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Taking the Utilitarian Basis for Patent Law Seriously: The Case for Restricting Patentable Subject Matter

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Taking the Utilitarian Basis for Patent Law Seriously: The Case for Restricting Patentable Subject Matter

David S. Olson[*]

Abstract

Courts, the Patent Office, and commentators are in vigorous disagreement about what types of innovation should be patentable, and what, if any, innovation should remain off-limits to patenting. This Article shows that the disarray in the area of patentable subject matter results from a widespread failure to take the utilitarian policy underlying patent law seriously. Despite near-universal agreement that patent rights exist to provide incentives for innovation by allowing inventors to recoup their costs of research and development, courts have expanded patentable subject matter to many new fields without first demanding evidence that the newly patentable fields suffer from lack of incentives to innovate. The failure to ask the threshold question of whether patents are needed in a particular field to achieve efficient levels of innovation has resulted in both incoherent case law on patentable subject matter, and costs to society from increased patent monopolies.

This Article explains that the sensible basis for determining patentable subject matter is to determine whether innovation is unlikely in the absence of patents. Part II of the Article sets forth an explanation and model showing that there is no reason to expand patentable subject matter into fields where innovation is already healthy due to other incentives such as low R&D costs, lead-time or reputation benefits from innovation, or other legal protections such as trade secret and copyright law. To the extent that others argue for patentability even where there is no market failure in innovation, they are not following the utilitarian rationale for patent law, and incoherence results.

Part III of the Article demonstrates how courts historically considered the issue of innovation market failure, at least implicitly, in their decisions as to what types of inventions were not patentable. But with the advent of software and the Information Age, the courts' patentable subject

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matter tests no longer fit. Rather than reworking their tests to serve patent law's underlying rationale, they instead slowly abandoned their role as gatekeepers of patentable subject matter, resulting in the current inefficient regime in which almost all innovation is patentable. The courts failure to grapple with the utilitarian rationale for patentability means that current judicial consideration of patentable subject matter continues to be misdirected. Part IV applies the model and explanation from Part II to the sample case of business methods—one of the fastest growing and most harmful areas of patenting—showing an example of a field in which patents are not efficient. Finally, Part VI urges that the courts or Congress return consideration of market failure to the center of patentable subject matter determinations.

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I. INTRODUCTION

There is widespread agreement that the reason we have a patent system is utilitarian—to solve a market failure problem. The theory is that absent the right to exclude that patents provide, copycats will quickly enter the market and drive down prices below the price at which the inventor can recoup her research and development costs. In other words, without patent grants, too little innovation will occur because the rational inventor will not bother to invent knowing that she will not be able to recoup the cost of invention.[1] It is also well-recognized that our patent system's mechanism for incentivizing innovation—granting property rights to inventors—causes deadweight loss to society in the form of higher prices and some consumers ending up priced out of the market. Accordingly, a properly crafted patent law should provide enough property rights to incentivize the socially desirable (efficient) level of innovation, and no more. Patents broader in scope or longer in duration than the inventor needs to recoup her costs of invention (research and development) inevitably harm society in the form of higher prices on patented goods, fewer numbers of consumers able to purchase the patented goods, and decreased GDP through deadweight loss.

A review of patent literature confirms the widespread agreement on the above propositions.[2] It is, therefore, anomalous and troubling that the

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[1] The utilitarian rationale for patent law is set forth explicitly in the Constitution. U.S. CONST. art. I, § 8, cl. 8 ("To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries.") Moreover, a survey of patent law casebooks shows that law students are uniformly taught that our patent system exists to achieve explicitly utilitarian aims: incentivizing the production and distribution of innovation. *See, e.g.*, ROBERT P. MERGES & JOHN F. DUFFY, PATENT LAW AND POLICY: CASES AND MATERIALS 1-13 (4th ed. 2007); MARTIN ADELMAN ET AL., CASES AND MATERIALS ON PATENT LAW 33-45 (1998); WILLIAM H. FRANCIS ET AL., CASES AND MATERIALS ON PATENT LAW 66-73 (4th ed. 1995); ROBERT P. MERGES ET AL., INTELLECTUAL PROPERTY IN THE NEW TECHNOLOGICAL AGE 127 (Rev. 4th ed. 2007); ROCHELLE COOPER DREYFUSS & ROBERTA ROSENTHAL KWALL, INTELLECTUAL PROPERTY: TRADEMARK, COPYRIGHT, AND PATENT LAW 553 (1996).

[2] *See, e.g.*, WILLIAM D. NORDHAUS, INVENTION, GROWTH, AND WELFARE: A THEORETICAL TREATMENT OF TECHNOLOGICAL CHANGE 70-90 (1969) (analyzing the tradeoff between patents' enhanced incentives and the reduction in competition due to patent exclusivity); Kenneth W. Dam, *The Economic Underpinnings of Patent Law*, 23 J. LEGAL STUD. 247, 247 (1994) (discussing the utilitarian basis for patent law); Robert P. Merges, *Commercial Success and Patent Standards: Economic Perspectives on Innovation*, 76 CAL. L. REV. 803, 808-09 (1988) (laying out the utilitarian motivation for patent protection); Robert P. Merges & Richard R. Nelson, *On the Complex Economics of Patent*

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current law in the U.S. regarding what types of inventions are eligible for patenting (patentable subject matter) has developed with little explicit consideration of the utilitarian question that should guide our crafting of patent law, and especially of the determination of which subject matter should be patentable. If we are utilitarian about patent law, then the question to be asked for each potentially patentable subject matter is whether there is a market failure present such that granting patentable subject matter status to a particular type of innovation will do more harm than good? If there is, the subject matter should be patentable. If not, no patent rights should exist for that area of innovation. Thus, when it comes to whether a particular type of innovation should be patentable, the following questions should be asked. (1) Would this type of innovation occur at sufficient levels without a patent grant? (2) Would granting a patent right for this type of innovation cause more loss to society than gain? (3) If society would not benefit from granting patentability to the particular type of innovation, can sufficiently clear lines be drawn between this subject matter and other subject matter that does need the protection of patentability? If the answer to the third question is no, then a fourth question should be asked: (4) considering as a whole the type of subject matter within which the particular subtype of innovation that does not need patentability falls, does society gain or lose from granting patents to the broader subject matter as a whole?

While this analysis and these questions naturally follow from taking seriously patent law's purpose of solving market failures, it may be surprising for the non-initiate to learn that the courts have allowed a breathtaking expansion of patentable subject matter in the last few decades

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Scope, 90 COLUM. L. REV. 839, 839 (1990) (noting that "the economic significance of a patent depends on its scope: the broader the scope, the larger the number of competing products and processes that will infringe the patent" and further noting that "proprietary control of technology tend to cause 'dead weight' costs due to restrictions on use."); Julie E. Cohen & Mark A. Lemley, *Patent Scope and Innovation in the Software Industry*, 89 CAL. L. REV. 1, 50 (2001) (stating that the "central task" of the patent system is "ensuring sufficient rewards (and therefore sufficient incentives) to patentees while avoiding an unnecessary degree of deadweight loss to society as a whole."); Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & ECON. 265 (1977) (setting forth the thoroughly utilitarian "prospect theory" of patents); Paul Klemperer, *How Broad Should the Scope of Patent Protection Be?*, 21 RAND J. ECON. 113 (1990); Alan Greenspan, Remarks at the Stanford Institute for Economic Policy Research Economic Summit: Intellectual Property Rights (Feb. 27, 2004) http://www.federalreserve.gov/boarddocs/speeches/2004/200402272/default.htm (querying "[a]re the protections sufficiently broad to encourage innovation but not so broad as to shut down follow-on innovation?").

without any discussion as to whether each new area of patentability is welfare-enhancing. Some might justify this by arguing that the patentable subject matter section of the patent statute does not say anything about granting patents only in cases of market failure. This is true, but such an argument ignores that for most of the history of this country, courts limited patentable subject matter in ways that, at least implicitly, sought to deny patentability where it was likely that no market failure was present. Such limitations are now almost non-existent, although, likely in an effort to avoid Supreme Court review, the Federal Circuit has shown recently that it will disallow patents on processes not tied to any physical implementation,[3] and has decided to review its patentable subject matter jurisprudence *en banc*.[4]

The purpose of this Article is threefold. First, the Article seeks to answer the question: why has this large expansion of patentable subject matter occurred without any seeming analysis of its efficiency? Second, using business methods as a specific example, the Article argues that not all types of innovation need the incentive of a patent grant to be produced at a socially desirable level. Third, the Article suggests that while courts could take the utilitarian analysis into account and return to the roles they played as crafters of a federal common law of patentable subject matter for the first century and a half of this country's existence, the optimal solution may be to assign an administrative agency with the task of conducting explicit utilitarian analysis and rulemaking in determining what types of innovation should be patentable.

The Article proceeds as follows. Following this introduction, Part II explains the utilitarian basis for patent law, the basic economics of the market failure problem that patent law seeks to solve, and the corresponding problem of deadweight loss that is created from patent protection. Part II explains the indisputable harms that come from granting patents where they are not needed.

Part III examines the federal courts' historic approach to patentable subject matter ("PSM"). PSM has always been defined very broadly in the patent statutes. Nevertheless, starting almost immediately, courts limited the types of innovations that qualified for patentability. Courts early on excluded abstract ideas, phenomena of nature, and laws of nature from patentability. These exclusions were sensible, because any increased

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[3] *See* In re Comiskey, 499 F.3d 1365 (2007); In re Nuijten, 500 F.3d 1346 (Fed. Cir. 2007).

[4] In re Bilski, 264 Fed. App'x 896 (2008).

incentive to innovate arising from patentability would have been far overshadowed by the cost to society of allowing ownership of these types of inventions and discoveries. In effect, the courts treated the broad wording of the PSM section of the patent statute as an invitation to engage in crafting a federal common law of PSM. This federal common law approach continued for almost two hundred years. Generally, the courts' determinations of what should not be PSM lined up with areas that likely did not need the incentive of a patent grant, or for which the patent grant would be unduly costly.

Historically, the federal courts did a fairly good job of denying patentability to the types of innovations that did not require patentability to be produced at socially optimal levels. Regardless of whether this resulted from fortuitous accident, or from an implicitly utilitarian approach to patentable subject matter, the courts have now largely abandoned their role as gatekeepers of subject matter patentability. A review of the history of patentable subject matter jurisprudence shows that for much of U.S. history the federal courts took it upon themselves to analyze classes of subject matter and exclude from patentability those types of innovation for which the patent grant likely would increase beneficial invention by less than the patent monopoly would cost society.

Critics of the courts' approach to PSM cases have pointed out that, especially with regard to older cases, the decisions sometimes seemed to turn on the issue of claim scope as much as PSM. The courts were wary about granting patent claims that were too broad or that allowed the invention to be described and claimed at too high a level of abstraction. This phenomenon certainly occurred in some of the cases, and for sensible reasons. If patentees were allowed to claim their invention at too high a level of abstraction, then their patent claims might cover more than they had actually invented, and such claims would have allowed patentees to block subsequent innovation.[5] But in addition to cases in which claim scope was perhaps the core issue, courts also held that some types of innovation simply were not patentable under the patent act. The case law review in Part III shows that a utilitarian market failure analysis seems to have underlain courts' analyses in these cases, and that generally the courts got the cost-benefit question right.

In Part III, I also engage the argument of some commentators that substantive PSM analysis was rightly abandoned because patents can be

[5] *See, e.g.*, Consol. Elec. Light Co. v. McKeesport Light Co., 159 U.S. 465 (1895). These days courts reject such claims on the grounds of inadequate written description or enablement. 35 U.S.C. § 112.

adequately examined under the statutory sections analyzing novelty, non-obviousness, written description and enablement. I point out that while it is true that individual patent claims in some cases (especially very old cases) could be better analyzed under other sections of the Patent Act, it simply does not follow that this means that all types of innovation need patent grants to be produced at adequate levels. Put differently, it does not follow from analyzing particular decisions about the scope of particular claims that no analysis should ever be done as to whether a type of innovation suffers from a market failure problem. There are obviously types of innovation for which R&D costs are low, and trade secrecy, head starts, lock-ins, or other sets of incentives adequately incentivize innovation. These types of innovations should not receive patent protection if we are concerned with achieving higher levels of societal welfare.

Part III finishes its review of PSM case law by showing that in recent decades, as technology and innovation have moved from the physical to the electronic and intangible—to computers, software, and Information Age processes—the traditional tests that courts developed to distinguish unpatentable subject matter have seemed inadequate. By relying on ossified tests instead of the underlying utilitarian calculus that courts historically used, at least implicitly, the courts in recent years found themselves in both line-drawing predicaments and in situations where innovation that obviously suffers from a market failure problem would be excluded by strict application of their old PSM tests. Instead of reworking their PSM tests for the Information Age, the pro-patent Federal Circuit, and to a lesser but still significant extent, the Supreme Court, simply threw up their hands and started reading section 101 of the patent statute broadly, such that virtually "anything under the sun made by man"[6] became patentable. While this eliminated the trouble of making hard decisions regarding PSM, patent examiners and courts left with only the remaining sections of the patent act as screens for patentability have been unable to refuse granting patents where they are not needed to incentivize invention.

Thus, federal courts have largely stopped denying patents based on rulings about the patentability of broad subject classes. Notwithstanding two recent Federal Circuit cases holding that it is still possible to draft a patent claim so untethered from the physical world that it will be denied for lack of patentable subject matter,[7] the trend over the last decades toward

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[6] Diamond v. Chakrabarty, 447 U.S. 303, 309 (1980)

[7] *See* In re Comiskey, 499 F.3d 1365 (2007); In re Nuijten, 500 F.3d 1346 (Fed. Cir. 2007).

allowing patents on virtually every type of subject matter is exemplified by such things as the allowance of patents on business methods,[8] tax strategies[9] and sports moves;[10] the elimination of the "technological arts" requirement for patentability; and the upholding of a patent on medical diagnosis in *Lab. Corp. of Amer. Holdings v. Metabolite Labs., Inc.*[11]

This Article argues that while the abandonment of the PSM gatekeeper role happened for historically understandable reasons, it is very problematic. The case law shows how we are now left with a specialized patent court, the Federal Circuit, that has increasingly relied on a bare textualist approach to the Patent Act, creating the current situation in which inventions not traditionally considered within the "technological arts" are nonetheless patentable. Since the courts have stopped actively excluding certain subject matter from patentability, no one else has stepped in to perform this function. This Article analyzes how the present lack of any thoughtful arbiter of patentable subject matter is costly to society. After setting out a model to show how some classes of subject matter are appropriate for patentability while others are not, this Article applies the model to business methods and concludes that patentability for this subject matter is inefficient. This conclusion begets the corollary conclusion that the reinstatement of some entity in the patentable subject matter gatekeeper role is desirable. Not only would this go a long way toward preventing unmerited patents and their significant attendant costs to society, it would also decrease the number of patent applications that must be fully examined by an overburdened Patent and Trademark Office (PTO).

The problem caused by unneeded patents has become more acute in recent years as entities have arisen that attempt to monetize patents not by practicing the patent, but by enforcing them aggressively against those who arguably infringe. This has led to a state of affairs in some industries, like software, in which firms forbid their employees from reviewing patents for fear of being sued for willfully infringing someone else's patent.[12] While this perverse behavior is caused in part by problems with the willfulness

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[8] *See, e.g.*, U.S. Pat. No. 5,960,411 (Amazon.com patent on 1-Click® ordering).

[9] *See, e.g.*, U.S. Pat. No. 6,567,790 (funding of a GRAT with nonqualified stock options); U.S. Pat. No. 6,292,788 (tax-deferred real estate transaction); U.S. Pat. No. 7,149,712 (purchase of an annuity contract to fund a charitable remainder trust); U.S. Pat. No. 7,177,829 (H&R Block'sTax Refund System).

[10] *See, e.g.*, U.S. Pat. No. 5,616,089 (method of putting).

[11] 548 U.S. 124 (2006).

[12] Mark A. Lemley et al., *Ending Patent Law's Willfullness Game*, 18 BERKELEY TECH. L.J. 1085 (2003).

standard for patent infringement,[13] it is also quite telling that firms in some areas do not think that reading patents is necessary to their product development. In other words, the benefit of disclosure of new invention that is the *quid pro quo* for a patent is thought to be of little or no use in some fields. That some firms are competing and producing new products without any reliance on the innovation disclosed in patents in the relevant field should give us some pause as to the value of, and need for, such patents.

The extension of patentability to new areas of innovation—some of which likely do not need the additional incentive—causes problems for the patent system in another way: it overburdens the patent office and correspondingly, more bad patents issue. There is wide consensus that thousands of unmerited patents are being granted each year.[14] These patents lack merit either because they are obvious/non-novel, or because no one makes use of the patented invention.[15] Unfortunately, such "worthless" patents are not costless. The owners of these patents increasingly are extracting payments from firms that do or make things that arguably are covered by these obvious or non-commercialized patents. Some entities have arisen that quite successfully monetize large portfolios of otherwise worthless patents. These entities are referred to disparagingly as "trolls," and various reform proposals have been made to address them. While numerous commentators have suggested reforms to improve patent quality,[16] knocking out whole areas of subject matter from patentability

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[13] *Id.*

[14] *See, e.g.*, Kimberly A. Moore, *Worthless Patents*, 20 BERKELEY TECH. L.J. 1521 (2005) (identifying worthless patents based on patent expiration from lack of payment of maintenance fees); Mark A. Lemley et al., *What to do About Bad Patents*, IP L. & BUS., January 2006, at 20; Lawrence Lessig, *The Problem With Patents*, INDUS. STANDARD, Apr. 23, 1999, http://www.thestandard.com/article/0,1902,4296,00.html.

[15] Some patents are simply absurd. *See, e.g.*, U.S. Patent No. 6,368,227, at [57] (filed Nov. 17, 2000) ("A method of swing[ing] on a swing is disclosed, in which a user positioned on a standard swing suspended by two chains from a substantially horizontal tree branch induces side to side motion by pulling alternately on one chain and then the other."); U.S. Patent No. 5,443,036 (filed Nov. 2, 1993) (method of exercising a cat by inducing it to chase the dot projected by a laser pointer).

[16] *See, e.g.*, Mark A. Lemley & Kimberly A. Moore, *Ending Abuse of Patent Continuations*, 84 B.U. L. REV. 63 (2004); Michael Risch, *The Failure of Public Notice in Patent Prosecution*, 21 HARV. J.L. & TECH. 179 (2007); Matthew Sag & Kurt Rohde, *Patent Reform and Differential Impact*, 8 MINN. J. L. SCI. & TECH. 1 (2007); Jay P. Kesan & Andres A. Gallo, *Why 'Bad' Patents Survive in the Market and How Should We Change?—The Private and Social Costs of Patents*, 55 EMORY L.J. 61 (2006); Kristen Osenga, *Entrance*

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would reduce the load on the patent office, allowing examiners to do a better job on patent examination. Moreover, although commentators have argued that patent quality will improve in areas of newly patentable subject matter as the PTO builds up its library of prior art and trains examiners in the new fields,[17] such improvement seems to be a long time coming, judging by the continuing high volume of bad patents in areas that were formerly unpatentable, like software and business methods.[18]

Ramps, Tolls, and Express Lanes—Proposals for Decreasing Traffic Congestion in the Patent Office, 33 FLA. ST. U. L. REV. 119 (2005).

