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The Antipatent: A Proposal for Startup Immunity

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Amy L. Landers*

The Antipatent: A Proposal for Startup Immunity

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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.[1] One of the foundational assumptions of the U.S. patent system is that "IP rights play a large role in generating economic growth."[2] In the words of the former U.S. Patent and Trademark Office Director David Kappos, "[o]ur 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."[3] Some assert that patents are necessary to correct the market failure inherent in knowledge-based assets.[4] Intangible information can be costless for rivals to reproduce and, absent some form of protection or reward, some posit that "the inventor will therefore be at a market disadvantage relative to rivals, and will possibly be dissuaded from investing" in research and development.[5]

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1. Office of the Press Sec'y, *Fact Sheet - Executive Actions: Answering the President's Call to Strengthen Our Patent System and Foster Innovation*, THE WHITE HOUSE (Feb. 20, 2014), http://www.whitehouse.gov/the-press-office/2014/02/20/fact-sheet-executive-actions-answering-president-s-call-strengthen-our-p, *archived at* http://perma.unl.edu/H5T-PGQ6; *see also, e.g.*, S. COMM. ON PATENTS, TRADEMARKS, & COPYRIGHTS, 90TH CONG., REP. OF THE PRESIDENT'S COMMISSION ON THE PATENT SYSTEM 5 (Comm. Print 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"); STUDY OF S. COMM. ON PATENTS, TRADEMARKS, & COPYRIGHTS, 85TH CONG., AN ECONOMIC REVIEW OF THE PATENT SYSTEM (Comm. Print 1958) (study prepared by Fritz Machlup); ECON. & STAT. ADMIN. & U.S. PAT. & TRADEMARK OFF., INTELLECTUAL PROPERTY AND THE U.S. ECONOMY: INDUSTRIES IN FOCUS at I (2012), *archived at* http://perma.unl.edu/W7UD-BW5N (stating that "[p]rotecting our ideas and IP promotes innovative, open, and competitive markets, and helps ensure that the U.S. private sector remains America's innovation engine"); Pres. Richard M. Nixon, Special Message to Congress Proposing Patent Modernization and Reform Legislation (Sept. 27, 1973), *archived at* http://perma.unl.edu/8P68-DPSV (observing that the nation's "creative history" is based in part on the patent laws that have "enormously stimulated our progress and prosperity").

2. ECON. & STAT. ADMIN. & U.S. PAT. & TRADEMARK OFF., *supra* note 1, at v.

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

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

5. Nancy Gallini & Suzanne Scotchmer, *Intellectual Property: When Is It the Best Incentive System?*, 2 INNOVATION POL'Y AND THE ECON. 51, 53 (2002).

This view stridently advocates the necessity of patent laws as a critical path to encourage knowledge creation and economic growth.[6] Some research has observed a positive correlation between research-and-development spending, innovation, and growth in the gross domestic product.[7] The National Patent Planning Commission, an ad hoc body commissioned by President Roosevelt, described in a 1945 report:

> 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.[8]

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."[9] Patents are intended to provide incentives to innovate through the restriction on the use of newly created knowledge.[10] Under this view, the 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, affirmed this principle by maintaining that a patent's pecuniary rewards are a key component toward encouraging invention. The Federal Circuit explained, "the 'encouragement of investment-based risk is the fundamental purpose of the patent grant, and is based directly on the right to exclude.'"[11] In this same vein, the court explained, "the Patent Act creates an incentive for innovation. The economic rewards during the period of exclusivity are the carrot.

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6. WILLIAM NORDHAUS, INVENTION, GROWTH AND WELFARE: A THEORETICAL TREATMENT OF TECHNOLOGICAL CHANGE 8–9 (1969) (discussing the assumption that technological advance is linked to economic growth); ADAM B. JAFFE & JOSH LERNER, INNOVATION AND ITS DISCONTENTS 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").

7. WILLIAM J. BAUMOL, THE FREE-MARKET INNOVATION MACHINE: ANALYZING THE GROWTH MIRACLE OF CAPITALISM 51–52 (2002).

8. Vannevar Bush, *Science: The Endless Frontier*, *in* 8 SCIENCE, TECHNOLOGY, AND SOCIETY 22 (John Dewey & Julius A. Sigler eds., 1997).

9. STUDY OF S. COMM. ON PATENTS, TRADEMARKS, & COPYRIGHTS, *supra* note 1, at 21.

10. *See, e.g.*, Joseph E. Stiglitz, *Economic Foundations of Intellectual Property Rights*, 57 DUKE L.J. 1693, 1696 (2008).

11. Sanofi-Synthelabo v. Apotex, Inc., 470 F.3d 1368, 1383 (Fed. Cir. 2006) (quoting Patlex Corp. v. Mossinghoff, 758 F.2d 594, 599 (Fed. Cir. 1985)).

The patent owner expends resources in expectation of receiving this reward."[12]

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.[13] He explains, that one possible interpretation of the relevant data suggests "that patents are not central to appropriating the returns to R&D in most industries."[14] Legal scholar Robert Merges expresses similar doubts, stating: "Try 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."[15]

Merges's misgivings about the utilitarian justification for patents echo those of economist Fritz Machlup.[16] During 1958, Machlup recognized that no empirical evidence or theoretical argument confirmed or refuted any beneficial effect of the patent system on the state of technological advancement.[17] Acknowledging that it "seems very likely" 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."[18] Faced with a conflict between competition and patents as the primary drivers of invention and innovation, 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.[19]

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12. King Instruments v. Perego, 65 F.3d 941, 950 (Fed. Cir. 1995).
13. Adam B. Jaffe, *The U.S. Patent System in Transition: Policy Innovation and the Innovation Process*, 29 RES. POL'Y 531, 540 (2000).
14. *Id.* at 554.
15. ROBERT P. MERGES, JUSTIFYING INTELLECTUAL PROPERTY 3 (2011). Merges's 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. *Id.*
16. 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. STUDY OF S. COMM. ON PATENTS, TRADEMARKS, & COPYRIGHTS, *supra* note 1.
17. *Id.*
18. *Id.* at 78; *see also* BAUMOL, *supra* note 7, at 50 (noting that "[i]t is competitive pressures that force firms to run as fast as they can in the innovation race just to keep up with the others").
19. STUDY OF S. COMM. ON PATENTS, TRADEMARKS, & COPYRIGHTS, *supra* note 1, at 80.

Recent data casts doubt on the necessity of patents in all technology fields. One survey of over one thousand early stage technology companies reported that patents are not a strong incentive to create, develop, and commercialize technology.[20] Although the patent system exists to foster new technologies, "startup executives report that patents generally provide relatively weak incentives to conduct innovative activities."[21] 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.[22]

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.[23] These included fields that are encompassed within computing, software, the Internet, and biotechnology.[24] The lack of patents in these technology areas was due to accident, rather than by design.[25] Although created fortuitously, this circumstance generated a safe harbor against shut down threats. In turn, entities were able to experiment, create follow-on improvements, and innovate.

Others have analyzed the heavy transaction costs 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 *dis*incentive for innovation."[26] 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

20. Stuart J.H. Graham et al., *High Technology Entrepreneurs and the Patent System: Results of the 2008 Berkeley Patent Survey*, 24 BERKELEY TECH. L.J. 1255 (2009).

21. *Id.* at 1255.

22. *Id.* at 1289–90.

23. 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.

24. *Id.* at 613.

25. *Id.* at 620 (observing that "the fact that previous enabling technologies were not generally patented may be thought a happy accident for innovation").

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

from patents to innovation or to productivity."[27] Specifically, Boldrin and Levine argue that, despite increased numbers of issued patents since the 1980s, there has not been a corresponding increase in research and development investment, or "any additional surge in useful innovations and aggregate productivity."[28] 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, to prevent new entrants from gaining a foothold, and to encourage rivals to exit the field.[29] 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 the insiders."[30]

Some engaged in the creation of patentable technology have expressed concern about the patent system's effect on their respective fields.[31] These include objections by software programmers, who, according to one source, have "mostly been opposed to patents on software."[32] Another comes from a Nobel-prize winning biologist, who stated "the tools for manipulating genomes should be in the public domain," because "it's 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."[33] Two leaders in the synthetic biology field performed a survey to determine the key technologies used by other researchers.[34] 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 uncer-

27. Michele Boldrin & David K. Levine, *The Case Against Patents*, J. OF ECON. PERSP., Winter 2013, at 7.

28. *Id.* at 4.

29. *Id*. at 11. These authors cite Apple's iPhone as one example of this phenomenon.

30. *Id.* at 11. *See generally* TIM WU, THE MASTER SWITCH: THE RISE AND FALL OF INFORMATION EMPIRES (2010).

31. *See, e.g.*, BESSEN & MEURER, *supra* note 26, at 189 (cataloguing the software industry's opposition to patent protection); Alok Jha, *Human Genome Project Leader Warns Against Attempts to Patent Genes*, THE GUARDIAN, Jun. 24, 2010, http://www.theguardian.com/science/2010/jun/24/human-genome-project-patent-genes/print, *archived at* http://perma.unl.edu/H5S7-L2LK; Heidi Ledford, *Bioengineers Look Beyond Patents*, NATURE, July 3, 2013, http://www.nature.com/polopoly_fs/1.13320!/menu/main/topColumns/topLeftColumn/pdf/499016a.pdf, *archived at* http://perma.unl.edu/8NNX-AW39; Nicole Wilke, *A Patent Lie: How Yahoo Weaponized My Work*, WIRED, Mar. 13, 2012, http://www.wired.com/2012/03/opinion-baio-yahoo-patent-lie/, *archived at* http://perma.unl.edu/P3JA-QEWD.

32. BESSEN & MEURER, *supra* note 26, at 189.

33. Jha, *supra* note 31.

34. Linda J. Kahl & Drew Endy, *A Survey of Enabling Technologies in Synthetic Biology*, 7 J. BIOLOGICAL ENGINEERING 1 (2013).

tainty at the foundation of that art's practice.[35] Kent Walker, Google's Senior Vice President and General Counsel, wrote that patent litigation involving low-quality software patents "threatens to stifle innovation."[36]

The question of whether the patent system as a whole is beneficial is currently one of the most crucial questions relating to the technological progress. Still, 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, "[n]o one can faithfully say what the industrial history of this country would have been without a patent system."[37] 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 startups 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, startups are precluded from patenting during the opt-out period. Because the program is voluntary, it permits 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 permits the field to learn critical (and, still unavailable) information about innovation in a world without patents. Various patentable scientific and technological fields would benefit from the research performed by those who opt into the program because the results of the participants' research and development inures to the public domain.

The current patent system sets a national unified policy with broad application to all acts of scientific creativity. It locks all innovators into the same system, regardless of the impact 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 allows individual entities to rationally decide, based on all of the evidence to date, whether innovation and nonpatent differentiators provide the preferred path toward viability and profitability without the patent system. This "antipatent" creates the opportunity to explore the technologically creative results obtained by inventors who are incentivized

35. *Id.* at 9.
36. Kent Walker, *Patents and Innovation*, GOOGLE BLOG (Apr. 4, 2011), http://googleblog.blogspot.com/2011/04/patents-and-innovation.html, *archived at* http://perma.unl.edu/J8HD-2AG5.
37. Pasquale J. Frederico, *Introductory*, 18 J. PAT. OFF. SOC'Y 11, 12 (1936).

