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PATENTING ABSTRACTIONS*

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This Article explores whether abstract ideas can and should be patentable. Historically, the patent system's scope has been restricted to protecting tangible products or processes as opposed to abstract ideas.

Ongoing advances in information technologies, however, have blurred the boundaries of the traditional doctrine, and many recently issued patents appear to protect abstractions. A recent U.S. Supreme Court decision, Bilski v. Kappos*, provided new, but vague, guidance on subject matter eligibility thresholds, leaving the question of the patentability of abstract ideas open. This Article addresses* Bilski*'s vague guidance both by descriptively showing that domestic patent law has consistently excluded abstract ideas and by proposing a more robust framework for assessing the patentability of abstractions. The proposed framework can be applied to the highly contested questions of whether business methods, computer software, and diagnostic methods each constitute patentable inventions. This Article concludes with*

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the argument that the Federal Circuit's updated approach in State Street Bank v. Signature Financial Group *was inevitable and is consistent with the information economy while the Federal Circuit's and Supreme Court's decisions in* Bilski v. Kappos *and* Mayo v. Prometheus *reflect stagnation and an ill-devised policy making process.*

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I. INTRODUCTION

In 2003, the United States Patent and Trademark Office ("USPTO") issued its first-ever patent for a legal method. The patent covered a tax strategy designed to minimize federal estate taxes through the use of a grantor-retained annuity trust.[1] This represents just one example of new patents that seem to capture abstractions. The USPTO has since issued about a dozen legal method patents, with an unknown number of legal method applications currently pending.[2] Today, there are many more patents issued over what seem to be pure abstract inventions in a variety of fields including insurance, marketing, and retirement plans.[3]

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[1] U.S. Patent No. 6,567,790 (filed Dec. 1, 1999).

[2] *See Issues Relating to the Patenting of Tax Advice: Hearing Before the Subcomm. on Select Revenue Measures of the H. Comm. on Ways and Means*, 109th Cong. 11–15 (2006) (statement of Mark Everson, Comm'r, IRS); *see also e.g.*, Method and Apparatus for Modeling and Executing Deferred Award Instrument Plan, U.S. Patent No. 6,609,111 (filed Oct. 18, 2000) (explaining that an invention which administers various deferred compensation programs that can reduce an individual's estate or income tax). *See generally* Andrew A. Schwartz, *The Patent Office Meets the Poison Pill: Why Legal Methods Cannot Be Patented*, 20 HARV. J.L. & TECH. 333 (2007) (exploring the patentability of legal tax methods and suggesting that they should not be patentable). As part of the new America Invents Act of 2011, Congress has sought to ban government-granted patents for tax-planning strategies. *See* Leahy-Smith America Invents Act § 14, Pub. L. No. 112-29, 125 Stat. 284 (2011) ("For purposes of evaluating an invention under section 102 or 103 of title 35, United States Code, any strategy for reducing, avoiding, or deferring tax liability, whether known or unknown at the time of the invention or application for patent, shall be deemed insufficient to differentiate a claimed invention from the prior art."). The proposed change responds to critics who see the new trend as a "symbol of the flaws in both the tax and intellectual-property systems, where companies have devoted significant effort to cutting their tax bills, and in some cases essentially equate[d] clever accounting schemes with innovations like a new semiconductor or a pharmaceutical product." Greg Hitt, *Politics & Economics: Ban on Tax-Plan Patents?; Congress Is Skeptical of Their Legitimacy*, WALL ST. J., A8 (Sept. 24, 2007).

[3] *See, e.g.*, U.S. Patent No. 4,642,768 (filed Mar. 8, 1984) (providing College Savings Bank with a patent on its insurance product used for funding a college education); U.S. Patent No. 5,136,502 (filed Oct. 2, 1991) (patenting a computer system used to fund and manage retiree health care benefits by employing a

This phenomenon deserves attention because it constitutes a departure from the traditional understanding of intellectual property regimes. Patent law and copyright law aim to provide incentives for the creation of socially desirable goods through the endowment of a monopoly grant for a limited period.[4] The U.S. Constitution provides in Article I, Section 8 that Congress shall have the power "[t]o 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 . . . ."[5] This clause forms the basis for grants of copyrights and patents. Copyright law and patent law generally define the protected subject matter under their respective statutes.[6]

Historically, patent protection has extended to functional technological works falling into four types of subject matter: (i) processes; (ii) machines; (iii) articles of manufacture; and (iv) compositions of matter—all of which are historically limited to tangible products and processes.[7] Moreover, patent law traditionally steered clear of purely informational works that have no function other than to inform, entertain, or present an appearance to human beings.[8] As a result, patent and copyright law protected two separate and distinct categories: nonfunctional subject matter (copyrights) and functional subject matter (patents).[9] While there had been very

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Voluntary Employee Beneficiary Association trust that in turn purchases variable life insurance contracts on a selected group of employees); U.S. Patent No. 5,235,507 (filed Jan. 16, 1990) (providing patent protection to a health insurance management system for software that verifies the insurance status of the claimant; identifies the appropriate insurance policy; calculates the amount to be paid to the health care provider; pays the provider; and calculates and debits the amount to be paid by the claimant).

[4] *See, e.g.*, Sony v. Universal Studios, 464 U.S. 417, 429 (1984); Diamond v. Chakrabarty, 447 U.S. 303, 307 (1980).

[5] U.S. CONST. art. I, § 8.

[6] *See* 17 U.S.C. § 102 (2006) (concerning copyright law); 35 U.S.C. § 101 (2006) (pertaining to patent law).

[7] 35 U.S.C. § 101 (2006); *see also* Dennis Karjala, *Distinguishing Patent and Copyright Subject Matter*, 35 CONN. L. REV. 439, 453 (2003) (tracing the historical reasons for the difference between patent law and copyright law subject matter eligibility).

[8] Karjala, *supra* note 7, at 453.

[9] *Id.*

little need to draw additional subject matter boundaries between copyright law and patent law, the recent advent of information technologies has begun to blur the distinction.

The introduction of computer software was one of the most significant challenges to the patent system and intellectual property law regimes. In the late 1970s and the early 1980s, judges, legislators, and prominent legal scholars around the world tried to find a way to fit software into existing intellectual property law regimes. Predictably, software raised a significant challenge as it is both a functional product that could be handled through the patent system, and also a written code that could be addressed through copyright law. Because of the complex nature of software, it has been a challenge to fit it easily into existing patent and copyright law regimes.[10]

Abstract inventions, potentially including computer software, are patentable largely because of *State Street Bank & Trust Co. v. Signature Financial Group Inc*.[11] The case essentially eliminated patentable subject matter eligibility thresholds and suggested that any invention with a tangible, concrete, and useful result can be patentable.[12] However, both the Federal Circuit, in *In re Bilski*,[13]

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[10] *See, e.g.*, Pamela Samuelson et al., *A Manifesto Concerning the Legal Protection of Computer Programs*, 94 COLUM. L. REV. 2308 (1994) (discussing the protection of computer program and suggesting the creation of a *sui generis* regime for protection rather than using exiting intellectual property regimes such as patent law or copyright law); Donald S. Chisum, *The Patentability of Algorithms*, 47 PITT. L. REV. 959 (1986) (arguing that software is patentable); Arthur R. Miller, *Copyright Protection For Computer Programs, Databases, and Computer-Generated Works: Is Anything New Since CONTU?*, 106 HARV. L. REV. 977 (1993) (defending application of copyright law to software); A. Samuel Oddi, *An Uneasier Case for Copyright than for Patent Protection of Computer Programs*, 72 NEB. L. REV. 351 (1993) (arguing that patents are appropriate for software).

[11] 149 F.3d 1368 (Fed. Cir. 1998).

[12] *Id.* at 1375 ("For purpose of our analysis, as noted above, claim 1 is directed to a machine programmed with the Hub and Spoke software and admittedly produces a 'useful, concrete, and tangible result.' . . . This renders it statutory subject matter, *even if the useful result is expressed in numbers, such as price, profit, percentage, cost, or loss*.") (emphasis added).

[13] 545 F.3d 943 (Fed. Cir. 2008).

and the Supreme Court, in *Bilski v. Kappos*,[14] more recently reexamined subject matter eligibility thresholds, holding that *State Street*'s patentability test allowed too many ineligible inventions into the patent system.[15] The Supreme Court, nevertheless, failed to provide clear guidance concerning the threshold inquiry for subject matter eligibility.[16]

The Supreme Court's recent decision in *Mayo Collaborative Services v. Prometheus Laboratories, Inc.*[17] only made matters more ambiguous. In *Mayo*, the Court held that a personalized medicine dosing process was ineligible for patent protection because the process was effectively a law of nature, and that combining a law of nature with well-known elements does not justify the grant of a patent monopoly.[18] The Court emphasized that the claims were overly broad because they were not confined to any particular useful application, suggesting that the different steps in the claims "add nothing specific to the laws of nature other than what is well-understood, routine, conventional activity, previously engaged in by those in the field."[19]

This Article explores the question of whether abstractions can or should be patentable in light of the lack of bright-line rules. Part II offers an historical setting regarding subject matter eligibility, showing that patent protection was confined to tangible applications rather than abstraction. Part III shows that patent law has, until recently, consistently excluded abstract ideas from patent protection through ill-defined gatekeeping mechanisms designed to keep abstractions within the public domain. As a result of the increased production of information technologies, however, courts have either stopped using the mechanisms to keep abstractions

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[14] 130 S. Ct. 3218 (2010).

[15] *Id.* at 3229.

[16] *See id.* at 3227–31.

[17] 132 S. Ct. 1289 (2012).

[18] *Id.* at 1297 ("If a law of nature is not patentable, then neither is a process reciting a law of nature, unless that process has additional features that provide practical assurance that the process is more than a drafting effort designed to monopolize the law of nature itself. A patent, for example, could not simply recite a law of nature and then add the instruction 'apply the law.' ").

[19] *Id.* at 1299–1300.

public or used them less frequently. Part III also reviews Supreme Court and Federal Circuit rulings during the last forty years on subject matter eligibility, showing that the courts' analyses have consistently centered upon finding a physical anchor. These analyses in turn serve to exclude abstractions and act as a proxy for more complex concerns of the courts pertaining to abstractions. Part IV suggests a more robust theoretical framework for assessing the patentability of abstractions by identifying and assessing the strength of a rich set of rationales for excluding abstractions, including economic, justice-property based, constitutional, and structural-constraint rationales.

With these insights, Part V explores the framework's utility in assessing the patentability of highly contested categories of inventions, such as business methods, computer software, and diagnostic methods. This Article then concludes that the Federal Circuit's approach in *State Street* was inevitable, more responsive to, and consistent with today's information economy, while the Federal Circuit's and Supreme Court's decisions in *Bilski* reflect stagnation and an ill-devised policy-making process. Because the search for physical anchoring in the courts' decisions is not grounded in any persuasive rationale, physical anchoring should not be a decisive factor in patentability analysis.

II. HISTORICAL SETTING

Although the protection of intellectual property is theoretically justified by the idea that it is analogous to property in tangible objects,[20] critics argue that intellectual property cannot be justified by the same principles that underlie property generally.[21] Viewed in the light of A.M. Honoré's classical-philosophical account of the fundamental elements of ownership,[22] it seems nonsensical to

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[20] *See* Justin Hughes, *The Philosophy of Intellectual Property*, 77 GEO. L.J. 287, 296–97 (1988).

[21] *See generally* Peter Drahos, A PHILOSOPHY OF INTELLECTUAL PROPERTY 48–49 (1st ed. 1996).

[22] *See* LAWRENCE C. BECKER, PROPERTY RIGHTS: PHILOSOPHIC FOUNDATIONS 18–19 (1977) (explaining Honoré's notion that full ownership is explicated by reference to the following elements: the right to possess, the right to use, the right to manage, the right to the income, the right to the capital, the right to

categorize intellectual property as the same as tangible property. Many of tangible property's ownership elements, such as possession and the right to capital, do not apply to intellectual property.[23] It is difficult to possess a patentable idea in the same way as a tangible asset, and it is also very difficult to imagine the consumption of an intangible idea, as compared to the consumption of a tangible good.

In 1769, Judge Joseph Yates delivered a dissenting opinion in *Millar v. Taylor*[24] opposing the recognition of property rights in purely intangible "ideas" and "sentiments."[25] Yates's dissent may seem like the product of a bygone age in which land served as the primary paradigm for property, but more modern judges also expressed similar views. Justice Oliver Wendell Holmes, for example, stated that protection of intellectual property through copyright:

> [R]estrains the spontaneity of men where but for it there would be nothing of any kind to hinder their doing as they saw fit. It is a prohibition of conduct remote from the persons or tangibles of the party having the right.[26]

In spite of these inherent difficulties, legal systems introduced intellectual property regimes.

However, this does not mean that accommodating intangible inventions has been an easy task. Subject matter eligibility questions have arisen and challenged many patent systems as patent law consistently demonstrated animosity towards patenting abstractions.[27] Under traditional eighteenth and nineteenth century conceptions of patentable subject matter, patents for processes were limited to processes tied to a particular apparatus or that transformed matter from one state to another.[28] Tangibility seemed

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security, the power of transmissibility, the absence of term, the prohibition of harmful use, liability to execution, and residuary character).

[23] *See* EATON S. DRONE, A TREATISE ON THE LAW OF PROPERTY IN INTELLECTUAL PRODUCTIONS 6 (1st ed. 1879).

[24] [1769] 98 Eng. Rep. 201 (K.B.).

[25] *Id.* at 230.

[26] White-Smith Music Publ'g Co. v. Apollo Co., 209 U.S. 1, 19 (1908) (Holmes, J., concurring).

[27] *See infra* Part III.A.

[28] *See* Diamond v. Chakrabarty, 447 U.S. 303, 308–10 (1980).

to be the touchstone for patent protection,[29] and was consistent with the industrial applications environment in which these rules were crafted.[30] As the discussion that follows shows, abstractions could not be patented because they were not tangible and did not fit into any of the recognized patentable subject matter categories, such as a machine, manufacture, composition of matter, or process.

Despite this common animosity towards patenting abstractions, the Constitution does not offer clear instructions as to subject matter eligibility and abstractions' patentability. The Constitution states that Congress has the power to grant to "[i]nventors" limited exclusive rights in their "[d]iscoveries" in order to promote the progress of "useful [a]rts."[31] The Constitution does not define inventors, discoveries, or useful arts, however, and the Supreme Court has refrained from adding much clarity to the meaning of these terms. Although the Court did expressly state that "it is only useful arts . . . that can be made the subject of a patent,"[32] it has not defined the term "useful arts."[33] The Court has, however, limited the phrase by excluding natural phenomena, laws of nature, and abstract ideas from patent protection.[34] In addition, lower courts have suggested on multiple occasions that useful arts means "technological arts," though this definition does not provide any

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[29] *See* Rebecca S. Eisenberg, *How Can You Patent Genes?*, 2 AM. J. BIOETHICS 3, 5 (2002).

[30] The first Patent Act was enacted during the late eighteenth century. Therefore, it is not at all surprising that the first Patent Act addressed types of innovations characteristic of that era, all of which are physical inventions. *See* Patent Act of 1790, ch. 7, 1 Stat. 109–12 (1790). *See generally* Edward C. Walterscheid, *To Promote the Progress of Science and the Useful Arts: The Background and Origin of the Intellectual Property Clause of the United States Constitution*, 2 J. INTELL. PROP. L. 1 (1994).

