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Patent Quality and Public Policy: Issues for Innovative Firms in Domestic Markets

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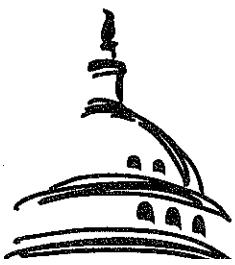

Prepared for Members and
Committees of Congress

Patent Quality and Public Policy: Implications for Innovative Firms in Domestic Markets

Summary

The administration of United States Patent and Trademark Office ("USPTO") concerns issues of resource availability and management, as well as need to identify and prioritize the goals of federal patent examination procedures. This report focuses upon this latter issue. There are currently at least three competing views concerning USPTO priorities.

One position is that the USPTO should aim to achieve a high level of patent quality. Government, industry, academia and the patent bar alike have traditionally agreed that the USPTO approve only those patent applications that fully describe and clearly claim an inventive advance. High quality patents fully disclose and distinctly claim a new, useful and unobvious invention, thereby meeting each of the statutory requirements under the Patent Act.

Some commentators have challenged the notion that high patent quality should be a priority goal. They believe that interested private parties are often able to assess the robustness and value of individual patents more easily than the USPTO, making a USPTO "hard look" during its examination procedures economically inefficient. Moreover, because relatively few patents are ultimately licensed or the subject of litigation, other observers have argued that it may be inefficient to conduct rigorous examination proceedings for all patents. These varying perspectives hold implications for the administration of the patent system.

Each of three views possesses its merits and shortcomings. Uniformly high levels of patent quality may be difficult for the USPTO to maintain in light of budget constraints and increasing workloads. However, improvidently granted patents may lead to certain social costs. Stringent patent grant proceedings could potentially limit some of these costs.

Legislation introduced before the 107th Congress bears upon the patent quality issue. In the event that Congress further considers this issue, USPTO administrative practices may be reviewed with an eye towards their capability for maintaining high levels of patent quality within current resource constraints. Congress may wish to consider whether patent examiners have appropriate resources and training that will allow them to conduct a rigorous review of patent applications. The responsibilities of patent applicants to contribute to quality patent examination may also be weighed. Finally, Congress might choose to assess the contributions members of the general public might make within an optimal patent examination regime, for example, by encouraging interested third parties to comment upon pending patent applications.

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Patent Quality and Public Policy: Issues for Innovative Firms in Domestic Markets

Patent rights do not arise automatically. Inventors who seek patent protection must first prepare applications that fully disclose and clearly claim their inventions.[1] Officials at the United States Patent and Trademark Office ("USPTO") then decide whether or not to allow the application to issue as a granted patent.[2]

Discussion of whether patent acquisition proceedings are being conducted in a rigorous fashion, usually confined to the community of patent professionals, have recently entered the popular press.[3] Several accounts suggest that the USPTO has become more lenient, allowing an increasing number of patents to issue that lay claim to knowledge that has previously entered the public domain.[4] This impression recently received a quantitative boost from Cecil D. Quillen, Jr. and Ogden H. Webster, whose data analysis concluded that the USPTO may approve as many as 97% of the applications placed before it.[5] Some commentators agree that the USPTO's growing workload and increasing budgetary pressures are at the root of perceived patent quality concerns.[6]

Sound USPTO administration concerns issues of resource availability and management, as well as the identification of the most appropriate purposes of patent examination procedures. This report will concentrate upon this latter, normative issue. A review of discussions within the policy community reveals that three competing views of the most appropriate goals of the USPTO have emerged.

The traditional view has been that high patent quality should be a significant goal of the United States Patent and Trademark Office ("USPTO"). Government, industry, academia and the patent bar alike have long insisted that the USPTO approve only those patent applications that fully describe and clearly claim an

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[1]35 U.S.C. § 112.

[2]35 U.S.C. § 131.

[3]Simson Garfinkel, "Patently Absurd," *Wired* (July 1994), 104; James Gleick, "Patently Absurd," *N.Y. Times Magazine* (12 Mar. 2000), 44; Robert M. Hunt, "You can patent that?," *Business Review* (1 Jan. 2001), 515; "Patently absurd?: Intellectual property," *The Economist* (23 June 2001).

[4]*See* John R. Thomas, "Collusion and Collective Action in the Patent System: A Proposal for Patent Bounties," *University of Illinois Law Review* (2001), 305.

[5]Cecil D. Quillen, Jr. & Ogden H. Webster, "Continuing Patent Applications and Performance of the U.S. Patent and Trademark Office," 11 *Federal Circuit Bar Journal* (2001), 1.

[6]*See* Thomas, *supra* note 4.

inventive advance.[7] Quality patents are, in short, valid patents. Such patents may be reliably enforced in court, consistently expected to overcome challenges to their validity, and dependably employed as a technology transfer tool.[8] They also may clarify the extent that others may approach the protected invention without infringing. These traits in turn should strengthen the incentives of private actors to engage in value-maximizing activities such as innovation or commercial transactions.[9]

Not everyone agrees. The notion that high patent quality is socially desirable has been challenged. Some commentators cite the Coase theorem. As discussed further below, the Coase theorem postulates that absent transaction costs and wealth or income effects, the initial assignment of legal entitlements does not affect the efficiency of the resulting allocation of resources. Applied to the patent law, the Coase theorem suggests that market forces will efficiently assign patent rights no matter what their quality.

Other commentators refer to the principle of rational ignorance, which is also discussed further below. Under the rational ignorance principle, the optimal time spent examining individual patent applications may be a brief period.[10] Because many patented inventions are not used in a way that calls their validity into question, some observers maintain, society may be better off making a searching inquiry only in those few cases where a patent is licensed or litigated. All three of these accounts hold implications for the administration of the patent system.

This report opens with an introduction to patent system fundamentals. It then considers merits and shortcomings of the three prevailing views of patent quality. This report closes by identifying legislative options for addressing patent quality issues, as well as by presenting suggestions for future research that will be pursued in a subsequent report.