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 ANTIPATENT

This Article proposes a voluntary opt-out system for emerging companies. Unlike a patent right to exclude, this proposal is for an antipatent, which has the opposite purpose. Essentially, an antipatent 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 obtain qualified immunity from all third-party patent infringement assertions. During the immunity time period, a startup in the program does not acquire any liability for nonwillful infringement of any patents. The entity can participate in "permissionless innovation" and invention—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.[38] 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.[39] As with other types of legal immunities, no liability inures to a startup that has a granted antipatent application. 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 pat-

38. Union Square Ventures founding partner Brad Burnham coined the term "permissionless innovation." *Software Patents Are the Problem Not the Answer*, USV.COM (Feb. 19, 2010), https://www.usv.com/posts/software-patents-are-the-problem-not-the-answer, *archived at* http://perma.unl.edu/E7YK-5MRX.

39. *See, e.g.*, 35 U.S.C. § 287(c) (2012) (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. Fla. Prepaid Postsecondary Educ. Expense Bd. v. Coll. Savings Bank, 527 U.S. 666, 670 (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).

ent claims that cover all, or any aspect, of the startup's activity. This includes patents that read on the startup's entire product, service, 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 antipatent 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 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 to provide the maximum opportunity for development.

The present proposal is feasible under current administrative and court structures. Startups that seek to opt out can file an application akin to those filed to secure patent protection at the U.S. Patent and 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 antipatent. 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 antipatent term.

This breadth of immunity warrants careful examination procedures at the PTO. Typical examination of patent applications results in a significant number of erroneous grants.[40] Because immunity applications will not be asserted against any entity, validity challenges in the courts might never occur.[41] To minimize errors, the PTO must implement strict review standards. These include a requirement that the applicant perform a high-quality prior-art search before filing, and once an immunity application is received, the applicant should be subjected to an intensive search and high level of review.[42] To further decrease the error rate, the patent examination should adopt the "sec-

40. *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).

41. Antipatents might use some of the postgrant review procedures currently in place as a safeguard against erroneous issuance.

42. *See generally* Mark Lemley et al., *What to Do About Bad Patents?*, REGULATION, Winter 2005–2006, at 10.

ond-pair-of-eyes" method used to scrutinize problematic business method patents.[43]

Under this proposal, published and granted antipatents have preclusive effects that parallel the current law for patents and published applications. In other words, the disclosure of a published antipatent operates as prior art to prevent others from obtaining patent rights on the disclosures set forth therein.[44] 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 antipatent's disclosure. Rather, the disclosures from the antipatent and any commercialized products offered for sale inure to the public domain. Because antipatents cannot be asserted or infringed, others are free to use the information 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.[45] 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.[46] To prevent abusive assertions of patent infringement, willfulness allegations must be pled with particularity.[47] As an additional procedural safeguard, infringement complaints against antipatent 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.[48] If the action proceeds past these safeguards, the patent holder can proceed against the antipatent 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

43. *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 (last modified Sept. 20, 2007), *archived at* http://perma.unl.edu/G6AL-U4LU (describing program).

44. 35 U.S.C. §§ 102–103 (2012).

45. For more assumptions about the type of entity eligible for the program, see *infra* Part III.

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

47. FED. R. CIV. P. 9(b).

48. 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. CIV. PROC. CODE § 425.16 (West 2015).

system have noted its shortcomings, and some data suggests that the system is not necessary to—and may be impeding—certain types of technological progress. Patent supporters state that criticisms of the patent system rest on "little empirical evidence."[49] Yet because the current patent regime has been ubiquitous for over two centuries in the United States, 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-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."[50] 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.

Antipatents are intended for startups that determine on an individual basis that they are better off without the patent system entirely. As a true opt-out, the grant of an antipatent precludes such entities from receiving any patents on any subject matter during the immunity period.[51] Additionally, the prohibition against patenting is critical to increase the public benefit from the proposed program. The information in an antipatent 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 applies to early stage startups.[52] This proposal contemplates that the startup's founding commences no longer than twenty-

49. *See* Kappos, *supra* note 3, at 487.
50. *Id.* at 500.
51. This proposal does not contemplate any prohibition on the filing of subsequent antipatent applications.
52. *Cf.* 35 U.S.C § 123(a) (2012) (defining "micro entities" as small entities with fewer than four previously filed patent applications, with a modest income, and that have not (and are not under an obligation to) transfer ownership of a patent to a larger entity). "Small entities" are defined as individuals and small firms with fewer than 500 employees. *See* 13 C.F.R. §§ 121.801–805 (2014); 37 C.F.R. § 1.27 (2014).

four months prior to the application date.[53] The program does not include startups that are acquired, majority-owned by a larger company, or have had an initial public offering.[54] For reasons that are explored in Part IV herein, small 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 their 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.[55] 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 in 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.

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53. 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 positions of CEO and president of the applicant are these individuals' primary occupations and that these positions be held for the first time.

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

55. *See* BESSEN & MEURER, *supra* note 26, at 188–203; DAN L. BURK & MARK A. LEMLEY, THE PATENT CRISIS AND HOW THE COURTS CAN SOLVE IT 157 (2009) (noting that "the software industry in particular [has] arguably suffered the most from the crisis in the patent system"); U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-13-465, INTELLECTUAL PROPERTY: ASSESSING FACTORS THAT AFFECT PATENT INFRINGEMENT LITIGATION COULD HELP IMPROVE PATENT QUALITY 45 (2013), *archived at* http://perma.unl.edu/BQL5-K7Q8 (identifying software patents as an area needed for further study).

To fully assess this proposal, the distinction between ideas, inventions, and innovation should be considered.[56] 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 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.[57] Bringing an idea into the invention stage may be simple for some types of inventions. Typically, more challenging, groundbreaking inventions take longer.[58]

Generally, 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.[59] Along the way, the process from idea to commercialization is iterative and riddled with setbacks, pivots, and deviations.[60] 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

56. 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).

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

58. *Cf.* SUZANNE BERGER, MAKING IN AMERICA: FROM INNOVATION TO MARKET 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").

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

60. *Id.* at 88.

to learn by building."[61] 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 can extend the time that the startup collects its initial revenues even further. Events that detract from this drive to market, including the multimillion dollar drain of patent litigation, can stymie the startup's viability.[62]

The commercialization of the Nest thermostat provides 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."[63] 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.[64] He discussed his concept with a colleague in Fall 2009, who agreed to form Nest with Fadell.[65] The company was founded in the middle of 2010.[66] In September of that year, Nest received its first round of venture funding.[67] While he sought this funding, Fadell did not present prospective investors with a working prototype, but instead a crude Styrofoam model and a business plan in a slide deck.[68] Based solely on this information, it might

61. *Id.*; *see also* Erica Fuchs & Randolf Kirchain, *Design for Location? The Impact of Manufacturing Offshore on Technology Competitiveness in the Optoelectronics Industry*, 56 MGMT. SCI. 2323, 2338–39 (2010) (recounting the interaction between designers and manufacturers for optoelectronic components).

62. *See* Catherine E. Tucker, *The Effect of Patent Litigation and Patent Assertion Entities on Entrepreneurial Activity*, SOC. SCI. RES. NETWORK (Jun. 25, 2014), http://ssrn.com/abstract=2457611, *archived at* http://perma.unl.edu/GCJ9-BYGR; *see infra* Part V.

63. Adam Lashinsky, *Is Tony Faddel the Next Steve Jobs . . . Or the Next Larry Page?*, FORTUNE (June 12, 2014, 7:29 AM), http://fortune.com/2014/06/12/tony-fadell-nest/, *archived at* http://perma.unl.edu/JWR8-4BMU; *The Podfather, Part III,* ECONOMIST, Mar. 9, 2013, http://www.economist.com/news/technology-quarterly/21572922-tony-fadell-helped-revolutionise-music-and-phone-industries-now-he-turning, *archived at* http://perma.unl.edu/W2VJ-2EUB.

64. *The Podfather, Part III*, *supra* note 63.

65. *Id.*

66. *See Nest*, CRUNCHBASE, http://www.crunchbase.com/organization/nest-labs (last visited Oct. 16, 2014), *archived at* http://perma.unl.edu/RZ8C-AVD3. Nest filed its articles of incorporation on June 30, 2010. *Id.*

67. Lashinsky, *supra* note 63.

68. Lashinsky, *supra* note 63. According to this article, one venture capitalist recalls that, during Faddel's pitch, he "was crestfallen" looking at the rudimentary model. *Id.* As his investor described, "My emotions couldn't have been lower,"

appear that at this juncture Faddel'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.[69]

Nest reached its first commercialized version of the Nest thermostat in October 2011 after receiving two rounds of funding.[70] Consistent with the startup's patent applications, the device predicts temperature needs by "learning" its user's habits so that it can customize home temperatures.[71] After a calendar year, the device had sold units in the area of "in the mid hundreds of thousands."[72] In the beginning of 2014, Google purchased Nest for 3.2 billion dollars, and the number of Nest thermostats sold had reached over one million.[73] Nest has now developed a revised version of its thermostat, a smart smoke detector, and is thought to be developing in-home camera technology.[74]

Nest represents a concept-to-commercialization example that succeeded under the best of circumstances. Run by a highly credentialed inventor, 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,

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but "[t]hen I got it. Nest was a Trojan horse into the home. In 48 hours we had a check for Tony." *Id.*

69. U.S. Patent No. 8,510,255 (filed Sept. 14, 2010); U.S. Patent Application Serial No. 2012/0066168 (filed Sept. 14, 2010); U.S Patent Application Serial No. 2012/0065783 (filed Sept. 14, 2010).

70. *Nest*, *supra* note 66. 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.*

71. Quentin Hardy, *Big Data in the (Heated or Cooled) Air Around You*, THE N.Y. TIMES BITS BLOG (Sept. 4, 2012, 11:45 AM), http://bits.blogs.nytimes.com/2012/09/04/big-data-in-the-heated-or-cooled-air-around-you/, *archived at* http://perma.unl.edu/MVS4-UEU9; Steven Levy, *Brave New Thermostat: How the iPod's Creator Is Making Home Heating Sexy*, WIRED (Oct. 25, 2011, 12:31 AM), http://www.wired.com/2011/10/nest_thermostat/, *archived at* http://perma.unl.edu/E8HE-WMVA (describing the Nest thermostat as "smart, thrifty and so delightful that saving energy was as much fun as shuffling an iTunes playlist").

72. Hardy, *supra* note 71.

73. Kent Bernhard Jr., *iPod Godfather Tony Fadell Builds Nest Egg with $3.2 B Google Deal*, UPSTART BUS. J. (Jan. 13, 2014), http://upstart.bizjournals.com/entrepreneurs/hot-shots/2014/01/13/ipod-godfather-tony-fadell-builds-nest.html, *archived at* http://perma.unl.edu/A937-YS5H.

74. Aaron Tilley, *Nest Is Buying Dropcam to Get More Data on the Home*, FORBES.COM (June 21, 2014, 2:28 PM), http://www.forbes.com/sites/aarontilley/2014/06/21/nest-buying-dropcam/, *archived at* http://perma.unl.edu/V8BR-4CSL.

but seven times).[75] The company, which started in April 2007, began with $400,000 in private investment that proved inadequate to manufacture the device.[76] Despite thousands of preorders, Fitbit had difficulty obtaining a second round of capital, finally convincing one venture capitalist to invest.[77] Fitbit required tremendous focus to belatedly get the product to the market during late 2009.[78] As the company's cofounder and CEO described, "one mistake in hardware and you're done. . . . One mistake can set you back months."[79] Fitbit's founders, both experienced entrepreneurs, noted that the first product launch experienced significant delays because of redesigns, logistical problems, and finding acceptable manufacturing sources.[80] During this delay, rivals began moving in.[81]

Many startups fail long before reaching Nest or Fitbit's sales levels.[82] The first few years are difficult, strenuous, and resource starved.[83] 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 antipatent 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

75. Robert Hof, *How Fitbit Survived as a Hardware Startup*, FORBES.COM (Feb. 4, 2014), http://www.forbes.com/sites/roberthof/2014/02/04/how-fitbit-survived-as-a-hardware-startup/, *archived at* http://perma.unl.edu/R4ZA-8AK4.