[31] U.S. CONST. art. I, § 8, cl. 8. *See generally* Edward C. Walterscheid, "*Within the Limits of the Constitutional Grant": Constitutional Limitations on the Patent Power*, 9 J. INTELL. PROP. L. 291, 331–54 (2002) (discussing patentable subject matter from a historical perspective).

[32] Dolbear v. Am. Bell Tel. Co. (*The Telephone Cases*), 126 U.S. 1, 533 (1888).

[33] *See* Bilski v. Kappos, 130 S. Ct. 3218, 3243 (2010) (Stevens, J., concurring); Pennock v. Dialogue, 27 U.S. 1, 18 (1829).

[34] *Bilski*, 130 S. Ct. at 3226.

better instruction.[35] Different interpretations suggested by numerous commentators also fail to offer helpful guidance.[36] As one commentator stressed, the Framers of the Constitution created a significant interpretational problem when they chose to use the term "discoveries" in the clause.[37] It is likely that the Framers viewed the term "discoveries" as synonymous with "invention" simply because the clause suggests that discoveries are the work product of inventors.[38] However, the eighteenth century definition of discoveries was broad enough to encompass more than the creation of something new; it embraced the process of searching for and finding something that existed but had not yet been revealed.[39] Congress, like the Framers, seems to have accepted the two terms as synonymous.[40]

The language of the Patent Act is only slightly more informative. The statutory definition of patentable subject matter has changed only semantically since the first patent statute, the Patent Act of 1790.[41] The Patent Act of 1790 authorized patents for "any useful art, manufacture, engine, or device, or any improvement therein not before known or used."[42] The Act of

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[35] *In re* Bilski, 545 F.3d 943, 957 (Fed. Cir. 2008). For example, in *Ex Parte Lundgren*, the majority of the Board of Patent Appeals and Interferences reversed an examiner's rejection of a patent application on a claim for a business method that described a method of compensating a manager, suggesting that there existed no separate "technological arts" test for patentability. *Ex Parte* Lundgren, No. 2003-2088, 2004 WL 3561262 at *5 (B.P.A.I. Apr. 20, 2004).

[36] *See, e.g.*, Arthur H. Seidel, *The Constitution and a Standard of Patentability*, 48 J. PAT. OFF. SOC'Y 5, 10 (1966) (suggesting that the term meant useful or helpful trades in 1787); Robert I. Coulter, *The Field of the Statutory Useful Arts (Part II)*, 34 J. PAT. OFF. SOC'Y 487, 496 (1952) ("It seems clear that 'useful arts' (as a unitary technical term) embraced the so-called industrial, mechanical and manual arts of the 18th century."); Karl B. Lutz, *Are the Courts Carrying Out Constitutional Public Policy on Patents?*, 34 J. PAT. OFF. SOC'Y 766, 771 (1952) ("It is clear from the above that 'useful arts' meant what we now call 'technology,' or 'applied science.' ").

[37] Edward C. Walterscheid, Originalism and the IP Clause: A Commentary on Professor Oliar's "New Reading", 58 UCLA L. REV. DISC. 113, 123–24 (2010).

[38] *Id.*

[39] *Id.*

[40] *Id.*

[41] Diamond v. Chakrabarty, 447 U.S. 303, 308–09 (1980).

[42] Patent Act of 1790, ch. 7, 1 Stat. 109–12 (1790).

1793 was amended to authorize patents for "any new and useful art, machine, manufacture, or composition of matter, or any new or useful improvement [thereof]."[43]

This revised definition of patentable subject matter was retained until 1952, when the term "art" was replaced with "process."[44] According to Section 101 of the current Act, a person who "invents or discovers any new and useful process, machine, manufacture, or any composition of matter, or any new and useful improvement thereof, may obtain a patent therefor."[45] Although three of these categories—machines, compositions of matter, and articles of manufacture—refer to physical artifacts themselves and have presented scant interpretational difficulty for courts, the fourth category—process—has proven decidedly more challenging. This is especially the case where the abstract innovation or process at issue completely lacks physicality. Because the Patent Act itself offers little assistance in clarifying what constitutes a patentable process,[46] it is helpful to turn next to historical jurisprudence.

The fact that a process patent claim does not encompass abstract, intangible processes seemed clear—at least under nineteenth century case law. Perhaps the earliest discussion of the nature of process patents by the Supreme Court occurred in 1853 with *Corning v. Burden*.[47] The Court explained the difference between a machine and a process in the following manner:

> The term machine includes every mechanical device . . . to perform some function and produce a certain effect or result. But where the result or effect is produced by chemical action, by the operation or application of some element or power of nature, or of one substance to another, such modes, methods, or operations, are called processes. . . . The arts of tanning, dyeing, making water-proof cloth, vulcanizing

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[43] *See Chakrabarty*, 447 U.S. at 308.

[44] *Id.*

[45] 35 U.S.C. § 101 (2012).

[46] The Patent Act circularly defines process to mean "process, art, or method, and includes a new use of a known process, machine, manufacture, composition of matter, or material." *Id.* § 100(b).

[47] 56 U.S. 252 (1854).

> India rubber, smelting ores, and numerous others, are usually carried on by processes . . . .[48]

Twenty-four years later, the Court's decision in *Cochrane v. Deener*[49] provided a definition for process that remains the most frequently quoted explanation of the term.[50] The Court defined process as only including actions transforming matter from one physical state into another (such as a chemical reaction). Specifically, the Court stated: "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*."[51]

Additionally, the early cases also suggested that principles are excluded from patent protection and, although employing different terminology, they essentially excluded abstractions from patent protection. This exclusion was created in order to add clarity to the scope of patentable subject matter in the IP Clause and the Patent Act. These cases consistently held that no one could obtain exclusive rights in principles, although their practical applications were patentable.

The earliest American case to discuss the unpatentability of principles was *Whitney v. Carter*[52] in 1810.[53] Whitney instituted an action against Carter for infringement of his cotton ginning patent.[54] Carter alleged that Whitney's gin was not novel because an earlier machine was the same "in principle" as Whitney's gin.[55] Whitney disagreed, alleging that even if the principle of the two machines was identical, the application of that principle was different.[56] The court agreed, holding that "the legal title to a

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[48] *Id.* at 267.
[49] 94 U.S. 780 (1877).
[50] *See id.* at 788.
[51] *Id.* (emphasis added).
[52] 29 F. Cas. 1070 (C.C.D. Ga. 1810) (No. 17,583).
[53] *Id.* at 1070.
[54] *Id.* at 1071.
[55] *Id.*
[56] *Id.* ("[Whitney] defined the term 'principle,' as applied to the mechanic arts, to mean the elements and rudiments of those arts, or, in other words, the first grounds and rule for them. That *for a mere principle a patent cannot be obtained*. That neither the elements, nor the manner of combining them, nor

patent consists, not in a principle merely, but in an *application* of a principle, whether previously in existence or not, to some new and useful purpose."[57] This was a commonly agreed upon proposition.[58]

In summary, while neither the Constitution nor the Patent Act explicitly excludes abstractions or abstract processes, patent protection has been traditionally confined to tangible application rather than abstract principles and the Supreme Court's definition of process suggests that physical transformation has been the touchstone for the patentability of processes. As the next section will discuss, several patent doctrines emerged over the years that screened out abstractions from patent protection.

III. THE EMERGENCE OF THE GATEKEEPERS OF ABSTRACTIONS

Over the years, courts have created various abstraction "gatekeepers." This Part discusses the gatekeeping mechanisms by analyzing their rationales and their applications in court. As this Part shows, the exclusion of abstract ideas, natural phenomena, and laws of nature, although vague, has been the only meaningful and stable tool at the court's disposal to exclude problematic subject matter. Additionally, more specific gatekeeping mechanisms were essentially aimed at addressing concerns already covered by the general exclusion, thus failing to offer meaningful guidance and resulting in their decline.

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even the effect produced, can be the subject of a patent; and that it can only be obtained for the application of this effect to some new and useful purpose." (emphasis added)).

[57] *Id.* at 1072–73 (emphasis added).

[58] *See* Whittemore v. Cutter, 29 F. Cas. 1123, 1124 (C.C.D. Mass. 1813) ("So if the principles of the machine are new, either to produce a new or an old effect, the inventor may well entitle himself to the exclusive right of the whole machine. By the principles of a machine, (as these words are used in the statute) is not meant the original elementary principles of motion, which philosophy and science have discovered, but the modus operandi, the peculiar device or manner of producing any given effect.").

A. *Exclusion of Abstract Ideas, Natural Phenomena, and Laws of Nature: Keeping Basic Tools of Science within the Public Domain*

The Supreme Court consistently reiterates that laws of nature, natural phenomena, and abstract ideas do not constitute patentable subject matter.[59] These exclusions reflect the fundamental concept that patents are issued only for new *means* to achieve useful results,[60] rather than for something akin to the discovery of a scientific principle.

Courts have offered different rationales for all these exclusions, doing it at times in an implicit manner. The most commonly asserted rationale is that the patent system was devised to protect means of implementation rather than mere concepts.[61] Additionally, courts have suggested that protecting these categories would effectively extend protection over means neither invented nor described by the applicant,[62] and that such items are basic, fundamental tools of scientific and technological work. Granting an exclusive right to such tools might impede future inventions and discoveries.[63] The Supreme Court, in *Gottschalk v. Benson*,[64]

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[59] *See* Gottschalk v. Benson, 409 U.S. 63, 67 (1972).

[60] *See, e.g.*, Morton v. N.Y. Eye Infirmary, 17 F. Cas. 879, 881 (C.C.S.D.N.Y. 1862) (No. 9,865) ("It is only where the explorer has gone beyond the mere domain of discovery, and has laid hold of the new principle, force, or law, and connected it with some particular medium or mechanical contrivance by which, or through which, it acts on the material world, that he can secure the exclusive control of it under the patent laws.").

[61] *See, e.g.*, Rubber-Tip Pencil Co. v. Howard, 87 U.S. 498, 507 (1874) ("An idea of itself is not patentable, but a new device by which it may be made practically useful is.").

[62] *See, e.g.*, Wyeth v. Stone, 30 F. Cas. 723, 727 (C.C.D. Mass. 1840) ("No man can have a right to cut ice by all means or methods, or by all or any sort of apparatus, although he is not the inventor of any or all of such means, methods, or apparatus."); *see also* O'Reilly v. Morse, 56 U.S. 62, 113 (1854) (suggesting that by generally claiming the concept of electromagnetism as a means to communicate, Morse effectively sought to patent the principle itself). *But see* Michael Risch, *Everything Is Patentable*, 75 TENN. L. REV. 591, 591–92 (2008) (suggesting that most if not all subject matter eligibility cases reflect concerns pertaining to other patentability criteria rather than thresholds questions).

[63] *See, e.g.*, Funk Bros. Seed Co. v. Kalo Inoculant Co., 333 U.S. 127, 130 (1948) ("[P]atents cannot issue for the discovery of the phenomena of nature.

stated the rationale succinctly: "Phenomena of nature, though just discovered, mental processes, and abstract intellectual concepts are not patentable, as they are the basic tools of scientific and technological work."[65] Other courts have explained that such items are not created but are simply discovered.[66]

B. *The Mental Steps Doctrine: Excluding Thoughts, the Liberal Arts, and Abstract Ideas*

The "mental steps" doctrine has been used to deny patent protection for certain processes or methods that involve human intervention. It reflects an attempt to circumscribe the breadth of patent monopolies and safeguard the sanctity of human thought and the values of the First Amendment.[67] The mental steps

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The qualities of these bacteria, like the heat of the sun, electricity, or the qualities of metals, are part of the storehouse of knowledge of all men.") (citation omitted); Le Roy v. Tatham, 55 U.S. 156, 175 (1853) ("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.").

[64] 409 U.S. 63 (1972).

[65] *Id.* at 67; *see also* Lab. Corp. of Am. Holdings v. Metabolite Labs., Inc., 548 U.S. 124, 128 (2006) (per curiam) (Breyer, J., dissenting). Justice Breyer explained that laws of nature are not protectable, not because they are obvious, easy, or not useful, but because of "a basic judgment that protection in such cases, despite its potentially positive incentive effects, would too often severely interfere with, or discourage, development and the further spread of useful knowledge itself." *Id.* In *Diamond v. Chakrabarty*, 447 U.S. 303 (1980), Justice Burger similarly stated that "[t]he laws of nature, physical phenomena, and abstract ideas have been held not patentable." *Id.* at 309 ("Thus, 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.").

[66] *See, e.g.*, *Le Roy*, 55 U.S. at 175 (holding that "[n]or can an exclusive right exist to a new power, should one be discovered in addition to those already known"). *But see* Stephen McKenna, *Patentable Discovery?*, 33 SAN DIEGO L. REV. 1241, 1276–77 (1996) (suggesting that the concerns with granting patent protection to discoveries are overstated and therefore the courts and the patent office should explicitly recognize the patentability of discoveries that are not inventions, subject to the same statutory constraints imposed on inventions).

[67] *See generally* Kevin Emerson Collins, *Propertizing Thought*, 60 SMU L. REV. 317 (2007) (discussing the problems arising when patent claims recite acts of thinking); Kevin Emerson Collins, *Constructive Nonvolition in Patent Law and the Problem of Insufficient Thought Control*, 2007 WIS. L. REV. 759 (2007)

doctrine, however, is ill-defined and its demise is attributable to the vagueness of its underlying rationales. The modern Supreme Court, nevertheless, still mentions the mental steps doctrine alongside other doctrines, suggesting its continued viability.[68]

Courts have offered different rationales for the doctrine, either explicitly or implicitly. In *In re Abrams*,[69] the United States Court of Customs and Patent Appeals ("CCPA") stated: "Citation of authority in support of the principle that claims to mental concepts . . . are not patentable is unnecessary. It is self-evident that thought is not patentable."[70] In *Benson*, the Supreme Court declared that mental processes are not patentable and that, like abstract ideas and laws of nature, mental processes are "basic tools of scientific and technological work."[71]

The cases decided under the mental steps doctrine demonstrate a concern with patenting abstract ideas. However, given the common factual scenarios of mental steps cases it is more logical to view the emergence of the doctrine as reflecting a concern that protecting abstract ideas might discourage people from simply taking measurements, making calculations, interpreting data, or pursuing any other form of information processing.

One of the earliest mental steps cases, *Ex parte Meinhardt*,[72] ruled that a method involving human measurement and calculation for a "system for spacing free-hand letters" on a page[73] was not eligible for a patent because the only protectable process claims

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(discussing problems with the patenting of thoughts).

[68] *See* Diamond v. Diehr, 450 U.S. 175, 195–96 (1981).

[69] 188 F.2d 165 (C.C.P.A. 1951).

[70] *Id.* at 168.

[71] Gottschalk v. Benson, 409 U.S. 63, 67 (1972); *see also* Pamela Samuelson, Benson *Revisited: The Case Against Patent Protection for Algorithms and Other Computer Program-Related Inventions*, 39 EMORY L.J. 1025, 1127, 1145 (1990) (arguing that there is no perceived need for an incentive to encourage the inventions of new mental processes and referring to the difficulty of enforcing patent rights in mental processes and the greater probability of independent invention with regard to mental processes). *But see* Donald S. Chisum, *The Patentability of Algorithms*, 47 U. PITT. L. REV. 959, 970 (1986) (criticizing *Benson*).

[72] *Ex parte* Meinhardt, 1907 Dec. Comm'r Pat. 237.