Introduction to the Patent System

Policy Aspirations

In the words of Article I, section 8, clause 8 of the U.S. Constitution, the patent system serves to "promote the progress of useful arts." Stated in more contemporary language, a principal effect of patent law in a market economy is to provide economic

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[7]*See, e.g.,* Irwin M. Aisenberg, "A Level Playing Field to Patent Protection," 35 *IDEA: The Journal of Law and Technology* (1995), 357; Robert Corcoran & Louis S. Zarfas, "Quality Review and Control in the PTO: The Historical Evolution," 81 *Journal of the Patent and Trademark Office Society* (1999), 5; Nancy J. Linck *et al.*, "A New Patent Examination System for a New Millennium," 35 *Houston Law Review* (1998), 305; Emily Sherwin, "Epstein's Property," 19 *Quinnipiac Law Review* (2000), 697.

[8]Linck *et al.*, *supra* note 7.

[9]Sherwin, *supra* note 7.

[10]Mark A. Lemley, *Rational Ignorance at the Patent Office*, 95 Northwestern U. L. Rev. (2001).

incentives to commit resources towards technological innovation. This effect is achieved by granting inventors exclusive rights to practice the patented invention.[11]

Industry reaction to the Plant Variety Protection Act of 1970 (PVPA) has been cited in support of the rationale that patent rights can stimulate invention. In a field in which proprietary rights were previously unavailable, the PVPA allowed plant breeders the ability to obtain patent-like protection on novel varieties of plants grown from seed.[12] In the decade prior to the promulgation of the PVPA, industry developed approximately 150 new plant varieties. But in the decade following the enactment of the PVPA, over 3000 new varieties were created.[13]

The regime of patents purportedly serves other goals as well. The patent system encourages the disclosure of products and processes, for each issued patent must include a description sufficient to enable skilled artisans to practice the patented invention.[14] Although estimates vary, one report observed that 85-90% of the information available in published patent instruments would not otherwise be publicly available.[15]

Issued patents may also encourage others to "invent around" the patentee's proprietary interest. A patentee may point the way to new products, markets, economies of production and even entire industries. Others can build upon the patentee's disclosure to produce their own technologies that fall outside the exclusive rights associated with the patent.[16]

The patent system has also been identified as a facilitator of markets. Without patent rights, an inventor may have scant tangible assets to sell or license. In addition, an inventor might otherwise be unable to police the conduct of a contracting party. Any technology or know-how that has been disclosed to a prospective licensee might be appropriated without compensation to the inventor. The availability of patent protection decreases the ability of contracting parties to engage in opportunistic behavior. By lowering such transaction costs, the patent system may make technology-based transactions more feasible.[17]

Through these mechanisms, the patent system may provide a more socially desirable outcome than its chief legal alternative, trade secret protection. Trade

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[11]Simone Rose, "Patent 'Monopolyphobia': A Means of Extinguishing the Fountainhead?," 49 *Case W. Res. L. Rev.* 509 (1999).

[12]7 U.S.C. § 2402(a).

[13]Pauline Newman, "Legal and Economic Theory of Patent Law," in Donald S. Chisum *et al.*, *Principles of Patent Law: Cases and Materials* 67, 70 (New York: Foundation Press, 1998).

[14]35 U.S.C. § 112.

[15]Newman, *supra* note 13, at 72.

[16]Rebecca S. Eisenberg, "Patents and the Progress of Science: Exclusive Rights and Experimental Use," 56 *University of Chicago Law Review* (1989), 1017.

[17]Robert P. Merges, "Intellectual Property and the Costs of Commercial Exchange: A Review Essay," 93 *Michigan Law Review* (1995), 1570.

secrecy guards against the improper appropriation of valuable, commercially useful and secret information. In contrast to patenting, trade secret protection does not result in the disclosure of publicly valuable information. That is because an enterprise must take reasonable measures to keep secret the information for which trade secret protection is sought. Taking the steps necessary to maintain secrecy, such as implementing physical security measures, also imposes costs that may ultimately be unproductive for society.[18]

The extent to which the patent system practically achieves these goals is difficult to assess. Economic research suggests that different industries attach widely varying values to patents. For example, one study of the aircraft and semiconductor industries suggested that lead time and the strength of the learning curve were superior to patents in capturing the value of investments.[19] In contrast, members of the drug and chemical industries attached a higher value to patents. Differences in the perception of the patent system have been attributed to the extent to which patents introduced significant duplication costs and times for competitors of the patentee.

Studies have indicated that individual entrepreneurs and small, innovative firms rely more heavily upon the patent system than larger enterprises. Larger companies often possess a number of alternative means for achieving a proprietary or property-like interest in a particular technology. For example, trade secrecy, ready access to markets, trademark rights, speed of development, and consumer goodwill may to some degree act as substitutes to the patent system. As Sally Wyatt and Gilles Bertin reported in their survey of alternatives to patenting, a representative of one European corporation opined that "multinational corporations could easily cease to use patents and use other available methods to achieve the same aims."[20] However, individual inventors and small firms often do not have these mechanisms at their disposal. As a result, the patent system may enjoy heightened importance with respect to these enterprises.[21]

Perhaps the best evidence available as to the perceived value of patents is that, in the United States, the number of filed patent applications and issued patents continues to climb.[22] In 1995, inventors filed 221,304 patent applications at the United States Patent and Trademark Office ("USPTO"). In 2000, that number had

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[18]David D. Friedman *et al.*, "Some Economics of Trade Secret Law," 5 *Journal of Economic Perspectives* (1991), 61.

[19]Levin, Richard C. *et al.*, "Appropriating the Returns for Industrial Research and Development," *Brookings Papers on Economic Activity*, 1987, in *The Economics of Technical Change*, eds. Edwin Mansfield and Elizabeth Mansfield (Vermont, Edward Elgar Publishing Co., 1993).

[20]Sally Wyatt & Gilles Y. Bertin, *Multinationals and Industrial Property* 139 (Harvester 1988).

[21]J. Douglas Hawkins, "Importance and Access of International Patent Protection for the Independent Inventor," 3 *University of Baltimore Intellectual Property Journal* (1995), 145.