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

77. *Id.*

78. *Id.*

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

80. *Id.*; Jenna Wortham, *Hamstrung by Delays, Fitbit Explains and Tries to Deliver*, N.Y. TIMES, Dec. 11, 2009, at B2.

81. Hof, *supra* note 75.

82. *See, e.g.*, *76 Failure Post-Mortems*, CB INSIGHTS.COM (Jan. 20, 2014), http://www.cbinsights.com/blog/startup-failure-post-mortem, *archived at* http://perma.unl.edu/MDJ2-7UJX (giving numerous examples of startup failures).

83. *See e.g.*, Jeanette Cajide, *Shutting Down Blurtt*, TECHCRUNCH.COM (Feb. 16, 2014), http://techcrunch.com/2014/02/16/shutting-down-blurtt/, *archived at* http://perma.unl.edu/ZYA6-6M8K (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").

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."[84] A problem space has three essential parts, including a starting point, an end goal and, between those two, a search space.[85] Essentially, this type of problem space represents the state wherein one has a goal but no clear path to obtaining it.[86] 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.[87] 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.[88] 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 in-

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

85. *Id.*

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

87. *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).

88. *See generally* THOMAS S. KUHN, THE STRUCTURE OF SCIENTIFIC REVOLUTIONS (3d ed. 1996).

crease in importance as subsequent decisions are made.[89] 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 Article accepts that this incentive operates for some startups. Further, this Article 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.[90] 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 return to the endeavor is likely to fall."[91]

At the same time, the value of patents to startups is not clear. 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."[92] This survey observes that the results are consistent among firms that hold patents and those that do not.[93] Another study suggests that this finding applies to large manufacturing companies, finding "patents are unambiguously the least central of the major appropriability mechanisms overall."[94] In another context, the long-held belief that

89. *See* Thomas V. Busse & 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).

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

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

92. Graham et al., *supra* note 20, at 1283. Notably, this survey does not address incentives to invention, and cautions that "further investigation of our findings is warranted." *Id.* at 1285.

93. *Id.* at 1285–87.

94. Wesley M. Cohen et. al., *Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (or Not)* 9 (Nat'l Bureau of Econ. Research, Working Paper No. 7552, 2000), *archived at* http://perma.unl.edu/PP4Q-9FDR. The Berkeley Patent Survey found that there were significant differences among the respondents from different industries. Graham, *supra* note 20, at 1286 (generally, biotechnology firms reported that patents served as a "moderate" incentive to innovate, whereas software firms found that patents "generally provide at best 'slight' incentives."); *see also* Cohen et al., *supra* note 94, at 12 (reporting similar distinctions).

patents operate effectively to prevent imitation has been questioned.[95] This is particularly true for startups, which because of their scarce resources may find themselves unable to afford the price to obtain and assert 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.[96] Some information demonstrates reason for concern. One study reported data suggesting that companies with higher litigation costs (which tend to be younger companies) tend to avoid research and development in fields occupied by companies with lower litigation costs (which tend to be larger incumbents) that have patented and obtained large awards.[97] This circumstance threatens to lock technological solutions into the hands of the first entities that develop solutions, rather than encouraging subsequent research and development by others.

One source identifies patent assertion by nonpracticing entities as being particularly problematic. Specifically, Professor Chien's survey of small companies reported that 40% that received a patent demand from a nonpracticing 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 shutdown business line or the entire business, and/or lost valuation."[98] 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.[99]

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

96. *Cf.* FED. TRADE COMM'N, TO PROMOTE INNOVATION: THE PROPER BALANCE OF COMPETITION AND PATENT LAW AND POLICY 50 (2003).

97. Josh Lerner, *Patenting in the Shadow of Competitors*, 38 J.L. & ECON. 463 (1995).

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

99. *See generally* KEVIN G. RIVETTE & DAVID KLINE, REMBRANDTS IN THE ATTIC 39–41 (2000) (with some exceptions that included Apple and National Semiconductor, noting "Silicon Valley's early antipathy toward patents").

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 but filed for only one patent.[100] Significantly, according to one insider, "[t]his growth was obviously not fuelled [sic] by patents, it was fuelled [sic] by competition and by open, nonproprietary interfaces."[101] During its second decade, Cisco began to gradually increase its filings.[102] By 2006, Cisco held over 2,500 issued U.S. patents and had applied for over 4,000 more.[103] Cisco engaged in this activity to establish a defensive patent portfolio.[104]

Similar to Cisco, Microsoft had very few patents during its first decade and a half.[105] In 1991, the company reached a turning point. In that year, its founder Bill Gates recognized 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."[106] Nonetheless, Gates stated his concern that patents gave others the "right to take as much of our profits as they want," and concluded the solution was "patenting as

100. *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.), *archived at* http://perma.unl.edu/4VS7-PZQU (noting that from 1984 through 1993, Cisco Systems had filed for only one patent and, by 1994, had over $1 billion in revenue annually).

101. *Id.*

102. *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).

103. *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), *archived at* http://perma.unl.edu/8S4Y-AUZP.

104. *Competition and Intellectual Property Law and Policy in the Knowledge-Based Economy*, *supra* note 100, at 674 (statement of Robert Barr, Vice President for IP and Worldwide Patent Counsel, Cisco Systems, Inc.) (stating that by 1994, Cisco hired patent counsel "to start a program to obtain more patents. . . . [for] 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").

105. Timothy B. Lee, *Analysis: Microsoft's Software Patent Flip-Flop*, ARS TECHNICA (Mar. 13, 2007), http://arstechnica.com/business/2007/03/analysis-microsofts-software-patent-flip-flop/, *archived at* http://perma.unl.edu/9FWG-5GMP ("Microsoft's first software patent was granted in 1988, and the company held only three software patents by its 15th anniversary in 1990.").

106. Memorandum from Bill Gates on Challenges and Strategy (May 16, 1991) (on file with author).

much as we can."[107] Today, Microsoft's Patent Tracker shows that the company owns over 46,000 issued patents worldwide.[108]

Facebook, which launched in 2004, had very few patents as of October 2008.[109] The company owned just 56 patents in early 2012.[110] By the end of March of that year, the company acquired roughly 750 more from IBM.[111] 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.[112] Facebook made acquisitions from other sources as well, including the patent portfolio of Friendster that "date[s] back to the early days of social networking, [and is] incredibly broad."[113]

Cisco, Microsoft, and Facebook present examples of companies that significantly increased their patent holdings years after commercial success. These are not isolated occurrences.[114] In these instances, pathbreaking innovation was accomplished without any significant protection from patents. Indeed, as Gates acknowledged, in the early

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107. *Id.*

108. See the Microsoft Patent Tracker at *Legal Resources*, MICROSOFT, http://www.microsoft.com/en-us/legal/intellectualproperty/Patents/ (last updated Dec. 11, 2014), *archived at* http://perma.unl.edu/3WE7-KF5F.

109. *See* Eric Eldon, *Facebook Awarded 1 of Its 35 Patent Applications—Significance Unclear*, INSIDE FACEBOOK (Feb. 26, 2010), http://www.insidefacebook.com/2010/02/26/facebook-awarded-1-of-its-35-patent-applications-significance-unclear/, *archived at* http://perma.unl.edu/8HFF-HLLP (discussing published applications); Bill Slawski, *Facebook Patent Filings (updated)*, SEO BY THE SEA (Jan. 24, 2010), http://www.seobythesea.com/2010/01/facebook-patent-filings/, *archived at* http://perma.unl.edu/XKN3-PF7Q.

110. Josh Lowensohn, *Facebook Shores Up Defenses, Taps IBM for Patents*, CNET.COM (Mar. 22, 2012), http://news.cnet.com/8301-13578_3-57402673-38/facebook-shores-up-defenses-taps-ibm-for-patents/, *archived at* http://perma.unl.edu/J7GZ-8923 ("[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.").

111. *Id.*

112. Facebook, Annual Report (Rule 10-K) at 73 (Apr. 23, 2012).

113. Liz Gannes, *Facebook Buys Friendster Patents for $40M*, GIGAMON (Aug. 4, 2010), http://gigaom.com/2010/08/04/facebook-buys-friendster-patents-for-40m/, *archived at* http://perma.unl.edu/LNL7-FFKM; *see also* Leonid Kravets, *Facebook's Patent Acquisitions? They're More About Google than Yahoo*, TECH CRUNCH (Apr. 27, 2012), http://techcrunch.com/2012/04/27/facebook-google-patents/, *archived at* http://perma.unl.edu/A4GK-7978 (stating "[t]he company paid 40 million for the Friendster social networking patent portfolio, acquired a group of patents from Walker Digital, and another from Hewlett-Packard").

114. *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, 1538–39 (2011) (observing that the "software industry developed in the 1960s, 1970s, and 1980s without any significant role for patent protection").

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, offer any guidance, 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 that certain fields demonstrate increased creativity in the aggregate from the minimal assertion of intellectual property rights.[115] 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.[116] 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.[117] In such instances, they conclude, "Imitation becomes a *spur* to innovation, whereas strong patents become an *impediment*."[118] These scholars make a compelling case. Still, nearly all forms of technological fields are characterized by sequential innovation and differentiated product development.[119] The results from the experiment may prove to be more profound, with implications for all technological fields. If broadly implemented, data gathered from an antipatent program could be used to identify such features across all technology areas.

A key question is whether "the enforcement process undermines the R&D incentives of small firms."[120] 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

115. James Bessen & Eric Maskin, *Sequential Innovation, Patents, and Imitation*, 40 RAND J. ECON. 611 (2009).

116. *Id.* at 612.

117. *Id.*

118. *Id.* at 613.

119. 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.

120. Jean O. Lanjouw & Mark Schankerman, *Protecting Intellectual Property Rights: Are Small Firms Handicapped?*, 47 J.L & ECON. 45, 48 (2004).

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 antipatent is their preferred strategy would rely on nonpatent 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 antipatent 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, and nonobvious inventions.[121] Invention is the result of a combination of factors, including technological creativity.[122] All technological progress is built on preexisting knowledge.[123] 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."[124]

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 older solutions do not provide satisfactory answers.[125] The results may be either a radical modification of a past solution or an entirely new structure based on profoundly original reinterpretations of existing information.[126] Just as one cannot create something from nothing, a creator must use preexisting knowledge to build creative, plausible, and useful solutions. As one source describes, "The skillful manipulation of ideas, of course, is precisely the job of working

121. *See* Mayo Collaborative Servs. v. Prometheus Labs, Inc., 132 S. Ct. 1289, 1305 (2012) ("[T]he promise of exclusive rights provides monetary incentives that lead to creation, invention, and discovery.").

122. *See* KSR Int'l 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.").

123. *See e.g.*, David Henry Feldman, *Creativity: Dreams, Insights, and Transformations*, *in* THE NATURE OF CREATIVITY 271, 288–89 (Robert J. Sternberg ed., 1988) (prior work "reduce[s] the 'mental distance' one has to go to be able to make meaningful change").

124. Carl Shapiro, *Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard Setting*, *in* 1 INNOVATION POLICY AND THE ECONOMY 119, 119 (Adam B. Jaffe et al. eds., 2001).

125. RONALD A. FINKE ET AL., CREATIVE COGNITION: THEORY, RESEARCH, AND APPLICATIONS, 150–51 (1992); Masao Ito, *Control of Mental Activities by Internal Models in the Cerebellum*, 9 NATURE 304, 308 (2008); Larry R. Vendervert et al., *How Working Memory and the Cerebellum Collaborate to Produce Creativity and Innovation*, 19 CREATIVITY RES. J. 1, 3 (2007).