[73] *Id.*

were either mechanical, chemical, or elemental processes, implicitly suggesting that methods requiring only the use of the human mind and writings were simply abstract and could not be patented.[74] Other early mental processes cases seem to have been decided on the basis of the abstract, algorithmic nature of the claim.[75]

During the 1940s, the USPTO, the Court of Appeals for the Ninth Circuit, and the CCPA recognized the mental steps doctrine. In a series of cases, these courts reviewed claims based on calculations, formulas, or other types of algorithms, rejected claims as unpatentable under the mental steps doctrine,[76] and in the 1950s and 1960s, denied protection to additional processes.[77]

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[74] *Id.* at 237–38; *see also* Warren T. Jessup, *Patentability of Mental Processes*, 40 J. PAT. OFF. SOC'Y 482 (1958).

[75] *See, e.g.*, Don Lee, Inc. v. Walker, 61 F.2d 58 (9th Cir. 1932) (finding a claim for a "method of counterbalancing engine main shafts" unpatentable because the claim was simply a "patent on a mathematical formula for the solution of a problem in dynamics" or "a monopoly of a formula for determining dynamic forces" and "such a computation is not a 'new and useful art, machine, manufacture or composition of matter' ").

[76] *See* Halliburton Oil Well Cementing Co. v. Walker, 146 F.2d 817, 821 (9th Cir. 1944) (rejecting process claims for a method for determining the location of an obstruction in an oil well because "these mental steps, even if novel, are not patentable," explaining that the "method here claimed consists in setting down three knowns in a simple equation and from them determining or computing an unknown"); *In re* Heritage, 185 F.2d 972 (C.C.P.A. 1950) (finding that a claim for a method of coating porous, sound-insulating fiber board with a minimum reduction in insulating quality was unpatentable because "[s]uch purely mental steps are not proper subject matter for protection under the patent statute," relying on another court's decision that found that a specified formula did not involve patentable subject matter); *Ex parte* Read, 123 U.S.P.Q. 446 (B.P.A.I. 1943) (rejecting a claim to a method for determining the rate of speed of a vehicle by using concentric logarithmic scales because it involved "purely a mental act," although it appears that the method was nothing more than a method for calculating speed using scales).

[77] *See, e.g.*, *In re* Abrams, 188 F.2d 165 (C.C.P.A. 1951) (endorsing a set of rules concerning mental steps processes: first, a process that is purely mental is unpatentable; second, a process that contains mental and physical steps is unpatentable if the advance over the prior art is found in the mental steps; and third, if a process contains both physical and mental steps and the advance over the prior art is found in the physical steps, the process is patentable).

Probably due to a lack of clarity concerning the underlying rationale of the doctrine, its application as a decisive factor in the denial of patent applications gradually declined.[78] More recent Supreme Court decisions have mentioned mental processes as an exception to patentability,[79] suggesting that the mental steps doctrine remains relevant as an abstractions gatekeeper.[80] Generally, however, the doctrine has lost its impact because of the ease with which it can be avoided by tying an invention to some physical means (for example, a computer), adding another limitation,[81] or disclaiming the scope covering human thinking.[82]

C. *The Printed Matter Rule: Excluding Things in the Copyright Law Domain*

The "printed matter" rule aims to exclude printed materials, such as literary texts, from patent protection. Case law on the printed matter rule does not offer any explanation concerning the rule's scope or underlying rationale. Some commentators have suggested, however, that the genesis of the rule on printed matter "is found in the long-standing rule that abstractions, mental

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[78] *See, e.g.*, *In re* Prater, 415 F.2d 1378, 1389 (C.C.P.A. 1968) (holding that a process "capable of performance without human intervention and directed to an industrial technology . . . is not precluded by the mere fact that the process could alternatively be carried out by mental steps"); *Ex parte* McNabb, 127 U.S.P.Q. 456, 457–58 (B.P.A.I. 1959) ("Any method or step in a method which can be manually performed and requires the use of the human eyes for detection or determination of any condition, such as temperature, pressure, time, etc., and/or the use of hands for the purpose of manipulating, such as turning off or on or regulating a given device . . . necessarily involves the human mind and hence can be classed as a mental step. Such steps, however, are not purely mental or interpretive steps and are not the kind which are prohibited by the decisions relating to purely mental steps."); *In re* Musgrave, 431 F.2d 882 (C.C.P.A. 1970) (permitting patent protection for processes that were purely mental in character only if the processes were so definite that they could be performed by a properly programmed machine).

[79] *See* Lab. Corp. of Am. Holdings v. Metabolite Labs., Inc., 548 U.S. 124 (2006) (per curiam) (Breyer, J., dissenting).

[80] *Id.* at 136–37.

[81] For example, adding elements that represent physical actions.

[82] *See* Jeff Thurston, Echoes from the Past: How the Federal Circuit Continues to Struggle with Patentable Subject Matter Post-*Bilski*, 77 MO. L. REV. 591, 610 (2012).

theories, or business methods are not patentable subject matter."[83] Thus, like abstract ideas, theories, or business methods, the printed matter rule purports to exclude the patenting of abstractions.

It is likely that the rule excludes printed matter and its content because printed matter is not functional and as a result does not fall within the scope of the "technological arts," notwithstanding the difficulty one might experience understanding this phrase. More importantly, the rule also reflects the division of labor between copyright law and patent law, as copyright regulates nearly every aspect of writing. Regardless of whether these rationales are the true rationales underlying the printed matter rule, the rule's existence and exceptions reflect the great caution exercised by courts in determining whether to provide patent protection to printed matter.

Like other gatekeepers, the printed matter rule provides a tool for the exclusion of abstractions from the realm of patentable material. Printed matter is not a "manufacture" and does not fit into any of the classes of patentable subject matter. However, if printed matter is integrated into some physical machine or structure, it can be an element of a patentable claim.[84]

In the past, due to the courts' failure to offer a clear rationale for both the printed matter rule and its exceptions, they struggled with applying the exclusion. This failure stemmed from the absence of a coherent thesis underpinning the doctrine. Some early cases on printed matter considered various kinds of printed business forms.[85] In these cases, the courts usually found no

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[83] Note, *The Patentability of Printed Matter: Critique and Proposal*, 18 GEO. WASH. L. REV. 475, 476 (1950). *See* Kevin Emerson Collins, *Semiotics 101: Taking the Printed Matter Doctrine Seriously*, 85 IND. L.J. 1379 (2010) (providing a comprehensive analysis of the printed matter doctrine).

[84] *Compare In re* Ngai, 367 F.3d 1336, 1339 (Fed. Cir. 2004) (affirming the denial of a patent when a known product has merely had instructions added to it), *with In re* Gulack, 703 F.2d 1381 (Fed. Cir. 1983) (affirming patentability where the printed matter, when integrated with the circular bands, produced a new product incapable of serving its function without both the printed matter and the physical band).

[85] The rule had been used to deny patent protection to information representation methods, texts (legal and other forms), and business forms. *See, e.g.*, Guthrie v. Curlett, 10 F.2d 725, 726 (2d Cir. 1926) (finding a "consolidated

invention in the arrangement of the printed matter and found such systems for doing business unpatentable, often deciding business forms' failure on grounds of novelty or obviousness.[86]

The exception to the printed matter rule emerged at about the same time the rule came to life.[87] A number of cases applied the

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tariff index" unpatentable because it simply pertained to information representation according to some rules, suggesting that "[a] new method . . . of making directories . . . may be both new and useful; but the patent law is prosaically practical, it can never get away from the necessity of means, and unless patentable means of expressing or using the new idea are shown there can be no valid patent"). For more cases that dealt with information organization, see Flint v. G.R. Leonard & Co., 27 F.2d 215, 217 (7th Cir. 1928) (finding a reference guide showing comparative express rates and parcel post unpatentable because "it does not contain the elements necessary to bring it within the scope of a patentable invention"); *In re* Lockert, 65 F.2d 159, 160 (C.C.P.A. 1933) (finding a chart for a postal scale unpatentable because the novel feature of the chart was the arrangement of the printed matter and "there was no mechanical relation or co-operation between [the] chart and the [scale] to which it is attached"); *In re* Reeves, 62 F.2d 199 (C.C.P.A. 1932) (finding a real estate valuation chart unpatentable because an "invention cannot rest alone in novel printing arrangement"); *see also* Conover v. Coe, 99 F.2d 377 (D.C. Cir. 1938) (finding a street railway coupon transfer ticket unpatentable); *In re* Haller, 161 F.2d 280 (C.C.P.A. 1947) (finding that a label on insecticide was merely the application of particular printed matter to an old article that cannot render the article patentable); *In re* Rice, 132 F.2d 140 (C.C.P.A. 1942) (denying patent protection to music sheets); *In re* Johns, 70 F.2d 913 (C.C.P.A. 1934) (finding a method of marking meat unpatentable subject matter); *In re* Sterling, 70 F.2d 910, 912 (C.C.P.A. 1934) (finding a new arrangement of check book unpatentable); *In re* Dixon, 44 F.2d 881 (C.C.P.A. 1930) (finding a form of promissory judgment note with attorney's fee clause and declaration of lien unpatentable); Boyle v. Ladd, 138 U.S.P.Q. (BNA) 289 (D.D.C. 1963) (finding a banking form unpatentable).

[86] *See, e.g.*, U.S. Credit Sys. Co. v. Am. Credit Indem. Co., 59 F. 139, 143 (2d Cir. 1893) (finding a patent on a means of insuring merchants against bad-debt losses invalid, suggesting that "[t]he three claims of the patent are concerned solely with the providing of sheets with appropriate headings, adapted to be used in preparing historical records of certain business transactions. There is nothing peculiar or novel in preparing a sheet of paper with headings generally appropriate to classes of facts to be recorded, and whatever peculiarity there may be about the headings in this case is a peculiarity resulting from the transactions themselves").

[87] *See, e.g.*, Cincinnati Traction Co. v. Pope, 210 F. 443, 447 (6th Cir. 1913) (finding a form of transfer ticket for street railways patentable because of the new functional relationship between the printed matter and a distinctive physical

exception to the printed matter rule, finding that a functional relationship existed between the printed matter and the material on which the printing was performed.[88]

While the CCPA recognized the exception to the printed matter rule, it also questioned the rule's integrity. In *In re Gulack*,[89] the CCPA rightly expressed its impatience with the rule.[90] The Federal Circuit later adopted these cautionary remarks uttered by the CCPA.[91]

In summary, the printed matter rule serves an important function in excluding purely informational works, such as arguably copyrightable content, purely informational works that are not copyrightable content, and some abstract ideas.

D. *The Business Methods Exception: Excluding Abstract Ideas*

The "business methods" exception was yet another tool employed by the courts to exclude abstract ideas. Like the other exceptions discussed in this Part, the business methods exception

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structure).

[88] *E.g.*, Myers v. Coe, 83 F.2d 708, 710 (D.C. Cir. 1940); *In re* Royka, 490 F.2d 981, 985 (C.C.P.A. 1974); Flood v. Coe, 31 F. Supp. 348, 349 (D.D.C. 1940) (finding a new price ticket for tagging garments in retail stores patentable under the exception to the printed matter rule because there was a "definite and decided relationship between the physical structure and the printed matter").

[89] *In re* Gulack, 703 F.2d 1381 (Fed. Cir. 1983).

[90] *Id.* at 1385 n.8 ("A 'printed matter rejection under § 103 stands on questionable legal and logical footing. Standing alone, the description of an element of the invention as printed matter tells nothing about the differences between the invention and the prior art or about whether that invention was suggested by the prior art.").

[91] *See In re* Beauregard, 53 F.3d 1583 (Fed. Cir. 1995) (vacating and remanding the CCPA's decision not to grant a patent on basis of the CCPA commissioner's concession that the printed matter doctrine is not applicable to computer programs in a tangible medium); *In re* Lowry, 32 F.3d 1579, 1583 (Fed. Cir. 1994) ("A 'printed matter rejection' under § 103 stands on questionable legal and logical footing. Standing alone, the description of an element of the invention as printed matter tells nothing about the differences between the invention and the prior art or about whether that invention was suggested by the prior art. . . . [The CCPA], notably weary of reiterating this point, clearly stated that printed matter may well constitute structural limitations upon which patentability can be predicated.") (quoting *In re* Gulack, 703 F.2d 1381 (Fed. Cir. 1983)).

was ill-defined, and most cases applying it failed to explain its rationale.[92] The business methods exception did, however, play a role as a gatekeeper to exclude information and abstractions from patent protection, until the Federal Circuit sounded its death knell in *State Street*.[93]

Examination of early and modern business methods cases suggests that these cases pertained to attempts to capture business concepts and ideas *per se*, and not their practical applications. The general notion that methods of doing business are not patentable subject matter can be found in some late nineteenth century and early twentieth century decisions.[94] However, some scholars have managed to show that business concepts were protected under domestic patent law during the early days of the patent system.[95]

The prevalent view is that the business method exception can be traced back to *Hotel Security Checking Co. v. Lorraine Co*.[96] Finding the invention at issue in the case obvious, the court stated that "[a] system of transacting business *disconnected from the means for carrying out the system* is not . . . an art."[97] It is this

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[92] *See* Samuelson, *supra* note 71, at 1054 n.25 (suggesting two rationales for the exception: first, improved business methods are not contributions to the "useful arts;" second, there has not been a need for patent incentives to bring about an appropriate level of innovation in business).

[93] *See* State St. Bank & Trust Co. v. Signature Fin. Grp., Inc., 149 F.3d 1368, 1375 (Fed. Cir. 1998).

[94] *See, e.g.*, Munson v. City of New York, 124 U.S. 601, 604 (1888) (doubting whether a method for the filing and canceling of bonds, coupons, and stock certificates to prevent fraud constituted patentable subject matter, questioning whether "upon the face of the specification [it] could be considered as an 'art, machine, or composition of matter,' within the meaning of the patent laws"); U.S. Credit Sys. Co. v. Am. Credit Indem. Co., 59 F. 139 (2d Cir. 1893) (invalidating a patent claim for a means of insuring businesses against bad debts for lack of novelty).

[95] Michael Risch, *America's First Patents*, 64 FLA. L. REV. 1279, 1320, (2012) ("[E]arly inventors sought business methods patents. Nearly 8% of all methods patents were business methods patents . . . ."); *id.* at 1327 ("[T]here are a sufficient number of patents relating to non-manufacturing methods, describing both business methods and non-business methods, to infer that early patentees did not believe that patents were limited to 'mechanical arts' or 'technological arts,' as some have argued the term 'useful arts' means.").

[96] *See* Hotel Sec. Checking Co. v. Lorraine Co., 160 F. 467 (2d Cir. 1908).

[97] *Id.* at 469 (emphasis added).

statement that led lower courts and the USPTO to regard the decision as reflecting the settled law on the unpatentability of "business plans and systems."[98]

The "mixture" of computer technology with business concepts and ideas in the 1960s and 1970s created confusion and inconsistency in the way courts analyzed business method patents when such patents were challenged. Because the doctrine was ill-defined, courts were more responsive to the combination of information technologies and business concepts, and consequently went to extraordinary lengths to find such patents valid, eventually leading to the doctrine's demise.[99]

Federal Circuit decisions continued to recognize the relevance of the business method exception, but it was not directly implemented.[100] However, as part of a more general process that patent law is undergoing,[101] the CCPA and its successor, the Federal Circuit, contributed to the erosion of abstraction

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[98] *See also* Lowe's Drive-In Theatres, Inc. v. Park-In Theatres, Inc., 174 F.2d 547, 551 (1st Cir. 1949) (prefacing its finding of a patent claim for a system of parking cars in an open lot unpatentable by stating that "it is elementary that however new and useful, or even revolutionary and beneficial to humanity an idea may be, it is not of itself patentable" and that a system of doing business, no matter how "novel, useful, or commercially successful is not patentable apart from the means for making the system practically useful, or carrying it out"). *But see* Park-In Theatres, Inc. v. Rogers, 130 F.2d 745 (9th Cir. 1942) (holding that the arrangement of cars in a drive-in theater was patentable subject matter).