[22]Robert Hunt, "Patent Reform: A Mixed Blessing for the U.S. Economy?," Federal Reserve Bank of Philadelphia Business Review, available at http://www.phil.frb.org /files/br/brnd99rh.pdf.

increased to 293,244 applications. These statistics suggest that members of the technological community continue to view patents as valuable.

The patent system has long been subject to criticism, however. Some observers believe that the patent system encourages industry concentration and presents a barrier to entry in some markets.[23] For example, the World Health Report 2000 of the World Health Organization reportedly identified patents as a significant barrier to entry for generic pharmaceutical manufacturers.[24]

Others believe that the patent system too frequently attracts speculators who prefer to acquire and enforce patents rather than engage in socially productive activity.[25] The late Jerome C. Lemelson, a prolific inventor who owned hundreds of patents and launched numerous charges of patent infringement, has sometimes been mentioned in this context. The annual revenue of the Lemelson estate's patent licensing program has been reported as collecting over $1.5 billion.[26] But as explained by journalist Michael Ravnitsky, "critics charge that many Lemelson patents are so-called submarine patents, overly broad applications that took so long to issue or were so general in nature that their owners could unfairly claim broad infringement across entire industry sectors."[27] Of such patent ventures, patent attorney James Pooley observes:

> Of course there is nothing inherently wrong with charging someone rent to use your property, including intellectual property like patents. But it's useful to keep in mind--especially when listening to prattle about losing American jobs to foreign competition--that these patent mills produce no products. Their only output is paper, of a highly threatening sort.[28]

Still other commentators suggest that the patent system often converts pioneering inventors into technological suppressors, who use their patents to block subsequent improvements and thereby impede technical progress.[29] The Wright brothers, for example, patented a method for stabilizing flight by warping the wings of an aircraft.[30] Their patent covered any system that varied the lateral margins of the wings in opposite directions. Soon thereafter, Glenn Curtiss and Alexander Graham Bell improved upon the Wright brothers' wing-warping device by using a set of wing flaps, or ailerons. Although the Curtiss-Bell invention was separately patented, use

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[23]*See* Thomas, *supra* note 4.

[24]"Gauging generics," *Pharmaceutical Executive* (1 Aug. 2000), 3537.

[25]Thomas, *supra* note 4.

[26]Nicholas Varchaver, "The Patent King," *Fortune* (14 May 2001), 202.

[27]Michael Ravnitsky, "More Lemelson Suits," *The National Law Journal* (17 Dec. 2001), B9.

[28]James Pooley, "Opinion: U.S. patent reform-a good invention," *Electronic Business* (1 Jan. 2000), 72.

[29]*See* Robert P. Merges & Richard R. Nelson, "On the Complex Economics of Patent Scope," 90 *Columbia Law Review* (1990), 839.

[30]*See* Steven C. Carlson, "Patent Pools and the Antitrust Dilemma," 16 *Yale Journal on Regulation* (1999), 359.

of that invention would result in the infringement of the Wright brothers patent. Some commentators believe that the Wright brothers employed their patent to block use of the Curtiss-Bell improvement invention to the detriment of the development of the U.S. aviation industry.[31]

When analyzing these contending views, it is important to note the lack of rigorous analytical methods available for analyzing the effect of the patent law upon the U.S. economy as a whole. The relationship between innovation and patent rights remains poorly understood. Concerned observers simply do not know what market impacts would result from changing patent term from its current twenty-year period, for example.[32] As a result, current economic and policy tools do not allow us to calibrate the patent system precisely in order to produce an optimal level of investment in innovation.

Legal Fundamentals

As mandated by the Patent Act of 1952,[33] U.S. patent rights do not arise automatically. Inventors must prepare and submit applications to the U.S. Patent and Trademark Office if they wish to obtain patent protection.[34] USPTO officials known as examiners then assess whether the application merits the award of a patent.[35] The patent acquisition process is commonly known as "prosecution."[36]

In deciding whether to approve a patent application, a USPTO examiner will consider whether the submitted application fully discloses and distinctly claims the invention.[37] In addition, the application must disclose the "best mode," or preferred way, that the applicant knows to practice the invention.[38] The examiner will also determine whether the invention itself fulfills certain substantive standards set by the patent statute. To be patentable, an invention must be useful, novel and nonobvious. The requirement of usefulness, or utility, is satisfied if the invention is operable and provides a tangible benefit.[39] To be judged novel, the invention must not be fully anticipated by a prior patent, publication or other knowledge within the public

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[31]*See* George Bittlingmayer, "Property Rights, Progress, and the Aircraft Patent Agreement," 31 *Journal of Law and Economics* 227, 230-31 (1988).

[32]*See* F. Scott Kieff, "Property Rights and Property Rules for Commercializing Inventions," 85 *Minnesota Law Review* (2001), 697.

[33]P.L. 82-593, 66 Stat. 792 (codified at Title 35 United States Code).

[34]35 U.S.C. § 111.

[35]35 U.S.C. § 131.

[36]John R. Thomas, "On Preparatory Texts and Proprietary Technologies: The Place of Prosecution Histories in Patent Claim Interpretation," 47 *UCLA Law Review* (1999), 183.

[37]35 U.S.C. § 112.

[38]*Ibid.*

[39]35 U.S.C. § 101.

domain.[40] A nonobvious invention must not have been readily within the ordinary skills of a competent artisan at the time the invention was made.[41]

If the USPTO allows the patent to issue, the patent proprietor obtains the right to exclude others from making, using, selling, offering to sell or importing into the United States the patented invention.[42] Patent title therefore provides inventors with limited periods of exclusivity in which they may practice their inventions, or license others to do so. The grant of a patent permits the inventor to receive a return on the expenditure of resources leading to the discovery, often by charging a higher price than would prevail in a competitive market.

Patent rights are not self-enforcing. A patentee bears responsibility for monitoring its competitors to determine whether they are using the patented invention or not. Patent proprietors who wish to compel others to observe their intellectual property rights must usually commence litigation in the federal courts.

