors cite Apple's iPhone as one example of this phenomenon).

³¹ *Id.*; see generally TIMOTHY WU, *THE MASTER SWITCH THE RISE AND FALL OF INFORMATION EMPIRES* (2010).

³² See, e.g., Nicole Wilke, *A Patent Lie: How Yahoo Weaponized My Work*, WIRED.COM (3/13/12), <http://www.wired.com/2012/03/opinion-baio-yahoo-patent-lie/>; Heidi Ledford, *Bioengineers Look Beyond Patents*, NATURE (7/3/13); Alok Jha, *Human Genome Project Leader Warns Against Attempts to Patent Genes*, THE GUARDIAN (6/24/10); BESSEN & MEURER, *supra* note 27, at 189 (cataloguing the software industry's opposition to patent protection).

³³ *Id.*

³⁴ Alok Jha, *Human Genome Project Leader Warns Against Attempts to Patent Genes*, THE GUARDIAN (6/24/10)(quoting John Sulston)

³⁵ Linda J. Kahl and Drew Endy, *A Survey of Enabling Technologies in Synthetic Biology*, 7 JOURNAL OF BIOLOGICAL ENGINEERING, 1 (2013).

³⁶ *Id.* at 9.

³⁷ Kent Walker, *Patents and Innovation*, Google Blog (4/4/11) (Google Senior Vice President & General Counsel), <http://googleblog.blogspot.com/2011/04/patents-and-innovation.html>.

currently one of the most crucial questions relating to the technological progress. As yet, the question remains unanswerable. Machlup identified the reason a half century ago—that is, no empirical data can be collected that measures the state of invention in the absence of patents. The U.S. has had a patent system since 1790 and, as one patent jurist noted, "No one can faithfully say what the industrial history of this country would have been without a patent system."³⁸ Other nations that share analogous economic attributes have robust patent systems as well.

This article proposes creating a limited patent-free zone, which allows innovative startups to obtain immunity from others' patents. This program is intended to provide an identified segment of start-ups with an opportunity to invent and innovate without fear of incurring the massive transaction costs and distraction precipitated by allegations of patent infringement. As a true opt-out, start-ups are precluded from patenting during the opt-out period. Because the program is voluntary, it will permit each entity to balance the benefits against the burdens of the patent system and make an individualized determination whether to "go patent-free" for a limited twenty-year term. At the same time, this system will permit the field to learn critical (as yet unavailable) information about innovation in a world without patents. Various patentable scientific and technological fields will benefit from the research performed by those who opt into the program because the results of the participants' research and development will inure to the public domain.

The current patent system sets a national unified policy that with broad application to all acts of scientific creativity. It locks all innovators into the same system, regardless of the impact that such uniformity has for individual players. This proposal attempts to set up a limited variation in that system, by introducing the ability to leave it. It would allow individual entities to rationally decide, based on all of the evidence to date, whether innovation and non-patent differentiators provide the preferred path toward viability and profitability without the patent system. This "anti-patent" creates the opportunity to explore the technologically creative results obtained by inventors who are incentivized to create by factors that do not include patents. By creating a voluntary system, the proposal assumes that each startup has superior information and motivations to make an opt-in decision based on its own self-interest.

II. The Proposed Solution: The Anti-Patent

This article proposes a voluntary opt-out system for emerging companies. Unlike a patent right to exclude, this proposal is for an anti-patent, which has the

³⁸ Pasquale J. Federico, *Introductory*, 18 J. PAT. OFF. SOC'Y 11, 12 (1936).

opposite purpose. Essentially, an anti-patent allows the owner to opt out of the patent system for a limited twenty-year term. This program includes two fundamental components. First, approved participants will obtain qualified immunity from all third party patent infringement assertions. During the immunity time period, a startup in the program will not acquire any liability for non-willful infringement of any patents. The entity can participate in permissionless invention and innovation—that is, the startup can experiment, invent, develop, and commercialize a product without any obligation to pay patent license fees or to respond to infringement allegations by patent holders.³⁹ Secondly, as a true opt-out program, the entity must forgo obtaining any patents for all inventions developed during that time. The work performed by the entity during this time passes to the public domain.

Congress has the ability to create statutory immunity to insulate a person or entity against liability for patent infringement.⁴⁰ As with other types of legal immunities, no liability inures to a startup that has a granted anti-patent. This program proposes a broad scope of immunity that protects the startup from *all* assertions of patent infringement for *all* work performed by that entity during the term. Thus, the immunity prevents lawsuits from those asserting patent claims that cover all, or any aspect, of the startup’s activity. This includes patents that read on the startup’s entire product and processes, as well any portion of either, and subsequent projects. The immunity applies to all theories encompassed by direct and indirect infringement, and applies to products and processes that are in development, as well as those that are commercially available. As a practical matter, the anti-patent eliminates any expense or uncertainty for a license, litigation, or court-imposed remedy.

Any suits that might be filed against the entity would be subject to a motion to dismiss asserting immunity as a complete defense. Disposition using this method is dramatically less expensive compared with full-scale litigation that

³⁹ The term "permissionless innovation" was coined in Union Square Ventures founding partner Brad Burnham, *Software Patents Are the Problem, Not the Answer*, USV.COM (2/19/10) at <https://www.usv.com/posts/software-patents-are-the-problem-not-the-answer>.

⁴⁰ See, e.g., 35 U.S.C. § 287(c) (granting immunity from patent infringement for designated persons and entities engaged in certain types of medical activity); patent rights do not entitle owners to an absolute right to assertion against any and all infringers. Exceptions have long been available. As one example, the Eleventh Amendment creates immunity for state entities accused of patent infringement. *Florida Prepaid Postsecondary Education Expense Board v. College Savings Bank*, 527 U.S. 627, 643 (1999). There is no constitutional bar that prevents Congress from enacting limited exclusions from patent protection that are consistent with the purpose of the law. See, e.g., Janice M. Mueller, No “Dilettante Affair”: Rethinking the Experimental Use Exception to Patent Infringement for Biomedical Research Tools, 76 WASH. L. REV. 1, 49 (2001) (stating that the U.S. Constitution’s source of power to create intellectual property legislation allows Congress to “grant less-than-exclusive patent rights” that include exceptions and limitations).

typically runs into millions of dollars. Immunity allows startups to focus on research and development, invention, and innovation. Although the immunity time period can be varied, this proposal contemplates that the program match the current patent term of twenty years from the date of the application provides the maximum benefit to the public.

The present proposal is feasible under current administrative and court structures. Startups who seek to opt out can file an application that is akin to those filed to secure patent protection at the U.S. Patent & Trademark Office ("PTO"). This application must include disclosure and at least one claim for an invention that meets all of the requirements of the Patent Act. However, there is a critical distinction for an anti-patent. If this application is granted, no patent is issued and no right to exclude exists. Instead, the applicant is granted qualified immunity against all third party patents. As a true opt-out, that inventive entity cannot obtain the rights to any patent during the twenty-year anti-patent term.

This breadth of this immunity warrants careful examination procedures at the PTO. Typical examination of patent applications results in a significant number of erroneous grants.⁴¹ Because immunity applications will not be asserted against any entity, validity challenges in the courts might never occur.⁴² To minimize errors, the PTO must implement strict review standards. These include a requirement that the applicant perform a high quality prior art search prior to filing, and once an immunity application is received, subjected to an intensive search and level of review.⁴³ To further decrease the error rate, the patent examination should adopt the "second pair of eyes" method used to scrutinize problematic business method patents.⁴⁴

Under this proposal, published and granted anti-patents have preclusive effects that parallel the current law for patents and published applications. In other words, the disclosure of published anti-patent operates as prior art to prevent others from obtaining patent rights on the disclosures set forth therein.⁴⁵ The logical conclusion from the operation of these rules is that others cannot obtain a patent for the same invention or any nonobvious variant that appears in the anti-

⁴¹ See John R. Allison & Mark A. Lemley, *Empirical Evidence on the Validity of Litigated Patents*, 26 AIPLA Q.J. 185, 205 (1998); Donald R. Dunner et al., *A Statistical Look at the Federal Circuit's Patent Decisions: 1982-1994*, 5 FED. CIR. B.J. 151, 154-56 (1995).

⁴² Anti-patents might use some of the post-grant review procedures currently in place as a safeguard against erroneous issuance.

⁴³ See generally Mark Lemley, Doug Lichtman, Bhaven Sampat, *What to Do About Bad Patents?*, REGULATION, 10 (Winter 2005-2006).

⁴⁴ See U.S. Patent & Trademark Office, *Patent Quality Improvement: Expansion of the Second-Pair-of-Eyes Review*, U.S. PATENT & TRADEMARK OFFICE, <http://www.uspto.gov/web/offices/com/strat21/action/q3p17a.htm> (describing program).

⁴⁵ 35 U.S.C. §§ 102; 103.

patent's disclosure. Rather, the disclosures from the anti-patent and any commercialized products offered for sale inure to the public domain. Because anti-patents cannot be asserted or infringed, others are free to use the information disclosed therein to replicate, vary, design around, and improve the technology disclosed therein.

The program presumes that the startup is engaged in original research and development, and therefore the immunity granted is qualified.⁴⁶ Immunity is lost on a showing that the applicant willfully copied another's patented invention. The standard for willfulness for such complaints parallels the willfulness standard for claims for utility patent infringement.⁴⁷ To prevent abusive assertions of patent infringement, willfulness allegations must be pled with the particularity.⁴⁸ As additional procedural safeguard, infringement complaints against anti-patent holders should include the ability to challenge the allegations by requiring the presentation of evidence to support the willfulness assertions for a determination before discovery and patent rule obligations commence.⁴⁹ If the action proceeds past these safeguards, the patent holder can proceed against the anti-patent holder as a defendant in the same manner as any other accused infringer in a patent case. This safeguard prevents entities from seeking immunity merely to copy another's patented technology.

One critical component of this proposal is data gathering. To date, the vast majority of theories, empirical work, and policy drivers assume the existence of a patent system. Critics of the current patent system have noted its shortcomings, and some data suggests that the system is not necessary--and may be impeding--certain types of technological progress. Patents supporters state that criticisms of the patent system rest on "little empirical evidence."⁵⁰ Yet because the current patent regime has been ubiquitous for over two centuries in the U.S., certain types of opportunities to obtain data to support critical analysis can never exist. Although failures of the patent system can be collected under the current regime, data cannot be collected that examines the creative benefits of a system that is entirely unrestricted by third party patents. In other words, the second and third

⁴⁶ For more assumptions about the type of entity eligible for the program, see Section III here.

⁴⁷ *In re Seagate Technology, LLC*, 497 F.3d 1360 (Fed. Cir. 2007) (defining the willfulness standard).

⁴⁸ FED. R. CIV. PROC. 9(b).

⁴⁹ Such a statute might be modeled after California's Anti-SLAPP legislation, which is applied to cases that attempt to chill the exercise of freedom of expression. CAL. CODE CIV. PROC. § 425.16 et seq.

⁵⁰ See Kappos, *supra* note 3 at 487.

order effects of permissionless innovation have not been fully tested in real world settings.

Former PTO Director David Kappos asserts that under the current patent system, "[o]ur country gets the maximum possible amount of innovation, both breakthrough and follow-on incremental improvements."⁵¹ Yet there is virtually no opportunity to test this assertion in real-world settings absent the adoption of the type of program proposed herein. To meaningfully test the system's efficacy, participants in the program will be expected to submit data that tracks variables that include both invention inputs and outputs. The results, whether positive or negative to the causes of technological progress, will unquestionably yield important information.

Anti-patents are intended for startups that determine, as an individual basis, that they are better off without the patent system entirely. As a true opt-out, the grant of an anti-patent precludes such entities for receiving any patents on any subject matter during the immunity period.⁵² Additionally, the prohibition against patenting is critical to increase the public benefit from the proposed program. The information in an anti-patent can be learned, replicated, and varied by those inside and outside the relevant field. This system permits immediate and meaningful dissemination of new technical solutions in an enabled form. This program allows a period of unconstrained creativity within a technology space, and the fruits of that work are then distributed to the public in the form of commercialized products.

This plan is aimed at a narrower class of companies that small and micro entities as previously defined according to patent practice.⁵³ Rather, this proposal contemplates that the startup's founding commences no longer than twenty-four months prior to the application date.⁵⁴ The program does not include startups that have been acquired or majority-owned by a larger company, or had an initial public offering.⁵⁵ For reasons that are explored in Section IV herein, small

⁵¹ *Id.* at 500.

⁵² This proposal does not contemplate any prohibition on the filing of subsequent anti-patent applications.

⁵³ According to 35 USC § 123(a), micro entities are small entities with fewer than four (4) previously filed patent applications, a modest income and has not (and is not under an obligation to) transfer ownership of a patent to a larger entity. Small entities are defined as individuals and small firms with under 500 employees. *See* 13 C.F.R. 121.801-805 and 37 C.F.R. 1.27.

⁵⁴ Safeguards could be drafted into the proposal to ensure that the entity is a bona fide startup. For example, the PTO application could require a certification that the CEO and president of the applicant are these individual's primary occupation and that these positions be held for the first time.

⁵⁵ *Cf.* Gilbert B. Goldberg, *Government Assistance to Entrepreneurships: On Local, State/Provincial, and Federal Levels*, 33 CAN.-U.S. L.J. 126 (2007)(representative of the U.S.

innovative entities are significant contributors to the creation of new invention and are the most vulnerable to accusations of patent infringement. This proposal is targeted to assist nascent companies to attain financial and creative viability, by shielding such entities until these ideas can be fully developed. It is anticipated that such entities will be primarily focused on development associated with the invention that is described in the immunity application, during the beginning years.

The proposed program is scalable in scope and size. The initial launch might be limited in size and subject matter. For example, numerical or geographic limits can be imposed. The program might be limited to fields identified as particularly problematic for the patent system, such as software and business method patents.⁵⁶ As will be seen throughout subsequent sections, this later limitation is the most desirable starting point for this program.

III. Assumptions: Ideas, Inventions and Innovations

This proposal is designed for certain startup entities, and based on certain assumptions about the innovation process engaged by such entities. In particular, immunity from liability from patent infringement is intended to benefit the work of nascent, innovative startups that are engaged in the commercial development of a new idea. Consistent with the Patent Act's purpose, this proposal is intended to foster the creation and dissemination of novel, nonobvious implementations by firms that are most likely to be irreparably burdened by an assertion of patent infringement.

To fully assess this proposal, the distinction between ideas, inventions, and innovation should be considered.⁵⁷ As an initial matter, ideas are concepts that are not yet actualized. They may be part of a business, a product, a service, a way of satisfying a market need, or creating an entirely new market. Unless the idea has some potential commercial value, it is quite unlikely to become

Small Business Association, defining startups as companies that have been in business less than two years).

⁵⁶ See BESSEN & MEURER, *supra* note 27, at 188-203 (2008); DAN L. BURK & MARK A. LEMLEY, THE PATENT CRISIS AND HOW THE COURTS CAN SOLVE IT, 157 (2009) ("the software industry in particular [has] arguably suffered the most from the crisis in the patent system"); United States Government Accountability Office, Intellectual Property 45 (Aug. 2013), <http://www.gao.gov/assets/660/657103.pdf> (identifying software patents as an area needed for further study).

⁵⁷ Stephen J. Kline & Nathan Rosenberg, *An Overview of Innovation*, in THE POSITIVE SUM STRATEGY: HARNESSING TECHNOLOGY FOR ECONOMIC GROWTH, 275, 276 (Landau and N. Rosenberg, eds. 1986).

actualized into a business. In contrast, an invention is an idea that has been refined into either an operable prototype that demonstrates a proof of the concept, or a filed patent application.⁵⁸ Bringing an idea into the invention stage may be simple for some types of inventions. Typically, more challenging, groundbreaking inventions take longer.⁵⁹

Typically, startups begin with the idea or proposed solution to a problem. In the vast majority of circumstances, considerable work must be undertaken for this idea to become an invention. During this process, the original idea can be modified, replaced, and made concrete as more details of its implementation are worked out. Once a completed invention exists, whether in the form of a prototype, filed patent application, or finished product, the startup's work is not over. Rather, the invention's proof of concept must be made into a form that is capable of manufacture, sale and consumer use. Such work is consistently undertaken under time pressure to obtain a first-mover advantage, which operates to attract a customer base and maximize early profits. If the implementation has network effects, this early market position can be an extremely powerful method of retaining and growing this base. Beyond this, early profits can be used to hire, develop refine the initial product, engage in exploratory research and development, obtain profits, and ultimately repay investors.

Despite these pressures and the best efforts of all involved, the first commercialization of a new idea can take years.⁶⁰ Along the way, the process from idea to commercialization is iterative and riddled with setbacks, pivots, and deviations.⁶¹ As one study observed, in the early stages of a new product type the "process by which the technology is scaled from pilot to commercial production creates opportunities to learn by building."⁶² There is no set time-to-market because there is a widely variable relationship between the amount of resources that a startup uses, the complexity of the product and the time necessary to complete the commercialized product. All else being equal, the more time and funding that the startup possesses, the faster the startup can get to market. Further, the first version of a commercial product might be far from perfect, and improvements may be necessary. Marketing to obtain a critical mass of customers

⁵⁸ *Makurkar v. C.R. Bard*, 79 F.3d 1572, 1578 (Fed. Cir. 1996)(defining invention as requiring proof of operability); *Estee Lauder Inc. v. L'Oreal, S.A.*, 129 F.3d 588, 592 (Fed. Cir. 1997)(same).

⁵⁹ *Cf.* SUZANNE BERGER, *MAKING IN AMERICA*, 87 (2013)(considering case studies in high technology that took "years and significant capital (always longer and more expensive than the CEO originally believed) to bring a product to market").

⁶⁰ *Id.* at 8 (listing several revolutionary products that were "long in the making").

⁶¹ *Id.* at 88.

⁶² *Id.*; *see also* Erica Fuchs and Randolph Kirchain, *The Impact of Manufacturing Offshore on Technology Competitiveness*, 56 *MANAGEMENT SCIENCE* 2323, 2338-39 (2010)(recounting the interaction between designers and manufacturers for optoelectronic components).

can extend the time that the startup collects its initial revenues even further. Events that detract from this drive to market, including the multi-million dollar drain of patent litigation, can stymie the startup's viability.⁶³

The commercialization of the Nest thermostat provides as a brief illustration of the distinction between ideas, inventions, and commercialization, as well as the impact of funding on time to market. This device started as the idea of Tony Fadell, an experienced, former Apple designer who has been called the "godfather of the iPod."⁶⁴ While designing a home in 2009, Fadell began to explore ideas for a smart, energy saving thermostat after considering the low-tech designs that were available then on the market.⁶⁵ He discussed his concept with a colleague in Fall 2009, who agreed to form Nest with Fadell.⁶⁶ In the middle of 2010, the company was founded.⁶⁷ In September of that year, Nest received its first round of venture funding.⁶⁸ While he sought this funding, Fadell did not present prospective investors with a working prototype, but instead based on a crude Styrofoam model and a business plan in a slide deck.⁶⁹ Based solely on this information, it might appear that at this juncture Fadell's *idea* had not yet materialized into an *invention* before September 2010. However, on September 14, 2010, Nest filed patent applications demonstrating that the startup's concept had indeed ripened into an invention as of that date.⁷⁰

Nest first commercialized the smart thermostat in October 2011 after receiving two rounds of funding.⁷¹ Consistent with the startup's patent applications, the device predicts temperature needs by "learning" its user's habits

⁶³ See Catherine E. Tucker, *The Effect of Patent Litigation and Patent Assertion Entities on Entrepreneurial Activity* (5/15/14)(unpublished manuscript available at <http://ssrn.com/abstract=2457611>); see also Section V *infra*.