[99] *See, e.g.*, Paine, Webber, Jackson & Curtis, Inc. v. Merrill Lynch, Pierce, Fenner & Smith, Inc., 564 F. Supp. 1358, 1369 (D. Del. 1983) (rejecting a non-statutory subject matter attack on a patent claim, which was drafted in "means" apparatus form, for a "Cash Management Account" because the claims allegedly teach a method of operation on a computer to effectuate a business activity," while acknowledging at the same time that "[t]he product of the claims . . . effectuates a highly useful business method and would be unpatentable if done by hand").

[100] *See In re* Alappat, 33 F.3d 1526, 1541 (Fed. Cir. 1994) ("We . . . note that *Maucorps* dealt with a business methodology for deciding how salesmen should best handle respective customers and *Meyer* involved a isystemv for aiding a neurologist in diagnosing patients. Clearly, neither of the alleged 'inventions' in those cases falls [sic] within any i 101 category."); *In re* Grams, 888 F.2d 835, 837 (Fed. Cir. 1989) (listing methods of doing business as among categories of unpatentable subject matter).

[101] See discussion *infra* Part II.E.

gatekeepers, affecting, *inter alia*, the application of the business method exception as well.[102] Thus, it is not surprising to find statements from cases applying the business method exception signaling the exception's demise. For example, Judge Newman, in her dissent in *In re Schrader,*[103] argued that the business method doctrine "merits retirement from the glossary of section 101."[104] She observed that the doctrine is a "fuzzy, . . . unwarranted encumbrance to the definition of statutory subject matter in section 101"[105] and concluded that it should be discarded as "error-prone, redundant, and obsolete."[106]

The opportunity to lay the exception to rest came a few years later. In *State Street*,[107] the patent at issue claimed "a computerized accounting system for managing a mutual fund investment structure."[108] The patent's specification referred to a computer program, marketed by the patentee, for carrying out the necessary calculations to manage a mutual fund investment structure on a personal computer.[109]

The district court found the patent claims invalid under Section 101 because they claimed "a mathematical algorithm [was] not applied to or limited by physical elements or process steps."[110] The court noted that its decision also complied with the exclusion from subject matter patentability of business methods.[111] The court's analysis acknowledged the underlying rationale of the exception:

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

[103] *In re* Schrader, 22 F.3d 290 (Fed. Cir. 1994).

[104] *Id.* at 298 (Newman, J., dissenting).

[105] *Id.*

[106] *Id.*

[107] 927 F. Supp. 502 (D. Mass. 1996).

[108] *Id.* at 504. The system concerned a "Hub and Spoke" arrangement in which separate mutual funds (the spokes) pooled their assets in an investment portfolio (the hub). *Id.* Such an arrangement created administrative challenges with which the patent aimed to cope, including, in particular, the daily allocation of income, capital gains, and expenses or investment losses. *Id*. at 504–05. The patent disclosed and claimed a data processing system for making the necessary daily calculations. *Id.*

[109] *Id.* at 505.

[110] *Id.* at 510 (citation omitted).

[111] *Id.* at 515.

"Business methods are unpatentable abstract ideas."[112] Applying the exception, the court found that "the . . . Patent is claimed sufficiently broadly to foreclose virtually any computer-implemented accounting method necessary to manage this type of financial structure."[113] It stated further:

> In effect, the . . . Patent grants [the patentee] a monopoly on its idea of a multi-tiered partnership portfolio investment structure; patenting an accounting system necessary to carry on a certain type of business is tantamount to a patent on the business itself. Because such abstract ideas are not patentable, either as methods of doing business or as mathematical algorithms, the . . . Patent must fail.[114]

The Federal Circuit held that "[w]hether the claims are directed to subject matter within § 101 should not turn on whether the claimed subject matter does 'business' instead of something else."[115] It also explicitly decided to sound the death knell of "this ill-conceived exception."[116]

However, the Supreme Court in *eBay, Inc. v. MercExchange, L.L.C.*[117] and *LabCorp*[118] seemed to disagree with the Federal Circuit by signaling its uneasiness with granting business method patents, questioning the exception's validity, and raising doubts concerning the patentability test outlined in *State Street*. The Court suggested that if the opportunity arose, it might reexamine the validity of such patents as well as the criteria for subject matter eligibility.[119] Most recently, however, in *In re Bilski*, both the

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[112] *Id.*

[113] *Id.* at 516.

[114] *Id.*

[115] State St. Bank & Trust Co. v. Signature Fin. Grp., Inc., 149 F.3d 1368, 1377 (Fed. Cir. 1998).

[116] *Id.* at 1375 ("Since its inception, the 'business method' exception has merely represented the application of some general, but no longer applicable legal principle, . . . business methods have been, and should have been, subject to the same legal requirements for patentability as applied to any other process or method.").

[117] 547 U.S. 388 (2006).

[118] 548 U.S. 124 (2006).

[119] *See id.* at 397 (Kennedy, J., concurring) (suggesting, in an opinion joined by Justices Stevens, Souter, and Breyer, that an "injunctive relief may have different consequences for the burgeoning number of patents over business methods, which were not of much economic and legal significance in earlier

Federal Circuit and the Supreme Court reexamined the Federal Circuit's ruling in *State Street* and held that business method patents are not *per se* excluded from patentability, suggesting that there is no basis for denying protection to business method patents.[120]

E. *The Mathematical Algorithm Exception: Searching for a Physicality Anchor*

This section discusses the emergence of the mathematical algorithm exception, highlighting major milestones in its development. The mathematical algorithm exception excludes algorithms, including algorithms that are incorporated in computer software, which are simply a series of logical steps that achieve a certain result. Compared to other gatekeepers, this exception signifies the most meaningful response from courts directed at the challenges posed by the patentability of software and new technologies. The following discussion sheds light regarding the analysis of abstractions' patentability by exposing the weak rationales for excluding abstractions through the mathematical algorithm exception.

The general expansion of patentable subject matter during the last fifteen years is primarily attributable to the introduction of

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times. *The potential vagueness and suspect validity of some of these patents* may affect the calculus under the four-factor test") (emphasis added); Lab. Corp. of Am. Holdings v. Metabolite Labs., Inc., 548 U.S. 124, 136 (2006) (Breyer, J., dissenting) (per curiam) (noting that the Federal Circuit's decision in *State Street Bank & Trust Co. v. Signature Financial Group, Inc.* did not state that "a process is patentable if it produces a 'useful, concrete, and tangible result,' " but stressed that "this Court has never made such a statement and, if taken literally, the statement would cover instances where this Court has held the contrary") (citation omitted).

[120] *See In re* Bilski, 545 F.3d 943, 960 (Fed. Cir. 2008) ("[B]usiness method claims (and indeed all process claims) are 'subject to the same legal requirements for patentability as applied to any other process or method.' ") (citation omitted); Bilski v. Kappos, 130 S. Ct. 3218, 3228 (2010) ("Section 101 similarly precludes the broad contention that the term 'process' categorically excludes business methods. The term 'method' which is within § 100(b)'s definition of 'process,' at least as a textual matter and before consulting other limitations in the Patent Act and this Court's precedents, may include at least some methods of doing business.").

information technologies, such as computer hardware and software. Unlike industrial age innovations, which focused on tangible processes and products, information technologies at times capture innovations that are not tangible. Unsurprisingly, while the various patent gatekeepers performed well in the old industrial age, the advent of computer technologies forced the CCPA and Federal Circuit to adapt their doctrines regarding computer software patentability. The CCPA and Federal Circuit have been largely unsuccessful in confronting the challenges of these new technologies because they have failed to offer a workable and coherent framework for assessing subject matter eligibility. Of all information technologies, the introduction of computer technology provided one of the greatest challenges to the patent system. While computer programs were initially considered generally unpatentable,[121] the CCPA still upheld computer program-related claims as long as they contained some claim language that limited the patent scope to machine implementations of the process.[122]

However, after the CCPA repudiated the mental steps doctrine in *In re Musgrave*,[123] the only requirement for the patentability of a process was that it needed to form part of the "technological arts."[124]

In response to *In re Musgrave*, which failed to provide clear guidelines on the patentability of computer programs, the Supreme Court issued its famous trilogy *Gottschalk v. Benson*,[125] *Parker v.*

[121] In 1966, the USPTO issued a set of guidelines that limited the availability of patents for computer-related inventions. Richard A. Bachand, *Patents: Proposed Guidelines to Examination of Programs*, 4 TULSA L.J. 258, 258 (1967). The guidelines generally provided that computer programs were unpatentable. *Id.* at 260.

[122] The USPTO guidelines created an exception, however, for a programmed computer that was claimed as a component of a patentable process. *Id.* This condition was satisfied if the computer program, which in and of itself was not patentable, was combined with other nonobvious elements that produced a physical result. *Id*. at 261.

[123] 431 F.2d 882 (C.C.P.A. 1970).

[124] *Id.* at 893. The CCPA's decision in *In re Musgrave* disrupted the status quo ante concerning the non-patentability of mental processes, because the CCPA's decision did not provide clear guidelines as to what excludes computer software from patent protection.

[125] Gottschalk v. Benson, 409 U.S. 63 (1972).

Flook,[126] and *Diamond v. Diehr*,[127] creating a new abstractions gatekeeper: the mathematical algorithm exception. In the trilogy cases, the Court strongly opposed the patentability of the inventions at issue.

In *Benson*, the first of the trilogy cases, the Court emphasized the physicality of patentable processes as a precondition to patentability and introduced the machine-or-transformation test, providing that "[t]ransformation and reduction of an article 'to a different state or thing' is the clue to the patentability of a process claim that does not include particular machines."[128] The Court noted that the claims at issue "were not limited to any particular art or technology, to any particular apparatus or machinery, or to any particular end use" and, moreover, that the claims "purported to cover any use of the claimed method" for converting binary-coded decimal numerals into pure binary numbers, using a general-purpose computer.[129] As a result, "the patent would wholly pre-empt the mathematical formula and in practical effect would be a patent on the algorithm itself."[130]

Similarly, the majority in *Flook* noted that mathematical algorithms were unpatentable because they were similar to laws of

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[126] Parker v. Flook, 437 U.S. 584 (1978).

[127] Diamond v. Diehr, 450 U.S. 175 (1981).

[128] *Benson*, 409 U.S. at 70.

[129] *Id.* at 64.

[130] *Id.* at 72. Throughout the decision, the Court made many statements that implicitly suggested why it was disturbed by the information processing claimed in the patent. *Id.* at 65. While describing how digital computers operate on data, the Court stated that they "operate[] on data expressed in digits, solving a problem by doing arithmetic as a person would do it by head and hand. *Id.* Likewise, discussing the conversion of BCD to pure binary form, the Court noted that such conversion could "be done mentally" through use of a table printed in the text of the opinion. *Id.* at 67. It also pointed out that the method "varies the ordinary arithmetic steps a human would use by changing the order of the steps," although it also noted the method could be carried out without a computer. *Id.* All of these statements suggest that, although computerized, the method of the claim pertained to something that humans have always had access to without the aid of a computer, suggesting implicitly that they should be able to keep employing these "basic tools" without being hindered by property rights bestowed upon a patentee.

nature.[131] Nonetheless, the Court sought to avoid holding that all mathematical algorithms and computer-related inventions are *per se* unpatentable[132] and suggested that "it is equally clear that a process is not unpatentable simply because it contains a law of nature or a mathematical algorithm."[133] However, the Court found the invention at issue—a method for updating alarm limits with regard to catalytic conversion—unpatentable.[134] Interestingly, the Court reached this conclusion even though patenting the invention would not have precluded every possible use of the algorithm and despite the fact that the claims also included the step of adjusting the alarm value to the updated number calculated by use of the algorithm. The Court explained that the latter post-solution step was essentially "conventional or obvious," and that the patent claim would effectively cover the algorithm itself.[135]

The Supreme Court's decision in *Benson* was heavily criticized.[136] The absence of additional guidance concerning a

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[131] Parker v. Flook, 437 U.S. 584, 589 (1978). *But see* Chisum, *supra* note 71, at 959 (suggesting that *Benson* was wrongly decided and arguing that the Court failed to offer any viable policy justification for excluding by judicial fiat mathematical algorithms).

[132] *Flook*, 437 U.S. at 595 ("Neither the dearth of precedent, nor this decision, should therefore be interpreted as reflecting a judgment that patent protection of certain novel and useful computer programs will not promote the progress of science and the useful arts, or that such protection is undesirable as a matter of policy. Difficult questions of policy concerning the kinds of programs that may be appropriate for patent protection and the form and duration of such protection can be answered by Congress on the basis of current empirical data not equally available to this tribunal.").

[133] *Id.* at 590.

[134] *Id.* at 600.

[135] *Id.* at 590.

[136] *See, e.g.*, Chisum, *supra* note 7171, (arguing that algorithms should be the subject of patent protection if the patent law standards of novelty and unobviousness are met.); Irah H. Donner & J. Randall Beckers, *Throwing Out Baby* Benson *with the Bath Water: Proposing a New Test for Determining Statutory Subject Matter*, 33 JURIMETRICS J. 247, 254 (1993) (suggesting that it is time to sound the death knell of *Benson*: "Since the courts, including the Supreme Court, and commentators have been unable to make sense of the past, we propose that it is time to throw out the baby with the bath water. That is, we now attempt a new approach for use in determining statutory subject matter as described below."); Lee A. Hollaar, *Justice Douglas Was Right: The Need for*

number of major aspects of the decision led courts to refrain from adhering entirely to the new exception, instead exhibiting a willingness to retain some elements whilst ignoring others.[137] The dominant approach as reflected by the CCPA's decisions was to narrowly read the *Benson* requirements. This narrow interpretation, along with the prohibition to wholly preempt mathematical algorithms, opened the door to the patentability of algorithms.[138]

Furthermore, courts had adopted different rules and approaches in their attempts to follow the *Benson* decision. The CCPA elevated the form of claims over their substance, finding claims

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Congressional Action on Software Patents, 24 AIPLA Q.J. 283, 297–304 (1996) (suggesting to adopt Justice Douglas' approach in Benson and adopting a legislation which protects software by following 3 steps: clarifying that computer-implemented processes are patentable, excluding information stored in obvious ways in determining novelty, and protecting those holding patents on methods from those who distribute computer programs implementing those methods.); Samuelson, *supra* note 71, at 102 (suggesting there is a basis in patent law for denying patents to computer program algorithms and to a number of other computer program-related innovations).

[137] *See* Chisum, *supra* note 71, at 992 ("The development of the law after *Benson* as to the patentability of processes that involve computation or the use of mathematical concepts follows a path of confusion and arbitrary distinctions. All of the difficulties in achieving rationality and predictability can be traced back to the ambiguous and poorly-supported holding in *Benson* on the nonpatentability of algorithms.").

