Marquette Intellectual Property Law Review

Volume 10 | Issue 1 Article 1

Winter 2006

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ARTICLES

CORPORATE PATENTS: OPTIMIZING ORGANIZATIONAL RESPONSES TO INNOVATION OPPORTUNITIES AND INVENTION DISCOVERIES

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Corporate patents[1]—that is, utility patents[2] owned by corporations[3]—are critically important, yet poorly understood creatures

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1. Patent owners can prevent others from making, using, or selling a patented invention. 35 U.S.C. § 154(a)(1) (2000). Generally, corporations can realize the commercial value of these patents by using or selling the patented items or services themselves or by permitting (i.e. "licensing") others to use or sell the patented items or services in exchange for royalty payments. Companies that choose to use or sell patented inventions themselves realize the value of the associated patents by setting the prices for their products or services at elevated levels that reflect the fact that the corporations are the sole legitimate sources or users of the patented inventions. Companies that choose to license their patented inventions to others realize the value of their patents through the licensees' royalty payments. Which of these means is the best for a patent holder to maximize patent value depends largely on whether the patent holder or licensee is the most efficient and effective in delivering products and services based on a patented invention to consumers.

2. Utility patents are the primary variety of patents issued under U.S. law. They control the making, using, and selling of useful devices, materials, and processes. *Id.* §§ 101, 154. Utility patents should be distinguished from two much less common types of patents: design patents (which control ornamental designs for useful products) and plant patents (which control new varieties of asexually reproducing plants). *See id.* §§ 171, 161.

3. The focus of the Article is on business corporations that seek and utilize patents. Most U.S. utility patents are owned by corporations. *See infra* Part I.A. However, some such patents are doubtless owned by partnerships and other collectively owned business entities. In addition, non-profit organizations, such as universities, comprise a small component of organizational patent owners. *See* UNITED STATES PATENT & TRADEMARK OFFICE, U.S. COLLEGES AND UNIVERSITIES—UTILITY PATENT GRANTS, CALENDAR YEARS 1969–2000,

of intellectual property law. Under U.S. law, corporations are not proper patent applicants because corporations do not discover inventions, individuals do.[4] Despite this, corporations are frequently assigned patent rights from individual inventors, often before the patents involved have even issued.[5] As a consequence, corporations own and control most patents.[6] Corporations use patents to structure and facilitate a wide variety of valuable transactions and activities.[7]

This Article argues that innovation concerning today's complex technologies often requires corporate efforts and that changes in patent and corporate laws are needed to fully promote effective and efficient

http://www.uspto.gov/web/offices/ac/ido/oeip/taf/univ/asgn/table_1.htm (last visited Sept. 27, 2002) [hereinafter U.S. COLLEGES AND UNIVERSITIES—UTILITY PATENT GRANTS] (placing university ownership for new patents issued in 2000 at 2% of all utility patents). To the extent that these non-corporate entities share the business objectives or organizational modes of action exhibited by business corporations, these other types of patent-owning entities should be governed by the considerations discussed here.

4. Only an individual inventor or group of individual inventors can apply for a utility patent under U.S. law. 35 U.S.C. §§ 111(a)(1), 116 (2000); 37 C.F.R. § 1.41(a) (2004). The failure of the actual inventor of a device or process to apply for a related patent will prevent the procurement of patent protection in most instances. *See* 35 U.S.C. § 102(f) (2000) (providing that a person shall not be entitled to a patent if "he did not himself invent the subject matter sought to be patented"); Lorenz v. Berkline Corp., 215 F. Supp. 869, 880 (N.D. Ill. 1963) ("A patent applied for by one who is not the inventor is unauthorized by law and void, whether taken out in the name of the applicant or of any assignee of his; it confers no right as against the public.").

5. *See* 35 U.S.C. § 261 (2000). Corporations may obtain assignments of patent rights even before a patent issues through two mechanisms. First, an inventor who has applied for a patent may be an employee of a corporation and have a pre-existing obligation under her terms of employment to assign any patent rights resulting from her employment to her corporate employer. Second, the inventor may have acted as an independent individual in making the invention covered by a patent, but have arranged during the often long pendency of the patent application (on average, approximately three years) to assign the inventor's patent rights to a corporation in exchange for compensation. In either of these types of circumstances, the relevant patent will be issued in the corporation's name with a notation reflecting the identity of the inventor that was the original patent applicant.

Corporations may also obtain ownership of patent rights after a patent has issued by obtaining an assignment from the initial patent holder or by acquiring (through mergers or other means) corporations or other legal entities that were themselves patent owners. Indeed, when large corporations acquire start-up companies that have discovered and developed a valuable new technology or product design, the patent rights of the start-up companies and the exclusive commercialization opportunities those rights imply are often among the most attractive features of the start-ups to the acquiring companies.

6. *See infra* Part I.A.

7. Intellectual property interests such as patents are so central to aiding modern corporate activities that, for many businesses, "[c]orporate value hinges not on the operation of production assets, but on the optimal financial exploitation of intellectual property." GORDON V. SMITH & RUSSELL L. PARR, INTELLECTUAL PROPERTY: LICENSING AND JOINT VENTURE PROFIT STRATEGIES xiii (1993).

innovation in corporate environments. The prevalence of patent ownership and exploitation by corporations reflect a fundamental but ill-appreciated truth about modern technological innovation. Patent incentives encouraging innovation by individuals do not bring most new inventions to the public. Rather, in many technological areas, corporate actions are the primary sources of innovation, hence, the main targets of patent incentives. Corporate financing and operations encouraged by patents are frequently required to gather and apply the personnel, resources, and marketing skills needed for developing, manufacturing, selling, and delivering highly complex, new products based on patented designs.

The discovery, perfection, and delivery to the public of new innovations through corporate processes require the initiation and funding of corresponding corporate enterprises. Both patent and corporate laws can further these corporate processes if such laws are tailored to promote the efficient formation and operation of corporate organizations focused on innovative activities. Changes in patent law standards may influence the perceived value of innovations in corporate settings,[8] while changes in corporate laws may affect how funding is sought for corporate efforts to develop patented inventions and how patented innovations are transformed into useful, widely distributed products.[9] An effective interplay between patent and corporate laws is needed to fully support and encourage corporate processes aimed at innovation. Legal reforms should recognize the critical and potentially synergistic relationship between patent and corporate laws as complementary means to promote corporate innovation.

This Article examines the often neglected linkage between patent and corporate laws and the roles that patents serve in promoting the discovery and commercialization of innovations by corporations.[10] The

8. *See infra* Part IV.A.

9. *See infra* Part IV.B.

10. The analysis presented here both extends and complements the work of Professor F. Scott Kieff. Professor Kieff has emphasized the importance of patent laws in encouraging the commercialization of new technologies and the realization of associated societal benefits. *See* F. Scott Kieff, *Property Rights and Property Rules for Commercializing Inventions*, 85 MINN. L. REV. 697 (2001). He has argued that the primary justification for patent rights lies in the incentives that patents provide for the commercialization of inventions. Professor Kieff concludes that exclusive patent rights are needed to ensure that fears of free riders do not cause the commercialization of new, nonobvious technologies to be underemphasized, resulting in the distribution of related products and services to the public at sub-optimal levels. *See id.* at 732–36. The analysis presented here recognizes that the commercialization of products and services based on new technologies is strongly promoted by patent incentives, but it views the initiation and funding of corporate efforts to be the primary vehicle for this

roles of patents in aiding the activities of corporate innovators define the distinctive functions of corporate patents.

The impacts of patents in the founding, growth, and maturation of corporations have been largely ignored by persons examining the significance and value of patent rights.[11] Yet, because corporations comprise such a large component of patent holders, the effects of patent rights on corporations are important consequences of the patent system that deserve further study. Likewise, corporate processes leading to patentable inventions and transforming such inventions into publicly available products are of major consequence for the patent system. Given that the ultimate end of patent law is to make products based on new technologies available to the public at the lowest net cost possible,[12] patent law goals are promoted by corporate processes that effectively and efficiently pursue technological innovation, product perfection, and the initial marketing of new products to the public.

In short, the satisfaction of patent law goals depends on features of both patent and corporate laws that support innovation and related product perfection and popularization processes. By treating patent and corporate law doctrines as complementary parts of the legal underpinnings encouraging organizational development of new

commercialization. Hence, the particular impact of patent laws on these corporate processes becomes a primary patent law focus. In addition to extending Professor Kieff's work in this respect, the present Article views corporate innovation as a joint product of structures and incentives created by the interplay of patent and corporate laws, suggesting that careful attention to how each of these types of law bear upon corporate innovation processes may have a valuable impact on public access to new technologies.

11. The reasons for this neglect are unclear. One possible source is the limited expertise of the specialists whose attention is needed to explore the interplay between patent and corporate laws. Patent law specialists tend not to be versed in the corporate laws governing how patents are used in corporation settings. Similarly, corporate and securities law specialists tend not to have strong backgrounds in patent law and, as a consequence, may overlook legal issues in the funding and operation of corporations that stem from the unusual features of patents as corporate property.

Another possible reason for the neglect of the interplay of patent and corporate laws may be that patents, unlike many other forms of property owned by corporations, may not have a clearly ascertainable liquidation value for which they could be sold immediately. Rather, the value of a patent is peculiarly tied to how the related patented technology is implemented in commercially successful products and services. This means that patent value is often tied to the success of subsequent commercializing activities by corporate owners, thereby making patent value and corporate operating success unusually intertwined considerations.

12. By minimizing the costs of producing and popularizing new inventions, an efficient version of patent law would maximize the net societal gains from each invention. *See*, *e.g.*, Mark F. Grady & Jay I. Alexander, *Patent Law and Rent Dissipation*, 78 VA. L. REV. 305, 316–18 (1992).

technologies and related products, changes in both patent and corporate laws promoting better innovative processes may be revealed.

For example, the distinctive benefits of patents in supporting corporate research and product development may justify extending patent rights to different types of subject matters and infringing activities than would be the case if patents were tailored just to encourage the efforts of individual innovators.[13] An organization-oriented body of patent law may be significantly different than an individual-oriented one.[14]

Similarly, corporate laws might be reshaped to better encourage modes of corporate formation, financing, operation, and ownership transfer that will support socially valuable innovation and product propagation efforts by corporations.

This Article identifies the distinctive public benefits of patent rights in corporate contexts by viewing those rights from corporate perspectives. It assesses the impacts of patent rights on several types of innovative activities typically undertaken through group processes and collective resources assembled and applied by corporations. The Article also considers how patents promote these sorts of group activities and applications of superhuman resources by corporations, focusing on types of patent impacts that are different from the influence of patents on individuals.

Shifting from a descriptive to a normative focus, the Article provides some examples of the types of patent and corporate law doctrines that might be adjusted to better promote optimal innovation and product introduction efforts by corporations. It argues that such adjustments can enhance the role of patent rights in promoting the success, effectiveness, and efficiency of companies that are technological innovators. These benefits can be achieved by increasing the value and incentive effects of patents themselves and by expanding the impact of patents on innovation-enhancing conduct such as public investment in corporate innovators.

These changes will promote the ultimate aim of the patent system to enhance technological innovations available to the public. The public benefits resulting from an innovation generally do not depend on

13. *See infra* Part IV.A.4–5.

14. Because the public's primary interest in recognizing patents and related constraints on patented inventions is in gaining access to greater numbers of useful inventions through efficient development processes, a shift to a more organization-centered patent law will serve the public interest to the extent that the shift produces more patentable inventions or reduces the net development cost of particular inventions.

whether the innovation occurs through corporate or individual activities. Hence, increases in the number of innovations realized by corporations or decreases in the net costs of discovering innovations and bringing related products to public availability are clearly in the public interest. To the extent that they alter the number or cost of useful products in these ways, changes in the scope of patent rights and the ways those rights are used in corporate activities supporting innovation will be important advances in the patent system.

I. CORPORATE DOMINANCE OF PATENT OWNERSHIP AND ENFORCEMENT

Utility patents issued by the United States Patent and Trademark Office (USPTO) in recent years reflect a striking picture of corporate ownership and control of patent interests.[15] Corporate ownership of patents has remained at 80% or greater of all utility patents since 1991 and, in recent years, has risen to almost 90%.[16] In some technological fields, corporations are almost the sole type of patent recipient, thereby reflecting the need for large-scale, corporate-financed resources to

15. Corporate ownership of utility patents is profiled in a number of statistical reports prepared by the USPTO. These include the following:

(1) UNITED STATES PATENT & TRADEMARK OFFICE, ALL TECHNOLOGIES REPORT, JANUARY 1, 1963–DECEMBER 31, 2001 (2002), http://www.uspto.gov/web/offices/ac/ido/oeip/taf/all_tech.pdf (last visited Mar. 20, 2003) [hereinafter ALL TECHNOLOGIES REPORT] (describing percentages of corporate patent ownership).

(2) UNITED STATES PATENT & TRADEMARK OFFICE, TOP TEN PATENTING ORGANIZATIONS, http://www.uspto.gov/web/offices/ac/ido/oeip/taf/reports.htm#top_org (last visited Oct. 2, 2002) (containing single year reports for 1991 through 2001).

(3) UNITED STATES PATENT & TRADEMARK OFFICE, PATENTING BY ORGANIZATIONS REPORT, http://www.uspto.gov/web/offices/ac/ido/oeip/taf/reports.htm#TO (last visited Oct. 2, 2002) (containing single year reports providing an extended list of prolific patenting organizations receiving patents for 1995 through 2001).

(4) UNITED STATES PATENT & TRADEMARK OFFICE, U.S. COLLEGES AND UNIVERSITIES—UTILITY PATENT GRANTS, CALENDAR YEARS 1969–2000, http://www.uspto.gov/web/offices/ac/ido/oeip/taf/univ/univ_toc.htm (last visited Dec. 16, 2002) (analyzing university-owned patents in comparison with all patents and all corporate patents).

(5) UNITED STATES PATENT & TRADEMARK OFFICE, PATENTING BY TECHNOLOGY CLASS, BREAKOUT BY ORGANIZATION, http://www.uspto.gov/web/offices/ac/ido/oeip/taf/tecasg/classes.htm (last visited Oct. 2, 2002) (analyzing utility patents granted to organizations in the five year period from 1997 through 2001 with separate analyses for each primary patent classification class).

16. ALL TECHNOLOGIES REPORT, *supra* note 15, at A1-2; *see also infra* Part I.A–B.

participate as an effective innovator.[17] In such settings, innovation is truly a corporate process; thus, patents, if they are to have any meaningful impact, must advance the useful arts through corporate incentives and corporate responses.

This section examines current levels of corporate patent ownership, the evolution of that ownership in recent years, the concentration of patent ownership among a few large corporations, and the disparate patterns of corporate patent ownership in different technology domains.

A. Corporate Domination of Patent Ownership

In 2000, corporations—both domestic and foreign—received 87% of all utility patents.[18] Of this percentage, 45% were received by U.S. corporations and 42% were received by foreign corporations.[19] Individual owners accounted for only 13% of all new patents.[20]

The USPTO treats university-owned patents as a form of corporate-owned patents. Hence, these corporate patent figures include university-owned patents. However, in recent years, such university-owned patents have accounted for only 2% of all utility patents and 4.5% of all corporate owned patents.[21] If university-owned patents are omitted, business corporations accounted for 85% of all utility patents in 2001. Given the small fraction of the total utility patent figures corresponding to non-business organizations such as universities, corporate patents will be assumed to be owned by business corporations in the remainder of this Article.

B. Historical Patterns of Corporate Patent Ownership

The high degree of corporate patent ownership just described is not a recent phenomenon. Although there has been a rise in corporate ownership over this period, high percentages of corporate patent ownership have prevailed for at least the last decade. The fractions of corporate utility patent ownership over this period have been as follows:[22]

17. *See infra* Part I.D.

18. ALL TECHNOLOGIES REPORT, *supra* note 15, at A1-2.

19. *Id.*

20. *Id.*

21. University-owned patents constituted 4.4% of all corporate owned patents in 2000 and have hovered between 3.4% and 4.9% since 1991. U.S. COLLEGES AND UNIVERSITIES—UTILITY PATENT GRANTS, *supra* note 3.

22. ALL TECHNOLOGIES REPORT, *supra* note 15, at A1-1, A1-2.

Year	Total Patents	Corporate Owned	Domestic Corporations	Foreign Corporations
1991	96,513	80%	41%	39%
1992	97,444	80%	41%	39%
1993	98,342	82%	43%	39%
1994	101,676	81%	43%	38%
1995	101,419	81%	43%	38%
1996	109,645	82%	44%	38%
1997	111,983	83%	45%	38%
1998	147,521	84%	45%	39%
1999	153,485	84%	45%	39%
2000	157,495	85%	45%	40%
2001	166,039	87%	45%	42%

Clearly, there has been a slow but steady increase in the fractional level of corporate ownership, initially involving increases only in domestic corporate ownership but most recently reflecting a gain by foreign corporations as well.[23]

While these percentage figures are important means to study the composition of patent ownership and the growing control of corporations over patents and patented inventions, such percentages mask to some degree the enormous magnitude of patents under corporate control at the end of this period in comparison with corporate patent ownership levels at the beginning of the period. Focusing on just the changes between 1991 and 2001, the actual numbers of patents under corporate control changed as follows:[24]

Year	Total Patents	Corporate Owned	Domestic Corporations	Foreign Corporations
1991	6,513	76,727	39,133	37,594
2001	166,039	143,269	74,327	68,942
Change	+72%	+87%	+90%	+83%

23. This growth in the fraction of utility patents owned by corporations seems to have extended back before the eleven years described here. Over the period of 1963 to 1987, corporations accounted for 76% of all utility patents, compared with 80% in 1991 and 87% in 2001. *Id.* at A1-2.

24. *Id.*

It is difficult to know with certainty the source of these major leaps in patent numbers, but several potential explanations are plausible.

First, this increase in patent totals, particularly in corporate patent totals, may reflect an increased confidence in patents generally as sources of intellectual property protections.[25] Such an increase in confidence may be a consequence of changes in patent laws and altered perceptions of patents by both legal and business specialists. The creation of the Court of Appeals for the Federal Circuit, with exclusive jurisdiction over appeals of patent cases, and the resulting development of a unified, relatively predictable body of case law regarding the scope and strength of patent rights may have reassured technology innovators about the probable extent of patent rights for particular innovations and thereby caused more innovators to seek patents.[26] Confidence that the resulting patent rights would have an enforceable impact over a predictable range of commercial activities may have caused more inventors—or the corporations backing those inventors—to pay the price—in both patent prosecution dollars and disclosures to competitors—associated with patent applications. Under this analysis, the increased number of patents seen in recent years is a descriptive, but non-technological phenomenon. That is, the increase may not reflect more inventions, just more patents concerning the type and number of inventions that were already being produced. This type of increase in patents produces a corresponding gain in the description of new technologies through more numerous patent disclosures.

A second explanation may be that there really has been an increase in innovation in this period, at least in the significantly new areas that are likely to lead to patentable inventions. Certainly a number of fields—from biotechnology to telecommunications electronics to information processing—have experienced breakthroughs in this period,

25. *See, e.g.*, George M. Sirilla et al., *The Advice of Counsel Defense to Increased Patent Damages*, 74 J. PAT. & TRADEMARK OFF. SOC'Y 705, 705 (1992) ("Since the creation of the United States Court of Appeals for the Federal Circuit in October 1982, the apparent value of U.S. patents has increased dramatically."); Robert P. Taylor, *Twenty Years of the Federal Circuit: An Overview*, *in* 1 PLI'S EIGHTH ANNUAL INSTITUTE FOR INTELLECTUAL PROPERTY LAW 9, 12 (David Bender & Robert P. Taylor co-chairs, 2002) (concluding that the net effect of the Federal Circuit's effort to clarify patent law is "readily apparent in the significantly greater value that patents enjoy today").

26. *See, e.g.*, KEVIN G. RIVETTE & DAVID KLINE, REMBRANDTS IN THE ATTIC: UNLOCKING THE HIDDEN VALUE OF PATENTS 43–44 (2000) (describing the increased use of patents to protect new technologies and creation of business assets following the clarification of patent law by the Court of Appeals for the Federal Circuit and the associated rise in the perceived value of patents among business leaders).

leading to streams of patentable innovations. Furthermore, advances in computers and the resulting use of computer-based information processing methods as broadly applicable analytic tools have caused re-evaluations and redesigns of devices and processes in a wide range of fields, in some cases producing new computer-based or computer-assisted designs that are significant enough departures from prior versions to qualify for patents. This may simply be a boom time in technological innovation, resulting in a corresponding growth in corporate patents.