⁶⁴ Adam Lashinsky, *Is Tony Fadell the Next Steve Jobs...Or the Next Larry Page?* FORTUNE.COM (6/12/14) at <http://fortune.com/2014/06/12/tony-fadell-nest/>; *The Godfather, Part III*, THE ECONOMIST (3/9/13), <http://www.economist.com/news/technology-quarterly/21572922-tony-fadell-helped-revolutionise-music-and-phone-industries-now-he-turning>.

⁶⁵ *Id.*

⁶⁶ *Id.*

⁶⁷ See Nest, CRUNCHBASE.COM, <http://www.crunchbase.com/organization/nest-labs>. Nest filed its articles of incorporation on June 30, 2010. *Id.*

⁶⁸ Lashinsky, *supra* note 64.

⁶⁹ Lashinsky, *supra* note 64. According to this article, one venture capitalist recalls that, during Fadell's pitch, he "was crestfallen" looking at the rudimentary model. *Id.* As his investor described, "My emotions couldn't have been lower," but "Then I got it. Nest was a Trojan horse into the home. In 48 hours we had a check for Tony." *Id.*

⁷⁰ U.S. Patent Number 8510255 (filing date 9/14/10); U.S. Patent Application No. 2012/0066168 (filing date 9/14/10); U.S. Patent Application No. 2012/0065783 (filing date 9/14/10).

⁷¹ Nest, CRUNCHBASE.COM, <http://www.crunchbase.com/organization/nest-labs>. In August 2011, just before Nest launched its first commercial product, the company obtained additional venture funding from Google Ventures, Kleiner Perkins Caufield & Byers, Lightspeed Venture Partners, Intertrust, Shasta Ventures, and Generation Investment Management. *Id.*

so that it can customize home temperatures.⁷² After a calendar year, the device had sold units in the area of "in the mid hundreds of thousands."⁷³ By the beginning of 2014, Google purchased Nest for 3.2 billion dollars, and the number of Nest thermostats sold had reached over a million.⁷⁴ Nest has now developed a revised version of its thermostat, a smart smoke detector, and is thought to be developing in-home camera technology.⁷⁵

Nest represents a concept-to-commercialization example that succeeded under the best of circumstances. Run by a highly credentialed inventor who was the "godfather of the iPod," Nest attracted early, robust funding that provided the resources to hire, design, and refine the original concept. By contrast, the early days of Fitbit, which ultimately designed the wearable fitness tracker, faced delays, undercapitalization, and failure (not once, but seven times).⁷⁶ The company, which started in April 2007, began with \$400,000 in private investment that proved inadequate to manufacture the device.⁷⁷ Despite thousands of pre-orders, Fitbit had difficulty obtaining a second round of capital, finally convincing one venture capitalist to invest after speaking to thirty.⁷⁸ Fitbit required tremendous focus to belatedly get the product to the market during late 2009.⁷⁹ As the company's cofounder and CEO described, "one mistake in hardware and you're done. One mistake can set you back months."⁸⁰ Fitbit's founders, both experienced entrepreneurs, noted that the first product launch experienced significant delays because of re-designs, logistical problems, and finding acceptable manufacturing sources.⁸¹ During this delay, rivals began moving in.⁸²

⁷² Quentin Hardy, *Big Data in the (Heated or Cooled) Air Around You*, THE NEW YORK TIMES BITS BLOG (9/4/12), <http://bits.blogs.nytimes.com/2012/09/04/big-data-in-the-heated-or-cooled-air-around-you/>; Steven Levy, *Brave New Thermostat: How the iPod's Creator Is Making Home Heating Sexy*, WIRED.COM (10/25/11), http://www.wired.com/2011/10/nest_thermostat/ (describing the Nest thermostat as "smart, thrifty and so delightful that saving energy was as much fun as shuffling an iTunes playlist").

⁷³ Hardy, *supra* note 72.

⁷⁴ Kent Bernhard Jr., *iPod Godfather Tony Fadell Builds Nest Egg with \$3.2 B Google Deal*, UPSTART.COM (1/13/14), <http://upstart.bizjournals.com/entrepreneurs/hot-shots/2014/01/13/ipod-godfather-tony-fadell-builds-nest.html>.

⁷⁵ Aaron Tilley, *Nest Is Buying Dropcam To Get More Data On The Home*, FORBES.COM (6/21/14), <http://www.forbes.com/sites/aarontilley/2014/06/21/nest-buying-dropcam/>.

⁷⁶ See Robert Hof, *How Fitbit Survived as a Hardware Startup*, FORBES.COM (2/4/14), <http://www.forbes.com/sites/roberthof/2014/02/04/how-fitbit-survived-as-a-hardware-startup/>.

⁷⁷ *Id.* ("We actually thought that we could get to market on \$400,000. A year later, we weren't even close") (statement of Fitbit cofounder and CEO James Park).

⁷⁸ *Id.*

⁷⁹ *Id.*

⁸⁰ *Id.* (statement of James Park, Fitbit cofounder and CEO).

⁸¹ *Id.*; Jenna Wortham, *Hamstrung by Delays, Fitbit Explains and Tries to Deliver*, THE NEW YORK TIMES (12/11/09).

⁸² *Id.*

Many startups fail long before reaching Nest or Fitbit's sales levels.⁸³ The first few years are difficult, strenuous, and resource-starved.⁸⁴ Although many startups fail for reasons that have nothing to do with the patent system, startups are the most likely entities to be slowed to a crawl or financially devastated by a patent suit. For some startups, the patent system may be precisely the right tool that carries the company through to viability rich with research and development in future products. For others, the potential for a patent suit may be a risk (or a reality) that is not worth its upsides.

Nest and Fitbit serve as examples of the type of startup that is eligible for the anti-patent program. Such entities begin with an idea that is refined toward commercialization, ultimately release a product, and move forward to create subsequent versions or other types of products. Startups in other fields, particularly software, might obtain the largest benefits from the proposed program. Currently, all of these companies are subject to patent demands that could stymie development. To appropriate a phrase, the patent system prevents the invisible hand of the startup market from deciding on an individualized basis whether the potential risk outweighs the rewards. Instead, firms are forced to decide to settle or litigate, which are expensive propositions even if there are strong defenses available, simply to continue to focus on innovation. Immunity relieves the startup from this Hobson's choice, and allows the entity to focus on permissionless innovation in the form of continuing research, development, and exploration.

IV. The Value of Experimentation without Adverse Consequences

A. Clearer Paths to Creation

The process of technological invention amounts to the use of creativity to solve a problem. To do so, it is useful to see the problem solving process as the inventor moving through a “problem space.”⁸⁵ A problem space has three essential parts, including a starting point, an end goal and, between those two, a

⁸³ See, e.g., *76 Failure Post-Mortems*, CB INSIGHTS.COM (1/20/14), at <http://www.cbinsights.com/blog/startup-failure-post-mortem> (giving numerous examples of startup failures).

⁸⁴ See e.g., Jeanette Cajide, *Shutting Down Blurtt*, TECHCRUNCH.COM (2/16/14), <http://techcrunch.com/2014/02/16/shutting-down-blurtt/> (citing CEO burnout as a reason to shut down her startup, stating that the problem with “burnout is that you become hopeless and you lose every aspect of your creativity.”).

⁸⁵ Patricia D. Stokes, *Using Constraints to Create Novelty: A Case Study*, 3 PSYCH. OF AESTHETICS, CREATIVITY AND THE ARTS, 174, 175 (2009).

search space.⁸⁶ Essentially, this type of problem space represents the state wherein one has a goal but no clear path to obtaining it.⁸⁷ There may be multiple ways to transverse the problem space. Different inventors might choose different end goals, each of which solves the same problem in a different way. A solution may lie at the end of a problem space. For the most difficult problems, it may be unclear whether a solution can be found at the time that a search begins.

The problem to be solved significantly defines the search space and therefore constitutes a primary constraint.⁸⁸ Some constraints are comparatively static, while others are dynamic. The most unyielding constraints are foundational. These are based on core theoretical principles accepted by the relevant scientific domain. To be useful, a final solution must be consistent with these governing theories.⁸⁹ Other constraints change as one moves forward through a problem-solving process. This might occur where new information is obtained. Other information may be found to be irrelevant, while new facts increase in importance as subsequent decisions are made.⁹⁰ These dynamic constraints can have either positive or negative effects on the problem-solving process, depending on the circumstances.

Patents exist to act as a positive constraint--that is, to operate as an incentive for entities and individuals to undertake the risk of research and development in uncertain areas. This paper accepts that this incentive operates for some startups. Further, this paper accepts that the value of this incentive includes its universality--that is, the fact that the patent operates as a strong right against *all* infringers almost without exception--is a critical part of this incentive.⁹¹ This has been the patent system's driving policy for over two centuries. What is unknown is whether invention and innovation in the aggregate will be benefitted through a system that allows freedom to operate for a small class of entities that have concluded that, on balance, the burdens of the patent system outweigh its benefits. As one economist has stated, "to the extent that firms' attention and resources are, at the margin, diverted from innovation itself towards the acquisition, defense and assertion against others of property rights, the social

⁸⁶ *Id.*

⁸⁷ See generally Roger L. Dominowski and Lyle E. Bourne Jr., *History of Research on Thinking and Problem Solving* in THINKING AND PROBLEM SOLVING 1, 23 (Richard J. Sternberg, ed. 1994).

⁸⁸ See Thomas Nickles, *Questioning and Problems in Philosophy of Science: Problem-Solving versus Directly Truth-Seeking Epistemologies* in QUESTIONS AND QUESTIONING 43, 54 (Michel Myer, ed. 1988) (defining problems as a series of constraints coupled with a demand for a solution).

⁸⁹ See generally Thomas S. Kuhn, *THE STRUCTURE OF SCIENTIFIC REVOLUTIONS* (3rd ed. 1996).

⁹⁰ See Thomas V. Busse and Richard S. Mansfield, *Theories of the Creative Process: A Review and a Perspective*, 14 J. OF CREATIVE BEHAVIOR 91, 100 (1980) (noting that constraints change over time during the problem-solving process).

⁹¹ See Section V, *infra*, for a discussion of patent law's comprehensive application.

return to the endeavor is likely to fall."⁹²

In 2009, the Berkeley Patent Survey reported, "the technology startup executives responding to our survey report that patents offer relatively mixed to weak incentives to engage in innovation."⁹³ The Berkeley Patent Survey observes that the results are consistent among firms that hold patents, and those that do not.⁹⁴ Another study suggests that this finding applies to large manufacturing companies, finding "patents are unambiguously the least central of the major appropriability mechanisms overall."⁹⁵ In another context, the long-held belief that patents operate effectively to prevent imitation has been questioned.⁹⁶ This is particularly true for startups, which because of their scarce resources may find themselves unable to afford the cost of obtaining and asserting patents.

Although a licensed patent can positively impact the startup's ability to build on technology, some third party patents operate as a negative constraint that deters startup innovation, particularly in industries characterized by multiple foundational patents owned by multiple patent holders.⁹⁷ Some information demonstrates reason for concern. One study reported data that suggests that companies that have higher litigation costs (which tend to be younger companies) tend to avoid research and development in fields in which companies with lower litigation costs (which tend to be larger incumbents) have patented and obtained large awards.⁹⁸ One inference that might be drawn from these findings is that startups are chilled from working in fields occupied by active incumbent patentees. This circumstance threatens to lock technological solutions into the

⁹² Adam B. Jaffee, *The U.S. Patent System in Transition: Policy Innovation and the Innovation Process*, 29 RES. POL'Y, 531, 555 (2000).

⁹³ *Berkeley Patent Survey*, *supra* note 21, at 1285-87. Notably, this survey does not address incentives to invention, and cautions that "further investigation of our findings is warranted." *Id.* at 1285.

⁹⁴ *Id.*

⁹⁵ Wesley M. Cohen, Richard R. Nelson, & John P. Walsh, *Protection Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (or Not)*, NBER WORKING PAPER 7552 (Feb. 2000), available at <http://www.nber.org/papers/w7552>. The *Berkeley Patent Survey* found that there were significant differences among the respondents from different industries. *Berkeley Patent Survey*, *supra* note 21, at 1286 (generally, biotechnology firms reported that patents served as a "moderate" incentive to innovate, which software firms found that patents "generally provide at least 'slight' incentives." *Id.*; see also Cohen *supra* note 95 at 12 (reporting similar distinctions).

⁹⁶ Edwin Mansfield, *R&D and Innovation: Some Empirical Findings in R&D, PATENTS & PRODUCTIVITY*, 127, 143 (Zvi Griliches ed., 1984) ("In our sample, about 60 percent [of innovations] were imitated within four years after their initial introduction").

⁹⁷ Cf. FEDERAL TRADE COMMISSION, TO PROMOTE INNOVATION: THE PROPER BALANCE OF COMPETITION AND PATENT LAW AND POLICY, 50 (Oct. 2003).

⁹⁸ Josh Lerner, *Patenting in the Shadow of Competitors*, 38 JOURNAL OF LAW AND ECONOMICS 463 (1995).

hands of the first entities that develop solutions, rather than encouraging subsequent research and development by others.

One source identifies that patent assertion by non-practicing entities is particularly problematic. Specifically, Professor Chien's survey of small companies reported that forty percent that received a patent demand from a non-practicing entity reported a "significant operational impact" in the form of either "delayed hiring or achievement of another milestone, change in the product, a pivot in business strategy, a shut-down business line or the entire business, and/or lost valuation."⁹⁹ This finding underscores that a significant percentage of small entities are obstructed in their efforts to innovate.

In an ideal world, the legal system's impact on creativity should be no greater than necessary to accomplish the law's goals. Yet some of the cited literature suggests that certain weaknesses in the patent system are being exploited to the detriment of future innovation. With some notable exceptions, many high-technology companies that developed key technologies had very few patents during their earliest years.¹⁰⁰

The experience of some companies demonstrates that patents are not vital in a company's early years to achieve success. During its first decade, Cisco Systems grew into a billion dollar company and had filed for only one patent.¹⁰¹ Significantly, according to one insider, "This growth was obviously not fuelled by patents, it was fuelled by competition and by open, nonproprietary interfaces."¹⁰² During its second decade, Cisco began to gradually increase its filings.¹⁰³ By 2006, Cisco held over 2,500 issued US patents and had applied for over 4,000 more.¹⁰⁴ Cisco engaged in this activity to establish a defensive patent portfolio.¹⁰⁵

⁹⁹ Colleen Chien, *Startups and Patent Trolls*, 17 STAN. TECH. L. REV. 461, 465 (2014).

¹⁰⁰ See generally KEVIN G. RIVETTE AND DAVID KLINE, REMBRANDTS IN THE ATTIC, 39-41 (Harvard Bus. School Press 2000) (with some exceptions that included Apple and National Semiconductor, noting "Silicon Valley's early antipathy toward patents").

¹⁰¹ *Competition And Intellectual Property Law and Policy in the Knowledge-Based Economy: Joint Hearings before the Fed. Trade Comm'n & Dep't of Justice*, 674 (Feb. 28, 2002) (statement of Robert Barr, Vice President for IP and Worldwide Patent Counsel, Cisco Systems, Inc.), available at <http://www.ftc.gov/opp/intellect/020228ftc.pdf> (noting that from 1984 through 1993, Cisco Systems had filed for only one patent and, by 1994, had over \$1 billion in revenue annually.).

¹⁰² *Id.* at 674.

¹⁰³ *Id.* (testimony of Cisco's Robert Barr, describing that Cisco's patent applications had gradually increased over the years to 2002, when it was targeted to file 750 patents per year).

¹⁰⁴ *Perspectives on Patents: Post-Grant Review Procedures and Other Litigation Reforms*, HEARING

BEFORE THE SUBCOMM. ON INTELLECTUAL PROPERTY OF THE S. COMM. ON THE JUDICIARY, 109TH CONG., (May 23, 2006) (Testimony of Mark Chandler, Senior Vice President and General Counsel, Cisco Systems) available at http://www.cisco.com/web/about/gov/docs/Cisco-Mark_Chandler_Patent_Testimony-May_2006.pdf.

Similar to Cisco, Microsoft had very few patents during its first decade and a half.¹⁰⁶ In 1991, the company reached a turning point. In that year, its founder Bill Gates recognized that the power of patents, noting that if patents had been sought on the fundamental building blocks of software when those concepts were first invented, “the industry would be at a standstill today.”¹⁰⁷ Nonetheless, Gates stated his concern that patents gave others the “right to take as much of our profits as they want,” and then directed that the solution was “patenting as much as we can.”¹⁰⁸ Today, Microsoft’s Patent Tracker shows that the company owns over 46,000 issued patents worldwide.¹⁰⁹

Facebook, which launched in 2004, had very few patents as of October 2008.¹¹⁰ The company owned just 56 patents in early 2012.¹¹¹ By the end of March of that year, the company acquired roughly 750 more from IBM.¹¹² Over the next month, Facebook purchased an additional 785 patents and applications from Microsoft that included rights to patents that had originally derived from AOL.¹¹³ Facebook made acquisitions from other sources as well, including the patent portfolio of Friendster that “date back to the early days of social networking, are incredibly broad.”¹¹⁴

¹⁰⁵ *Competition And Intellectual Property Law and Policy in the Knowledge-Based Economy: Joint Hearings before the Fed. Trade Comm’n & Dep’t of Justice*, 674 (Feb. 28, 2002) (statement of Robert Barr, Vice President for IP and Worldwide Patent Counsel, Cisco Systems, Inc.), available at <http://www.ftc.gov/opp/intellect/020228ftc.pdf> (By 1994, Cisco hired patent counsel “to start a program to obtain more patents. . . defensive purposes, to have something to offer in cross-licenses with older companies who have large patent portfolios and use them to obtain revenue and design freedom through licensing.”).

¹⁰⁶ Timothy B. Lee, *Analysis: Microsoft’s Software Patent Flip-flop*, ARS TECHNICA (3/13/07), <http://arstechnica.com/business/2007/03/analysis-microsofts-software-patent-flip-flop/> (“Microsoft’s first software patent was granted in 1988, and the company held only three software patents by its 15th anniversary in 1990”).

¹⁰⁷ Bill Gates, *Challenges and Strategy Memo* (5/16/1991) (Comes v. Microsoft, 05-CV-562, S.D. Iowa, Ex.738) (on file with author).

¹⁰⁸ *Id.*

¹⁰⁹ Microsoft Patent Tracker, <http://www.microsoft.com/en-us/legal/intellectualproperty/Patents/> (visited 7/27/14).

¹¹⁰ See Eric Eldon, *Facebook Awarded 1 of Its 35 Patent Applications—Significance Unclear*, INSIDE FACEBOOK (2/26/10), <http://www.insidefacebook.com/2010/02/26/facebook-awarded-1-of-its-35-patent-applications-significance-unclear/> (discussing published applications); Bill Slawski, *Facebook Patent Filings (updated)*, SEO BY THE SEA, (1/24/10), <http://www.seobythesea.com/2010/01/facebook-patent-filings/>.

¹¹¹ Josh Lowensohn, *Facebook Shores Up Defenses, Taps IBM for Patents*, CNET.COM (3/22/12), http://news.cnet.com/8301-13578_3-57402673-38/facebook-shores-up-defenses-taps-ibm-for-patents/ (In early 2012, “Facebook has 56 issued patents under its belt, and 503 that have been filed with the U.S. Patent and Trademark Office”).

¹¹² *Id.*

¹¹³ Facebook, Annual Report (Rule 10-K)(4/23/2012) at 73.