[138] *Id.* *See, e.g.*, *In re* Freeman, 573 F.2d 1237, 1246 (C.C.P.A. 1978), *abrogated by In re* Bilski, 545 F.3d 943 (Fed. Cir. 2008) (finding that a claim did not recite "mathematical algorithm" because it simply recited a series of steps determining spatial relationships of symbols not dependent on their mathematical meaning). As for the "whole preemption" limitation, see *In re* Chatfield, 545 F.2d 152, 156 (C.C.P.A. 1976) (holding that *Benson* precluded patents only where the claims if granted "would have preempted all practical use of both the underlying mathematical formula and the involved algorithm"); *In re* Noll, 545 F.2d 141, 148 (C.C.P.A. 1976) (distinguishing *Benson* on the ground that Noll's claims were limited to a particular technology (computer graphics systems and scan-conversion of graphic information)); *see also In re* Waldbaum, 559 F.2d 611, 617 (C.C.P.A. 1977) (rejecting the argument that because the applicant limited the scope of some of his claims to data processing applications and some to telephone service applications, they were patentable because a patent on these claims "would, in practical effect, be a patent on the algorithm itself—albeit in its limited, specific application to calculating the number of busy and idle lines in a telephone system") (emphasis omitted).

that recited a machine to be patentable, even if substantively the claims recited an algorithm.[139]

In response to the narrow interpretation of *Benson*, the CCPA and the Supreme Court in *Flook* introduced and embraced, respectively, the "point of novelty" test, which provided that if an algorithm was the only element that distinguished a process from the prior art, the claim would be considered limited to the algorithm and consequently unpatentable.[140] The courts thereby reinforced the applicability of the exception by finding that the addition of conventional post-solution steps did not convert algorithms into patentable subject matter.[141] Additionally, the courts reintroduced and reemphasized tangibility as the touchstone for the patentability of processes.[142] Lastly, the CCPA introduced

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[139] *See, e.g.*, Dann v. Johnson, 425 U.S. 219 (1976) (finding a machine claim for an automatic financial record-keeping system employing digital computer patentable); *In re* Bradley, 600 F.2d 807, 812–13 (C.C.P.A. 1979) (reversing a rejection of a claim drawn in apparatus form to what seemed to be a new data structure for a micro program function, concluding that the claims were for a new machine, a combination of "hardware elements, one of which happens to be a portion of the computer's control store microprogrammed in a particular manner"). *But see Freeman*, 573 F.2d at 1247 (expressing concern over evasive claim drafting); *In re* Richman, 563 F.2d 1026, 1030 (C.C.P.A. 1977) (expressing concern over evasive claim drafting).

[140] *See, e.g.*, *Flook*, 437 U.S. at 590, 592 (holding that while a process containing as one of its steps an unpatentable "law of nature or a mathematical algorithm" is not for that reason alone unpatentable, the unpatentable step must be considered "as though it were a familiar part of the prior arts and "well known"); *In re* Christensen, 478 F.2d 1392 (C.C.P.A. 1973) (finding data gathering steps old in the art and that the "point of novelty" lay in applicant's discovery of a new mathematical formula). Of course, such an assumption regarding the novelty of the algorithm is unjustified because it is baseless and signifies a far-reaching attempt to preclude patenting of algorithms. A few years later, however, the CCPA discarded the "point of novelty" test. *See In re* Diehr, 602 F.2d 982 (C.C.P.A. 1979); *In re* Chatfield, 545 F.2d 152 (C.C.P.A. 1976).

[141] *See, e.g.*, *Flook*, 437 U.S. at 589–90 (finding that neither the existence of uses of the formula at issue in the case outside the petrochemical industry nor the presence of specific "post-solution activity" could render the claim patentable).

[142] There are many manifestations of such a trend in courts' decisions. Some cases explained that the holding in *Benson* expressed the ancient rule that "practical" application remains the key to patent protection. *See, e.g.*, *In re* de Castelet, 562 F.2d 1236, 1243 (C.C.P.A. 1977) ("It is thus clear that the

the *Walter-Freeman-Abele* test, which provided that if an algorithm was applied "in a specific manner to define structural relationships between the physical elements" of an apparatus, or was applied in a specific manner to refine process claim steps, then it was possibly patentable.[143]

The 1980s represent a major turning point regarding subject matter eligibility generally and, in particular, the accommodation of computer software and mathematical algorithms. In 1980, the Supreme Court, in *Diamond v. Chakrabarty*,[144] signaled a broader scope of patentable subject matter, only limiting that the invention claimed be made by man.[145] The Court decided that a claim on bacterium to which naturally occurring plasmids were added, thereby allowing the bacterium to break down crude oil, was patentable.[146] Because *Chakrabarty* invented a "nonnaturally occurring manufacture or composition,"[147] specifically "a new bacterium with markedly different characteristics from any found in nature," the Court found the invention patentable.[148] More importantly, the Court adopted a very broad approach concerning patentable subject matter, reiterating that "Congress intended

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'nutshell' language of *Benson*, expressed the ancient rule that practical application remains the key."). Other courts explicitly stated that "inventions which Congress is constitutionally empowered to make patentable are tangible embodiments of ideas in the useful, or technological, arts." *In re* Sarkar, 588 F.2d 1330, 1333 (C.C.P.A. 1979). One of the clearest statements concerning tangibility in some cases can be found in the renewed emphasis on the *Benson* physical transformation test for process's patentability or the industrial character of the claims. *See, e.g.*, *In re* Walter, 618 F.2d 758, 768 (C.C.P.A. 1980) ("If . . . the claimed invention produces a physical thing, . . . the fact that it is represented in numerical form does not render the claim nonstatutory."); *Diehr*, 602 F.2d at 988 (reversing a rejection of claims to a method of operating a molding process to manufacture rubber articles with a perfect cure because "[t]hey recite a process involving the manipulation of apparatus resulting in the chemical and physical change of starting material, the time that the mold remains closed being controlled by a series of calculations using a recited formula").

[143] *Walter*, 618 F.2d at 767.

[144] 447 U.S. 303 (1980).

[145] *Id.* at 305.

[146] *Id.* at 305–06.

[147] *Id.* at 309.

[148] *Id.* at 310.

statutory subject matter to include anything under the sun that is made by man."[149]

The following year, the Supreme Court pursued the same path in *Diamond v. Diehr*,[150] finding a process for curing rubber to be patentable.[151] The process used a computer to repeatedly calculate an algorithm, the Arrhenius equation, which was a well-known method for determining the appropriate cure time of rubber.[152] Relying on *Cochrane v. Deener*,[153] the Court reemphasized process tangibility, defining a process as "an act, or a series of acts, performed upon the subject-matter to be transformed and reduced to a different state or thing."[154] In other words, it reintroduced the *Benson* physicality test, which required that a patentable process be tied either to a particular machine or device or transform an article into a different state or thing.[155] The Court reasoned that the invention was not rendered unpatentable simply because several of its steps employed a mathematical equation and a computer, suggesting that those claims did not preempt all uses of the mathematical algorithm.[156] However, the Court emphasized, as it did in *Flook*, that mathematical principles by themselves were not patentable.[157]

Diehr signaled the end of the "point of novelty" test, which maintained that an invention could not be found unpatentable simply because all the steps other than the use of the computer

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[149] *Id.* at 309 (internal quotation marks omitted).

[150] 450 U.S. 175 (1981).

[151] *Id.* at 184.

[152] *Id.* at 177.

[153] 94 U.S. 780 (1876).

[154] *Diehr*, 450 U.S. at 183 (internal quotation marks omitted).

[155] *See id.* at 184. The Court suggested that, in exploring patentability, one had to look at whether the "whole" invention—the sum of the individual steps—accomplished some physical feat or was accomplished in a physical manner. *Id*. at 188.

[156] *Id.* at 191–92.

[157] *Id.* ("[I]nsignificant post-solution activity will not transform an unpatentable principle into a patentable process."). The Court distinguished its decision in *Parker v. Flook*, suggesting that Flook's claims for computing alarm limit for any catalytic conversion of hydrocarbons were also not valid because they contained merely "token postsolution activity." *Id.* at 192 n.14. It seems that the Court viewed the claims as too vague and too broad.

were known in the art.[158] For a number of years following *Diehr*, the Federal Circuit declined to decide the patentability of computer-related inventions;[159] this was due to the USPTO's policy and practice of no longer resisting the issuance of patents for computer-related inventions.[160]

However, at some point following *Diehr*, the Federal Circuit struggled to interpret the standards announced in *Diehr* with respect to computer-related inventions.[161] In *Arrhythmia Research Technology, Inc. v. Corazonix Corp.*,[162] the Federal Circuit stretched the meaning of the physicality requirement by suggesting that the requirement could easily be satisfied not only by finding physical elements in the claims themselves or in their actual results, but alternatively by having physical representations.[163] The invention at issue was a method for measuring and analyzing EKG signals.[164] The Federal Circuit suggested that the invention had adequate physicality because the EKG signals were physical phenomena representing heart activity.[165] Additionally, the patent claimed a machine as performing the process, thereby accomplishing the process of the invention through physical means.[166] This claim drafting tool had been recognized as the "new machine" doctrine.[167] The Federal Circuit's artificial introduction of a machine was aimed at introducing a physical element that would provide adequate limitation to patent scope.

Sitting en banc, in *In re Alappat*,[168] the Federal Circuit crafted a new, broad test for subject matter eligibility regarding

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[158] *See id.*
[159] Samuelson, *supra* note 71, at 1092.
[160] *Id.* at 1093.
[161] *See* Chisum, *supra* note 71, at 1001.
[162] 958 F.2d 1053 (Fed. Cir. 1992).
[163] *Id.* at 1059 ("The electrocardiograph signals are first transformed from analog form, in which they are obtained, to the corresponding digital signal. These input signals are not abstractions; they are related to the patient's heart function.").
[164] *Id.* at 1054.
[165] *See id.* at 1060.
[166] *See id.* at 1055.
[167] *In re* Alappat, 33 F.3d 1526, 1545 (Fed. Cir. 1994).
[168] *Id.*

computer-related inventions by suggesting that an invention was patentable as long as it generated a "useful, concrete, and tangible result."[169] These eligibility requirements would be met by claiming a computer-related activity as a "machine" performing a process.[170] It also significantly limited the importance and applicability of the algorithm exception.

After *Alappat*, the USPTO issued new Examination Guidelines for Computer-Related Inventions ("USPTO Guidelines") in 1996 to provide examiners with guidance pertaining to subject matter eligibility of such inventions.[171] The USPTO Guidelines were

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[169] *Id.* at 1544. In *Alappat*, the inventor developed a machine that was programmed to run an algorithm that would improve the electronic waveform displayed on a digital oscilloscope. *Id.* at 1537. The USPTO rejected the claim, finding that an invention claiming a computer programmed to perform a series of calculations and output data was not distinguishable from a mathematical algorithm, which is unpatentable. *Id.* at 1539. The Federal Circuit, however, reversed this decision, reasoning that Alappat's invention was a patentable invention because it was a "machine," which is a Section 101 patentable category. *Id.* at 1545. The Federal Circuit relied on the Supreme Court's decision in *Diamond v. Chakarbarty*, suggesting that Congress intended Section 101 to protect any useful and new machine, manufacture, process, or composition of matter that met the Patent Act statutory requirements. *Id.* at 1542. The Federal Circuit viewed the Supreme Court's decisions regarding computer-related inventions as supporting the restrictive view that "certain types of mathematical subject matter, standing alone, represent nothing more than *abstract ideas* until reduced to some type of practical application." *Id.* at 1543. The court suggested that the analysis should explore whether the claim incorporates patentable subject matter and not whether it includes elements that when viewed separately would be unpatentable. *Id.* Viewed in this light, the court held that Alappat's claims recited a specific machine that produced a "useful, concrete, and tangible result" rather than a "disembodied mathematical concept." *Id.* at 1544.

[170] The Federal Circuit's decision *Arrhythmia*, 958 F.2d 1053 (Fed. Cir. 1992), marks the beginning of the erosion of different information gatekeepers. Note, however, that one exceptional Federal Circuit decision issued in 1994, *In re* Schrader, 22 F.3d 290 (Fed. Cir. 1994), seems to go against the court's decision in *In re Alappat* and its progeny. In *Schrader*, the court found a method for competitively bidding on a plurality of related items employing algorithms unpatentable subject matter. *Id.* at 294. The court seemed to broaden the "mathematical algorithm" exception, providing that it encompassed also non-numerical algorithms. *See id.* It also refocused processes' patentability on physical transformation. *Id.* at 295.

[171] *See* Examination Guidelines for Computer-Related Inventions, 61 Fed.

amended in 2005 and constitute an integral part of the Manual of Patent Examining and Procedure as part of the Interim Guidelines for Examination of Patent Applications for Patent Subject Matter Eligibility ("Amended Guidelines").[172] The Amended Guidelines comply with *Alappat*, and take an expansive view of software patentability.[173] Accordingly, the test for subject matter eligibility set forth in the Amended Guidelines is whether the invention produces a "useful, concrete, and tangible result."[174]

The Federal Circuit interpreted *Diehr* broadly in its decisions in *State Street*[175] and *AT&T Corp. v. Excel Communications, Inc.*[176] As discussed above, *State Street* concerned a patent claiming a data processing system for administering mutual funds.[177] The Federal Circuit found the claim patentable.[178] The court held that "to be patentable an algorithm must be applied in a 'useful' way,"[179] interpreting the Supreme Court trilogy (*Benson*, *Flook*, and *Diehr*) to provide "that mathematical algorithms are not patentable subject matter to the extent they are merely abstract ideas."[180] Importantly, the court held that "the transformation of data, representing discrete dollar amounts, by a machine through a series of mathematical calculations into a final share price"[181] constituted a "practical application of a mathematical algorithm, formula, or calculation, because it produces a 'useful, concrete, and tangible result'—a final share price momentarily fixed for

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Reg. 7478 (Feb. 28, 1996).

[172] *See* U.S. Patent and Trademark Office, Manual of Patent Examining Procedure § 2106 (8th ed., rev. 9 2012).

[173] *See* Steven M. Greenberg, The Inconsistent Treatment of Computer Software as Patentable Subject Matter, 11 J. TECH. L. & POL'Y 77, 86 (2006).

[174] *Id.* at 78.

[175] State St. Bank & Trust Co. v. Signature Fin. Grp., Inc., 149 F.3d 1368 (Fed. Cir. 1998), *abrogated by In re* Bilski, 545 F.3d 943 (Fed. Cir. 2008).

[176] AT&T Corp. v. Excel Commc'ns, Inc., 172 F.3d 1352 (Fed. Cir. 1999), *abrogated by In re* Bilski, 545 F.3d 943 (Fed. Cir. 2008).

[177] *State Street*, 149 F.3d at 1370; *see also* State St. Bank & Trust Co. v. Signature Fin. Grp., Inc., 927 F. Supp. 502, 504 (D. Mass. 1996).

[178] *State Street*, 149 F.3d at 1370.

[179] *Id.* at 1373.

[180] *Id.*

[181] *Id.*

recording and reporting purposes."[182] As a result, "[t]he question of whether a claim encompasses statutory subject matter should not focus on which of the four categories a claim is directed to . . . but rather on the essential characteristic of the subject matter, in particular, its practical utility."[183]

One year later, the court extended *State Street* in *Excel Communications* by upholding the patentability of a process for generating a message record for interchangeable telephone calls.[184] Although the end result of the process was the creation of a "signal useful for billing purposes," the court rejected the argument that *Diehr* stood for the proposition that process claims containing algorithms were patentable "only if there is a 'physical transformation' or conversion of subject matter from one state into another."[185] According to the court, physical transformation "is not an invariable requirement, but merely one example of how a mathematical algorithm may bring about a useful application."[186] The only requirement was that the process containing the algorithm "produces a tangible, useful, result."[187] *State Street* reflected the Federal Circuit's realization that subject matter eligibility thresholds, including the physical anchor requirement, were nonsensical in the new information age. It is, therefore, not surprising that rather than introducing a strict test for patentability, the court introduced a broad and flexible test, ruling that an invention was patentable as long as it produced a "useful, concrete, and tangible" result.[188] Arguably, in introducing this new test, the court did not abandon the physicality requirement because it

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[182] *Id.*

[183] *Id.* at 1375.