126. FINKE ET AL., *supra* note 125, at 164.

memory."[127] 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."[128]

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."[129] 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 that existed 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 the preexisting HVAC system and added new features that did not previously exist so as 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 preexisting and novel components of a claim. This information from one's memory, whether formerly or recently learned, is used as the raw material necessary to generate possible solutions and to test their usefulness.[130] As a hypothetical example, the "learning" aspect of a Nest device can be considered its novel *component*. Yet this novel component is based on some preexisting *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.[131] 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. Preexisting information that underlies new innovations derives

127. Nelson Cowan, *Embedded-processes Model of Working Memory*, *in* MODELS OF WORKING MEMORY: MECHANISMS OF ACTIVE MAINTENANCE AND EXECUTIVE CONTROL 62 (Akira Miyake & Priti Shah eds., 1999); Vendervert et al., *supra* note 125, at 5.

128. Feldman, *supra* note 123, at 294.

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

130. FINKE ET AL., *supra* note 125, at 164.

131. *See generally* U.S. Patent No. US 8,510,255 (filed Sept. 14, 2010) (describing the informational inputs used by the Nest device to predict temperature preferences).

from a wide variety of sources. These sources include the public domain, including theory and background information about the relevant technology.[132] 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.[133] 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."[134]

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 patented. Firms choose to keep some inventions secret, or have determined that some inventions are not worth the cost of patenting. As one example, General Electric engineers invented the compact fluorescent bulb in 1976, the spiral-shaped bulb that is now widely sold as an energy-saving device.[135] When first invented, the company decided that commercialization of the spiral-shaped bulbs was cost prohibitive, and so shelved the project without filing for patent protection.[136] In other instances, some companies rely on alternative mechanisms—including first to market, sales and service efforts, or a faster move up the learning curve—to establish leadership rather than patents.[137] A

132. *See, e.g.*, MIHALY CSIKSZENTMIHALYI, CREATIVITY: FLOW AND THE PSYCHOLOGY OF DISCOVERY AND INVENTION 90 (1996).

133. *See* Mayo Collaborative Servs. v. Prometheus Labs, 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, 602 (2010) (observing that abstract ideas are "part of the storehouse of knowledge of all men . . . and reserved exclusively to none" (quoting Funk Bros. Seed Co. v. Kalo Inoculant Co., 333 U.S. 127, 130 (1948) (internal quotation mark omitted)); *see also* Feist Publ'n, Inc. v. Rural Tel. Serv. Co., Inc., 499 U.S. 340 (1991) (facts are not copyrightable).

134. *Funk Bros. Seed Co.*, 333 U.S. at 130 (1948).

135. This invention has been credited to an engineer named Edward Hammer. *Compact Fluorescent: The Challenge of Manufacturing*, NAT'L MUSEUM OF AM. HISTORY (last visited Nov. 3, 2014), http://americanhistory.si.edu/lighting/20thcent/invent20.htm#in4, *archived at* http://perma.unl.edu/G6XA-TN7T.

136. *10 Questions for . . . Ed Hammer, CFL Inventor*, CONSUMER REPORTS.ORG (Aug. 29, 2008, 12:09 AM), http://www.consumerreports.org/cro/news/2008/08/10-questions-for-ed-hammer-cfl-inventor/index.htm, *archived at* http://perma.unl.edu/9MCD-DPD7 (interview with inventor).

137. *See generally* Richard C. Levin et al., *Appropriating the Returns from Industrial Research and Development*, 3 BROOKINGS PAPERS ON ECONOMIC ACTIVITY 783, 795 (1987) (in a survey of corporations, finding that "[g]enerally, lead time, learning

significant share of startups cannot afford to patent.[138] Indeed, one study found that only 10% of approximately three thousand major advances identified in various fields had been patented.[139] 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.[140] 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.[141] Other inventions may be independently created at nearly the same time, just as it has been demonstrated that different scientists working on the same problem have created the same invention independently and proximately in time.[142]

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 not patentable.[143] 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, 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.[144]

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curves, and sales or service efforts were regarded as substantially more effective than patents in protecting products").

138. Graham, *supra* note 20, at 1310.

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

140. *Cf.* KSR Int'l 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"); Bessen & Maskin, *supra* note 115, at 612 (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").

141. Bessen & Maskin, *supra* note 115, at 613 (discussing differentiated sequential improvements).

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

143. *See* Mayo Collaborative Servs. v. Prometheus Labs, Inc., 132 S. Ct. 1289, 1297 (2012).

144. Alice Corp. Pty. Ltd. v. CLS Bank Int'l, 134 S. Ct. 2347, 2354 (2014) (citations omitted) (quoting *Mayo*, 132 S. Ct. at 1293; Gottschalk v. Benson, 409 U.S. 63, 67 (1972)).

Moreover, 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 set point commands from the utility" to be used by an environmental control system within the building or home.[145] Honeywell's patent does not describe the particular methods used by the Nest thermostat with specificity. However, under patent law, doing so is not required. Broad claims read on multiple implementations that were never contemplated by the original inventor. In that sense, the Honeywell claim describes the concept of remote HVAC control, whether wireless or through a Wi-Fi enabled device, and serves as an informational input into Nest's device. Further, Nest must spend the resources to defend against Honeywell's claim even if it is invalid as abstract or for lack of novelty.

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.[146] 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 have never heard of, operating (if they operate at all) in an entirely different market claims that our company has stolen their property.[147]

Patent infringement does not require intent to copy.[148] In theory, the accused infringer has some options. She can modify the design to avoid the patent, attempt to license the patent, or ignore the patent and risk litigation. As detailed in the next section, these options must be considered even if the accused infringer has valid defenses.

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145. US Patent No. 6,975,958 (filed Apr. 30, 2003).

146. 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").

147. Burnham, *supra* note 38.

148. Intel Corp. v. U.S. Int'l Trade Comm'n, 946 F.2d 821, 832 (Fed. Cir. 1991) (intent is not a requirement to demonstrate direct infringement).

V. PATENT LOCK-IN: STANDING ON THE SHOULDERS OF PLAINTIFFS

It is an understatement to say that the patent system has changed significantly since enacted in 1790. Although the essential structure of the law's incentive system and fundamental requirements has been consistent, the manner in which the rights are acquired, owned, used, transferred, and asserted has significantly shifted.

Relevant here, there is widespread agreement that the numbers of patents issued since the 1980s has risen significantly.[149] The reasons for that rise have been the subject of conflicting theories and conclusions. One theory concludes that research activity has shifted from basic toward applied research, and that the rise is consistent with a burst of activity directed toward innovation.[150] 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."[151] 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-1980s as instructive. According to this source:

> Although the original suits were against non-U.S. 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.[152]

Another study found that firms, despite acknowledging that patents are not effective tools to create exclusivity, are patenting to obtain rights that can be used strategically. Some of these uses include blocking rivals from patenting related inventions, using patents to gain low-cost access to another's technology in negotiations, and protecting against patent suits.[153] This study recognized that some firms

149. *See, e.g.*, PRICEWATERHOUSECOOPERS LLP, 2013 PATENT LITIGATION STUDY: BIG CASES MAKE HEADLINES, WHILE PATENT CASES PROLIFERATE 6 (2014); Samuel Kortum & Josh Lerner, *Stronger Protection or Technological Revolution: What Is Behind the Recent Surge in Patenting?* (Nat'l Bureau of Econ. Research, Working Paper No. 6204, 1997), *archived at* http://perma.unl.edu/FHQ4-8K4Y (observing an unprecedented recent jump in patenting in the United States).

150. Kortum & Lerner, *supra* note 149, at 33 (observing an unprecedented recent jump in patenting in the United States).

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

152. *Id.* at 109.

153. Cohen et al., *supra* note 94.

were using "patent portfolios to garner licensing revenue."[154] Its authors conclude, "our findings suggest that patents are still not the major mechanism for appropriating returns to innovations in most industries."[155]

In addition to the escalating number of patents issued, the number of patent infringement lawsuits has ramped up over the past several years.[156] Some have documented that an increasingly large component of those suits in recent years were brought by nonpracticing entities.[157] According to one study of patent cases filed from 2007 through 2012, "Of the ten parties who filed the greatest number of patent litigations in the years . . . studied, all were patent monetization entities."[158] These entities have been actively asserting patents against small companies.[159] According to one study of 233 technology startups, seventy-nine have been approached with the threat of a patent monetization lawsuit.[160]

Generally, patent-infringement allegations impose significant transaction costs on participants. The financial costs range from five-hundred thousand up to several 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

154. *Id.* at 27.

155. *Id.* at 24.

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

157. Robin Feldman, Tom Ewing & Sara Jeruss, *The AIA 500 Expanded: The Effects of Patent Monetization Entities*, 17 UCLA J.L. & TECH. 1, 7 (2013) (finding that in 2012 "patent monetization entities represented a majority of the patent litigation filed in the United States").

158. *Id.*

159. Chien, *supra* note 98, at 464; *see also* SILICON VALLEY BANK, STARTUP OUTLOOK, 2013 REPORT, at 21–22 (charting the frequency of IP disputes among startups).

160. Chien, *supra* note 98, at 470.

161. AM. INTELLECTUAL PROP. LAW ASS'N, REPORT OF THE ECONOMIC SURVEY I-133 to -160 (2013).

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

163. Lerner, *supra* note 97, at 475–76.

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 nonmonetary 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 operational impact" falls hardest on smaller entities—that is, "[t]he 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 that 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 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 in litigation expenses to win a

164. Lanjouw & Schankerman, *supra* note 120, at 48–49; *see also* Lerner, *supra* note 97, at 465–66 (examining the effect of litigation costs on new biotechnology firms).
165. *See* Michael Waterson, *The Economics of Product Patents*, 80 AM. ECON. REV. 860, 867 (1990).
166. *See* Lanjouw & Schankerman, *supra* note 120, at 47.
167. *Id.*
168. *Id.* at 47–48.
169. Chien, *supra* note 98, at 465.
170. *Id.* at 475 (parenthesis omitted).
171. *Id.* at 476.
172. *Id.* at 477–78.
173. *Id.* at 477.
174. Charles Duhigg & Steve Lohr, *The Patent, Used as a Sword*, N.Y. TIMES, Oct. 17, 2012, http://www.nytimes.com/2012/10/08/technology/patent-wars-among-tech-giants-can-stifle-competition.html, *archived at* http://perma.unl.edu/LZ8-TBYD.

judgment of noninfringement 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 startup 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 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 cost that

175. *Id.*

176. Peter Cohan, *5 Reasons to Scrap Our Patent System: #1. Apple's Siri*, FORBES (Oct. 8, 2012), http://www.forbes.com/sites/petercohan/2012/10/08/5-reasons-to-scrap-our-patent-system-1-apples-siri/, *archived at* http://perma.unl.edu/X7XU-7WUX.

177. BESSEN & MEURER, *supra* note 26, at 133.

178. *Id.*

179. *Id.*

180. Ron D. Katznelson, Does the Law of Innovation Work Against Itself? 6 (July 17, 2014) (unpublished manuscript), *archived at* http://perma.unl.edu/Q8SN-8JKS.

181. *See generally* Robin Feldman & 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 context to another, the lack of predictability in patent decisions, and other uncertainties in patent law," validity and infringement are difficult to predict). Pretrial clearance is particularly problematic outside the chemical and pharmaceutical industry.