¹¹⁴ Liz Gannes, *Facebook Buys Friendster Patents for \$40M*, GIGAMON (8/4/10), <http://gigaom.com/2010/08/04/facebook-buys-friendster-patents-for-40m/>; see also Leonid

Cisco, Microsoft, and Facebook present examples of companies the significantly increased patent holdings years after commercial success. These are not isolated occurrences.¹¹⁵ In these instances, path breaking innovation was accomplished without any significant protection from patents. Indeed, as Gates acknowledged, in the early days of these industries patents had the potential to impede the entire field's path to diverse and complimentary solutions. Further, each company's acquisition of patents--through either original research or purchase-- appears to have been motivated to acquire a defensive portfolio. If these companies, each of which experienced major creative and commercial success, are any guides then patents may not be functioning well to incentivize technological creativity. Rather, in these cases patents appear to have taken on a secondary role as a protective asset.

One source suggests reasons that certain fields demonstrate increased creativity in the aggregate from the minimal assertion of intellectual property rights.¹¹⁶ Citing the early development of the software industry, Professors Bessen and Maskin argue that the industries that benefit most from this circumstance experience technological growth in a manner characterized by two essential features.¹¹⁷ The first feature is that the development of products is sequential, meaning that each successive invention builds on the preceding one; and second development is complementary, meaning that each potential innovator creates a differentiated approach to the product's design.¹¹⁸ In such instances, they conclude, "[i]mitation becomes a *spur* to innovation, whereas strong patents become an *impediment*."¹¹⁹ These scholars make a compelling case. Still, nearly all forms of technological fields are characterized by sequential innovation and differentiated product development.¹²⁰ The results from the experiment may prove

Kravets, *Facebook's Patent Acquisitions? They're More About Google Than Yahoo*, TECH CRUNCH (4/27/12), <http://techcrunch.com/2012/04/27/facebook-google-patents/> (stating "The company paid 40 million for the Friendster social networking patent portfolio, acquired a group of patents from Walker Digital, and another from Hewlett-Packard.").

¹¹⁵ See Mark A. Lemley, *Patenting Nanotechnology*, 58 STAN. L. REV. 601, 606 (2005) (inventions within these fields were either unpatented, through mistake or because they were created by government or university scientists with no interest in patents, or the patents presented no obstacle because the government compelled licensing of the patents, or they were ultimately invalidated"); see also Peter S. Menell, *Governance of Intellectual Resources and Disintegration of Intellectual Property in the Digital Age*, 26 BERK. TECH. L.J. 1523, 1538-38 (2011) (observing that the "software industry developed in the 1960's, 1970's, and 1980's without any significant role for patent protection").

¹¹⁶ James Bessen and Eric Maskin, SEQUENTIAL INNOVATION, PATENTS, AND IMITATION, 40 RAND J. OF ECON. 611 (2009).

¹¹⁷ *Id.* at 612.

¹¹⁸ *Id.* at 612.

¹¹⁹ *Id.* at 613.

¹²⁰ One exception to this statement is the pharmaceutical industry. Because the regulatory system provides a faster, less expensive market approval process through the abbreviated new drug application procedure, generics do not create substantively differentiated products.

to be more profound, with implications for all technological fields. It is not clear whether the software industry's development is characterized by alternative features, such as low barriers to entry or a short development cycle, that when unimpeded by patents allows for quick growth. Data gathered from an anti-patent program could be used to identify such features.

A key question is whether “the enforcement process undermines the R&D incentives of small firms.”¹²¹ As explored in later sections, any startup that engages in experimentation and innovation is subject to the patent claims of others. The question of whether, on balance, entrepreneurial firms operate more productively outside of the patent system has not been considered consistent with technological progress in a modern first world economy. The point of this proposal is to permit startups to self-select out of the patent system, to determine whether to obtain freedom to operate in a manner that is not currently possible. In turn, the results of the startup's work would inure to the public domain. Those who determine that an anti-patent is their preferred strategy would rely on non-patent mechanisms to differentiate their goods and services, and the public would obtain the benefit of their work without the burden that a patent provides. Additionally, the anti-patent system would be set up to permit researchers to obtain information about the results of the operation of these entities.

B. Components of Creative Endeavors

Patents are intended to incentivize the creation of useful, novel, nonobvious inventions.¹²² Invention is the result of a combination of factors, including technological creativity.¹²³ All technological progress is built on pre-existing knowledge.¹²⁴ As one economist points out, “no respectable scientist would fail to recognize and acknowledge the crucial role played by his or her predecessors in establishing a foundation from which progress could be made.”¹²⁵

¹²¹ Jean O. Janjouw & Mark Schankerman, *Protecting Intellectual Property Rights: Are Small Firms Handicapped?*, 47 JOURNAL OF LAW AND ECON. 45, 48 (2004).

¹²² See *Mayo Collaborative Services v. Prometheus Laboratories, Inc.*, 132 S.Ct. 1289, 1305 (2012). (“[T]he promise of exclusive rights provides monetary incentives that lead to creation, invention, and discovery.”).

¹²³ See *KSR Intern. Co. v. Teleflex Inc.*, 550 U.S. 398, 427 (2007). “We build and create by bringing to the tangible and palpable reality around us new works based on instinct, simple logic, ordinary inferences, extraordinary ideas, and sometimes even genius.”).

¹²⁴ See e.g., David Henry Feldman, *Creativity: Dreams, Insights, and Transformations*, in THE NATURE OF CREATIVITY, 271, 289 (Robert J. Sternberg, ed. 1988) (prior work “reduce[s] the ‘mental distance’ one has to go to be able to make meaningful change”).

¹²⁵ Carl Shapiro, *Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard Setting*, in INNOVATION POLICY AND THE ECONOMY, VOLUME 1 (Adam B. Jaffe, Josh Lerner and Scott Stern, eds. 2001).

There is widespread agreement that the creation of new ideas depends on the mind's processing of information that has already been learned. To solve a problem, an inventor considers alternatives after realizing that after that older solutions do not provide satisfactory answers.¹²⁶ The results may be either a radical modification of a past solution or an entirely new structure based on profoundly original re-interpretations of existing information.¹²⁷ Just as one cannot create something from nothing, a creator must use pre-existing knowledge to build creative, plausible, and useful solutions. As one source describes, "[t]he skillful manipulation of ideas, of course, is precisely the job of working memory."¹²⁸ As one psychologist explained, creativity "is at once the most individual and most social development process of all, because it depends directly on the efforts of others to provide the material that makes possible a new idea."¹²⁹

This principle that inventions are built on multiple informational inputs encompasses more than patent law's notion of combination claims, which are "new combinations of old elements or combinations of new and old elements."¹³⁰ To illustrate using a simplified example, assume that a patent claim includes three elements all of which existed in the prior art of the time: 1) a glass globe; 2) a filament capable of producing light; and 3) a mechanism which connects the filaments to electricity. In patent law parlance, this claim is a *combination* claim because it contains prior art elements are previously existent before Edison combined them in a nonobvious way. Other types of patent claims are *partial combination* claims--that is, these claims include some old components together with one or more entirely new components. For example, the inventors of the Nest thermostat combined heat sensing and setting features of pre-existing HVAC system and added new features that did not previously exist to enable the device to learn from various data inputs.

Patent claims incorporate not only preexisting components, but also previously existing *information*. Such information forms the building blocks of both the pre-existing and novel components of a claim. This information from one's memory, whether formerly or recently learned, is used as the raw material

¹²⁶ Larry R. Vendervert, Paul H. Schimpf, and Heshing Liu, *How Working Memory and the Cerebellum Collaborate to Produce Creativity and Innovation*, 19 CREATIVITY RES. J., 1, 3 (2007); Masao Ito, *Control of Mental Activities by Internal Models in the Cerebellum*, 9 NATURE 304, 308 (April 2008); RONALD A. FINKE, THOMAS B. WARD, AND STEVEN M. SMITH, CREATIVE COGNITION: THEORY RESEARCH, AND APPLICATIONS, 150-51 (1992).

¹²⁷ *Id.* at 164.

¹²⁸ Vendervert, et al., *supra* note 126 at 5; N. Cowan, *Embedded-processes Model of Working Memory*, in A. MIYAKE, P. SHAH (EDS.), MODELS OF WORKING MEMORY: MECHANISMS OF ACTIVE MAINTENANCE AND EXECUTIVE CONTROL, 62 (1999).

¹²⁹ D.H. Feldman, *Dreams, Insights, and Transformations*, in THE NATURE OF CREATIVITY, 271, 294 (Robert J. Sternberg, ed. 1988).

¹³⁰ *Clearstream Wastewater Systems, Inc. v. Hydro-Action, Inc.*, 206 F.3d 1440, 1445 (Fed. Cir. 2000).

necessary to generate possible solutions and to test their usefulness.¹³¹ As a hypothetical example, the "learning" aspect of a Nest device can be considered its novel *components*. Yet these novel components are based on some pre-existing *information*-- specifically, that future temperature preferences can be based on the occupant's past preferences, the season, and the anticipated times that the occupants are most likely to be home.¹³² That information was the foundation of the previously existing programmable thermostats sold in the past.

This point becomes important in understanding the reasons why even the most revolutionary startup can benefit from patent immunity. Pre-existing information that underlies new innovations derives from a wide variety of sources. These sources include the public domain, including theory and background information about the relevant technology.¹³³ It is likely that Edison used general knowledge about glass and electricity to create the bulb that would have been freely available for his use. The Nest thermostat uses information about Wi-Fi connected devices, the methods of programming predictive algorithms, and information about the manner in which various HVAC systems operate. All types of factual information, theories, and scientific laws are excluded from intellectual property protection.¹³⁴ Even if that information is developed by painstaking and expensive research performed by an inventor in preparation for the creation of an invention, such basic scientific principles and information are "free to all men and reserved exclusively to none."¹³⁵

New solutions can incorporate public domain information that was once claimed in patents that have now expired, or for which patent protection was never sought. Not all patentable information is, in fact, patented. Firms decline to patent in favor of keeping certain inventions secret, or have determined that some are not worth the financial cost of patenting. As one example, in 1976 General Electric engineers invented the compact fluorescent bulb in 1976, the spiral-shaped bulb that is now widely sold as an energy-saving device.¹³⁶ When first

¹³¹ *Id.* at 164.

¹³² *See generally* U.S. Patent No. US 8,510,255 (filed 9/14/10) (describing the informational inputs used by the Nest device to predict temperature preferences).

¹³³ *See, e.g.,* MIHALY CSIKSZENTMIHALYI, CREATIVITY: FLOW AND THE PSYCHOLOGY OF DISCOVERY AND INVENTION, 90 (1997).

¹³⁴ *See Mayo Collaborative Services v. Prometheus Laboratories, Inc.*, 132 S.Ct. 1289, 1297 (2012)(abstract principles are excluded from patent protection, as well as well-known methods for applying those principles); *Bilski v. Kappos*, 561 U.S. 593, 130 S.Ct. 3218, 3225 (2010)(observing that abstract ideas are "part of the storehouse of knowledge of all men ... free to all men and reserved exclusively to none.")(quoting *Funk Brothers Seed Co. v. Kalo Inoculant Co.*, 333 U.S. 127, 130, 68 S.Ct. 440, 92 L.Ed. 588 (1948)); *see also* Feist Publications, Inc. v. Rural Telephone Service Co., Inc., 499 U.S. 340 (1991)(facts are not copyrightable).

¹³⁵ *Funk Brothers Seed Co. v. Kalo Inoculant Co.*, 333 U.S. 127, 130 (1948)

¹³⁶ This invention has been credited to an engineer named Edward Hammer. *Compact Fluorescent: The Challenge of Manufacturing*, NAT'L MUSEUM OF AM. HISTORY, <http://americanhistory.si.edu/lighting/20thcent/invent20.htm#in4>.

invented, the company decided that commercialization of the spiral-shaped bulbs was cost prohibitive, and so shelved the project without filing for patent protection.¹³⁷ In other instances, companies rely on alternative mechanisms, including first-to-market advantages, sales and service efforts, or a faster move up the learning curve, to establish leadership rather than patents.¹³⁸ Moreover, a significant share of startups cannot afford to patent.¹³⁹ One study found that only ten percent (10%) of approximately 3,000 identified major advances in various fields had been patented.¹⁴⁰ Although the results of this study cannot readily be generalized to all types of research and development, this data underscores that many valuable solutions are in the public domain.

Some information protected by another's patent right might be used in new inventions. This is a function of the sequential nature of improvement.¹⁴¹ This does not warrant the inference that another's idea has been copied wholesale. Many later inventions improve, add to, or vary another's patented solution.¹⁴² Others may be independently created at nearly the same time.¹⁴³

It may seem curious to assert that *information* can be considered problematic to startups because it is subject to patent protection, because abstract ideas are unpatentable.¹⁴⁴ Yet patent law does protect particular *kinds* of information--specifically, information that represents a concrete solution to a problem. As the U.S. Supreme Court has explained:

At some level, all inventions ... embody, use, reflect,

¹³⁷ Ed Hammer, *More CFL History*, DROP-THE-HAMMER.COM (3/31/08)(podcast interview of inventor).

¹³⁸ See generally Richard C. Levin, et al., *Appropriating Returns from Industrial Research and Development*, 3 BROOKINGS PAPERS ON ECONOMIC ACTIVITY 783, 795 (1987) (in a survey of corporations, finding that "Generally, lead time, learning curves, and sales or service efforts were regarded as substantially more effective than patents in protecting products").

¹³⁹ *Berkeley Patent Survey*, *supra* note 21, at 1310.

¹⁴⁰ Roberto Fontana, et al., *Reassessing Patent Propensity: Evidence from a Data Set of R&D Awards: 1977-2004*, 42 RES. POL'Y 1780 (2013).

¹⁴¹ Cf. James Bessen and Eric Maskin, *Sequential Innovation, Patents, and Imitation*, 40 RAND J. OF ECON., 611, 612 (2009)(defining "sequential" as "each successive invention builds on the preceding one, in the way that the Lotus 1-2-3 spreadsheet built on VisiCalc, and Microsoft's Excel built on

Lotus."); KSR Intern. Co. v. Teleflex Inc., 550 U.S. 398, 427 (2007)(observing that inventions from the past "define a new threshold from which innovation starts once more").

¹⁴² Bessen & Maskin, *supra* note 102, at 613 (discussing differentiated sequential improvements).

¹⁴³ Mark A. Lemley, *The Myth of the Sole Inventor*, 110 MICH. L. REV. 709 (2012) (providing numerous examples); Amy L. Landers, *Ordinary Creativity in Patent Law: The Artist Within the Scientist*, 75 MISSOURI LAW REVIEW, 1, 62-65 (2010)(surveying literature outlining theories and documenting instances of multiple, near-simultaneous invention).

¹⁴⁴ See *Mayo Collaborative Services v. Prometheus Laboratories, Inc.*, 132 S.Ct. 1289, 1297 (2012).

rest upon, or apply laws of nature, natural phenomena, or abstract ideas. Thus, an invention is not rendered ineligible for patent simply because it involves an abstract concept. Applications of such concepts to a new and useful end, we have said, remain eligible for patent protection.¹⁴⁵

Separately, some patent claims are sufficiently amorphous to encompass concepts that are broadly applicable to numerous implementations. For example, Honeywell asserted a patent against the Nest thermostat device that claimed a method for controlling temperature inside a building or home which included two steps--first, "establishing communication with the environmental control system from a utility remote from the user's facility/home/building;" and second, "sending one or more setpoint commands from the utility" to be used by an environmental control system within the building or home.¹⁴⁶ Honeywell's patent does not describe the methods used by the Nest thermostat. However, under patent law, doing so is not required. The law allows broad claims to reach multiple, distinct implementations that were never contemplated by the original inventor. In that sense, Honeywell's claims to remote HVAC control, whether wireless or through a Wi-Fi enabled device, serve as an informational input into Nest's device and form a foundation of Honeywell's infringement assertion against Nest. Indeed, Nest must expend considerable resources to defend against Honeywells' claims even if they are invalid.

Further, Nest must fight the lawsuit even if it had no awareness of Honeywell's asserted patent. Most invention occurs independently of any knowledge that another holds a patent on the same information.¹⁴⁷ As one long-time venture capitalist in the software industry described:

I have never been a party to a discussion about ignoring someone's intellectual property rights for the sake of market share or to free up expansion capital. . . . [T]he companies I work with invest a huge amount of time and energy creating a service from scratch only to find after they have launched and become successful that a patent holder they

¹⁴⁵ *Alice Corp. Pty. Ltd. v. CLS Bank Int'l*, 134 S. Ct. 2347, 2354 (2014)(quotations and citations omitted).

¹⁴⁶ US Patent No. 6,975,958 (filed 4/30/03).

¹⁴⁷ Christopher Anthony Cotropia & Mark A. Lemley, *Copying in Patent Law*, 87 N.C. L. REV. 1421, 1459 (2009) (reporting results of a study that finds that, particularly outside the pharmaceutical industry, "the overwhelming majority of those in which the plaintiffs win and claim that the defendant was a willful infringer--involve not theft or even copying with a legitimate effort to design around but independent development by the defendant.").

have never heard of, operating (if they operate at all) in an entirely different market claims that our company has stolen their property.¹⁴⁸

Because patent infringement is a strict liability cause of action, an inventor that unknowingly incorporates another's claim into her invention is liable.¹⁴⁹ In theory, she has some options. She can modify the design to avoid the patent, she can attempt to license the patent, or she can ignore the patent and risk litigation. In practice, these are remarkably difficult to do.

V. Patent Lock-In: Standing on the Shoulders of Plaintiffs

The U.S. patent system has changed significantly since it was originally created in 1790. Although the essential structure of the law's incentive system and fundamental requirements has consistently endured, the manner in which the rights are acquired, owned, used, transferred and asserted has significantly shifted. Relevant here, the numbers of patents issued has risen significantly since the 1980's.¹⁵⁰ The reasons for that rise have been the subject of conflicting theories and conclusions. One theory asserts that research activity has shifted from basic toward applied research, and that the rise is consistent with a burst of activity directed toward innovation.¹⁵¹ Based on a study of the semiconductor industry, which experienced the most dramatic increase, an alternative study concluded that the primary reason for the increase was based on large-scale manufacturers "visibly 'ramping up' their patent portfolios and 'harvesting' latent inventions to add to their stock."¹⁵² Such patents could be used to defend against a charge of patent infringement, or in trade for a cross-license to obtain freedom to operate. To some degree, those engaged in growing a defensive portfolio cited Texas Instrument's assertion of semiconductor patents during the mid-1980's as instructive to the industry as a whole. According to this source:

Although the original suits were against non-U.S.

¹⁴⁸ Burnham, *supra* note 39.

¹⁴⁹ Intel Corp. v. U.S. Int'l Trade Comm'n, 946 F.2d 821, 832 (Fed. Cir. 1991).

¹⁵⁰ See, e.g., PRICEWATERHOUSECOOPERS, 2013 PATENT LITIGATION SURVEY, 6 (2014). Samuel Kortum & Josh Lerner, *Stronger Protection or Technological Revolution: What Is Behind the Recent Surge in Patenting?* NAT'L BUREAU OF ECON. RES. WORKING PAPER 6204 (Sept. 1997)(observing an unprecedented recent jump in patenting in the United States).

¹⁵¹ Samuel Kortum & Josh Lerner, *Stronger Protection or Technological Revolution: What Is Behind the Recent Surge in Patenting?* NAT'L BUREAU OF ECON. RES. WORKING PAPER 6204, 33 (Sept. 1997)(observing an unprecedented recent jump in patenting in the United States).