[184] AT&T Corp. v. Excel Commc'ns, Inc., 172 F.3d 1352, 1353 (Fed. Cir. 1999), *abrogated by In re* Bilski, 545 F.3d 943 (Fed. Cir. 2008).

[185] *Id.* at 1358.

[186] *Id.*

[187] *Id.* at 1360–61.

[188] *Id.* at 1360. *But see* Thomas R. Makin, Hotel Checking: You Can Check Out Any Time You Want, But Can You Ever Leave? The Patenting of Business Methods, 24 COLUM. J.L. & ARTS 93, 112 (2001) (critiquing State Street for offering a "toothless test to analyze business method patents," effectively failing "to impose any such meaningful limitation on the business method patent free-for-all").

required that the result be tangible.[189] However, a closer reading of the case's facts suggests that tangibility does not stand for physicality but rather for something else.[190] The court found that the numbers that were generated using the invention at issue, which simply represented dollar figures, constituted a "tangible" result. This clearly suggests that the test's tangibility requirement did not necessarily require physicality, but was probably a proxy for addressing the court's concern in preventing overreaching, broad patents.[191] Therefore, under *State Street*, an invention, including an algorithm's application, does not need to satisfy any physicality requirement as long as it was useful and concrete.

Despite these developments regarding the patentability of computer-related inventions and their applicability to business methods, the USPTO, until recently, relied on *In re Musgrave* in its

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[189] *Excel Commc'ns, Inc.*, 172 F.3d at 1360.

[190] The Federal Circuit's decision in *State Street* and ensuing rulings were criticized on many grounds. *See* John R. Thomas, *The Patenting of the Liberal Professions*, 40 B.C. L. REV. 1139, 1140–42 (1999) (arguing that the decision expands eligibility to the liberal arts and hence, undermines the constitutionally mandated requirement to grant patents only to advances in the "useful arts."); *see also* Kevin Michael Lemley, *Just Turn North on* State Street *and Then Follow the Signs Given by the Federal Circuit: A Sophisticated Approach to the Patentability of Computerized Business Methods*, 8 J. TECH. L. & POL'Y 1, 4–5 (2003) (stating that the decision focuses on the utility of the invention's end result as part of the subject matter eligibility inquiry, when traditionally, such inquiry was reserved to a later stage, and arguing that the decision suggests that tangibility of the end result is required, failing to explain why it introduces such a requirement in the first place and failing to explore where the *State Street*'s invention tangibility lies, when what was produced was a final share price). The chief criticism was that the court's subject matter eligibility test was, at best, vague and unclear, creating uncertainty as to its scope and applicability. *See, e.g.*, *Ex parte* Burnhouse, No. 2007-0345, 2007 WL 1291416, at *13 (B.P.A.I. May 2, 2007) (finding some claims of a method of indicating actions to be taken for selected programs listed in an electronic programming guide unpatentable, inter alia, for failure to recite statutory subject matter, holding that "[o]ur understanding of the current precedents is: Any computer program claimed as a machine implementing the program (*Alappat*, *State Street*) or as a method of a machine implementing the program (*AT&T*), is patentable if it transforms data and achieves a useful, concrete and tangible result (*State Street*, *AT&T*). Exceptions occur when the invention in actuality preempts an abstract idea, as in a mathematical algorithm").

[191] *See Burnhouse*, 2007 WL 1291416, at *13.

USPTO Guidelines, suggesting that "[o]nly when the claim is devoid of any limitation to a practical application in the technological arts should it be rejected under 35 U.S.C. § 101."[192] The USPTO Guidelines did not define the term "technological arts." However, as already discussed, many patents issued during the 1990s and early 2000s appear to bear little relationship to what most people would consider "technology."[193] Capturing abstractions *per se* through patents is one clear example of this trend.

One of the most anticipated decisions in the law of patent eligibility in recent years was the Supreme Court's approach in *Laboratory Corp. of America Holdings v. Metabolite Laboratories, Inc.* ("*LabCorp*").[194] The inventors discovered a naturally occurring correlation between deficiencies of folate and cobalamin and the level of the amino acid homocysteine.[195] They obtained a patent which claimed, *inter alia*, a method for diagnosing a folate or cobalamin deficiency in humans. This method was comprised of (1) testing for the presence of an elevated level of homocysteine and (2) correlating an elevated level of homocysteine with a folate and cobalamin deficiency.[196]

The Supreme Court invited the Solicitor General to file a brief stating the U.S. Government's views on whether the patent claim at issue was invalid by reason of the rule that laws of nature, natural phenomena, and abstract ideas were unpatentable.[197] Nonetheless, the Court decided to dismiss the writ of certiorari as improvidently granted.[198] In his dissent, Justice Breyer, with whom Justices Souter and Stevens concurred, argued against dismissing the writ, despite the fact that LabCorp had not raised the law of nature exclusion at the district court and the Federal Circuit had not discussed the issue at all.[199] Although Justice Breyer did not

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[192] MPEP § 2106 (8th ed., Rev. 3, Aug. 2005).
[193] *Excel Commc'ns, Inc.*, 172 F.3d at 1358.
[194] Lab. Corp. of Am. Holdings v. Metabolite Labs., Inc., 548 U.S. 124, 125 (2006) (per curiam).
[195] *Id.* at 128 (Breyer, J., dissenting).
[196] *Id.* at 129.
[197] *Id.* at 132.
[198] *Id.* at 125 (per curiam).
[199] *Id.* at 131 (Breyer, J., dissenting).

explicitly express any views regarding the question whether patentable processes require physical transformation of matter,[200] he noted that the claim at issue did not involve any physical transformation.[201] Justice Breyer also questioned *State Street*'s patent eligibility test that suggested that processes were patentable as long as they produced a "useful, concrete, and tangible result."[202] The dissenting Justices' statements in *LabCorp* forced the Federal Circuit to reconsider its *State Street* test. Soon after *LabCorp* was decided, the Federal Circuit encountered a number of additional cases in which it was able to do so. Indeed, in *In re Comiskey*,[203] *In re Nuijten*,[204] and *In re Bilski*,[205] the Federal Circuit essentially repudiated the patentability test announced in *State Street* and replaced it with *Diehr*'s "machine-or-transformation" test.[206]

In *In re Bilski*, Claim 1 of the patent application claimed a three-step method for a broker to hedge risks for purchaser-users of an input of a product or service (termed a commodity).[207] The Federal Circuit held that Claim 1 was directed to abstract ideas and as such was unpatentable.[208] Although the court reverted to the machine-or-transformation test, it suggested that physicality was only a proxy and that a patentable article could either be a physical thing or "representative" of physical things—which the court defined mostly by exclusion.[209] For example, mere "legal obligations," "business risks," or "other abstractions" would not qualify.[210] The court's rationale for these exclusions was that they better prevented overarching, broad patent claims.[211] Although

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[200] *Id.* at 136.
[201] *Id.*
[202] *Id.*
[203] 499 F.3d 1365 (Fed. Cir. 2007), *opinion withdrawn and superseded on reh'g en banc*, 2006-1286, 2009 WL 68845 (Fed. Cir. Jan. 13, 2009), *opinion revised and superseded*, 554 F.3d 967 (Fed. Cir. 2009).
[204] 500 F.3d 1346 (Fed. Cir. 2007).
[205] *In re* Bilski, 545 F.3d 943, 963 (Fed. Cir. 2008).
[206] *Id.* at 961–62.
[207] *Id.* at 949.
[208] *Id.* at 965–66.
[209] *Id.* at 963.
[210] *Id.*
[211] *Id.* at 962. The court also emphasized both that "mere field of use

agreeing with the majority's holding, Judge Rader's dissent in *In re Bilski* suggested that the machine-or-transformation test was nonsensical if "raw materials . . . of information-age processes are electronic signals and electronically-manipulated data."[212] Judge Rader suggested that the test left many questions unanswered, was suitable for the industrial age but not the information age, and that its focus should be upon the three exclusions to patentability.[213]

The Supreme Court affirmed the Federal Circuit's rejection of Bilski's patent application.[214] However, in a complex decision delivered by Justice Kennedy, the Court rejected the machine-or-transformation test established by the Federal Circuit as the exclusive test for patent eligibility on the basis that it read unexpressed limitations into the language of the Patent Act.[215] The Court also held that business method patents were not to be categorically excluded.[216] In reaching its holding, the Court relied on Section 273 of the Patent Act,[217] and focused on the claims at issue as constituting abstract ideas with only insignificant post-solution activity, citing *Benson*, *Flook*, and *Diehr*.[218]

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limitations" were insufficient to limit the scope of claims and that "insignificant" extra-solution activity was also insufficient to meet the test's machine-or-transformation prongs. *Id.* at 957 n.2. Additionally, the court emphasized that claims "must impose meaningful limits," suggesting that mere manipulation of information and "abstract constructs such as legal obligations, organizational relationships, and business risks" did not meet the test's transformation prong. *Id.* at 962. However, the court suggested that "transformation of . . . raw data into a particular visual depiction of a physical object is enough." *Id.* at 963.

[212] *Id.* at 1013 (Rader, J., dissenting); *see also* Robert Plotkin, *Computer Programming and the Automation of Invention: A Case for Software Patent Reform*, 2003 UCLA J.L. & TECH**.** 7, 99 ("Patent law's emphasis on physical structure made sense, and continues to make sense, in the context of electromechanical devices that must be designed and described in terms of their physical structure to enable the public to make and use them. Software programs, however, need not be designed nor described in terms of their physical structure to enable the public to make and use them.").

[213] *Bilski*, 545 F.3d at 1014 (Rader, J., dissenting).

[214] Bilski v. Kappos, 130 S. Ct. 3218, 3223 (2010).

[215] *Id.* at 3227, 3231.

[216] *Id.* at 3228.

[217] *Id.*

[218] *Id.* at 3230.

The Court agreed with Judge Rader's observation in his dissent in *Bilski*[219] that the machine-or-transformation test or the business method exclusion might have made sense in relation to "industrial age" technologies but that they were no longer pertinent to new "information age" technologies. The Court, therefore, suggested that the subject matter provisions of the Patent Act needed to be construed in a dynamic fashion to remain relevant.[220] The Court rightly suggested that the machine-or-transformation test would create uncertainty as to the patentability of software, advanced diagnostic methods, inventions based on linear programming, data compression, and the manipulation of digital signals.[221]

In addition to the Court's rejection of the machine-or-transformation test as the sole test for patentability, the Court also rejected the *State Street* test for patentable subject matter, suggesting that it was too broad. The Court concluded that the concept of hedging that was described above[222] in Claim 1 and additional claims of the patent at issue was an unpatentable abstract idea.[223]

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[219] *Bilski*, 545 F.3d at 1013–14 (Rader, J., dissenting).

[220] *Bilski*, 130 S. Ct. at 3228. *But see* Thomas F. Cotter, *A Burkean Perspective on Patent Eligibility*, 22 BERKELEY TECH. L. J. 855 (2007) (arguing that a Burkean-inspired approach to patent law—one that respects tradition and that generally prefers gradual to radical change—suggests that we consider again some traditional, but now dormant, restraints on patentable subject matter that may have embodied a degree of wisdom. Specifically, some of the traditional limitations on patentable subject matter, as embodied in the technological arts, mental steps, and physical transformation doctrines, may yet have much to recommend them and should be reintroduced in a reformed way into the patent system); Jay Dratler, *Does Lord Darcy Yet Live? The Case Against Software and Business-Method Patents*, 43 SANTA CLARA L. REV. 823 (2003) (arguing that state-granted monopolies for minor "innovations" without technological risks, such as business methods, will have a corrosive effect that may take decades or centuries to emerge and suggesting that courts re-open the safety valves of the subject matter exceptions and introduce a more robust test for obviousness that may require discriminating judgments and increase the uncertainty of patent litigation).

[221] *Bilski*, 130 S. Ct. at 3227.

[222] *See Bilski*, 545 F.3d at 962–63.

[223] *Bilski*, 130 S. Ct. at 3231.

F. *Post*-Bilski *Criticism and New Approaches*

Overall, the Supreme Court's decision in *Bilski* has sparked an ongoing debate regarding subject matter eligibility thresholds. Although there seems to be a consensus among scholars and courts that *Bilski* created vagueness and uncertainty regarding subject matter eligibility thresholds, debate remains regarding how to best address these issues.[224]

Although the Federal Circuit and Supreme Court reintroduced stringent subject matter eligibility thresholds in *Bilski*, the Federal Circuit has taken a variety of approaches towards subject matter eligibility post-*Bilski*. Some judges, such as Newman and Plager, suggest that courts should simply avoid the metaphysical question of whether an invention is unpatentably abstract and instead focus on the conditions of patentability found in Sections 102, 103, and 112 of the Patent Act.[225] This, they suggest, "would make patent litigation more efficient, conserve judicial resources, and bring a degree of certainty to the interests of both patentees and their competitors in the marketplace."[226]

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[224] *See, e.g.*, Matthew DeLulio, *Courts Left with Little Guidance Following the Supreme Court's Decision in* Bilski v. Kappos, 13 TUL. J. TECH. & INTELL. PROP. 285 (2010); Rochelle C. Dreyfuss & James P. Evans, *From* Bilski *back to* Benson: *Preemption, Inventing Around, and the Case of Genetic Diagnostics*, 63 STAN. L. REV. 1349 (2011); Peter S. Menell, *Forty Years of Wondering in the Wilderness and No Closer to the Promised Land:* Bilski*'s Superficial Textualism and the Missed Opportunity to Return Patent Law to Its Technology Mooring*, 63 STAN. L. REV. 1289 (2011); Paul E. Schaafsma, *The Case for Financial Product Patents: What the Supreme Court Got Right and Wrong in* Bilski v. Kappos*, and a Suggestion for a Reasonable Line on Business Method Patents*, 92 J. PAT. & TRADEMARK OFF. SOC'Y 398 (2010).

[225] *See* MySpace, Inc. v. GraphOn Corp., 672 F.3d 1250, 1260 (Fed. Cir. 2012) (finding courts should "insist that litigants initially address patent invalidity issues in terms of conditions of patentability defenses as the statute provides, specifically §§ 102, 103, and 112."); Classen Immunotherapies, Inc. v. Biogen IDEC, 659 F.3d 1057, 1066–67 (Fed. Cir. 2011) (applying *Bilski*, Judge Newman reiterated that Section 101 inquiries should avoid barring at the threshold and should instead preserve legal and practical distinctions between the threshold Section 101 inquiry and the substantive conditions for patentability).

[226] *MySpace*, 672 F.3d at 1250.

Other judges on the Federal Circuit argue that subject matter eligibility questions should be addressed, suggesting that the statute "is the standard expressed in the Constitution and it may not be ignored."[227] Therefore, "a robust application of section 101 [sic] is required to ensure that the patent laws comport with their constitutionally defined objective."[228]

Some judges have suggested that *Bilski* advises against the use of any rigid rules in the Patent Act,[229] while others note that *Bilski* cautioned against applying limitations and conditions to patent law that were not expressed by the legislature, including categorical exclusions.[230] It is, therefore, unclear which test will be eventually

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[227] *Id.* at 1269 (Mayer, J., dissenting) (quoting *Graham v. John Deere Co*., 383 U.S. 1, 6 (1966)).