182. Christina Mulligan & Timothy B. Lee, *Scaling the Patent System*, 68 N.Y.U. ANN. SURV. AM. L. 289, 304–05 (2012).

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 "[p]atent 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 reparsed, 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 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

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

184. Harry Surden, *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 & Mark A. Lemley, *Fence Posts or Sign Posts? Rethinking Patent Claim Construction*, 157 U. PA. L. REV. 1743, 1745 (2009).

187. *Id.* at 1751–52 (noting the high reversal rates of patent claim construction determinations by the district court).

188. BESSEN & MEURER, *supra* note 26, at 20–21; Burk & Lemley, *supra* note 186, at 1744 ("Patent law has provided none of the certainty associated with the definition of boundaries in real property law.").

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

190. *Id.*

191. BESSEN & MEURER, *supra* note 26, at 71 (noting that the problems of ascertaining patent rights in the information technology sector are acute); Burk & Lemley, *supra* note 186, at 1760.

introduces uncertainty, the potential for large cash expenditures and the potential for a shutdown injunction after a product launch.[192]

In addition to the indeterminacy of patent claims, the transaction costs associated with 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]

This entrepreneur is not alone, as other inventors in complex technology areas do not undertake the onerous task of obtaining patent clearance.[198] Certainly, 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,

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* Mulligan & Lee, *supra* note 182, at 297.
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 26, at 152–55 (uncertain boundaries of patent claims are prevalent in for software, business methods and biotechnology).
195. 35 U.S.C. § 102 (2012).
196. Mark Lemley, *Ignoring Patents*, 2008 MICH. ST. L. REV. 19, 20; *see* BESSEN & MEURER, *supra* note 26, at 9.
197. Burnham, *supra* note 38.
198. Lemley, *supra* note 196, at 21 ("[B]oth researchers and companies in component industries simply ignore patents. Virtually everyone does it.").

rather than research and development. These costs are significant, as a patent trial costs an average of $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 was never 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 that cover specified technology clusters.[204] From the perspective of those accused of infringement, these portfolios create a cloud of uncertainty that translates into an exponential multiplication of risk compared to the assertion of a single patent. The owner of hundreds, or thousands, of relevant patents that 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

199. AM. INTELLECTUAL PROP. LAW ASS'N, *supra* note 161, at I-135 (2013); *see* 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 3 n.8 (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. Graham, *supra* note 20, at 1315–16.

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

203. *Id.* at 7.

204. *See e.g.*, Feldman & 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").

give rise to 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]

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, "[t]o produce the finished commercial product requires a license to every one of those hundreds or thousands of patents. If the producer misses

205. *Cf.* Boyle, *supra* note 162, at 62–63 (describing the problems associated with analyzing the Motorola patents acquired by Google as a defensive measure: "[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. Parchomovsky &Wagner, *supra* note 202, at 32.

207. Feldman & Ewing, *supra* note 181, at 25.

208. *See* Jerry R. Green & Suzanne Scotchmer, *On the Division of Profit in Sequential Innovation*, 26 RAND J. ECON. 20, 20 (1995) (observing that a first inventor may not have a sufficient incentive to invest if competition from improved products undermines the original inventor's profits).

209. *See* 35 U.S.C. § 271(d)(4) (2012); Cohen et al., *supra* note 94, at 22 (patentees sometimes use patents to create fences around their core products, which are not licensed).

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] For example, 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 improving 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 the 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 has multiple components 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 standard-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 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 welcome 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. Patent monetizers 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 ri-

210. Cohen et al., *supra* note 94, at 22.

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* Shapiro, *supra* note 124, at 123.

vals' 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 a massive damages judgment. As one source observes, "[t]he 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] The large scale nature of this fight suggests that industry incumbents would have been quite unlikely to license a new entrant that was seeking to introduce a competing good. Startups in this field, without significant patent holdings, face the risk of large licensing and litigation costs, as well the cost of design and manufacturing that are inherent in designing new hardware.

Patents owned by entities seeking to obtain licensing revenues 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] For example, former camera maker Kodak asserted digital-camera patents against Apple's iPhone.[221] Kodak's patents claim a compo-

215. Anne Layne-Farrar & Klaus M. Schmidt, *Licensing Complementary Patents: "Patent Trolls," Market Structure, and "Excessive" Royalties*, 25 Berkeley Tech. L.J. 1121, 1131 (2010).

216. Duhigg & Lohr, *supra* note 174 (detailing parties and widespread nature of the past and ongoing smartphone patent litigation); *The Great Patent Battle*, ECONOMIST, Oct. 21, 2010, http://www.economist.com/node/17309237, *archived at* http://perma.unl.edu/8JJN-K2BG (same); Florian Mueller, *Samsung Files ITC Complaint Against Apple: Long-Time Partners Heading for Ugly Divorce? — UPDATED*, FOSS PATENTS (June 30, 2011), http://www.fosspatents.com/2011/06/samsung-files-itc-complaint-against.html, *archived at* http://perma.unl.edu/V552-3WVV (cataloguing lawsuits between Samsung and Apple, filed in the U.S., Japan, South Korea, Germany, the UK and Italy); *see also* Michael A. Carrier, *A Roadmap to the Smartphone Patent Wars and FRAND Licensing*, CPI ANTITRUST CHRON., Apr. 30, 2012, *archived at* http://perma.unl.edu/6NKW-8VZR (same); Leo Kelion, *Mobile Phone Makers Wage War to Protect Their Patents*, BBC.COM (Oct. 23, 2011), http://www.bbc.co.uk/news/business-15343549, *archived at* http://perma.unl.edu/X3RJ-FEXX (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 & Bryan Pon, *Structuring the Smartphone Industry: Is the Mobile Internet OS Platform the Key?*, 11 J. INDUSTRY, COMPETITION & TRADE 239 (2011).

217. *The Great Patent Battle*, *supra* note 216.

218. Duhigg & Lohr, *supra* note 174.

219. *See generally* Layne-Farrar & Schmidt, *supra* note 215.

220. Jiaqing 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.*, Complaint and Jury Claim, Eastman Kodak Co. v. Apple Inc., No. 6:10-cv-06022-MAT-JWF (W.D.N.Y. Jan. 14, 2010), 2010 WL 193340 (asserting three

nent 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 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 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.

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patents against Apple); Certain Mobile Telephones and Wireless Communication Devices Featuring Digital Cameras, and Components Thereof, Inv. No. 337-TA-703 (Jan. 14, 2010) (complaint filed with International Trade Commission asserting one patent against the camera preview function of Apple's iPhone).

222. Certain Mobile Telephones, *supra* note 221.

223. *See, e.g.*, Complaint ¶¶ 8–10, Oracle America, Inc. v. Google, No. CV 10-03561 (N.D. Cal. Aug. 12, 2010), 2010 WL 3355241 (asserting ownership over the former Sun Java patents asserted against Google); Oracle Corp., Annual Report (Form 10-K), at 2 (June 30, 2010) (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."). Google's Android software is incorporated into some manufacturer's smartphones. *See generally Comparison of Android Devices*, WIKIPEDIA, http://en.wikipedia.org/wiki/Comparison_of_Android_devices, *archived at* http://perma.unl.edu/F4HA-R4YK (last visited July 13, 2013); *Device Gallery*, ANDROID.COM, http://www.android.com/devices/ (last visited July 13, 2013), *archived at* http://perma.unl.edu/9WXH-3WPV.

224. Order Granting in Part Motion to Strike Damage Report of Plaintiff Expert Iain Cockburn, Oracle America, Inc. v. Google, Inc., No. CV 10-03561 (N.D. Cal. July 22, 2011) (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, & Timothy D. Syrett, The Smartphone Royalty Stack 2 (May 29, 2014) (unpublished manuscript) (available at WilmerHale.com), *archived at* http://perma.unl.edu/X7LV-KTUN.

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

Patent law's experimental use defense provides scant ability to perform experimentation. Unlike 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 a commercial product.[229] Indeed, under the Federal Circuit's decision in *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, 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 antipatents 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 antipatent proposal described herein.

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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").

228. *Madey*, 307 F.3d at 1362.

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).

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) (2012). The prior use defense can be asserted against patents issued on or after September 16, 2011.

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 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 quite common.[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 prelitigation negotiations. However, patentees are not currently deterred from filing suit by other viable defenses that are 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 still be too much for the startup to sustain. In the meantime, investors may be chilled, potential customers deterred, and the startup's resources drained.

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]

234. *See generally* Lemley, *supra* note 142 (analyzing invention not as a individual phenomenon, but as a social one).

235. *See, e.g.*, *Edison 2012 Best New Product Award*, EDISONAWARDS, http://www.edisonawards.com/BestNewProduct_2012.php (last visited Oct. 13, 2014), *archived at* http://perma.unl.edu/CAK9-P9KY (Smart System Category); *Nest Learning Thermostat, 2nd Generation*, IDSA, http://www.idsa.org/nest-learning-thermostat-2nd-generation (last visted Oct. 13, 2014), *archived at* http://perma.unl.edu/CE6Y-DQUC (Gold—International Design Award from the Industrial Designers Society of America 2013) [hereinafter *Nest IDSA Award*]; *Red Dot Award: Product Design 2013*, REDDOT, http://red-dot.de/pd/online-exhibition/work/?lang=en&code=2013-05-7986 (last visited Oct. 13, 2014), *archived at* http://perma.unl.edu/H9EU-ZJV7.

236. *Nest IDSA Award*, *supra* note 235.

Months after Nest's first commercial launch, Honeywell sued Nest for infringement of seven patents.[237] None of the Honeywell's patents anticipated the complete groundbreaking work of the Nest device, rather they were asserted against preexisting features used in the Nest. Honeywell's patents date back to the mid-2000s, and among other things claim the use of "grammatically complete sentences" to control a thermostat, and a thermostat that 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 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 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 United States more than one year prior to another's

237. Complaint and Demand for Jury Trial at 4–7, Honeywell Int'l, Inc. v. Nest Labs, Inc., No. 0:12-cv-00299-SRN-JSM (D. Minn. Feb. 6, 2012).

238. *See e.g.*, U.S. Patent No. 7,584,899 (filed Oct. 9, 2006) (HVAC controller); U.S. Patent No. 7,142,948 (filed Jan. 7, 2004) (controller interface with dynamic schedule display).

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 that "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 Labs, Inc.'s Answer to Amended Complaint, Counterclaims, and Demand for Jury Trial at 3, No. 0:12-cv-00299 SRN-JSM (D. Minn. Apr. 12, 2012). *See also* Joint Motion to Stay the Action Pending Reexamination of the Patents in Suit, No. 0:12-cv-00299-SRN-JSM (D. Minn. Sept. 21, 2012) (detailing the requests for reexamination).

240. *See e.g.*, Demand for Jury Trial, Olivistar, LLC v. Fitbit, Inc., No. 2:14-cv-00539-JRG (E.D. Tex. April 24, 2014); Demand for Jury Trial, iLife Technologies, Inc. v. Fitbit, Inc., No. 3:13-cv-04778-M (N.D. Tex. Dec. 6, 2013); Demand for Jury Trial, SportBrain Holdings Inc. v. Fitbit, Inc., No. 2:13-cv-00212-JRG (E.D. Tex March 15, 2013).

241. *See* Matt Brian, *Already Targeting Adidas and Fitbit, SportBrain Sues Nike over Fuelband Patent Infringement*, THE NEXT WEB (Jan. 3, 2013, 2:38 PM), http://thenextweb.com/insider/2013/01/03/already-targeting-adidas-and-fitbit-sport-brain-sues-nike-over-fuelband-patent-infringement/, *archived at* http://perma.unl.edu/F49Q-LZ9U.

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 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 invention and innovation. Its limits render it inapplicable for meaningful protection for startups. Establishing the ability to rely on a prior use defense necessitates record keeping 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 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

242. Under 35 U.S.C. § 273(a)(1) (2012), 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. Second, the AIA provides that commercial use includes nonprofit uses in research laboratories, universities, and hospitals. *See id.* § 273(c)(1)–(2).