¹⁵² Bronwyn H. Hall & Rosemarie Ham Ziedonis, *The Patent Paradox Revisited: An Empirical Study of Patenting in the U.S. Semiconductor Industry, 1979-1995*, 32 THE RAND J. OF ECON. 101, 108 (2001).

firms, TI's successful enforcement of its patents enabled the firm to charge higher royalty rates to other firms in the industry. Indeed, interviewees were well aware of the strategies that Texas Instruments had put in place to manage-and profit from-its patent portfolio; representatives from several firms plan to adopt a similarly aggressive licensing strategy once their portfolios grow larger.¹⁵³

Another study finds that firms, despite acknowledging that patents are not effective tools to create exclusivity, are patenting to obtain rights that can be strategically useful. Some include blocking rivals from patenting related inventions, using patents to gain low-cost access to another's technology in negotiations and to protect against patent suits.¹⁵⁴ This study recognized that some firms were using "patent portfolios to garner licensing revenue."¹⁵⁵ Its authors conclude, "our findings suggest that patents are still not the major mechanism for appropriating returns to innovations in most industries."¹⁵⁶

In addition to the escalating numbers of patents issued, the number of patent infringement lawsuits has ramped up over the past several years.¹⁵⁷ Some have documented that an increasingly large component of those suits in recent years is brought by non-practicing entities.¹⁵⁸ According to one study of patent cases filed from 2007 through 2012, "[o]f the ten parties who filed the greatest number of patent litigations in the years . . . studied, all were patent monetization entities."¹⁵⁹ These entities have been active asserting patents against small companies. According to one study of 233 technology startups, 79 have been approached with the threat of a patent monetization lawsuit.¹⁶⁰

Generally, patent infringement allegations impose significant transaction costs on participants. The financial cost ranges from \$500,000 up to several

¹⁵³ *Id.* at 109.

¹⁵⁴ Cohen, *supra* note 95.

¹⁵⁵ *Id.* at 27.

¹⁵⁶ *Id.* at 24.

¹⁵⁷ PRICEWATERHOUSECOOPERS, 2013 PATENT LITIGATION SURVEY, 6 (2014)(charting cases filed since 1991); Owen Byrd & Brian Howard, LEX MACHINA 2013 PATENT LITIGATION YEAR IN REVIEW, 1 (2014) (charting cases filed since 2005).

¹⁵⁸ Robin Feldman, Tom Ewing & Sara Jeruss, *The AIA 500 Expanded: The Effects of Patent Monetization Entities*, UCLA J. OF L. & TECH., 1, 7 (2013)(finding that in 2012 "patent monetization entities represented a majority of the patent litigation filed in the United States").

¹⁵⁹ *Id.* at 7.

¹⁶⁰ Chien, *supra* note 99, at 470.

million dollars per case.¹⁶¹ Allegations of patent infringement are not susceptible to quick dismissals. Imprecise claim boundaries can generate infringement arguments on either side of the equations, as with many patent claims “any competent lawyer could make a case that any complex [product] was potentially infringing hundreds of patents, or that it was not.”¹⁶² Moreover, the financial impact of patent litigation hits harder on small firms, because such organizations tend to be more thinly funded and lack in-house counsel to absorb the work inherent in litigating such complex cases.¹⁶³

This cost imposes significant burdens on small companies. Smaller firms avoid research and development in areas where a threat of a patent lawsuit from a larger firm exists.¹⁶⁴ These circumstances can lead to reduced competition and consumer choice.¹⁶⁵ Small firms suffer additional disadvantages in patent litigation when compared to larger, more established firms.¹⁶⁶ Because such firms typically own few patents, early settlement of the allegations through a non-monetary cross-license is not an option in many cases.¹⁶⁷ Additionally, small firms rarely have a large portfolio of patents to assert against others, reducing the possibility that such firms can be used to lay a foundation for settlement and cooperation.¹⁶⁸ According to the Chien survey, the “significant operation impact” falls hardest on smaller entities--that is, “the smaller the company, the more likely it was to report a significant operational impact,” and “small companies [are] targeted more as unique defendants, and paying more in time, money and operational impact, relative to their size, than large firms.”¹⁶⁹

This same study recognized startups cannot raise funds to fight a patent lawsuit, and that some small firms “can go out of business over these kinds of suits.”¹⁷⁰ One interviewee noted that the company’s founder had “lost his house, car [and] all his assets.”¹⁷¹ Another observed that patentees have an incentive to assert patents against small entities, because such entities are more likely to settle

¹⁶¹ AMERICAN INTELLECTUAL PROPERTY LAW ASSOCIATION, REPORT OF THE ECONOMIC SURVEY, I-133 - I-160 (2013).

¹⁶² James Boyle, *Open Source Innovation, Patent Injunctions, And The Public Interest*, 11 DUKE L. & TECH. REV. 30, 62 (2012).

¹⁶³ Josh Lerner, *Patenting in the Shadow of Competitors*, 38 JOURNAL OF LAW & ECON. 463, 475-76 (1995).

¹⁶⁴ Jean O. Lanjouw & Mark Schankerman, *Protecting Intellectual Property Rights: Are Small Firms Handicapped?*, 47 J. L. AND ECON. 45, 48-49 (2004); see also Josh Lerner, *Patenting in the Shadow of Competitors*, 38 J. L. & ECON. 463, 465-66 (1995).

¹⁶⁵ See Michael Waterson, *The Economics of Product Patents*, 80 THE AMERICAN ECONOMIC REVIEW 860, 867 (1990).

¹⁶⁶ See Lanjouw and Schankerman, *supra* note 164 at 47.

¹⁶⁷ *Id.* at 47.

¹⁶⁸ *Id.* at 47-48.

¹⁶⁹ Chien, *supra* note 99 at 465.

¹⁷⁰ *Id.* at 13 (parenthesis omitted).

¹⁷¹ *Id.* at 14.

for a higher royalty rate to avoid the high transaction costs of patent litigation, to “feed the war chest” for suits against larger players, and to establish a high royalty rate for the patent.¹⁷² One firm acknowledged that it no longer develops products for the U.S. market, due to the risk of patent litigation.¹⁷³

Reports suggest that, even when small companies obtain successful results in court, the cost of such litigation can be lethal. For example, sources report that a small software company, Vlingo, invented successful technology, and was sued by a larger company, Nuance, with a broad patent that was alleged to be infringed by Vlingo’s core product.¹⁷⁴ Vlingo incurred \$3 million dollars in litigation expenses to win a judgment of non-infringement at trial.¹⁷⁵ During the course of this experience, Vlingo “lost [its] partnerships with Apple and Google, and sold [the] company to Nuance in December 2008.”¹⁷⁶ Another source describes microprocessor giant Intel’s patent lawsuits against start-up rival Cyrix.¹⁷⁷ During the four years of litigation, Cyrix had trouble selling to computer makers because “most of them were also customers of Intel and they were reluctant to buy a product that might infringe.”¹⁷⁸ Although Cyrix was ultimately successful in the lawsuit, it “lost the war, having lost much of its competitive advantage” and had “lost the window of opportunity to establish itself in the marketplace.”¹⁷⁹

A. The Difficult Path to Permission: Search

It has been asserted that some startups are sued because they are “simply bona-fide infringers who carelessly failed to conduct the rudimentary patent due-diligence prior to entry.”¹⁸⁰ Yet the difficulty of doing so should not be underestimated. In the majority of technological fields, the uncertainty inherent in the patent system renders accurate evaluation of infringement at the outset of a project impracticable.¹⁸¹ As one data point, one study examined software patent

¹⁷² *Id.* at 15-16.

¹⁷³ *Id.* at 15.

¹⁷⁴ Charles Duhigg and Steve Lohr, *The Patent, Used as a Sword*, THE NEW YORK TIMES (10/7/12), <http://www.nytimes.com/2012/10/08/technology/patent-wars-among-tech-giants-can-stifle-competition.html>.

¹⁷⁵ *Id.*

¹⁷⁶ Peter Cohan, *5 Reasons to Scrap Our Patent System: #1. Apple's Siri*, FORBES.COM (1/8/12), <http://www.forbes.com/sites/petercohan/2012/10/08/5-reasons-to-scrap-our-patent-system-1-apples-siri/>.

¹⁷⁷ BESSEN & MEURER, *supra* note 27 at 133.

¹⁷⁸ *Id.* at 133.

¹⁷⁹ *Id.*

¹⁸⁰ Ron D. Katznelson, Ph.D, *Does the Law of Innovation Work Against Itself?* 6 (7/17/14) (unpublished manuscript available at <http://ssrn.com/abstract=2468193>).

¹⁸¹ See generally Robin Feldman and Tom Ewing, *The Giants Among Us*, 2012 STAN. TECH. L. REV. 1, 24 (“Given the difficulty of translating the abstract language of a patent from one

data and extrapolated that it would require "two million patent attorneys, working full-time, to compare every firm's products with every [software] patent issued in a given year" and that "[a]t a rate of \$100 per hour, that would cost \$400 billion."¹⁸² Because of the uncertainty of claim construction, a final analysis of even a single patent claim cannot be performed with absolute certainty. Rather, whether a new product incorporates another's invention is rarely ascertainable until trial and appeal are complete, with the attendant that ranges up to over a million dollars.¹⁸³ This is because patent claims lack the necessary clarity for authoritative guidance.¹⁸⁴ Unlike a deed of land, patent claims are drafted using language to attempt to capture new concepts and sometimes "the nature of language makes it impossible to capture the essence of a thing in a patent application."¹⁸⁵ Virtually every infringement occurs because the meaning of patent claims are "inherently indeterminate" and "patent attorneys seize on such indeterminacy to excuse infringement or to expand their client's exclusive rights."¹⁸⁶ Where the stakes are high for either party, the claim text is parsed, or then the court's interpretation of the terms are re-parsed, until a court of appeals determines the issue on review.¹⁸⁷

Unlike real property rights, patent claims capture intangible rights that have proven difficult to ascertain with any certainty.¹⁸⁸ It can be impossible to ascertain whether a particular implementation is infringing until after trial and appeal.¹⁸⁹ As one source concludes, "claim construction may be inherently indeterminate: it may simply be impossible to cleanly map words to things."¹⁹⁰ Under these circumstances, a startup cannot ascertain whether a license is necessary without undertaking the substantial expense, disruption and delay of

context to another, the lack of predictability in patent decisions, and other uncertainties in patent law" validity and infringement are difficult to predict). Pre-trial clearance is particularly problematic outside the chemical and pharmaceutical industry.

¹⁸² Christina Mulligan & Timothy B. Lee, *Scaling the Patent System*, NYU ANNUAL SURVEY OF AMERICAN LAW (forthcoming), (3/6/12)(unpublished manuscript available at <http://ssrn.com/abstract=2016968>).

¹⁸³ Kimberly A. Moore, *Are District Court Judges Equipped to Resolve Patent Cases?*, 12 FED. CIRCUIT B.J. 1-2 & n.4 (2002) (outlining the complexity and expense of obtaining definitive rulings in patent cases).

¹⁸⁴ Harry Surde, *Efficient Uncertainty In Patent Interpretation*, 68 WASH. & LEE L. REV. 1737, 1751 (2011) ("In other words, the legally authoritative meanings of most of the words of the claim are not definitively knowable *ex ante*, but rather, exist in a probabilistic range of possible scopes.").

¹⁸⁵ Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co., 535 U.S. 722, 731 (2002).

¹⁸⁶ Dan L. Burk and Mark A. Lemley, *Fence Posts Or Sign Posts? Rethinking Patent Claim Construction?*, 157 U. PA. L. REV. 1743, 1745 (2009).

¹⁸⁷ *Id.* at 1751-522 (noting the high reversal rates of patent claim construction determinations by the district court).

¹⁸⁸ *Id.* at 1744 (2009)("Patent law has provided none of the certainty associated with the definition of boundaries in real property law."); BESSEN & MEURER, *supra* note 27 at 20-21.

¹⁸⁹ See Burk, *supra* note 186 at 1745.

¹⁹⁰ *Id.* at 1745.

litigation. The problem is particularly acute in all technology sectors, with the exception of claims that disclose a particular chemical or genetic structure.¹⁹¹ A startup that is developing and planning technological innovation faces a task fraught with risk. This circumstance introduces uncertainty, the potential for large cash expenditures and the potential for a shut down injunction after a product launch.¹⁹²

In addition to the indeterminacy of patent claims, the transaction costs associated to meaningfully searching out any potentially problematic claims is prohibitive for patents in most fields outside the pharmaceutical and chemical patentable subject areas.¹⁹³ Software is particularly problematic.¹⁹⁴ Further, if any potentially relevant patents are identified, the innovator must analyze its validity, which is performed by analyzing all potentially relevant claims in light of the prior art. A comprehensive search of the prior art can add considerably to the expense.¹⁹⁵ As one scholar observed, "it's a wonder companies make products in patent-intensive industries at all."¹⁹⁶

One entrepreneur in the software industry is reported to have had this experience:

I ignored my lawyer's advice not to do a patent search to avoid subjecting myself the possibility of treble damages for willful infringement. I hired several firms to search for patents that our service might infringe. Each of them came back with completely different patents and each time I sent them back to do it again, they came back with still more different patents. When I searched myself in the patent database, each time I entered the same search query, it would return different results. None of these patents seemed to cover what we did, so I eventually gave up.¹⁹⁷

¹⁹¹ *Id.* at 1760; BESSEN & MEURER, *supra* note 27 at 71 (noting that the problems of ascertaining patent rights in the information technology sector are acute).

¹⁹² Cf. Peter S. Menell & Michael J. Meurer, *Notice Failure and Notice Externalities*, J. OF LEGAL ANALYSIS, 1, 18 (2013) (noting the difficulty that the notice failure presented by intangible rights complicates resource planning and development).

¹⁹³ See Christina Mulligan and Timothy B. Lee, *Scaling the Patent System*, NYU ANNUAL SURVEY OF AM. L., 289, 297 (2012).

¹⁹⁴ MENELL & MEURER, *supra* note 192, at 20 ("Software, for example, is notoriously amorphous, whereas chemistry has the Periodic Table to guide cataloging of knowledge."); See also BESSEN & MEURER, *supra* note 17 at 152 (uncertain boundaries of patent claims are prevalent in for software, business methods and biotechnology).

¹⁹⁵ 35 U.S.C. § 102.

¹⁹⁶ Mark Lemley, *Ignoring Patents*, 2008 MICH. ST. L. REV. 19, 20; BESSEN & MEURER, *supra* note 27 at 9.

¹⁹⁷ Burnham, *supra* note 67.

This entrepreneur is not alone, as other inventors in complex technology areas do not undertake the onerous task of obtaining patent clearance.¹⁹⁸ Certainty, this strategy is dangerous for those without deep pockets for defense. Once the product is in the final stages of its design, patent assertion can impose serious costs that threaten to undo the innovation, and impose a considerable burden on the resource-starved enterprise.

A patentee does not need to demonstrate infringement to extract a license from a startup. Rather, the patent owner needs only to raise a colorable claim of infringement. This is because any lawsuit has the potential to divert the startup's transaction costs to litigation defense, rather than research and development. These costs are significant, as patent trial costs average \$1.6 million for cases with less than \$25 million in dispute, and a mean of \$3.5 million for the valuation of harm is higher.¹⁹⁹ These costs are not symmetrical, as the cost to defend and attempt to invalidate a patent are far greater than those necessary to assert a patent.²⁰⁰ A rational startup would pay a licensing fee solely to avoid this massive financial drain, even if the asserted patent appears invalid on its face.²⁰¹ With the largest share of transaction costs, the startup has an incentive to capitulate despite the fact that infringement of a valid patent had never been proven.

This circumstance becomes more complicated as rights holders began to take a portfolio approach to patent ownership.²⁰² Accumulating patents across a technology area is a powerful strategy against rivals and entrants. As one source points out, "a well-conceived patent portfolio operates much like a 'super-patent'; its scale-effects mean that a holder wields otherwise-unattainable market power in a particular technological field."²⁰³ Some companies are adept at acquiring groups

¹⁹⁸ Lemley, *supra* note 196, at 21 ("both researchers and companies in component industries simply ignore patents. Virtually everyone does it.").

¹⁹⁹ AIPLA 2013 REPORT OF THE ECONOMIC SURVEY, I-135 (2013); *see also* Jonathan L. Moore, *Particularizing Patent Pleading: Pleading Patent Infringement in a Post-Twombly World*, 18 TEX. INTELL. PROP. L.J. 451, 458-61 (2010).

²⁰⁰ This statement assumes that the startup has not yet acquired any patents that might be asserted as the foundation of a counterclaim against the patentee. In this sense, the patentee is akin to a non-practicing entity (NPE) that cannot be sued for infringement because it has no products. *See* U.S. GOV'T ACCOUNTABILITY OFFICE, REPORT TO CONGRESSIONAL COMMITTEES: INTELLECTUAL PROPERTY: ASSESSING FACTORS THAT AFFECT PATENT INFRINGEMENT LITIGATION, p. 3, nt. 8 (August 2013) ("Because NPEs do not make products, they generally have less information to disclose and thus have lower discovery costs. They also cannot be countersued for patent infringement.").

²⁰¹ *Berkeley Patent Survey*, *supra* note 21, at 1315-16.

²⁰² *Cf.* Gideon Parchomovsky & R. Polk Wagner, *Patent Portfolios*, 154 U. OF PENN. L. REV. 1, 5 (2005) (noting that firms will take a portfolio approach to patents).

²⁰³ *Id.* at 7.

that cover specified technology clusters.²⁰⁴ From the perspective of those accused of infringement, these portfolios create a cloud of uncertainty that translates into and exponential multiplication of risk compared to the assertion of a single patent. The owner of hundreds, or thousands, of relevant patents approaches a company that is engaged in product development creates an intimidation factor that cannot be paralleled by the assertion of a single patent.

The uncertainty inherent in predicting infringement of a single patent claim is magnified for portfolios. Any large group patents, including those with low-quality, vague claims, create enough noise to create risk surrounding an innovator's product release.²⁰⁵ Further, the “purposeful combination of distinct-but-related individual patents” forms a strong deterrent to open exploration of a technology space.²⁰⁶ Even if the coverage of multiple patents creates an imperfect veneer around a particular solution, the vagueness inherent in the patent’s claim scope can be asserted to fill any gap. If one patent’s claim scope is too narrow, that weakness can be easily overcome with arguments based on any of a dozen or so other patents in a stack. The patent owner’s arguments about claim scope coverage cannot be dismissed lightly because “the range of each patent cannot be determined without a large investment of time and effort, and any pre-litigation predictions about the scope of a patent may prove incredibly wrong.”²⁰⁷

B. Patent Lock-In

The patent system's structure establishes a right to exclude for all patent holders. Patents are asserted in a manner akin to a *res*, a legal right based on a subject matter that can be asserted against the world. No proof of copying is required. The assertion of the right operates as a strict liability tort, and therefore no knowledge of the patent is required before liability attaches. It has been theorized that first inventors who cannot enforce their rights against improvers would lack appropriate incentives to perform original research and “stymie the entire line of technology.”²⁰⁸

²⁰⁴ See e.g., Feldman and Ewig, *supra* note 181 at 1-2, describing the aggregations of “chunks” of patents from industries that range from “computers to telecommunications to biomedicine to nanotechnology.”).

²⁰⁵ Cf. James Boyle, *Open Source Innovation, Patent Injunctions, And The Public Interest*, 11 DUKE L. & TECH. REV. 30, 62-63 (2012) (describing the problems associated with analyzing the Motorola patents acquired by Google as defensive measure as “[o]f course any competent lawyer could make a case that any complex [product] was potentially infringing hundreds of patents, or that it was not.”).

²⁰⁶ Parchomsky and Wagner, *supra* note 202 at 32.

²⁰⁷ Feldman and Ewig, *supra* note 179 at 25.