An accused infringer may contend that the asserted patent is invalid.[43] Such an argument asserts that the USPTO improvidently granted the patent. However, by virtue of having been approved by the USPTO, each issue patent enjoys a presumption of validity. Accused infringers bear the burden of proving that a patent is invalid by clear and convincing evidence.[44]

Interested parties possess another mechanism for challenging the validity of an issued patent. They may request that the USPTO commence an administrative revocation proceeding termed a "reexamination." In order to provoke a reexamination, an individual must present the USPTO with one or more pertinent patents and printed publications. If the USPTO agrees that these references raise a substantial new question of patentability,[45] the agency will subject the patent to a renewed prosecution in light of this additional information.

The maximum term of patent protection is ordinarily set at 20 years from the date the application is filed.[46] The patent applicant gains no enforceable rights until such time as the application is approved for issuance as a granted patent, however. Once the patent expires, others may employ the patented invention without compensation to the patentee.

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[40]35 U.S.C. § 102.

[41]35 U.S.C. § 103.

[42]35 U.S.C. § 271(a).

[43]35 U.S.C. § 282.

[44]*Ibid.*

[45]35 U.S.C. § 303(a).

[46]35 U.S.C. § 154(a)(2). Although patent term is based upon the filing date, the patentee gains no enforceable legal rights until the USPTO allows the application to issue as a granted patent. A number of Patent Act provisions may modify the basic 20-year term, including examination delays at the USPTO and delays in obtaining marketing approval for the patented invention from other federal agencies.

Competing Perspectives Upon The Goal of Patent Quality

The community of patent professionals has engaged in a dialogue over the desirability of high levels of patent quality. The traditional and probably most widely held view is that the USPTO should strive to maintain consistently high levels of patent quality. Two opposing views have arisen in response to this traditional view, however. One challenge is suggested by the Coase theorem, a staple of scholars within the law and economics movement. The second is the fundamental economic principle of rational ignorance. This report next reviews these three concepts.

Traditional Views

Government, industry, academia and the patent bar alike have long insisted that the USPTO approve only those patent applications that describe and claim a patentable advance.[47] Because they meet all the requirements imposed by the Patent Act, quality patents may be dependably enforced in court and employed as a technology transfer tool. Such patents are said to confirm private rights by making their proprietary uses, and therefore their value, more predictable. Quality patents also may clarify the extent that others may approach the protected invention without infringing. These traits in turn should strengthen the incentives of private actors to engage in value-maximizing activities such as innovation or commercial transactions.[48]

In contrast, poor patent quality is said to hold deleterious consequences. Large numbers of inappropriately granted patents may negatively impact entrepreneurs. For example, innovative firms may be approached by an individual with a low quality patent that appears to cover the product they are marketing. The innovative firm may recognize that the cost of challenging a patent even of dubious validity may be considerable. Therefore, the firm may choose to make payments under licensing arrangements, or perhaps decide not to market its product at all, rather than contest the patent proprietor's claims.

Some enterprises have also been accused of creating "patent thickets," or clusters of closely related patents that cover different aspects of a particular technology. For example, a drug company may own a suite of patents covering not just the pharmaceutical compound, but also various formulations, chemical intermediates, metabolites, and methods of manufacturing and using the pharmaceutical. Some enterprises have been said to cause follow-on patents to issue as earlier patents are set to expire, resulting in an "evergreening" portfolio that effectively extends patent term beyond the twenty-year statutory period.[49]

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[47] *See supra* note 7.

[48] Sherwin, *supra* note 7.

[49] *See* Alfred B. Engelberg, "Special Patent Provisions for Pharmaceuticals: Have They Outlived Their Usefulness?", 39 *IDEA: Journal of Law and Technology* (1999), 389.

Improvidently granted patents are also believed to create duplicative transactions costs. For example, if the patent quality is low, private parties must engage in extensive due diligence efforts in order to assess whether individual issued patents are enforceable or not. The result may be that the innovative community must consistently conduct their own private patent examinations, revisiting the work of the USPTO to see if it was done properly.

Poor patent quality may also encourage activity that is not socially productive. Perhaps attracted by large damages awards and a potentially porous USPTO, rent-seeking entrepreneurs may be attracted to form speculative patent acquisition and enforcement ventures. Industry participants may also be forced to expend considerable sums on patent acquisition and enforcement.[50] The net results would be reduced rates of innovation, decreased patent-based transactions, and higher prices for goods and services.

Poor patent quality may also negatively impact market capitalization and other investment decisions. The stock market valuation of a firm may depend in part upon its patent position. An episode that suggests this relationship occurred on March 14, 2000, when in response to the completion of Phase I of the Human Genome Project President Bill Clinton and UK Prime Minister Tony Blair issued a joint statement urging that "raw fundamental data on the human genome . . . should be made freely available to scientists everywhere."[51] A number of biotechnology companies lost a substantial percentage of their market capitalization as investors sold shares in record numbers.[52] Among these enterprises were Human Genome Sciences, Inc, which fell 25% on the day on the announcement, and Incyte Pharmaceuticals, Inc., which fell 30%.[53] The chief concern of many sellers was that biotechnology patent rights would be weakened or subject to uncertainty.[54] The USPTO responded by issuing a press release on March 16, 2000, explaining that U.S. patent policy was unaffected by the joint statement. As the impact of the Clinton-Blair announcement was better understood, the stock prices of many biotechnology enterprises rose.[55] To the extent that venture capitalists and other individuals rely upon a firm's patent position when making investment decisions, poor quality suggests that patents may be unreliable measures of value.

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[50]Robert P. Merges, "As Many As Six Impossible Patents Before Breakfast: Property Rights for Business Concepts and Patent System Reform," 14 *Berkeley Technology Law Journal* (1999), 577.

[51]Peter G. Gosselin & Paul Jacobs, "Clinton, Blair to Back Access to Genetic Code," *Los Angeles Times* (14 March 2000), C1.

[52]Greg Heberlein, "Market movers: Biotech bubble pops as Nasdaq falls 200," *The Seattle Times* (15 March 2000), C1.

[53]"Clinton/Blair gene patent announcement draws reaction," *Biotech Patent News* (1 March 2000).