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. *Id.* § 273(e)(3).

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 could 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 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 [they] will not try to appropriate all of the cumulative innovator's gains later and thereby encourages follow-on inventions."[247]

One such example was IBM's 2005 proclamation that the company was making five hundred 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 development of the open-source Linux operating system.[249] Nonetheless, some have suggested that IBM's Linux support was incentivized by competition, specifically, to en-

245. Merges, *supra* note 212, at 374.

246. *See generally* Oren Bar-Gill & Gideon Parchomovsky, *The Value of Giving Away Secrets*, 89 VA. L. REV. 1857, 1858 (2003) (describing the phenomenon, and observing that it provides knowledge to the firm's rivals).

247. *Id.* at 1861.

248. Steve Lohr, *I.B.M. to Give Free Access to 500 Patents*, N.Y. TIMES, Jan. 11, 2005, http://www.nytimes.com/2005/01/11/technology/11soft.html, *archived at* http://perma.unl.edu/4G8U-MH5F.

249. *See id.*

courage the market's adoption of Linux as a viable alternative to IBM's rival Microsoft's operating system solutions.[250]

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."[251] Tesla's announcement observed that "[t]echnology leadership is not defined by patents," and that patents provide "small protection . . . against a determined competitor."[252] 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 to Tesla, which is fighting for adoption of electric cars as a viable option to gas-fueled models. Furthermore, this decision could 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.[253] Yet not every patent holder seeks to leverage their positions in the same way as IBM and Tesla.

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 the past is any guide, private ordering solutions become likely only if the patentee's release of rights to assert align with the patentee's long-term self-interest. In the present cli-

250. *See id.* ("[S]upporting 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*, FIN. TIMES, Feb. 3, 2005, http://www.ft.com/cms/s/0/faa156e2-7589-11d9-9608-00000e2511c8.html#axzz3GA1lu6mB, *archived at* http://perma.unl.edu/47EE-W6V8; Florian Mueller, *KnowRi$ht Conference Speech on Software Patents, Standards and Competition,* FOSS PATENTS (May 6, 2010), http://www.fosspatents.com/2010/05/knowriht-conference-speech-on-software.html, *archived at* http://perma.unl.edu/5RY3-6KDW. 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, http://www.microsoft.com/openspecifications/en/us/programs/interop/interoperability-principles-patent-pledges/default.aspx (last visited Oct. 14, 2014), *archived at* http://perma.unl.edu/9MCH-5CDV.

251. Elon Musk, *All Our Patents Belong to You*, TESLA BLOG (June 12, 2014), http://www.teslamotors.com/blog/all-our-patent-are-belong-you, *archived at* http://perma.unl.edu/J9WB-QJBR.

252. *Id.*

253. Jerry Hirsch & Tiffany Hsu, *Elon Musk Opens Up Tesla Patents to Everyone*, L.A. TIMES, June 12, 2014, http://www.latimes.com/business/autos/la-fi-tesla-open-source-20140613-story.html, *archived at* http://perma.unl.edu/ZK5G-95GV. 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.*

mate, 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.[254] 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 nonpracticing entities.[255] Essentially, these entities obtain rights through the purchase or license of patents that are identified as particularly problematic for certain applications.[256] 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."[257] 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 nonpracticing entities.[258]

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 from $36,000 to $5 million annually.[259] For entities that cannot afford lower prices to obtain patents, such

254. *See generally* Thierry Ryana & Ludmila Striukova, *Large-Scale Open Innovation: Open Source vs. Patent Pools*, 52 INT'L J. TECH. MGMT. 477 (2010) (describing patent pools and open source models).

255. *See* David Hetzel, *Embracing the New IP Reality*, INTELL. ASSET MGMT., May–June 2010, at 29.

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

257. *See* RPX Corp., Annual Filing (Form 10-K), at 1 (Mar. 10, 2014) (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"); *Reducing Patent Risk*, RPX CORP., http://www.rpxcorp.com/rpx-services/ (last visited Oct. 14, 2014), *archived at* http://perma.unl.edu/95KY-SMX3.

258. *Id.*

259. *See* Hetzel, *supra* note 255, at 29, 33.

subscription amounts appear to be quite high. 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.[260] One estimate pins the number of patents that relate to cell-phone technology at 250,000.[261] 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 in which there is no certainty of avoiding infringement or 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. Despite the implementation of a system like this current proposal, the number of patents has exponentially increased and "the U.S. 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."[262] 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.

VI. THE RATIONALE FOR SHIELDING STARTUPS

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.[263] He hypothesized that the wealthiest and largest firms are responsible for the most groundbreaking innovations, be-

260. RPX Corp., Annual Filing (Form 10-K), at 2 (Mar. 10, 2014) (noting that "there are several thousand issued United States patents with 'DRAM' specifically listed as a claim element").

261. Mike Masnick, *There Are 250,000 Active Patents That Impact Smartphones; Representing One in Six Active Patents Today*, TECHDIRT (Oct. 18, 2012), https://www.techdirt.com/blog/innovation/articles/20121017/10480520734/there-are-250000-active-patents-that-impact-smartphones-representing-one-six-active-patents-today.shtml, *archived at* http://perma.unl.edu/S74Q-YP94.

262. Boldrin & Levine, *supra* note 27, at 3.

263. *See* JOSEPH A. SCHUMPETER, CAPITALISM, SOCIALISM, AND DEMOCRACY 101 (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*

cause such firms were the most capable of shouldering the considerable expense associated with research and development.[264] 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."[265]

Schumpeter's belief that large firms were the sources of major change, although initially influential, has been subjected to criticisms in more recent years.[266] Originally developed in 1942, his hypothesis has now been described as "primitive," and based on antiquated assumptions.[267] 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.[268] Moreover, Schumpeter's own body of work acknowledges that markets are subject to dynamic forces that displace incumbents.[269] Such forces invoke the process of creative destruction that displaces existing dominant systems in favor of new ones.[270] Over the past century, such forces have included scientific and technological advance.[271]

Today, there is recognition that small firms play an important role within the entire creativity ecosystem that drives technological progress.[272] An early study by economist F.M. Scherer concluded "the

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id. at 100 ("And in this country monopoly is being made practically synonymous with any large-scale business.").

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

265. *See* JOHN KENNETH GALBRAITH, AMERICAN CAPITALISM 87 (1993); *see also* G. Warren Nutter, *Monopoly, Bigness, and Progress*, 64 J. POL. ECON. 520, 524 (1956) (stating that monopolies "raise the odds in favor of the most risky innovations," and that "bigness makes possible the most expensive").

266. *See, e.g.*, FED. TRADE COMM'N, TO PROMOTE INNOVATION: THE PROPER BALANCE OF COMPETITION AND PATENT LAW AND POLICY 12–15 (2003), *archived at* http://perma.unl.edu/C9XU-BRZ4 (summarizing some criticisms).

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

268. *See, e.g.*, 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"); Scherer, *supra* note 267, at 1417 ("Important in Schumpeter's schema was the ability of monopolists to . . . secure a high financial standing.").

269. *See* SCHUMPETER, *supra* note 263, at 83.

270. *See id.*

271. *See* Margaret B. W. Graham, *Schumpeter's Children*, WILSON Q., Spring 2010, at 48.

272. *See* ZOLTAN J. ACS. & DAVID B. AUDRETSCH, INNOVATION AND SMALL FIRMS 54 (1990) ("No single firm size is uniquely conductive to technological progress.

data suggest that smallness is not necessarily an impediment to the creation of patentable inventions and may well be an advantage."[273] In a later study, Scherer confirmed that large firms contribute slightly less than their share of technical advances compared to smaller ones.[274] He concluded that "the evidence leans weakly against the Schumpeterian conjecture that the largest sellers are especially fecund sources of patented inventions."[275] In this same vein, a Small Business Administration study found that "[s]mall firms, even with fewer resources and lower expenditures on R&D than large firms, are better at developing emerging technologies."[276] This same study found that "patents of small firms in general are likely to be more technologically important than those of large firms."[277] 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.[278] Additionally, he explains that small firms typically have the right incentives, motivations, and focus to foster technological progress.[279]

Some researchers have broadened their examination beyond patent data to compare innovation rates.[280] Such research assumes that inputs that lead to technological change, such as research and development, precede the introduction of new products.[281] Findings using these metrics demonstrate that *both* large firms and small firms are productive.[282] Yet these findings can be broken out in a manner that

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There is room for firms of all sizes.") (quoting F.M. SCHERER, INDUSTRIAL MARKET STRUCTURE AND ECONOMIC PERFORMANCE 418 (2d ed. 1980)).

273. F.M. Scherer, *Firm Size, Market Structure, Opportunity and the Output of Patented Inventions*, 55 AM. ECON. REV. 1097, 1105 (1965).

274. *See* F.M. SCHERER, INNOVATION AND GROWTH: SCHUMPETERIAN PERSPECTIVES 226–27 (1986).

275. *Id.* at 235.

276. ANTHONY BREITZMAN & DIANA HICKS, AN ANALYSIS OF SMALL BUSINESS PATENTS BY INDUSTRY AND FIRM SIZE 23 (2008) (summarizing findings).

277. *Id*. at iii.

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

279. *Oversight and Authorization Hearings into the Policies and Enforcement Record of the Antitrust Division (DOJ) Before the Subcomm. on Monopolies and Commercial Law of the H. Comm. on the Judiciary*, 100th Cong. 179–80 (1988) (testimony of F.M. Scherer), *archived at* http://perma.unl.edu/6APY-4BRB.

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

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

282. *Id.* at 681.

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.[283] Yet in other industries, small firm activity is superior, introducing more innovations per employee compared to large firms.[284] Furthermore, there does not appear to be a significant difference in the quality of the advances generated by small versus large firms.[285]

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.[286] These reasons include the propensity of some small firms to serve as agents of technological change and for others to create complimentary products based on innovations 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.[287] Competition and diversity within a technological space "benefits society by increasing the number of productive approaches to innovation that are collectively pursued in the industry."[288] 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.[289] For example, economist Jennifer Reinganum points out that new entrants have a significant incentive to invest in uncertain, revolutionary fields whenever that firm has an opportunity to capture the postinnovation mar-

283. *See* ZOLTAN J. ACS & DAVID B. AUDRETSCH, MAX PLANCK INSTITUTE OF ECONOMICS, ENTREPRENEURSHIP, GROWTH AND PUBLIC POLICY GROUP, ENTREPRENEURSHIP, INNOVATION, AND TECHNOLOGICAL CHANGE 28 (2005).

284. *See* ACS & AUDRETSCH, *supra* note 272, at 24; Morton I. Kamien & Nancy L. Schwartz, *Market Structure and Innovation: A Survey*, 13 J. ECON. LITERATURE 1, 16–19 (1975); Scherer, *supra* note 273, at 1121 ("Inventive output increases with firm sales, but generally at a less than proportional rate.").

285. *See* ACS & AUDRETSCH, *supra* note 272, at 16.

286. *Id.* at 54.

287. *See* Jonathan B. Baker, *Fringe Firms and the Incentive to Innovate*, 63 ANTITRUST L.J. 621, 633–34 (1995).

288. Wesley M. Cohen & Steven Klepper, *Firm Size Versus Diversity in the Achievement of Technological Advance*, *in* INNOVATION AND TECHNOLOGICAL CHANGE, *supra* note 278.