[228] *Id.*

[229] Ultramercial, LLC v. Hulu, LLC, 657 F.3d 1323, 1327 (Fed. Cir. 2012) (acknowledging that the machine-or-transformation test remains "simply a useful and important clue, an investigative tool" used to analyze abstracted processes under Section 101, and is perhaps better suited for Industrial Age processes as opposed to inventions in the Information Age); Arlington Indus., Inc. v. Bridgeport Fittings, Inc., 632 F.3d 1246, 1258 (Fed. Cir. 2011) (Lourie, C.J., concurring in part and dissenting in part) (stating the problem in claim interpretation is the focus on "muddy, conflicting, and overly formulaic rules."); Research Corp. Techs., Inc. v. Microsoft Corp., 627 F.3d 859, 868 (Fed. Cir. 2010) (suggesting that *Bilski* did not presume to provide a rigid formula or definition of abstractness and reemphasized the significance of a broad statutory reading of Section 101); Cancer Research Tech. Ltd. v. Barr Labs., Inc., 625 F.3d 724, 734–38 (Fed. Cir. 2010) (Prost, C.J., dissenting) (citing *Bilski* as standing for the Supreme Court's warning away of excessive formalities in patent laws), *petition for reh'g denied*, 637 F.3d 1293, 1296 (Fed. Cir. 2011); CyberSource Corp. v. Retail Decisions, Inc., 654 F.3d 1366, 1371 (Fed. Cir. 2011) (suggesting that per *Bilski*, while the machine-or-transformation test remains an important clue, failing it is not dispositive); King Pharm., Inc. v. Eon Labs., Inc., 616 F.3d 1267, 1274 (Fed. Cir. 2010) (acknowledging that *Bilski* makes clear that there is no exclusive inquiry under Section 101); Prometheus Labs., Inc. v. Mayo Collaborative Serv., 628 F.3d 1347, 1352–53 (Fed. Cir. 2010) (suggesting that *Bilski* only rejected the exclusive nature of the machine-or-transformation test and regarded the test as merely a "useful and important clue, an investigative tool" that often leads to a clear and compelling conclusion as to Section 101 subject matter).

[230] Dealertrack, Inc. v. Huber, 674 F.3d 1315, 1333 (Fed. Cir. 2012) (suggesting that *Bilski* stands for a broad statutory reading as to eligible subject matter); Ass'n for Molecular Pathology v. USPTO, 653 F.3d 1329, 1353 (Fed.

adopted for the purpose of exploring eligibility thresholds, as well as how the courts will handle abstract innovation.

Justice Stevens's overview in *Bilski* shows that searching for physical anchors in claims primarily served as both a means for excluding abstractions and also as a proxy for concerns felt by some courts regarding patenting abstractions.[231] As shown by Michael Risch, most of the significant cases pertaining to subject matter eligibility involved claims excluded from patent protection because of criteria other than subject matter eligibility.[232] Further, Professors Merges and Crouch have recently proposed that rather than try to handle the complexity of *Bilski*'s subject matter eligibility thresholds, the thresholds should be avoided by limiting reference to Section 101 only if absolutely necessary to determine the validity of a claim.[233] Instead of applying Section 101, Merges

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Cir. 2011); *see also* Fort Props., Inc. v. Am. Master Lease LLC, 671 F.3d 1317, 1323 (Fed. Cir. 2012) (citing *Dealertrack* as a source to interpret and apply *Bilski*).

[231] *See* Makin, *supra* note 188, at 103 (explaining the abstractness test and the physicality/transformation touchstone, suggesting that they are simply a proxy for protecting the public domain from over-expansive business method patenting).

[232] Risch, *supra* note 622, at 640–41; *see also* Erik S. Maurer, *An Economic Justification for a Broad Interpretation of Patentable Subject Matter*, 95 NW. U. L. REV. 1057, 1096 (2001) ("[W]here the marketplace is allowed to select what subject matters of invention should be patented, the requirements of novelty, utility, and non-obviousness protect society's existing store of knowledge against monopoly with minimally intrusive legal intervention."); Eugene R. Quinn, Jr., *The Proliferation of Electronic Commerce Patents: Don't Blame the PTO*, 28 RUTGERS COMPUTER & TECH. L.J. 121, 153 (2002) ("[S]tatutorily-created or judicially-created exceptions to patentability are not wise, particularly when there are other alternatives that would be just as effective."); John A. Squires & Thomas S. Biemer, *Patent Law 101: Does a Grudging* Lundgren *Panel Decision Mean that the USPTO Is Finally Getting the Statutory Subject Matter Question Right?*, 46 IDEA 561, 585–86 (2006) (supporting the decision in *Ex Parte Lundgren* and suggesting that we should move away from subject matter eligibility inquiries and focus instead on novelty and obviousness analysis).

[233] Dennis Crouch & Robert P. Merges, *Operating Efficiently Post*-Bilski *by Ordering Patent Doctrine Decision-Making*, 25 BERKELEY TECH. L.J. 1673, 1674 (2010); *see also* Mark A. Lemley, Michael Risch, Ted Sichelman & R. Polk Wagner, *Life After* Bilski, 63 STAN. L. REV. 1315, 1331 (2011) (arguing that perceiving Section 101 as a gatekeeper is wrong and suggesting that the

and Crouch suggest that any claim could be invalidated under one of the less controversial and less complex requirements for patentability—Sections 102, 103, and 112.[234] Like Professor Risch, they support this conclusion based upon a set of empirical data that indicates that the "vast majority of patent claims challenged on subject matter eligibility were also challenged on other grounds."[235]

While it is an appealing approach, eliminating subject matter eligibility thresholds would be an illogical measure, as these thresholds serve an important role in weeding out many undeserving inventions without engaging in a full examination of the patent application.[236] Additionally, the requirement to engage in a subject matter eligibility inquiry is constitutionally mandated and therefore cannot be avoided.[237] Furthermore, others counter that the eligibility thresholds are justified on many grounds and should be preserved by further refinement of the eligibility tests in order to maintain a robust public domain.[238]

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abstract idea exception should be reconceived as a scope limitation so that downstream innovation will not be threatened); Daniel J. Klein, *The Integrity of Section 101—A "New and Useful" Test for Patentable Subject Matter*, 93 J. PAT. & TRADEMARK OFF. SOC'Y 287, 291 (2011) (suggesting a patentability test based on the language "new and useful" of Section 101 of the Patent Act so as to avoid the use of extra-statutory categorical exclusions).

[234] Crouch & Merges, *supra* note 233, at 1674.

[235] *Id.*

[236] *See, e.g.*, Cotter, *supra* note 220, at 876.

[237] *See* MySpace, Inc. v. GraphOn Corp., 672 F.3d 1250, 1264 (Fed. Cir. 2012) (Mayer, J., dissenting); *see also* Crouch & Merges, *supra* note 233, at 1686 (suggesting that Section 101 inquiry can be necessary in some cases).

[238] *See, e.g.*, Menell, *supra* note 224, at 1314 (criticizing *Bilski* and arguing that the subject matter inquiry must evolve to meet the new challenges of the Information Age, adopting a flexible analysis which is sensitive of history, constitutional constraints, statutory evolution, and modern technology); Stephen Pulley, *An "Exclusive" Application of an Abstract Idea: Clarification of Patent-Eligible Subject Matter After* Bilski v. Kappos, 2011 BYU L. Rev. 1223, 1225 (2010) (proposing a clearer method of evaluating abstract ideas as a tool for interpreting Section 101 of the Patent Act rather than as an exception to it and suggesting that as a result not all abstractions should be categorically excluded); Joshua D. Sarnoff, *Patent Eligible Inventions After* Bilski*: History and Theory*, 63 HASTINGS L.J. 53, 53 (2011) (suggesting that subject matter eligibility exclusions were justified historically on both deontological and utilitarian moral

Last, many policy rationales support excluding abstractions from patent protection. These policy rationales are discussed in the next Part.

IV. RATIONALES FOR EXCLUDING ABSTRACTIONS: A FOUR-TIER FRAMEWORK

To date, most academic literature has not paid close attention to the question of patenting abstractions. This question has never been dealt with seriously or explicitly by the Supreme Court or Federal Circuit, resulting in both a lack of persuasiveness and clarity in their decisions and a negative impact on innovation in many important fields such as computer software, diagnostic methods, and business methods. The intention of this Part is, thus, to identify and further explore the rationales underlying the prohibition of patenting abstractions to promote doctrinal coherence. The following discussion identifies four groups of rationales found in legal scholarship and jurisprudence for excluding abstractions: economic, constitutional law, justice-based, and structural concerns. A discussion of the wisdom and strength of each rationale consequently casts doubt on the notion that the USPTO and courts automatically apply these rationales when excluding abstractions from patent protection. Further, viewed through this framework, this Part contends that abstractions should not be automatically excluded. Rather, each abstract invention requires a case-by-case analysis with a focus upon the applicability of each set of rationales. Such a specific, case-by-case exploration and analysis of the applicability of each set of rationales to different types of abstract inventions will advance understanding as to why patenting abstractions has not actually had the devastating effects upon domestic patent law that many predicted.

As noted in Part III above, courts have introduced many gatekeepers to patentable subject matter: the traditional exception for abstract ideas, natural phenomena, and laws of nature; the

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grounds, and that we should retain them in order to maintain a robust public domain "suggests the high social stakes involved, the lack of theoretical or empirical demonstration that competing innovation approaches are better, and the moral concerns that would be raised by their elimination").

mental steps doctrine; the printer matter rule; the business method exception; and the mathematical algorithm exception. Each gatekeeper addresses a different set of concerns regarding subject matter eligibility. However, the most commonly used exception for patentable subject matter is the rule that laws of nature, natural phenomena, and abstract ideas are not patentable. As shown above, most of the other abstractions gatekeepers can easily be captured by the prohibition against patenting abstract ideas.

Such a gross grouping between unpatentable and patentable inventions fails to take into account the differences between laws of nature and natural phenomena on the one hand and abstract ideas on the other. It also fails to recognize that the universe of abstract ideas captures many claims that are in effect very different from each other. Therefore, rather than analyze the universe of inventions dualistically (patentable vs. unpatentable), it is more useful to imagine a spectrum along which abstract inventions could be placed. The spectrum would be comprised of two ends—patentable inventions on one end and unpatentable inventions on the other. An abstraction's placement on this spectrum would depend on the specific concerns arising out of each abstraction. Because each abstraction raises different concerns and the strengths of those concerns differ widely, it would be inaccurate to place all abstractions on the same end of the spectrum. Rather, abstractions should be placed somewhere along the spectrum, offering a more accurate analysis of abstractions' patentability. This, as a result, might lessen the strength of the objections to patentability in some instances.

A. *Economic Rationales*

Various economic rationales exist concerning whether abstract ideas should be patentable. An analysis of each economic rationale's strengths and weaknesses demonstrates that abstract ideas do not all raise the same economic costs as traditional economic analysis of intellectual property law has suggested.

In their seminal work on the law and economics of patents,[239] Professor Landes and Judge Posner broadly stated: "An important

[239] William M. Landes & Richard A. Posner, The Economic Structure of

limitation of patent law is that fundamental ideas, such as physical laws, cannot be patented."[240] There are various economic rationales for this position. First, patenting fundamental ideas could help create huge, stifling monopolies with little counterbalancing benefit.[241] Capturing abstractions, such as the law of gravity or the concept of hedging, through patents, would grant a large monopoly over many possible applications of these theories, including those that the inventors themselves did not invent.[242] However, other types of abstractions do not necessarily raise such grave concerns. For example, if the USPTO issues a patent over a method of instructing algebra that teaches specific steps to be taught in order to achieve certain class performance, it is difficult to imagine how such an invention that undoubtedly captures an abstract process as it pertains to different actions a teacher could take in order to achieve certain teaching goals in the classroom could lead to stifling monopolies. This abstract process is unlike the other abstractions described above, as it is more contextual and limited to certain circumstances—it could be perceived as a "practical application." Although these abstract processes are not physical, they are functional, useful, and not merely observational or theoretical. In fact, many patent applications over abstractions, such as those described in *In re Comiskey*,[243] *In re Ferguson*,[244] and *In re Bilski*,[245] teach abstract processes but are nevertheless practical and useful in the real world.

Second, patents are not the sole reward for discovering certain kinds of abstractions or information, especially in scientific and technological fields. Therefore, these activities are already sufficiently incentivized and do not require additional incentives.

Intellectual Property Law (Harvard University Press, 2003).

[240] *Id.* at 305.

[241] *Id.* at 306.

[242] *Id.* at 308–09.

[243] *In re* Comiskey, 499 F.3d 1365, 1368 (Fed. Cir. 2007) (describing a method patent for determining and conducting arbitration).

[244] *In re* Ferguson, 558 F.3d 1359, 1361 (Fed. Cir. 2009) (discussing an application on how to market products).

[245] *In re* Bilski, 545 F.3d 943, 949 (Fed. Cir. 2008) (describing an application hedging risks in commodities markets).

An exemplary incentive is the fame a person may attain for discovering basic ideas.[246] The creation of tax strategy methods is insightful in illustrating another type of reward; legal tax advice is rendered on a regular basis in return for fees so that its provision does not really require patent incentives. Additionally, many commercial entities engage in basic research because they see how it can be commercially applied and are consequently able to make the connection between basic research and commercial value.[247] Nevertheless, it is conceivable that some abstractions do require incentives for their creation and dissemination. For example, certain abstract ideas require the investment of many resources. Thus, it is likely that in many fields, due to lack of patent protection for abstractions, a less-than-optimal level of innovation occurs as a result of an inability to patent certain abstract innovations.

Third, as Landes and Posner suggested, it is difficult to demarcate boundaries of fundamental ideas or abstractions.[248] However, prescribing boundaries of a fundamental or abstract idea is no more difficult than drawing the boundaries of other process patents. Furthermore, the boundaries of abstractions depend on how they are characterized. For example, the arguably abstract processes at issue in *In re Comiskey*,[249] *In re Ferguson*,[250] and *In re Bilski*[251] were specific and adequately defined to the same extent as previously patentable processes.[252] Accordingly, instead of being

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[246] LANDES & POSNER, *supra* note 239, at 306–07.

[247] *Id.*

[248] *Id.* at 306.

[249] *In re* Comiskey, 499 F.3d 1365, 1368 (Fed. Cir. 2007).

[250] *In re* Ferguson, 558 F.3d 1359 (Fed. Cir. 2009).

[251] *In re* Bilski, 545 F.3d 943 (Fed. Cir. 2008).

[252] *In re Comiskey* states that representative Claim 1 involves a series of steps: (1) the document and its author are enrolled; (2) any challenges to the document must be presented to the pre-chosen arbitrator; (3) the complainant submits a request to resolve the dispute by arbitration; (4) arbitration resolution is conducted; (5) support is provided to the arbitration; and (6) a final and binding award or decision is determined. These steps describe a process that is arguably tailored to a certain arbitration method, which requires the occurrence of different steps. *Comiskey*, 499 F.3d at 1368–69. The process is limited by the different steps leading to the resolution of the dispute. *Id.* at 1369. In *In re Ferguson* the patent application pertained to a marketing paradigm. *Ferguson*,

regarded as vague, the court in each case could have determined that the respective processes were patentable because they did not resemble merely purely theoretical concepts.