[54]Heberlein, *supra* note 52.

[55]Bob Woods, "Biotech Stocks Rebound After Analysts Address Clinton Speech," Newsbytes News Network (15 March 2000).

Although low patent quality appears to affect both investors and competitors of a patentee, patent proprietors themselves may also be negatively impacted. Patent owners may make managerial decisions, such as whether to build production facilities or sell a product, based upon their expectation of exclusive rights in a particular invention. If their patent is declared invalid by the USPTO or a court, the patentee will be stripped of exclusive rights without compensation. The issuance of large numbers of invalid patents would increase the possibility that the investment-backed expectations of patentees become unsettled.[56]

In sum, the traditional view is that patent quality matters. Under this perspective, the improvident issuance of patents brings many social costs. Inventors may possess diminished incentives to innovate and disclose their innovations, venture capitalists may be hindered by unreliable innovation indicators when making investment decisions, and markets may be restricted due to costly diligence efforts that suppress transactions. In contrast, high quality patents are said to contribute to the incentives of private parties to innovate, invest in the inventions that underlie their technological properties, and disclose their inventions to others without fear of opportunistic behavior.

The Coase Theorem

In contrast to the traditional view of patent quality, the Coase theorem offers a different perspective upon the worth of high levels of patent quality. The Coase theorem provides that when bargaining costs are zero, the initial assignment of legal entitlements does not affect the efficiency of the resulting allocation of resources.[57] Ronald Coase, who was awarded the 1991 Nobel Prize in Economics, introduced this concept in 1960 in his article "The Problem of Social Cost."[58] The implication of the Coase theorem is that, in the absence of transaction costs, legal rules do not affect individuals' economic behavior.[59]

An example illustrates the logic of the Coase theorem. Suppose that the use of machinery is worth $100 to a manufacturer but, because it generates a great deal of smoke, its operation causes $90 in injury to a neighboring homeowner. The efficient allocation of resources calls for continued operation of the manufacturer's equipment, for this creates $100 in value at a cost of only $90. If the manufacturer was forced to stop using her machines, the collective wealth of the two parties would be $10 less. The social cost would also be $10, for society as a whole would be $10 poorer.

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[56]*See* Craig Allen Nard, "Certainty, Fence Building and the Useful Arts," 74 *Indiana Law Journal* (1999), 759.

[57]Michael I. Swygert & Katherine Earle James, "A Primer on the Coase Theorem: Making Law in a World of Zero Transaction Costs," 11 *DePaul Business Law Journal* (1998), 1.

[58]Ronald H. Coase, "The Problem of Social Cost," 3 *Journal of Law & Economics* (1960), 1.

[59]Herbert Hovencamp, "Marginal Utility and the Coase Theorem," 75 *Cornell Law Review* (1990), 783.

The Coase theorem says that the efficient outcome -- continued operation of the manufacturer's equipment -- will result whether or not the manufacturer is held liable under nuisance law or not. If the manufacturer is liable, he will be willing to bargain with the homeowner to continue operating the machinery. If for example, the manufacturer pays the homeowner $95, both the manufacturer and the homeowner will be $5 better off. If the manufacturer is not liable, the homeowner will be willing to pay the manufacturer only $90 to stop using the machinery, but the manufacturer will be unwilling to accept anything less than $100. Once again, the manufacturer will continue operating the machinery.

In this example, the implication of the Coase theorem is that the assignment of legal liability to the manufacturer will not determine whether the manufacture may use his machines or not. Forces of supply and demand dictate that the machinery will run. Whatever the legal determination, the parties will bargain to achieve the same efficient result.

To continue this hypothetical, observe that the parties will not reach an optimal result if the costs of communication and bargaining exceed $10. Such costs are commonly known as "transaction costs." If the manufacturer is found liable and transaction costs are $15, the manufacturer must pay the homeowner at least $90 plus the $15 in transaction costs before the homeowner will agree to permit the machinery to operate. But the manufacturer is unwilling to pay more than $100. No bargain can be reached, and the presence of transaction costs will lead to social losses.

The Coase theorem, by its own terms, involves a world where transactions may be completed without cost. Nevertheless, it is regarded as offering insights into making legal decisions in a real world in which substantial transaction costs exist. One such insight is that if transaction costs are low, private markets will achieve the optimal resource allocation regardless of any entitlements assigned by the law. Some commentators suggest that acceptance of the Coase theorem permits decision makers to spend less resources on difficult, value-laden questions of deciding how to assign legal entitlements, and instead merely attempt to reduce marketplace transaction costs.[60]

Applied to the patent law, the Coase theorem suggests that low patent quality does not detract from efficient operation of markets. Stated in the manner of the Coase theorem, the allocation of initial entitlements of patent rights between rival inventors is irrelevant to reaching economically efficient outcomes. Suppose, for example, that Company A can produce a patented product more cheaply than Company B. If Company B holds a patent, then the parties can be expected to negotiate an assignment or license. Absent nontrivial transaction costs, private bargaining will inevitably transfer Company B's patent to Company A, an entity that more highly values the asset. Alternatively, if Company A owns the patent, or if no patent exists, then Company A can market its product without negotiating a license.

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[60]Daniel Q. Posin, "The Coase Theorem: Through a Glass Darkly," 61 *Tennessee Law Review* (1994), 797.

Although the parties' individual wealth varies depending upon who owns the patent, in either case Company A's superior product will reach the market.[61]

The Principle of Rational Ignorance

A second challenge to the traditional goal of patent quality comes from the principle of rational ignorance. This principle recognizes that obtaining information can be a costly undertaking. An individual may spend more resources acquiring certain information than the benefits that information will provide. When the cost of acquiring information exceeds the benefits to be derived from the information, it is rational to remain ignorant.[62]

Suppose, for example, that a surgeon may command fees of $300 per hour. From the perspective of a cost-benefit analysis, the surgeon would not wisely spend an hour clipping grocery coupons from a newspaper, for a benefit of saving perhaps $10 from his grocery bill. Such a surgeon is rationally ignorant about opportunities to save money from local grocers.