²⁰⁸ See Jerry R. Green and Suzanne Scotchmer, *On the Division of Profit in Sequential Innovation*, THE RAND J. OF ECON., 20 (1995) (observing that a first inventor may not have a

A startup's products can implicate the patent rights of more than one patent holder. Attempting to obtain clearance cannot be assured, because patent holders have no obligation to license and typically do not license patents obtained to protect their core products.²⁰⁹ If the patentee is willing to negotiate, a license is not assured because the parties may be unable to agree on price. As one scholar observed, "To produce the finished commercial product requires a license to every one of those hundreds or thousands of patents. If the producer misses even a single patent and does not procure a license ahead of time, then it faces the possibility of being held up later."²¹⁰

Underlying this concern is the reality that technical progress is cumulative, in that "products are often the results of several steps of invention, modification, and improvement."²¹¹ Independent inventors working on the same problem create similar solutions that can create value through a process that leads to multiple technological options.²¹² Sometimes the iterative work of technical progress is performed by a single entity, but frequently it is performed by a number of inventors working independently.²¹³ As some examples, the inventors of the Nest thermostat did not invent the concept of controlling heating and cooling systems via a centralized controller; rather, their work was directed to improve existing technology. Similarly, the Fitbit was not the first device to track one's steps, or the first remote device to send data wirelessly. Instead, the Fitbit was designed to improve on earlier work of others in this field. In areas of rapid, competitive technological progress, innovation runs into a collision of patent rights by others.

The problem is multiplied in industries where the infringing product is multi-component and, therefore, subject to multiple patents owned by separate entities. As a partial solution, some obtain freedom to innovate through cross-licenses, patent pools, or standards-setting understandings that limit the level of patent royalties.²¹⁴ If these were the only considerations at play, cross licensing might be a satisfactory private ordering solution. Yet this analysis is incomplete for several reasons. As an initial matter, various patentees are subject to differing incentives that render any complete private ordering solutions unlikely to

sufficient incentive to invest if competition from improved products undermines the original inventor's profits).

²⁰⁹ See 35 U.S.C. § 271(d)(4); Cohen, *supra* note 95 at 22 (patentees sometimes use patents to create fences around their core products, which are not licensed).

²¹⁰ *Id.*

²¹¹ *Id.* at 20.

²¹² Cf. Robert P. Merges, *Rent Control in the Patent District: Observations on the Grady-Alexander Thesis*, 78 VA. L. REV. 359, 374 (1992).

²¹³ *Id.* at 371-72 (suggesting that single entities lack incentives to explore different iterations of successful solutions).

²¹⁴ See generally Carl Shapiro, *Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard Setting* in INNOVATION POLICY AND THE ECONOMY, VOLUME 1, 119, 123 (ADAM B. JAFFE, JOSH LERNER AND SCOTT STERN EDS., 2001).

materialize. For example, assume that a new entrant begins to make and sell a new type of smartphone, and holds no patents. Currently, there is no comprehensive cross-licensing arrangement in the industry to welcomes new entrants. The entrant might encounter companies that hold significant numbers of patents and produce smartphones (or significant components of them) that include Nokia, Apple, Samsung, and Google. NPE's present a separate set of prospective licensors.

How might a new entrant clear the right to proceed to make its phones? The incumbents will view the startup as a rival. Among any group of competing producers, each has an incentive to raise their rivals' costs, preferably to the point that the competitor would make no profit and exit the market.²¹⁵ Generally, patents are a powerful way to control pieces of a lucrative and growing technology fields. The incumbents fought each other in patent wars of global dimensions.²¹⁶ A patent pool or cross licensing arrangement would have reduced the risk of injunction or massive damages judgment. As one source observes, "The combatants have deep pockets and much to lose."²¹⁷ Yet settlement took years and, according to one source, up to \$20 billion dollars spent on litigation and the acquisition of defensive patents.²¹⁸ This circumstance suggests that industry incumbents would have been quite unlikely to license a new entrant with a competing good. Startups in this field, without significant patent holdings, faces a risk of large licensing and litigation costs, as well the cost of design and manufacturing that are inherent in designing new hardware.

²¹⁵ Anne Layne-Farrar and Klaus Schmidt, *Licensing Complementary Patents: "Patent Trolls," Market Structure, and "Excessive" Royalties*, Working Paper, University of Munich, CES and CEPR, 13 (9/22/09) (unpublished manuscript available at <http://www.sfbtr15.de/uploads/media/275.pdf>).

²¹⁶ Florian Mueller, *Samsung files ITC Complaint against Apple: Long-time Partners Heading for Ugly Divorce? -- UPDATED*, FOSS PATENTS (6/29/11) available at <http://www.fosspatents.com/2011/06/samsung-files-itc-complaint-against.html> (cataloguing lawsuits between Samsung and Apple, filed in the U.S., Japan, South Korea, Germany, the UK and Italy); Charles Duhigg and Steve Lohr, *The Patent, Used as a Sword*, THE NEW YORK TIMES (10/7/2012) (detailing parties and widespread nature of the past and ongoing smartphone patent litigation); *The Great Patent Battle*, THE ECONOMIST (10/21/10) (same); see also Michael A. Carrier, *A Roadmap to the Smartphone Patent Wars and FRAND Licensing*, 2 CPI ANTITRUST CHRONICLE (April 2012)(same). Leo Kelion, *Mobile Phone Makers Wage War to Protect their Patents*, BBC.COM (10/23/11), <http://www.bbc.co.uk/news/business-15343549> (summarizing the lawsuits against HTC, Motorola, Nokia, Google, and Samsung). For a detailed review of the primary participants in the smartphone industry, see Martin Kenney and Bryan Pon, *Structuring the Smartphone Industry: Is the Mobile Internet OS Platform the Key?*, 11 J. OF IND., COMP. AND TRADE, 239 (2011).

²¹⁷ *The Great Patent Battle*, The Economist (10/21/10), <http://www.economist.com/node/17309237>.

²¹⁸ Duhigg and Lohr, *supra* note 216.

Non-practicing entities present another difficulty.²¹⁹ Seeking to obtain the highest possible royalties, the preferred strategy is to hold a group of patents, wait until the market chooses the winners, and then sue for infringement.²²⁰ Producing patentees that in the same market present another source of patent assertion. For example, former camera maker Kodak asserted digital camera patents against Apple's iPhone.²²¹ Kodak's patents claim a component feature of the iPhone, which allows users to digitally preview images prior to taking a picture with the iPhone's camera.²²² Similarly, Oracle, an information technology company, asserted software patents against Google's Android platform.²²³ Oracle sought billions in damages.²²⁴ Indeed, it has been estimated that \$120 of every smartphone sold goes to paying patent royalties, and that this figure equals or exceeds the costs of the physical components.²²⁵

As a practical matter, the suggestion that startups license the technology that is used in their new products is not practicable for complex technologies. The risk of patent assertion, the high cost of licensing, and the uncertainty over whether all necessary licenses are available demonstrate some of the intellectual property hazards in creating a new product. For certain complex products, the

²¹⁹ See generally Anne Layne-Farrar and Klaus Schmidt, *Licensing Complementary Patents: "Patent Trolls," Market Structure, and "Excessive" Royalties*, UNIVERSITY OF MUNICH, CES AND CEPR (9/22/09) (unpublished manuscript available at <http://www.sfbtr15.de/uploads/media/275.pdf>).

²²⁰ Jiaqing "Jack" Lu, *The Myths and Facts of Patent Troll and Excessive Payment: Have Nonpracticing Entities (NPEs) Been Overcompensated?*, 47 BUS. ECON. 234, 239 (2012).

²²¹ See, e.g., *Eastman Kodak Company v. Apple Inc.*, 6:10-cv-06022-MAT-JWF (NYWD)(filed 1/14/10) (asserting three patents against Apple); *In re Mobile Telephones and Wireless Communication Devices Featuring Digital Cameras, and Components Thereof*, Complaint, 337-TA-703 (ITC) (filed 1/14/10)(asserting one patent against the camera preview function of Apple's iPhone).

²²² *In re Certain Mobile Telephones and Wireless Communication Devices featuring Digital Cameras, and Components Thereof*, Commission Opinion (Public Version), 337-TA-703 (ITC) (8/9/12) (detailing Kodak's infringement allegations).

²²³ See, e.g., Oracle Corp., Securities and Exchange Commission Statement 10-K Annual Report, at 2 (6/30/10) (referring to Oracle's "acquisition of Sun, [in which Oracle] acquired software technologies that expanded and enhanced our existing database and middleware software product offerings, including the Java technology platform."); *Oracle America, Inc. v. Google, Inc.*, Complaint, ¶¶ 8-10 (CV 10-03561 N.D. Cal. 8/12/10) (asserting ownership over the former Sun Java patents asserted against Google). Google's Android software is incorporated into some manufacturer's smartphones. See generally ANDROID.COM, *Device Gallery*, <http://www.android.com/devices/> (last visited 7/13/13); *Comparison of Android devices*, WIKIPEDIA.COM, available at http://en.wikipedia.org/wiki/Comparison_of_Android_devices (last visited 7/13/13).

²²⁴ *Oracle America, Inc. v. Google, Inc.*, Order Granting in Part Motion to Strike Damage Report of Plaintiff Expert Ian Cockburn (CV 10-03561 N.D. Cal. 7/22/11) (describing a damages range of \$1.4-6.1 billion, and that "the most likely" figure was "approximately \$2.6 billion").

²²⁵ Ann Armstrong, Joseph J. Mueller, and Timothy D. Syrett, *The Smartphone Royalty Stack: Surveying Royalty Demands for the Components Within Modern Smartphones*, http://www.wilmerhale.com/uploadedFiles/Shared_Content/Editorial/Publications/Documents/The-Smartphone-Royalty-Stack-Armstrong-Mueller-Syrett.pdf.

number of potentially applicable patents reaches the thousands.²²⁶ Further, the patent system has no prohibition on aggregate royalties that exceed all profit, or even the entire selling price of a commercial product.

C. Patent Law's Limited Experimental Use Defense

The current patent system prevents those who are working in the vast majority of technological fields from undertaking experimentation. In short, the system was not designed to accommodate creative competition. Rather, the law operates to grant rights to the first to secure a patent, as broadly as the patentee can legitimately claim.

Patent law's experimental use defense provides scant ability to perform experimentation. Unlike in copyright law, patent law has no fair use doctrine. Patent law's experimental use is extraordinarily narrow.²²⁷ Unless the startup is creating new medical devices or pharmaceuticals, this defense cannot be expected to protect the vast majority of the startup's work.

The reason for this is that the common law experimental use defense does not shield any work that is performed for any commercial purpose or within the scope of the entity's business.²²⁸ Under this definition, any work that the startup performs will not receive any protection from the experimental use defense. Thus, the experimental use standard does not protect the use of another's patented technology *to experiment*.

Despite the ostensible existence of this defense, under the applicable law one who undertakes activity that reads on another's patent claim is infringing even if that use is never incorporated into commercial product.²²⁹ Indeed, under the Federal Circuit's *Embrex, Inc. v. Service Engineering Corp.*, work that is performed in order to create a commercial implementation to *avoid* another's patent is not protected by experimental use.²³⁰ In that case, the defendant had created an iterative implementation of its product that was never sold or offered for sale. The court rejected the argument that the use "did not infringe because they were scientific experiments and did not result in the sale of any machines,

²²⁶ Tun-Jen Chiang, *The Reciprocity Of Search*, 66 VAND. L. REV. 1, 15 (2013).

²²⁷ *Madey v. Duke University*, 307 F.3d 1351, 1362 (Fed. Cir. 2002) (observing that patent law's experimental use defense is "very narrow and strictly limited."; Dan L. Burk & Brett H. McDonnell, *The Goldilocks Hypothesis: Balancing Intellectual Property Rights at the Boundary of the Firm*, 2007 U. Ill. L. Rev. 575, 604 n.194 (2007) (noting that experimental use "may have been largely obliterated by recent Federal Circuit decisions.").

²²⁸ *Madey v. Duke University*, 307 F.3d 1351, 1362 (Fed. Cir. 2002)

²²⁹ *Id.* (the experimental use defense does not protect university research that is not intended for commercial distribution).

²³⁰ *Embrex, Inc. v. Service Engineering Corp.*, 216 F.3d 1343 (Fed. Cir. 2000)

and therefore were either merely *de minimis*, or exempt under the experimental use exception."²³¹ As one article notes, experimental use outside the medical context "may have been largely obliterated by recent Federal Circuit decisions."²³²

D. Prior User Rights

One might argue that anti-patents are unnecessary because startups have the benefit of the prior user defense.²³³ This assertion misunderstands the nature of the prior user defense, the laborious innovation process, and the anti-patent proposal described herein.

As background, the prior user defense can be asserted against a claim of patent infringement if the prior user has commercially used the subject matter at least one (1) year before either 1) the effective filing date of another's patent; or 2) the invention was disclosed to the public by another (under the new section 102(b)). The defense is of absolutely no assistance for the volume of patents that have priority dates earlier than the startup's date of commercialization. This is not a trivial consideration. Instances of near-simultaneous independent invention are more common than previously supposed.²³⁴

Perhaps the primary difficulty with a startup's ability to rely on a prior user defense is because *it is a defense*. Demonstrating good faith prior commercial use assumes that litigation has proceeded, which is an expensive proposition. The startup must keep invention and detailed sales records to establish the defense. As a defense, it will require the startup to engage in claim construction, discovery, infringement analysis, expert retention, and other expensive aspects of litigation before the issue can be resolved. In some cases, an appeal will be required. It is theoretically conceivable that the issue might be resolved prior to litigation, if the patentee retreats without payment during pre-litigation negotiations. However, patentees are not currently deterred from moving forward to filing suit by other viable defenses commonly asserted in patent litigation, including invalidity, unenforceability, and misuse. A rational patentee will proceed to litigation if there is a chance that the potential recovery will exceed the cost, factoring in risk. At best, a settlement might be lower than if the defense did not exist. However, that sum might be too much for the startup to sustain. In the meantime, investors may be chilled, potential clients deterred, and the startup's resources drained.

²³¹ *Id.* at 1349.

²³² Dan L. Burk & Brett H. McDonnell, *The Goldilocks Hypothesis: Balancing Intellectual Property Rights at the Boundary of the Firm*, 2007 U. ILL. L. REV. 575, 604 n.194 (2007).

²³³ 35 U.S.C. § 273(a). The prior use defense can be asserted against patents issued on or after September 16, 2011.

²³⁴ See generally Lemley, *supra* note 143.

The prior user defense will not assist for the vast range of products that are incorporated into multifunctional devices, or constitute improvements on existing technology. For example, the Nest device won numerous awards for its groundbreaking design.²³⁵ The Industrial Design Association commented that Nest's learning thermostat was "disrupting an industry that had seen little innovation in decades."²³⁶ Months after Nest's first commercial launch, Honeywell sued Nest for infringement of seven patents.²³⁷ None of the Honeywell's patents anticipate the complete groundbreaking work of the Nest device, rather these are asserted against pre-existing features used in the Nest. Honeywell's patents date back to the mid-2000's, and among other things claim the use of "grammatically complete sentences" to control a thermostat, and a thermostat which calculates the time necessary to reach a different temperature set point.²³⁸ As an entity formed in 2009, a prior commercial use defense offers startup Nest absolutely no assistance.²³⁹

Similarly, other entities have sued Fitbit for patent infringement.²⁴⁰ As one example, SportBrain's asserted a broad patent from the year 2000 against Fitbit, which commenced operations in 2007. This temporal sequence prevents Fitbit from relying on prior commercial user defense. SportBrain's patent appears to block off exploration of this entire field, having been asserted against Nike and Adidas.²⁴¹ Although one might believe that the prior user defense solves patent infringement assertions against inventive startups, its limitations are insufficient

²³⁵ See, e.g., Edison 2012 Best New Product Award, Smart System Category, EDISONAWARDS.COM, http://www.edisonawards.com/BestNewProduct_2012.php; *Red Dot Award: Product Design 2013*, REDDOT.DE, <http://red-dot.de/pd/online-exhibition/work/?lang=en&code=2013-05-7986>; Gold International Design Award from the Industrial Designers Society of America 2013, IDSA.ORG, <http://www.idsa.org/nest-learning-thermostat-2nd-generation>.

²³⁶ Gold International Design Award from the Industrial Designers Society of America 2013, IDSA.ORG, available at <http://www.idsa.org/nest-learning-thermostat-2nd-generation>.

²³⁷ *Honeywell, Int'l v. Nest Labs, Inc.*, CV 12-cv-00299 (D. Minn.)(filed 2/6/12)(complaint).

²³⁸ U.S. Patent Nos. 7,142,948 (filing date 1/7/04) and 7,584,899 (filing date 9/8/09).

²³⁹ Nest filed for reexamination of all seven patents in the U.S. Patent and Trademark Office, asserting in its answer that Honeywell is not seeking to assert valid patent, but rather "Honeywell wants to use this lawsuit to scare a new competitor—and its customers, retailers and installers— out of what Honeywell believes is its space." Nest Lab Inc.'s Answer to Amended Complaint, Counterclaims, and Demand for Jury Trial, CV 12-cv-00299 (D. Minn.)(filed 4/12/12)(answer and counterclaim); Joint Motion to Stay the Action Pending Reexamination of the Patents in Suit, CV 12-cv-00299 (D. Minn.)(filed 9/21/12)(detailing the requests for reexam).

²⁴⁰ See e.g., *SportBrain Fitness, Inc. v. Fitbit, Inc.*, 2:13-cv-00212 (E.D. Tex.)(complaint filed 3/15/13); *iLife Technologies, Inc. v. Fitbit, Inc.*, 3:13-cv-4778 (N.D. Tex.) (complaint filed 12/6/13); *Olivestar, LLC v. Fitbit, Inc.*, 2:14-cv-539 (E.D. Tex.) (complaint filed 4-24-14).

²⁴¹ See Matt Brian, *Already Targeting Adidas and Fitbit, SportBrain sues Nike over Fuelband Patent Infringement*, THE NEXT WEB (1/3/13), <http://thenextweb.com/insider/2013/01/03/already-targeting-adidas-and-fitbit-sportbrain-sues-nike-over-fuelband-patent-infringement/>.

to erase the difficulties that inherently arise from the operation of sequential invention.

Moreover, one cannot rely on the prior user defense merely because one independently created another's claimed invention. A key component of this defense is *prior commercial use*. That is, the prior user must reduce the invention to practice and commercially use the invention within the U.S. more than one year prior to another's filing or disclosure date to qualify for the defense. One who independently develops, but has not yet commercially implemented, the subject matter of the asserted claim prior to the one-year grace period is not be protected by the defense.²⁴² As the Nest and Fitbit demonstrate, startups can take years to bring an idea to commercial implementation, and even longer to establish sales.²⁴³ In such cases, the prior user defense does not protect the initial releases.

Under the statute the prior use right is “not a general license under all claims of the patent,” but rather is limited to the subject matter that has been commercially practiced by the prior user.²⁴⁴ Under this limitation, startup's later variations and improvements are left vulnerable to a third party's claims of patent infringement. a startup that pursues one form of a commercialized product, while holding alternatives in abeyance until sufficient funds are obtained to broaden their market offerings will not be able to rely on the prior user defense.