[17] *See, e.g.*, Jeffrey R. Kuester & Lawrence E. Thompson, *Risks Associated with Restricting Business Method and E-Commerce Patents*, 17 GA. ST. U. L. REV. 657, 681 (2001):

> Every new technology presents the PTO with the challenges of creating a sufficient prior art database and channeling the expertise necessary to evaluate the prior art. Internet business method patents are similar, in this respect, to biotechnology and software. The PTO is designed to promote and incorporate new technologies; this, however, takes time. The PTO is taking steps to improve the prior art database and the expertise of the examining core. It is the authors' belief that the PTO will be able to improve the prior art database over time; thus, the costs associated with the challenges of business patents will eventually be reduced.

Id. See also, Jeffrey A. Berkowitz, *Business Method Patents: Everybody Wants to Be a Millionaire*, 609 PRAC. L. INST. 7, 9 (2000) (explaining that the prior art database will improve as a result of the influx of patent applications); Greg S. Fine, *To Issue or Not to Issue: Analysis of the Business Method Patent Controversy on the Internet*, 42 B.C. L. REV. 1195, 1210 (2001) ("[W]ith greater wealth of prior art to evaluate novelty and greater resources to ensure that patent applications are not overly broad, the major causes of poor quality patents are being eliminated."); Kevin M. Baird, *Business Method Patents: Chaos at the USPTO or Business as Usual*, 2001 U. ILL. J.L. TECH. & POL'Y 347, 364 ("The lack of prior art references and examiner training has led to the issuance of many invalid business method patents resulting in more patent litigation and greater uncertainty in the patent system.").

[18] *See, e.g.*, Robert P. Merges, *As Many As Six Impossible Patents Before Breakfast: Property Rights for Business Concepts and Patent System Reform*, 14 BERKELEY TECH. L.J. 577, 589 (1999) ("There are persistent reports that patents in the software area, and perhaps especially, patents for "business methods" implemented in software, are of extremely poor quality. People familiar with the technology involved and the history of various developments in it report that patents in this area are routinely issued which overlook clearly anticipating prior art."); Michael J. Meurer, *Business Method Patents and Patent Floods*, 8 WASH. U. J.L. & POL'Y 309, 323-24 (2002) ("Time pressure, lack of expertise, and lack of prior art yield low patent quality during floods. . . . And the technical breakthrough precipitating a flood might take a while to enter the prior art."); NAT'L ACAD. OF SCIS., A PATENT SYSTEM FOR THE 21ST CENTURY 41-49 (Stephen A. Merill et al., eds., National Academies Press 2004) ("There are…several reasons to suspect that more issued patents are deviating from previous or at least desirable standards of utility, novelty, and especially

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Part IV analyzes the specific example of business methods and concludes that business methods are one area of innovation that does not need the incentive of patentability. Rather, Part IV shows that, in fact, patents on business methods preclude competition and harm consumers.

Part V discusses solutions to the problem. First, the Supreme Court and the Federal Circuit could resume their roles as gatekeepers of subject matter patentability. Recent cases suggest that both courts are considering doing just that.[19] Second, if courts are unwilling to resume their historic role as subject matter gatekeepers given current broad construction of section 101 of the Patent Act, then Congress could pass legislation explicitly setting forth a utilitarian calculus that courts and the PTO should use in determining whether particular types of innovation should qualify as patentable subject matter. A third, and perhaps better, solution may be for Congress to delegate the determination of categories of patentable subject matter to an administrative agency, perhaps in the form of creating a commission within the PTO to hold hearings, take evidence, and decide what subject matter is patentable.

II. The Efficient Functioning of the Patent System

A. The Patent System Exists to Promote Public Goods

The Patent Act is enacted pursuant to Article I, Section 8 of the Constitution, which grants Congress the power to provide patent and copyright protection. The patent laws are codified as 35 U.S.C. § 100 *et seq.* Section 101 states: "Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefore, subject to the conditions and requirements of this title."[20] Section 101 does two things. First, it sets forth the subject matter that may be patented—any "process,

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non-obviousness and that this problem is more pronounced in fast-moving areas of technology newly subject to patenting than in established, less rapidly changing fields."); Susan Walmsley Graf, *Improving Patent Quality Through Identification of Relevant Prior Art: Approaches to Increase Information Flow to the Patent Office*, 11 LEWIS & CLARK L. REV. 495, 504 (2007) ("[I]t is widely perceived that in the software and business method areas, where there is a short history of patenting and there is not a strong tradition of non-patent literature publishing, much that is known will not be found in prior art searches.").

[19] *Metabolite*, 548 U.S. 124; *Bilski*, 264 F. App'x 896.

[20] 35 U.S.C. § 101. The term "process" is defined by 35 U.S.C. §100(b): "The term 'process' means process, art or method, and includes a new use of a known process, machine, manufacture, composition of matter, or material."

machine, manufacture, or composition of matter."[21] Second, it requires that a thing be "new" and "useful" before patent protection is granted.[22]

The other primary sections of the Patent Act that determine whether a patent is granted are sections 102, 103, and 112. Section 102 specifies the requirements an invention or discovery must meet to be determined novel.[23] Section 103 requires that an invention be "nonobvious."[24] Finally, Section 112 requires that a patent enable a person having ordinary skill in the art to practice the invention without undue experimentation, that the patent contain adequate written description to delimit the patent grant, and that the applicant disclose her best mode of practicing the invention.[25]

I take as a well-accepted starting point that the purpose of a patent is to encourage inventors to produce socially valuable goods that would not otherwise be produced.[26] So long as the cost of copying someone else's

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[21] 35 U.S.C. § 101.

[22] The bar for usefulness is set quite low, however. An applicant need merely show operational, beneficial, and specific utility. This means that an applicant's invention must work as intended (this is presumed), that it must be capable of some beneficial use (to be judged by the market), and that the inventor must know for what, specifically, the invention is useful. *See* Juicy Whip, Inc. v. OrangeBang, Inc., 185 F.3d 1364 (Fed. Cir. 1999); *In re* Fisher 421 F.3d 1365 (Fed. Cir. 2005); USPTO Utility Examination Guidelines, 66 Fed. Reg. 1092 (Jan. 5, 2001). If an application clears these low utility hurdles, it will be granted a patent. The extent of its usefulness is left to be decided by the market, as Judge Story explained in *Lowell v. Lewis*, 15 F. Cas. 1018, 1019 (C.C. Mass. 1817):

> [I]f the invention steers wide of these objections, whether it be more or less useful is a circumstance very material to the interests of the patentee, but of no importance to the public. If it be not extensively useful, it will silently sink into contempt and disregard.

[23] 35 U.S.C. § 102.

[24] 35 U.S.C. § 103 ("A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, 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. Patentability shall not be negatived by the manner in which the invention was made.")

[25] 35 U.S.C. § 112 ("The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.")

[26] Note that while there is wide agreement that the purpose of the patent laws is to encourage invention, *see, e.g.*, Mark A. Lemley, *Property, Intellectual Property, and Free Riding*, 83 TEX. L. REV. 1031, 1031 (2005) ("Intellectual property protection in the United States has always been about generating incentives to create."), this position is not without

(Continued…)

invention is less than the cost of inventing, inventors are not incentivized to invent, because they are unable to recover the costs of inventing. This is known as a public goods problem. The patent system solves the public goods problem of invention by granting inventors monopoly rights[27] over the production and sale of their inventions for a limited period of time—currently twenty years from the filing of a patent.[28] The ensuing monopoly

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critics. For example, F. Scott Kieff disagrees that the purpose of this section of the Constitution, or at least of the patent laws as enacted, is to encourage invention and disclosure. Kieff argues that patents are not necessarily efficacious in encouraging invention and that the current patent laws were rather written "to facilitate commercialization of new goods and services." F. Scott Kieff, *Property Rights and Property Rules for Commercializing Inventions*, 85 MINN. L. REV. 697, 753 (2001). Kieff contends that "treatment of patents as property rights provides incentives for the investment and ordering of private activities necessary for such a complex commercialization process while at the same time providing a workable framework for deciding which inventive activities merit government intervention in the first instance." *Id.* This debate is beyond the scope of this Article. Instead, in this Article I adopt the generally accepted view that the purpose of the Progress Clause of the Constitution (U.S. CONST. art. I, § 8, cl. 8) is to encourage invention.

[27] Note that my use of the term "patent monopoly" or "monopoly rights" in this context is not meant to refer to a producer who has monopoly power in a certain market. Rather, I use the term in this section to signify that the patent right gives the holder exclusive control over the use of the patented technology to make products or practice methods covered by the patent.

The Supreme Court has repeatedly referred to patents as "monopolies." *See, e.g.*, Blonder-Tongue Labs., Inc. v. Univ. of Ill. Found., 402 U.S. 313, 342 (1971) ("Although recognizing the patent system's desirable stimulus to invention, we have also viewed the patent as a monopoly which, although sanctioned by law, has the economic consequences attending other monopolies."); United States v. Line Material Co., 333 U.S. 287 (1948); Precision Instrument Mfg. Co. v. Auto. Maint. Mach. Co., 324 U.S. 806, 816 (1945) ("a patent is an exception to the general rule against monopolies and to the right to access to a free and open market. The far-reaching social and economic consequences of a patent, therefore, give the public a paramount interest in seeing that patent monopolies spring from backgrounds free from fraud or other inequitable conduct and that such monopolies are kept within their legitimate scope."); United States v. Univis Lens Co., 316 U.S. 241 (1942); United States v. Masonite Corp., 316 U.S. 265 (1942).

The Federal Circuit, on the other hand, has often derided the use of the term "patent monopoly." *See, e.g.*, Schenck v. Nortron Corp., 713 F.2d 782, 786 n.3 (Fed. Cir. 1983) ("It is but an obfuscation to refer to a patent as 'the patent monopoly' or to describe a patent as an 'exception to the general rule against monopolies.'"); *In re* Kaplan, 789 F.2d 1574, 1578 (Fed. Cir. 1986); Jamesbury Corp. v. Litton Indus. Prods., Inc., 756 F.2d 1556, 1559 (Fed. Cir. 1985) ("Further, this court has disapproved of a challenger's characterization of a patentee by the term 'monopolist,' which is commonly regarded as pejorative.").

[28] *See* 35 U.S.C. § 154.

rents act as incentives to invent. But monopoly rights also entail obvious costs to society—the so-called "deadweight loss" of monopoly. Society's goal should be to provide the efficient quantity of patent protection, that quantity of protection that maximizes the difference between these benefits and costs.

The patent monopoly granted to inventors is hefty: inventors have the sole right to make, sell, use, or license their inventions. Anyone else who makes, sells, uses, or licenses the invention or an equivalent thereof—even if that person invented it independently—infringes the patent and can be enjoined from practicing the patent and made to pay damages.[29]

This hefty monopoly power is only granted in exchange for new, useful, and nonobvious inventions, and it is only granted in exchange for a disclosure of the invention that is sufficient to enable a person having ordinary skill in the art to make the invention.[30] The system also is designed to keep the price paid by society in the form of the patent monopoly, with its resultant decreased competition and increased costs, less than the benefit that society gains from the increased invention of new, useful, nonobvious things.[31] Thus it is vitally important that the patent laws be properly balanced. If the patent laws extend too far, they decrease social utility by allowing more harm to society from patent monopoly than is gained by promoting new inventions. If the patent laws provide too little protection for inventions, then social utility is decreased because inventors do not have adequate incentive to invent.[32]

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[29] 35 U.S.C. § 271.

[30] 35 U.S.C. §§ 101-103, 112.

[31] Robert Nozick argues that the patent monopoly should exist only for the period of time when no one else would have thought of the invention. ROBERT NOZICK, ANARCHY, STATE AND UTOPIA, 178-182 (1974). Actually, the benefit may still exceed the cost of the patent even if someone else would have invented the same thing late in the patent's coverage. A cost benefit analysis must be done weighing the incentive needed by the inventor against the benefit to the public of having the invention earlier than someone else would have invented it. But in any case, patent protection should not extend beyond the point at which the cost of protection equals the public benefit from the early invention. And in fact, the policy should be to try to give the minimum amount of protection needed to incentivize adequate levels of invention.

Nozick also argues that, conceptually, patent protection should not apply to cases of independent invention, but that difficulties of proving this, combined with the fact that few will try to invent something from scratch once it has been invented and made public, may make it reasonable to exclude all others after an invention is patented. *See id.*

[32] Judge Posner explained the economics behind patent law in *Roberts v. Sears, Roebuck & Co.*, 723 F.2d 1324 (7th Cir. 1983). Judge Posner asserted that patent protection should be granted only for inventions that would not otherwise be developed. Posner's

(Continued…)

B. The Efficiency of Patentability Determinations at the Level of Subject Matter Classes: (Re)Applying Economic Analysis

Although the Patent Act attempts to guard against patent monopolies being granted for old or obvious inventions or for inventions that have not been adequately disclosed to the public, the Act leaves open two areas of inefficiency. First, the current patent application examination regime overwhelms patent examiners with the sheer number of patents that must be examined.[33] Second, examining a patent application for novelty, non-obviousness, and disclosure/enablement does not alone assure that patents

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view is that the nonobvious standard should serve the strictly economic purpose of awarding patent protection only when such protection is a necessary incentive to spur invention. Thus, for Posner, patent grants for inventions developed in a flash of inspiration are troubling, since the inventive process required no incentive to occur. Posner rationalizes the fact that patent law grants protection in these cases by claiming that such protection encourages potential inventors to seek the training necessary for experiencing such flashes of creative brilliance. *Id.*

While it may be that, historically, independent invention was rare once a patent had issued, if this was once so, it is no longer. In recent years numerous patents have been asserted against firms that began their allegedly infringing activity without any knowledge of the patent *See, e.g.*, IPXL Holdings, L.L.C. v. Amazon.com, Inc., 430 F.3d 1377 (Fed. Cir. 2005). In fact, many firms forbid their engineers and researchers from reading patents so that they can avoid liability for willful infringement. Mark A. Lemley et al., *Ending Patent Law's Willfullness Game*, 18 BERKELEY TECH. L.J. 1085 (2003). Multiple instances of independent invention are thus common in some fields.

[33] The current patent regime requires that patent examiners thoroughly examine a patent and list all bases for rejection, rather than working in a piecemeal fashion as bases for rejection are discovered and overcome. This requirement obviously increases the amount of time that must be spent on even facially invalid patents, and consequently leads to less time overall for examining any patent. *See* FTC, TO PROMOTE INNOVATION: THE PROPER BALANCE OF COMPETITION AND PATENT LAW AND POLICY, EXECUTIVE SUMMARY 10 (2003), *reprinted in* 19 BERKELEY TECH. L.J. 861, 872 (2004) ("Hearings participants estimated that patent examiners have from 8 to 25 hours to read and understand each application, search for prior art, evaluate patentability, communicate with the applicant, work out necessary revisions, and reach and write up conclusions. Many found these time constraints troubling."); Bronwyn H. Hall & Dietmar Harhoff, *Post-Grant Reviews in the U.S. Patent System – Design Choices and Expected Impact*, 19 BERKELEY TECH. L.J. 989, 995-96 (2004) ("There is evidence that patent grant rates have also risen, suggesting that time pressures have led to less scrutiny of each individual application. These are signs of a system under stress."); Susan Walmsley Graf, *Improving Patent Quality Through Identification of Relevant Prior Art: Approaches to Increase Information Flow to the Patent Office*, 11 LEWIS & CLARK L. REV. 495, 502 (2007) ("This more than tripling in the rate of utility application filings has resulted in overburdened examiners who have little time to devote to each patent application.").

are granted only on inventions for which society realizes gains greater than the costs of the monopoly rights under consideration. Nowhere does the Patent Act explicitly state that patent examiners should reject a patent if it is not needed to incentivize the particular type of invention. Instead, courts and the PTO traditionally have interpreted section 101 of the Patent Act as a basis for rejecting types of inventions for which it is not efficient to provide patents.[34] Specifically, courts and the PTO have traditionally ruled that particular classes of subject matter are outside the realm of patentability.

This subject matter discrimination was efficient for two reasons. First, it allowed courts to exclude classes of matter for which the patent grant was not needed to incentivize invention, or for which the deadweight loss of the patent monopoly obviously outweighed any increased incentive. Second, by excluding certain classes of subject matter, the courts increased the efficiency of the PTO by eliminating whole classes of inventions from examination.

1. Basic Economics of Patent Monopolies[35]

Before introducing the subject matter patentability model in the next subsection, this subsection first gives a synopsis of the economic explanation for the general need for patents to incentivize invention, as well as the costs to society that come from patent monopolies.

Potential inventors must decide what quantity of time and resources to invest in inventing. The returns from inventing are the revenues an inventor can gain from selling, licensing, or using her invention. An inventor will choose to invent to the extent that she can get greater returns from her next invention than from other investments of her time and talent. Once she has an invention, she will seek to make money from it.

If she cannot exclude rivals from entering the market for her invention, she will often not be able to recoup her costs of invention because competitors will be able to copy her invention and undersell her

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[34] Courts and the PTO have not done an explicit efficiency analysis when determining unpatentable subject matter, but I argue in this Article that such analysis underlay their subject matter patentability determinations. *See infra*, part III.

[35] Because the cost to society due to patent monopolies is a crucial component of this Article, I set out in this section a brief explanation of the economics of competitive and monopoly markets. It is well known that monopolies are costly to society. Economists call the loss to society caused by monopolies "deadweight loss." This subsection sets out the basic economic explanation for why monopolies cause deadweight loss. Readers familiar with basic economics, as well as those who accept that monopolies cause loss to society but who are not interested in seeing the graphical demonstration of that loss, may want to skip this subsection and proceed directly to the model set out in the next subsection.

because they have no costs of invention to recoup. In many cases, once the product goes on sale it takes little time and expense for competitors to gain the knowledge and ability to make the invented product. Economists call this free dissemination of the knowledge needed to make the invention a "public good." Such knowledge is non-excludable, and one person's use of the knowledge does not prevent another from using it.[36] Accordingly, the rational producer will not expend resources to invent in a competitive market when she cannot make back the cost of her investment in inventing.