Mark Lemley, a member of the University of California at Berkeley law faculty, has recently applied the rational ignorance principle to the issue of patent quality. Lemley asserts that the USPTO wisely spends little time and effort examining individual applications.[63] Lemley's initial observation is that only about 5% of issued patents are subject to litigation or licensing. As a result, money spent improving USPTO examination procedures is, in Lemley's view, largely wasted on the large majority of patents that will never be used. Lemley reasons that society is better off making a searching inquiry of the prior art only in those few cases where a patent is licensed or litigated.

Lemley therefore concludes that the USPTO has rationally chosen to be lenient when deciding whether or not to allow particular patent applications to issue. Because the cost of making rigorous validity determinations for each patent application exceeds the benefits, according to Lemley, resource-intensive efforts to improve patent quality would be unwise. Lemley advises that the innovative community should resign itself to the fact that invalid patents will issue and allow the federal judiciary to deal with them during enforcement litigation.

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[61]Robert P. Merges, "Of Property Rules, Coase and Intellectual Property," 94 *Columbia Law Review* (1994), 2655.

[62]Ralph T. Byrns & Gerald W. Stone, *Economics* (4th ed. 1989) 433.

[63]Mark A. Lemley, "Rational Ignorance at the Patent Office," 95 *Northwestern University Law Review* (2001), 1495.

An Assessment of Challenges to Traditional Notions of Patent Quality

Acceptance of one of these three views of patent quality holds consequences for patent administration. Maintenance of the traditional view indicates that the USPTO should take steps to ensure that each patent it issues marks a patentable advance over the prior art. If there is a perceived shortcoming in patent quality, the USPTO should take more ambitious steps to improve the rigor of its patent examination procedures.[64]

In contrast, acceptance of the Coase theorem or rational ignorance principle suggests that the USPTO should not be overly concerned with patent quality, but instead process patent applications as quickly as possible. In keeping with the Coase theorem and rational ignorance principle, the USPTO might choose to suspend substantive patent examination, wherein examiners consider whether the claimed invention meets core patentability requirements such as novelty and nonobviousness, and instead simply register each filed patent application. Further, if reforms of the patent system are considered at all, the Coase theorem and rational ignorance principle suggest that they be directed towards increasing the efficiency of litigating and licensing of those patents that prove commercially valuable.

Each of these three accounts of patent quality may deserve further consideration, however. The traditional view of patent quality may be theoretically sound but difficult to achieve in practice. The contrast of the Coase theorem and rational ignorance principle with the prevailing wisdom of the patent community, as well as their profound implications for patent administration, suggests that they may not so easily translate into the patent system. This report next considers the limits of these concepts as applied to the regime of patents.

Assessing Traditional Views of Patent Quality

The practical achievability of the traditional concept of patent quality should be considered in light of the demands that Congress has placed upon the USPTO through the patent statute. Section 102 of the patent statute defines the prior art pertinent to each application. Information meeting the requirements of this provision must be contrasted with the claimed invention in order to decide the issues of novelty and nonobviousness. Section 102 is a long provision that is not easily susceptible to summary. However, its prior art definition generally includes all patents and printed publications available anywhere, as well as technology known or on sale within the United States.[65] These references must have been available either prior to the time the invention was made, or more than one year before the inventor filed an application at

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[64] *See, e.g.*, Julie E. Cohen, "Reverse Engineering and the Rise of Electronic Vigilantism: Intellectual Property Implications of 'Lock-Out' Programs," 68 *Southern California Law Review* (1995), 1091; Andy Johnson-Laird, "Looking Forward, Looking Backward?," 4 *Journal of Small & Emerging Business Law Review* (2000), 95; Jay P. Kesan & Marc Banik, "Patents as Incomplete Contracts: Aligning Incentives for R&D Investment with Incentives to Disclose Prior Art," 2 *Washington University Journal of Law and Policy* (2000), 23.

[65] 35 U.S.C. § 102.

the Patent Office. Many of these references are subject to a minimal requirement of public availability. Section 102 also allows for so-called secret prior art, however, which need not have been publicly accessible at all.[66]

The § 102 prior art definition is quite broad. Every book, journal article, leaflet, and student thesis published anywhere in the world in any language potentially serves as prior art. Other permissible sources of prior art, such as sales offers or knowledge, need not have been formally documented at all.[67] The difficulties inherent in obtaining, organizing, and analyzing these diverse sources of prior art should be apparent.[68]

As a result, the decision that the USPTO should maintain persistently high quality levels for all issued patents may therefore not be a light one to make. The USPTO likely does not have ready access to all the information that is statutorily pertinent to patentability. Accessing this information may be costly and in many cases may not be practical.

The USPTO also appears to face a number of practical difficulties that make the goal of high patent quality hard to fulfill. Well-publicized budgetary policies have diverted funds from the USPTO to other governmental functions, resulting in a decrease in the hiring and training of examiners.[69] Although the USPTO currently employs approximately 3,000 examiners, it claims to need to hire 700 more during the year 2002. The resources associated with training this cohort of neophyte patent examiners may be considerable.

The USPTO has also experienced difficulty in retaining its examiners. A boom in the intellectual property profession resulted in a situation where trained examiners with several years of experience could find higher-paying jobs in the private sector. In the year 2000, attrition among examiners was 14 percent. Some USPTO initiatives to raise salaries have resulted in some decreases to the attrition rate.[70]

According to some observers, the allowance of patents on business methods has also exposed the USPTO to many new disciplines in which it has scant examining experience.[71] Traditionally, the patent system was combined to inventions from the sciences and engineering. However, recent judicial decisions have opened the patent system to virtually any innovative advance. As a result, the USPTO must deal with application in disciplines such as finance, marketing, architecture and education.[72] In

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[66]35 U.S.C. § 102(e).

[67]Thomas, *supra* note 4.

[68]*Ibid.*

[69]*Ibid.*

[70]Sabra Chartrand, "New Patent Office Has Old Goal," *New York Times* (31 Dec. 2001).

[71]Thomas, *supra* note 4.