The aim of this proposal is to permit a narrow class of entities to engage in permissionless innovation. The limits on the prior user defense render it inapplicable for meaningful protection for startups. Establishing the ability to rely on a prior use defense necessitate recordkeeping and structures that place burdens on resource-constrained research. The existence of this defense does not eliminate the thorny issues associated with claim construction, or the indeterminate boundaries that make the assertion of a patent easy to assert and difficult to defend against. The merits of a prior use defense will not be resolved until trial, after the astronomical discovery costs have been incurred. A patentee, who has comparatively low discovery costs, meets her burden of proof with evidence demonstrating infringement by a preponderance of the evidence. As a fact-intensive inquiry with a clear and convincing burden of proof, it can be expected that startup's prior use defense might be unsuccessful as an evidentiary matter

²⁴² Under 35 U.S.C. § 273(a)(1), commercial use includes internal commercial uses, arm's length sales, and other commercial transfers. The statute includes two additional specific examples of commercial uses. First, a prior use includes premarket regulatory review for testing required by regulatory agencies, such as the U.S. Food and Drug Administration. As a second example, the AIA provides that commercial use includes nonprofit uses in research laboratories, universities, and hospitals.

²⁴³ This time period is highly variable. Generally, it can be expected that software startups have a shorter commercialization period than developments in the hardware space, however that circumstance can be reversed depending on a number of factors.

²⁴⁴ 35 U.S.C. § 273(e)(3).

even if the startup's position is well supported in fact. As a practical matter, a startup may choose to license an asserted patent even if a viable prior user defense exists, given the distraction and the high transaction costs associated with patent litigation.

E. Other Private Ordering Solutions

It might be argued that private ordering systems might resolve some of the difficulties associated with developing technology within a technological context populated by patent rights held by others. In theory, such a solution is both plausible and desirable. Yet in reality "it seems whimsical to assume that all improvers and potential improvers will be able to bargain with the holders of pioneering patents."²⁴⁵ As individual licensing is not a clear path toward freedom to operate, this subsection explores the limited extent to which certain alternative private ordering mechanisms operate.

1. Patent Pledges

Some private entities have been attuned to the needs of innovators and derived some partially effective solutions. Some inventors have voluntarily relinquished patent rights. For example, some may make their invention and disclaim any intent to seek patent protection for the disclosed subject matter.²⁴⁶ This act both exposes the detail's of first inventor's creation to her rivals, and prevents that inventor from obtaining a patent if that inventor refrains from filing for a patent application for one year after the disclosure. One plausible explanation for this behavior is that firms forgo patent protection to encourage others to adopt the first inventor's foundational technology. In other words, firms disclaim rights to their technology "to send a credible signal that she will not try to appropriate all of the cumulative innovator's gains later and thereby encourages follow-on inventions."²⁴⁷

One example of was IBM's 2005 proclamation that the company was making 500 software patents freely available to anyone working on open-source projects.²⁴⁸ At that time, IBM's move was said to help foster third party

²⁴⁵ Robert P. Merges, *Rent Control in the Patent District: Observations on the Grady-Alexander Thesis*, 78 VA. L. REV. 359, 374 (1992).

²⁴⁶ See generally Oren Bar-Gill and Gideon Parchomovsky, *The Value of Giving Away Secrets*, Bar-Gill, VIRGINIA LAW REVIEW, 1857, 1858 (2003) (describing the phenomenon, and observing that it provides knowledge to the firm's rivals).

²⁴⁷ *Id.* at 1861.

²⁴⁸ See Steve Lohr, *I.B.M. to Give Free Access to 500 Patents*, THE NEW YORK TIMES (1/11/05), <http://www.nytimes.com/2005/01/11/technology/11soft.html>.

development of the open source Linux operating system.²⁴⁹ Because IBM's software patent holders are pervasive, one might applaud IBM's pronouncement as a key private ordering solution that permits third party developers to engage in permissionless innovation.²⁵⁰ Nonetheless, some have suggested that IBM's Linux support was incentivized by competition--specifically, to encourage the market's adoption of Linux as a viable alternative to IBM's rival Microsoft's operating system solutions.²⁵¹

Tesla Motors, a primary innovator of electrically powered cars, has recently announced that the company "will not initiate patent lawsuits against anyone who, in good faith, wants to use our technology."²⁵² Tesla's announcement observed that "[t]echnology leadership is not defined by patents," and that patents provide "small protection against a determined competitor."²⁵³ This move might be seen as a mechanism to convene those interested in developing all electric, zero-emission cars around Tesla's technology. If successful, the increase in the market will provide some benefit Tesla, which is fighting for adoption of electric cars as a viable option to gas fueled models. The move encourages adoption of Tesla's technology, which if successful will grow the number of Tesla-standard charging stations across the U.S. Additionally, this move allows Tesla to increase its market share in a complementary asset--that is, a supply of batteries manufactured by the company.²⁵⁴

Certainly, the default at present for most rights holders is to continue ownership, particularly if such patents were acquired for defensive uses. Disclaiming such rights broadly destroys any defensive value of such patents. If

²⁴⁹ *Id.*

²⁵⁰ *Id.* ("If you open up your technology and reveal quickly, people will build on your stuff.") (statement of MIT Professor Eric von Hippel).

²⁵¹ *Id.* ("supporting Linux helps to undermine I.B.M.'s rivals and can be seen as a smart tactic for I.B.M."); Patti Waldmeir, *Why IBM Is Giving Away Something for Nothing*, FINANCIAL TIMES (2/3/05); Florian Mueller, *KnowRi\$ht Conference Speech on Software Patents, Standards and Competition*, FOSS PATENTS (5/6/10) available at <http://www.fosspatents.com/2010/05/knowriht-conference-speech-on-software.html>. Notably, IBM's open strategy was limited to Linux-based solutions and did not extend to other IBM patents in other technological areas such as networking. *Id.* In a similar vein, Microsoft has pledged that it will not assert certain patents against open source developers. *Patent Pledge for Open Source Developers*, Microsoft Open Specifications, available at <http://www.microsoft.com/openspecifications/en/us/programs/interop/interoperability-principles-patent-pledges/default.aspx>.

²⁵² Elon Musk, *All Our Patents Belong to You*, BLOG, TESLA MOTORS.COM (6/12/14), <http://www.teslamotors.com/blog/all-our-patent-are-belong-you>.

²⁵³ *Id.*

²⁵⁴ Jerry Hirsch & Tiffany Hsu, *Elon Musk Opens Up Tesla Patents to Everyone*, L.A. TIMES (6/12/14), <http://www.latimes.com/business/autos/la-fi-tesla-open-source-20140613-story.html>. Tesla's "good faith" limitation on the use of its technology contemplates innovative variation, and does not cover outright copying or use by another that has sued Tesla for patent infringement. *Id.*

the past in any guide, private ordering solutions become likely on if the patentee's release of rights to assert align with the patentee's long-term self-interest. In the present climate, open offers to use patent rights will continue to be the exception, rather than the rule. Rational rights-holders will choose to hold onto their rights absent a reason to release them. Those that are risk averse may decline to engage in such behavior entirely, because of the lack of predictable information about potential subsequent opportunities to enforce or monetize the rights. In the main, rational patentees are more likely to seek licensing revenues from startups rather than creating open systems from which rivals might emerge.

2. Coordinated Efforts to Resolve Innovation Roadblocks

Patentees have engaged in creative coordination to avoid roadblocks and patent thickets, including the formation of patent pools and open source models.²⁵⁵ More recently, defensive aggregators have emerged as an alternative structure to obtain licensing opportunities, insurance, and other forms of assistance to companies seeking to avoid patent demands from non-practicing entities.²⁵⁶ Essentially, these entities obtain rights through the purchase or license of patents that are identified as particularly problematic for certain applications.²⁵⁷ For example, RPX advertises that the firm acquires patents and patent rights, and its "clients generally receive a license to every patent," and furthermore "making each patent in the RPX portfolio one less patent that could be used in an infringement assertion against the members of our network."²⁵⁸ In other words, RPX attempts to obtain cost-effective licenses, to permit their innovator clients to obtain predictable, controlled costs against the assertion of patent infringement allegations. RPX focuses primarily on threats that come from non-practicing entities.²⁵⁹

These services come at a cost. Although RPX notes that its clients include small and emerging entities among its clients, RPX's subscription service ranges

²⁵⁵ Thierry Ryana & Ludmila Stiukova, *Large-Scale Open Innovation: Open Source vs. Patent Pools*, 52 INT'L J. OF TECH. MANAGEMENT, 477-496 (2010) (describing patent pools and open source models).

²⁵⁶ See David Hetzel, *Embracing the New IP Reality*, INTELLECTUAL ASSET MANAGEMENT, 29 (May/June 2010).

²⁵⁷ *Id.* at 32 (describing the business models of two defensive aggregators, RPX and AST).

²⁵⁸ *Reducing Patent Risk*, RPX.COM, <http://www.rpxcorp.com/rpx-services/>; RPX CORP., SECURITIES AND EXCHANGE COMMISSION 10-K FILING (3/7/14) (describing the company's business model as the acquisition of patents that "are being or may be asserted against our current and prospective clients," which RPX "then provide[s] our clients with a license to these patent assets to protect them from potential patent infringement assertions."

²⁵⁹ *Id.*

from \$36,000 to \$ 5 million annually.²⁶⁰ For entities that cannot afford lower prices to obtain patents, such subscription amounts appear cost-prohibitive. Furthermore, no single aggregator or patent pool can promise comprehensive coverage against all patent risks. For some technologies, the number of relevant patents numbers in the thousands.²⁶¹ One estimate pins the number of patents that relate to cell phone technology at 250,000.²⁶² Even if the number of relevant patents is lower, and assuming that a startup could afford to become a member of all defensive aggregators, there remains the risk of patent litigation from patentees that have not sold or licensed their rights to any aggregator.

For those engaged in innovation, neither the patent system nor private ordering solutions offer freedom from the threat of patent infringement assertions. In essence, by engaging in technological exploration, one is locked into a system from which there is no certainty to avoid infringement or to incur the large transaction costs associated with resolving patent disputes. Since 1790, the balance has tipped sharply in favor of the first inventor in a manner that locks in subsequent improvers. The benefits from the system are said to inure to the public, as well as to the incentives that the system creates for subsequent improvers. Absent the implementation of a system like this current proposal, the reasons that the numbers of patents has exponentially increased and yet "the US economy has seen neither a dramatic acceleration in the rate of technological progress nor a major increase in the levels of research and development expenditure."²⁶³ Further, the existence of the system in its present form prevents robust study and a developed understanding of the type of invention and innovation that are capable of occurring without its downsides.

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²⁶⁰ David Hetzel, *Embracing the New IP Reality*, INTELLECTUAL ASSET MANAGEMENT, 29, 33 (May/June 2010).

²⁶¹ RPX CORP., SECURITIES AND EXCHANGE COMMISSION 10-K FILING (3/7/14) (noting that "there are several thousand issued United States patents with 'DRAM' specifically listed as a claim element.")

²⁶² Mike Masnick, *There Are 250,000 Active Patents That Impact Smartphones; Representing One In Six Active Patents Today*, TECHDIRT.COM (10/18/12) available at <https://www.techdirt.com/blog/innovation/articles/20121017/10480520734/there-are-250000-active-patents-that-impact-smartphones-representing-one-six-active-patents-today.shtml>.

²⁶³ Michele Boldrin & David K. Levine, *The Case Against Patents*, 27 J. OF ECON. PERSPECTIVES 3, 7 (2013).

VI. The Rationale for Shielding Start-Ups

A. The Role of Small Firms in Creating New Ideas

In an earlier era, economist Joseph Schumpeter postulated that large firms were primarily responsible for the most significant technological advances.²⁶⁴ He hypothesized that the wealthiest and largest firms are responsible for the most groundbreaking innovations, because such firms were the most capable of shouldering the considerable expense associated with research and development.²⁶⁵ Other theorists supported this perspective, including Galbraith who proclaimed, “unless a firm has a substantial share of the market it has no strong incentive to undertake a large expenditure on development.”²⁶⁶

Schumpeter’s belief that large firms were the sources of major change, although initially influential, has been subjected to criticisms.²⁶⁷ Originally developed in 1942, his hypothesis has now been described as “primitive,” and based on assumptions of limited applicability today.²⁶⁸ These include Schumpeter’s assertion that only monopoly firms possess sufficient capital for research and development, a circumstance that now has been partially displaced by the availability of venture capital investment.²⁶⁹ Moreover, Schumpeter’s own body of work acknowledges that markets are subject to dynamic forces that

²⁶⁴ See JOSEPH A. SCHUMPETER, *CAPITALISM, SOCIALISM AND DEMOCRACY*, 101 (Harper & Row 1942) (“The monopolist firm will generate a larger supply of innovations because there are advantages which, though not strictly unattainable on the competitive level of enterprise, are as a matter of fact secured only on the monopoly level”); see also *id.* at 100 (“And in this country monopoly is being made practically synonymous with any large-scale business”).

²⁶⁵ See Paul J. McNulty, *On Firm Size and Innovation in the Schumpeterian System*, 8 J. OF ECON. ISSUES, 627 (1974) (summarizing research on the “Schumpeterian hypothesis” that “large firms with substantial market power have both greater incentive and more ample research for research and innovation”).

²⁶⁶ See JOHN KENNETH GALBRAITH, *AMERICAN CAPITALISM*, 87 (Transaction 1993); see also, G. Warren Nutter, *Monopoly, Bigness, and Progress*, 64 JOURNAL OF POLITICAL ECONOMY 520, 524 (1956) (stating that monopolies “raise the odds in favor of the most risky innovations,” and that “bigness makes possible the most expensive”).

²⁶⁷ See, e.g., Federal Trade Comm’n, *To Promote Innovation: The Proper Balance of Competition and Patent Law and Policy*, Ch. 2(II)(a)(3) (Oct. 2003) (summarizing some criticisms).

²⁶⁸ See F.M. Scherer, *Schumpeter and Plausible Capitalism*, 30 J. ECON. LIT. 1416, 1417 (1992).

²⁶⁹ *Id.* at 1417 (“Important in Schumpeter’s schema was the ability of monopolists to . . . secure a high financial standing”); F.M. SCHERER & DAVID ROSS, *INDUSTRIAL MARKET STRUCTURE AND ECONOMIC PERFORMANCE*, 646, 652 (3d ed. 1990) (“noting that growth of a venture capital industry in United States that can “channel[] investment into new high-technology firms shows that past monopoly profits are no sine qua non for supporting innovation”).

displace incumbents.²⁷⁰ Such forces invoke the process of creative destruction that displaces existing dominant systems in favor of new ones.²⁷¹ Over the past century, such forces have included scientific and technological advance.²⁷²

Today, there is recognition that small firms play an important role within the entire creativity ecosystem that drives technological progress.²⁷³ An early study by economist F.M. Scherer concluded “the data suggest that smallness is not necessarily an impediment to the creation of patentable inventions and may well be an advantage.”²⁷⁴ In a later study, Scherer confirmed that large firms contribute slightly less than their share of technical advances compared to smaller ones.²⁷⁵ He reached the conclusion, “the evidence leans weakly against the Schumpeterian conjecture that the largest sellers are especially fecund sources of patented inventions.”²⁷⁶ In this same vein, a Small Business Administration study found, “[s]mall firms, even with fewer resources and lower expenditures on R&D than large firms, are better at developing emerging technologies.”²⁷⁷ This same study found that “patents of small firms in general are likely to be more technologically important than those of large firms.”²⁷⁸ Although the reasons for this disparity have not been fully explained, Scherer’s work suggests that the availability of venture capital financing and ability to form collaborative research ventures are plausible contributing factors.²⁷⁹ Additionally, he explains that small firms typically have the right incentives, motivations, and focus to foster technological progress.²⁸⁰

Some researchers have broadened their examination beyond patent data to

²⁷⁰ JOSEPH A. SCHUMPETER, CAPITALISM, SOCIALISM, AND DEMOCRACY, 83 (Harper 1942).

²⁷¹ *Id.*

²⁷² See Margaret B. W. Graham, *Schumpeter’s Children*, WILSON Q. (Spring 2010).

²⁷³ ZOLTAN J. ACS. AND DAVID B. AUDRETSCH, INNOVATION AND SMALL FIRMS, 54 (The MIT Press 1990); F. M. SCHERER, INDUSTRIAL MARKET STRUCTURE AND ECONOMIC PERFORMANCE, 2nd ed., 418 (1980) (“No single firm size is uniquely conducive to technological progress. There is room for firms of all sizes”).

²⁷⁴ F.M. Scherer, *Firm Size, Market Structure, Opportunity and the Output of Patented Inventions*, THE AMERICAN ECONOMIC REVIEW, 1097, 1105 (1965).

²⁷⁵ F.M. SCHERER, INNOVATION AND GROWTH: SCHUMPTERIAN PERSPECTIVES, 226-27 (1986).

²⁷⁶ *Id.* at 235.

²⁷⁷ Anthony Breitzman and Diana Hicks, *An Analysis of Small Business Patents by Industry and Firm Size*, SMALL BUS. ADMIN. RES., 23 (Nov. 2008) (summarizing findings).

²⁷⁸ *Id.* at iii.

²⁷⁹ F.M. Scherer, *Changing Perspectives on the Firm Size Problem*, 24, 27-29 in INNOVATION AND TECHNOLOGICAL CHANGE (Zoltan J. Acs & David B. Audretsch eds., 1991).

²⁸⁰ Hearing, SUBCOMM. ON THE JUDICIARY, HOUSE OF REPRESENTATIVES (100th Cong. 1st and 2nd Sess.), 179-80 (2/24/88) (testimony of F.M. Scherer).

compare innovation rates.²⁸¹ Such research assumes that inputs that lead to technological change—such as research and development—precede the introduction of new products.²⁸² Findings using these metrics demonstrate that *both* large firms and small firms are productive.²⁸³ Yet these findings can be broken out in a manner that demonstrates variation in different industries. For example, large firms have proven to be more innovative in capital-intensive technologies, including the pharmaceutical and aircraft sectors.²⁸⁴ Yet in other industries, small firm activity is superior, introducing more innovations per employee compared to large firms.²⁸⁵ Furthermore, there does not appear to be a significant difference in the quality of the advances generated by small versus large firms.²⁸⁶

B. Small Firms as Compliments and Competitors

For a number of reasons, “[t]here is room for firms of all sizes” in fostering technological growth.²⁸⁷ These reasons include the propensity of some small firms to serve as agents of technological change, and for others to create complimentary products that are based on innovations that have been introduced by larger incumbents. Further, by offering competing innovative solutions, small firms can stimulate large firms to compete by creating new versions, variations, and new solution categories.

As a general matter, the firms with the greatest incentive to introduce new products are “fringe firms” and not market leaders.²⁸⁸ Competition and diversity

²⁸¹ William S. Comanor & F. M. Scherer, *Patent Statistics as a Measure of Technical Change*, 77 J. OF P. ECON. 392 (1969) (detailing the statistical problems using patents to measure technological change).

²⁸² See generally Zoltan J. Acs & David B. Audretsch, *Innovation in Large and Small Firms: An Empirical Analysis*, 78 THE AMERICAN ECONOMIC REVIEW 678, 688 (1988) (finding a correlation between research and development expenditures and innovative activity).

²⁸³ *Id.* at 681.

²⁸⁴ Zoltan J. Acs & David B. Audretsch, *Entrepreneurship and Innovation*, MAX PLANCK INSTITUTE OF ECONOMICS, ENTREPRENEURSHIP, GROWTH AND PUBLIC POLICY GROUP, 21 (2005).

²⁸⁵ Morton I. Kamien & Nancy L. Schwartz, *Market Structure and Innovation: A Survey*, 13 JOURNAL OF ECONOMIC LITERATURE 1, 16-19 (1975); F.M. Scherer, *Firm Size, Market Structure, Opportunity, and the Output of Patented Inventions*, 55 THE AMERICAN ECONOMIC REVIEW 1097, 1121 (1965) (“Inventive output increases with firm sales, but generally at a less than proportional rate”); ZOLTAN J. ACS AND DAVID B. AUDRETSCH, *INNOVATION AND SMALL FIRMS*, 24 (MIT Press 1991).