This is a classic example of what economists call a "public goods problem," and illustrates why public goods such as inventions are often under-produced in a competitive market. The classic solution to a public goods problem is to subsidize production of the public good. The patent system does this by granting inventors patents that give them the exclusive

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[36] Inventors often develop means to overcome the nonexcludable nature of their invention, such as requiring employees to contract not to reveal company trade secrets. *See* Gideon Parchomovsky & Peter Siegelman, *Towards an Integrated Theory of Intellectual Property*, 88 VA. L. REV. 1455, 1494 (2002) ("As a substitute for patent protection, trade secrecy presents businesses with a choice between patent and trade secret protection. While firms can elect either option, they cannot employ both modes to protect the same information.") This may provide effective protection from competition and thus delay the emergence of a competitive market. When trade secret protection is available to inventors, no patent is needed. In other cases, however, such as when the invention is sold publicly, keeping the invention a trade secret is not an option. In cases where both patent protection and trade secret protection is available, a rationale inventor will elect whichever regime gives greater protection. *See* Dan L. Burk, *Legal Constraint of Genetic Use Restriction Technologies*, 6 MINN. J. L. SCI. & TECH. 335, 348 (2004) ("Thus the inventor's choice is an election between twenty years of certain patent protection or perpetual, but less certain, trade secret protection—a choice that in any given instance hardly can be said to have a foregone outcome."). Thus, if an inventor feels confident that she can keep her invention secret for more than twenty years, she will elect trade secrecy over patenting. Note, *Patent Preemption of Trade Secret Protection of Inventions Meeting Judicial Standards of Patentability*, 87 HARV. L. REV. 807, 821 (1974) ("Although there are thus several factors which indicate that patentable inventions will ordinarily be patented, there are situations in which an inventor with a clearly patentable innovation may prefer to rely on trade secret protection rather than to apply for a patent."). Note that an inventor is not allowed to elect trade secrecy and then patentability serially. *See* Ellen Lauver Weber, *Patenting Inventions that Embody Computer Programs Held as Trade Secrets*- White Consolidated Industries v. Vega Servo-Control, 713 F.2d 788 (Fed. Cir. 1983), 59 WASH. L. REV. 601, 604-05 (1984). ("Thus, the secrecy essential to trade secret protection is incompatible with patent protection. This policy conflict requires an inventor to choose between trade secret protection and patent protection.").

right to control their invention for twenty years. Once an inventor has a patent, she has monopoly power, at least with regard to her invention.[37]

Once a patentee has market power as to her invention, she will charge a price above the competitive level. This has two consequences: First, some money that would have stayed in consumers' pockets (consumer surplus) in a competitive market now goes to the monopolist. This is a redistribution of surplus between consumers and the producer (rents), and is not in itself a source of inefficiency.[38] But the second consequence of supra-competitive pricing is that consumers who value the good above its competitive price but below the price charged by the patentee will no longer buy the good. Thus, some of the surplus that would exist in a competitive market is lost. This lost surplus, the "deadweight loss" (L) from monopoly, *is* a source of inefficiency. In addition, allocation inefficiency is created because resources that would have gone to making additional units of the invention now go to a lower-valued use. Thus, society's total utility is less than in a competitive market. This deadweight loss from monopoly provides the efficiency-based rationale for antitrust law.[39]

2. Economic Model Showing the Need for Subject Matter Discrimination

Society must strike a balance between a system with no patent protection and fewer inventions than socially optimal, and a system of

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[37] The primary characteristics of a monopoly are: (1) a single seller who is (2) a price maker in (3) a market with blocked entry, and (4) who sells a good with no close substitutes. HAL R. VARIAN, INTERMEDIATE MICROECONOMICS (5th ed. 1999). Patent holders are single sellers, at least if they choose not to license others. They sell in a market with blocked entry because the patent allows them to legally block others from making, using, or selling their invention. Whether the patented invention has close substitutes such that the patent holder can be a true price maker is another question. In reality, many patented goods may have close substitutes in the market. In such situations the inventor's ability to extract monopoly rents is diminished accordingly. If patents are effective, however, they must either confer some pricing power, or at least lead inventors to believe that they will confer pricing power, sufficient to compensate the inventor for investing the cost of invention, or the inventor would not be incentivized to produce the invention in the first place.

[38] But note that the shift in money from consumer to producer may raise fairness, equality, or distributional concerns.

[39] HERBERT HOVENKAMP, THE ANTITRUST ENTERPRISE: PRINCIPLE AND EXECUTION 15-20 (2005).

overly broad patent protection and a large cost to society from the deadweight loss of patent monopolies.[40]

One can graphically represent three different possible relationships between amount of increased invention (I) and monopoly deadweight loss (L) that result from patent protection. In Figures 1a, 2a, and 3a, amount of patent protection (p) is graphed on the horizontal axis. For the sake of simplicity, the amount of patent protection is considered as one continuous variable. Thus, longer patent durations and increased areas of patent coverage—such as a broader interpretation of the breadth of patent coverage—are both represented as simply increasing patent protection (p).[41] The vertical axis measures dollar value. These figures assume that for increased invention (I) there are diminishing marginal returns to increased patent protection (p).[42] This reflects the assumption that a switch from zero patent protection to a grant of a three-year patent is likely to lead to a larger increase in invention (I) than a switch from a twelve-year to fifteen-year monopoly.[43] Deadweight loss (L) is modeled as a straight line. This means

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[40] In this analysis I make the reasonable assumption that amount of innovation (I) increases as patent protection increases but that the increase is at a decreasing rate. I assume that the deadweight loss from patent protection increases at a constant rate.

[41] In reality, the term of a patent, the breadth of claims, the strength of equivalents protection, etc., may be functions of patent protection that are somewhat discontinuous. For the sake of simplicity, however, and because an aggregation effect is likely to smooth out the discontinuity somewhat, for purposes of this model everything that may increase a patent's strength is modeled simply as amount of patent protection (p).

[42] In other words, dI/dp is a decreasing function of p.

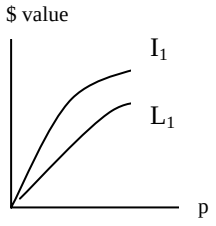
[43] Of course, there may be individual cases in which this assumption does not hold. For instance, if a patentee thinks that his patented invention will only develop a significant market after several years of marketing, in such a case the marginal value of an additional three years of patent protection will be greater at the end of the patent term than at the beginning. Likewise, a small increase in the subject matter covered by the law of equivalents may induce relatively little additional invention, but once the equivalents coverage increases to a certain level a large jump in invention may occur as inventors imagine being able to apply their patents to vastly wider areas. In such a case the amount of invention, I, would not be a smoothly increasing function of p (amount of patent protection), but would instead discontinuously jump upwards at the point that inventors saw great potential for additional coverage and profits. Notwithstanding that there are likely numerous examples in which amount of invention, I, is not a continuously increasing variable of p, it seems reasonable to assume for the sake of this model that in the aggregate such factors will balance out such that I can be modeled as a continuously increasing function of p. For instance, for each patent that takes a few years to establish a market, there may be other patents in fields where the technology has changed to such an extent after three years that the patent is virtually worthless.

that deadweight loss (L) is a constantly increasing function of patent protection (p).[44] This reflects the assumption that deadweight loss (L) from patent protection is as high in one year as it was the year before.[45]

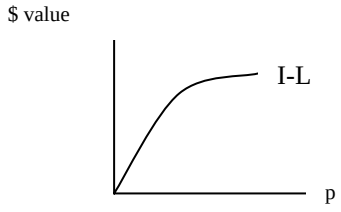
[44] In other words, dL/dp = k.

[45] Because the deadweight loss from monopoly is assumed to be the same each year the patent is in effect, the total deadweight loss from a patent will increase at a constant rate. If a one-year monopoly yields total deadweight loss = L, a two-year monopoly will yield twice that amount of deadweight loss (2 x L), a three-year monopoly will yield thrice the deadweight loss (3 x L), etc. Of course, for the same reasons discussed in modeling the variable for amount of increased invention (I), for individual patents the deadweight loss may not be a smoothly increasing function of patent protection (p). For instance, in fields where technology is rapidly changing, a patent may become obsolete after ten years such that the deadweight loss is zero after that point. In other cases, in which it takes some time to establish a market, the deadweight loss may not be significant until after a few years. As with modeling amount of increased invention (I), however, it seems likely that in the aggregate these individual differences should even out such that it is reasonable to model deadweight loss (L) as a smoothly increasing function of patent protection. In the aggregate, it is indeed unlikely that deadweight loss (L) is a concave curve (i.e., that dL/dp is a decreasing function of p). This is because it is unlikely that on aggregate the fifth year of a monopoly should yield a smaller amount of deadweight loss than the fourth year.

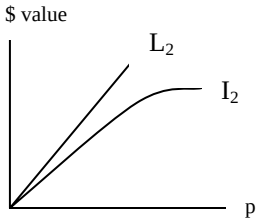
1.a.



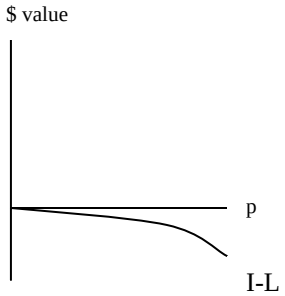
1.b.



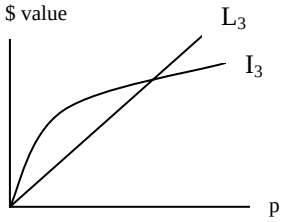
2.a.



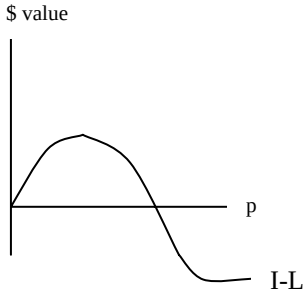
2.b.



3.a.



3.b.



Figures 1b, 2b, and 3b correspond to Figures 1a, 2a, and 3a, respectively. Here the horizontal axes again express amount of patent protection (p). The vertical axis measures utility in dollar value. For each of these Figures the curve represents the gain to overall utility from increased invention (I) minus the deadweight loss from the patent monopoly (L).

For the class of inventions in Figure 1a, deadweight loss (L) is always less than increased invention (I). Figure 1b shows that utility continuously increases as patent protection is increased. Accordingly, for situations that correspond to Figure 1a, patent protection should always be granted. No amount of patent protection is too much; greater patent

protection (p) always yields increased values of utility (U). The relationship depicted in Figure 1a likely only exists theoretically. It is hard to imagine a class of subject matter or even a single item for which no amount of patent protection is too high.[46]

The second possibility, as illustrated in Figure 2a, is that deadweight loss (L) is always greater than increased invention (I). Figure 2b illustrates that patent protection should never be granted to such subject matter because utility constantly decreases as patent protection increases. Abstract ideas and laws of nature most likely correspond to Figure 2a, because a patent on an unapplied abstract idea would confer monopoly power over all products and processes relying on the idea, resulting in enormous deadweight loss.[47]

Discovery of natural phenomena also historically has been classified as unpatentable subject matter. This rule may derive more from a policy value of common ownership of the fruits of nature than from any economic rationale. Or perhaps this rule originated at a time when most natural phenomena were discovered by accident, or would have been discovered soon by another. For the scientist who spends years gathering plants in the rainforest and testing them to see if they have any positive medicinal value, however, the increase in invention/discovery provided by patent protection is likely to be greater than the deadweight loss of the patent monopoly, and thus the relationship in Figure 2 should not apply.[48]

A third possibility is represented in Figure 3a. Here deadweight loss (L) is initially less than increased invention (I), but at some point deadweight loss (L) becomes greater than the additional amount of invention (I). Figure 3b shows that patent protection provides positive social utility up to the point where L = I. Past this point, patent protection decreases social utility. One can imagine that most currently patentable subject matter correspond to the curves in Figure 3. Mechanical devices are classic examples of figure 3a inventions. A limited time patent on a better

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[46] Even in the case of a natural monopoly patent protection would not produce constantly greater invention (I). The additional patent protection would produce no difference in market structure, but instead would simply substitute the inventor for an alternate natural monopolist.

[47] A lack of patent protection for abstract ideas may yield a less than optimal production of such ideas. However, allowing patents on such ideas would produce problems of defining the breadth of an idea and determining what constitutes “use” of the idea. *See* discussion, *infra*, section III.

[48] Recognition of this seems to have occurred. *See* Diamond v. Chakrabarty, 447 U.S. 303 (1980); *see also Metabolite*, 548 U.S. 124, discussed *infra*.

mousetrap increases social utility by increasing invention, but an unlimited patent right on the mousetrap likely results in excessive deadweight loss. The Patent Act's grant of strong patent protection for a limited time implicitly assumes that conditions conform to Figure 3a.

In a world without information and transaction costs and with unlimited time each patent application would be evaluated to determine to which Figure it best corresponds. In the real world, however, these costs preclude matching each individual patent claim to its corresponding Figure. In other words, ideally the Patent Office would determine for each patent application whether the invention costs are large enough to need patent protection to be recouped, and if so, whether the benefit of the invention is greater than the deadweight loss from granting the patent. But in reality, undertaking this analysis on a patent-by-patent basis would be impossibly time and resource intensive.[49] Moreover, even if there were sufficient time and resources, information asymmetries inherent in the process could make it impossible for the Patent Office to gather all of the relevant information that the applicant possesses in order to correctly determine whether a particular application should be granted.

The above analysis shows that the most efficient patent regime is one that starts by determining initially, on a category-by-category basis, whether classes of inventions should be patentable. If so, then the other tests for patentability such as novelty, nonobviousness, and enablement/written description, that are set out in section 102, et seq. of the Patent Act should be applied.[50] If not, then it is a waste of time and resources to engage in any of the tests set out in sections 102 et seq. of the Patent Act. And indeed, the Patent Act sets out the determination of subject matter patentability in section 101 of the Act as the very first step in determining the patentability of an invention or discovery.[51] The following flowchart illustrates why these other tests for patentability cannot take the place of the subject matter patentability screen, and why it would be inefficient not to apply the subject matter patentability screen first.

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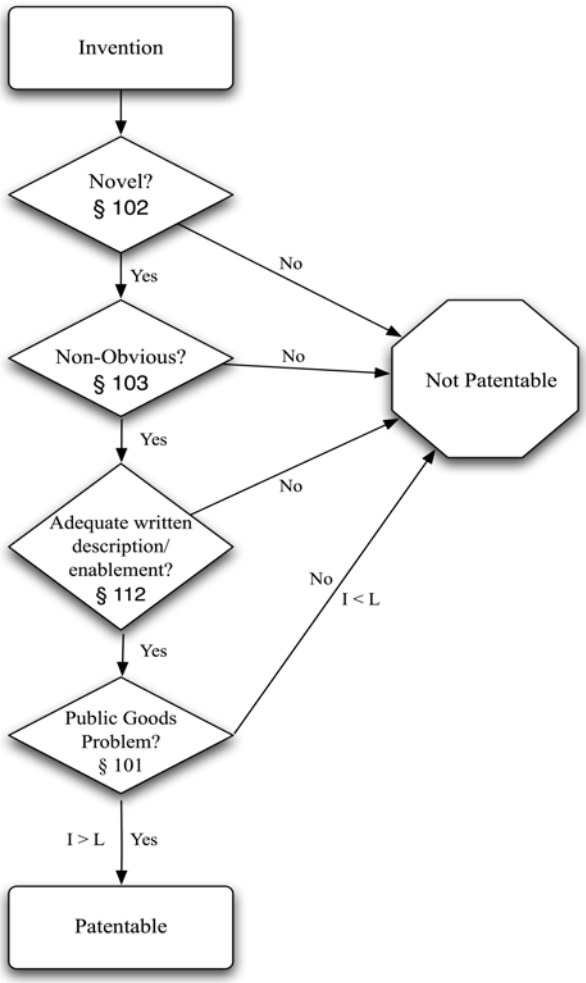
[49] Indeed, determining whether a proposed invention is novel is alone often too time intensive a task for the PTO to complete accurately. *See* Mandy B. Seuffert, Comments, *Soft-Science Examiners at the USPTO: A Non-Obvious Solution to Reduce Erroneous Patent Grants*, 10 MARQ. INTELL. PROP. L. REV. 111-12 (2006) ("Because they lack the resources to both devote more time to individual applications and to conduct more thorough reviews, a number of patents may be issued in error.").

[50] 35 U.S.C. §§ 102, 103, and 112.

[51] 35 U.S.C. § 101.



This flowchart illustrates that if only the screens for patentability contained in section 102 *et. seq.* of the Patent Act are used to determine patentability, inventions that need no incentivization—that do not suffer from the public goods problem—will inefficiently be granted patents. In other words, once we get to section 102 of the Patent Act, we have already assumed that a public goods problem exists such that patents are needed to incentivize meritorious inventions within a field. But if no public goods problem exists, as is the case for, say, movie scripts, which are already incentivized by the existence of copyright, then no amount of screening for

novelty, non-obviousness, and enablement can make the granting of a patent efficient or necessary.[52]

Thus, the critical first inquiry for the patentability of an invention should be whether the invention is within a subject matter area that is subject to a public goods problem such that absent patent protection an underproduction of inventions in that subject matter will result. If a public goods problem exists, then the subject matter should be patentable and the other tests for patentability should be applied. If no public goods problem exists, either because of the nature of the subject matter, or because other factors exist that adequately incentivize production of the public good, then subject matter patentability should be denied and the patentability inquiry should end.

As will be described more fully in the next section, the traditional patent law regime implicitly recognized the efficiency of making categorical determinations about patentable subject matter first before continuing to the other screens for patentability. The traditional regime addressed this need through a systematic classification of inventions by subject matter. These classifications allowed patentability first to be decided on a class-by-class basis, rather than on an invention-by-invention basis. The traditional patent law regime implicitly matched each proposed subject matter class to its corresponding Figure. If a class corresponded to Figure 2, where deadweight loss (L) is always greater than additional invention (I), then all the inventions within that class received no patent protection.[53] Of course, an individual invention within an unpatentable class may have been an exception and actually merited some patent protection. But if the information costs of correctly categorizing this invention outweigh the utility gained from patenting it, society is better off simply determining subject matter patentability on a broad class-by-class basis and leaving unpatentable those individual inventions that do not correspond to the rest of the class. When a class of inventions historically has been deemed to

[52] Not that this stops some from enthusiastically endorsing patents on such things as storylines. *See, e.g.*, Knight & Associates Home Page, http://www.plotpatents.com/.

[53] I am not suggesting that historically Congress and the courts went through this formal modeling when determining the patentability of various types of inventions. But as explained infra, such analysis seems to have occurred implicitly. The model set forth in this Article is an attempt to formalize the analysis of what should and should not be patentable subject matter.

merit some patent protection (i.e., when the class is deemed to correspond to Figure 3), each patent application has received additional attention.[54]

III. The Role of Courts in Excluding Inefficient Subject Matter

A. The Courts' Historical Classification of Unpatentable Subject Matter Based on Congress's Delegation

In this part of the Article I attempt to show two things. First, courts historically have served as gatekeepers making rough determinations, albeit in an informal, implicit, or intuitive manner, of whether invention in particular subject matter classes needed incentivization via patent grants. Second, I show the gradual process by which the federal courts abandoned their gatekeeping role.