However, a third, business-related explanation may account for much of the increase in corporate patents seen in the patent data. Innovators or their business backers may be obtaining larger numbers of patents because patents are increasingly being seen as critical commercialization tools for new innovations. As the risk and cost of developing new technologies grows, the risk containment and investment attraction attainable through patent rights may seem increasingly desirable. Patent-based business models may seem increasingly critical as innovators or their business associates look ahead not only to the full course of efforts needed to pursue engineering discoveries that may support new products, but also to the broader set of activities needed to transform raw engineering discoveries into marketable product designs, to establish manufacturing programs for these products, and to gain public acceptance of the products through initial marketing campaigns.[27]

The great expense that is often entailed in pursuing the full course of

27. A number of expensive activities may be needed to bring a raw technological advance from the point of partial appreciation of its potential utility sufficient to gain a patent to the later stage of widespread delivery to the public of useful, commercially successful products based on the technology. Critical post-invention steps in the commercialization of products based on a new technology can include the following:

(1) Linking a technological discovery to a worthwhile marketing opportunity;

(2) Having the new technology endorsed by parties whose opinions matter;

(3) Incubating the technology to determine its full potential and cost-effectiveness;

(4) Mobilizing adequate resources for demonstration of the technology;

(5) Successfully demonstrating the technology in the context where it will be used;

(6) Mobilizing market constituents needed to popularize the technology and to deliver its benefits;

(7) Promoting final products and services to skeptical customers;

(8) Choosing an appropriate business formula to access the relevant business context; and

(9) Sustaining commercialization after product launch.

VIJAY K. JOLLY, COMMERCIALIZING NEW TECHNOLOGIES: GETTING FROM MIND TO MARKET 2–3 (1997).

these post-invention efforts, coupled with the need to generate extensive investor support to cover these expenses, may be causing inventors and entrepreneurs to focus increasingly on patents as necessary elements of viable development strategies for new products.[28] Absent patents, innovators can only seek investment backing for new products based on the inventors' personal skills in commercializing an innovation before competitors do and the tenuous intellectual property protections afforded by trade secret laws. With one or more patents covering a key bit of technology, innovators can promise investors a stake in a particular, exclusive marketing opportunity as bounded by the technology controlled by the patent rights and the patent holder's ability to exclude others from this opportunity through the exercise of those rights. Particularly in resource intensive fields, a start-up enterprise needs patent rights to even catch the preliminary attention of potential investors, most of whom have many investment alternatives to choose from and who see the risk containment characteristics of patent rights as a minimum threshold feature of an investment worth considering.[29] In

28. The encouragement of these types of post-invention commercialization activities was a primary goal of the drafters of our present Patent Act. *See generally* Kieff, *supra* note 10, at 736–46. According to Giles Rich, a central drafter of the Patent Act and later a major figure in shaping patent law as a federal appellate judge, the primary justification for patent rights as granted under the Act lay not in the encouragement of invention or disclosure of new technologies. Rather, a third type of inducement via patent rights was key:

> The third aspect of inducement is by far the greatest in practical importance. It applies to the inventor but not solely to him, unless he is his own capitalist. . . . It might be called the inducement to risk an attempt to commercialize the invention. It is the "business" aspect of the matter which is responsible for the actual delivery of the invention into the hands of the public.

Giles S. Rich, *The Relation Between Patent Practices and the Anti-Monopoly Laws, Part II*, 24 J. PAT. OFF. & TRADEMARK SOC'Y 159, 177 (1942).

29. Investment capital investors are frequently deluged with requests for funding and will typically use the strength of intellectual property interests as one of several preliminary screening criteria for winnowing down pools of possible companies for investment. A typical, experienced investment capital investor may receive one thousand funding proposals a year, of which only one hundred receive more than a cursory review and about five will receive investment backing. In making the threshold choice of which companies to scrutinize in detail, the present or projected patent portfolios or other intellectual property interests of various companies seeking investment provide relatively easily assessed indicators of investment value. Absent strong intellectual property protections that appear likely to ensure some market exclusivity and associated profit potential in light of a company's business plans, a company will typically not attract sufficient attention to gain full scrutiny of other, more complex business characteristics such as the strengths of the company's management team and products and how these relate to the comparable qualities of competitors. In short, patents and other risk-reducing intellectual property interests serve as threshold indicators of potential business success because these interests are relatively easily assessed at early stages of business investment evaluations. *See* James. E. Malackowski & David I. Wakefield,

short, patents may have become the entry ticket into the venture capital derby, an essential business model feature of the viable start-up company.[30] Whatever their incentives for increased technology development, patents may be being sought in larger and larger numbers as part of corporate business development strategies, primarily because the ownership of patents serves to attract the investment needed for commercialization of high-tech products.

C. Concentration of Corporate Patent Ownership

Within the group of corporations receiving utility patents in 2001, patent ownership was highly concentrated in the hands of a few large-scale corporate owners. Of the 143,269 patents received by corporate owners in 2001, the ten corporations with the largest patent numbers received 16,758 of those patents, approximately 12% of the total.[31] These ten corporations controlled a substantial fraction of the total range of new devices and processes emerging from the patent system in this year.

This degree of concentration in corporate patent ownership, however, was not limited to the top ten corporations. Looking at a broader set of corporations, the top one hundred corporate patent recipients accounted for 51,833 patents, 31.2% of all new utility patents in 2001.[32] A further breakdown of corporate patents issued in 2001

Venture Investment Grounded in Intellectual Capital, *in* FROM IDEAS TO ASSETS: INVESTING WISELY IN INTELLECTUAL PROPERTY 157, 162–65 (Bruce Berman ed., 2002).

30. Even after a promising technology is discovered, the smooth and successful commercialization of the technology often depends on further resource allocations in order to bring products incorporating the technology to the public. Both technical promise and further enthusiasm by those with necessary resources are needed to avoid having the progress of new technologies stalled on the path towards useful products. In order to bring products successfully to the public, commercialization frequently depends on successfully managing two things: "creating enough value in a predecessor stage to make a technology worth taking further, and mobilizing stakeholders concerned with the next stage and convincing them of its future potential." JOLLY, *supra* note 27, at 13. Patent rights and the promise of exclusive marketing opportunities for patented products are part of the means that patent law provides to mobilize business executives and investors to back the product design, manufacturing, and marketing efforts needed to actually deliver patented products and the benefits of a new technology to the public.

31. ALL TECHNOLOGIES REPORT, *supra* note 15, at A1-1; UNITED STATES PATENT & TRADEMARK OFFICE, PRELIMINARY LIST OF TOP PATENTING ORGANIZATIONS, CALENDAR YEAR 2001 (2002), http://www.uspto.gov/web/offices/ac/ido/oeip/taf/top01cos.htm [hereinafter TOP TEN PATENTING ORGANIZATIONS 2001].

32. *See* UNITED STATES PATENT & TRADEMARK OFFICE, PATENTING BY ORGANIZATIONS 2001 (2002), http://www.uspto.gov/web/offices/ac/ido/oeip/taf/topo_01.pdf

shows the following percentages of patents issued to the indicated groups of corporate patent recipients:[33]

Ranking	Percentage of Total	Range of Patents	Average Patents for Ranking Group
1–10	10.1%	3411 to 1166	1676 per corporation
11–100	21.0%	1149 to 168	388 per corporation
101–436	15.1%	167 to 40	75 per corporation
437–26,693	40.7%	39 to 1	2.6 per corporation

While these ranking categories have somewhat arbitrary boundaries, they serve to illustrate the overall pattern of concentration in corporate patent ownership. A few corporations at the very top of the patent ownership list control a very high percentage of patents per corporation. The largest single corporate patent recipient, the IBM Corporation, accounted for 2% of all utility patents by itself.[34]

A first tier of companies, corresponding to the top ten companies, received more than a thousand patents per company in 2001 alone.[35] The intellectual property assets accumulated by each of these companies in this one year reflect a broad set of controls over numerous inventions. The scope of technology controls gained by these companies in this one year is even more significant than the number of patents suggests because the control associated with these patents will sweep into the future over the life of the patents each company received.

A second tier of companies, corresponding to the next ninety companies in the patent recipient rankings, accounted for another 21% of patents.[36] These companies each received numbers of patents in the hundreds in 2001 and, thus, were also positioned to maintain control over a substantial number of technological advances in their fields,

[hereinafter PATENTING BY ORGANIZATIONS 2001].

33. *See id.* The average patent numbers in the last column were obtained by taking the total number of patents obtained by corporations in the indicated ranking group and dividing by the number of corporations included in the ranking group. For example, the total number of patents obtained for the corporations ranked one through ten in receipt of patents was 16,758 patents, producing an average of 16,758/10 or 1676 for each corporation in this ranking group.

34. *See id.*

35. *See id.*

36. *See id.*

although not nearly as many developments as the top ten companies.

A third tier of companies, corresponding to the remainder of the corporations for which the USPTO tracked and reported company-specific patent totals, received between 40 and 167 patents.[37] Even the smallest of these patent totals, if obtained regularly by a corporation, would probably be sufficient to maintain control over future products in a particular market segment or sub-domain of a commercial field.

Finally, a fourth tier of corporate patent owners included a large number of corporations receiving relatively few patents each. This tier accounted for 40.7% of all utility patents issued in 2001.[38] As suggested by the average of 2.6 patents per company in this group, the group was comprised mostly of companies receiving one or two patents and a few that obtained somewhat more.[39] Many of the companies in this group—literally tens of thousands of small companies with one or two patents—are probably start-up companies that have staked their futures on the commercialization of a new technology corresponding to their narrow patent interests. The number of these corporate holders of small-scale patent interests suggests the presence of numerous instances of relatively isolated technological innovation outside of large corporate environments. However, the large number of companies with only a few patents also highlights the need for active and effective corporate financing of small companies if the technologies being promoted by these relatively small-scale patent holders are to be developed into marketable products available to the public.

In addition to the increase in the percentage of patents owned by corporate patent owners generally, the concentration of patent ownership of the largest corporate patent owners also increased in the past decade. During this period, the fraction of all utility patents owned by a few large companies has steadily grown. The following table tracks the percentage of all utility patents received by the top ten corporate patent owners:[40]

37. *See id.*

38. *See id.*

39. *See id.*

40. *See* ALL TECHNOLOGIES REPORT, *supra* note 15, at A1-1; UNITED STATES PATENT & TRADEMARK OFFICE, PRELIMINARY LIST OF TOP PATENTING ORGANIZATIONS, CALENDAR YEAR 1991 (1992), http://www.uspto.gov/web/offices/ac/ido/oeip/taf/top91cos.htm; UNITED STATES PATENT & TRADEMARK OFFICE, PRELIMINARY LIST OF TOP PATENTING ORGANIZATIONS, CALENDAR YEAR 1995 (1996), http://www.uspto.gov/web/offices/ac/ido/oeip/taf/top95cos.htm; TOP TEN PATENTING

Year	Total Patents Received by Top Ten Corporations	Percentage of All Patents Granted to Top Ten Corporations
1991	8,045	8.3%
1995	9,991	9.9%
2001	16,758	10.1%

A similar trend produced increased concentration in the patent ownership among the top one hundred patent recipients. The number of patents received by the top one hundred corporations rose from 29,647, or 29.2%, of all patents issued in 1995 to 51,666, or 31.2%, of all patents issued in 2001.[41]

D. Varying Scope and Concentration of Corporate Patent Ownership Among Technology Fields

In certain technology areas, high proportions of corporate patent ownership and high concentrations of such ownership among a very few companies have been particularly extreme in recent years. Indeed, in a few complex, resource intensive areas, individual patent ownership of new patents has been almost unknown, reflecting the need for corporate backing to discover and commercialize most or all patentable advances. Because the numbers of patents issued in one year for certain technology areas was quite small, the patent data studied in this portion of the Article reflects totals for a five-year span, covering all utility patents issued in the 1997–2001 period.

This Article does not attempt to document all of the corporate patent ownership patterns for all of the technology categories covered by U.S. patents. The discussions in this subsection focus on a few important technology classes and the substantial variations in corporate patent ownership for those classes.[42] Among these technology areas,

ORGANIZATIONS 2001, *supra* note 31.

41. *See* UNITED STATES PATENT & TRADEMARK OFFICE, PATENTING BY ORGANIZATIONS 1995 (1996), http://www.uspto.gov/web/offices/ac/ido/oeip/taf/topo_95.pdf; PATENTING BY ORGANIZATIONS 2001, *supra* note 32. The USPTO's reporting of corporate patent ownership in 1991 does not cover patent ownership by individual corporations other than the top few corporations, thereby precluding comparisons of patent ownership of the top one hundred corporations for 1991 with later figures.

42. The USPTO classifies the technologies covered by particular patents into "technology classes." Technology classes are "based on (1) technology associated with a particular industry, or (2) subject matter having similar function, use, or structure." UNITED STATES PATENT & TRADEMARK OFFICE, OVERVIEW OF THE CLASSIFICATION SYSTEM I-1

three patterns of corporate patent ownership were found: (1) in some fields corporate patent ownership is moderate and both corporate and individual ownership are significant; (2) in additional fields corporate patent ownership is very common, but spread among a substantial number of corporations; and (3) in a third group of technology areas corporate patent ownership is highly significant and ownership of patents is highly concentrated in a few companies. These patterns of corporate patent ownership and a few of the technology domains that illustrate each pattern are described in the remainder of this subsection.

1. Moderate Corporate Ownership

While there are not many technology domains in which corporate patent owners do not play a highly significant role, there are a few areas of technology in which individual innovators constitute the bulk of patent owners. For example, patents issued from 1997 through 2001 for new tool designs reflected a high percentage of patents owned by individuals and relatively little corporate ownership.[43] Within this category, individually owned patents accounted for 84.5% of the total, while corporate-owned patents only accounted for 15.5%.[44] Corporate ownership was spread among a substantial number of companies, with the top ten corporate patent recipients taking only 10.9% of all patents in this class.[45]

This pattern of patent ownership suggests that many innovators in this field are probably individuals or small groups of individual inventors working in isolation from corporate support and resources. Certainly, the relatively "low-tech" character of many new tool designs would probably put many innovations in this field within the reach of

(2002), http://www.uspto.gov/web/offices/opc/documents/overview_dec02.pdf (last visited Nov. 27, 2003). Every patent application is assigned to one or more classification categories based on the technology addressed by the patent claims in the application. If the application results in an issued patent, these classification designations are carried forward as part of the published patent record and provide a useful tool for searching for patents by technology type.

43. These advances fall within the USPTO's Class 81, Tools: "In this class are tools which are not structurally limited to any classified art. This class is limited to hand tools, except in [certain noted subclasses]." UNITED STATES PATENT & TRADEMARK OFFICE, CLASSIFICATION DEFINITIONS 81-1 (2004), http://www.uspto.gov/web/patents/classification/uspc081/defs081.pdf.

44. *See* UNITED STATES PATENT & TRADEMARK OFFICE, PATENTING BY TECHNOLOGY CLASS, BREAKOUT BY ORGANIZATION, 1997–2001, CLASS 81, TOOLS, www.uspto.gov/web/offices/ac/ido/oeip/taf/tecasg/081_tor.htm (last visited Oct. 2, 2002).

45. *See id.*

independent inventors. Furthermore, these sorts of devices may be encountered by individuals in their personal lives, leading to an appreciation of problems with present designs and innovative efforts to fix those problems that are undertaken by individuals in their personal capacities outside of any roles they may have as corporate employees. Such innovations developed on personal time with personal resources would typically fall outside any obligation to assign resulting patents to the individuals' corporate employers, even if the individuals were employed by corporations. Thus, the resulting patents tend to remain in the hands of the individuals who produce patentable tool designs.

2. Extensive Corporate Ownership—Widely Distributed

A second pattern of corporate patent ownership involving extensive corporate ownership distributed among a substantial number of corporations was present in several technology fields from 1997 through 2001. This pattern of patent ownership governed advances in such widely divergent technological classes as refrigeration equipment, bodies and tops of land vehicles, and artificial intelligence.

Refrigeration advances[46] showed a 74.4% ownership by corporations from 1997 through 2001, with only 25.6% of patents for such advances issued to individuals.[47] The top ten corporate patent recipients accounted for 31.2% of all patents in this class.[48]

The invention class covering bodies and tops of land vehicles[49] reflected a 62.5% corporate ownership from 1997 through 2001, with

46. *See* UNITED STATES. PATENT & TRADEMARK OFFICE, CLASSIFICATION DEFINITIONS, CLASS 62, REFRIGERATION 62-1 (2004), http://www.uspto.gov/web/patents/classification/uspc062/defs062.pdf.

> This class includes (1) processes and apparatus peculiar to removing heat from a substance, usually by a change of phase of a coolant or refrigerant, as by evaporation, melting or sublimation, (2) the resultant product of part (1), e.g., ice, liquefied or solidified gases, and (3) processes and apparatus peculiar to handling the latter as a stored product, not elsewhere provided for.

Id.

47. *See* UNITED STATES PATENT & TRADEMARK OFFICE, PATENTING BY TECHNOLOGY CLASS, BREAKOUT BY ORGANIZATION, 1997–2001, CLASS 62, REFRIGERATION, http://www.uspto.gov/web/offices/ac/ido/oeip/taf/tecasg/062_tor.htm (last visited Feb. 4, 2003).

48. *See id.*

49. UNITED STATES PATENT & TRADEMARK OFFICE, CLASSIFICATION DEFINITIONS, CLASS 296, LAND VEHICLES: BODIES AND TOPS 296-1 (2003), http://www.uspto.gov/web/patents/classification/uspc296/defs296.pdf. "This class includes patents relating to that portion of a land vehicle, secured to the running-gear thereof, which operates as a receptacle or load carrier, together with the top or cover therefor." *See id.*

37.5% of such patents issued to individuals.[50] The top ten corporate patent holders accounted for 27.4% of all patents in this class.[51]

For the patent class covering data processing inventions related to artificial intelligence,[52] the degree of corporate ownership from 1997 through 2001 was 81.2%, and the individual ownership was 18.8%.[53] The top ten corporate owners received 50.2% of all the patents issued in this class.[54]

While corporations clearly predominated as patent owners in these technology classes, a substantial number of individuals also received patents in these areas, indicating that substantial advances were possible and even common in both individual and corporate contexts. These types of technologies are apparently ones that can be explored at the cutting edge without the sorts of equipment or resources that belong exclusively to corporate innovators. While corporate backing of some sort is apparently helpful and common, the involvement of massive corporations engaged in large-scale efforts within the field does not seem essential, as is reflected in the relatively small portion of the total number of patents received by the top ten corporate patent recipients. These technologies seem to be successfully advanced and commercialized by numerous small to medium-sized corporations rather than a few corporate giants that produce large quantities of patentable advances.

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50. *See* UNITED STATES PATENT & TRADEMARK OFFICE, PATENTING BY TECHNOLOGY CLASS, BREAKOUT BY ORGANIZATION, 1997–2001, CLASS 296, LAND VEHICLES: BODIES AND TOPS, http://www.uspto.gov/web/offices/ac/ido/oeip/taf/tecasg/296_tor.htm (last visited Dec. 14, 2002).

51. *See id.*

52. *See* UNITED STATES PATENT AND TRADEMARK OFFICE, CLASSIFICATION DEFINITIONS, CLASS 706, DATA PROCESSING—ARTIFICIAL INTELLIGENCE 706-1 (2005), http://www.uspto.gov/web/patents/classification/uspc706/defs706.pdf.

> This is a generic class for artificial intelligence type computers and digital data processing systems and corresponding data processing methods and products for emulation of intelligence (i.e., knowledge based systems, reasoning systems, and knowledge acquisition systems); and including systems for reasoning with uncertainty (e.g., fuzzy logic systems), adaptive systems, machine learning systems, and artificial neural networks.

Id.

53. *See* UNITED STATES PATENT & TRADEMARK OFFICE, PATENTING BY TECHNOLOGY CLASS, BREAKOUT BY ORGANIZATION, 1997–2001, CLASS 706, DP: ARTIFICIAL INTELLIGENCE (DATA PROCESSING), http://www.uspto.gov/web/offices/ac/ido/oeip/taf/tecasg/706_tor.htm (last visited Oct. 2, 2002).