²⁸⁶ *Id.* at 16.

²⁸⁷ *Id.* at 54 (MIT Press 1991).

²⁸⁸ Jonathan B. Baker, *Fringe Firms and the Incentive to Innovate*, 63 ANTITRUST L. J. 621, 633-34 (1994-1995).

within a technological space “benefits society by increasing the number of productive approaches to innovation that are collectively pursued in the industry.”²⁸⁹ In some instances, small firms act as agents of change. Numerous examples of small startups that introduced new technology are almost too numerous to count--Hewlett-Packard, Apple, Cisco, Microsoft, Google--all began as small scale research projects.

Scholars have provided reasons that suggest that small firm incentives will continue to generate similar results.²⁹⁰ For example, economist Jennifer Reinganum points out that new entrants have incentives to invest in uncertain, revolutionary fields whenever that firm has an opportunity to capture the post-innovation market.²⁹¹ She reasons that, if the effort is fruitful, “a successful incumbent merely ‘replaces himself,’ and must devote resources from the current business to take the risk, while this consideration is absent from the new entrant’s decision.”²⁹² She explains, “for drastic innovations, the incumbent always invests less than the challenger, so that the incumbency changes hands more often than not” in favor of the new entrant.²⁹³

In a similar vein, economist John Scott explains that, for a single firm with a research budget that equals the same aggregate amount spread across multiple, smaller firms, “rivals would pursue diverse research strategies aimed at producing a unique product unlikely to be considered a mere substitute for competing innovations, but instead likely to have a decisive advantage that would drive other innovations from the post-innovation market.”²⁹⁴ He concludes that a larger monopolist lacks any incentive to ensure diverse outcomes because “regardless of the number of trials producing successful, substitutable innovations, the monopolist gains the same expected benefit.”²⁹⁵ Further, Scott asserts that smaller rivals have an incentive to invest more resources than a monopolist to develop the winning solution and thereby drive its rivals from the field.²⁹⁶

²⁸⁹ Wesley M. Cohen and Steven Klepper, *Firm Size versus Diversity in the Achievement of Technological Advance*, in ZOLTAN J. ACS & DAVID AUDRETSCH, INNOVATION AND TECHNOLOGICAL CHANGE 183, 185 (Michigan 1991).

²⁹⁰ *Id.* at 183; Jennifer F. Reinganum, *Uncertain Innovation and the Persistence of Monopoly*, 73 AMER. ECON. REV. 741 (1983).

²⁹¹ *Id.*

²⁹² *Id.* As Reinganum points out, at the time that the decision is made to invest in a research project, the new entrant has no current business revenue to preserve. At that point, the risk of the new endeavor is the entrant’s only chance to obtain revenue. *Id.* at 745.

²⁹³ *Id.* at 743 (emphasis omitted). This theory has found empirical support in a study of the disc drive industry. Josh Lerner, *Exploration of a Technology Race*, 28 RAND J. OF ECON. 228 (1997).

²⁹⁴ John T. Scott, *Research Diversity Induced by Rivalry* in ZOLTAN J. ACS & DAVID AUDRETSCH, INNOVATION AND TECHNOLOGICAL CHANGE 132, 137-38 (Michigan 1991).

²⁹⁵ *Id.* at 139.

²⁹⁶ *Id.* at 138.

Some caution that the societal benefits of the existence of multiple firms vary by industry.²⁹⁷ Therefore, some restraint may be necessary to gauge “[t]he net effect on social welfare of increasing the number of firms depends on the magnitude of these costs relative to the benefit of having additional approaches of innovation pursued.”²⁹⁸ Nonetheless, on the whole this research supports the concept that ensuring the continued viability of new entrants can create a positive effect on the type and diversity of knowledge creation in the aggregate.

Beyond this, some small entrants have invented creative and worthwhile solutions that are compliments to incumbents' inventions. Unlike competitive activity, this cooperative approach benefits the startup and the incumbent.²⁹⁹ The photo sharing application Instagram was created just after Apple released an improved camera in its iPhone 4.³⁰⁰ In doing so, the value inured to both Instagram and Apple. Startups can provide capabilities when incumbents decide to buy a technological solution, rather than to make it in-house. For example, IBM outsourced the design of a personal computer operating system to the then-start up Microsoft, and the microchip design to Intel just after the hardware company was spun off from Fairchild Semiconductor.³⁰¹ Entrants provide other benefits, including providing inventive inputs. Specifically, large pharmaceutical companies have begun to acquire small inventive companies to obtain access to new medicines.³⁰² Large entities undertook this measure “in spite of increasing investments in R&D, [because] it appears to be a challenge for originator companies to refill the product pipeline and the number of novel medicines reaching the market has been decreasing.”³⁰³ Other small firms provide needed complimentary assets to downstream innovators, who incorporate the small firm’s technology into their own designs.³⁰⁴ Alternatively, small firms that have spun off

²⁹⁷ Cohen & Klepper, *supra* note 289 at 195.

²⁹⁸ *Id.*; see also WILLIAM J. BAUMOL, *THE FREE-MARKET INNOVATION MACHINE* 24 (Princeton 2002) (such conduct may be socially wasteful because the winner-take-all nature of patents).

²⁹⁹ Joshua S. Gans, David H. Hsu, Scott Stern, *When Does Start-Up Innovation Spur the Gale of Creative Destruction?* NBER WORKING PAPER SERIES, 2 (Working Paper 7851)(August 2000).

³⁰⁰ See Somini Sengupta, Nicole Perlroth and Jenna Wortham, *Behind Instagram's Success, Networking the Old Way*, THE NEW YORK TIMES (4/13/12), <http://www.nytimes.com/2012/04/14/technology/instagram-founders-were-helped-by-bay-area-connections.html>.

³⁰¹ See Graham, *supra* note 272, at 52.

³⁰² European Union, Communication from the Commission: Executive Summary of the Pharmaceutical Sector Inquiry Report, Final Report, 3 (July 8 2009).

³⁰³ *Id.* at 3.

³⁰⁴ Joshua S. Gans, David H. Hsu, Scott Stern, *When Does Start-Up Innovation Spur the Gale of Creative Destruction?* NBER WORKING PAPER SERIES, 27-28 (Working Paper 7851)(August 2000).

from universities gain benefits from work performed with those entities.³⁰⁵

One key function that startups can play in the larger system of technological creativity is to introduce changes that incentivize incumbent firms to invest in creating groundbreaking solutions. This creates an ecosystem of competition for new ideas, which has the potential to create welfare effects. As one of many examples, in computer networking industry startup Nicira began to create virtual networks by implementing agile software solutions that could displace the market that is now dominated by hardware incumbents that include Cisco.³⁰⁶ Nicira, which was recently purchased for \$1.26 billion, is predicted to disrupt the current market by creating the next wave.³⁰⁷ In response to Nicira and other developments, Cisco has determined to “reinvent” itself to create its own software-based networking implementation.³⁰⁸ Although not all incumbents respond by launching a competing technology, these instances demonstrate that entrants can act as catalysts that drive an entire field forward.³⁰⁹ Similarly, startup inroads into the wearable technology, including Fitbit and Jawbone, may be prompting Apple to accelerate the development of a smart watch that is geared to collect health information.³¹⁰ Absent such competition, a set of large firms within an industry might continue to evolve established technologies without undertaking the expense and risk of pioneering new ones.

³⁰⁵ Zoltan J. Acs and David B. Audretsch, *Entrepreneurship and Innovation*, MAX PLANCK INSTITUTE OF ECONOMICS, ENTREPRENEURSHIP, GROWTH AND PUBLIC POLICY GROUP, 20 (2005) (“small- and medium-sized enterprises are better able to exploit their university-based associations and generate innovations”)(citing Albert N. Link and John Rees, *Firm Size, University Based Research, and the Returns to R&D*, 2 SMALL BUSINESS ECONOMICS 25 (1990)).

³⁰⁶ See Cade Metz, *Mavericks Invent Future Internet Where Cisco is Meaningless*, WIRED.COM (4/16/12) available at <http://www.wired.com/wiredenterprise/2012/04/nicira/>; Quentin Hardy, *What is Nicira Up To?* THE NEW YORK TIMES (10/17/11) available at <http://bits.blogs.nytimes.com/2011/10/17/what-is-nicira-up-to/>.

³⁰⁷ *VMWare to Acquire Nicira*, VMWare Press Release (7/23/12), <http://www.vmware.com/company/news/releases/vmw-nicira-07-23-12.html>; Quentin Hardy, *Start-Up Nicira Plans to Disrupt Networking Giants*, THE NEW YORK TIMES (2/6/12), <http://bits.blogs.nytimes.com/2012/02/06/start-up-nicira-plans-to-disrupt-networking-giants/>.

³⁰⁸ See Quentin Hardy, *Cisco’s Bold Networking Start-Up*, THE NEW YORK TIMES (3/16/12), <http://bits.blogs.nytimes.com/2012/03/16/ciscos-bold-networking-startup/>; Barb Darrow, *Cisco SDN news: New Switches Now, a Controller Later, and Insieme Comes Home*, GIGAOM (11/6/13), <http://gigaom.com/2013/11/06/cisco-sdn-news-new-switches-now-a-controller-later-and-insieme-comes-home/>.

³⁰⁹ Cf. Thomas S. Robertson, Jehoshua Eliashberg and Talia Rymon, *New Product Announcement Signals and Incumbent Reactions*, 59 J. OF MARKETING 1 (1995) (outlining a range of responses undertaken by incumbents in response to a rival’s new product announcement that may threaten the incumbent’s core business).

³¹⁰ Cf. *Startups that Can Threaten Apple*, ENTREPRENEURSHIP MINGLE (2/14/14) available at <http://maz.entrepreneursmingle.com/blog/2014/02/14/startup-can-threaten-apple/>; Charlie Osborne, *Apple’s iWatch roundup: Rumors, Specs, Price, and Release Date*, ZDNET (6/20/14) available at <http://www.zdnet.com/apples-iwatch-roundup-rumors-specs-price-and-release-date-7000030768/>.

C. Could Large Firms Fill the Gap?

If one assumes that all small firms disappeared tomorrow, it might be hypothesized that larger incumbents could—and would—fill in the gap. Large firms have certain advantages in creating new solutions, including research and development economies of scale, and the ability to maximize the profits earned from successes. Yet these incentives, which can spur large firms to create socially beneficial solutions, come “at the cost of reducing the number of productive approaches to innovation that are collectively pursued in the industry.”³¹¹ Although entrepreneurial large firms do exist, they may be the exception rather than the rule. This circumstance raises questions about the extent to which large firms are likely to invest in invention outside their core area.

Established companies can miss opportunities to develop next generation businesses, even when the prospects are technologically accessible.³¹² This occurs when the incumbent acts rationally to preserve existing profits and respond to their existing customer base.³¹³ As one author notes, the economic pressure on large companies demands large revenue sources to maintain growth rates, and under these circumstances the investment necessary to create small, risk-laden emerging markets is undervalued.³¹⁴ Under pressure to maintain or increase profits, incumbents are incentivized to disregard new opportunities, which are initially geared toward smaller, indeterminate markets that are presently incapable of returning assured returns on investment.³¹⁵ Another source hypothesizes that established companies might be deterred from making groundbreaking changes that cannibalize sales of their existing products.³¹⁶

As one example, during the 1980’s AT&T faced competition in carrying telephone communications from the comparatively smaller MCI Worldcom,

³¹¹ Cohen & Klepper, *supra* note 287 at 185.

³¹² CLAYTON M. CHRISTENSEN, *THE INNOVATOR’S DILEMMA*, 8-9 (Harvard 1997) (describing Sears, Digital Equipment Corporation, and Bucyrus Erie, among others); *see also* Merges, *supra* note 212 at 371-72 (observing that rational firms may limit the type and number of alternative implementations that they create, “satisficing” rather than fully developing all types of products).

³¹³ See Henry C. Lucas Jr. & Jie Mein Goh, *Disruptive Technology: How Kodak Missed the Digital Photography Revolution*, 18 *Journal of Strategic Information Systems* 46, 47 (2009) (“The root cause of failure to adapt to disruptive technologies is that the company practiced good management. The decision-making and resource-allocation processes that make established companies successful cause them to reject disruptive technologies”).

³¹⁴ *Id.* at 102.

³¹⁵ *Id.*

³¹⁶ Christensen, *supra* note 312 at 568 (Rigid Disk Drive Industry); *cf.* Pino G. Audia and Jack A. Gancalo, *Past Success and Creativity Over Time: A Study of Inventors in the Hard Disk Drive Industry*, 53 *MANAGEMENT SCIENCE* 1, 11 (2007) (observing that companies who have a history of building on prior successes do not typically engage in exploratory work in later years).

which had licensed the first successful single-mode optical fiber technology from Corning Glass.³¹⁷ According to one source, AT&T had refused to license fiber optic technology from Corning because when AT&T had the telecommunications monopoly “and must have been less than enthusiastic about ripping up its existing copper wire network in order to replace it with fiber.”³¹⁸ According to this same source, this circumstance unleashed fiber optic communications as a medium, enabled new forms of telecommunications, and forced AT&T to install fiber optic cable to keep up with its competitors.³¹⁹ Consistent with this example, Clayton Christensen has theorized that the incumbent’s biggest strength—the ability to stay close to its current customers—leads larger firms to choose safe solutions over groundbreaking ones.³²⁰ As he explains:

Generally, disruptive technologies look financially unattractive to established companies. The potential revenues from the discernable markets are small, and it is often difficult to project how big the markets for the technology will be over the long term. As a result, managers typically conclude that the technology cannot make a meaningful contribution to corporate growth and, therefore, that it is not worth the management effort required to develop it.³²¹

The former chief executive of past photography leader Polaroid has acknowledged the resistance that prevented that company from moving forward into the new frontier of digital photography.³²² Having invested millions into the successful development of digital imaging and print capability, Polaroid’s “senior management strongly discouraged search and development efforts that were not consistent with the [company’s] traditional business model.”³²³ As one of its

³¹⁷ See Donald B. Keck, *Optical Fiber Spans 30 Years*, 17 LIGHTWAVE 78 (July 2000); Graham, *supra* note 272 at 52.

³¹⁸ Robert E. Litan, Deputy District Attorney General, U.S. Department of Justice, *Antitrust Enforcement And The Telecommunications Revolution: Friends, Not Enemies*, Address Before The National Academy of Engineering (Washington, D. C. Oct. 6, 1994) available at <http://www.justice.gov/atr/public/speeches/0115.htm> (copy of file with the author).

³¹⁹ Robert E. Litan, Deputy District Attorney General, U.S. Department of Justice, *Antitrust Enforcement And The Telecommunications Revolution: Friends, Not Enemies*, Address Before The National Academy of Engineering (Washington, D.C. Oct. 6, 1994) available at <http://www.justice.gov/atr/public/speeches/0115.htm> (copy of file with the author).

³²⁰ See generally CLAYTON M. CHRISTENSEN, *THE INNOVATOR'S DILEMMA* (Harper 2011); see also WILLIAM L. BALDWIN AND JOHN T. SCOTT, *MARKET STRUCTURE AND TECHNOLOGICAL CHANGE* 13 (Harvard 187); see Joseph L. Bower and Clayton Christensen, *Disruptive Technologies: Catching the Wave*, HARVARD BUSINESS REVIEW 43 (Jan.-Feb. 1995).

³²¹ *Id.* at 47.

³²² Nick Bilton, *Disruptions: Innovation Isn't Easy, Especially Midstream*, THE NEW YORK TIMES (April 15, 2012) (quoting Gary T. DiCamillo, former chief executive at Polaroid).

³²³ M. Tripsas and Giovanni Gavetti, *Capabilities, Cognition, and Inertia: Evidence from Digital Imaging*, 21 STRATEGIC MANAGEMENT JOURNAL 1147, 1158 (2000).

former CEO explained, “We knew we needed to change the fan belt, but we couldn’t stop the engine.”³²⁴

Similarly, Kodak, which invented the digital camera, was unable to move the technology forward to commercialization.³²⁵ During the critical years of the 1990's Kodak attempted to hold onto its then-profitable film and photofinishing business.³²⁶ Rivals moved in, and Kodak never recovered. The company’s profits went from \$2.5 billion in 1999 to a losing streak that ultimately resulted in Kodak’s bankruptcy.³²⁷ As one industry participant explained, “Kodak sat on a mountain of cash and profitability in their traditional photography business and I believe their thinking was digital photography will eat into my most profitable business.”³²⁸

This phenomenon is not limited to the photographic industry.³²⁹ In the computer disk drive industry, incumbent IBM led the development of thin film technology during the 1960’s.³³⁰ After investing fourteen years and \$300 million, IBM introduced the technology in its highest end product.³³¹ Yet IBM was one of

³²⁴ Bilton, *supra* note 322 (quoting Gary T. DiCamillo, former chief executive at Polaroid).

³²⁵ *The Last Kodak Moment?*, THE ECONOMIST (1/14/2012), <http://www.economist.com/node/21542796>; see Chunka Mui, *How Kodak Failed*, FORBES.COM (1/18/12) available at <http://www.forbes.com/sites/chunkamui/2012/01/18/how-kodak-failed/> (describing the invention of the digital camera by Kodak engineer Steve Sasson, and Kodak’s inadequate corporate response to this new disruptive technology).

³²⁶ *Id.* at 13 (quoting George Eastman); Henry C. Lucas Jr. & Jie Mein Goh, *Disruptive Technology: How Kodak Missed the Digital Photography Revolution*, 18 J. OF STRATEGIC INFORMATION SYS. 46, 53 (2009) (quoting former Kodak CEO George Fisher, who explained that managers within the organization were concerned about the low profit margin of digital technology, new customer needs, and new competitors that the company was ill-equipped to understand).

³²⁷ *Id.* (discussing 1999 profits); see also, David Cay Johnston, *Kodak to Reduce Its Work Force by Up to 15,000*, THE NEW YORK TIMES (1/23/2004), <http://www.nytimes.com/2004/01/23/business/kodak-to-reduce-its-work-force-by-up-to-15000.html> (describing competition and Kodak’s difficulties implementing digital technology); Michael J. de la Merced, *Eastman Kodak Files for Bankruptcy*, THE NEW YORK TIMES DEALBOOK (1/19/12), <http://dealbook.nytimes.com/2012/01/19/eastman-kodak-files-for-bankruptcy> (Kodak bankruptcy).

³²⁸ Lucas & Goh, *supra* note 326 at 54 (statement of Carly Fiorino, ex-CEO of Hewlett-Packard).

³²⁹ Other examples include Xerox’s invention of the graphical user interface, which was then developed by Microsoft and Apple, Fairchild’s development of silicon processors which was subsequently adopted by Intel, and AT&T’s invention of transistor and cell phone technology, which was later used by numerous cell phone makers. See Sharon Belezon & Andrea Pataconi, *How Does Firm Size Mediate Firms’ Ability to Benefit from Invention?* (2/19/2013)(unpublished manuscript, draft on file with author).

³³⁰ Clayton Christensen, *The Rigid Disk Drive Industry: A History of Commercial and Technological Turbulence*, THE BUS. HIST. REV., 531, 551 (1993).