Historically the federal patent statutes have adopted broad language as to what types of inventions are patentable. In fact, the language of the various patent statutes has been so broad that one might think that virtually anything is patentable, so long as it meets the requirements of novelty, nonobviousness, and enablement. Such a broad reading of the statute would, however, make patentable even those classes of inventions where the deadweight loss of the patent grant exceeds increased invention. Implicitly recognizing this, the Supreme Court and federal courts have traditionally ruled certain classes of subject matter to be outside the patent statutes' broad allowance of patentability. The oldest and most enduring of these exceptions to subject matter patentability are: laws of nature, natural phenomena, and abstract ideas.[55] Moreover, courts historically have focused

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[54] Note that patent claims are given more or less coverage during the application process when the patentee typically negotiates with the patent examiner on the breadth of the claims that will be allowed and, therefore, implicitly, on the equivalents that will be covered by the patent.

[55] See, for example, *Diamond v. Diehr*, 450 U.S. 175, 185 (1981), in which the Court stated that it "has undoubtedly recognized limits to § 101 and every discovery is not embraced within the statutory terms. Excluded from such patent protection are laws of nature, natural phenomena, and abstract ideas." (citations omitted). The Court went on to explain that "A principle, in the abstract, is a fundamental truth; an original cause; a motive; these cannot be patented, as no one can claim in either of them an exclusive right." *Id.* (citation omitted). The Court further explained that "[A] new mineral discovered in the earth or a new plant found in the wild is not patentable subject matter. Likewise, Einstein could not patent his celebrated law that $E = mc^2$; nor could Newton have patented the law of gravity. Such discoveries are 'manifestations of . . . nature, free to all men and reserved exclusively to none.' " *Id.* (citing Diamond v. Chakrabarty, 447 U.S. 303, 309 (1980) (quoting Funk Bros. Seed Co. v. Kalo Inoculant Co., at 130)).

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on a variety of tests for subject matter patentability that, either intentionally or felicitously, managed to exclude classes of subject matter for which deadweight loss of patentability likely exceeded increased invention.

Congress traditionally has recognized the value of the patent common law created by the federal courts. Accordingly, Congress has worded the patent acts broadly, so as to continue to give discretion to courts in determining subject matter patentability. The current Patent Act, passed in 1952, is no exception. In the 1952 Act, Congress kept the definition of patentable subject matter very general.[56] Congress did not overturn or narrow any of the judicially created law regarding patentable subject matter. All that Congress did was change the term "art" to "process" and define "process" as either "process or method," which definitions were in keeping with judicial decisions.[57] Nothing in the 1952 Patent Act indicated that Congress intended the courts to change their patent common law making roles or stop performing their function as gatekeepers of subject matter patentability.

B. Judicial Tests For Patentable Subject Matter

The difficulty in determining the dividing line between efficiently incentivizing invention and causing excessive deadweight loss from the

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Note that wrapped up in the Court's holdings that these areas are not properly subject to patent protection under section 101 may be practical problems regarding deciding the novelty of discoveries in such areas (§ 102), or in describing or enabling discoveries in these areas (§ 112).

[56] 35 U.S.C. § 101 ("Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.").

[57] *See* S. REP. NO. 82-1979 (1952), *reprinted in* 1952 U.S.C.C.A.N. 2394, 2398-99:

> The present law states that any person who has invented or discovered any "new and useful art, machine, manufacture, or composition of matter . . . may obtain a patent." That language has been preserved except that the word "art" . . . has been changed to the word "process." "Art" in this place in the present statute has a different meaning than the words "useful art" in the Constitution, and a different meaning than the use of the word "art" in other places in the statutes, and it *is interpreted by the courts* to be practically synonymous with process or method. The word "process" has been used to avoid the necessity of explanation that the word "art" as used in this place means "process or method," . . . The definition of "process" has been added in section 100 to make it clear that "process or method" is meant, and also to clarify the present law as to the patentability of certain types of processes or methods as to which some insubstantial doubts have been expressed.) (emphasis added).

patent monopoly has caused courts to create and reject a number of different tests. The physical transformation test, the mathematical algorithm exception, the mental steps doctrine, and the business method exception are some of the many tests that courts have created for this purpose. I will review these four tests that help distinguish, albeit not explicitly, efficient from inefficient subject matter for patentability as well as, sometimes, patentable process from abstract idea. A review of the ways the Supreme Court and Federal Circuit have developed and discarded these tests gives insight into how the courts eventually rejected their roles as determiners of efficient subject matter for patentability and threw open the gates for the patentability of business methods and virtually everything else.

1. The Rise and Fall of the Physical Transformation Test, the Mental Steps Doctrine, and the Mathematical Algorithm Exception

The physical transformation test[58] served courts well over the years as a test that excluded classes of subject matter for which the deadweight loss of monopoly exceeded increased invention. This test functioned by asking a simple question about processes for which patents were sought: Does the process achieve a physical transformation of something in the material world?[59] If so, then the invention was the type of subject matter that was patentable, and further inquiry into novelty, nonobviousness, enablement, etc., would proceed. If not, the court held the process to be unpatentable, and the inquiry ended. Conducting this test at the initial subject matter level served both to prevent the patenting of inventions or discoveries for which deadweight loss was likely to outweigh increased invention, and to determine which inventions were of a sort that was worthy of further examination for patentability. In other words, the initial subject matter patentability test in the form of the physical transformation test

[58] The physical transformation test overlaps with, and may, for practical purposes, be identical to the "mental steps" doctrine, which traditionally held that processes involving mental steps are not patentable. *See, e.g.*, *In Re* Heritage, 150 F.2d 554, 556-58 (C.C.P.A. 1945).

[59] The Supreme Court began to sketch out the physical transformation test in *Dolbear v. Am. Bell Tel. Co.* (The Telephone Cases), 126 U.S. 1 (1888). There the Court was confronted with Alexander Graham Bell's claim for the use of electric current to transmit vocal or other sounds. In upholding the patent, the Court stressed that the patent did not cover "the use of electricity distinct from the particular process with which it is connected in his patent." Id. at 535. The Court distinguished between the idea of using electricity as a motive power—which idea was not patentable—and claims for particular processes using electricity to accomplish specified physical objectives.

served to quickly exclude entire classes of invention and to save the Patent Office time and resources.

The physical transformation test was particularly effective at separating out inefficient subject matter classes in the pre-information age during which economically valuable inventions mainly concerned mechanical devices and processes rather than, say, software or information. At the time, most economically valuable processes were those that accomplished physical results. Moreover, the perfection of such mechanical and chemical processes generally required sustained research and investment of time and resources. Accordingly, allowing a patent on processes that affected physical transformation incentivized such invention.[60] Drawing the line at physically transformative processes served to cabin the patent within a reasonably narrow zone, so that future invention was not discouraged and the amount of deadweight loss from monopoly was minimized.[61] Requiring inventors to state their inventions in the form of a patent *for* something forced inventors to tie their processes to certain and definite physical activity, and thus left the abstract process unclaimed and free of patent protection.[62]

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[60] Thus, the Court allowed the patenting of processes that accomplished physical transformations of materials, but did not allow patents on processes that did not achieve physical transformations. *See, e.g.*, Cochrane v. Deener, 94 U.S. 780, 788 (1876) ("A process is a mode of treatment of certain materials to produce a given result. It is an act, or a series of acts, performed upon the subject-matter to be transformed and reduced to a different state or thing.").

[61] *See Benson*, 409 U.S. at 69 ("In *Corning v. Burden*, [56 U.S.] (15 How.) 252, 267-68 (1853), the Court said, 'One may discover a new and useful improvement in the process of tanning, dyeing, etc., irrespective of any particular form of machinery or mechanical device.' The examples given were the 'arts of tanning, dyeing, making waterproof cloth, vulcanizing India rubber, smelting ores.' *Id.* at 267. Those are instances, however, where the use of chemical substances or physical acts, such as temperature control, changes articles or materials. The chemical process or the physical acts which transform the raw material are, however, sufficiently definite to confine the patent monopoly within rather definite bounds.")

[62] Thus, an inventor who discovered a new method of refining flour was not allowed to patent the use of currents of air to remove impurities, but rather was forced to claim the use of air currents as part of an overall process *for refining flour*. Cochrane v. Deener, 94 U.S. 780, 785-86 (1876). This left the abstract process open for incorporation and use by others, yet gave enough protection to the inventor to incentivize his invention and disclosure in the form of a patent. The inventor in such a case gained protection from others who might wish to appropriate the process in the iron smelting industry, but did not achieve monopoly over all potential adaptations and incorporations of his process. Of course, an inventor might have been able to claim his invention more broadly (depending

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The physical transformation test began to erode as the use of computers in business and industry became widespread. As patent claims moved from processes that mixed particular substances together to produce a new tangible product to processes that used programmable computers to monitor timing or temperature in industrial processes, courts were faced with new challenges in determining where the physical transformation line lay, and what exactly should constitute a patentable physical transformation.[63]

As courts continued to wrestle with this line-drawing dilemma, a 1966 Presidential Commission on the Patent System concluded that software should not be patentable.[64] In making its recommendation, the Commission analyzed whether the costs of the patent system needed to be incurred in order to stimulate invention in the software field, then in its infancy. The Commission concluded that they did not, noting "the creation of programs has undergone substantial and satisfactory growth in the

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on the prior art), such that he could have claimed a process *for refining a metal*, or perhaps even a process *for refining a substance*. Even such broad claims still serve to cabin the patent right, however, because they still tie the use of the process to refining something. Thus, a novel adaptation of the process to, for instance, more homogenously mix materials would not be prohibited by the patent grant.

[63] It is important to note that this problem arose from increasing difficulty in drawing lines as to physical transformation, rather than from a sense that software or information-based processes were not being adequately incentivized without patent protection. The physical transformation test began to unravel once the PTO was faced with patent applications for machines that included software that controlled the machine's manufacturing processes. *See infra*. In these cases, the software was given patent protection as part of the machine, even though software on its own still resided outside the boundary of patentable subject matter. New problems arose when patent applications began claiming software that merely affected the inside of a computer. In such cases it was harder to distinguish a physical transformation of the abstract ideas/processes embodied in the software. This problem worried courts throughout the 1960s and 1970s. Any position taken by the Court other than one in favor of the patentability of software was problematic, since the same functionality often could be achieved by changing a system's hardware, which was unarguably patentable under the law of the day. Thus it seemed that disallowing software patents would cause a senseless division in the kinds of computer innovation that received patent protection. Chisum, et al., describe the problem this way: "If a mechanical device is patentable subject matter, then why not an electronic device like computer hardware? And if hardware is patentable subject matter, then why not a general purpose piece of hardware programmed for a specific purpose? And for that matter, why not software?" CHISUM, ET. AL., PRINCIPLES OF PATENT LAW 754 (1st ed. 1998).

[64] UNITED STATES, TO PROMOTE THE PROGRESS OF USEFUL ARTS IN AN AGE OF EXPLODING TECHNOLOGY, REPORT OF THE PRESIDENT'S COMMISSION ON THE PATENT SYSTEM (1966).

absence of patent protection and that copyright protection for programs is presently available."[65] The Commission also recommended that the line-drawing problems regarding software should be resolved against patentees and that neither software nor computers programmed in a specified manner should be allowable subject matter.[66]

At roughly the same time, the PTO published new examination guidelines that were designed to disallow software patents and maintain the physical transformation test that had functioned so efficiently for so long.[67] The proposed guidelines deemed a computer program by itself, whether claimed as an apparatus or a process, unpatentable subject matter.[68] The PTO formally adopted the guidelines in 1968, noting, however, that a programmed computer *could* be *part* of a patentable process if the process was otherwise nonobvious and produced a *physical* result.[69]

The conclusions of the President's Commission and the PTO guidelines were well supported by the patent law decisions of the day.

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[65] *Id.* at 13.

[66] The Commision stated:

> Uncertainty now exists as to whether the statute permits a valid patent to be granted on programs. Direct attempts to patent programs have been rejected on the ground of nonstatutory subject matter. Indirect attempts to obtain patents and avoid the rejection, by drafting claims as a process, or a machine or components thereof programmed in a given manner, rather than as a program itself, have confused the issue further and should not be permitted.

Id. The Commission also pointed out and predicted the problems with adequately examining software patents given the lack of prior art files and the prodigious amounts of new software being created all the time:

> The Patent Office now cannot examine applications for programs because of a lack of a classification technique and the requisite search files. Even if these were available, reliable searches would not be feasible or economic because of the tremendous volume of prior art being generated. Without this search, the patenting of programs would be tantamount to mere registration and the presumption of validity would be all but nonexistent.

Id. Note that the problems the Commission warned about with regard to the inadequacy of prior art search capability at the PTO for software appear to have been well-founded and apply with at least equal force to business method patents.

[67] 829 Off. Gaz. Pat. Off. 865 (Aug. 16, 1966).

[68] These guidelines were based on the "mental steps doctrine" and on the definition of "process" given in *Cochrane v. Deener*, 94 U.S. 780 (1876); s*ee also* Examination of Patent Applications on Computer Programs, 33 Fed. Reg. 15609 (Oct. 22, 1968).

[69] *See* Examination of Patent Applications on Computer Programs, 33 Fed. Reg. 15609.

Specifically, the "mental steps" doctrine, a variation on the "physical transformation" test, attempted to draw the line between patentable processes and abstract ideas by denying patentability to inventions consisting mainly of mathematical formulas, methods of computation, or other mental operations.[70] The mental steps doctrine served the same function as the physical transformation test in that it prohibited patents for subject matter for which the deadweight loss of the patent monopoly was likely to outweigh the incentive to invent. First, the mental steps doctrine protected against excessive deadweight loss by not allowing patents on abstract formulas or mental steps.[71] Second, the doctrine prevented patents on known methods to which some mental step had been added.[72] Third, the doctrine implicitly acknowledged that less incentive was needed to encourage the invention of processes of mental steps or the discovery of new mathematical formulas than was needed to encourage the invention of new industrial processes. Simply put, the material resources needed to invent a mental process are low, while the materials required to design and test a new industrial process could be considerable. Accordingly, it made sense to incentivize invention of physically transforming processes via the patent grant, while leaving mental processes unpatentable.

Notwithstanding the above, in 1968—the very year in which the Presidential Commission and the PTO urged the rejection of software patents—the Court of Customs and Patent Appeals (CCPA)[73] rejected the mental steps doctrine in *In re Prater*.[74] The CCPA did not engage in an

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[70] *See, e.g.*, *In re* Heritage, 150 F.2d at 556-58 (C.C.P.A. 1945); *In re* Shao Wen Yuan, 188 F.2d 377 (C.C.P.A. 1951); *In re* Bolongaro, 62 F.2d 1059, 1060 (C.C.P.A. 1933).

[71] A patent on a formula itself might have costs in terms of deadweight loss far in excess of the incentive it provided to derive such formulas.

[72] For example, a person could not patent a known method of catalyzation simply by adding a computer program that used an algorithm to continuously update the alarm limits for the process. Parker v. Flook, 437 U.S. 584 (1978).

[73] The CCPA was the predecessor court to the Federal Circuit Court of Appeals. The CCPA was given jurisdiction over appeals of patentability from the Patent and Trademark Office. In 1982 the Court of Appeals for the Federal Circuit was created with jurisdiction over all appeals from the PTO and also from all patent claims raised by plaintiffs in any district court (the Federal Circuit does not have jurisdiction over patent claims raised as defenses). 28 U.S.C. § 41.

[74] 415 F.2d 1378 (C.C.P.A. 1968), *modified on reh'g*, 415 F.2d 1393 (C.C.P.A. 1969). In *Prater*, the claim was for an improved process for analyzing spectrographic data. The claimant used an analog computer to calculate mathematical formulas that he had come up with in order to obtain the best results. The patent application gave an analog computer as the preferred embodiment, but stated that a programmed digital computer would also work.

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analysis of the efficiency of granting patents to inventions involving mental steps. Rather, the CCPA engaged in a formal textual analysis of the patent statute, largely abandoning the role the federal courts had traditionally occupied as shapers of the federal patent common law. The CCPA held that the precedent that the mental steps doctrine depended upon had either been inadequately reasoned or simply misinterpreted over the years. The court held that just because a process may be done mentally (as is possible with the derivation or application of a formula), it should not be barred from patent protection if the same process could, in the alternative, be accomplished by another mechanism, such as a programmed computer.[75]

The CCPA went further two years later in *In re Musgrave*,[76] when it announced that any process containing a sequence of operational steps was patentable under section 101 so long as it was within the "technological arts."[77] The next year, in *In re Benson*,[78] the CCPA allowed the patenting of software generally by holding that computers are within the "technological arts" for purposes of section 101, regardless of the use to which they are put.[79]

The Supreme Court accepted certiorari of *Benson* and reversed. The claimants in *Benson* claimed a method for converting binary-coded decimal (BCD) numerals into the pure binary numerals used as the basic language of computers. The respondents apparently had varied the order of steps for the conversion from the usual order that a human would use to accomplish the

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The Patent Office previously had rejected the process claims based on the mental-steps doctrine. It found that the only novel part of the process was the discovery of an unpatentable mathematical principle. It also rejected the apparatus claim, holding that once the mathematical formula was held to be within the prior art, there was no patentable part of the apparatus. *See id.* at 1379-81.

[75] *Id.* at 1389.

[76] 431 F.2d 882 (C.C.P.A. 1970).

[77] *Id.* at 893. Note that the majority opinion in *Musgrave* used the term "technological arts" without ever defining it. Judge Baldwin, in a concurring opinion, criticized this new and indefinite test for patentability. *Id.* at 895 ("First and foremost will be the problem of interpreting the meaning of 'technological arts': Is this term intended to be synonymous with the 'industrial technology'-- mentioned by Judge Smith? It sounds broader to me. Necessarily, this will have to be considered a question of law and decided on a case-by-case basis. Promulgation of any all-encompassing definition has to be impossible.")

[78] 441 F. 2d 682 (C.C.P.A. 1971).

[79] Note that patent protection has been broadened even further subsequently due to the PTO's complete rejection of the "technological arts" limitation for patentability. *See, e.g.*, *Ex parte* Lundgren, No. 2003-2088, at 4 (B.P.A.I. 2005), discussed *infra*.

conversion, but the results were the same.[80] Faced with such a broad claim for a method of solving a mathematical problem, the Court held that the claims were outside of patentable subject matter because they amounted to a patent on the algorithm itself:

> Here the "process" claim is so abstract and sweeping as to cover both known and unknown uses of the BCD to pure binary conversion. The end use may (1) vary from the operation of a train to verification of drivers' licenses to researching the law books for precedents and (2) be performed through any existing machinery or future-devised machinery or without any apparatus.[81]

Thus, the Court used the mathematical algorithm exception to exclude subject matter (algorithms not tied to particular uses) the patenting of which would cause much more deadweight loss than necessary to incentivize the invention.[82]

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[80] The Supreme Court, unlike the CCPA, did not engage in a formalistic interpretation of the bare patent statute. Rather, the Court implicitly analyzed the monopoly cost of the patent by examining the breadth and preclusive effect the patent would have. The Court noted that the patentee claimed his method of numeric conversion without limiting it "to any particular art or technology, to any particular apparatus or machinery, or to any particular end use." *Benson*, 409 U.S. at 64. The claims "purported to cover any use of the claimed method in a general purpose digital computer of any type." *Id.* In other words, the claims were tied to no physical transformation. Nor were they tied to a particular use within a program or computer. The patentee sought rights over the numeric conversion method generally.