54. *See id.*

3. Extensive Corporate Ownership—Highly Concentrated

A third set of technology classes had corporate patent ownership patterns reflecting large percentages of corporate ownership concentrated in a few organizations. This type of patent ownership—probably indicating the need for extensive resources and accumulated expertise to support advances—was present from 1997 through 2001 for patents falling under the semiconductor device manufacturing process, electrical connector, telecommunications, cleaning compounds, and software development, installation, and management invention classes.

For inventions involving semiconductor device manufacturing processes,[55] corporate patent owners received 98.6% of the 16,541 utility patents issued from 1997 through 2001.[56] Individuals received almost none of these patents, accumulating only 1.4% of the patents in this class over this period.[57] Within the corporate owner group, ownership was highly concentrated among a few large owners. The top ten corporate patent owners accounted for 48.7% of the patents in this class.[58]

In the area of electrical connectors,[59] the level of corporate patent

55. *See* UNITED STATES PATENT & TRADEMARK OFFICE, CLASSIFICATION DEFINITIONS, CLASS 438, SEMICONDUCTOR DEVICE MANUFACTURING 438-1 (2005), http://www.uspto.gov/web/patents/classification/uspc438/defs438.pdf.

> A. This class provides for manufacturing a semiconductor containing a solid-state device by a combination of operations wherein:
>
> (1) no other class provides for the overall combination, and
>
> (2) the intent is to use the electrical properties of the semiconductor in the device for at least one of the following purposes: (a) conducting or modifying an electrical current, (b) storing electrical energy for subsequent discharge within a microelectronic integrated circuit, or (c) converting electromagnetic wave energy to electrical energy or electrical energy to electromagnetic energy.

Id.

56. *See* UNITED STATES PATENT & TRADEMARK OFFICE, PATENTING BY TECHNOLOGY CLASS, BREAKOUT BY ORGANIZATION, 1997–2001, CLASS 438, SEMICONDUCTOR DEVICE MANUFACTURING: PROCESS, http://www.uspto.gov/web/offices/ac/ido/oeip/taf/tecasg/438_tor.htm (last visited Dec. 14, 2002).

57. *See id.*

58. *See id.*

59. *See* UNITED STATES PATENT & TRADEMARK OFFICE, CLASSIFICATION DEFINITIONS, CLASS 439, ELECTRICAL CONNECTORS 439-1 (2004), http://www.uspto.gov/web/patents/classification/uspc439/defs439.pdf.

> This is the generic class for a pair of mated conductors comprising at least two electrically conducting elements which are interconnected to permit relative motion of such conducting elements during use without a break in electrical conductivity there between (see Subclass References to the Current Class, below).

ownership was nearly as high as the area of semiconductor device manufacturing processes with corporations obtaining 88.1% of all such patents from 1997 through 2001 and individuals controlling the remaining 11.9%.[60] The corporate ownership was again highly concentrated, with the top ten corporate patent recipients gaining 51.7% of all patents in the class over this period.[61]

Telecommunications patents[62] were received in a similar pattern from 1997 through 2001. Corporations received 95.3% of all such patents and individuals received the remaining 4.7%.[63] One owner,

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> Also, this is the generic class for a device constituting an electricity conducting contact between conductors of electricity; wherein the joint is of a type which may be readily made and broken, repeatedly by attachment and detachment of contact supporting structure on each conductor.
>
> (1) Note. A soldered joint or joint formed by twisting together a pair of conductors and any of various other splices that is more or less permanent in nature is not generally provided for in this class. See the reference to Class 174 below for location of a device relating to such a splice joint. Also, see below for the scope of this class with regard to general utility and the lines with respect to other classes providing for a joint, per se.
>
> (2) Note. Included under this class definition is a device known in the art as a contact plug, an outlet receptacle, a lamp socket, a vacuum tube socket, a connection block, a cable terminal, a cable joint, a binding post, a cube tap, a grounding strap, etc.
>
> (3) Note. This class also includes a device specialized for use with an electrical connector and not elsewhere classifiable. Such a device may be, for example, any of certain types of mounting or supporting means, a locking device, a shield or cover, a strain relieving device, etc.

Id.

60. *See* UNITED STATES PATENT & TRADEMARK OFFICE, PATENTING BY TECHNOLOGY CLASS, BREAKOUT BY ORGANIZATION, 1997–2001, CLASS 439, ELECTRICAL CONNECTORS, http://www.uspto.gov/web/offices/ac/ido/oeip/taf/tecasg/439_tor.htm (last visited Dec. 14, 2002).

61. *See id.*

62. *See* UNITED STATES PATENT & TRADEMARK OFFICE, CLASSIFICATION DEFINITIONS, CLASS 455, TELECOMMUNICATIONS 455-1 (2005), http://www.uspto.gov/web/patents/classification/uspc455/defs455.pdf.

> This is the generic class for modulated carrier wave communications not elsewhere classifiable.
>
> Some art areas excluded from this class are: Alternating or pulsating current telegraphy; Antennas; Broadcast or multiplex stereo; Condition responsive indicating systems with a radio coupling link; Directive carrier wave systems; Multiplex carrier wave communications; Paging via modulated carrier wave; Pulse or digital communications which may be modulated onto a carrier wave; Reflected carrier wave systems (e.g., radar); Selective (e.g., remote control); Telemarketing; Television; Facsimile.

Id.

63. *See* UNITED STATES PATENT & TRADEMARK OFFICE, PATENTING BY

Motorola, Inc., accounted for 12.6% of all patents in this class.[64] As a group, the top ten corporate patent owners accounted for 55.7% of all patents in this class.[65]

In a chemical context, the patents for cleaning compositions issued from 1997 through 2001 also showed high levels of corporate patent ownership and concentration of this ownership among a few large corporations.[66] The percentage of corporate ownership was 93.1% for this class, with individual ownership at only 6.9%.[67] Corporate ownership was even more concentrated than for the other patent classes analyzed here. The top ten corporate patent owners received 64.5% of

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TECHNOLOGY CLASS, BREAKOUT BY ORGANIZATION, 1997–2001, CLASS 455, TELECOMMUNICATIONS,http://www.uspto.gov/web/offices/ac/ido/oeip/taf/tecasg/455_tor.htm (last visited Dec. 14, 2002).

64. *See id.*

65. *See id.*

66. *See* UNITED STATES PATENT & TRADEMARK OFFICE, CLASSIFICATION DEFINITIONS, CLASS 510, CLEANING COMPOSITIONS FOR SOLID SURFACES, AUXILIARY COMPOSITIONS THEREFOR, OR PROCESSES OF PREPARING THE COMPOSITIONS 510-1 (2003), http://www.uspto.gov/web/patents/classification/uspc510/defs510.pdf.

> This class includes the following subject matter, not provided for elsewhere, when a utility set forth below is either (a) claimed or (b) solely disclosed.
>
> (A) CLEANING COMPOSITIONS FOR SOLID SURFACES which are specialized and designed for, or peculiar to, use in cleaning or removing foreign matter from solid surfaces.
>
> (B) AUXILIARY COMPOSITIONS, PER SE, for perfecting the cleaning compositions of this class or for perfecting a cleaning process (e.g. rinse- or dryer-added fabric softener compositions, etc.) for which there is no provision elsewhere.
>
> (C) COMPOSITIONS OF THIS CLASS DEFINED IN TERMS OF SPECIFIC PHYSICAL STRUCTURE (E.G., TABLET, COATED PARTICLE, ETC.) – The lines generally prevailing between the composition classes and the article classes are applicable to Class 510 unless otherwise indicated, with the exception that Class 510 provides for a composition, per se, defined in terms of specific structure, having a utility for Class 510.
>
> (D) PACKAGES of compositions of this class, or other articles which releasably enclose or support such compositions, for which there is no provision elsewhere.
>
> (E) PROCESSES OF PREPARING subject matter of A–D not provided for elsewhere.

Id.

67. *See* UNITED STATES PATENT & TRADEMARK OFFICE, PATENTING BY TECHNOLOGY CLASS, BREAKOUT BY ORGANIZATION, 1997–2001, CLASS 510, CLEANING COMPOSITIONS FOR SOLID SURFACES, AUXILIARY COMPOSITIONS THEREFOR, OR PROCESSES OF PREPARING THE COMPOSITIONS, http://www.uspto.gov/web/offices/ac/ido/oeip/taf/tecasg/510_tor.htm (last visited Oct. 17, 2002).

patents in this class.[68]

Patents for software development, installation, and management advances exhibited a similar ownership pattern.[69] Corporations owned 96.1% of the patents for this technology class.[70] Individual owners received only 3.9% of new patents in this class. The concentration of patent ownership was particularly high, with the top ten patent recipients gaining 70.6% of patents.[71]

The highly concentrated pattern of corporate patent ownership in these areas suggests that advantages related to large corporate size or the scale of innovative efforts were important in these settings. Certainly, the technological resources needed to engage in research are large in many of these areas, effectively precluding independent research by individuals. It may also be the case that personnel working for large companies that manufacture products or provide services in these areas encounter or learn of design flaws in existing products and services to a greater extent than individuals acting alone, with the result that personnel in these corporations are better informed about the goals of innovation to improve the products or services. Alternatively, large

68. *See id.*

69. *See* UNITED STATES PATENT & TRADEMARK OFFICE, CLASSIFICATION DEFINITIONS, CLASS 717, DATA PROCESSING: SOFTWARE DEVELOPMENT, INSTALLATION AND MANAGEMENT 717-1 (2005), http://www.uspto.gov/web/patents/classification/uspc717/defs717.pdf.

> This class provides for software program development tool and techniques including processes and apparatus for controlling data processing operations pertaining to the development, maintenance, and installation of software programs. Such processes and apparatus include:
>
> A. Processes and apparatus for program development functions such as specification, design, generation, and version management of source code programs.
>
> B. Processes and apparatus for debugging of computer program including monitoring, simulation, emulation, and profiling of software programs.
>
> C. Processes and apparatus for translating or compiling programs from a high-level representation to an intermediate code representation and finally into an object or machine code representation, including linking, and optimizing the program for subsequent execution.
>
> D. Processes and apparatus for updating, installing, and version management of developed code.

Id.

70. *See* UNITED STATES PATENT & TRADEMARK OFFICE, PATENTING BY TECHNOLOGY CLASS, BREAKOUT BY ORGANIZATION, 1997–2001, CLASS 717, DP: SOFTWARE DEVELOPMENT, INSTALLATION, AND MANAGEMENT (DATA PROCESSING), http://www.uspto.gov/web/offices/ac/ido/oeip/taf/tecasg/717_tor.htm (last visited Dec. 14, 2002).

71. *See id.*

companies in these fields may find a stream of related patents to be advantageous in other respects, such as serving as a continuing shield to isolate company activities from competitive pressures or as bargaining chips in efforts to gain cross-licenses concerning key technologies controlled by other companies. Whether motivated by surrounding business factors or the technological demands of research in these settings, innovation by large-scale corporate innovators seems to predominate in the five fields described here. In these fields, corporate patent ownership was extremely high and individual research and the promotion of patentable innovations by individuals does not seem to be a realistic patent law goal. Rather, effective innovation in these fields seems to depend on the incentives and rewards that patents provide to corporations as they pursue and fund their research in these resource-intensive fields and develop and market related products and services.

In these settings—and in the technological contexts described earlier in which numerous small companies are active innovators—the encouragement of effective and efficient means to bring new innovations to the public will be furthered by strengthening the role of patents in promoting corporate efforts to pursue innovation by groups of inventors and to apply large-scale resources to these tasks. These same ends will also be furthered by creating supporting corporate law standards that will aid in the funding and completion of these innovation efforts. The remainder of this Article examines how patents may influence innovation by corporate organizations and suggests some changes in patent and corporate laws that might better encourage innovation in corporate contexts.

II. DISTINCTIVE FEATURES OF CORPORATE INNOVATORS

Several features make corporations different sorts of innovators than individuals and may require adjustments in patent and corporate laws to fully support corporate innovation. The key features of corporate innovators that distinguish them from individual innovators acting outside corporate environments include the following:

(1) The tendency of corporate organizations to pursue technological discoveries and the development of related new products through group action;

(2) The ability of corporate organizations to gather, organize, and apply resources to innovation on a superhuman scale;

(3) The need for collective funding of corporate innovators—often from remote investors having little direct contact with the

corporations—in order to support large-scale innovation and related manufacturing and marketing programs; and

(4) The obligations of company owners and managers to share aspects of control over corporate innovation as dictated by corporate governance processes.

This section describes these distinctive qualities of corporate innovators. The next section assesses how these distinctive qualities relate to patent incentives and related features of corporate laws supporting innovation.

A. Introduction

As described by noted economist John Kenneth Galbraith, the purpose of a corporation is "to do business as would an individual but with the added ability to assemble and use the capital of several or numerous persons. In consequence, it can undertake tasks beyond the financial reach of any single person."[72]

When corporations initiate technological innovation efforts—as opposed to acquiring rights in fully developed technological devices or processes discovered and perfected by others[73]—Galbraith's brief description identifies many of the distinctive attributes that distinguish corporate innovators from individual actors. First, corporate behavior in pursuit of innovation has a superficial resemblance to individual behavior; that is, corporate actions in pursuit of innovation follow patterns that track the actions of rational individuals. In this respect, organizational innovation by corporations can roughly be understood by thinking of corporate innovation as individual innovation writ large. Corporations, like individual innovators, use rational means to analyze consumer problems that might be suitable for technological solutions (typically through marketing studies or evaluations of consumer products in the corporations' existing field of interest), seek such solutions though rationally directed and limited research, and transform their discoveries into perfected, manufactured, and marketed products

72. JOHN KENNETH GALBRAITH, THE NEW INDUSTRIAL STATE 75 (4th ed. 1985).

73. As used here, "innovation" refers to the discovery of a technological advance combined with the product development, perfection, and implementation steps necessary to bring the new technology into public usage. Innovation can occur through original work at any stage of this process. Patents can influence each of these stages. The promise of patents can encourage the pursuit of new technological discoveries with identifiable utility. Existing patents (or anticipated patents) can encourage innovation at the later stages of product perfection, manufacturing, and marketing by improving the effectiveness or reducing the cost of an exclusively marketed patented product.

through the rational allocations of appropriate resources, often in competition with other internal demands for the use of the same resources.

Corporations frequently create their own internal systems resembling markets for the allocation of resources to potential corporate tasks,[74] meaning that they incorporate their own pressures which tend to limit product research and development activities to only those efforts that seem rational and efficient in light of the likely degree of public interest and commercial return of resulting corporate products and services.[75] Because of these ongoing pressures stemming from the looming attraction of alternative uses of corporate resources and the need for corporate managers to continuously turn away from those alternative uses to keep supporting successive steps of corporate innovation, the scope of corporate efforts aimed at innovation may be particularly fine-tuned, rationally directed, and scaled in ways that cause them to be highly efficient. In short, corporate innovators may be, in effect, exceptionally efficient substitutes for individual innovators, not just large-scale counterparts to individual innovators.

However, it is easy to make too much of the analogy of corporations to individual innovators and to think that patents and other incentives for innovation will have similar impacts on corporations and individuals. There are major differences in the actions, resources, financing, and

74. *See* Oliver Williamson, *Corporate Governance*, 93 YALE L.J. 1197, 1225 (1984) (observing that the tendency of modern corporations to operate in discrete divisions or operating units aids corporate management in monitoring the success of discrete corporate activities and in allocating resources among those internal activities with the greatest potential returns; in effect, such a multi-divisional corporation becomes a miniature capital market in which internal investment in future corporate activities is allocated in accordance with perceived potential for investment return).

75. The availability of patent rights for certain types of technological developments may cause corporations to affirmatively pursue such developments at the expense of efforts to advance technologies that are less likely to produce proprietary interests and associated opportunities for commercialization. This type of choice undertaken internally as corporate managers allocate product research and development resources was described by one observer as follows:

> [I]f the area is wide open for exploitation, the intellectual property strategy may show the potential for numerous patentable inventions that in turn will require a team of researchers. On the other hand, if there is limited opportunity for proprietary development, then perhaps very few or no technical resources should be devoted to that product, or those resources should be geared to buying or licensing the technology.

H. Jackson Knight, *Intellectual Property "101": What Executives and Investors Need to Know About Patent Rights and Strategy*, *in* FROM IDEAS TO ASSETS: INVESTING WISELY IN INTELLECTUAL PROPERTY 3, 22 (Bruce Berman ed., 2002).

governance of corporations that make them significantly different types of innovators from individuals. These differences are described in the remainder of this section.

Corporations differ from individuals in ways that make corporations both better and worse innovators than individuals in certain respects. First, corporations innovate through group conduct rather than through the isolated actions of one inventor or a small group of inventors acting as individuals.[76] Corporate innovation is consequently subject to the strengths and weaknesses of group action. Second, corporate innovation often benefits in critical ways from the organization and application of superhuman resources to innovative tasks.[77] When these superhuman resources are organized and applied effectively, corporate innovators acting with collective resources have the ability to make discoveries and advance technological knowledge in various ways that are beyond the reach of any individual. Third, the generation and application of capital from backers (ranging from a relatively small, directly contacted group of investors at the outset of a corporate innovator's existence to a widely distributed, loosely engaged set of investors in a publicly traded corporate innovator) is an ongoing feature of corporate innovation and a source of related performance pressures.[78] Fourth, corporate managers and employees seeking innovations are accountable to corporate shareholders and must share with investors through corporate governance processes some degree of management information and control over corporate innovation.[79] These distinctive aspects of corporate innovation are examined in this section as they relate to the potential influence of patent rights and incentives.

B. Group Action

1. How Group Action Influences Corporate Innovation

Under the leadership of corporate managers who translate their own visions of corporate goals into corporate actions, corporations tend to pursue technological innovation through rationally constructed means of gaining access to and implementing technologies that promote the corporations' business interests.[80] Not every company leader sees

76. *See infra* Part II.B.
77. *See infra* Part II.C.
78. *See infra* Part II.D.
79. *See infra* Part II.E.
80. Corporations may seek to advance their interests through a number of strategies

technological innovation as the best means to business success. The development of new technologies is only one of several competing strategies that a company may use to advance its business interests. Alternatives to technological innovation include adopting a business strategy that emphasizes the increasingly efficient use of old technologies, the marketing of carefully improved products based on old technologies, or the expansion of commercial success based on product image rather than product performance. Even if a company wishes to adopt new technologies in its practices or products, it can often just use new technologies that are not legally restricted or obtain the rights to use restricted technologies by licensing innovations produced by others, by acquiring the patents controlling these innovations, or by acquiring ownership of the companies that control the innovations.

Despite the availability of these sorts of alternative strategies, many companies maintain at least some component of internal innovation regarding their products and practices. While efforts to innovate in internal operating practices generally involve similar steps, the discussion here will focus on steps that companies take to develop new technologies for inclusion in products or services offered to customers.

In developing and implementing new technologies to improve products and services, group efforts may come into play at several stages of corporate operations. Specifically, group efforts may alter and enhance innovative activities in corporations at any or all of the following stages of innovation: (1) identifying consumer needs that are unmet or poorly met by current technologies, (2) experimenting with technological solutions to these needs, (3) testing the resulting invention designs, (4) developing and perfecting resulting products and services, and (5) commercializing these products or services by implementing necessary manufacturing and marketing programs.[81]

based on the development of new intellectual property. For example, using a technology-based strategy, a company may seek to develop advances in a particular sub-domain of technology with the hope that the company's control over that aspect of technology will help it to create and market a series of related products over time. Under an alternative product-based strategy, a company may seek to develop protectable product features that will allow the company to maintain exclusive marketing advantages concerning a product or product line. Under a third, invention-based strategy, a company developing a particular engineering breakthrough, which is a distinctive departure from earlier engineering approaches to the same design problem, may seek to control product implementations based on that new approach even if the commercial significance and means of exploiting the new approach are not yet fully apparent. *See* Knight, *supra* note 75, at 14–17.

81. *See generally* JOLLY, *supra* note 27, at 2–3. A corporation need not engage in group actions in all of these areas for the considerations addressed here to arise. It is sufficient that at least one of these types of functions is undertaken through group activity.