³³¹ *Id.* at 551 & 578.

the last entities to introduce the technology to the rest of its line.³³² By then, new entrants had leapt ahead to develop component parts that relied on this platform technology that had been developed by IBM.³³³ In the earliest era, the market-dominant incumbent, IBM, controlled the pace of the introduction of new technologies into the market.³³⁴ After entrants began designing alternatives, the entire market—including IBM—began to develop new implementations.³³⁵

These examples suggest Schumpeter's view of large firms' capacity to undertake complex, groundbreaking projects is accurate, other factors may allow small firms to lead the way for technological innovation. Certainly, many incumbents have developed and introduced numerous important, groundbreaking technologies.³³⁶ Indeed, some large firms make a conscious effort to undertake inventive risks. Perhaps learning from the startup mindset which seeks to disrupt market incumbents, “[t]he corporation has become entrepreneurial.”³³⁷ Some established companies have incorporated entrepreneurship initiatives into their standard business practices, funded startup efforts, and hosted entrepreneurs-in-residence in order to infuse “startup culture” into their everyday operations.³³⁸ Yet it is not entirely clear how widespread these lessons have been learned by large incumbents, and at the same time startups by their nature have different incentives to create challenging technology.

VII. An Individualized Balance: Benefits of the Patent System

A. Potential Adverse Impacts of Opting Out

Entities view the desirability of the patent system differently. One study of small, emerging firms reported that interviews with the “top executives at these early-stage firms whether the patents that they are seeking (and for which they are devoting scarce resources) offer incentives to create, develop, and commercialize the technology that is at the core of the venture, they answer that, in general,

³³² *Id.* at 579.

³³³ *Id.* at 578-79. Notably, these new entities were able to enter the field by hiring key IBM engineers, and because IBM enjoyed only “weak patent protection.” *Id.* at 579.

³³⁴ *Id.* at 579.

³³⁵ *Id.* at 580-83.

³³⁶ Ashish Sood & Gerald J. Tellis, *Technological Evolution and Radical Innovation*, 69 J. OF MARKETING 152, 161 (2005).

³³⁷ See Graham, *supra* note 272.

³³⁸ See Dan Schawbel, *How Big Companies are Becoming Entrepreneurial*, TECHCRUNCH.COM (7/29/12), <http://techcrunch.com/2012/07/29/how-big-companies-are-becoming-entrepreneurial/>.

patents are not serving that purpose particularly well."³³⁹ This same study found that "[s]ubstantial numbers of early-stage technology companies appear to be opting out of the patent system altogether" by declining to pursue patent protection for their inventions.³⁴⁰ Some simply ignore patents until addressing an infringement allegation becomes an imperative.³⁴¹ This proposal offers a structured method to formally opt out of the patent system. Although "going patent-free" has the benefit of immunizing the entity from suit, this commitment requires relinquishing the ability to obtain patents during the life of the anti-patent. This loss is potentially quite significant and should not be undertaken lightly.

Patents allow their owners to capture value from inventive activity and, under some circumstances, to contribute toward securing a competitive position.³⁴² To the extent that the startup can fund assertion of the right, patents can be valuable to secure a position against larger incumbents who may have superior production, resources, and distribution methods.³⁴³ A first-mover that captures an early and strong patent position in an emerging market can gain significant advantages.³⁴⁴ For example, a robust patent portfolio can successfully stave off competitors for years. During that time, the inventive firm can experiment, re-design, and establish a market position before others begin to enter the field.³⁴⁵ A strong patent position can, under some circumstances, allow a firm to be the exclusive supplier of a product market, which enables the firm to build up other complimentary assets including trademarks, customer loyalty, and a distribution system.³⁴⁶ If successful, these assets provide the first patentee with a favorable position after the patents expire.³⁴⁷

Further, patents facilitate engagement with others, whether through

³³⁹ *Berkeley Patent Survey*, *supra* note 21, at 1287.

³⁴⁰ *Berkeley Patent Survey*, *supra* note 21, at 1276.

³⁴¹ Lemley, *supra* note 196 at 21-22.

³⁴² David J. Teece, Gary Pisano, and Amy Shuen, *Dynamic Capabilities and Strategic Management*, 18 STRATEGIC MANAGEMENT JOURNAL 509, 521 (1997) (intellectual property protection can be one of several "key differentiators" among firms); Joel West, *Does Appropriability Enable or Retard Innovation?* in HENRY CHESBROUGH, WIM VANHAVERBECK AND JOEL WEST, EDS., *OPEN INNOVATION: RESEARCHING A NEW PARADIGM*, (Oxford University Press 2006).

³⁴³ David J. Teece, *Profiting from Technological Innovation: Implications for Integration, Collaboration, Licensing and Public Policy*, 15 RES. POL'Y 285, 301 (1986) ("Large firms are more likely to possess the relevant specialized and cospecialized assets within their boundaries at the time of new product introduction").

³⁴⁴ *See id.* at 290 (1986).

³⁴⁵ *Id.*

³⁴⁶ *Id.* (describing the successful strategy of G.D. Searle with respect to its NutraSweet sugar substitute).

³⁴⁷ *Id.*

collaboration, integration, or licensing.³⁴⁸ Invention and product development rely on a mix of inflows and outflows of knowledge.³⁴⁹ These interactions can be important for a number of reasons, including the development of products that require competencies from more than one specialty.³⁵⁰ These relationships are built on a more complex set of considerations that include inbound and outbound licensing of intellectual property rights.³⁵¹ A company that lacks IP might be hindered in collaborative development, particularly if the proposed collaborator owns strong rights but cannot expect to receive any useful licenses in return.³⁵² Further, patents facilitate contractual relationships with upstream suppliers and downstream manufacturers, and prevent such partners from converting themselves into competitive adversaries.³⁵³

B. The Venture Capital Question

Technological advance is expensive. Virtually all founders require outside capital to move their concept into a commercialized product. In many cases, traditional sources of lending are not available to startups, because nascent firms without any sales records represent significant uncertainty and lack sufficient tangible assets to secure a loan. Entrepreneurial companies can require years to deliver revenue, the scope of a new market is uncertain, and there are numerous variables that might assist or prevent success along the way.³⁵⁴ For many, funding sources that specialize in new firms, including grants, angel and venture funding, are the most viable options.³⁵⁵

³⁴⁸ Cf. *id.* at 293 (describing advantageous contractual relationships with suppliers, manufacturers and distributors).

³⁴⁹ See David J. Teece, *Explicating Dynamic Capabilities: The Nature of Microfoundations of (Sustainable) Enterprise Performance*, 28 STRATEGIC MANAGEMENT JOURNAL 1319, 1325 (2007) (considering the eco-system of inputs that contribute to competitive advantage).

³⁵⁰ Teece, *supra* note 349, at 293 (noting that “the variety of assets and competences which need to be accessed is likely to be quite large, even for only modestly complex technologies”).

³⁵¹ Larry A. DiMatteo, *Strategic Contracting: Contract Law as a Source of Competitive Advantage*, 47 AM. BUS. L.J. 727, 754-57 (2010).

³⁵² Cf. HENRY CHESBOROUGH, WIM VANHAVERBEKE AND JOEL WEST, OPEN INNOVATION: A NEW PARADIGM FOR UNDERSTANDING INDUSTRIAL INNOVATION, 14 (2006) (observing that intellectual property “flows in and out of the firm on a regular basis, and can facilitate the use of markets to exchange valuable knowledge”); Tamara Loomis, *Cell Break*, IP L. & BUS. (July 2005) (discussing an example for new entrants to the GSM cell phone market that must pay 10-15% royalty amounts, while companies that owned patents paid nothing).

³⁵³ Cf. Teece, *supra* note 349 at 294 (observing that licensing can bring about “the added danger that the partner may imitate the innovator’s technology and attempt to compete with the innovator”).

³⁵⁴ PAUL A. GOMPERS & JOSH LERNER, THE MONEY OF INVENTION: HOW VENTURE CAPITAL CREATES NEW WEALTH, 47 (2001);

³⁵⁵ See generally Thomas Hellmann and Manju Puri, *Venture Capital and the Professionalization of Start-Up Firms: Empirical Evidence*, 57 THE J. OF FINANCE, 169 (2002).

Venture capital has played a significant role in the development of new ideas and technological innovation in the U.S.³⁵⁶ One study estimates that venture funding is responsible for between eight and twelve percent of all innovative activity in the U.S.³⁵⁷ Further, venture funding delivers roughly three times the inventive results as the same amount spent in the corporate sector.³⁵⁸ Selection for funding by a well-know venture firm can become a seal of approval that allows the startup to obtain additional backing from other sources.³⁵⁹ Some venture firms provide management advice and other advantages that facilitate a funded startup's success.³⁶⁰ Indeed, sometimes the distinction between a forgotten invention and a successful one is that the later obtained early venture funding, advice, and introductions to critical players within the industry. As one example, a CEO in the biometrics information field stated that the company's patent position was "a key question that came up during negotiations" with prospective investors.³⁶¹ One study concluded that patenting by specialized entrants viewed patents as "especially critical to these firms in attracting venture capital funds."³⁶² Another found investor's perceptions of start-ups with patents are positive, overall resulted in increased valuations and a higher likelihood of offers for funding.³⁶³

Venture firms can be extremely selective, selecting as few as six (6) out of one thousand (1,000) applicants.³⁶⁴ It has been said that startups must seek patent protection as a prerequisite to venture funding.³⁶⁵ The reasons include the belief that patents applications to be filed to facilitate market exclusivity, which in turn

³⁵⁶ Samuel Kortum & Josh Lerner, *Assessing the Contribution of Venture Capital to Innovation*, 31 RAND J. ECON. 674, 691 (2000).

³⁵⁷ *See id.*

³⁵⁸ *Id.* at 675.

³⁵⁹ GOMPERS & LERNER, *supra* note 354 at 51.

³⁶⁰ *Id.* at 43, and 52-53 (listing examples).

³⁶¹ *Berkeley Patent Survey*, *supra* note 21, at 1305.

³⁶² Bronwyn H. Hall & Rosemarie Ham Ziedonis, *The Patent Paradox Revisited: An Empirical Study of Patenting in the U.S. Semiconductor Industry, 1979-1995*, 32 THE RAND J. OF ECON. 101, 104 (2001).

³⁶³ David H. Hsu & Rosemarie Ziedonis, *Patents as Quality Signals for Entrepreneurial Ventures*, 6 (Apr. 2007) (unpublished manuscript, on file with author).

³⁶⁴ PAUL A. GOMPERS & JOSH LERNER, *THE MONEY OF INVENTION: HOW VENTURE CAPITAL CREATES NEW WEALTH*, 9 (2001)(estimating that out of two million U.S. startups, only about 2,200 firms receive venture funding); Ronald J. Mann, *Do Patents Facilitate Financing in the Software Industry?*, 83 Tex. L. Rev. 961, 975 (2005) (citing MICHAEL A. CUSUMANO, *THE BUSINESS OF SOFTWARE* 198 (2004)).

³⁶⁵ *See* Mario W. Cardullo, P.E., *Intellectual Property – The Basis for Venture Capital Investments*, p. 2, WIPO.INT ("Without the strength of the intellectual property and its protection, little if any investments would be made into new or growing enterprises.") available at http://www.wipo.int/export/sites/www/sme/en/documents/pdf/venture_capital_investments.pdf; Mike Masnick, *Venture Capitalist Explains How Patents Can Be A Tax On Innovation*, TECHDIRT.COM (reporting the commonly held assumption that "venture capitalists won't invest in companies without patents").

leads to superior returns on investment.³⁶⁶ Some point out that funding decisions can be made more confidently in firms that hold patents, because these rights are a proxy for the quality of the startup's technology.³⁶⁷ Additionally, patents provide investors with some return on their investment as a revenue source, whether through licensing or sale, particularly if the startup should fail.³⁶⁸

Nonetheless, one comprehensive study observed that there is “some ambiguity about the role played by patents in securing funding,” and that “patenting may not be a necessary condition for access to entrepreneurial capital.”³⁶⁹ Venture capitalists do not use a uniform strategy, and their methods and criteria for assessing financing decisions varies.³⁷⁰ Other indicators of quality exist beyond intellectual property, including management education and experience, the earning potential of the proposed concept, reasonable capital requirements, and a unique product that will likely manifest a significant competitive advantage, among other things.³⁷¹ Moreover, the importance of patents to investors varies between different technology sectors.³⁷² For example, patents are more important to venture capitalists investing in biotechnology companies compared to software and Internet startups.³⁷³ This same distinction exists for angel investors and other funding sources.³⁷⁴ Significantly, studies have reported that a significant percentage of venture backed software firms do not hold any patents.³⁷⁵ For those firms that do hold patents, it has been difficult to ascertain whether those patents attracted venture funding, or alternatively whether

³⁶⁶ See, e.g., *id.* at 3.

³⁶⁷ *Berkeley Patent Survey*, *supra* note 21, at 1303.

³⁶⁸ Dietmar Harhoff, *The Role of Patents and Licenses in Securing External Finance for Innovation*, HANDBOOK OF RESEARCH ON INNOVATION AND ENTREPRENEURSHIP 55 (2011); R. Epstein and M. Pierantozzi, *Obtaining Maximum Value from Distressed Patent Assets*, 28 AM. BANKRUPTCY INST. J. 48 (2009).

³⁶⁹ *Berkeley Patent Survey*, *supra* note 21, at 1305.

³⁷⁰ Gompers & Lerner, *supra* note 354 at 47; Vance H. Fried & Robert D. Hisrich, *Toward a Model of Venture Capital Investment Decision Making*, 23 FINANCIAL MANAGEMENT 26, 31 (1994) (concluding that “The specifics of each criterion will vary from VC to VC. . . . Even if two VCs have the same criteria, there may be major differences in their judgment as to how well as particular investment proposal meets these criteria”).

³⁷¹ Cf. Ronald J. Mann, *Do Patents Facilitate Financing in the Software Industry?*, 83 TEX. L. REV. 961, 975-76 (2005); Vance H. Fried & Robert D. Hisrich, *Toward a Model of Venture Capital Investment Decision Making*, 23 FINANCIAL MANAGEMENT 26, 30-31 (1994).

³⁷² *Berkeley Patent Survey*, *supra* note 21, at 1279-80.

³⁷³ Michael J. Meurer, *Inventors, Entrepreneurs, and Intellectual Property Law*, 45 HOUS. L. REV. 1201, 1224 (2008) (observing that, although there is disagreement among researchers, there is “strong evidence” that patents are more important to obtain venture capital funding in the biotechnology field when compared to the information and communication technology field).

³⁷⁴ *Berkeley Patent Survey*, *supra* note 21, at 1308.

³⁷⁵ *Id.*; Ronald J. Mann, and Thomas W. Sager, *Patents, Venture Capital, and Software Start-ups*, 36 RESEARCH POLICY, 193, 197 (2007) (reporting that nine percent (9%) of the surveyed software firms had acquired a patent prior to their first round of venture funding).

the cash infusion was used for patent application fees and attorney time.³⁷⁶

Moreover, the amount of patent litigation has changed the risk calculus over the past few several years. One recent study found that *one hundred percent* of the venture capitalists surveyed stated that a patent demand against a startup would be a “major deterrent” in deciding whether to invest.³⁷⁷ Most venture capitalists surveyed found that their companies experienced significant impacts from the assertion of patents, such as distracting management, expending resources, or altering business plans.³⁷⁸ Some respondents described a few more extreme results, including one companies’ need to raise a bridge round to cover defense costs, another that had spent millions, and a third that went under.³⁷⁹ Less tangible impacts include “a huge emotional and financial toll,” that “slow[ed] down our progress.”³⁸⁰ As one venture capitalist summarized, “when companies spend money trying to protect their intellectual property position, they are not expanding; and when companies spend time thinking about patent demands, they are not inventing.”³⁸¹ This same study affirmed the high number of startups that are subjected to patent demands.³⁸² By comparison, a patent opt-out optimizes the return for each investment dollar spent.

Immunity from patent lawsuits eliminates the cost, risk and uncertainty of patent assertion. One venture capitalist points out that “permissionless innovation” within the software industry “led to the explosion of independently created services on the internet,” and that currently “it becoming impossible to invent new services on the web without the permission of a patent holder who claims to own the intellectual property embodied in your invention.”³⁸³ One venture capitalist concluded that non-practicing entities are creating difficulties for the acquisition of startups, because buyers “are worried about buying a

³⁷⁶ *Id.* at 199 (2007).

³⁷⁷ Robin Feldman, *Patent Demands & Startup Companies: The View from the Venture Capital Community*, 55-56 (unpublished manuscript available at <http://ssrn.com/abstract=2346338>). According to this survey, roughly half of those surveyed agreed that a patent demand “would be a major deterrent on its face, and the other half indicated that it could be a major deterrent, depending on the circumstances.” *Id.* at 56.

³⁷⁸ *Id.* at 40-41 (estimating that seventy-four percent (74%) of venture capitalists reported “either a highly significant or moderately significant impact on the companies that received them”).

³⁷⁹ *Id.* at 45.

³⁸⁰ *Id.* at 47.

³⁸¹ *Id.* at 51.

³⁸² *Id.* at 34-38 (reporting that over seventy percent (70%) of the venture capitalists surveyed reported that one of their funded companies had received a patent demand).

³⁸³ Brad Burnham, *Software Patents Are the Problem, Not the Answer*, USV.COM (2/19/10) (founding partner of Union Square Ventures, a U.S. venture capital firm), available at <http://www.usv.com/posts/software-patents-are-the-problem-not-the-answer>.

company and getting sued."³⁸⁴

Certainly, the upward trajectory of patent litigation over the past few decades has introduced funding challenges. One study of venture capital investment in these areas concluded that high levels of patent litigation in those fields have a significant negative impact on venture capital investment.³⁸⁵ Extrapolating from this data, and building in certain assumptions, this research stated "VC investment in new innovation and startups over the past five years would likely have been \$109 million higher than it would have been but-for excess patent litigation."³⁸⁶ It bears emphasis that the anti-patent's proposal is voluntary—only startups that perceive that their opportunities are greater without the patent system will elect to participate. To some venture capitalists, the prospect of backing a firm that can engage in permissionless innovation and distinguishing its products on non-patent differentiators might be the wiser course.³⁸⁷ As a practical matter, many new technology companies cannot afford the high price of patent litigation against a large incumbent.³⁸⁸

VIII. Conclusion

This proposed system operates to address some of the specific criticisms that have been leveled at the patent system over recent years. As has been outlined, the deadlock between supporters of the current system and its critics will be narrowed and perhaps resolved by additional data. Currently, it cannot be ascertained with any certainty whether the maximum level of innovation is occurring. By creating a narrow, voluntary program, important new information about the operation of invention, innovation and job growth in the absence of patents would be obtained. The current state of the research suggests that a primary starting point is with the software industry, where there has been widespread evidence of the problems created by the uniform patent lock-in. If adopted, the anti-patent system would alleviate those problems. On the other hand, if little support for an immunity proposal cannot be obtained, that

³⁸⁴ Colleen V. Chien, *Patent Assertion and Startup Innovation*, New America Foundation.com, at 47 (2013) available at http://www.newamerica.net/publications/policy/patent_assertion_and_startup_innovation.

³⁸⁵ Catherine Tucker, *The Effect of Patent Litigation and Patent Assertion Entities on Entrepreneurial Activity*, MIT SLOAN SCHOOL WORKING PAPER 5095-14, 15 (June 22, 2014) (unpublished manuscript available at <http://ssrn.com/abstract=2457611>).

³⁸⁶ *Id.* at 31.

³⁸⁷ Startups commonly rely on non-patent differentiators to establish market leadership, including first-mover advantages, trade secrecy, copyrights, branding strategies, trademarks, mechanisms that inhibit reverse engineering, and a variety of superior production, implementation, and marketing capabilities.

³⁸⁸ See Ronald J. Mann, *Do Patents Facilitate Financing in the Software Industry?*, 83 TEX. L. REV. 962, 981 (2005);

circumstance likewise provides important information about the authenticity of the criticism leveled at the patent system to date.