[81] *Id.* at 68.

[82] The Court stated its holding "in a nutshell" as the following:

> It is conceded that one may not patent an idea. But in practical effect that would be the result if the formula for converting BCD numerals to pure binary numerals were patented in this case. The mathematical formula involved here has no substantial practical application except in connection with a digital computer, which means that if the judgment below is affirmed, the patent would wholly pre-empt the mathematical formula and in practical effect would be a patent on the algorithm itself.

Id. at 71-72. The Court here may have been conflating claim scope with patentable subject matter, at least to some extent. But allowing excessively broad ranges of patentable subject matter necessarily allows broader claim scope. If, for instance, patents on processes not linked to any physical apparatus or transformation are allowed as patentable subject matter, then the scope of such patents' claims will obviously be very broad. Further, even if the scope of the claim here were limited somehow, such as to computers, the increased incentive to innovate that this would give would likely be dwarfed by the deadweight loss that would occur if the discoverer could claim ownership of all uses of the algorithm itself,

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It is notable that the Court did not simply apply the physical transformation test, however, instead the Court retreated somewhat from that test, stating,

> It is argued that a process must either be tied to a particular machine or apparatus or must operate to change articles or materials to a "different state or thing." We do not hold that no process patent could ever qualify if it did not meet the requirements of our prior precedents. It is said that the decision precludes a patent for any program servicing a computer. We do not so hold.[83]

In so doing the Court implicitly acknowledged that it is not the physical transformation test *per se* that is needed, but rather that the test thus far had served the efficient and prudential purpose of precluding classes of inventions from patentability for which a patent grant would be inefficient.

Just six years later, the Supreme Court revisited the issue of the patentability of algorithms in *Parker v. Flook*.[84] The claimant in *Flook* sought to patent a method that utilized a mathematical algorithm to continuously update alarm limits (safety limits) for a catalyzing process. The claimant used a computer in his machine to continuously do the math to change the alarm limits. The Court recognized that in order to determine the patentability of the process in *Flook* it again had to distinguish between patentable processes and abstract ideas. The Court said: "The line between a patentable 'process' and an unpatentable 'principle' is not always clear. Both are 'conception[s] of the mind, seen only by [their] effects when being executed or performed.'"[85]

The Court in *Flook* decided to draw the line of patentability well away from the unpatentable principle side of the spectrum by treating all mathematical algorithms as unpatentable subject matter. Since defining the parameters of the mathematical algorithm exception had been difficult for courts in the past, *Flook* provided an opportunity to stake out new, firmer boundaries. The Court wrote, "[w]e use the word 'algorithm' in this case, as

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even if the uses are limited to computers. As the Court said, this seems the only practical medium in which to utilize the formula anyway.

But note that claim 8 of the Patent in *Benson* discusses "shift register[s]," which seem to at least tie this claim to a particular way of implementing the process on a computer. *Id.* at 73-74 (Appendix). Claim 13, however, was not limited to shift registers. *Id.*

[83] *Id.* at 71.

[84] 437 U.S. 584 (1978).

[85] *Id.* at 589 (quoting Tilghman v. Proctor, 102 U.S. 707, 728 (1880)).

we did in *Gottschalk v. Benson*, to mean '[a] procedure for solving a given type of mathematical problem ….'"[86] The Court clearly equated these types of procedures for solving mathematical problems with unpatentable "laws of nature,"[87] and held that process claims containing mathematical algorithms must be tested for subject matter patentability in two steps.[88] The first step was to assume the mathematical algorithm was part of the prior art, even if it was novel and nonobvious.[89] The second step was to examine

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[86] Parker v. Flook, 437 U.S. at 585 n.1 (internal citations omitted) (quoting Gottschalk v. Benson, 409 U.S. 63, 65 (1972)).

[87] *Id.* at 589.

[88] The Court held that whether claims were drafted as process claims or machine claims was not determinative, because if it were, clever drafting could determine patentability. The Court instead held that claims that were novel only because of inclusion of an algorithm could not be patented. In its description of algorithms the Court equated algorithms directly to laws of nature:

> First, respondent incorrectly assumes that if a process application implements a principle in some specific fashion, it automatically falls within the patentable subject matter of . . . § 101 and the substantive patentability of the particular process can then be determined by the conditions of §§ 102 and 103. This assumption is based on respondent's narrow reading of *Benson*, and is as untenable in the context of § 101 as it is in the context of that case. It would make the determination of patentable subject matter depend simply on the draftsman's art and would ill serve the principles underlying the prohibition against patents for "ideas" or phenomena of nature. The rule that the discovery of a law of nature cannot be patented rests, not on the notion that natural phenomena are not processes, but rather on the more fundamental understanding that they are not the kind of "discoveries" that the statute was enacted to protect. The obligation to determine what type of discovery is sought to be patented must precede the determination of whether that discovery is, in fact, new or obvious.

Id. at 593.

Here the Court discusses the efficiency of conducting a first screen to exclude certain inefficient classes of inventions before engaging in the more time and labor-intensive tasks of examining novelty and nonobviousness of the intention.

[89] *See id.* at 591. The Court claimed that its prior precedence led to the two-part test:

> *MacKay Radio* and *Funk Bros.* point to the proper analysis for this case: The process itself, not merely the mathematical algorithm, must be new and useful. Indeed, the novelty of the mathematical algorithm is not a determining factor at all. Whether the algorithm was in fact known or unknown at the time of the claimed invention, as one of the "basic tools of scientific and technological work," see *Gottschalk v. Benson*, 409 U.S., at 67, it is treated as though it were a familiar part of the prior art.

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the process as a whole to determine whether, once the algorithm was assumed to be part of the prior art, the process contained a patentable invention. The Court in *Flook* held that the claimant failed the test.[90]
Here the court was saying that because the discovery or design of algorithms is not the sort of thing it is efficient to incentivize by means of the patent grant, no patent on the algorithm is available. Nevertheless, as with all inventions, if aside from the unpatentable subject matter there is something that makes the remaining subject matter novel and nonobvious, then a patent may be had.

Justice Stewart, joined by Chief Justice Burger and Justice Rehnquist, dissented in *Flook*, arguing that the majority was smuggling in the novelty and inventiveness requirements of sections 102 and 103 to the consideration of statutory subject matter under section 101.[91] What the dissent did not realize, however, is that making a quick analysis to determine subject matter patentability is quite different than doing a fulsome novelty analysis. The majority's rule allowed courts and examiners to efficiently say that inventions in certain classes of subject matter were not patentable—in this case, algorithms—and quickly move on to analyze whether the patentable subject matter part of a claim was novel and nonobvious, and therefore patentable.

Id. at 591-92. Here again the Court is asserting that the discovery of the algorithm is not the sort of thing to be incentivized by the patent system. Rather, it is inventive uses of algorithms that should be incentivized by the patent grant. Discovery of algorithms, the Court is therefore saying, is not the sort of thing for which the gain to invention of allowing patents is likely to exceed the deadweight loss of the patent monopoly.

[90] The Court held:

Respondent's process is unpatentable under § 101, not because it contains a mathematical algorithm as one component, but because once that algorithm is assumed to be within the prior art, the application, considered as a whole, contains no patentable invention. Even though a phenomenon of nature or mathematical formula may be well known, an inventive application of the principle may be patented. Conversely, the discovery of such a phenomenon cannot support a patent unless there is some other inventive concept in its application.

Id.

[91] Justice Stewart wrote:

> Indeed, I suppose that thousands of processes and combinations have been patented that contained one or more steps or elements that themselves would have been unpatentable subject matter. *Eibel Process Co. v. Minnesota & Ontario Paper Co.*, 261 U.S. 45, is a case in point. There the Court upheld the validity of an improvement patent that made use of the law of gravity, which by itself was clearly unpatentable.

Id. at 599-600

A sea change began in 1980. In *Diamond v. Chakrabarty*,[92] the Supreme Court extended patent protection to a living organism—a man-made bacteria capable of breaking down crude oil and thus useful in treating oil spills. Although the long-held rule against the patentability of living things had been economically efficient in the past, the court in *Chakrabarty* recognized that biotechnology changed things. In the past, a patent sought on a living thing would have been for an organism that was discovered in nature. Thus, prior to the biotechnology industry, living organisms were discoveries that correspond to Figure 3, *supra* Part II.B.2, for which patenting would cause more deadweight loss than increased invention or discovery. With the advent of bioengineered organisms, however, the calculus changed. As the record in *Chakrabarty* made clear, a great deal of time, effort, and experiment were necessary to produce the man-made oil-eating bacteria.[93] Accordingly, if invention in the field was to be encouraged, patent protection was necessary. And indeed, when it comes to patents for engineered organisms, the deadweight loss is much less than for discovered organisms because no use of a naturally occurring organism is thereby precluded by the patent.[94]

Unfortunately, however, the Court went beyond this efficiency analysis. Rather than simply expanding subject matter patentability piecemeal, as economic efficiency dictates, the Court followed suit with the CCPA and largely abandoned its common lawmaking role in the area of patent law. Thus, the Court announced that its decision was based on a bare

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[92] 447 U.S. 303 (1980).

[93] *Id.*

[94] The Court recognized this difference between engineered and discovered organisms and held:

> The patentee has produced a new bacterium with markedly different characteristics from any found in nature and one having the potential for significant utility. His discovery is not nature's handiwork, but his own; accordingly it is patentable subject matter under § 101.

Id. at 310. The Court was careful to distinguish the labor and capital-intensive human-engineered bacteria from those organisms that are merely discovered:

> This is not to suggest that § 101 has no limits or that it embraces every discovery. The laws of nature, physical phenomena, and abstract ideas have been held not patentable. Thus, a new mineral discovered in the earth or a new plant found in the wild is not patentable subject matter.

Id. at 309. (quoting Funk Bros. Seed Co. v. Kalo Inoculant Co., 333 U.S. 127, 130 (1948)) (internal citations omitted.)

textual reading of the Patent Act.[95] Rather than continue to wrestle with issues of how to draw lines on physical transformation, mental steps, and what types of living organisms should receive patent protection, the Court largely abandoned any gatekeeping role and stated that courts "should not read into the patent laws limitations and conditions which the legislature has not expressed."[96] The Court then announced that Congress had meant patentable subject matter to "include anything under the sun that is made by man."[97]

The problem with this abdication of subject matter patentability analysis is that under a bare textual reading of the Patent Act, it is no longer apparent why even the traditionally off-limit subject matters should not be patentable. Even though the Court in *Chakrabarty* asserted that abstract ideas, laws of nature, and natural phenomenon remain unpatentable subject matter, there is no textual basis for this exception.[98]

The second case signaling the Supreme Court's abandonment of a subject matter gatekeeping role came in the 1981 case of *Diamond v. Diehr*.[99] The Court's holding there is diametrically opposed to its holding in *Flook*, notwithstanding the two cases' strikingly similar facts. The claimant in *Diehr* sought a patent for a process for curing synthetic rubber that included the use of a well-known mathematical formula and a programmed digital computer. Although there was some wrangling over whether the method of continuously measuring the curing temperature was new, in the end it appears that the only novel element of the process was the use of a programmed digital computer that received information on the temperature as the rubber cured and, by repeatedly solving the appropriate mathematical

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[95] *Id*, at 307 (characterizing the decision as "a narrow one of statutory interpretation requiring us to construe 35 U.S.C. § 101 . . . .")

[96] *Id.* at 308 (quoting United States v. Dubilier Condenser Corp., 289 U.S. 178, 199 (1933)).

[97] *Id.* at 309 (citing the Committee Reports, S. Rep. No. 1979, 82d Cong., 2d Sess., 5 (1952); H.R. Rep. No. 1923, 82d Cong., 2d Sess., 6 (1952); Testimony of P.J. Federico, Hearings on H.R. 3760 before subcommittee No. 3 of the House Committee on the Judiciary, 82d Cong., 1st Sess., 37 (1951)).

[98] See 35 US.C. § 101 ("Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.") Under this bare text, there is no reason to exclude new and useful discoveries or inventions of abstract ideas, laws of nature, or natural phenomenon from patentability. An abstract idea can surely be a new and useful process, just as a law of nature can be. And a natural phenomenon can surely be a composition of matter.

[99] 450 U.S. 175 (1981).

formula, adjusted the timer that opened and closed the mold to achieve a more perfect cure then had previously been possible.[100]

Justice Rehnquist distinguished *Flook* by saying that the application in *Flook* had only "sought to protect a formula for computing [an alarm limit],"[101] while the claim in *Diehr* was "for a process of curing synthetic rubber."[102] This rather weak distinction showed that the tide had turned toward increased patentability of non-physical processes and computer programs.

The Federal Circuit (which succeeded the CCPA)[103] took its cue from the Supreme Court's change of direction and continued to expand the scope of patentable subject matter by adopting the Court's bare textualist reading of the Patent Act and not performing any separate efficiency

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[100] Justice Stevens pointed out that the Patent and Trademark Office Board of Appeals expressly found that the only difference between the claimed method and traditional methods of rubber curing was the constant recalculating of the time the mold should be closed. *Id*. These findings were not disturbed by the CCPA.

[101] *Id.* at 186 (quoting Parker v. Flook, 437 U.S. 586 at 586 (1978)).

[102] *Id.* at 176.

[103] Congress created the Court of Appeals for the Federal Circuit in 1982. Federal Courts Improvement Act of 1982, Pub. L. No. 97-164, 96 Stat. 25 (codified as amended at 28 U.S.C. §§ 41-49). The formation of the Federal Circuit did not change the path the federal courts were on towards an abandonment of the patentable subject matter gatekeeper role, but Congress's concurrent consolidation and assignment of patent appeals to the Federal Circuit, *id*., likely sped the abandonment of the gatekeeper role because there were no longer a number of circuit courts to debate and disagree about the patentability of various subject matter. Once the Federal Circuit embraced ever expanding subject matter patentability there were no other circuit courts to disagree and stir debate.

In addition, the Federal Circuit has often been accused of a pro patent bias. *See, e.g.*, Mark D. Janis, *Reforming Patent Validity Litigation: The "Dubious Preponderance,"* 19 BERKELEY TECH. L.J. 923, 928 (2004) ("The generally received wisdom [is] that the Federal Circuit adopted a pro-patent bias early in its tenure."); Glynn S. Lunney, Jr., *E-Obviousness*, 7 MICH. TELECOMM. & TECH. L. REV. 363, 380 (2001) ("the Federal Circuit has taken its role as defender of the patent system seriously. In pursuit of that perceived role, the Federal Circuit has at times shown a reckless indifference to its sworn duty to 'uphold the law,' which presumably includes following the binding precedent of the [Supreme] Court even where (or perhaps, especially where) certain members of the Federal Circuit believe the [Supreme] Court is wrong.") (footnote omitted); Robert P. Merges, *Commercial Success and Patent Standards: Economic Perspectives on Innovation*, 76 CAL. L. REV. 803, 822 (1988) ("the Federal Circuit appears to be a 'pro-patent' court.").

Moreover, until lately the Supreme Court has not often granted certiorari of patent cases. The Supreme Court has not been required to decide patent law issues arising from circuit splits, but instead only seems to accept certiorari of patent cases if it thinks that changes may need to be made to the Federal Circuit's case law.

analysis gate-keeping as to subject matter patentability. Thus, in 1992, in *Arrhythmia Research v. Corazonix*,[104] the Federal Circuit found valid a patent on a method of converting the signal from an electrocardiogram machine into a different visual image that could be used to help determine ventricular tachycardia. The process used a mathematical formula and a programmed computer, although the claims stated that hard-wired logic circuitry could be used. In deciding *Arrhythmia Research*, the Federal Circuit asserted that Congress had never meant to exclude algorithms from patentability.[105]

Interestingly, the Federal Circuit did not entirely abandon the requirement that a process do something physical to be patentable, however. Instead it held that the "claimed steps of 'converting', 'applying', 'determining', and 'comparing' are physical process steps that transform one physical, electrical signal into another. The view that 'there is nothing necessarily physical about "signals" is incorrect.'"[106] The Federal Circuit then adopted its own two-step procedure for determining unpatentable algorithms, which de-emphasized the physical transformation requirement.[107]

In the case of *In re Alappat*,[108] the Federal Circuit further expanded the patentability of algorithms. It held that "the proper inquiry in dealing with the so called mathematical subject matter exception to §101 … is to see whether the claimed subject matter *as a whole* is a disembodied mathematical concept …."[109] The concurring and dissenting opinion of Chief Judge Archer and the concurring opinion of Judge Rader made it clear that they thought that only abstract mathematical formulas should be denied patentable subject matter status, and that applications of

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[104] 958 F.2d 1053 (Fed. Cir. 1992).

[105] *Id.* at 1064 ("Indeed Congress has never stated that section 101's term 'process' excludes certain types of algorithms. Therefore, as *Diehr* commands, this court should refrain from employing judicially-created tests to limit section 101.")

[106] *Id.* at 1059 (quoting *In re* Taner, 681 F.2d 787, 790 (CCPA 1982)).

[107] The court described its new test as follows:

> First, the claim is analyzed to determine whether a mathematical algorithm is directly or indirectly recited. Next, if a mathematical algorithm is found, the claim as a whole is further analyzed to determine whether the algorithm is "applied in any manner to physical elements or process steps," and, if it is, it "passes muster under § 101."

Id. at 1063.

[108] 33 F. 3d 1526 (Fed. Cir. 1994).

[109] *Id.* at 1544 (emphasis added).

mathematical formulas should always be patentable.[110] Judge Rader thought that this approach was especially justified by the fact that "the line of demarcation between a dedicated circuit and a computer algorithm accomplishing the identical task is frequently blurred and is becoming increasingly so as the technology develops. In this field a software process is often interchangeable with a hardware circuit."[111]

Thus by the time business method patents reached the Federal Circuit, the court's jurisprudence had all but reached the point at which any applied use of an abstract idea was patentable. This broadening of subject matter patentability with regard to software algorithms made it difficult for the Federal Circuit to uphold the business method exception or the physical transformation test as viable exceptions to patentability. And indeed, those tests have now all been laid by the wayside by Federal Circuit decisions.

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[110] Chief Judge Archer stated:

> The dispositive issue is whether the invention or discovery for which an award of patent is sought is more than just a discovery in abstract mathematics. Where the invention or discovery is only of mathematics, the invention or discovery is not the "kind" of discovery the patent law was designed to protect and even the most narrowly drawn claim must fail. *Diehr*, 450 U.S. at 192 n. 14. To come within the purview of § 101 and the patent law, a mathematical formula or operation must be "applied in an invention of a type set forth in 35 U.S.C. § 101."

Id. at 1557 (quoting *Meyer*, 688 F.2d at 795) (Archer, C.J., concurring in part and dissenting in part).