289. *See e.g.*, *id.* at 183; Jennifer F. Reinganum, *Uncertain Innovation and the Persistence of Monopoly,* 73 AM. ECON. REV. 741 (1983).

ket.[290] 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.[291] 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.[292]

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."[293] 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."[294] 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.[295]

Some caution that the societal benefits of the existence of multiple firms varies by industry.[296] Therefore, some restraint may be necessary to gauge "[t]he net effect on social welfare of increasing the number of firms[, which] depends on the magnitude of these costs relative to the benefit of having additional approaches of innovation pursued."[297] 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.

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290. *See* Reinganum, *supra* note 289, at 741.

291. *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.

292. *Id.* at 743 (emphasis omitted); *see also* Josh Lerner, *An Empirical Exploration of a Technology Race*, 28 RAND J. ECON. 207, 228 (1997) (describing empirical support for this theory in a study of the disc drive industry).

293. John T. Scott, *Research Diversity Induced by Rivalry*, *in* INNOVATION AND TECHNOLOGICAL CHANGE, *supra* note 278.

294. *Id.* at 139.

295. *See id.* at 138.

296. *See* Cohen & Klepper, *supra* note 288, at 195.

297. *See id*; *see also* WILLIAM J. BAUMOL, THE FREE-MARKET INNOVATION MACHINE 24 (2002) (explaining that competitive approaches may be socially wasteful because the winner-take-all nature of patents).

Unlike competitive activity, this cooperative approach benefits the startup and the incumbent.[298] The photo-sharing application Instagram was created just after Apple released an improved camera in its iPhone 4.[299] 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-startup Microsoft and the microchip design to Intel just after the hardware company was spun off from Fairchild Semiconductor.[300] 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.[301] 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."[302] Other small firms provide needed complimentary assets to downstream innovators, who incorporate the small firm's technology into their own designs.[303] Alternatively, small firms that have spun off from universities gain benefits from work performed with those entities.[304]

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, 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.[305] Nicira, which was recently purchased for $1.26 billion, is

298. Joshua S. Gans et al., *When Does Startup Innovation Spur the Gale of Creative Destruction?* 2 (Nat'l Bureau of Econ. Res., Working Paper 7851, 2000).

299. *See* Somini Sengupta et al., *Behind Instagram's Success, Networking the Old Way*, N.Y. TIMES, Apr. 14, 2012, at A1, *archived at* http://perma.unl.edu/QRU2-P2LC.

300. *See* Graham, *supra* note 271, at 52.

301. *See Executive Summary of the Pharmaceutical Sector Inquiry Report*, at 3 (July 8, 2009), *archived at* http://perma.unl.edu/673A-TQ4H.

302. *Id.* at 3.

303. *See* GANS ET AL., *supra* note 298, at 27–28.

304. *See* ACS & AUDRETSCH, *supra* note 283, at 22 (noting "small- and medium-sized enterprises are better able to exploit their university-based associations and generate innovations").

305. *See, e.g.*, Quentin Hardy, *What is Nicira Up To?*, N.Y. TIMES BITS (Oct. 17, 2011), http://bits.blogs.nytimes.com/2011/10/17/what-is-nicira-up-to/, *archived at* http://perma.unl.edu/6EV-3ETE; Cade Metz, *Mavericks Invent Future Internet Where Cisco Is Meaningless*, WIRED (Apr. 16, 2012), http://www.wired.com/wiredenterprise/2012/04/nicira/, *archived at* http://perma.unl.edu/6S3L-HKUR.

predicted to disrupt the current market by creating the next wave.[306] In response to Nicira and other developments, Cisco has determined to "reinvent" itself to create its own software-based networking implementation.[307] 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.[308] Similarly, startup inroads into 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.[309] 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.

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 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."[310] Although entrepreneurial large firms do exist, they may be the exception rather

306. *See* Quentin Hardy, *Startup Nicira Plans to Disrupt Networking Giants*, N.Y. TIMES BITS (Feb. 6, 2012), http://bits.blogs.nytimes.com/2012/02/06/startup-nicira-plans-to-disrupt-networking-giants/, *archived at* http://perma.unl.edu/VZT4-27CE; Press Release, VMWare, VMWare to Acquire Nicira (July 23, 2012), http://www.vmware.com/company/news/releases/vmw-nicira-07-23-12.html, *archived at* http://perma.unl.edu/E8PM-PSYW.

307. *See, e.g.*, Barb Darrow, *Cisco SDN News: New Switches Now, a Controller Later, and Insieme Comes Home*, GIGAOM (Nov. 6, 2013), http://gigaom.com/2013/11/06/cisco-sdn-news-new-switches-now-a-controller-later-and-insieme-comes-home/, *archived at* http://perma.unl.edu/K7KQ-SQHG; Quentin Hardy, *Cisco's Bold Networking Startup*, N.Y. TIMES BITS (Mar. 16, 2012), http://bits.blogs.nytimes.com/2012/03/16/ciscos-bold-networking-startup/, *archived at* http://perma.unl.edu/LX2Q-R6KQ;.

308. *Cf.* Thomas S. Robertson et al., *New Product Announcement Signals and Incumbent Reactions*, 59 J. 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).

309. *Cf.* Charlie Osborne, *Apple's iWatch Roundup: Rumors, Specs, Price, and Release Date*, ZDNET (June 20, 2014, 6:15 PM), http://www.zdnet.com/apples-iwatch-roundup-rumors-specs-price-and-release-date-7000030768/, *archived at* http://perma.unl.edu/DBY9-25XN; *Startups That Can Threaten Apple*, ENTREPRENEURS MINGLE, http://maz.entrepreneursmingle.com/blog/2014/02/14/startup-can-threaten-apple/ (last visited Oct. 8, 2014), *archived at* http://perma.unl.edu/LJ2V-ESWX.

310. Cohen & Klepper, *supra* note 288, at 185.

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.[311] This occurs when the incumbent acts rationally to preserve existing profits and respond to their existing customer base.[312] 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.[313] 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.[314] Another source hypothesizes that established companies might be deterred from making groundbreaking changes that cannibalize sales of their existing products.[315]

As one example, during the 1980s AT&T faced competition in carrying telephone communications from the comparatively smaller MCI Worldcom, which had licensed the first successful single-mode optical fiber technology from Corning Glass.[316] According to one source, AT&T had refused to license fiber optic technology from Corning because when AT&T had the telecommunications monopoly, it "must have been less than enthusiastic about ripping up its existing copper wire network in order to replace it with fiber."[317] According to this

311. CLAYTON M. CHRISTENSEN, THE INNOVATOR'S DILEMMA: WHEN NEW TECHNOLOGIES CAUSE GREAT FIRMS TO FAIL 8–9 (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).

312. *See* Henry C. Lucas Jr. & Jie Mein Goh, *Disruptive Technology: How Kodak Missed the Digital Photography Revolution*, 18 J. STRATEGIC INFO. SYS. 46, 47 (2009) ("The root cause of the 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.").

313. *Id.* at 54.

314. *Id.*

315. Clayton Christensen, *The Rigid Disk Drive Industry: A History of Commercial and Technological Turbulence*, BUS. HIST. REV. 531, 568 (1993). *Cf.* Pino G. Audia & Jack A. Goncalo, *Past Success and Creativity Over Time: A Study of Inventors in the Hard Disk Drive Industry*, 53 MGMT. SCI. 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).

316. *See* Graham, *supra* note 271, at 54; Donald B. Keck, *Optical Fiber Spans 30 Years*, LIGHTWAVE, July 2000, at 78.

317. Robert E. Litan, Deputy Assistant Attorney Gen., U.S. Dep't of Justice, Antitrust Enforcement and the Telecommunications Revolution: Friends, Not Enemies, Ad-

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.[318] 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.[319] 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.[320]

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.[321] Having invested millions into the successful development of digital imaging and print capability, Polaroid's "senior managers strongly discouraged search and development efforts that were not consistent with the [company's] traditional business model."[322] As one of its former CEOs explained, "[w]e knew we needed to change the fan belt, but we couldn't stop the engine."[323]

Similarly, Kodak, which invented the digital camera, was unable to move the technology forward to commercialization.[324] During the

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dress Before the National Academy of Engineering (Oct. 6, 1994), *archived at* http://perma.unl.edu/9BBL-MRES.

318. *Id.*

319. *See* WILLIAM L. BALDWIN & JOHN T. SCOTT, MARKET STRUCTURE AND TECHNOLOGICAL CHANGE 13 (1987) (discussing how poor innovative performance occurs when a group is content with a monopoly position and feels little pressure to compete); Joseph L. Bower & Clayton Christensen, *Disruptive Technologies: Catching the Wave*, HARV. BUS. REV., Jan.–Feb. 1995, at 43; *see generally* CHRISTENSEN, *supra* note 311.

320. Bower & Christensen, *supra* note 319, at 47.

321. Nick Bilton, *Disruptions: Innovation Isn't Easy, Especially Midstream*, N. Y. TIMES BITS (Apr. 15, 2012, 11:00 AM), http://bits.blogs.nytimes.com/2012/04/15/disruptions-innovation-isnt-easy-especially-midstream/, *archived at* http://perma.unl.edu/R5XW-TNAE (quoting Gary T. DiCamillo, former chief executive at Polaroid).

322. Mary Tripsas & Giovanni Gavetti, *Capabilities, Cognition, and Inertia: Evidence from Digital Imaging*, 21 STRATEGIC MGMT. J. 1147, 1158 (2000).

323. Bilton, *supra* note 321 (quoting Gary T. DiCamillo, former chief executive at Polaroid).

324. *The Last Kodak Moment?*, ECONOMIST, Jan. 14, 2012, http://www.economist.com/node/21542796, *archived at* http://perma.unl.edu/5S73-5B7Q; *see* Chunka Mui, *How Kodak Failed*, FORBES (Jan. 18, 2012), http://www.forbes.com/sites/chunkamui/2012/01/18/how-kodak-failed/, *archived at* http://perma.unl.edu/8W9F-59YC (describing the invention of the digital camera by Kodak engineer Steve Sasson, and Kodak's inadequate corporate response to this new disruptive technology).

critical years of the 1990s, Kodak attempted to hold onto its then-profitable film and photofinishing business.[325] 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.[326] 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 traditional most profitable business."[327]

This phenomenon is not limited to the photographic industry.[328] In the computer disk drive industry, incumbent IBM led the development of thin-film technology during the 1960s.[329] After investing fourteen years and $300 million, IBM introduced the technology in its highest end product.[330] Yet IBM was one of the last entities to introduce the technology to the rest of its line.[331] By then, new entrants had leapt ahead to develop component parts that relied on this platform technology that had been developed by IBM.[332]

These examples suggest Schumpeter's view of large firms' capacity to undertake complex, groundbreaking projects is accurate, but other factors may allow small firms to lead the way for certain types of technological innovation. Certainly, many incumbents have developed

325. Lucas & Goh, *supra* note 312, at 53 (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); Mui, *supra* note 324 (quoting George Eastman).

326. *The Last Kodak Moment*, *supra* note 324 (discussing 1999 profits); *see also* David Cay Johnston, *Kodak to Reduce Its Work Force by Up to 15,000*, N.Y. TIMES, Jan. 23 2004, http://www.nytimes.com/2004/01/23/business/kodak-to-reduce-its-workforce-by-up-to-15000.html, *archived at* http://perma.unl.edu/7BYR-NLB3 (describing competition and Kodak's difficulties implementing digital technology); Michael J. de la Merced, *Eastman Kodak Files for Bankruptcy*, N.Y. TIMES DEALBOOK, Jan. 19, 2012, http://dealbook.nytimes.com/2012/01/19/eastman-kodak-files-for-bankruptcy, *archived at* http://perma.unl.edu/J4FD-EC6P (discussing Kodak bankruptcy).