In short, by operating within a corporate infrastructure and applying corporate resources, working groups within corporate organizations can pursue a variety of key innovative tasks, often through means and with results that would be impossible for an individual innovator to attain. However, in applying group activities to innovative tasks in corporate organizations, employee groups are subject to several operational strengths and weaknesses that are endemic to group action in business settings.[82]

2. Potential Benefits of Group Action for Technological Innovation

Innovation conducted through group efforts within corporate organizations may produce useful advances in the discovery, development, and popularization of patented inventions. The benefits of working through groups of corporate employees and with large-scale

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Furthermore, it is not necessary that all of these steps be taken by one company. In many instances, for example, a small company or individual acts as the initial innovator, makes an invention, and transfers the resulting patent and technological know-how to a larger company. Up to this point, the process of innovation may have been undertaken by either one individual or a very small group. However, subsequent steps in the process of bringing the technology involved to the public in the form of widely available products or services may be undertaken through group action within the large corporation that eventually controls the patent and the technology. As of this point in the process, the group action considerations addressed here become relevant.

82. An agency process is present whenever one party is called upon to act on behalf of another. For a complete treatment of the features of agency processes, see Kenneth J. Arrow, *The Economics of Agency*, *in* PRINCIPALS AND AGENTS: THE STRUCTURE OF BUSINESS 37 (John W. Pratt & Richard J. Zeckhauser eds., 1985). In these types of settings, the effectiveness of three types of features will determine the efficiency and success of an agency process in achieving results desired by a principal: (1) mechanisms for defining the conduct desired by the principal, (2) mechanisms for monitoring whether that conduct is being undertaken by the agent, and (3) mechanisms for tying the agent's performance rewards to the completion of the desired conduct. *See id.*

All agency processes are subject to certain costs. Agents "seldom work for free, they require continuing supervision, and, worst of all, they often serve themselves at the expense of their principals." Samuel Issacharoff & Daniel R. Ortiz, *Governing Through Intermediaries*, 85 VA. L. REV. 1627, 1638 (1999). Typical costs of accomplishing tasks through agency relationships include (1) expenditures by principals to monitor the actions of agents, (2) bonding expenditures by agents to engender trust by principals, and (3) the residual losses due to divergences of agents' conduct from the actions desired by principals. *See* Michael C. Jensen & William H. Meckling, *Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure*, 3 J. FIN. ECON. 305, 308 (1976).

> [In general,] [a]gency . . . involves an important tradeoff. While it allows us to accomplish more things more cheaply, it carries its own costs and dangers, particularly the risk that our agents will shirk and work against our interests in pursuing their own. Our goal, then, should be to maximize the benefits of agency while minimizing its costs.

Issacharoff & Ortiz, *supra*, at 1638–39.

corporate assets may be realized in many stages of the innovation process from problem definition efforts, through invention discovery steps, to product introduction and popularization stages.

In identifying and understanding problems with existing products or services, groups of persons working for companies may use their collective expertise, experience, or information sources to identify consumer needs, marketing opportunities, and technical capabilities that suggest invention potential. By effectively combining their talents, knowledge, and command over resources, groups of employees within corporations can identify opportunities for innovation in existing consumer products or settings over a broader range of circumstances than individuals could identify.

Once research is under way, corporations can sometimes use resource planning and large-scale capital funding to apply physical resources and research staffs on scales that make possible types of scientific and engineering research that would be simply impossible for an individual to fund or carry out.

Similarly, once a new technology has been discovered, groups of developers and marketers within corporations may be able to bring together information about customers' activities and desires in specifying particular product and service features based on the new technology. Somewhat differently composed groups of corporate employees will also have the types of collective information needed to effectively and efficiently design and implement the initial manufacturing and marketing programs for newly designed products.

In each of these settings, the strengths of group information collection, analysis, and effort can be brought to bear to produce better evaluations and actions than would be possible through the capabilities of one individual. While these sorts of group efforts certainly require coordination to be effective and will involve some special costs in this regard, the net benefits of group action in these areas can be considerable. When group action can draw upon the accumulated experience of multiple corporate employees with past products and product-related corporate systems, such efforts can produce new product designs that avoid past product errors, that build on corporate production and marketing strengths, and that utilize the collective knowledge of corporate personnel about their industry and customer preferences to the public's benefit.

3. Potential Weaknesses of Group Action for Technological Innovation

Unfortunately, group efforts may also introduce errors or inefficiencies into innovative processes. These problems can stem from difficulties in motivation, coordination, and information handling arising in group processes.

In order to be motivated to diligently pursue corporate interests in carrying out innovative efforts, persons working in groups of corporate employees must have some personal reason or motivation to seek innovations that will serve corporate interests. In some instances, this type of motivational alignment—in which the interests of individuals are aligned with their corporate employer's interests in innovation—can be achieved through promises of salary increases or promotional opportunities that are tied to success in innovation. Under these arrangements, successes in corporate innovation produce increased individual salaries or promotions, thereby tying individual researchers' interests and motivations to corporate interests.

The patents arising out of corporate employees' discoveries are typically required by employment contracts to be assigned to the inventors' corporate employers. Hence, there is typically little or no incremental compensation for producing patentable inventions and transferring related patents per se. However, individual employees must still be given incentives to seek patentable inventions for the benefit of their employers even though the employees will not own the patents themselves and may gain no direct benefit from the enforcement of those patents. To encourage efforts to discover patentable inventions and to seek related patents, companies frequently promise bonuses for the completion of patent applications or payments to individual inventors of percentages of later licensing royalties derived from patents stemming from the employees' discoveries.[83]

83. Bonuses are a common means to encourage employees to disclose inventions to their employers or to complete the paper work necessary to obtain a patent:

> Typically, bonus awards are given to inventors to encourage disclosures. These may be progressive in size, depending on the disposition of the idea. For example, a $100 bonus may be given upon submission of the disclosure statement, $500 to $1,000 upon approval of filing a patent application based on the idea, and $1,000 to $2,000 upon actual filing. In the event a patent of significant value issues, an additional substantial bonus may be granted at the patent committee's discretion. The CEO should announce this bonus award policy and personally deliver the message that the quality and quantity of the ideas submitted will be taken into consideration during each employee's evaluation.

Leo R. Reynolds, *Intellectual Property Assets*, *in* STARTING UP AND ADVISING AN

While these motivational measures are helpful, they may still not adequately align corporate employees' efforts regarding patentable inventions to the interests of their corporate employers. Corporate employees may undertake significantly weaker efforts to make patentable discoveries than would be the case if they would own the resulting patents because their corporate employer, and not they, will reap most of the benefits from the patents. In these circumstances, where employees may be satisfied with their guaranteed salaries and not greatly concerned about incremental bonuses or highly contingent payments of future royalty percentages for making patentable inventions, the motivations of individual employees will not conform to those of their corporations and corporate interests in patentable inventions will not be fully served.

Alternatively, corporate incentive systems concerning patentable inventions may over-encourage the pursuit of such inventions. When the seeking and obtaining of a patent becomes an end in itself, corporate employees may pursue any sort of patentable discovery even when the invention being sought does not have significant economic potential as the basis for commercial products or services. In such circumstances, incentives to create patentable inventions, such as salary bonuses for such inventions or related patent applications, may encourage inefficient efforts to pursue patents, leading to discoveries when there is either no net benefit to the corporation involved or even if there is some net benefit, the benefit is less than the corporate gains that might have been realized had the same resources been devoted to other profit-making activities.

Coordination problems may also plague efforts to produce corporate innovations through group efforts. In innovative efforts, as with other group activities in corporate enterprises, multiple employees require coordination in order to work effectively towards a common goal. This type of coordination becomes a significant burden as groups become large. When this sort of coordination is done poorly, it may also be a source of great inefficiency and waste in corporate innovation programs.

Even when efforts of multiple parties are properly coordinated to pursue innovative goals, gaps in the communication of critical information among multiple innovators may cripple the effectiveness of their efforts. Particularly when the successful completion of tasks by one group member depends on prior steps being performed by another member, accurate and complete communication between such parties is

EMERGING MASSACHUSETTS BUSINESS 4-1, 4-14 (Lawrence H. Gennari ed., 2001).

often essential for effective group action.

C. Extensive Resources

Corporate efforts to discover and to perfect useful inventions sometimes also differ from individual efforts in the size and nature of the resources that corporations can apply to innovative tasks. Corporations can apply extensive resources to innovative programs, in part, because investor backing gives the corporations the funding to acquire these resources. Also, if a company is pursuing multiple research projects in a given technological domain, the costs of particular equipment or personnel can be spread across the multiple projects in a way that no individual innovator would be capable of doing. In short, corporations frequently have access to more resources supporting innovation and, through careful planning, can make better use of the resources they have.

Corporations with expensive equipment or other types of costly research infrastructures may have sole access to certain research domains. In many fields in which the study of new technologies requires the application and coordination of extensive, complex resources and the actions of numerous personnel, corporate innovation is the only innovation. It is unlikely, for example, that an individual inventor could marshal the resources and supporting personnel needed to make substantial advances in integrated circuit designs. In short, corporate efforts to advance technology through group efforts and the extensive application of capital gained from multiple investors is the only viable path of technological advance in these sorts of complex, resource intensive domains. In such settings, the impact of patent and corporate law standards on corporate incentives and affairs are particularly important: if these standards are not successful in encouraging advances or impede the discovery or popularization of advances in some way, there are no alternative channels of individual innovation that patents can encourage as a means of achieving equivalent public gains from the technology involved.

In some industries and innovative settings, the resources required for innovation and the group actions needed to complete it are so substantial that only large corporations are sufficient to initiate and to conduct effective innovation. For example, in the pharmaceutical industry, the equipment and testing procedures needed to develop new drugs are enormous; thus, only innovative effort conducted on a large corporate scale is likely to be effective in producing new product designs. In these contexts, innovation is, by virtue of the nature of the

innovative processes and resources needed, concentrated in the operations of a few giant corporations.

D. Capital Needs

The need to obtain capital in order to facilitate large-scale innovation efforts and to keep the support of existing investors over the course of innovation programs is a source of ongoing pressure on corporate innovators. This pressure stems from requirements—privately imposed by individual investors in small companies and statutorily imposed in large companies that are publicly traded—of disclosures and reports to potential and existing investors about the nature and expected business value of various innovative programs and technological discoveries. The need for capital may also encourage inefficient efforts to hurry innovative products into production in order to realize profits at the earliest possible time and thereby generate more capital or placate existing investors.

The need for capital in conducting research programs and developing products from the resulting discoveries is not peculiar to patented inventions, but will apply when any type of product or process innovation is pursued through corporate enterprises. However, the association of patent interests with promising technologies allows a relatively concrete value to be attached to those technologies at an early stage in the development of related products and marketing programs. By giving corporate managers a set of patent assets and exclusive marketing opportunities to point to in fundraising activities, patents on key technologies can entice investor interest in the funding of further rounds of activities that are needed to transform an unproven new technology into specific product designs, to establish manufacturing programs for the resulting products, and to undertake the initial marketing efforts needed to popularize those products.

Corporate ownership of patents permits the ownership interests of persons providing financing of product, manufacturing, and marketing development efforts to be combined in convenient ways with prior corporate ownership interests given to technology discoverers in exchange for an assignment of their patents and to an initial corporate management team. Investors bringing critical new money into a company that is developing a new technology can simply be given stock in a sufficient ownership percentage to reflect the degree of risk being taken by the new investors. This percentage will typically reflect the scope of interest that the venture capitalists or other investors involved feel is necessary to ensure that, when the company is successful and sold

at a later point, the investors' likely share of the resulting proceeds will represent a return on their initial investment at a rate that justifies the risks that they are taking in investing in an untried technology, and typically, an untried company.[84]

E. Governance Influences

In carrying out innovative efforts with funding provided by multiple investors, corporations sacrifice some of the control that they would otherwise have over the course of innovative efforts.[85] Corporate laws do not generally allow shareholders to take over the day-to-day management of the companies that they own, reserving the final say on day-to-day corporate matters to the boards of directors and senior executives of each company.[86] However, corporate laws regarding the internal control or "governance" of corporations specify several features of corporate operations that limit the freedom of choice of senior executives and that help shareholders to hold these executives accountable for their management decisions.[87] In extreme cases,

84. *See* Tom Smith, *A Venture Capital Analysis*, http://www.morebusiness.com/running_your_business/financing/vent-cap.brc#value (last visited Oct. 8, 2005). Typically, venture capitalists "seek to earn between 5 and 10 times their initial investment within a 5–8 year [period of expected investment]." *Id.*

85. Corporate and securities laws require companies to adopt governance processes under which shareholders possess powers to select or change the members of a company's board of directors. Company managers are, at least formally, accountable to the board members whom the shareholders select. Not only do corporate and securities laws impose substantive checks on management action through these governance mechanisms but also generally require that corporate managers disclose accurate information to shareholders about the status of corporate affairs. These accountability and information disclosure obligations limit the absolute control of managers over corporate affairs in ways that are designed to reassure shareholders and to limit the risks shareholders face in entrusting investments to companies.

86. *See, e.g.*, 18B AM. JUR. 2d *Corporations* § 1290 (2004) ("The directors of a corporation are its executive representatives charged with the administration of its internal affairs and the management and use of its assets.").

87. Corporate governance mechanisms place a number of structural limitations on important activities undertaken by corporate managers, such as efforts to obtain and to enforce patents. The primary process for accomplishing this is a hierarchy of accountability of corporate managers to superiors and of senior executives to corporate board members. In addition, corporate governance processes typically produce ongoing disclosures to shareholders about performance by top managers in material areas, such as patent management and enforcement, thereby aiding shareholders in taking that performance into account in shareholder voting. Corporate boards serve what Ira Millstein has described as a "certifying" function in evaluating the performance of senior managers and reporting on or "certifying" the quality of that performance in disclosures to shareholders. Ira M. Millstein, *The Evolution of the Certifying Board*, 48 BUS. LAW. 1485, 1493–94 (1993). He concludes that this certifying process has positive impacts in both limiting management conduct and

corporate governance processes can force changes in corporate management or shifts in corporate ownership to new parties who demand changes in management and business directions.[88]

The need for periodic information reporting to shareholders and the need to adhere to shareholder decision processes that hold senior managers accountable for corporate performance sometimes constitute indirect limitations on the course of corporate innovation efforts and distinguish those efforts from individual endeavors to pursue and popularize inventions. Shared control held by corporate shareholders and managers can lead to background struggles that hinder the course of innovative efforts or, at least, make innovation efforts inefficient and unnecessarily costly. However, the threat of being held accountable and potentially removed by shareholders looms over senior executives and creates incentives for attention to corporate and shareholder interests that may encourage careful attention to the development and popularization of patented technologies and related products. Hence, while the present system of partial shareholder control over corporate activities and innovative efforts may sometimes detract from the singular vision and focused pursuit of innovative programs in corporate settings, no generally effective substitute for aligning the interests of

communicating positive management performance features to shareholders:

> The process of corporate governance will never become, nor should it be, free of tension. There should be constructive tension between shareholders and boards, and between boards and managers. This does not mean bullhorns, coercion, threats, and hostility. Such means are out of place absent a total unwillingness by boards and managers to respond. But it does mean accountability. Neither boards nor shareholders should ever cease to be vigilant over their respective charges.
>
> A "certifying board" provides that accountability mechanism—accountability of the board to the shareholders, and of managers to the board. And it is a good prescription for all, including the managers. An independent credible board is not just good for the corporation and its shareholders; a credible board can be management's greatest ally. It can certify to shareholders in times of trouble that management is pursuing the appropriate course.

Id.

88. Persons willing to acquire a substantial percentage of the stock of a company can sometimes mount a corporate takeover and force a change in corporate managers. Indeed, the threat of such a change can cause corporate managers to be highly attentive to keeping corporate performance levels and stock prices high in order to curb shareholder enthusiasm for sales of stock to persons potentially mounting a takeover attempt. In this respect, the threat of a takeover can substitute for direct shareholder monitoring in encouraging corporate managers to pursue profitable corporate performance. With respect to patent interests, this suggests that corporate managers will have ongoing reasons to maximize patent value even in the absence of detailed scrutiny or pressure from current shareholders. *See* John Pound, *The Rise of the Political Model of Corporate Governance and Corporate Control*, 68 N.Y.U. L. REV. 1003, 1016–20 (1993).

senior managers and shareholders has as yet been found. Consequently, corporate governance limitations continue to bear on the nature of innovation in corporate settings and the ways that such innovation is influenced by corporate shareholders.

As part of the governance processes providing shareholders with opportunities to hold corporate managers accountable for their direction of corporate innovation programs, corporate managers may be obligated to provide special disclosures to shareholders of material information about innovation programs and related patent interests. Senior managers will have obligations under securities laws and fraud standards to be complete and accurate in information provided to shareholders about innovation programs and patent interests. Any disclosures by senior managers about patent values or enforcement risks that are so restricted or one-sided as to be materially misleading will undercut the ability of shareholders to review the performance of corporate managers with respect to key patents and will create a basis for personal liability to the shareholders of the parties making the incomplete or inaccurate statements.[89] These requirements of accurate and complete disclosures are direct reflections of the economic interest of shareholders in the value of corporate patents and the need for accurate information if shareholders are to review and to evaluate how their company's patent interests are being protected and commercialized by corporate managers.

Corporate officers may also have duties to their corporations under state corporation laws concerning the ways that the officers monitor patent enforcement risks and respond to patent enforcement problems. Because they are, in effect, stewards of the shareholders' interests, senior corporate managers have duties under state corporation laws to monitor risks to corporate patent enforcement and to resolve problems with such patents as they arise.[90] When they fail to address known or

89. Materially misleading statements about patent interests or other key corporate assets can form the basis for corporate and personal liability under federal securities laws. *See* Pommer v. Medtest Corp., 961 F.2d 620 (7th Cir. 1992); Robert A. Prentice & John H. Langmore, *Beware of Vaporware: Product Hype and the Securities Fraud Liability of High-Tech Companies*, 8 HARV. J.L. & TECH. 1 (1994).

90. Delaware law governs the duties of corporate officers and directors in most large corporations because they are incorporated in that state.

> [T]he question of whether a corporate director has become liable for losses to the corporation through neglect of duty is determined by the circumstances. If he has recklessly reposed confidence in an obviously untrustworthy employee, has refused or neglected cavalierly to perform his duty as a director, or has ignored either willfully or through inattention obvious danger signs of employee wrongdoing, the

reasonably discoverable risks regarding corporate patent ownership or enforcement and their corporation suffers identifiable harm as a result, corporate officers may be found to have breached their duties to their corporation and be held personally liable for the corporation's losses.[91] Similarly, if corporate managers take actions concerning the ownership or enforcement of corporate patents that favor the managers at the expense of their corporation, the managers may be seen as having breached their fiduciary duties to their corporation and be held liable for the damage that their corporation has suffered.[92] These sorts of

law will cast the burden of liability upon him.

Graham v. Allis-Chalmers Mfg. Co., 188 A.2d 125, 130 (Del. 1963).

91. *See* American Bar Association, *Corporate Director's Guidebook*, 59 BUS. LAW. 1057, 1069–70 (2004).

> A director should inquire into potential problems or issues when alerted by circumstances or events suggesting that board attention is appropriate; for example, inquiry is warranted when information provided on an important matter appears materially inaccurate or inadequate or there is reason to question the veracity of management. When directors uncover or receive from others information indicating that the corporation is or may be experiencing significant problems in a particular area of business, or may be engaging in unlawful conduct, they should make further inquiry and follow up until they are reasonably satisfied that management is dealing with the situation appropriately. Even when there are no such "red flags," directors should periodically satisfy themselves that the corporation maintains programs that are appropriately designed to identify and manage business risks and reasonably effective to maintain compliance with laws and corporate policies and procedures.

Id.

Corporate directors or officers may be personally liable based on inattention to the mismanagement of key corporate assets like corporate patents when the directors or officers were aware of flaws in patents or enforcement efforts, but failed to take actions to correct the situation or to curb related corporate losses. *Cf. In re* Abbott Labs. Derivative S'holders Litig., 325 F.3d 795, 809 (7th Cir. 2003) (recognizing that, when there were repeated indications to corporate directors that key production activities were being undertaken illegally, "the directors' decision to not act was not made in good faith and was contrary to the best interests of the company" and, if proven, was a breach of duty supporting personal liability of the directors for resulting corporate losses); McCall v. Scott, 239 F.3d 808, 814, 819 (6th Cir. 2001), *amended on denial of reh'g by* 250 F.3d 997 (6th Cir. 2001) (holding that the directors' sustained failure to act against a corporation's systematic health care fraud occurring from at least 1994 to 1996 alleged sufficient facts "to present a substantial likelihood of liability").