[111] *Id.* at 1583 (Rader, J., concurring). Judge Rader's concurring opinion was even more expansive of patentability:

> In the wake of *Diehr* and *Chakrabarty*, the Supreme Court only denies patentable subject matter status to algorithms which are, in fact, simply laws of nature. . . .
>
> The limits on patentable subject matter within section 101 do not depend on whether an invention can be expressed as a mathematical relationship or algorithm. Mathematics is simply a form of expression—a language.

Id. at 1582 (Rader, J., concurring).

2. The Business Method Exception and Its Undoing

The first thing to understand about the business method exception[112] is that for all of its efficiency in excluding business methods from patentability, it was always an exception based on *dicta*. For most of this century, *Hotel Security Checking Co. v. Lorraine Co.*[113] was cited as the case that made business methods unpatentable *per se*.[114] But the court in *Hotel Security* never held this. The patent at issue in *Hotel Security* was for a method of keeping track of the food waiters were taking to tables in order to verify that the waiters were giving the full cost of each meal to the hotel.[115]

The Second Circuit disallowed the patent, but, contrary to subsequent popular belief, it did not hold that business methods are outside of the subject matter that can be awarded process patents. Instead, the court

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[112] The phrases "business method exception" and "business method patents" raise the question of what, exactly, is a business method, and how is it distinguished from other processes. Unfortunately, there is not a clear answer to the question, especially when it comes to software related to conducting business, like the software at issue in *State St. Bank*. The United States Patent & Trademark Office sets out Class 705 for patents that claim "machines and their corresponding methods for performing data processing operations . . . utilized in 1) practice, administration, or management of an enterprise, or 2) processing of financial data, or 3) determination of the charge for goods or services." U.S. PATENT AND TRADEMARK OFFICE WHITE PAPER ON AUTOMATED FINANCIAL OR MANAGEMENT DATA PROCESSING METHODS (BUSINESS METHODS) (hereafter "PTO BUSINESS METHODS WHITE PAPER") (2000), *available at* http://www.uspto.gov/web/menu/busmethp/whitepaper.pdf. Drawing the line between business methods on the one hand and software processes, on the other, can be particularly difficult when it comes to on-line businesses or processes. For example, Amazon's 1-Click patent describes a method of allowing customers to place orders for merchandise over the Internet. U.S. Patent No. 5,960,411 (filed Sep. 12, 1997).

[113] 160 F. 467 (2d Cir. 1908).

[114] *See, e.g.*, Rinaldo Del Gallo, III, *Are "Methods of Doing Business" Finally Out of Business as a Statutory Rejection?*, 38 IDEA 403, 408-409 (1998).

[115] *Id.* at 467. The method involved assigning each waiter a number, and having the head waiter keep track of the food each waiter took from the kitchen. The waiters were also given slips of paper with their numbers on the paper, and they returned these, along with the payment for each meal, to the head cashier when the customer paid for his meal. By comparing the head waiter's list of food each waiter took from the kitchen with the slips and amounts each waiter gave to the head cashier, the hotel could discern when a waiter failed to pay the hotel the cost of all the meals he served to dining room customers. *Id.*

held that the "invention" was not new and useful.[116] The court said: "The fundamental principle of the system is as old as the art of bookkeeping, i.e. charging the goods of the employer to the agent who takes them."[117] The court went on to say in *dicta* that "[i]f at the time of [the inventor's] application, there had been no system of bookkeeping of any kind in restaurants, we would be confronted with the question whether a new and useful system of cash-registering and account-checking is such an art as is patentable under the statute."[118]

The court specifically left the question open to future cases. But for nearly ninety years it was believed that the answer to the question was negative because of one oft-quoted passage:

> A system of transacting business disconnected from the means for carrying out the system is not, with the most liberal interpretation of the term, an art. Advice is not patentable. . . . No mere abstraction, no idea, however brilliant, can be the subject of a patent irrespective of the means designed to give it effect.[119]

Although this statement was *dicta*, it showed that the court was quite comfortable weighing in and judging patents on business methods to be inefficient and unneeded.[120]

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[116] *See id.* at 469 (the Court held that "[i]t cannot be maintained that the physical means described by [the inventor],—the sheet and slips,—apart from the manner of their use, present any new and useful feature.").

[117] *Id.*

[118] *Id.* at 472.

[119] *Id.* at 466.

[120] *Lowe's Drive-In Theatres Inc. v. Park-In Theaters, Inc.*, 174 F.2d 547, at 552 (1st Cir. 1949) (holding invalid a patent on drive-in theaters as obvious, but stating that that "a system for the transaction of business, such, for example, as the cafeteria system for transacting the restaurant business, … however novel, useful, or commercially successful is not patentable apart from the means for making the system practically useful …."). Likewise, close scrutiny reveals that other cases cited as holding business methods unpatentable largely made their statements about the patentability of business methods in *dicta*. *See, e.g.*, U.S. Credit System Co. v. Am. Credit Indem. Co., 59 F. 139 (2d Cir. 1893); *In re* Patton, 127 F.2d 324 (C.C.P.A. 1942).

For an excellent discussion of the inconclusiveness of the precedent supposedly holding business methods unpatentable subject matter *per se* see Judge Newman's dissent in *In re* Schrader, 22 F.3d 290, 296-99 (Fed. Cir. 1994) (J. Newman, dissenting). Her analysis is supported by the work of several scholars, who note that the business method exception seems only to have appeared in *dicta*. *See* E. Robert Yoches & Howard G. Pollack, *Is the "Method of Doing Business" Rejection Bankrupt?*, 3 FED. CIR. B.J. 73 (1993); George E. Tew, *Method of Doing Business*, 16 J. PAT. OFF. SOC'Y 607, 607 (1934)

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Over the years confidence nevertheless grew that the *dicta* of various cases that spoke skeptically of the patentability of business methods had in fact made business methods unpatentable subject matter.[121] This became the accepted conventional wisdom until the Federal Circuit unequivocally held business methods to be patentable subject matter in the *State Street Bank* decision.

The Federal Circuit shattered the conventional wisdom that business methods were unpatentable subject matter in 1998 in the *State Street Bank*[122] decision. In that case the patent was on a system that kept track of the value of shares in a "hub and spoke" mutual fund arrangement. Various mutual funds ("spokes") pooled their resources together (the "hub") in order to gain economies of scale in investing and managing the portfolios. The system used a computer to keep track of the ownership and dollar values of the various funds and of the shares owned by those invested in the funds.[123]

The case was initially decided by a Massachusetts district court. The district court held that the system was unpatentable under the alternate rationales of either the mathematical algorithm exception or the business method exception. Importantly, the district court also offered up an economic efficiency rationale for its decision. The district court stated that allowing the patent would "foreclose virtually any computer-implemented accounting method necessary to manage this type of financial structure."[124] In reaching its decision, the district court clung to the physical transformation test and ignored the recent whittling away of the test by the Federal Circuit in the 1990s. Instead, the district court relied on the sixteen-year-old Supreme Court case of *Diamond v. Diehr* to hold that an element of "physical transformation" was still necessary for patentability.[125]

("It is probably settled by long practice and many precedents that 'methods of doing business,' as these words are generally understood, are unpatentable, notwithstanding the absence in decided cases of any logical or statutory reason or rule why they are unpatentable.").

[121] *See, generally*, Rinaldo Del Gallo, III, *Are "Methods of Doing Business" Finally Out of Business as a Statutory Rejection?*, 38 IDEA 403, 405-11 (1998).

[122] State St. Bank & Trust Co. v. Signature Fin. Group, Inc., 927 F. Supp. 502 (D. Mass. 1996).

[123] *Id*. at 516.

[124] *Id*. at 516.

[125] *Id.* at 509. The district court said that the process in *Diehr* "'involve[d] the transformation of an article . . . into a different state or thing.' This element of physical transformation, hinted at in *Benson* and *Flook*, was made explicit in *Diehr*[.]" *Id.* (quoting *Diehr*, 450 U.S. at 184). This is not to say that the court's position was without support in contemporary academic writing. *See, e.g.*, Lawrence Kass, *Computer Software*

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The Federal Circuit reversed,[126] holding that, regardless of whether the system was classified as process or machine, the mathematical algorithm exception did not bar patentability. The court held that the mathematical algorithm test only refers to abstract ideas that are not useful, stating: "Unpatentable mathematical algorithms are identifiable by showing they are merely abstract ideas constituting disembodied concepts or truths that are not 'useful.'"[127] The Federal Circuit held that the district court's insistence on physical transformation was no longer applicable in light of *Chakrabarty*, *Diehr* and the Federal Circuit's own case law.[128]

The Federal Circuit went on to specifically overrule the business method exception.[129] As can be seen by the above discussion of the case law, this holding was prefigured by the trend of ever-increasing subject matter patentability and the fact that the business method exception had never been more than *dicta*. The court brushed aside this century-old legal conventional wisdom with little discussion of the policies underlying the exception. Instead, the court spent a few paragraphs explaining that the decisions typically credited with having been decided on grounds of the business method exception could also be explained as having been decided on other grounds, like lack of novelty or nonobviousness.[130] The court dismissed the business method exception, stating that it was "tak[ing] this opportunity to lay this ill-conceived [business method exception] to rest."[131]

Patentability and the Role of Means-Plus-Function Format in Computer Software Claims, 15 PACE L. REV. 787, at 801 (1995) ("The Supreme Court elaborated on the Benson proscription against patenting pure mathematical algorithms in *Parker v. Flook* and *Diamond v. Diehr*, which collectively circumscribed what may be termed a 'physicality requirement' for processes that contain mathematical algorithms."); Jur Strobos, *Stalking the Elusive Patentable Software: Are There Still* Diehr *Or Was It Just a* Flook*?*, 6 HARV. J.L. & TECH. 363, 387 (1993) ("These two . . . requirements for software patentability, are hereinafter referred to as the 'preemption' and 'transformation' inquiries, respectively . . . . The first addresses preemption of human use of this equation by 'head and hand.' The second addresses whether the particular claimed use is a process with a product, or a transformation and reduction of a particular entity, such as input data, to a different state, rather than an idea or 'patent protection for that formula in the abstract.'") (quoting *Diehr*, 450 U.S. at 184).

[126] State St. Bank & Trust Co. v. Signature Fin. Group, Inc., 149 F.3d 1368 (Fed. Cir. 1998).

[127] *Id.* at 1373.

[128] *Id.* at 1374.

[129] *Id.* at 1375.

[130] *Id.*

[131] *Id.*

The Federal Circuit barely addressed the district court's economic efficiency analysis. The Federal Circuit simply responded that "[w]hether the patent's claims are too broad to be patentable is not to be judged under § 101, but rather under §§ 102, 103, and 112. Assuming the [district court] to be correct, it has nothing to do with whether what is claimed is statutory subject matter."

Here then the Federal Circuit neared completion of its abandonment of any gatekeeping function as to subject matter patentability. The Federal Circuit disclaimed any role in analyzing whether it is efficient to grant patents on certain classes of subject matter. The result of the language in the Federal Circuit's *State Street Bank* decision was to require that virtually all patents be examined as to novelty, nonobviousness, and the other sections of the Patent Act and allowed as patentable if they met those other requirements. In effect, after *State Street Bank* the Federal Circuit's position was that neither courts nor the PTO should engage in an analysis of whether a patent on a particular invention was needed to incentivize invention, and if so, whether the added incentive outweighed the deadweight loss of the patent grant for the particular type of invention.

3. The Federal Circuit Retreats Further

The positions taken by the Federal Circuit in *State Street Bank* have been repeated and confirmed in subsequent rulings. A year later, in *AT&T Corporation v. Excel Communications, Inc.*,[132] the Federal Circuit again strictly limited the mathematical algorithm exception,[133] and re-emphasized its rejection of the "physical transformation" test.[134] The Court reiterated that the criterion for subject matter patentability is simply whether the process produces a "useful, concrete and tangible result."[135]

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[132] 172 F.3d 1352 (Fed. Cir. 1999).

[133] The Federal Circuit reiterated that, "[b]ecause § 101 includes processes as a category of patentable subject matter, the judicially-defined proscription against patenting of a 'mathematical algorithm,' to the extent such a proscription still exists, is narrowly limited to mathematical algorithms in the abstract." *Id.* at 1356. The invention at issue claimed a process for adding a data field to call billing records used by long distance carriers, which data field allowed the identification of the long distance carrier with whom each call originated. *Id.* at 1352-54.

[134] The Court emphasized that "physical transformation" is not "an invariable requirement, but merely one example of how a mathematical algorithm may bring about a useful application." *Id.* at 1358.

[135] *Id.* at 1359. Of course the Federal Circuit noted that the three exceptions to subject matter patentability set out by the Supreme Court in Diehr still apply—"laws of nature, natural phenomena, and abstract ideas." Id. at 1355. The Court also noted that the patent at

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The Board of Patent Appeals and Interferences followed the Federal Circuit's expansionist lead in *Ex parte Lundgren*.[136] There the Board rejected the judicially created "technological arts" test of subject matter patentability that was developed by the CCPA in *Musgrave*. The technological arts test was originally devised by the CCPA to get around the "mental steps" exclusion for PSM so long as the inventions were within the broad field of the "technological arts."[137]

Even the very broad "technological arts" test could be used to prohibit patentability of some inventions, however, and the patent examiner in *Lundgren* made such a rejection. At issue in *Lundgren* was a method of compensating a manager of a private firm in an oligopoly market so as to reduce incentives for collusion with other firms.[138] The claim at issue in *Lundgren* did not tie the claimed method to a computer or to any other implementing technology. Instead, the patent claimed a method of comparing the absolute performance of a firm against the average performance of the other firms in the oligopolistic market, so as to make a manager's compensation dependent on her firm's performance measured against the other firms in the market, rather than dependent on overall

issue did not pre-empt all uses of the mathematical principle it made use of and therefore did not run afoul of another problem that the supposed mathematical algorithm exception sought to prevent—the patenting of all uses of an algorithm, which would in effect be the patenting of an abstract idea. Id. at 1357-58.

[136] *Ex Parte* Lundgren, 76 U.S.P.Q.2d 1385 (B.P.A.I. 2004).

[137] See discussion and notes, *supra*, Part III.B.1.

[138] Note that no firm in the oligopolistic market would want to use such a method, because if it worked it would eliminate potential oligopoly profits. Rather, the method would have to be imposed on the firms by some outsider, likely a government regulator. Thus, Lundgren (an economist working for the federal government) was attempting to patent a theory of economic regulation of oligopoly markets. *See* Steve Seidenberg, *The Lundgren Method*, INSIDECOUNSEL MAG., Jan. 1, 2006, http://www.insidecounsel.com/issues/insidecounsel/15_170/ip/261-1.html. Evidence for this theory is amply provided by the fact that Lundgren filed an *amicus* brief in the Microsoft Antitrust remedy hearings arguing that he should be allowed to participate in the remedy hearings in order to demonstrate that his patent pending method would be the best remedy for Microsoft's antitrust violations. As Lundgren adroitly noted in his reply brief, "Carl Lundgren would be prepared to argue that use of his invention would provide a better remedy in this case than would any other remedy. If Carl Lundgren should prevail in a fair contest to select the best remedy, he could earn a fortune." Reply by Carl Lundgren to the Parties' Responses to Motions Regarding Amicus Participation at 3, United States v. Microsoft, Corp., No. 00-5212 (D.C. Cir. 2000) available at http://www.usdoj.gov/atr/cases/f223500/223523b.htm). Lundgren's attempt to patent theories of regulation and then have them imposed by court order suggests its own host of problems that space constraints prohibit investigating in this Article.

profitability. The patent examiner rejected the patent application as being outside of the "technological arts"[139] The Board of Patent Appeals, however, rejected that a "technological arts" test ever existed. The Board stated that *Musgrave* never required an invention to be within the technological arts, and that, to the extent it did, it was contrary to the Supreme Court's later decision in *Benson*.[140]

4. The Supreme Court Punts: *LabCorp v. Metabolite*

The Federal Circuit continued dismantling barriers to patentable subject matter in *Lab. Corp. of America. Holdings v. Metabolite Labs., Inc.*[141] In *Metabolite* the Federal Circuit upheld the validity of a two-step process patent claim that covered (1) using patented or unpatented methods to test for an elevated level of an amino acid called homocysteine in warm-blooded animals and (2) correlating an elevated level of total homocysteine with a deficiency in either of two vitamins, cobalamin or folate.[142] Metabolite argued that any total homocysteine tests that defendant LabCorp performed and reported back to doctors must infringe the patent claim, because the relationship between homocysteine and vitamin deficiency is now so well-known that in looking at the homocysteine measurement doctors would automatically reach a conclusion about whether a vitamin deficiency existed.[143] The jury found for Metabolite on this theory, and the court enjoined LabCorp from performing "any homocysteine-only test."[144]

LabCorp appealed, arguing that upholding the patent would improperly give "a monopoly over a basic scientific fact rather than any novel invention."[145] The Federal Circuit rejected LabCorp's arguments and

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[139] *Id.* (stating that the invention was "an economic theory expressed as a mathematical algorithm without the disclosure or suggestion of computer, automated means, apparatus of any kind.").

[140] Id. at 4-5.

[141] 370 F.3d 1354 (Fed. Cir. 2004).

[142] Lab. Corp. of Amer. Holdings v. Metabolite Labs, Inc., 548 U.S. 124, 129 (Breyer, J., dissenting). The patent claim states in full:

> A method for detecting a deficiency of cobalamin or folate in warm-blooded animals comprising the steps of:
> assaying a body fluid for an elevated level of total homocysteine; and correlating an elevated level of total homocysteine in said body fluid with a deficiency of cobalamin or folate.

U.S. Patent No. 4,940,658, claim 13 (filed Nov.20, 1986).

[143] *Metabolite*, 548 U.S. at 129-30 (Breyer, J., dissenting).

[144] *Id.* at 130 (Breyer, J., dissenting).

[145] *Id.* at 131 (Breyer, J., dissenting).

affirmed. The Court did not address the subject matter patentability question, but instead agreed with the lower court that because the correlation is now well-known, almost every doctor who ordered and read results of homocysteine tests was a direct infringer and that LabCorp induced infringement by publishing continuing education articles.[146]

The Supreme Court granted *certiorari* on the issue of whether such a claim is patentable subject matter, but later dismissed the writ of certiorari as improvidently granted.[147] Although the dissent to the dismissal of *certiorari* did not carry the day, one can see in it an attempt by three justices to return to a subject matter patentability gatekeeper role. Justices Stevens and Souter joined Justice Breyer's dissent from the dismissal of the writ of certiorari, which urged that the claim was an unpatentable attempt to patent a "natural phenomenon." The dissent alternately referred to the process claimed in *Metabolite* as a "law of nature" and a "phenomenon of nature."[148] The dissent also acknowledged that drawing the line between patentable and unpatentable subject matter can be difficult and arbitrary.[149] But the dissent did not view this as a reason to abandon a gatekeeping role, and opined that the *Metabolite* case was "not at the boundary."[150] The dissent had "little doubt that the correlation between homocysteine and vitamin deficiency set forth in claim 13 is a 'natural phenomenon.'"[151]

I submit that to the extent the dissent found legitimacy in the historical tests for subject matter patentability on the basis of the tests' historical provenance rather than on the basis of their ability to prevent the granting of patents where there is no public goods problem, the dissent's focus was misplaced. Given the recent line of cases directly rejecting the historical tests, the dissent might have more profitably analyzed directly whether allowing patents on processes such as the one claimed in *Metabolite* causes more deadweight loss from the patent monopoly than increase in invention. That is the important question for which the historical tests are only a screen.