[72]*Ibid.*

these disciplines new to the patent system, the USPTO may have few competent examiners and little documentation of the state of the art.[73]

Patent applications have also become more difficult to process, reflecting the increasing sophistication of technological advance. USPTO Director James E. Rogan remarked that one patent application was recently filed with 12 CD's, the equivalent of six million pages of data. The expertise and time required for the USPTO to process such an application would appear to be considerable.[74]

As well, the number of filed patent applications has increased dramatically in recent years. In 2000, the USPTO received nearly 312,000 applications, 75 percent more than the 178,000 received in 1991.[75] This surge in applications has led some commentators to suggest that the capabilities of the USPTO are becoming more strained.[76]

In sum, although the goal of consistently high levels of patent quality may be a sound one, it may be very difficult to achieve. The patent statute makes an enormous amount of information pertinent to the patentability of each application. However, not all of this of this information is readily availability to USPTO examiners. The USPTO also arguably faces a challenging operating environment in terms of its budget, personnel and workload. The maintenance of higher levels of patent quality than are currently observed may require additional resource expenditures or improved grant procedures at the USPTO.

Assessing the Coase Theorem

Several points of distinction also distance the Coase theorem from the realities of the contemporary patent system. First, the Coase theorem presumes that interested parties passively accept the rights and responsibilities given to them by the legislature and courts. Returning to an earlier hypothetical, for example, the manufacturer and homeowner simply accept the tort law of nuisance as it exists. Neither party expends resources encouraging a legislature or court to establish or amend the nuisance law.[77]

This presumption stands in high relief to the workings of the patent system. Inventors and patent attorneys devote substantial resources, recently estimated at over $4 billion annually, towards obtaining rights allocations from the USPTO.[78] Each week thousands of patents issue, and thousands more patent applications are filed. These high initial resource expenditures present a substantially different starting point than the Coase theorem's presumption that entitlements are costlessly received. If

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[73] *Ibid.*

[74] Chartrand, *supra* note 70.

[75] *Ibid.*

[76] *Ibid.*

[77] *See* Chulho Jung *et al.*, "The Coase Theorem in a Rent-Seeking Society," 15 *International Review of Law and Economics* (1995), 259.

[78] *See* Lemley, *supra* note 63.

resource expenditures associated with patent acquisition are accounted for, it may be more difficult for interested parties to achieve efficient results through Coasian bargaining.

Another difficulty in translating the Coase theorem into the patent system is that the Coase theorem is more concerned with maximizing overall social utility rather than with ensuring a just distribution of resources. The Coase theorem explains that total output in an economy is unaffected by the initial allocation of rights. To continue the earlier example of the manufacturer and the homeowner, in the absence of transaction costs the parties will bargain to produce the same outcome regardless of whether the manufacturer is liable in tort to the homeowner or not. However, although the Coase theorem does not expressly state this, the determination of the manufacturer's liability will decide whether wealth is transferred between the parties. If the manufacturer would be liable to the homeowner, then the homeowner will have more money after the bargain is struck.[79]

The Coasian indifference to resource distribution does not appear to match well with a patent law that allocates property rights to inventors rather than infringers. That parties will bargain to the efficient outcome regardless of the initial allocation of patent rights is beside the point. The patent law grants property rights to individuals in order to stimulate them to invent, to disclose their inventions, and to license their technological properties to others. Unlike the Coase theorem, it matters in the patent law whether or not the actual inventor of a particular technology will receive a proprietary interest.

A third point of departure between the Coase theorem and the modern patent system is that Coasian bargaining assumes that the parties will equitably divide -- rather than dispute -- the cooperative surplus to be gained through their bargaining. Recalling the earlier example, the manufacturer and the homeowner will supposedly agree to split the difference between the value to the manufacturer of running smoke-producing machines and the harm to the homemaker. Although this bargaining may succeed with regard to smoke particles, the parties may have a more difficult time achieving consensus with regard to the intangible properties awarded by the patent law. In the patent law, there is no smoky soot or other tangible marker of the infringement of the property right. Inventors often work at different times and places, and the prior inventions of others may be unknowingly incorporated into subsequent products.

As a result, the bargaining parties may disagree about whether and to what degree the prior work added to the value of the subsequent one. Prior creations may be minor inputs that are subsequently incorporated into a larger product, or they may take on a form similar to a common predecessor technology. In the case of patented inventions, an infringer may have no way of knowing that her own independent invention is an infringement, or that, at the time she makes her investment decisions, that a pertinent patent even exists. Experience suggests that patent proprietors and accused infringers often disagree about whether the latter party employs the patented invention at all, not to mention its value relative to prior art knowledge. These factors

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[79]Merges, *supra* note 61.

at the least suggest very high transactions costs that will often defeat Coasian bargaining.[80]

These three distinctions suggest that the Coase theorem lacks significant explanatory power within the context of the patent system. Many differences may exist between the assumption built into the Coase theorem and the contemporary realities of the patent law. As a result, the Coase theorem does not appear to have gained acceptance within the intellectual property community.

Assessing the Principle of Rational Ignorance

The rational ignorance principle too may possess shortcomings when applied to the patent system. First, the rational ignorance principle assumes that the decision maker, when deciding whether to obtain additional information or not, knows that he will bear responsibility for that choice.[81] To return to an earlier example, the surgeon decides not to clip coupons knowing that he could pay less at the grocer.

In contrast to the surgeon, the USPTO bears no responsibility for allowing an invalid patent to issue. Courts do not fine the USPTO upon invalidating a patent; the examiners who allowed the case are not disciplined for their oversight; nor must the USPTO compensate affected members of the public for an improvident grant. The costs of not acquiring information are simply shifted to other actors, in particular the federal courts, the patentee's competitors and ultimately consumers. Under these circumstances, the threshold under which the USPTO becomes rationally ignorant is extremely slight. Yet just because the USTPO acts rationally given its own role and resources does not necessarily imply that the patent acquisition regime as a whole acts efficiently.