92. A corporate officer or director will breach his duty of loyalty when he promotes his personal interests at the expense of his corporation's interests:

> The duty of loyalty requires a director's conduct to be in good faith and in the best interests of the corporation—and not in the director's own interest or in the interest of another person (such as a family member) or an organization with which the director is associated. Simply put, a director should not use the director's corporate position for personal profit or gain or for other personal or noncorporate advantage.

American Bar Association, *supra* note 91, at 1070.

limitations on the potential actions of corporate managers in securing and enforcing patents are direct consequences of the shared ownership of corporations and the corresponding duties of corporate managers to seek and administer the ownership of patents as representatives of the interests of their corporations and, ultimately, of its shareholders.

III. THE CORPORATE IMPACT OF PATENT REWARDS: RECONSIDERING PATENT INCENTIVES IN CORPORATE SETTINGS

Patent rights are frequently justified based on their influence in promoting innovative efforts.[93] Starting from this premise, analysts have specified several ways that patent rights might beneficially influence the development of new inventions or encourage related processes used to bring products and services based on new inventions to the public. This section examines these justifications for patent rights and critiques their implications in light of the probable influence of patent rights on corporate innovation rather than individual innovation.

A. Reward Theory

Reward theory justifies patent rights on the ground that the recognition of such rights rewards an innovator for the risk and expense involved in producing a useful invention.[94] Through the recognition of patent rights, an inventor obtains a temporary monopoly over the making, using, and selling of the patented invention. The value of the temporary control over the invention depends, at least roughly, on the degree of increased utility provided to users by the patented invention and, therefore, the amount that users will pay for access to the invention

93. *See* Kenneth W. Dam, *The Economic Underpinnings of Patent Law*, 23 J. LEGAL STUD. 247, 247 (1994).

> [In understanding the impact of patent laws,] it is important to recognize the primary problem that the patent system solves. This problem—often called the "appropriability problem"—is that, if a firm could not recover the costs of invention because the resulting information were available to all, then we could expect a much lower and indeed suboptimal level of innovation. In short, the patent system prevents others from reaping where they have not sown and thereby promotes research and development (R & D) investment in innovation.

Id.

94. *See*, *e.g.*, Jeremy Bentham, *Manual of Political Economy*, *in* 3 THE WORKS OF JEREMY BENTHAM 31, 71 (John Bowring ed., 1962) (noting that allowing an inventor an "exclusive privilege" to commercialize a patented invention is "the best proportioned, the most natural, and the least burthensome" means to encourage technological innovation, producing an infinite effect, yet costing nothing).

over the cost of non-patented substitutes.[95]

Reward theory has developed into two variants—one weak and one strong.[96] The weak version simply posits that patents are designed to reward and encourage increased efforts to produce innovations.[97] However, the mechanism by which patents further this end is not explained. The analyses in this Article describing how patents facilitate the functions and success of corporate innovators provide several possible explanations of the mechanisms whereby patent rewards encourage socially valuable innovation and fulfill the broad purposes of the patent system.

A second, strong version of reward theory suggests that patent rights should only be recognized when the lure of potential patent rights has actually influenced individual innovators.[98] Such a view would limit patent rights to cases in which they have had a measurable impact on innovative conduct. However, this approach is probably too narrow because it is based on too restrictive a notion of how patents may increase the public's access to useful inventions. It fails to recognize that, as argued in this Article, existing and potential patents can have beneficial impacts on the operation of innovative corporations at the organizational level that extend beyond the immediate development of new inventions. These further impacts—such as the patent-influenced generation of funding for post-invention product design and perfection activities based on a new invention or the development and implementation of manufacturing and marketing programs for introducing products incorporating a new invention—are also valuable to society because they expand the range of publicly available innovations.

Patents create important corporate rewards in several ways that encourage corporations to develop innovative products and to bring those products to the public. Potential impacts of patents on innovation

95. *See* 2 JOHN STEWART MILL, PRINCIPLES OF POLITICAL ECONOMY 548–49 (5th ed., D. Appleton & Co. 1909) (explaining that patent rewards for useful innovations are preferable to a government-administered bonus system rewarding innovations because patents avoid discretion on the part of government officials and secure rewards to inventors that are proportional to the usefulness of the inventions, with the rewards being paid by the consumers who benefit from the inventions).

96. *See* Grady & Alexander, *supra* note 12, at 312–13.

97. *See*, *e.g.*, WARD S. BOWMAN, JR., PATENT AND ANTITRUST LAW: A LEGAL AND ECONOMIC APPRAISAL 33–52 (1973).

98. *See*, *e.g.*, FREDERIC M. SCHERER, INDUSTRIAL MARKET STRUCTURE AND ECONOMIC PERFORMANCE 443–44 (2d ed. 1980); A. Samuel Oddi, *Beyond Obviousness: Invention Protection in the Twenty-First Century*, 38 AM. U. L. REV. 1097, 1101 (1989).

in corporate environments including the following:

(1) Patents can serve as the basis for corporate financing efforts that focus on and separately value innovation efforts, thereby bringing investor backing to innovators who would otherwise lack the financial backing and resources needed to commercialize innovative discoveries;[99]

(2) Patents and the scope of returns they promise provide a basis for identifying cost-justified innovation efforts and for securing investor funding of innovation at levels that correspond at least roughly to the expected public value of the inventions being sought;[100]

(3) Patents and businesses aimed at producing new, patentable innovations form attractive targets for risk-preferring investors, thereby encouraging the efficient support for innovation by giving this subclass of investors a relatively direct means to support high risk innovation efforts;[101]

(4) Patents can strengthen innovative companies by differentially favoring innovative companies over other companies that fail to innovate, thereby increasing the chances that innovators will survive and serve as "repeat players" that continue to produce useful advances as they engage in ongoing competition with less innovative companies;[102]

(5) Patents create some rewards that are peculiar to corporations by expanding the value of existing corporate marketing and manufacturing efforts;[103] and

(6) In some settings, where uses of enormous or complex resources are the only ways to achieve innovation results, corporate backing opens the door to new ranges of effective innovation and potential public gains.[104]

Each of these possible impacts of patent rewards in promoting corporate innovation is assessed in this subsection.

1. Separating Innovation Incentives and Rewards from Manufacturing and Marketing Capabilities

In influencing corporate behavior, patents bring technological innovations a transferable value that is independent of particular manufacturing and marketing efforts, thereby making such innovations

99. *See infra* Part III.A.1.
100. *See infra* Part III.A.2.
101. *See infra* Part III.A.3.
102. *See infra* Part III.A.4.
103. *See infra* Part III.A.5.
104. *See infra* Part III.A.6.

more attractive targets of corporate business activities and associated corporate enterprises. By allowing innovations to be valued and transferred, patents facilitate the separation of innovation from product production, marketing, and delivery. While some companies may engage in both innovation and the later stages of product delivery to the public, this integration is not necessary. Companies can form around an innovation opportunity, seeking corporate funding and organizing corporate activities around the most efficient and effective means to discover a new technology and reduce it to practice. The technology can then be patented and transferred to another corporation with greater resources via either an assignment of the resulting patents or a merger of the innovating corporation into the larger corporation.

This process makes innovation its own separate business realm, separating the risks and opportunities of this field from the areas of manufacturing and marketing. Given that the latter may require enormous resources and rely on accumulated expertise in long-standing companies, the ability of innovators to separate out innovation efforts and to pursue them through financing that is sufficient to support innovation, but not later commercialization efforts, establishes a valuable business option that expands opportunities for innovation. The availability of this separate channel or means of innovation expands the number and diversity of viable innovators beyond those relatively few companies that would be able to both engage in effective innovation and commercialize the resulting technological advances.

2. Scaling the Scope of Innovation Efforts and Achieving Efficient Funding

By attaching a value to an invention that roughly reflects the value of the invention in its full range of uses rather than just the use that a particular company or set of consumers might make of the invention, a patent can encourage the funding of efforts to pursue the invention up to the full value of the invention to the public. Innovation expenses up to this level will be cost-justified because the value of resulting patent rights promises a payback corresponding to the increased utility of the invention to the public, at least during the term of the patent. The promise of this payback can, in turn, be the basis for efforts to raise financial backing for innovation efforts from potential corporate shareholders. The rough equation of patent value with consumer value of the related invention will encourage associated corporate efforts that are funded and tailored in their scope to match the probable public value of the resulting innovations. In short, patents form a bridge

linking the estimation of cost-justified corporate funding and organizational effort to the public value of corporate innovations.

3. Providing Investment Opportunities for Risk-Preferring Investors

Businesses aimed at producing new, patentable innovations form attractive targets for investors seeking high-risk investments with the potential for a large return. By ensuring that the initial commercial returns related to a particular innovation will come primarily to the company completing the innovation and its investors, a corporate patent can provide the reassurance to investors that their high-stakes "bet" made by investing in a high-tech start-up company will be matched by a return that reflects the full value of the patentable technologies that result. Absent such a guarantee, investors would be worried about free riders appropriating the value of any technology that was developed with their investment dollars and would discount the potential value of an innovative company's efforts accordingly.

Indeed, because the circumstances potentially leading to appropriation would not be within their knowledge or control, investors might tend to overestimate the likelihood of appropriation of a new innovation by companies that paid nothing to the original innovator, thereby making backing of such an innovator seem even more risky than would be suggested by the inherent risks of failure raised by technology research and the high likelihood of losses stemming from many innovation efforts. This combination of free rider risks layered on top of innovation failure risks would be likely to deter many parties and to significantly reduce investor interest in high-tech development efforts. Patents counteract some sources of doubt about investment in technology innovators by giving innovators the ability to reserve the sole rights to commercialize a new technology to a single company, thereby creating a legally-backed source of predictable returns for investors in the company.

4. Strengthening Innovators over Technologically Stagnant Companies

Patents can also increase technological innovation by backing the efforts of companies that are "repeat players" in innovative efforts. Once a company assembles expertise and resources needed to innovate in a given field and gains experience with advanced technologies in that field, the company is a likely source of further advances. Value returned in connection with an initial patented advance can help to fund further innovative efforts and strengthen the company involved in marketing efforts when it competes with other companies that have not

discovered functionally important and commercially popular technologies. By establishing a source of value and economic return that distinguishes them from a less innovative companies, innovative companies can survive in periods of competition and go on to further rounds of innovative efforts. To the extent that these companies possess personnel, expertise, or values that make them particularly adept at multiple rounds of innovation, the success of an initial round, as backed by patent rewards, can provide the basis for subsequent rounds, with corresponding public benefits from any positive results in the subsequent rounds.

A similar argument based on maintaining active markets for the transfer of innovations can be made for companies that acquire a technology valued by the public and thereby achieve a source of income that allows them to survive over less innovative or less astute technology acquirers. By strengthening the technologically astute companies that place their acquisition funds behind innovative efforts rather than strengthening less innovation-focused companies that might put their resources behind increased marketing of old products or non-innovative product differentiation efforts with little increase in consumer utility, patent rights create important opportunities for transfers of rights to innovations and associated means for companies using those innovations successfully to produce related profits, engage in further technology acquisitions and, ultimately, to bring more innovations to public attention and availability.

5. Increasing Corporate Rewards by Complementing Existing Marketing Efforts

Another reason why patents may have a distinct lure for corporate innovators and, hence, create unusually strong rewards and incentives for the pursuit of useful inventions in corporate settings is that patented improvements in existing products or completely new inventions in the same product field as a company's previous endeavors can provide the means for a company to extend and improve existing marketing efforts. Patented improvements may allow a company to keep marketing its products as the best in the field, either because the products have greater actual utility or because they have certain distinctive and patented features that appeal to consumer tastes and are unavailable in competitors' products.

In these circumstances, patents correlate with marketing potential and value, a potential value that may be particularly large for corporations with preexisting stakes in a given marketing domain. A

new patented innovation may be seen as having value equal to the perceived marketing benefits that the resulting patent rights and control will gain the company involved rather than value equal to the increased utility the invention will provide to the public. Hence, the real rewards driving patent-related innovation may not be the objective value of the patent rights themselves, but rather the perceived marketing value of the rights in combination with preexisting products, marketing programs, and consumer perceptions of the corporation involved. In short, marketing context and potential may drive innovation efforts and directions in some settings more than an objective assessment of the full scope of technology value and related patent rewards.

These types of market-driven values associated with corporate patents may enhance innovation incentives in ways that benefit the public. A corporation with established marketing programs may be well-informed about the product needs of its customers and perceive the value to customers of particular innovations. Based on this information about consumer preferences, the corporation's managers may place a much higher value on certain innovations and related patents than would an innovator acting in relative isolation from the relevant consumer and marketing information. As more efficient and complete gatherers of consumer preference information than individual innovators, corporations initiating innovation or technology acquisition efforts may be particularly effective in targeting the direction and scope of those efforts so as to meet consumer needs. The promise of patent rewards in this context becomes a means whereby corporations can translate existing marketing and consumer information into product innovation programs that match consumer needs far better than comparable efforts by less well-informed innovators acting outside of corporate organizations.

On the other hand, market-driven rewards for patented innovations may direct some innovative programs away from their proper focus on product utility and public benefit towards a different emphasis on strategic corporate marketing strength and products that cater to non-functional consumer preferences. To the extent that the marketing potential of patented innovations is the driving force behind innovation programs in certain corporations and that marketing potential deviates in some way from increased utility to consumers, companies may fall into a pattern of innovating for product differentiation's sake rather than seeking innovations with true improvements in product functionality or efficiency. Whether this type of innovation is contrary to the public interest depends on how closely the marketing success of

the corporations involved correlates with improved product functionality provided to customers. To the extent that product markets value appealing product features over functional ones, product development resources may be inefficiently diverted to focusing on producing new appealing features rather than increasingly useful ones. In this respect, the patent system may actually divert innovation efforts away from products with substantial utility and towards products with the modicum of utility needed to satisfy patent law standards and gain patents, but with a perceived value that relates mostly to the vanity or nonfunctional tastes of consumers.

6. Assembling Group Action or Extensive Resources Needed for Innovation

In some highly complex or resource intensive fields like pharmaceutical drug development or biotechnology engineering, the range of group actions and extensive resources needed to advance technological understanding effectively precludes individuals acting in isolation from supporting organizations from being effective innovators. Innovation in these settings is purely corporate because only through the backing and group funding of multiple investors can the types of resources and group actions needed to produce new innovations be undertaken. There may be gradations in the size of the corporate entities involved. For example, the pharmaceutical field includes a number of small drug companies and several "big pharm" giants, which are innovators in different drug areas.[105] However, all of these companies, at their various size levels, conduct research and product development efforts that are far beyond the capabilities and resources of individual inventors.

The need for corporate backing of research programs to accomplish certain types of innovation—and the enhancement of innovation capabilities provided by such backing even in areas in which individual innovation is possible—makes the processes for funding and administering corporate backing of research efforts critical considerations in the attainment of patent law goals. Ideally, patents will encourage research efforts that entail the least development cost possible for a given invention, thereby maximizing the net societal gain

105. *See* Dror Ben-Asher, *In Need of Treatment? Merger Control, Pharmaceutical Innovation, and Consumer Welfare*, 21 J. LEGAL MED. 271, 300–01 (2000) (describing the respective advantages of relatively small and large innovators in the pharmaceutical field).

from that invention.[106] The public's net benefit from the emergence and popular adoption of a new, patented invention is the net increase in total societal utility, taking into account the total increase in utility experienced by users of the invention, but lessened by the costs of developing the invention. An invention that is developed through inefficient means, involving unnecessary expense in either the engineering studies leading to the invention or in the financing or corporate management steps underlying those studies, is less valuable to society than the same invention developed through more efficient means because the net gain to society from the efficiently produced innovation is greater.

To the extent that the backing for a line of innovation is developed through inefficient or ineffective means, costs are injected into technology innovation programs that could be avoided and society loses portions of the net value of resulting innovations. Hence, the effectiveness of corporate formation and investment generation processes for backing innovation programs are of critical importance to the fulfillment of patent law policies and overall social goals regarding technological development. If these supporting corporate processes are conducted with unnecessary costs or with less than complete backing for available, cost-effective programs of technological development, the types and net value of innovations that will stem from the resulting corporate innovation efforts will not be optimal responses to public demands for new technologies.

On the other hand, if corporate processes work effectively, they can be a highly valuable means to match the scope of funding and available engineering resources to the pursuit of various types of publicly valuable innovations. By making opportunities for innovation available to small corporation-backed innovators that work outside of large companies, corporate funding through start-up companies allows innovation to stem from many more sources than would be the case if only large, long-standing corporations could undertake complex, resource-intensive innovation programs. Corporate funding at the start-up level takes the

106. Patents allow inventors to collect a "monopoly rent" from users that is equal to the increased utility of a patented invention over non-patented substitutes. This monopoly rent is effectively equal to the net societal gain from a patented invention as reflected in the incremental amount that consumers will pay for access to the invention. When duplicate or otherwise wasteful invention development efforts are undertaken in the course of producing a patented invention, economists speak of the undesirable results as a diminishment of the monopoly rent from the patent or "rent dissipation." Ideally, the patent system and related legal standards, such as corporate law provisions related to the generation of funding for innovative programs, should be administered to minimize monopoly rent dissipation.

blinders of large corporate thinking off of innovation decisions and adds a wide array of independent corporate innovators led by individuals with new innovation insights to the mix of potentially effective innovators.

At the same time, competition for innovation-related sources of funding ensure that there are constant pressures for innovators in start-up and small companies to conduct their innovation programs in a lean, efficiently focused manner. Investment generation forces in the area of high-tech venture funding create a form of market discipline concerning the scope of innovation efforts, producing pressures for effective and efficient action by innovators in start-up companies that should minimize innovation costs. In this respect, investors—primarily venture capitalists in the sphere of small company-backed innovators—serve the interests of the patent system by keeping pressures on innovators to be effective, but efficient, in producing socially valuable (and highly commercializable) new innovations.

B. Prospect Theory

Prospect theory offers an alternative justification for patent rights that focuses on a later stage of innovative processes than reward theory. Prospect theory is concerned with the efficient pursuit of practical implementations of a newly discovered invention. The view that patent rights may play a key role in this type of prospecting for practical applications was first developed by Professor Edmund Kitch.[107] Under this view, the issuance of a patent is likened to the recognition of a prospector's claim under mining law. The holder of patent rights, like the holder of a mining claim, is given an exclusive opportunity to search for something valuable in the protected domain and to bring it to the public. In the context of patented inventions, this involves the transformation of a patented invention from an early stage, often barely workable form, into a more useful and thoroughly understood product ready for manufacturing, distribution, and public adoption.[108]

The prospecting phase may also entail the search for additional application settings in which a patented invention appears to have the potential to be used in a variety of fields. For example, if a patented invention involves a new design for a hinge that is initially used in the automotive field, the patent holder might prospect during the life of his

107. *See* Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & ECON. 265, 272–79 (1977).

108. *See id.*

or her patent for a variety of other application settings, such as the cabinetry field, in which the new hinge arrangement would also have particular value. The patent holder might then seek to license manufacturers to make and to sell in the relevant settings beyond automotive designs to ensure that the patented design was used in those settings, albeit with corresponding license fees paid to the patent holder. This sort of prospecting for new application fields due to the encouragement of patent rights has the potential to bring a patented invention into more hands than would be the case if an innovator had no economic interest in applications beyond the area of the innovator's primary manufacturing and marketing capabilities and main chance to commercialize his or her invention.

Overall, advocates of the prospecting view of patent rights feel that the enforcement of patent rights to ensure that an exclusive opportunity to engage in this type of product and application prospecting achieves many of the same benefits gained by legal recognition of mining claims in mineral prospecting settings. In the patent setting, these benefits include avoiding the duplication of effort in prospecting for workable or improved versions of patented inventions, maintaining substantial incentives for investment in the development of such inventions, reducing the need for devotion of resources to secrecy or physical security measures for protecting the inventions, and aiding the patent holder in maintaining control over the later use of the invention so as to ensure that the patent holder receives rewards for successful prospecting and not other imitators.[109]

As with the initial pursuit of an invention, prospecting for useful implementations of an already discovered invention can often be furthered by group actions undertaken through corporate efforts. Many of the same sorts of advantages of group processes and collective resources already described concerning the discovery of new inventions will generally also aid post-invention steps to produce useful product designs incorporating the innovations and to perfect those designs.