327. Lucas & Goh, *supra* note 312, at 54 (statement of Carly Fiorina, ex-CEO of Hewlett-Packard).

328. 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 Belenzon & Andrea Patacconi, How Does Firm Size Mediate Firms' Ability to Benefit from Invention? (Feb. 19, 2013) (unpublished manuscript) (on file with author).

329. Christensen, *supra* note 315, at 551.

330. *Id.* at 551, 578.

331. *Id.* at 579.

332. *Id.* at 578–79. Notably, these new entities were able to enter the field by hiring key IBM engineers, and because IBM enjoyed only "little patent protection" at that time. *Id.* at 579.

and introduced numerous important, groundbreaking technologies.[333] 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 itself became entrepreneurial."[334] 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.[335] Yet entrepreneural incumbents, although emblematic of the movement toward creative thinking, remain the exception rather than the rule.

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, patents are not serving that purpose particularly well."[336] 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.[337] Some simply ignore patents until addressing an infringement allegation becomes an imperative.[338] This proposal offers a structured method to formally opt out of the patent system. Although "going patent free" has the benefit of a immunizing the entity from suit, this commitment requires relinquishing the ability to obtain patents during the life of the antipatent. 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 com-

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

334. *See* Graham, *supra* note 271, at 48.

335. *See* Dan Schawbel, *How Big Companies Are Becoming Entrepreneurial*, TECHCRUNCH.COM (July 29, 2012), http://techcrunch.com/2012/07/29/how-big-companies-are-becoming-entrepreneurial/, *archived at* http://perma.unl.edu/BXF7-JVNY.

336. Graham et al., *supra* note 20, at 1287.

337. Graham et al., *supra* note 20, at 1276.

338. Lemley, *supra* note 196, at 21–22.

petitive position.[339] 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.[340] A first mover that captures an early and strong patent position in an emerging market can gain significant advantages.[341] For example, a robust patent portfolio can successfully stave off competitors for years. During that time, the inventive firm can experiment, redesign, and establish a market position before others begin to enter the field.[342] 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.[343] If successful, these assets provide the first patentee with a favorable position after the patents expire.[344]

Further, patents facilitate engagement with others, whether through collaboration, integration, or licensing.[345] Invention and product development rely on a mix of inflows and outflows of knowledge.[346] These interactions can be important for a number of reasons, including the development of products that require competencies from more than one specialty.[347] These relationships are built on a more complex set of considerations that include inbound and outbound licensing of intellectual property rights.[348] A company that lacks IP might be hindered in collaborative development, particularly if the

339. David J. Teece, Gary Pisano, & Amy Shuen, *Dynamic Capabilities and Strategic Management*, 18 STRATEGIC MGMT. J. 509, 521 (1997) (intellectual property protection can be one of several "key differentiators" among firms); Joel West, *Does Appropriability Enable or Retard Innovation?*, *in* OPEN INNOVATION: RESEARCHING A NEW PARADIGM (Henry Chesbrough, Wim Vanhaverbeke & Joel West eds., 2006).

340. 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.").

341. *See id.* at 290.

342. *Id.*

343. *Id.* at 299–300 (describing the successful strategy of G.D. Searle with respect to its NutraSweet sugar substitute).

344. *Id.* at 300.

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

346. *See* David J. Teece, *Explicating Dynamic Capabilities: The Nature and Microfoundations of (Sustainable) Enterprise Performance*, 28 STRATEGIC MGMT. J. 1319, 1325 (2007) (considering the ecosystem of inputs that contribute to competitive advantage).

347. Teece, *supra* note 346, 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").

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

proposed collaborator owns strong rights but cannot expect to receive any useful licenses in return.[349] Further, patents facilitate contractual relationships with upstream suppliers and downstream manufacturers, and prevent such partners from converting themselves into competitive adversaries.[350]

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.[351] For many, funding sources that specialize in new firms, including grants and angel and venture funding, are the most viable options.[352]

Venture capital has played a significant role in the development of new ideas and technological innovation in the U.S.[353] One study estimates that venture funding is responsible for between 8% and 14% of all innovative activity in the U.S.[354] Further, venture funding delivers roughly three times the inventive results as the same amount spent in the corporate sector.[355] Selection for funding by a well-known venture firm can become a seal of approval that allows the startup to obtain additional backing from other sources.[356] Some venture firms provide management advice and other advantages that facilitate a funded startup's success.[357] Indeed, sometimes the

349. *Cf.* Henry Chesbrough, *Open Innovation: A New Paradigm for Understanding Industrial Innovation*, *in* OPEN INNOVATION, *supra* note 339, at 14 (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, at 32 (discussing an example for new entrants to the GSM cell phone market that must pay 10%–13% royalty amounts, while companies that owned patents paid nothing).

350. *Cf.* Teece, *supra* note 346, 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").

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

352. *See generally* Thomas Hellmann and Manju Puri, *Venture Capital and the Professionalization of Startup Firms: Empirical Evidence*, 57 J. FIN. 169 (2002).

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

354. *See id.*

355. *Id.* at 675.

356. GOMPERS & LERNER, *supra* note 351, at 51.

357. *Id.* at 43, and 52–53 (listing examples).

distinction between a forgotten invention and a successful one is that the latter 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.[358] One study concluded that patenting by specialized entrants viewed patents as "especially critical to these firms in attracting venture capital funds."[359] Another found investor's perceptions of startups with patents are positive, overall resulting in increased valuations and a higher likelihood of offers for funding.[360]

Venture firms can be extremely selective, choosing to fund as few as six out of one thousand applicants.[361] It has been said that startups must seek patent protection as a prerequisite to venture funding.[362] The reasons include the belief that patents applications should be filed to facilitate market exclusivity, which in turn leads to superior returns on investment.[363] 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.[364] 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.[365]

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

358. Graham et al., *supra* note 20, at 1305.
359. Hall & Ziedonis, *supra* note 151, at 104.
360. David H. Hsu & Rosemarie Ziedonis, Patents as Quality Signals for Entrepreneurial Ventures 6 (Apr. 2007) (unpublished manuscript) (on file with author).
361. GOMPERS & LERNER, *supra* note 351, at 9 (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)
362. *See* Mario W. Cardullo, *Intellectual Property – The Basis for Venture Capital Investments*, WIPO 2, http://www.wipo.int/export/sites/www/sme/en/documents/pdf/venture_capital_investments.pdf (last visited Nov. 1, 2014), *archived at* http://perma.unl.edu/F3ZE-PR5K ("Without the strength of the intellectual property and its protection, little if any investments would be made into new or growing enterprises."); Mike Masnick, *Venture Capitalist Explains How Patents Can Be a Tax on Innovation*, TECHDIRT, https://www.techdirt.com/articles/20090216/0120263775.shtml (last visited Feb. 12, 2015), *archived at* http://perma.unl.edu/BD49-BS3N (reporting the commonly held assumption that "venture capitalists won't invest in companies without patents").
363. *See*, *e.g.*, Cardullo, *supra* note 362, at 3.
364. Graham et al., *supra* note 20, at 1303.
365. Ron Epstein & Michael Pierantozzi, *Obtaining Maximum Value from Distressed Patent Assets*, 28 AM. BANKR. INST. L.J. 48 (2009); Dietmar Harhoff, *The Role of Patents and Licenses in Securing External Finance for Innovation*, *in* HANDBOOK OF RESEARCH ON INNOVATION AND ENTREPRENEURSHIP 55 (2011).

to entrepreneurial capital."[366] Venture capitalists do not use a uniform strategy, and their methods and criteria for assessing financing decisions vary.[367] 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.[368] Moreover, the importance of patents to investors varies between different technology sectors.[369] For example, patents are more important to venture capitalists investing in biotechnology companies compared to software and Internet startups.[370] This same distinction exists for angel investors and other funding sources.[371] Significantly, studies have reported that a significant percentage of venture-backed software firms do not hold any patents.[372] For those firms that do hold patents, it has been difficult to ascertain whether those patents attracted venture funding, or alternatively whether the cash infusion was used for patent-application fees and attorney time.[373]

Moreover, the amount of patent litigation has changed the risk calculus over the past 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.[374] Most venture capitalists surveyed found that their companies experienced significant impacts from the assertion of

366. Graham et al., *supra* note 20, at 1305.

367. GOMPERS & LERNER, *supra* note 351, at 47; Vance H. Fried & Robert D. Hisrich, *Toward a Model of Venture Capital Investment Decision Making*, 23 FIN. MGMT. 28, 31 (1994) (concluding that "[t]he 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").

368. *Cf.* Fried & Hisrich, *supra* note 367, at 30–31; Mann, *supra* note 363, at 975–76.

369. Graham et al., *supra* note 20, at 1305.

370. 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).

371. Graham et al., *supra* note 20, at 1308.

372. *Id.*; Ronald J. Mann & Thomas W. Sager, *Patents, Venture Capital, and Software Startups*, 36 RES. POL'Y 193, 197 (2007) (reporting that 9% of the surveyed software firms had acquired a patent prior to their first round of venture funding).

373. Mann & Sager, *supra* note 372, at 199–200.

374. Robin Feldman, *Patent Demands & Startup Companies: The View from the Venture Capital Community* 55–56 (Univ. of Cal. Hastings Coll. of Law, Research Paper No. 75, 2013), *archived at* http://perma.unl.edu/75X5-5DEN. 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.

patents, such as distracting management, expending resources, or altering business plans.[375] 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.[376] Less tangible impacts include "a huge emotional and financial toll," that "slow[ed] down our progress."[377] 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."[378] This same study affirmed the high number of startups that are subjected to patent demands.[379] 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 [is] 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."[380] Another concluded that nonpracticing entities are creating difficulties for the acquisition of startups, because buyers "are worried about buying a company and getting sued."[381] Thus, it is not entirely clear that the venture-capitalist community prefers the current system, compared to one that allows a startup to focus on invention and innovation for their first two decades.

Certainly, the upward trajectory of patent litigation over the past several years 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

375. *Id.* at 40–41 (estimating that 74% of venture capitalists reported "either a highly significant or moderately significant impact on the companies that received them").

376. *Id.* at 45.

377. *Id.* at 47.

378. *Id.* at 51.

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

380. Brad Burnham, *Software Patents Are the Problem, Not the Answer*, USV.COM (Feb. 19, 2010), http://www.usv.com/posts/software-patents-are-the-problem-not-the-answer, *archived at* http://perma.unl.edu/DH6X-4WRG (the author is a founding partner of Union Square Ventures, a U.S. venture capital firm).

381. Colleen V. Chien, *Patent Assertion and Startup Innovation*, NEW AM. FOUND. 47 (2013), http://www.newamerica.net/publications/policy/patent_assertion_and_startup_innovation, *archived at* http://perma.unl.edu/U48W-XGQQ.

venture capital investment.[382] Extrapolating from this data, and building in certain assumptions, this research stated, "VC investment in new innovations and startups over the past five years would likely have been $109 million higher than it would have been but-for excess patent litigation."[383] It bears emphasis that the antipatent'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 nonpatent differentiators might be the wiser course.[384] As a practical matter, many new technology companies cannot afford the high price of patent litigation against a large incumbent.[385]

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 antipatent system would alleviate those problems. On the other hand, if little support for an immunity proposal cannot be obtained, that circumstance likewise provides important information about the authenticity of the criticism leveled at the patent system to date.

382. Catherine E. Tucker, *The Effect of Patent Litigation and Patent Assertion Entities on Entrepreneurial Activity* 15 (MIT Sloan Sch., Working Paper 5095-14, 2014), *archived at* http://perma.unl.edu/8BWU-RZJL.

383. *Id.* at 31.

384. Startups commonly rely on nonpatent 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.

385. *See* Mann, *supra* note 361, at 981.