The theory of rational ignorance also makes the most sense for the patent system if the rate of patent usage is believed to be very low. For example, Lemley estimates that only about 1.5% of issued patents are litigated, with an additional 3.5% being licensed.[82] Lemley further observes that the Patent Act requires patentees to pay maintenance fees during the term of the patent. If the patentee does not pay the appropriate fee in a timely fashion, the patent will expire. In Lemley's view, the fact that few patentees pay maintenance fees sufficient to sustain the patent through its maximum twenty-year term suggests that the great majority of patents lack commercial value.[83]

Other research suggests higher patent usage rates than surmised by Lemley, however, even where these patents are not maintained for their maximum life. A study conducted by economist Ove Granstrand, a member of the faculty of the Chalmers University of Technology in Sweden, reveals robust rates of commercial

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[80]*Ibid.*

[81]*See* Byrns & Stone, *supra* note 62.

[82]Lemley, *supra* note 63.

[83]*Ibid.*

usage among the Japanese and Swedish corporations he surveyed in 1992.[84] Granstrand's survey results follow:

Table1. Patent Usage Survey Results

	Percentage of patented inventions that were marketed	Percentage of patents leading to market success	Percentage of patents that were licensed	Average number of years that patents are maintained	Percentage of patents kept to maximum term
Japanese firms	26.1	14.7	11.3	10.5	16.1
Swedish firms	60.5	38.1	4.9	11.4	21.6

The Grandstrand study suggests that many patented inventions may have commercial significance, even though the proprietor chooses not to pay maintenance fees that would allow the corresponding patent to endure for its maximum term. In considering this data, the fact that patent maintenance fees are increasingly costly as the patent ages may be significant.[85] Also, the product cycles in some industries, such as computer software and electronics, tend to be far shorter than the maximum twenty-year patent term.[86]

Another survey, conducted by Professor Ron Westrum and businessman Ed Zimmer, concluded that the prospects of independent inventors making patent-based profits were comparable to the overall success rates of small businesses.[87] The Westrum and Zimmer study found that 34% of patented inventions were profitable. This study also suggests that for independent inventors, many more patented inventions achieve marketplace successes.

Finally, use of the rational ignorance principle also depends upon a comparison of the costs and benefits of high patent quality. There may be good reason to believe that the cost of intellectual property compliance is considerable within the United States. To the extent that improvidently granted patents are among those intellectual properties that firms must respect, such patents may add considerably to the cost of doing business in the United States.

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[84]Ove Granstrand, *The Economics and Management of Intellectual Property* (1999), 165.

[85]*See* Thomas J. Kowalski, "The Maintenance Fee System and Policy of the Patent and Trademark Office: Arbitrary, Irresponsible and In Need of Reform," 30 *IDEA: Journal of Law and Technology* (1989), 95.

[86]*See* Mark Aaron Paley, "A Model Software Petite Patent Act," 12 *Santa Clara Computer and High Technology Law Journal* (1996), 301.

[87]Reported in Joanne Hayes-Rines, "Invention Survey," *Investor's Digest* (Nov./Dec. 2001), 30.

One benchmark consists of the $843 billion Americans spent on compliance with federal regulations in 2000. This sum is equal to 8 percent of the U.S. Gross Domestic Product and amounts to $8,164 per household; it does not account for benefits obtained from that regulation. A recent Small Business Administration study found that companies with 20 workers or less face an annual regulatory toll of $6,975 per employee.[88] A great deal of this regulation is embodied within the daily Federal Register. The 2000 Federal Register consisted of 83,000 pages of regulations, proposed rules, notices, executive orders, proclamations and other presidential documents.

Eighty-three thousand pages of regulations is a large number, but it is considerably smaller than the number of pages of patents that issue. In the year 2000, the USPTO issued 175,983 patents. This number works out to 3,350 patents in each USPTO Official Gazette, which together comprise approximately 40,000 pages per week. In sum, the USPTO issues roughly as many pages of regulations in a fortnight as the rest of the federal government publishes within the Federal Register in a year.

In light of the high costs of complying with federal regulation, there is ample reason to believe that the costs of complying with USPTO work product may be substantial. Even if the percentage of improvidently granted patents is relatively small, the size of the patent system is such that they may amount to an impressive amount of regulation. Although commentators such as Lemley confine the costs of improvidently issued patents to the expenses associated with litigating patent enforcement charges, such costs are likely much higher.

As with the Coase theorem, the principle of rational ignorance too may hold little prescriptive power in the context of patents. Rational ignorance arguably does a poor job of describing the role of the USPTO within the patent system. Further, the costs of improvidently granted patents may be much higher than the litigation or licensing costs associated with some of them. Simply put, once the costs of poor quality mount, so does the value of assessing whether that patent should have been granted or not. Ignorance may no longer be a rational option.

Concluding Observations

The USPTO has traditionally counted among its goals as the achievement of consistently high levels of patent quality. Challenges founded upon the Coase theorem and rational ignorance principle have cast some doubt upon this aspiration. Although each of these three accounts of patent quality has its merits and shortcomings, it is difficult to assess quantitatively the optimal level of patent quality. Most apparent is that the ideal of patent quality is easy to articulate yet difficult to achieve in practice.

Some legislation introduced before the 107th Congress bears upon the patent quality issue. H.R. 1333, the Patent Improvement Act of 2001, would require patent applicants to disclose whether they completed a prior art search in connection with

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[88]W. Mark Crain & Thomas D. Hopkins, The Impact of Regulatory Costs on Small Firms. Available at http://www.sba.gov/advo/research/rs207tot.pdf.

that application. H.R. 1333 would also establish administrative patent revocation proceedings called oppositions. Oppositions would allow interested parties to contest an issued patent or pending patent application, possibly providing the USPTO with more salient data that could inform patentability determinations.

Should Congress further consider this issue, there exists the possibility that USPTO administrative practices could be reviewed with an eye towards their capability for maintaining high levels of patent quality within practical constraints. Congress may wish to consider whether patent examiners have appropriate resources and training that will allow them to conduct a rigorous review of patent applications. The responsibilities of patent applicants to contribute to quality patent examination might also be weighed. Finally, Congress might wish to assess the contributions members of the general public might make within an optimal patent examination regime. A subsequent report will proceed further with this analysis, considering practical measures directed towards patent quality.