In some contexts, there are clear reasons to expect that established corporate organizations will be more effective and efficient in prospecting for products following the development of a patented innovation or the acquisition of a patent interest than individuals who are primarily experts in the field of an invention. In a corporate setting, particularly in a large corporation with an established product design staff and experience with the consumer needs and interests of a given

109. *Id.* at 276–79.

field, a wealth of product design expertise and experience can be applied to a product prospecting program. A new innovation becomes a new tool or design element that is thrown into an existing design mix, to which product designers add a broad array of design experience. These experienced product designers will tend to have design insights about useful design features and be able to avoid design flaws to a greater, faster extent than less experienced designers. The result should be functionally better, more extensive, and faster product designs than would be possible for an individual innovator either acting alone or with the few additional product design specialists the individual's resources could bring into the process.

Preexisting corporate expertise regarding the manufacturing of similar products may also aid product designers in large companies to take a patented discovery and quickly transform it into products that can be produced effectively and efficiently. Again, the preexisting experience and expertise of persons already in a corporate organization may allow that organization to marshal an effective manufacturing design and implementation program for new products based on a patented design when other parties new to the field would either design unmanufacturable products or take far longer to work out the manufacturing problems with new products based on patented designs.

Corporate ownership may also be an effective vehicle for combining product design and manufacturing expertise and experience held in one corporation with control over a patented design held in another corporation. By establishing a joint venture to design and produce products based on the patented design and then operating this joint venture through a new corporation that is jointly owned by the technology contributor and the source of product design and manufacturing expertise, a newly-formed corporation can bring together access to a patented design and the expertise needed to effectively translate the design into mass-produced products that can be marketed and delivered to the public. The shared ownership of the technology originator and the experts in product design and marketing will ensure that all these relevant parties will be motivated to promote their corporation's interests and work diligently to bring successful products into the market. This type of new corporation achieves the same type of linkage of product design and manufacturing expertise with rights to a new invention that occurs in a large, established corporation when one of its research personnel achieves a new patented invention and the corporation's own design staff and manufacturing specialists determine how to implement the invention in new products and how to

manufacture those products.

C. Disclosure Theory

Another interpretation of patent rights finds the justification for such rights in their potential to encourage the disclosure of otherwise secret or overlooked knowledge about patented inventions. From this perspective, patent rights are given in exchange for disclosures of inventions through published patent applications. Such rights are seen as a means to ensure that discoveries of exceptional product and process designs—that is, designs that are not merely obvious variations of prior designs produced through incremental, everyday engineering processes—are not lost to the public by being ignored or concealed when made, but are brought to public attention.[110] This approach to patent rights does not turn on how various discoveries were made, how much effort was invested in making the discoveries, or on whether patent incentives were needed to encourage the discoveries. Rather, patents have merit under this theory due to the need to encourage parties with valuable and unusual product or process designs to make these available to the public so that the designs can be used through the permission of the patent holders in present activities, used freely when the patents expire, and provide the starting point for additional product and process improvements.[111]

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110. *See* RAYMOND T. NIMMER, 1 THE LAW OF COMPUTER TECHNOLOGY § 2.3 (3d ed. 2005).

> [T]he grant of property rights (and thereby the creation of incentives) is reconditioned on compliance by the patent applicant with statutory requirements that make a public disclosure of the inventions. . . . The public record gives information for others in their own work.
>
> Thus, while patent laws give rights to inventors, it seeks to promote the public disclosure of scientific and technological data. At least in theory, this perpetuates a process of innovation among a community of scholars using shared information.

Id.

111. Assurance provided by patent rights may also encourage disclosures of technological advances through publications outside of patents. For example, the potential impact of software patents on voluntary disclosure practices at the AT&T Corporation was described by one of its attorneys as follows:

> One of the functions served by patents is to disclose [new technological advances] to the public. . . . Patents themselves of course contain disclosures, but also in an organization like mine again, we encourage publication of technical ideas, in fact last year we published some forty-four hundred technical articles. Many of these would not have been published if we could not also have concurrently filed patent applications so that the publication of the technical papers would not compromise the value of our inventions included in the disclosures.

UNITED STATES PATENT & TRADEMARK OFFICE, PUBLIC HEARING ON USE OF THE

Under this type of disclosure theory, patents are aimed at ensuring that, as product and process designs reach new plateaus of knowledge through leaps forward in technical understanding, these plateaus are available to all users and designers through patent-induced design disclosures. By creating incentives for design disclosures—and the ultimate free availability of the disclosed designs after expiration of the applicable patents—patent rights can overcome what might otherwise be a preference for secret commercialization of new designs by innovators. Patent incentives for disclosure also encourage innovators to take a broad view of invention value, giving them reasons to pursue and to disclose inventions outside of the fields in which the innovators possess self-commercialization capabilities.

Disclosure incentives associated with patent rights may be particularly important with respect to innovations made in large corporate organizations. A large corporation that discovered a product or process that was capable of being used in secret might have sufficient resources—or be able to assemble such resources—to maintain the secrecy of the advance and use it to commercial advantage without revealing it to the world. Indeed, absent patent protection, such secrecy would probably be a corporation's optimal course of action because revealing the innovation would make it available to competitors that could use the innovation to their own competitive advantage without bearing any of the costs of developing the innovation. Hence, patent incentives may be particularly important in extracting commercially valuable designs from large corporate organizations that have means of commercially exploiting those designs in secret and that would tend to do so were the incentives and controls of patent rights not available.

Concealment of a new advance may also seem to a company to be its best course in the absence of patent rights when a particular advance is more suitable for effective exploitation by the company's competitors than by the innovating company itself. If the innovator cannot achieve a substantial commercial gain from a new design, but its competitors could, the release of the design to the public would differentially favor the competitor and the innovator would suffer both the costs of development and whatever further costs resulted from the strengthened competition from the second firm. However, with patent rights, a company with an innovation is encouraged to disclose the innovation

PATENT SYSTEM TO PROTECT SOFTWARE-RELATED INVENTIONS 7 (1994) (statement of William Ryan, Intellectual Property Owners, Inc. and AT&T general counsel), *available at* http://www.uspto.gov/web/offices/com/hearings/software/sanjose/sjhrng.pdf.

even if it will aid a competitor because the competitor can be forced to pay royalties for usage of the innovation.

Indeed, the attachment of patent rights to a new innovation can cause a company to re-evaluate or "mine" various types of innovations that it cannot use in its own operations, but would be valuable to other parties. Such innovations would tend to be ignored in companies if no patent rights or other controls over the innovations were available because the disclosure of the innovations would produce no particular advantage to the company that discovered the innovations. However, with patent rights, a company is not only encouraged to disclose innovations that are potentially valuable outside of the company's field but also given incentives to actively publicize and to explain the features and availability of the new technology in ways that will bring it to the attention of potential adopters. Patent holders are encouraged to engage in active disclosures and publicity about patented advances because resulting increases in the adoption of the patented inventions will tend to expand the patent holder's total patent royalties.

D. Rent Dissipation Theory

Rent dissipation theory adopts a somewhat different view of the significance of patents in the period immediately after a patent issues. Instead of being concerned with encouraging product prospecting by a patent holder, rent dissipation theory focuses on avoiding wasteful activities by others, thereby maximizing the incremental value (or "monopoly rent") that use of a patented invention is capable of bringing to society.[112] Rent dissipation occurs when some of this value is wasted or "dissipated." For example, rent dissipation may occur if multiple parties compete in a redundant, wasteful fashion to solve a particular technological problem.[113]

The interpretation of patent rights as a means to avoid rent dissipation holds that patent rights encourage disclosures of successful

112. Two leading proponents of the rent dissipation summarized this theory in regards to patents:

> Rent dissipation theory posits that society profits from innovations, often realizing benefits far in excess of the inventor's development costs. The difference between what society would pay for an innovation and its actual cost of development—the rent—is awarded to the inventor in the form of a monopoly right; otherwise competition by imitators would discourage innovation by making it unprofitable.

Grady & Alexander, *supra* note 12, at 308.

113. *Id.*

inventions that help to avoid some types of post-invention rent dissipation. Patent rights are believed to have two valuable impacts in this regard. First, the lure of patent rights encourages intense competition to develop initial inventions and rapid disclosure of early-stage versions of the inventions, thereby accelerating the point at which duplicative efforts to develop the invention can be identified and will tend to be stopped.[114] Second, patents reduce subsequent rent dissipation by discouraging duplicate efforts to create product implementations of patented inventions.[115]

When one innovator produces a useful design and gains a related patent, the resulting rights give that party exclusive control (during the life of the patent) over the subsequent implementation of products and services based on the patented design. This includes designs that extend the patented design in some way, meaning that the patent holder has effective control over how design improvement steps will proceed in seeking enhancements to the patented invention.

Advocates of the rent dissipation view of patent rights argue that patent holders will administer this product improvement process in an efficient manner over the range of potential improvements signaled by a patented invention. Patent holders will pursue (or encourage others to pursue) reasonable invention improvement efforts of this sort because patent holders stand to gain the most in net licensing revenue from such an efficient course of subsequent product improvement. Their self-interest will cause patent holders to tend to cut off or to avoid inefficient rent dissipation by duplicate innovators seeking improvements in a patented technology. Hence, patent rights are seen as having a valuable impact in the post-patent issuance period by reducing rent dissipation regarding the patented invention, thereby maximizing society's net gain from the invention.[116]

However, when additional lines of improvement are not signaled by a patented invention—that is, they are not obvious to average practitioners in the field given knowledge of the patented invention—patent holders will probably not administer efficient attempts at improvement in these unforeseen additional directions. Hence, these types of improvement efforts should probably not remain under the control of patent holders. To achieve this, patent rights should, according to adherents to the rent dissipation view of patents, be

114. *Id.* at 316–21.

115. *Id.*

116. *Id.* at 318.

interpreted as being inapplicable to such un-signaled and unforeseeable types of modifications to patented designs.[117]

The rent dissipation reduction implications of patent rights and disclosures may be particularly important with respect to the types of innovations that tend to be developed in corporate settings with large amounts of supporting resources. There are several reasons why, absent patent incentives and disclosures, rent dissipation due to parallel development programs may be particularly large in corporate settings.

First, the tendency of various corporations will be to conduct research programs in secret and to maintain their results in secret forms for as long as possible to forestall adoption of the resulting innovations by competitors. The longer this type of secrecy extends, the more likely it is that another company will progress down similar research paths, setting up the type of duplicative research efforts that early disclosures encouraged by patent rights can help to prevent.

Second, enormous resources are committed by corporations to particular research efforts in some high-tech fields. If even a few instances of duplicate expenditures of such large quantities of resources can be prevented by patent rights and disclosures, a significant amount of rent dissipation and waste to society can be avoided.

Third, by clarifying that an effort to improve particular patented products will be under the control of the patent holder, the enforcement of patents may strengthen investor confidence in backing efforts to develop improvements to patented inventions. By lessening the risks that amounts spent in developing improvements may benefit free riders who have not borne the costs of development, patents may facilitate the funding and efficient formation of corporate enterprises to produce those improvements, thereby avoiding rent dissipation through inefficient enterprise formation or under funding.

IV. REFORMING PATENT AND CORPORATE LAWS TO PROMOTE INNOVATION IN CORPORATE ORGANIZATIONS

If the collective impacts of patent and corporate laws are to encourage effective and efficient innovation programs in corporate settings and thereby maximize the number and value of new advances brought to the public, several changes in present patent and corporate laws may be desirable. This section reviews some of these potentially desirable legal changes.

117. *Id.* at 319.

The goal in this section is not to describe all of the changes in patent and corporate law that may improve innovation in corporate settings. The purpose here is rather just to identify a few illustrative reforms and the reasons why they may enhance corporate innovation. Further detailed assessments of these and other like reforms will be needed to determine if they are desirable on balance and, if so, how they should be implemented within existing legal structures. The aim here is to identify a few of the key elements of present patent and corporate law standards that merit rethinking from a corporate perspective in order to ensure that patents and related corporate processes strongly encourage and support innovation by corporate organizations.

A. Patent Law Reforms

1. Changing Who Receives Patents: Recognizing Corporate Inventors and Organizational Patent Applicants

A procedural change that might both streamline the process of obtaining corporate patents and eliminate possible inefficiencies and uncertainties regarding the availability of patent rights for advances developed in corporate environments or with corporate backing would be to allow a corporation to apply directly for a patent[118] related to an

118. Present patent law standards preclude corporate patent applications because a patent application must be "made, or authorized to be made, by the inventor" of the item or process sought to be patented. 35 U.S.C. § 111(a)(1) (2000). However, patent laws allow corporations to act as agents of inventors in pursuing some patent applications that arise in narrow circumstances. The Patent Act allows a person other than an inventor (including a company) to pursue a patent application when the second party (1) establishes a "sufficient proprietary interest" in the patent—perhaps through an assignment agreement covering a transfer of the inventor's interest in the patent to the corporation—and (2) the inventor either cannot be found after a diligent search or refuses to sign the patent application. *Id.* § 118. In these circumstances, a patent application may be pursued by a corporation on behalf of and as an agent for the inventor, provided that the corporation can provide proof of the pertinent facts justifying its application on behalf of the inventor and a showing that such an application is necessary to preserve the rights of the parties. *See id.*

While these provisions allow for corporate-initiated patent applications in limited circumstances, they still retain a degree of uncertainty regarding the ability of a corporation to pursue an application. The nature of a diligent search for an absent inventor will be somewhat unclear in a particular setting, raising questions about the adequacy of a corporate application based on inventor absence. When an inventor is present but hesitates to sign an application, it will be unclear as to what point this hesitation becomes a refusal to sign a corporate application. In addition, a corporation seeking to pursue an application under the above provisions will need to show that its action on behalf of an inventor is needed to preserve the rights of the parties, perhaps due to a likely loss of the opportunity to obtain a patent if there is a further delay in filing an application.

Furthermore, even when a refusal to sign is clearly present, the documentation of that

invention made by corporate employees while working within the scope of their employment or by other agents of a corporation when acting within the scope of their agency relationships.[119] The net effect of this change would be to recognize that the corporation is the primary party in interest in these situations and to grant any resulting patent directly to the corporation.

Typically, employees working in a corporate environment are subject to an ongoing obligation under the contractual terms of their employment to assign any patent rights resulting from their work to their corporations.[120] Given the general enforceability of these contract

refusal may raise other questions about the validity of the patent that would result from a corporate application. When an inventor has refused to sign an application and indicates that he has refused because he thinks that (1) he is not the inventor of the item covered by the application, (2) the application misstates the characteristics of the invention in some material respect, or (3) the corporation involved is not entitled to rights in the patent at issue, these types of documented sources of controversies may be used at a later point by potential infringers to attack the validity of the patent that issues from a corporate application.

119. Such a change in patent laws would implement an equivalent of the "work for hire" doctrine under copyright law. This doctrine specifies that, when a work is created by a corporate employee while working within the scope of his or her assigned duties, the copyright on the work is owned by the corporation involved from the outset. 17 U.S.C. § 201(b) (2000) (providing that an employer, including a corporate employer, is deemed the author and copyright holder of a "work for hire" created by an employee within the scope of his or her employment and in the absence of a written agreement specifying that the employee retains the copyright in his or her work). A corporation will also be deemed the author of a work and entitled to the copyright in that work when the corporation specially orders or commissions the work provided that the parties expressly agree in a signed writing that the work will be considered a work for hire. *Id.* The aim of specifying the work for hire doctrine in federal copyright statutes was, in part, to clarify the initial ownership of the copyright resulting from a work for hire without the need for further copyright ownership transfers from an individual author to an employer or other party commissioning works. *See* Cmty. for Creative Non-Violence v. Reid, 490 U.S. 730, 737 (1989).

120. *See* KINNEY & LANGE, P.A., INTELLECTUAL PROPERTY LAW FOR BUSINESS LAWYERS § 17.4.2 (1996) (describing the importance of such assignment agreements as basic features of an intellectual property management program in a business environment); *see also id.* at app. p, at 639 (containing an example of an agreement assigning all the rights in inventions and works of authorship of an employee to an employer).

A contract providing for the assignment to a corporate employer of a patent not yet issued will be strictly enforced if the patent meets contract law standards for enforceability. *See* United States v. Dubilier Condenser Corp., 289 U.S. 178, 187 (1933), *amended by* 289 U.S. 706 (1933). In the absence of such an agreement, an employee will also be considered to be obligated to assign a patent for an invention to his employer if the employee was "hired to invent," that is, when his assigned duties were to pursue new designs for practical objects or processes. *See id.* However, when an invention happens to occur in the scope of an employee's assigned work activities but those activities do not include the pursuit of inventions, the employee is not, in the absence of an express assignment agreement, under an obligation to assign her employer any patent rights arising from the invention. In these circumstances, the employer whose resources and work time were used to create the

terms, employees assigned to work on innovation projects in corporate settings cannot have legitimate expectations of acquiring patent rights personally under present circumstances. Consequently, the proposed change would not deprive many, if any, employees of patent rights that they would retain under present arrangements.[121] These rights arising out of innovations in corporate workplaces are almost universally assigned to the corporations involved and exploited by the corporations, not their employees. Similar patterns of contract provisions calling for required assignments of patent rights to corporate principals tend to prevail under the terms of agency arrangements outside of employment

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invention may obtain a "shop-right" to use the patented invention without paying the patent holder a royalty. *See id.* at 188–89. Other than this narrow shop-right, the employee will hold all the resulting patent rights and will be able to exclude parties other than the employer from making, using, and selling the patented invention.

The Supreme Court has described the hesitancy of federal courts to find patent assignment obligations on the part of employees as follows:

> The reluctance of courts to imply or infer an agreement by the employee to assign his patent is due to a recognition of the peculiar nature of the act of invention, which consists neither in finding out the laws of nature, nor in fruitful research as to the operation of natural laws, but in discovering how those laws may be utilized or applied for some beneficial purpose, by a process, a device or a machine. It is the result of an inventive act, the birth of an idea and its reduction to practice; the product of original thought; a concept demonstrated to be true by practical application or embodiment in tangible form.
>
> Though the mental concept is embodied or realized in a mechanism or a physical or chemical aggregate, the embodiment is not the invention and is not the subject of a patent. This distinction between the idea and its application in practice is the basis of the rule that employment merely to design or to construct or to devise methods of manufacture is not the same as employment to invent. Recognition of the nature of the act of invention also defines the limits of the so-called shop-right, which shortly stated, is that where a servant, during his hours of employment, working with his master's materials and appliances, conceives and perfects an invention for which he obtains a patent, he must accord his master a non-exclusive right to practice the invention. This is an application of equitable principles. Since the servant uses his master's time, facilities, and materials to attain a concrete result, the latter is in equity entitled to use that which embodies his own property and to duplicate it as often as he may find occasion to employ similar appliances in his business. But the employer in such a case has no equity to demand a conveyance of the invention, which is the original conception of the employee alone, in which the employer had no part.

Id. (citations omitted).

121. However, the proposal would alter the patterns of patent ownership regarding inventions developed by employees working within the scope of their employment, but who are not subject to a patent assignment agreement or who specifically hired to work on developing inventions. Ownership of patents resulting from such inventions are presently held by the employees. *Id.* The proposal would place the ownership of such patents for inventions created in the course of employment in the hands of the corporate employer of the inventor.

settings, making the immediate impact of the proposal on patent ownership by non-employee agents modest as well.

The proposed change to allow a corporate application for a patent covering an invention made in a corporate environment has several advantages over the presently prevailing two-step process of an individual-initiated patent application followed by a patent ownership assignment executed by the patent applicant in favor of his or her corporation. By allowing a corporation to apply directly, the inattention or resistance of an individual inventor in completing a patent application and then a related assignment agreement will not impede or create uncertainty about corporate ownership of a patent arising out of an innovation program that a company has funded and supported. By reducing the uncertainty of company managers and investors about the ability of a company to follow through and obtain patent rights regarding an innovation, corporate patent applications and resulting patents issued directly to corporations should increase the value and strength of patent incentives for innovation and the willingness of investors to back those efforts. With the confidence that it will control resulting patent rights without further concern over the cooperation of particular employees in seeking those rights, a corporation might be more certain of its ability to obtain patents and associated rewards and, therefore, engage in greater search efforts to discover patentable inventions.