If such an analysis had been conducted, the *Metabolite* claim would have failed the economic litmus test. An examination of the process claimed in *Metabolite* shows that while the process does produce a useful result—

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[146] *Id.* (Breyer, J., dissenting) (quoting *Metabolite*, 370 F.3d at 1365).
[147] *Id.* at 124.
[148] *Id.* at 132, 134 (Breyer, J., dissenting).
[149] *Id.* at 134 (Breyer, J., dissenting).
[150] *Id.* at 135 (Breyer, J., dissenting).
[151] *Id.* (Breyer, J., dissenting).

the testing for homocysteine and correlation with vitamin deficiency is no doubt useful in medicine—giving a blanket monopoly over all uses of the correlation is much more incentive than is needed to encourage discovery of such correlations. The dissent was correct that the other claims in the *Metabolite* patent, which covered the methods of testing for homocysteine that the inventors designed, should be sufficient to incentivize the discovery of scientific correlations such as the one at issue in the case.

If a doctor discovers a previously unknown medical correlation, then she is in the best position to be the first one to design and market a test for that correlation. That is likely all the incentive needed to efficiently encourage research and discovery of scientific correlations. To give the discoverer a patent monopoly over all uses of the correlation, both known and unknown, causes a large amount of deadweight loss that is likely to outweigh any increased incentive to invent.[152] The ability of other scientists to "correlate" a scientific fact from observing some phenomenon is obviously critical to scientific progress. To give one person the ability to restrict the correlations another makes in her mind is to give a very broad monopoly indeed, and one that the courts have historically and quite rightly refused to give, whether by reason of the "natural phenomenon exception", the "laws of nature exception", or the "mental steps doctrine."

The *Metabolite* patent shows that merely satisfying the Federal Circuit's one remaining test for subject matter patentability—determining whether the patent results in a "useful, concrete, and tangible result"[153]—is not enough to prevent the grossly inefficient granting of patents. The result of the Federal Circuit's decision in *Metabolite* is that now that the correlation between elevated levels of the amino acid in question and vitamin deficiency are known, any test for the level of that amino acid—including tests that existed in the prior art, or new and more efficient tests that are later developed—will infringe the patent.[154] The Federal Circuit has now completely surrendered the gatekeeper role with regard to patentable subject matter, and although three justices sought to reverse that decision in *Metabolite*, the majority of the Supreme Court remains on the sidelines in this debate.

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[152] The incentive is particularly outsized in the case of discoveries in the fields of science and medicine because much of the research is already incentivized by government grants, as, indeed, was the research underlying the discovery in the *Metabolite* patent. *See* U.S. Patent No. 4,940,658, col.1 l.7 ("The research leading to this invention was partially funded by grants from the U.S. government.").

[153] *State St. Bank*, 149 F.3d at 1373.

[154] *See Metabolite*, 548 U.S. at 131-32 (Breyer, J., dissenting).

5. Renewed Federal Circuit Interest in Delimiting Patentable Subject Matter?

Perhaps out of fear that the Supreme Court is simply waiting for a more fully briefed case to come before it in order to weigh in on patentable subject matter, the Federal Circuit has decided two recent cases in which it held that some process claims divorced from any hardware or machine are not patentable subject matter.[155] In the pending case of *In re Bilski* the Federal Circuit is reconsidering its patentable subject matter jurisprudence *en banc*.[156] The court asked litigants to address the specific question of whether the claimed method of hedging against weather risks in purchasing commodities qualifies as patentable subject matter.[157] But the court also asked the parties to address, *inter alia*, (1) "[w]hat standard should govern in determining whether a process is patent-eligible subject matter under section 101,"[158] (2) "whether a method or process must result in a physical transformation of an article or be tied to a machine to be patent-eligible subject matter", and (3) whether the court's business method cases should be reconsidered or overruled in any respect.[159]

The Federal Circuit has an opportunity to return its jurisprudence on patentable subject matter to a position that increases social welfare by denying patentability to subject matter that do not need the additional incentive of a patent grant to be produced at efficient levels. Ideally the Federal Circuit would reclaim its role of crafter of section 101 common law. If it does so, the Federal Circuit should proclaim that both Congressional intent and the fact that the Constitution grants Congress the patent power

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[155] In *In re Nuijten*, 500 F.3d 1346 (Fed. Cir. 2007), the invention was a new method of "watermarking" signals. These signals might carry audio or any other type of information. Nuijten was granted claims for (1) the process of watermarking the signals, (2) structural means and machinery for encoding the signal, and (3) encoded signals stored in a storage medium. The PTO rejected Claim 14 (and dependent claims), which covered the encoded signal on its own, without reference to any storage medium. The Federal Circuit held that Claim 14 was properly rejected as unpatentable subject matter. The Court held that a signal, being transitory and intangible, complies with none of the four categories for patentable subject matter under § 101 (process, machine, manufacture, or composition of matter).

In *In re Comiskey*, 499 F.3d 1365 (2007), the Court rejected claims to a method of arbitration that were not tied to any implementing system or machine. The Court held that claims tied to software were patentable subject matter.

[156] In re Bilski, 264 Fed. App'x 896 (2008).

[157] *Id.*

[158] *Id.*

[159] *Id.*

solely "To promote the Progress of Science and useful Arts," means that those subject matter that do not need the incentive of the patent grant are not eligible for patents under section 101.

If the Federal Circuit is not comfortable declaring that under section 101 areas that do not need patents cannot have them, then it would do well to at least revert to one of its old proxy tests for efficiency of patentable subject matter. The Court could reaffirm its physical transformation test for patentable subject matter. Reclaiming this test would eliminate patentability for business methods, as well as for most software claims that are not tied to some industrial or mechanical process. While this may exclude from patentability some inventions that need the incentive of patents to be adequately produced, it seems likely that it would prevent the patenting of far more inventions that have no need of the patent incentive. Avoiding patenting these inventions would decrease deadweight loss from patents, lighten the load on the Patent Office, decrease the costs of patent thickets in these areas, and allow innovation in these areas without any fear of patent infringement.

IV. Application of the Model to Business Methods

With the courts' abdication of their historical gatekeeper roles and their adoption of a bare textualist reading of the Patent Act, nearly anything now qualifies as patentable subject matter. Can this possibly be efficient? Although I have just suggested that the answer is no in the above discussion of *Metabolite* and *Bilski*, I turn to another class of subject matter to provide a definitive answer to the question, for fear that *Metabolite* and *Bilski* may be labeled outliers by some.

This part of the Article makes use of the categories set out in Part II, above, to evaluate whether business methods are most likely to correspond to the situation where patentability causes more deadweight loss to society than gain from increased invention (Figure 2), and thus should receive no patent protection, or to correspond to the situation where limited patentability produces more welfare gain from increased invention than deadweight loss from the patent monopoly (Figure 3), and thus should receive limited patent protection.[160]

Even if business methods correspond to Figure 2, where patentability is never efficient, it may still be efficient to grant patent protection. If business methods cannot practically be separated from other processes, such as software, society must analyze them together, as one

[160] *See* Figures in Part II.B., *supra*.

large class of general processes. In such a case, if the benefits from granting patent protections to the larger class outweigh the deadweight losses from granting business methods patent protection, society should grant the entire class patent protection. If the benefits from granting the larger class patent protection are less than the deadweight losses from granting business methods patent protection, society should deny the entire class patent protection.

There is strong reason to believe that business methods lie on Figure 2 where patenting is never efficient. Particularly in the case of business methods, the level of incentive to invent new and useful business methods is quite high without any patent protection. Recall that an inventor's end goal (to say nothing of a businessperson's) is to maximize profits. A new business method increases profits by making a firm a more efficient producer, improving the quality of the firm's product, decreasing costs of production, or simply by more effectively marketing the product. The effect of the business method may be either or both of decreased costs (a more efficient business produces the same good at less cost) and increased revenue (a firm that produces a better product can sell more goods and/or charge a higher price).

In a highly competitive market, a firm that offers even a slight drop in price or improvement in service reaps large gains in extra sales, and thus large gains in revenue. While rivals will copy the method, they generally do not do so until the method has been proven successful. Further, it takes time to learn and institute a new method. Thus, in the short run (the time it takes for rivals to copy the new business method) the inventing firm receives exclusive benefits of the new method. Often, just this temporary increase in revenue will be enough to make the invention worthwhile (i.e. to outweigh the relatively low cost of invention in the field of business methods).

Trade secret law provides a further incentive to invest in business methods, in that it allows firms to extend their enjoyment of the revenue increases they can achieve in the "short run" for as long as they can keep their new business methods secret.[161] This increases revenue in the firm's profit equation, and thus increases the amount that a firm will be willing to spend on invention. A firm achieves trade secret status by implementing confidentiality and security requirements. In addition, firms make use of

[161] Actually, a firm must merely take the appropriate steps to keep its methods secret, and then courts will protect against and give remedies for unauthorized distribution of the methods in many cases. Of course, a competitor is always free to reverse engineer the trade secret method, if it can.

employee contracts that bind their employees to conceal confidential business methods from rivals, giving the firm exclusive use.[162] A firm thus quickly and cheaply achieves a form of monopoly protection without any foray into the patent application process.[163]

The trade secret regime has a substantial efficiency advantage over patent law. Private parties are allowed to establish their own levels of protection for each trade secret. The government does not have to evaluate each trade secret method to determine whether it should be patented and the breadth of claims that should be allowed. Instead, the trade secret regime puts the determination of the level of protection on the party with the most information about the value of the protection as opposed to its cost. In other words, the inventing firm can obtain a higher level of trade secret protection by taking more steps to keep the information secret, or it may obtain a lower level of protection by expending less on precautions to keep the process secret.[164] Thus the trade secret regime places the evaluation of the costs and benefits of trade secret protection on the firms—those entities that have the

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[162] Note that the level of trade secret protection varies from state to state, and is fairly weak in some states, like California, where a higher premium is placed on employee mobility and the free flow of information. *See* Christopher Rebel J. Pace, *The Case for a Federal Trade Secrets Act*, 8 HARV. J.L. & TECH. 427, 443-44 (2007) ("[D]espite this universal recognition and near-universal origin of trade secrets protection, states vary widely in their treatment of trade secret misappropriation....For example, a number of states have not adopted the UTSA's central definition of 'trade secret.' California dropped the UTSA requirement that a trade secret not be 'readily ascertainable by proper means.'"); Adam Gill, Note, *The Inevitable Disclosure Doctrine: Inequitable Results are Threatened but not Inevitable*, 24 HASTINGS COMM. & ENT. L.J. 403, 416 (2002) ("[T]he codification of [California Business and Professions Code 16600] and the related case law leave no doubt that California places a high value on and has a strong tradition of protecting employee mobility.").

[163] Some business methods may not be able to be kept secret if they are used. Amazon's 1-Click method of selling products, for instance, has to be publicized to be used. Amazon can, of course, both keep secret and copyright the underlying code, but the method of selling must be revealed to be utilized. On the other hand, in some instances the monopoly protection can be strong and long-lasting. Coca-Cola has kept the formula for Coke a trade secret for over a century. David S. Levine, *Secrecy and Unaccountability: Trade Secrets in Our Public Infrastructure*, 59 FLA. L. REV. 135, 156 (2007) ("[T]he formula for Coca-Cola, which is not patented, is the most famous example of a trade secret and has existed as a trade secret for over 100 years.").

[164] For instance, courts will give more protection to secrets when precautions are taken to strictly limit knowledge of them to those with a need to know, when physical security features are put in place, or when all materials having to do with the trade secret are clearly marked "confidential" or "top secret." *See, e.g.*, Rockwell Graphic Sys., Inc. v. DEV, Indus., Inc., 925 F.2d 174 (7th Cir. 1991).

lowest costs to gather the relevant information. The firms then internalize and weigh all the relevant factors discussed above. The inventing firm considers the costs of inventing, the increased rewards from using the new business method, and the costs of trade secret protection, and then decide whether to engage in the costs of inventing and the appropriate level of protection for the resulting process.[165] Rival firms consider, and act to get in on, the economic profits being gained by the inventing firm. When rivals enter a single-player market and convert it to a competitive one, they divide up the would-be monopolist's profits until such point that enough rivals have entered the market to drive deadweight loss down to zero. If the economic profits (and corresponding societal deadweight loss) are high, rivals will likely invest enough to invent the new business methods on their own.[166]

In addition, the internal structure of many firms may provide additional incentives to invent new business methods. Employees are promoted through the managerial ranks for improving a firm's efficiency. The prospect of promotion and a pay raise provides employees significant independent incentive to invent.[167] Further, if firms face a low cost of

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[165] Firms will not automatically seek maximum trade secret protection. Employees do not like contract provisions that limit their ability to work for a competitor in the future, or that threaten to penalize them if they reveal secrets. The employer will have to raise wages to compensate employees for this inconvenience. Thus, the employer will choose the level of trade secret protection for which increased revenues outweigh increased wages and other costs.

[166] The resources the second firm spends inventing the same business method is economic waste. Therefore if business methods are expensive to invent, patent protection might be a less costly alternative than the regime of trade secret protection, because patent holders must disclose their inventions. Additionally, if some business methods are sufficiently nonobvious that other firms will not be able to invent them, then a twenty-year patent protection accompanied by disclosure would be less costly to society than allowing the inventing firm to have a perpetual monopoly.

It should be noted, however, that even though patent protection may be cheaper than trade secret protection for some inventions, allowing a firm to choose between the two options is likely the least efficient alternative. This is because firms will choose the option that has maximum anti-competitive effect each time, that is, the firm will opt for whichever option will provide the longest period of monopoly.

[167] But see literature suggesting that there is a general decrease in innovation within firms compared to without. *See, e.g.*, Kim B. Clark, *The Interaction of Design Hierarchies and Market Concepts in Technological Evolution*, 14 RES. POL'Y 235-51 (1985); Richard N. Foster & Sarah Kaplan, CREATIVE DESTRUCTION: WHY COMPANIES THAT ARE BUILT TO LAST UNDERPERFORM THE MARKET—AND HOW TO SUCCESSFULLY TRANSFORM THEM (2001). *Cf.* Paul Romer, *Thinking and Feeling*, 90 AM. ECON. REV. 439 (2000). The literature argues that several factors converge to decrease innovation within a firm. First,

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invention, the free rider problem may not lead to underproduction of the invention.

The nature of business methods indicates that a low cost of invention is probable. When a pharmaceutical company attempts to synthesize a new drug, it must hire researchers for lengthy periods of time,

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while innovators generally do not capture the full benefit of their innovations, they may face the full brunt of the punishment for a risk gone bad. Second, managers often do not really know what potential innovators do and so do not do well in giving innovators resources and incentives to innovate. Third, Professor Clayton Christensen maintains that market players do especially poorly in coming up with innovation in the form of "disruptive technologies"—i.e. innovation that leads to disruption in the market or in the way a firm does business. CLAYTON M. CHRISTENSEN, THE INNOVATOR'S DILEMMA: THE REVOLUTIONARY NATIONAL BESTSELLER THAT CHANGED THE WAY WE DO BUSINESS (1997). According to Professor Christensen, while leading firms outperform others in perfecting existing technology in the market, they consistently miss identifying and developing disruptive technologies. The reason for this, according to Christensen, is that firms see it as rationale to pursue continued revenue from providing customers with marginally improved technology, but see great risk in betting on a new and disruptive technology, and consistently decline to take that risk. According to Professor Christensen's study of the issue, it is outside firms that consistently are willing to bet their firms to enter the market and pursue the disruptive technologies.

Even taking the above arguments at face value, however, there is reason to believe that while innovation may be a problem within certain market-leading firms, it is not a problem within the market as a whole. For while innovators within a firm may not reap the full benefit of their innovations, while reaping the full costs of mistakes, entrepreneurs outside the firms can generally receive the full benefit of their innovation upon entering a market. Indeed, Professor Christensen's work shows that outside innovators consistently enter the market to make innovative leaps forward. And note that Professor Christensen's study found this level of innovation before the advent of business method patents.

On the other hand, Bessen and Meurer argue that most important innovation does occur within firms:

> [S]ome people claim that almost all "breakthrough" inventions come from small inventors, and their interests should be paramount in debates about patent reform . . . . There are good reasons to think that small inventors make important inventions. This is not true of all types of small inventors, of course; many small inventors patent games, simple machines, and other low-tech inventions. Nevertheless, many small inventors do make important high-tech inventions. But there is no evidence to suggest that *most* breakthrough inventions come from small inventors. What limited evidence—for example, the characteristics of inventors nominated to the National Inventors Hall of Fame—suggest that most recent major inventions originated in large organizations, although a significant minority of important inventions are developed by independent inventors or inventors working in small firms.

JAMES BESSEN & MICHAEL J. MEURER, HOW JUDGES, BUREAUCRATS, AND LAWYERS PUT INNOVATORS AT RISK 19-20 (2008).

and the overhead for research laboratories and product development is quite costly. In addition, it is expensive and time-consuming to complete FDA trials and win approval to sell a new drug. Most new business methods, however, are developed in the normal course of business. Large independent labor expenditures are not needed to create them. Further, new business methods often simply increase efficiencies within the company. A firm has an incentive to closely tailor new methods to its structure. Rivals with different structures will find it more difficult to copy the tailored methods, and the inventing firm thus will enjoy a longer period of exclusivity.

In addition, business method patents will often merely serve to redistribute rents among existing parties rather than enhancing innovation. This is because many business methods are simply creative marketing techniques. They are not technological advances that increase society's productive capacity; they simply divert existing consumers from one purchase to another.

The case of *In re Maucorps*[168] is illustrative. Here, patent protection was denied to "a computer-implemented model of a sales organization" that determined "the optimum number of times a sales representative for a business should visit each customer over a period of time. The optimum number of sales representatives the organization should have, and the optimum organization of sales representatives."[169] As the Court stated, the ultimate effect was that the applicant "arrive[d] at the optimum business organization."[170]

Although the court denied patent protection under the mathematical algorithm exception, not the business method exception,[171] the case aptly illustrates why patents should be denied to such things as business marketing methods. It is doubtful that the applicant in *Maucorps* increased society's productive capacity through his organization method: more likely he merely diverted some customers from rival firms to his own firm. It is difficult to see what interest society has in redistributing economic rents among private parties.

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[168] 609 F.2d 481 (1979).

[169] *Id.* at 481.

[170] *Id.* at 482.