Furthermore, the issuance of patents directly to a corporation may avoid adverse skewing of patent-related rewards and incentives towards those few individuals within corporate organization who fit patent law standards for "inventors" and, consequently, whose cooperation with the completion of patent applications and assignments is needed to perfect corporate patent rights. Because their cooperation with the relevant "paperwork" is particularly important to their corporations, these individuals may reap especially high rewards from their corporations for these ministerial tasks even though their contribution to a patented invention is no greater than other parties. A more rational and effective incentive scheme may entail the sharing by a broader range of employees of patent-related rewards as granted under an employer's performance bonus or royalty sharing systems. A corporation should be able to adjust these rewards to innovators or parties supporting innovation to a pattern that the corporation's management feels will most effectively and efficiently promote internal efforts to produce innovations without the skewing effect of the special status of patent applicants within a group of corporate employees

meaningfully contributing to a patented invention.

2. Changing What is Received: Clarifying the Scope and Value of Patents

To the extent that perceived patent value encourages both the organization of corporate efforts to innovate and the backing of those efforts by investors, the more that patents have a clear, determinable value, the more carefully and accurately corporations can match their innovation efforts and investors can match the scope of their support and investment backing to the probable value of resulting products to society. Because they control the making, using, and selling of products that incorporate the patented inventions,[122] patents have a value that depends directly on the amounts that consumers will pay for access to products based on the patented inventions. This amount, in turn, reflects the consumers' perceptions of the increased value to them of the patented invention relative to non-patented substitutes. In a sense, patents serve as an economic surrogate for the exclusive opportunity to market patented products. Because the prices consumers are willing to pay for products incorporating patented inventions will roughly equal the amount of increased utility that they gain from the products,[123] the overall economic value of the opportunity to market patented products is a good measure of the social usefulness of those products as reflected in consumer preferences and the prices that consumers are willing to pay for access to the patented products.

By offering means to clarify patent enforceability, scope, and value and by establishing means for communicating the resulting values for various patents, the patent system can create clear signals about the scope of utility of various patented inventions and give corporate managers useful signals about not only how to prioritize product

122. *See* 35 U.S.C. § 154 (2000).

123. If a product with a patented feature costs more than substitute items not subject to patent controls, consumers will only pay an amount for the item with the patented feature up to the increased utility they feel that they will gain from that item over the substitutes. Thus, for example, if a new cell phone with a patented feature costs $150.00, but other cell phones are available at $100.00, a rational consumer will only buy the phone with the patented feature if that phone has an incremental functionality that the consumer feels is worth the incremental cost. Because most patents cover improved designs on existing products and the prior, unpatented versions of those products are typically still available and in competition with the newer, patented versions, prices for patented items are typically in clear competition with the prices for somewhat less desirable, unpatented versions of the same products. Hence, a party offering a patented version of an earlier product must justify any price increment involved in terms of identifiable increases in product functionality and value to the consumer.

development efforts when multiple choices are available, but also about the range of expenses of development that will be cost-effective for a particular invention. Similarly, investors presented with a range of potential investments in innovative enterprises—or with choices between investments in such enterprises and other investments in less innovative enterprises involving less risky business activities—will be able to look to the projected value of a present or anticipated patent as an indicator of a likely rate of return from an investment in a corporate innovator holding the patent.

Presently, there are many sources of errors in patent value estimates that may reduce investors' incentives to make investments in corporations that rely on patent rights and related market exclusivity as key features of their business plans. A thorough assessment of the projected value of a patent requires several complex steps, including: (1) an analysis of the meaning of the patent claims defining the scope of the items or processes covered by the patent, (2) a comparison of the claims with present and anticipated products or services to determine the scope of manufacturing or sales activities potentially affected by the patent, (3) a determination of the market for the affected products or services, and (4) a determination of the cost or functional advantage—and hence, the increased marketable value—of products or services incorporating or relying on the patented invention over other unpatented substitutes.[124] Clearly, there is some potential for speculation and error at each of these steps.

These sorts of assessments of patent value are subject to further uncertainty if there are reasons to expect that the patent under scrutiny may be held invalid and unenforceable.[125] Also, a patented design or method may unexpectedly lose its functional advantage and corresponding value due to the later development of alternative technologies that provide more useful or less expensive substitutes for the patented technology.[126] In addition, the value of an exclusive marketing opportunity that is protected by an enforceable patent is subject to risks that a company will fail to properly follow up on the opportunity and gain all the available profits due to errors in the

124. *See* Method and System for Rating Patents and Other Intangible Assets, U.S. Patent No. 6,556,992 (filed Sept. 14, 2000) (issued Apr. 29, 2003) (describing methods of patent valuation).

125. *See*, *e.g.*, RICHARD RAZGAITIS, VALUATION AND PRICING OF TECHNOLOGY-BASED INTELLECTUAL PROPERTY 30 (2003).

126. *See id.*

company's manufacturing or marketing processes.[127]

Furthermore, the types of information needed for patent valuations, such as costs and earnings from specific products and design approaches, are rarely available to the public. Detailed figures on these characteristics of business activities are typically kept confidential by companies to avoid aiding competitors. Hence, patent valuation studies either need to be conducted with the cooperation of the affected companies or need to be based on estimates of many of the relevant cost and profit figures.

Two types of changes in patent law standards might help to clarify patent values and strengthen investors' abilities to interpret the business significance of patents. The first type of change involves alterations in legal standards and procedures that will provide more information at an earlier point to investors on the likely scope of patent protections and the corresponding range of products and services that a given patent will control. The second type of change involves adjustments in patent remedy standards to specify a presumptively correct minimum amount of damages for infringement, thereby making the value of patents in litigation more predictable. This litigation value will define a minimum estimated value for a patent that will apply in a "worst case" scenario when all attempts to generate other profits from a patented invention through product sales or patent licensing are unsuccessful and litigation is required to gain value from patent rights.

Because uncertainty about the enforceability of a patent in commercially significant settings will reduce the perceived value of the patent, the accurate estimation of patent value would benefit from the availability of any post-issuance means to clarify the enforceability of a patent or at least to establish the absence of a risk of invalidity or unenforceability that would otherwise raise questions about the patent's value.[128]

For example, an enhanced reexamination procedure that gives a patent holder an inexpensive means to clarify that a specific prior art device or process does not provide a ground for questioning the validity of a given patent might provide important reassurances to investors, particularly when prior art has been discovered after the examination of a patent and is, therefore, not within the examiner's assessment of the

127. *See id.*

128. The risk of successful challenges to the validity of a patent is a major source of uncertainty and reduced patent value. *See id.*

patentability of the invention involved.[129]

Alternatively, to gain an assessment of patent validity in these circumstances that is not tainted by possible USPTO bias, another type of useful proceeding might be a special form of declaratory judgment action in which a patent holder could seek to clarify its title or control over a set of product or process designs and associated marketing opportunities. This sort of action would serve a purpose somewhat like a "quiet title" action in real property law.[130] Under this procedure, a patent holder would be able to describe a range of products anticipated to be manufactured and marketed based on a patented design and to seek a ruling interpreting the relevant patent and determining whether the company holds the rights to exclude others from marketing goods similar to the indicated products. This type of action might also allow a patent holder to identify particular items of prior art apparently threatening the validity of the patent in question—particularly prior art sources not considered by the examiner who reviewed the patent—and to request that the court find that the prior art does not render the indicated patent invalid. Once patent scope and validity questions were addressed in a declaratory judgment proceeding such as this, subsequent litigants who were not parties to the declaratory judgment proceedings, while not completely barred from raising similar questions, could be

129. For a complete description of present criteria for reexamination of issued patents by the USPTO, see Sherry M. Knowles et al., Inter Partes *Patent Reexamination in the United States*, 86 J. PAT. & TRADEMARK OFF. SOC'Y 611, 614–25 (2004), and Frederick C. Williams, *Giving* Inter Partes *Patent Reexamination a Chance to Work*, 32 AIPLA Q.J. 265, 273–87 (2004).

130. A quiet title action typically entails a judicial proceeding to resolve adverse or inconsistent claims to disputed property. *See generally* Del Webb Conservation Holding Corp. v. Tolman, 44 F. Supp. 2d 1105, 1109 (D. Nev. 1999). A leading treatise describes the purposes behind such actions as the following:

> [T]o protect an owner of legal title from being disturbed in his or her possession and from being harassed by suits in regard to that title by persons setting up unjust and illegal pretensions. Quiet title actions are also intended to allow holders of equitable interests the right to remove from their way to legal title any unlawful hindrance having the appearance of a better right.

65 AM. JUR. 2D *Quieting Title* § 1 (2003). Statutes providing for actions to quiet title generally permit resolution of every claim through which a plaintiff may be deprived of his or her property or through which its value may be depreciated. *Id.* § 13. These threats that can be resolved in a quiet title action include prospective activities or interests of other parties from which the plaintiff in the quiet title action anticipates injury. *See id.* § 28. For example, in *Philadelphia Mortgage & Trust Co. v. City of Omaha*, 90 N.W. 1005 (Neb. 1902), the court considered the future impact of an attempt to collect taxes and the possibility of an associated lien being placed on property as a sufficient threat to be resolved through a quiet title action. The court held that a plaintiff in such an action was only entitled to relief quieting title if the tax in question was absolutely void. *Id.* at 1005.

required to overcome the ruling in the declaratory judgment proceeding with a particularly strong evidentiary showing.

This type of declaratory patent ruling would identify the types of product features in the field of the proposed products that are exclusive to the patent holder based on the patent at issue, thereby creating a relatively certain basis for a corresponding market potential analysis. Such a ruling would give clear backing to the business formation and funding efforts surrounding the patent and products at issue.

Clarity as to the value of patents would be increased if legal standards were adjusted to confirm that recoverable damages associated with patent infringement—and, by implication, the value of the relevant patent if its holder is pressed to the point of litigation—will generally be no less than an amount that is at least roughly predictable at patent issuance. For example, a presumptively correct floor on patent damages might be set at the amount of the net profits made by infringers on sales of an infringing product provided that the patent holder had sufficient product manufacturing and marketing capabilities to make it reasonably probable that the patent holder could have concluded the same sales.

This type of presumed floor on patent damages—or some other predictable floor that was apparent early in the life of each patent—would allow patent holders to predict the probable litigation value and worth of a patent based on the actual or, more likely, the estimated pricing and production practices of competitors selling infringing products. The expected conduct of infringers can be projected from their past sales of earlier, non-infringing products, with adjustments in the price to reflect the greater attraction of the patented versions of the products and further adjustments in expected profit levels to reflect differences, if any, in the production costs of the patented and unpatented product versions.

This patent damage estimate assumes that the patent infringers from whom the patent holder will recover damages are reasonably competent business persons and that their profits from sales of infringing items are good approximations for the profits the patent holder could have gained absent the infringement. In litigation, a patent holder should have the option of proving even greater actual damages, based on showings of such factors as a likelihood that the patent holder could have charged higher prices for the patented item than were charged by the infringers or that the patent holder would have had lower production costs and greater profits per unit of the patented item.

3. Changing Where Patentable Innovations are Produced: Altering Inventorship Standards to Encourage the Formation of Innovative Groups and Projects

Other patent law changes may cause patents to better encourage the formation of working groups for the pursuit of innovation efforts. Patent law standards might aid in the formation of these groups by altering notions of who qualifies as an inventor and patent co-owner to include all those parties whose involvement in a group project is critical to the discovery and initial commercial development of a new innovation. The idea behind this reform is that the coalescence of a new joint venture between companies or a new start-up company can best be encouraged by giving all of the essential players in these enterprises an ownership interest in the resulting intellectual property.[131] In the patent sphere, this can be achieved by adjusting patent ownership standards to recognize the full range of participants in group innovation as co-owners of the patents resulting from an innovation.

To encourage group formation, inventorship standards might be adjusted to include as inventors, or as persons sharing initial patent ownership, all those persons who contribute skills or resources that are material in developing the concept for a new invention or whose skills were needed to reduce an invention to practice, not just those who actually conceived of an invention. This change would make the contributors of critically important skills and resources parties who are inherently interested in the long-term usefulness of the resulting inventions because they will share in the co-ownership of patents that

131. Of course, multiple participants in a group endeavor can agree among themselves to contractually determined patterns of intellectual property ownership that will allocate fractional ownership interests as the parties see fit and thereby create incentives to join together in innovative groups to maximize the value of the intellectual property involved. For example, parties in a company pursuing innovative product designs might agree that all patents resulting from their efforts would be assigned to a given corporation and that the fractional ownership interests of each of the parties would be handled through allocations of percentages of the overall stock ownership of the company.

The difference between this presently available process, the proposed revisions to inventorship standards, and the resulting range of initial patent ownership is that the proposed system would start any ownership allocation transaction with a broader set of shared interests and joint incentives for innovation. Using this set of shared interests as a default condition or bargaining starting point may reduce transaction costs regarding the process of achieving the parties desired ownership allocation because fewer transfers of interest may be needed to achieve a desirable set of incentives. This allocation may also avoid some of the effects of bargaining failures. Even if the parties were unable to bargain effectively to reallocate their interests, the law will guarantee each participant in the joint innovation enterprise a co-owner's fractional share in the resulting patent interests.

stem from the inventions. As co-owners, they will be willing to invest their own efforts in proportion to the long-term advantages of the resulting patented inventions.

Alternatively, a functionally similar result might be achieved under existing inventorship standards through contracts promising participants in innovation efforts assignments of fractional interests in resulting patents or fractional interests in royalties resulting from those patents. A third approach to reach a similar result would be to establish a corporation surrounding an innovation effort, to allow the corporation to apply directly for patents or obligate researchers to assign patents resulting from the innovation effort to that corporation, and to give each of the relevant participants in the innovation efforts a fractional stake in the patent-owning corporation.

4. Changing When Patents are Available: Establishing Patent Value at Earlier Stages of Innovation

Indications of potential commercial value can arise in the progressive understanding of an innovation before any particular practical application of the innovation may be apparent. In order to ensure that an innovation at this promising stage attracts management's attention and the investment of resources needed for later stages of product prospecting and development, a patent interest should be available for an innovation at the earliest possible stages of its development.

Several types of patent law adjustments might help to advance the recognition of patent rights to earlier stages of the development of an innovation. These desirable changes include shifts in utility standards to demand only a small showing of utility of a sort indicating that an innovation is suitable for prospecting for products and for related corporate and investor backing. Current patent law standards preclude a patent for a discovery until it is "refined and developed to [the] point . . . where specific benefit [from the discovery] exists in currently available form."[132] This compels parties developing innovations to bring inventions to a stage of development in which they can establish the present utility of the invention before they can obtain a patent. However, in order to encourage early-stage backing of invention design perfection and product implementation efforts, patent standards might be altered to recognize sufficient utility in an invention for patenting when the state of knowledge regarding the invention is such that there is

132. Brenner v. Manson, 383 U.S. 519, 534–35 (1966).

a promising range of likely applications and investor backing of the development of those applications is likely to be advanced by patents governing the resulting products. Once patents are issued at this stage, aggressive fundraising to support large-scale development efforts can start at an earlier point than would be the case if patenting is delayed to a later stage of invention development.

Recognition of patent interests, or at least probable patent interests, at earlier stages of innovation development would also be furthered by changes in patent laws to implement mechanisms for speeding the patent application and issuance processes. Changes to speed these processes might include new provisions for expedited patent application filing requirements that would ease and speed the process of patent filing so as to make the review and issuance of a patent more rapid,[133] greater use of interim reviews by patent examiners such that the likely scope of an ultimate patent can be better predicted at the early stages of patent application processing,[134] and increased use of applicant-funded expedited processing of patent applications, at least when such applicant-funded procedures will not prejudice the normal handling of applications by parties who do not have the resources to invoke these special procedures.[135]

133. For example, a patent applicant might be required—or at least given the option—to submit complete information about the prior art searches she, or her patent searching specialist, had conducted, along with assessments of how components of the prior art found in these searches compare with the invention being sought to be patented. While these searches and critiques would not be binding on a patent examiner, they might help to avoid duplications of effort and speed during a patent examiner's review of a patent application.

134. For example, a patent examiner might issue a preliminary "triage" assessment of probable patentability issues identified in a quick examination of a patent application, thereby allowing a patent applicant to respond with quick amendments to avoid issues or with explanations of why the examiners concerns were misplaced or were not barriers to issuing a patent. The surfacing of potential issues early in the process may allow them to be dealt with quickly and efficiently before both the examiner's and the applicant's time is wasted on unnecessary analyses and submissions.

135. This type of applicant funding of patent reviews by reliable personnel selected by the USPTO would be a parallel to the applicant-funded procedures used in some county planning offices to speed reviews of major building projects and accelerate the issuance of building permits. So long as the availability of specially-funded and speeded applications processes does not prejudice the result in favor of patent applicants with sufficient funds to obtain expedited processing and the availability of such processing does not create greater delays or other incremental problems for un-expedited applicants, the speed accomplished through specially funded patent application processing will aid the public by bringing patented inventions to public attention and availability more quickly than regular patent processing.

5. Changing How Patentable Innovations are Assessed: Modifying Nonobviousness Standards to Encourage Group Innovation and the Accumulation of Organizational Knowledge

Patent law standards that may discourage parties or organizations with accumulated knowledge and intellectual property rights in a particular field to form group enterprises aimed at discovering and commercializing further innovations could be revised to better encourage group innovation. For example, standards for identifying relevant "prior art" for purposes of determining the novelty and nonobviousness of new inventions should be adjusted to ensure that patents encourage the formation of innovative groups in which the assembly of information, expertise, and resources through group processes are needed to bring innovations to the public. This includes circumstances in which group processes are needed to promote the discovery of a new invention, the development of products from an invention, or the initiation of manufacturing and marketing of new products based on a new invention. The range of advances that are seen as new, nonobvious designs potentially qualifying for patents should be adjusted to ensure that patent rights attach to innovations and encourage group efforts when public access to the innovations will be significantly furthered by group processes to develop related products, manufacturing programs, and marketing efforts. This can be accomplished by carefully tailoring the range of prior art that is deemed sufficient to preclude a patent for a particular invention.

Existing patent laws recognize that the accumulated knowledge gained by a single organization which is actively developing technological innovations in a given field should not restrict or diminish the opportunity of the organization to gain a patent when it develops an additional new invention. This view is implemented in the Patent Act's standards for determining the nonobviousness of an invention for which a patent is sought.[136] Normally, an invention that is new and useful is

136. *See* 35 U.S.C. § 103(a) (2000).

> A patent may not be obtained . . . if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

Id. This test is commonly and somewhat awkwardly referred to as requiring that an invention exhibit "nonobviousness" in order to be patentable. The Supreme Court has summarized the basic considerations in determining if an invention is nonobvious as follows:

> Under § 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of

nonetheless denied a patent when the invention is a mere obvious variation from a useful product or services already available to the public—that is, a mere obvious variation from the prior art of the field.

However, a special rule applies to corporations and other organizations that develop and accumulate a substantial body of innovations in a particular field. In such organizations, information held by others in the organizations at the time a further advance is made is not considered to be part of the prior art of the field for purposes of determining the nonobviousness of the further advance. This rule is implemented under the following statutory provision:

> Subject matter developed by a person [other than the inventor], which qualifies as prior art [due to previous invention by another], shall not preclude patentability under [the nonobviousness standards of the Patent Act] where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person.[137]

Congress added this language to the patent statute specifically to avoid the invalidation of patents on the basis of the work of fellow employees engaged in team research.[138]

This provision of patent law frequently has an impact on prior art and nonobviousness determinations in corporate settings. For example,

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> ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined. Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented. As indicia of obviousness or nonobviousness, these inquiries may have relevancy.

Graham v. John Deere Co., 383 U.S. 1, 17–18 (1966).

137. 35 U.S.C. § 103(c) (2000); *see also* 37 C.F.R. § 1.130 (2004) (describing required contents of affidavit needed to disqualify prior art under § 103(c) in the context of a patent examination or reexamination proceeding).

> For purposes of applying this section of the Patent Act, "another person" has been interpreted by courts as meaning any inventive entity that is not identical in composition to any other inventive entity. For example, when an application for a patent is made in the names of *A* and *B*, prior art attributable to *A* or to *A* and *C* is deemed to be prior art developed by "another person." *See* JOHN GLADSTONE MILLS III ET AL., 3 PATENT LAW FUNDAMENTALS § 17:8 (2d ed. 2005).