[171] *See id.* at 484-85. *See also State Street Bank*,149 F.3d at 1376 (reading *In re* Marcoups as rejecting the patent claim under the "'mathematical algorithm exception,' not the business method exception").

One might counter that while protections for marketing devices provide society little benefit, they likely produce little harm. After all, rents are merely reallocated among parties leaving aggregate social utility unaffected. But Louis Kaplow has described a general danger of patent misuse that applies in cases such as this. Kaplow shows that all patent protection in the business context carries the danger of decreasing social utility.[172] When competing businesses hold potentially conflicting patents, they may either sue one another for infringement, or they may settle their claims. Risk aversion will lead many competitors to reach a settlement under which each party grants a cross-license to the other even if the patents have questionable validity.

Kaplow shows that companies can utilize such cross-licensing agreements as court-enforceable controls for cartel pricing.[173] Suppose, for example, that Amazon.com, Borders, and Barnes & Noble each hold a patent for a method of online book shopping. Suppose online book shopping is a market of three; these firms hold the only three patents for online book shopping. In a world with no cross licensing, they would be competitors. Efforts to form a cartel would likely fail as the rewards to cheating (increased market share) would be large, and cartel monitoring would be difficult. Through cross-licensing agreements, however, these competitors gain access to one another's accounting records. They can thus monitor output and pricing. Further, license fees could be raised to punish cartel cheaters. Thus, cross-licensing business methods could create additional monopolies wider in scope than the original patent protection intended, and create additional deadweight losses to society.[174] This general danger of patent misuse is yet another reason to withhold patentability from subject matter areas in which there is not clear evidence that the benefits from patentability significantly outweigh the costs.[175]

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[172] *See* Louis Kaplow, *The Patent-Antitrust Intersection: A Reappraisal*, 97 HARV. L. REV. 1813 (1984). *See also*, Herbert Hovenkamp; Mark D. Janis and Mark A. Lemley, *Anticompetitive Settlement of Intellectual Property Disputes*, 87 MINN. L. REV. 1719 (2003) ("Because . . . competitors may agree to stop competing, to regulate the price each charges, and to exchange information about products and prices, settlements of IP disputes naturally raise antitrust concerns.")

[173] *Id.*

[174] *Id.*

[175] Nevertheless, as Professor Merges notes, some commentators ignore the cost-benefit analysis of patentability of business methods and instead simply argue that business methods should be patentable because everything else is. *See* Merges, *As Many as Six*

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It is important to remember that copying business rivals is not inherently bad. In fact, the functioning of a free market depends on it. Proponents of business method patents ignore the fact that business methods are among those things that we most want firms to be able to copy. The very basis of efficient markets is the ability of firms to see an economically profitable business opportunity and move into that market so as to drive economic profits down until all deadweight loss is squeezed out of the market and producer and consumer surplus is maximized in the aggregate. Whereas it may be necessary for firms to be granted patents on their new products in order to encourage the optimal amount of invention of new products, it is less likely that it is necessary to subsidize firms to figure out the best ways to market and sell their new products, or the best ways to run their business operations more efficiently so as to decrease costs and increase profits.[176] Moreover, allowing some firms to patent methods of

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Impossible Patents Before Breakfast: Property Rights for Business Concepts and Patent System Reform 14 BERKLEY TECH L.J. 577 (1999).

[176] Indeed, it is arguable that the four largest groupings of business method patent filings (Class 705) are for functions that firms are incentivized to constantly improve on their own simply by virtue of operating in competitive markets. The PTO White Paper on Business Methods sets out the following as the four largest groups for patent filings within Class 705:

1. Determining Who Your Customers Are, and The Products/Services They Need/Want
   Operations Research - Market Analysis
2. Informing Customers You Exist, Showing Them Your Products & Services, and Getting Them to Purchase
   Advertising Management
   Catalog Systems
   Incentive Programs
   Redemption of Coupon
3. Exchanging Money and Credit Before, During, and After the Business Transaction
   Credit and Loan Processing
   Point of Sale Systems
   Billing
   Funds Transfer
   Banking
   Clearinghouses
   Tax Processing
   Investment Planning
4. Tracking Resources, Money, And Products
   Human Resource Management
   Scheduling

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doing business such that their rivals cannot organize themselves in the most efficient manners for a period of twenty years may have much larger costs in terms of deadweight loss to society than the granting of patents on particular products. When a firm is issued a patent on a product, its rivals cannot produce that product unless licensed to do so. When a firm is granted a patent on a method of doing business, however, it can prevent its rivals from using the more efficient method, and make the costs of *all* of its rivals' goods relatively more expensive, thus driving up deadweight loss across an industry instead of merely for a particular product.[177] The benefits of the patent would have to be very great indeed to justify this result.

The preceding discussion suggests that incentives to create new business methods (either within firms or without) are already quite high without patent protection and that the increase in incentive from patent protection is therefore likely to be fairly small. Further, the extension of patent protection to business methods likely causes large deadweight loss to society. Thus, business methods likely correspond to Figure 2, where the amount of deadweight loss from each amount of patent protection is always greater than the invention corresponding to each amount of patent protection. This means that business methods as a class should be placed among those subjects, like natural phenomena and abstract ideas, that should be excluded from patent protection.

The only reason not to make business methods unpatentable subject matter is if the condition mentioned at the start of this section applies—if business methods cannot be reliably separated into their own subject matter category. The complete answer to this question is beyond the scope of this Article, but some initial thoughts can be offered.

First, even though some difficult line drawing may sometimes be called for in deciding whether to classify an invention as a business method, in many cases the classification will not be difficult.

Accounting
Inventory Monitoring

PTO BUSINESS METHODS WHITE PAPER, at section III. While arguments may exist as to whether firms are adequately incentivized to improve in all four of the above groups, it seems inarguable that prior to patent protection, firms are already incentivized to continually improve their business practices in groups 1 and 2 even in the absence of any patent protection.

[177] Imagine the loss in utility if Federal Express's "hub and spoke" delivery method had been patented. Or the utility loss that would have occurred if Wal-Mart had exclusive rights to its "just-in-time" warehousing and shipping method. Or consider the more severe losses to society if Adam Smith had been able to patent the division of labor method he instituted at his pen factory.

Second, the mere existence of some difficult line-drawing cases is not typically enough to turn a court away from an otherwise sensible distinction. Even though it may have become more difficult to draw the line between business methods and business processes due to the increased importance of computers, information, and services in the "new economy," the line between business methods and patentable processes has been drawn fairly successfully by courts for a century. Further, there has been no suggestion by the Federal Circuit that the duty of drawing lines between business methods and other processes has become so difficult as to be impossible, or even that uncertainty over where the line lay was causing an excessive number of appeals on the issue.[178]

Third, the other types of patents that may be hard to distinguish from business method patents are software patents (in cases in which the business method is implemented through software or computers) and process patents generally. Even if some "business method" inventions are disguised as software or other process inventions in their patent applications, this does not augur against making business methods unpatentable. If claims for business methods are disguised as software patents, then each claim will at least be tied to a software implementation and therefore the breadth of the patent will be narrower than one claiming a pure business method. Additionally, even if some business methods are allowed to issue as patents under the guise of ordinary processes, many of the most troubling or socially useless business method patents—patents on business structure, organization, or marketing—will be among those inventions that are most easily identifiable as business methods, and therefore will not be patentable. In other words, even if there is some slippage on the periphery, the rule against business method patents should nevertheless serve to prohibit patenting of core business methods.

Fourth, if business methods remain patentable, then drawing the line between business method patents and other unpatentable subject matter may be equally or more difficult than drawing the line between unpatentable processes and business methods. Would music videos have been classified as patentable business methods if such patent protection had been available at the time of their invention? How about "junk" bonds? Would they be classified as patentable business methods or as unpatentable financing

[178] Instead, in *State Street Bank*, the Federal Circuit simply abandoned any gate-keeping role or efficiency analysis and ruled that textually there is no statutory basis to exclude business methods from patentability. Thus there has never been a congressional or judicial finding that the line would be more difficult to draw than the many difficult lines courts must draw in all areas of the law.

tools? Likewise, would Walter Lipton's invention of the "poison pill" in the 1980's be granted patent protection as a business method, or would it be classified as some sort of unpatentable shareholder self-governance? The slippery slope of patents for processes not resulting in physically changed products does not end with business methods, but rather may drop off even more precipitously thereafter.[179]

V. Implications and Suggested Solutions

A. Revival of the Gatekeeper Role

An obvious conclusion results: because it remains efficient to analyze classes of subject matter and exclude some classes from patentability, the gatekeeper role should be revived. Once this delegation is made, a systematic analysis of suspect classes of subject matter should be made, starting with business methods, and likely continuing to software and beyond.

As has been shown, the federal courts' abandonment of the subject matter patentability gatekeeper role has decreased total social utility and PTO efficiency. Accordingly, if the courts do not take the role back upon themselves—which the Supreme Court could do, but probably will not, and which the Federal Circuit almost certainly will not do—then it makes sense for Congress to take up the role or to delegate it. While Congress could take on the role of determining efficient subject matter itself, it is probably not the body best suited to the task. Congress probably does not have the time or the ability to focus the extended attention necessary to come up with the best determinations of subject matter patentability. In addition, Congress

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[179] In addition, problems with determining patent boundaries may lead to even greater deterrence of innovation in fields subject to patenting. *See* JAMES BESSEN AND MICHAEL J. MEURER, PATENT FAILURE: HOW JUDGES, BUREAUCRATS, AND LAWYERS PUT INNOVATORS AT RISK 56 (2008):

> But the hard fact is, innovators cannot quickly and easily obtain a reliable judgment on whether prospective technology infringes on others' patents. Perhaps in an earlier time, when technology was simpler, this was not such a serious problem because the ambiguity of patent claims was not so great. But. . . there are reasons to think that this ambiguity has been increasing substantially in recent years. In addition, changes made during the 1990s in the legal methods used to determine the boundaries of patents appear to have made the uncertainty even greater.

Id.

suffers from the well-known problems of industry capture and susceptibility to lobbying.[180]

A better choice probably would be for Congress to delegate the gatekeeper role to an administrative agency. An administrative agency, such as the PTO, could devote the time and resources necessary for thorough analysis.[181] An agency could hire and/or consult with economists, industry members, academics, etc., so as to have a much greater factual and analytical framework available to it in making its determination than a court would typically have available to it from the submissions of the parties to a dispute.[182] In addition, the administrative rulemaking process is probably best adapted to making rules on patentable subject matter, because of the additional provisions for public comment.

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[180] *See* Andrew E. Jankowich, *Property and Democracy in Virtual Worlds*, 11 B.U. J. SCI. & TECH. L. 173, 200 (2005) ("Congress has a poor history of crafting statutes to deal with technological and intellectual property issues and is likely to focus only on issues that are controversial or are raised by large organized lobbies."); Vincent R. Johnson, *Regulating Lobbyists: Law, Ethics, and Public Policy*, 16 CORNELL J.L. & PUB. POL'Y 1, 12 (2006) ("Although modern practices are more subtle, lobbying continues to pose threats to the proper operation of government. This is particularly true in cases where lobbyists distort relevant facts, produce decisions based on favoritism rather than the merits, or give some segments of the community a real or perceived unfair advantage in securing access to members of government.")

[181] An agency could also take into account the amount and likelihood of other invention incentives for a particular subject matter in making a determination of whether that subject matter should be patentable. For instance, an agency tasked with determining whether scientific correlations should be patentable subject matter could analyze how much of the research that leads to the discovery of such correlations is already incentivized by other means, such as the government grant that underwrote some of the research in the *Metabolite* patent. *See* U.S. Patent No. 4,940,658 col.1 l.7 ("The research leading to this invention was partially funded by grants from the U.S. government.").

[182] That the amount and forms of legal protection needed to incentivize innovation seems to vary by industry is an additional factor that points to the appropriateness of having an administrative agency determine patentable subject matter. *See* FTC, TO PROMOTE INNOVATION: THE PROPER BALANCE OF COMPETITION AND PATENT LAW AND POLICY, ch. 3, at 1 (2003) (finding that "issues of fixed cost recovery, alternative appropriability mechanisms, and relationships between initial and follow-on innovation" differ by industry); Dan L. Burk & Mark A. Lemley, *Policy Levers in Patent Law*, 89 VA. L. REV. 1575, 1588-89 (2003) ("In short, innovation differs by industry in a variety of ways. Each distinct technology displays an idiosyncratic profile of technical and economic determinants for research, development, and return on investment. Given this, there is no *a priori* reason to believe that a single type of legal incentive will work best for every industry. Indeed, there is every reason to believe that achieving optimal innovation in different industries will require greater or lesser measures of legal incentive, and in some cases perhaps even no legal incentive at all.").

Congress may want to specifically delegate to the rulemaking agency the authority to treat different classes of subject matter differently. For example, if it is not most efficient simply to disallow patentability for certain types of subject matter, it may make sense to grant certain subject matter shorter periods of patentability so as to maximize efficiency. An agency might find that it is more efficient to patent software for shorter periods of time, whereas twenty-year patents on drugs continue to make sense.[183] An additional advantage to delegating the role to an administrative agency is that the agency could more easily adjust the level of protection if it is found that the level selected by the agency is either inefficiently high or low. Once Congress has passed legislation on complex matters like patent coverage, it is less likely to soon retread that ground.[184]

B. Additional Complication of International Agreements

One factor that impacts Congress's ability to fully delegate determination of subject matter patentability and term is found in the Agreement on Trade-Related Aspects of Intellectual Property Rights

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[183] This idea is not new. In 2000, Jeff Bezos, CEO of Amazon.com, suggested that patents on Internet methods be limited to 3-5 years. Matt Richtel, *Chairman of Amazon Urges Reduction of Patent Terms*, N.Y. TIMES, Mar. 11, 2000 at B4. This might make sense for patents on business methods or software because for these subject matters costs of invention may be quite low, but not so low that a smaller amount of patent protection does not have a positive effect on the amount of invention that is not outweighed by the deadweight loss to monopoly. Thus, some small amount of patent protection—like a three to five year patent term—might give businesses an additional small incentive to invent without causing an equal or greater deadweight loss. Deadweight loss might in turn become greater than additional invention after three to five years, if the amount of invention does not increase much with the additional patent protection.

[184] This is exemplified by the fitful course of current patent reform legislation in Congress. *See* Charlene Carter, *Conflicting Views Mire Patent Reform*, ROLL CALL, June 19, 2008, *available at* 2008 WLNR 11550290; Seth Stern, *Economic Worries and Manufacturing Interests Threaten Patent Overhaul*, CQ TODAY, April 4, 2008, *available at* 2008 WLNR 6665327; Robert Pear, *Patent Bill is Bonanza to Lobbyists*, N.Y. TIMES, April 30, 2008, at C1; Sheila Riley, *Proposed Bill to Stop 'Patent Trolls' Supported by Big Tech Companies*, INV. BUS. DAILY, May 29, 2008, *available at* 2008 WLNR 10075009; Nuala Moran, *U.S. Patent Reforms Might Force Firms to Rely on Trade Secrets*, 19 BIOWORLD TODAY, June 23, 2008, *available at* 2008 WLNR 11689592; *New BIO Study Concludes Patent 'Reform' Legislation Would Impose Significant Costs on Patent System and Could Undermine U.S. Innovation and Economic Growth*, LIFE SCI. WKLY, Feb. 26, 2008, at 3894, *available at* 2008 WLNR 3442226.

("TRIPs").[185] The TRIPs agreement states "patents shall be available for any inventions, whether products or processes, in all fields of technology, provided that they are new, involve an inventive step and are capable of industrial application."[186] The TRIPs agreement does not pose a problem for the exclusion of business methods from section 101 patentable subject matter, because business methods may reasonably be defined as not being within a "field of technology," and often are not capable of "industrial application" in any strict sense. No other country has as yet explicitly included business methods within its patentable subject matter. Thus the United States has broken from the practice in other nations by allowing the patenting of business methods, so forbidding them patent protection would bring the United States back into harmony with other countries.

When it comes to the patentability of other subject matters, such as software, for instance, the TRIPs agreement may have more of an impact. Currently, however, Europe and Japan do not interpret TRIPs to mandate coverage of software, so here too an agency could make determinations as to subject matter patentability without running afoul of TRIPs.

The issue of variable patent terms does directly conflict with the TRIPs agreement, however. The TRIPs agreement explicitly states that patent protection shall extend for at least twenty years from the date of filing the application.[187] Accordingly, the TRIPs Agreement would have to be amended to allow for this disparate treatment of different classes of subject matter. Unfortunately, the price of uniformity in international patent laws is a decreased ability to locally shape efficient patent protection. Thus, in order to allow flexibility in patent terms the effort would have to be taken up both at the national and international levels.

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[185] *See Agreement on Trade-Related Aspects of Intellectual Property Rights*, *reprinted in* SELECTED INTELLECTUAL PROPERTY AND UNFAIR COMPETITION STATUTES, REGULATIONS AND TREATIES 847 (Roger E. Schecter ed., 2004) [hereinafter SELECTED INTELLECTUAL PROPERTY STATUTES].

[186] *Id.* at Article 27, ¶ 1; *see also id.* at n.5 ("For the purposes of this Article, the terms 'inventive step' and 'capable of industrial application' may be deemed by a Member to be synonymous with the terms 'non-obvious' and 'useful' respectively.").

[187] *See id.* at Art. 33 ("The term of protection available shall not end before the expiration of a period of twenty years counted from the filing date."); *see also id.* at Art. 27 ("patents shall be available and patent rights enjoyable without discrimination as to . . . the field of technology . . . .").

VI. CONCLUSION

This Article has analyzed the historical role that federal courts have played as gatekeepers of subject matter patentability and why they eventually abandoned that role. The review of the courts' decisions showed that this abandonment was neither a single impetuous expansion of subject matter patentability, nor a reasoned analysis of the efficiency of expansion. Rather, it was slow and steady erosion that occurred as judges unsuccessfully attempted to adjust traditional tests for subject matter patentability to fit the contours of new technology and the Information Age. The increasing value of software programs pressured courts to protect software processes through the patent law. In order to do this, first the Federal Circuit, and then the Supreme Court, moved away from tests that used physical/nonphysical distinctions to determine the line between patentable subject matter and unpatentable abstract ideas. The courts thus struck down the physical transformation test, the mathematical algorithm exception, and, most recently, the business method exception.

This Article has shown how the courts' gradual abdication of their gatekeeper role has allowed the patentability of virtually every subject matter. The result has been a flood of new patents drawn to subject matter that formerly were unpatentable. This Article has explained that this approach is unnecessarily costly for society. The Article's case study of business method patents provides a prime example of a type of subject matter for which allowing patentability makes society worse off. Accordingly, this Article recommends that either the courts or Congress revive the gatekeeper role. If Congress takes up the task, this Article suggests that the role might profitably be delegated to an administrative agency that can perform the analyses necessary to determine the classes of subject matter for which it is utility-enhancing to grant patentability, and for which classes it is not.