138. *See* SECTION-BY-SECTION ANALYSIS: PATENT LAW AMENDMENTS OF 1984, Pub. L. No. 98-622, 98 Stat. 3383 (1984), *reprinted in* 1984 U.S.C.C.A.N. 5827, 5833 (stating that the provisions of § 103(c) were aimed at encouraging communications among members of research teams and at overturning earlier case law that had suggested that one team member's earlier invention that was not made public might be treated as prior art for purposes of determining the novelty and nonobviousness of a later invention by a second team member).

in one case in which a corporation owned a patent on a fluidic nozzle and obtained a further patent on windshield washer technology, the corporation's common ownership of the two patents precluded the nozzle patent from being used as prior art for purposes of determining whether the invention covered by the windshield washer patent was obvious and unpatentable.[139] In a typical high-tech company in which all employees are under an obligation to assign to their company the patent rights arising out of their work, this provision means that the prior work of one employee for the company will not affect the patentability of the work of a second employee even if the latter is an obvious variation of the work of the former. Put in positive terms, a company's own efforts to accumulate a large body of design knowledge among its employees does not work against a large company by lessening the scope of patent incentives and the rewards the company enjoys in connection with a new discovery.

However, the range of circumstances in which prior, accumulated knowledge should be ignored in nonobviousness analyses should probably be expanded to encourage various types of group efforts to produce innovations and to promote the formation of the groups needed in these efforts. One type of innovative group that probably deserves similar prior art treatment to that currently afforded large corporations involves participants in innovative teams from multiple corporations, universities, or other organizations. In these settings, when various contributors may be adding their respective knowledge and that of their organizations to a group innovation effort, the accumulated innovative histories and knowledge of their organizations should not be held against them for purposes of determining the patentability of their discoveries in a newly formed innovation team.

An additional category of group enterprises that plays a key role in bringing new innovations to the public includes combinations of parties that are formed after the discovery of patented inventions to engage in further testing of the invention and to follow on efforts to commercialize the inventions. These types of enterprises are not specially protected by the present statutory language on the handling of prior art in nonobviousness assessments because these enterprises and the patent assignment arrangements they often entail do not predate the discovery of a patented invention. Hence, the collective prior art of the participants in these sorts of groups are not commonly owned at the time of the inventions and will not come within the current provisions of

139. Bowles Fluidics Corp. v. Mossinghoff, 620 F. Supp. 1297, 1306 n.7 (D.D.C. 1985).

the patent laws calling for special treatment of prior art under common ownership.

In order to encourage a broader range of group efforts that will enhance the availability of innovations, patent laws might specify that prior art held by parties who, by the time of a patent application, have established contract rights specifying that the parties will collectively be the assignees of the patent being sought should have their prior art excluded from consideration for purposes of determining the nonobviousness of the invention covered by the application. This will encourage parties holding related expertise—the sorts of parties best suited to form group enterprises that will effectively commercialize and deliver a new innovation to the public—to join together in joint enterprises and to participate in these joint enterprises with diligent product development and commercialization efforts.

This change will expand the period in which parties can establish advantageous group enterprises to develop and commercialize innovations in a given area. By reducing the range of prior art potentially undercutting resulting patents, present law favors the formation of corporate enterprises or other group financing and ownership arrangements that are formed before the discovery of a patentable invention. However, under the altered rule described here, parties in a field with a substantial amount of accumulated expertise and existing intellectual property rights would be encouraged to form joint enterprises that follow up on the discovery of patentable inventions by pursuing the further development of the invention into useful products and the manufacturing and marketing start-up activities needed to bring these products to the public.

B. Corporate Law Reforms

A variety of corporate law reforms might promote financial backing for corporations' innovative efforts by expanding shareholders' understanding of the value of corporate patents and by enhancing corporate management's accountability to shareholders regarding the pursuit and enforcement of corporate patents and related business risks. This subsection briefly examines some possible corporate law changes that would have these impacts.

1. Specifying Required Securities Disclosures

When a corporation engages in a public offering to generate widespread investor funding for the commercialization of products that

are asserted to be protected by patent rights, a large portion of the value of the corporate enterprise involved will depend on the strength of the patent rights held by the entity. Even if the products being developed by the corporation are popular with consumers and initially generate large volumes of product sales, whether or not the benefits of similar sales volumes will inure to the corporation over time will depend greatly on the scope of patent controls preventing other companies from jumping in and sharing the profits from the popular new products. Hence, even in the best of new product development situations, strong patent rights surrounding successful products are often needed to establish substantial long-term product exclusivity and corresponding corporate value.

As they are being asked to invest in an enterprise that is relying heavily on patent rights for its future well-being, potential investors should have access to sufficient information to evaluate the scope and strength of patent rights being relied on by the company involved. The information investors can evaluate in this regard and the confidence of investors in corporate enterprises aimed at commercializing patented inventions will be enhanced if corporate disclosures filed in connection with public stock offerings are required to include several types of information bearing on the future force and effect of patent rights held by the corporations making the offerings.[140]

For example, required securities disclosures might include opinions from qualified patent counsel regarding the validity and scope of any patents that the company seeking funding is relying on for substantial protection of its future business operations.[141] The required disclosures might also include any material information held by company executives

140. *Cf.* ROBERT A. FIPPINGER, THE SECURITIES LAW OF PUBLIC FINANCE § 7:5 (2d ed. 1994) (describing a rule proposed by the National Association of Securities Dealers (NASD) in the early 1970s that would have obligated lead underwriters to develop and adhere to specific written due diligence procedures for investigating a company embarking on a public offering, including procedures for "[e]xamination of business protection devices and related data such as trademarks, patents, copyrights and production obsolescence, among others").

141. Topics that are presently required to be addressed in connection with new stock offerings by publicly traded corporations and in later ongoing disclosures by those corporations are addressed in Regulation S-K issued by the Federal Securities and Exchange Commission (SEC). This Regulation provides detailed guidance for compliance with the line-item disclosure that is required by the various forms and schedules that have to be filed with the SEC under both the Securities Act of 1933 and the Securities Exchange Act of 1934. *See* 17 C.F.R. § 229.10–249.10(b) (2004); *see also* THOMAS LEE HAZEN, THE LAW OF SECURITIES REGULATION § 3.4 (4th ed. 2002 & Supp. 2004) (describing disclosures required in connection with new stock offerings of publicly traded entities).

tending to undercut or contradict the enforceability of these patents. These types of disclosures might be made mandatory through either changes in securities statutes to address patent-related disclosures generally or new regulations addressing the special disclosure problems of high-tech start-up companies relying on patent holdings as significant features of their business models. Alternatively, similar changes might be implemented through judicial interpretations of existing securities law standards requiring disclosures of material information so as to recognize that, in the context of a company in which the business model relies heavily on the enforceability of particular patents and in which investors have a corresponding stake and interest in those patents, material information that must be disclosed to investors includes patent validity and scope evaluations held by corporate management.

2. Clarifying Fraud Standards

In the context of smaller-scale stock sales in which companies developing innovations are not making public offerings of stock and the formal disclosure requirements of federal securities laws do not apply, securities fraud laws and common law fraud standards still constrain how companies may describe patents and related business features as the companies promote sales of securities.[142] Investor confidence in representations about corporate business potential and the role of patent rights in reducing corporate operating risks would be enhanced by fraud standards that discouraged misrepresentations about patents by requiring complete and accurate disclosures of corporate executives' assessments regarding the validity of key corporate patents that are touted and relied upon in a company's business plan. The information considered and the experts consulted by executives in reaching their conclusions regarding patent validity and the business impact of patent interests should be subject to similar disclosure requirements in order to make a company's positive statements about the importance of its patents not misleading.

In many business settings, stock in high-tech corporate start-up companies will be sold to venture capitalists and other early-stage

142. In general, state laws prohibit material misstatements in connection with the sale of a security. In addition, an omission of information in connection with the sale of a security may also be the basis of liability, but typically only when, under the circumstances, the omission of information tends to make the provided information materially misleading. 69A AM. JUR. 2D *Securities Regulation–State* § 187 (2003). Information will generally be considered material "if there is a substantial likelihood that a reasonable investor would consider it important in making an investment decision." *Id.* § 190.

corporate investors based on representations regarding the scope and importance of patent protections covering the company's present or projected products. Sometimes, these sorts of representations are made in settings where corporate managers know that there are reasons to be cautious about reliance on patent rights, yet these reasons for caution my be omitted from the statements the managers make to potential investors. When a corporate manager emphasizes the future business importance of a company patent without including specific risk-clarifying information the manager holds about the possible invalidity or restricted scope of the patent, fraud laws should recognize that the failure of the manager to be more forthcoming and balanced in this type of representation to investors amounts to a material misstatement regarding the future role of the patent. Put simply, presentation of a rosy picture of patent significance in such a business context amounts to a misrepresentation when information about the favorable impacts that a patent is expected to have is not balanced with known information about patent invalidity or inapplicability to the business opportunities the corporation in question. Such a material misstatement should open up the manager making the statement to damage liability for securities holders' losses when the flaws of the patents and the negative impact of those flaws on corporate fortunes are later revealed.

Of course, corporate managers should not be obligated to make disclosures of adverse information regarding patent enforcement in all circumstances.[143] Two types of cases should give rise to an obligation to be complete in statements made about the corporate significance of particular patents.

First, when managers themselves point investors to patents as key corporate assets and sources of reduced business risk in ensuring the exclusivity of marketing opportunities, corporate managers should have a duty to couple their positive remarks with whatever qualifying information that the managers have. Absent this, the unqualified representations of the managers will tend to convey an unqualified message regarding the strength and importance of the patents addressed—a message that the managers involved know to be untrue. In short, knowing overstatement of the legal and business significance of patents is a type of material misstatement that fraud laws should

143. Under most state standards, individuals involved in selling stock do not face liability for non-disclosure when the parties provide no information to buyers of the stock. *See*, *e.g.*, McCall v. Finley, 362 S.E.2d 26, 31 (S.C. Ct. App. 1987); 69A AM. JUR. 2d *Securities Regulation–State* § 187 (2003).

recognize as a valid basis for damage claims from investors who rely on corporate managers unqualified statements.

Second, when the nature of a company's business would naturally focus investors on the importance of patents in maintaining the exclusivity of certain product production and marketing opportunities, even general statements of corporate health and positive future potential may need to be accompanied by patent risk information held by executives making the statements. The combination of an assertion of strong corporate performance or prospects without the associated disclosure of patent enforcement concerns should be seen as a material misstatement. These sorts of misstatements should establish a cause of action giving investors a source of relief when they were misled by overly favorable statements about company fortunes and the company involved has suffered a loss due to these undisclosed risks regarding patent enforcement.

In certain circumstances, professional duties or other fiduciary obligations possessed by persons holding information on potential patent invalidity or unenforceability may obligate the persons to disclose that information even in the absence of a positive representation of corporate business soundness.[144] In these settings, the normal rule that persons holding adverse information need not disclose it is overcome by the professional or fiduciary duties of the parties. When this is the case, state fiduciary standards will require that persons make positive disclosures of material information regarding risks to the enforceability and value of corporate patents. The failure to make such disclosures will open the individuals involved to damage claims from corporate shareholders and others who are adversely affected by the ultimate unenforceability of the patents involved and the resulting drop in corporate fortunes.

3. Corporate Governance Standards

Under present standards defining the duties of corporate officers and directors, such individuals are obligated to periodically monitor significant risks to corporate performance and to react when unusual

144. *Cf.* Dowse v. Federal Rubber Co., 254 F. 308, 309–15 (N.D. Ill. 1918) (holding that the fiduciary obligation of the corporate director required the transfer of a patent obtained by the director to the corporation); PAT K. CHEW, DIRECTORS' AND OFFICERS' LIABILITY § 5:4.4 (1999) ("Because of their fiduciary status, directors and officers are more vulnerable than ordinary employees to losing ownership of their inventions. Since the fiduciary-inventor has a special position of trust in the corporation, the courts may consider it inequitable for the fiduciaries to own their inventions.")

information indicates a serious threat to future corporate well-being.[145] In the context of businesses that are based on the commercialization of patented inventions and in which the unexpected unenforceability of key patents will be a major business disaster, the duties of corporate leaders should be interpreted to extend to the monitoring of evolving circumstances affecting the enforceability and business value of corporate patents.[146] Diligence in these monitoring efforts by corporate executives should aid the executives in proactively managing patent-related risks to corporate performance. It should also reassure shareholders that patent enforcement risks will be caught at a stage when their adverse effects on corporate performance can be minimized. Such monitoring by corporate executives may also detect new information about material patent risks that will need to be passed on to shareholders, thereby aiding their assessments of corporate performance and potential.

This type of monitoring of patent enforceability risks is particularly critical when business planning at the outset of a major product development or manufacturing initiative has been premised on the assumed enforceability of key patents and the corresponding exclusivity of a marketing opportunity. Resources committed to such an endeavor may be largely wasted if the patents are not enforceable and the company involved must fight to compete with several other companies for product sales in the same market. Such competition will typically produce lower income for the patent holder for two reasons: (1) the patent holder's volume of product sales in the targeted market will go down because sales in that market will be shared with competitors and (2) each product unit will sell at a lower price determined by head-to-head competition rather than by the temporary marketing exclusivity ensured by patent rights.

Failures of corporate leaders to meet monitoring and reaction duties

145. A director or officer's failure to make reasonable inquiry into "red flags" suggesting adverse corporate developments or a director's inadequate monitoring of major facets of corporate performance are independent grounds for finding a breach of the duty of care. The receipt of information that would cause a reasonable person to suspect an adverse corporate development may require a director or officer to make inquiries to determine if the suspected problem is present. Even absent cause for suspicion, courts have found directors and officers liable for inadequate monitoring of corporate affairs and inadequate oversight of significant corporate activities. 3A WILLIAM MEADE FLETCHER ET AL., FLETCHER CYCLOPEDIA OF THE LAW OF PRIVATE CORPORATIONS § 1034.80 (perm. ed. 2002).

146. *See In re* Caremark Int'l Inc. Derivative Litig., 698 A.2d 959, 971 (Del. Ch. 1996) (holding that a corporate director breaches his or her duty of care through a sustained or systematic failure to exercise oversight concerning major risks to corporate interests).

under state corporation laws can lead to damage claims against these individuals for losses suffered by their corporations when these losses would have been likely to have been avoided through more diligent management attention and action. If corporate fortunes drop precipitously following a finding that key patents are unenforceable, corporate leaders who should have detected, through reasonable fact finding, the source of unenforceability[147] or who were aware of potential problems with the patents but did not react by conducting a complete study and redirecting corporate affairs to prevent wasteful reliance on a flawed patent strategy[148] will be personally liable to their corporation for the losses that their inattention caused.

By clarifying the obligations of corporate directors and officers to act on behalf of shareholders in the monitoring and management of threats to patent enforceability and to provide shareholders with information about these threats so that shareholders can take their own protective actions, corporate duty laws are important sources of pressure for patent management diligence on the part of corporate leaders. These pressures not only compel corporate leaders to engage in patent monitoring and management practices that may reduce corporate commitments to wasteful uses of resources in pursuit of unexpectedly non-exclusive marketing opportunities but may also increase shareholder confidence in patent-based businesses. This last result should ease the formation of high-tech businesses to develop products and services based on patented inventions and increase the value of patents themselves by making them more attractive linchpins for business formation and financing.

4. Information Disclosure Demands from Shareholders

Existing corporate law standards require companies to respond to shareholder demands for disclosure to the shareholders of certain business records.[149] In the past, these sorts of disclosure requirements

147. *See id.*

148. *Cf.* Graham v. Allis-Chalmers Mfg. Co., 188 A.2d 125, 130 (Del. 1963) (noting that a corporate director will face personal liability for corporate losses when the director has "ignored either willfully or through inattention obvious danger signs of employee wrongdoing").

149. Under the laws of most states, corporate shareholders are entitled to review all the books, papers, records, federal reports, and other data of the corporation as to assets, liabilities, contracts, operations and practices. *See* 5A FLETCHER ET AL., *supra* note 145, § 2239.

However, the range of records that are subject to this right is generally limited to those records that will aid shareholders in protecting their interests. *See id.* At least some states

have focused primarily on corporate financial records that shareholders needed to fully consider a matter under shareholder control. However, the notion that shareholders are entitled to review corporate records related to major aspects of corporate performance might be extended to recognize corporate shareholders' rights to compel disclosures of opinion letters regarding patent validity or other similar records on patent rights held by company management.

Such a right to compel disclosure of these sorts of assessments of corporate patent rights and, by implication, to reveal associated business risks would give shareholders meaningful information allowing them to independently assess the possibility that key corporate patents will be unenforceable or inapplicable to the sorts of business activities being planned or undertaken by the shareholders' corporations. Absent these sorts of compelled disclosures, corporate shareholders concerned about patent strength and related corporate business strategies must rely on the thoroughness of patent evaluation studies initiated by corporate managers and the willingness of the managers to accurately disclose or describe the adverse portions of the results obtained in those studies. Patent evaluation and disclosure processes flowing through corporate managers who may have personal reasons to downplay or conceal problems with patents are likely to produce inadequate information for shareholders in many cases. Because of over-optimism born of their enthusiasm for their business plan—or because of an outright willingness to misrepresent the range of known risks associated with their company's patents—corporate leaders of high-tech businesses may downplay or omit disclosures to shareholders of adverse patent evaluation results.

Information disclosure rights for shareholders in small companies that are not subject to the more formal disclosure requirements

extend the right of shareholders to inspect books and records to include inspection of corporate contracts and other significant business papers. *See*, *e.g.*, Weigel v. O'Connor, 373 N.E.2d 421, 426–28 (Ill. Ct. App. 1978) (holding that a corporate shareholder is legitimately entitled to know anything and everything that the records, books and papers of a company would show so as to protect the shareholder's interests as long as he has an honest motive, is not proceeding for vexatious or speculative reasons, is seeking something more than satisfaction of his curiosity, and is not conducting a general fishing expedition).

This type of standard might support a shareholder right to inspect an opinion of counsel regarding the enforceability and scope of a corporate patent, at least when enforcement of the patent is a key aspect of a corporation's business plan. *See* Stone v. Kellogg, 46 N.E. 222, 226 (Ill. 1896) (recognizing that the right of shareholders to review corporate records is "founded on the principle that the shareholders have a right to be fully informed as to the condition of the corporation, the manner in which its affairs are conducted, and how the capital to which they have contributed is employed and managed").

governing pubic companies under federal securities laws would be a valuable means to inform shareholders regarding possible threats to their companies due to changes in expected patent enforceability or previously unappreciated weakness in patent enforcement strategies. In addition, the potential for compelled disclosures of adverse patent evaluations would remind corporate managers in these settings that maintaining patent value and accurately disclosing the strength and business significance of corporate patents are key management responsibilities. Given the threat of compelled disclosures to shareholders, corporate managers will understand that they can be held accountable for their management of patent enforcement practices and related business operations that rely on the force of corporate patents.

V. CONCLUSION

The efficient development and public dissemination of new and useful innovations depends on the clarity of patent incentives and the efficiency of corporate processes for backing innovation efforts. Changes in both patent and corporation laws can make the formation of collective enterprises for innovation both more likely and more efficient. Because the public benefits from more instances of patentable innovation and lowered financing and administrative cost in producing these innovations, the strength of patent incentives and the success of corporate laws supporting innovative organizations are complementary areas of public concern.

By adjusting the sorts of legal underpinnings described in this Article, legal reforms can shape patent interests and incentives so as to promote the formation of group enterprises that are needed for many complex and resource intensive forms of modern innovation and encourage investors to back those enterprises. This type of encouragement and support for organizations that are capable of modern innovation is critical in a period when highly useful technological innovations often depend on massive commitments of personnel and resources.

As modern society has increasingly come to depend on products and services that can only be provided effectively through large, corporate enterprises, the power and flexibility of corporate organizations in financing and organizing the provision of these products and services has taken on increased importance. The premise of this Article is that modern innovation is more and more often a type of activity that requires the sorts of group action, large commitments of resources, and collective funding that can only be effectively accomplished through

corporate organizations, and that legal infrastructures, including patent and corporate laws, should be tailored to efficiently promote the creation and operation of these organizations.

In this context, corporate patents—both promised patents for future innovations and issued ones for innovations that have yet to be transformed into publicly available products—are critically important focal points for corporate action that can spark complex innovative efforts, promote the formation of innovative groups to pursue these efforts, reassure business leaders about the merit of committing large amounts of resources to such efforts, and encourage the backing of complex innovation efforts by a broad set of investors. As central features of innovative organizations, corporate patents and further corporate law standards that increase the value of patents and investor confidence in patent interests are critical means for expanding the activities of innovative corporate organizations and for increasing the beneficial advances these organizations bring to the public.