Fourth, the economic risks of granting property rights in abstractions might be enormous.[253] There is a tremendous potential for rent-seeking that would be created if property rights could be obtained in abstractions.[254] Inventors would be highly motivated to obtain patent rights in abstractions because of the arguably broad scope of patents that would protect abstractions. There is also potential for enormous transaction costs that would be imposed upon would-be users.[255] The transaction costs would be large because the scope of abstractions *per se* is often extremely difficult to ascertain, such that newcomers would be unaware as to when they must obtain a license to make use of that abstraction.[256] Additionally, the greater the number of elements, which are owned by individuals and out of which a new invention could be made (i.e., the more the size of the public domain diminishes and the more licenses are required by new users), the greater the transaction costs that would be incurred by newcomers.[257]

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558 F.3d at 1361. Claim 1 is a representative method claim that involves the creation of a shared market force with marketing channels that allow the marketing of a number of related products. *Id.* The products are produced independently, and the independent producers receive a share of the shared marketing revenue. *Id.* This claim is arguably limited to a specific marketing method. Lastly, in *In re Bilski*, the patent application included 11 claims for a method for hedging risk in the commodities (or options) market. Claim 1 is made of a series of steps: (1) initiating a series of transactions between the provider and consumer where the consumer buys the commodity at a fixed rate based on an average of historical prices, according to the consumer's risk position; (2) identifying the commodity's market participants with a counter-risk; (3) initiating a series of transactions between the provider and market participants at a second fixed rate so that the risk is balanced between the market participants and consumers. *Bilski*, 545 F.3d at 949. These steps add context and limit the applicability of the claim to certain circumstances rather than every situation of risk hedging.

[253] LANDES & POSNER, *supra* note 239, at 306.

[254] *Id.* at 305.

[255] *Id.* at 305–06.

[256] *Id.* at 306.

[257] *See* Michael A. Heller & Rebecca S. Eisenberg, *Can Patents Deter Innovation? The Anticommons in Biomedical Research*, 280 SCI. 698, 699

However, given the diversity of abstractions, the transaction costs would not necessarily be high in any given case. The existence of such costs depends on, among other factors, the nature of the invention at issue, the field of the invention, the density of patents, and the existence of dependency and blocking patents in each case.[258]

Fifth, the non-patentability of fundamental ideas or abstractions is related to the observation that, at times, the costs of achieving a discovery are less than what is needed to develop a new invention.[259] When something is arguably known and is just "waiting to be found," the danger of a wasteful race to find it is increased because the probability of success and expected gain is greater.[260] However, it is unclear whether discoveries are any more or less certain than inventions. It is possible that certain discoveries may require greater efforts compared with certain inventions. Additionally, this analysis is not necessarily applicable to abstractions. Laws of nature and natural phenomena are arguably different from abstractions when considering this characterization of discovery because many abstractions are not necessarily "waiting to be found," but in many instances originate with their conceiver.

While this argument is not necessarily true in all cases, it seems that this characterization of discoveries as things that are waiting to be found suggests that the likelihood of independent creation by two or more inventors is increased with regard to things that are discovered or are abstract, as compared with tangible inventions.

(1998) ("Each upstream patent allows its owner to set up another tollbooth on the road to product development, adding to the cost and slowing the pace of downstream biomedical innovation.").

[258] *See* David E. Adelman, *A Fallacy of the Commons in Biotech Patent Policy*, 20 BERKELEY TECH. L.J. 985, 1001–04 (2005) (discussing various theories on the existence of transaction costs in the biotech industry).

[259] LANDES & POSNER, *supra* note 239, at 304; s*ee also* Christopher M. Holman, *Biotechnology's Prescription for Patent Reform*, 5 J. MARSHALL REV. INTELL. PROP. L. 318, 330 (2006) (observing that researchers of biotechnology had not "stopped a project due to the existence of third party patents on research inputs. In contrast, access to tangible property in the form of material transfers was found to be much more likely to impede research.").

[260] LANDES & POSNER, *supra* note 239, at 308.

Creating something tangible, such as a machine or pharmaceutical product, can require more research, development, and investment of resources when compared to abstract inventions, such as tax strategy methods. Although the creation of both types of inventions can impose significant costs, intangible inventions are developed mainly as a result of one's brain-work and are arguably more likely to be developed by individuals than tangible inventions, that more often require both brain-work and physical resources under the auspices of well-funded corporations or research laboratories. Furthermore, and as a result of this possible difference, the increased likelihood of independent creation for intangible inventions is linked to the constitutional legal concerns that have been raised with regard to capturing abstractions. If the likelihood of independent creation is higher for the creation of intangible inventions compared to that of tangible inventions, it is arguable that such inventions raise more constitutional legal concerns because of their frequent occurrence. The higher the likelihood of their creation, the more constitutive they are.

Sixth, major detection and enforcement difficulties exist in relation to patents that merely capture abstractions.[261] Naturally, these major difficulties bring large costs. For example, consider the possible infringement of a patent that captures the invention at issue in *LabCorp*, pertaining to the correlation between level of homocysteine blood test results and B12 deficiencies.[262] Identifying doctors who have employed the specific method patented by the inventor, which pertains to doctors' diagnoses and analyses of blood test results of patients, is not simple and requires significant detection expenses. Furthermore, many abstract inventions can be infringed by mere perception and analysis.[263] Thus, it is easy to imagine the problems that could arise regarding

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[261] *Id.*

[262] *See* Lab. Corp. of Am. Holdings v. Metabolite Labs., Inc., 126 S.Ct. 2921, 2921 (2006) (per curiam).

[263] *See, e.g.*, Lab. Corp. of Am. Holdings v. Metabolite Labs., Inc., 548 U.S. 124, 125 (2006) (per curiam) (pertaining to a diagnostic test used to measure the bodily amounts of certain amino acids); Regents of the Univ. of Cal. v. Eli Lilly & Co., 119 F.3d 1559, 1563 (Fed. Cir. 1997) (pertaining to an application to determine the amounts of insulin in the body); *In re* Bell, 991 F.2d 781, 785 (Fed. Cir. 1993) (a probe isolating certain genes of interest).

detection. Of course, such difficulties, standing alone, are not reason enough to deny protection.[264]

B. *Justice-Based Rationales*

The Supreme Court's seminal decisions on patentable subject matter eligibility identify two major justice/property-based rationales concerning why laws of nature, natural phenomena, and abstract ideas do not receive patent protection.[265]

The first major concern is that allowing patents over laws of nature, natural phenomena, and abstract ideas effectively extends protection over means that are not invented by the applicant. For example, in *Wyeth v. Stone*,[266] the patentee invented a new machine for cutting ice.[267] He stated in his patent application, "It is claimed, as new, to cut ice of a uniform size, by means of an apparatus worked by any other power than human. The invention of this art, as well as the particular method of the application of the principle, are claimed by the subscriber . . . ."[268] Justice Story ruled that "such a claim is utterly unmaintainable in point of law," explaining:

> It is a claim for an art or principle in the abstract, and not for any particular method or machinery, by which ice is to be cut. *No man can have a right to cut ice by all means or methods, or by all or any sort of apparatus, although he is not the inventor of any or all such means, methods, or apparatus.* A claim broader than the actual invention of the patentee is, for that very reason, upon the principles of the common law, utterly void . . . .[269]

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[264] There are other instances where major detection and enforcement problems within IP regulation still exist. Copyright infringement by individuals on the internet and tax evasion are both instances where enforcement has been a difficult task for many years and where we still have regulation and civil and criminal enforcement.

[265] *See generally* JOSHUA D. SARNOFF, PATENTS AND MORALITY: RELIGION, SCIENCE, NATURE AND THE LAW (2012) (discussing the immoral implications of broad patentable subject matter).

[266] 30 F. Cas. 723 (C.C.D. Mass. 1840).

[267] *Id.* at 725.

[268] *Id.*

[269] *Id.* at 727 (emphasis added). It should be noted, however, that Justice Story's reasoning is not necessarily accurate, as patent law effectively grants protection to more than what was actually invented by the patentees. In the

The second justice-based rationale is that laws of nature, natural phenomenon, and abstract ideas are the handiwork of nature and are merely discovered—thus the individual who discovered them did not contribute anything to the alleged invention. As a result, the individual's connection to the alleged invention does not justify the endowment of a patent. In *Funk Brothers Seed Co. v. Kalo Inoculant Co.*,[270] the patent at issue was for a mixture of three types of naturally occurring bacteria, which together formed a general soil supplement.[271] The key to this invention was the identification and isolation of strains of three different types of bacteria able to mutually coexist, thus allowing one general application.[272] The patentee did not induce the bacteria to do anything beyond the bacteria's natural function.[273] In the Court's view, the patentee simply researched natural bacteria and isolated three strains possessing the described properties, making the discovery unpatentable.[274] The Court drew the following broadly worded conclusion:

> [P]atents cannot issue for the discovery of the phenomena of nature. The qualities of these bacteria, like the heat of the sun, electricity, or the qualities of metals, are part of the storehouse of knowledge of all men. They are manifestations of laws of nature, free to all men and reserved exclusively to none.[275]

Arguably, this reasoning is not entirely accurate. Although laws of nature and natural phenomena, as well as abstract ideas, are part of the storehouse of knowledge, the reality is that even the law of

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infringement doctrine of equivalence, for example, an infringer is liable not only for literal infringement of the claims, but also for infringement by means that are substantially similar to the patentee's invention. *See* Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co., 535 U.S. 722, 738 (2002)*; see also* O'Reilly v. Morse, 56 U.S. 62, 113 (1853) (invalidating Morse's eighth claim because it went beyond the means of achieving a useful result that Morse has in fact invented: "In fine he claims an exclusive right to use a manner and process which he has not described and indeed had not invented, and therefore could not describe when he obtained his patent.").

[270] 333 U.S. 127 (1948).

[271] *Id.* at 128–30.

[272] *Id.*

[273] *Id.* at 131.

[274] *Id.*

[275] *Id.* at 130.

gravity or the theory of relativity were "created" to some extent by their "discoverers"—in that their discoverers identified and conceptualized them and contributed at least to the descriptions or definitions of the rules and theories. Regardless, even if such discoveries do not reflect a meaningful contribution on the part of the individual who discovered them (as discussed below), such an analysis is not entirely applicable to creators of abstract inventions. The value added by inventors of abstractions distances them considerably from the discoverer pole of the spectrum. This is because, unlike discoveries that can arguably be gleaned from nature and are waiting to be discovered, abstract ideas, such as mathematical algorithms or economic theories, do not necessarily reside in nature waiting to be identified. Therefore, it cannot automatically be assumed that abstract ideas are discovered and should not be patented.

C. *Constitutional Law Rationales*

Another commonly articulated reason for why laws of nature, natural phenomena, and abstract ideas should not be patentable is the concern that such things are fundamental building blocks of both scientific research and the creation of knowledge.

Particularly, abstractions are a critically important resource to learning, culture, competition, innovation, and democratic discourse. However, the Intellectual Property Clause of the United States Constitution authorizes the granting of patents only in instances where it advances the useful arts. Patenting abstractions could impede the advance of the useful arts because doing so would constitute granting monopolies on basic tools of science and other critically important rules and theories that exist in society. Considered in this light, abstractions are part of the public domain because of society's unwillingness to allow their appropriation by any one individual.[276]

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[276] Miriam Bitton, *Modernizing Copyright Law*, 20 TEX. INTELL. PROP. L.J. 65, 70 (2011); Margaret Jane Radin, *Information Tangibility*, *in* Economics, Law and Intellectual Property: Seeking Strategies for Research and Teaching in a Developing Field 395, 408–09 (Ove Granstrand ed., 2003) (discussing the impact of propertizing information on free speech); Pamela Samuelson, *Challenges in Mapping the Public Domain*, *in* The Future of the Public Domain:

Many patent law decisions have emphasized the importance of laws of nature, natural phenomena, and abstract ideas, finding these items unpatentable because they are basic tools of scientific and technological work. For example, in *Le Roy v. Tatham*,[277] the Supreme Court discussed the general problems concerning patentability of "principles" and laws of nature, offering rationales for their exclusion: "It is admitted, that a principle is not patentable. 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."[278] Likewise, in *Benson*, the Supreme Court emphasized, "[p]henomena of nature, though just discovered, mental processes, and abstract intellectual concepts are not patentable, as they are the basic tools of scientific and technological work."[279]

Identifying the Commons in Information Law 7, 7–21 (Lucie Guibault & P. Bernt Hugenholtz eds., 2006).

[277] 55 U.S. 156 (1852).

[278] *Id.* at 174–75.

[279] Gottschalk v. Benson, 409 U.S. 63, 67 (1972). A few seminal Supreme Court decisions point to the special status of abstractions. *See generally* Miriam Bitton, *Trends in Protection for Informational Works Under Copyright Law During the 19th and 20th Centuries*, 13 MICH. TELECOMM. & TECH. L. REV. 115, 136–39 (2006) (providing a thorough analysis of the treatment of informational works under copyright law). Justice Brandeis's famous dissent in *International News Service v. Associated Press* contains a classic rationale for denying legal protection to ideas and information, emphasizing their importance and public domain status: "The general rule of law is, that the noblest of human productions—knowledge, truths ascertained, conceptions, and ideas—become, after voluntary communication to others, free as the air to common use." Int'l News Serv. v. Associated Press, 248 U.S. 215, 250 (1918). Similarly, in *Harper & Row Publishers, Inc. v. Nation Enterprises*, the Supreme Court accepted this proposition and observed that copyright protected only the author's expression, not his ideas—the latter being freely useable by anyone without charge and without permission. Harper & Row, Publishers, Inc. v. Nation Enters., 471 U.S. 539, 547 (1985). Likewise, in *Feist Publications, Inc. v. Rural Telephone Service Co.*, the Supreme Court opined that "raw facts [in copyrighted works] may be copied at will" and that "[t]his result is neither unfair nor unfortunate. It is the means by which copyright advances the progress of science and art." Feist Publ'ns, Inc. v. Rural Tel. Serv. Co., 499 U.S. 340, 350 (1991). As in *Harper & Row*, the Court in *Feist* emphasized that "copyright assures authors the right to their original expression, but encourages others to build freely upon

Some scholars have even suggested that due to their importance, ideas, information, theories, and scientific principles are "First Amendment public domain" materials.[280] Thus, it has long been suggested that they should not be the subject of either patents or copyrights based upon First Amendment protections.

Furthermore, courts have consistently acknowledged that despite the importance of abstractions, patent law does not protect the most valuable aspects of inventions. For example, Judge Frank's opinion in *Schering Corp. v. Gilbert*[281] provides:

> It is indeed something of a paradox, but, nevertheless, doubtless wise, that our patent law gives no reward to the discoverers of scientific principles, while it protects the discoveries and inventions of lesser minds, who find new, original and useful applications of such principles. No Prometheus is welcome in the Patent Office.[282]

Judge Frank's analysis implicitly suggests that capturing abstractions through patents can raise significant First Amendment concerns, such as the possibility that someone could infringe upon an abstraction by merely perceiving and analyzing it.[283]

D. *Structural Limits of the Patent System*

As the historical review shows, the patent system was structured with tangible inventions in mind, traditionally limiting patent protection for inventions having some useful end. "Useful" was interpreted very narrowly, encompassing things that are physically embodied or that create some physical transformation in

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the ideas and information conveyed by a work." *Id.* at 349–50.

[280] *See* Diane Leenheer Zimmerman, Is There a Right to Have Something to Say? One View of the Public Domain, 73 FORDHAM L. REV. 297, 326 (2004).

[281] 153 F.2d 428 (2d Cir. 1946).

[282] *Id.* at 435 (Frank, J., dissenting); *see also* Morton v. N.Y. Eye Infirmary, 17 F. Cas. 879, 884 (C.C.S.D.N.Y. 1862) ("A discovery may be brilliant and useful, and not patentable. No matter through what long, solitary vigils, or by what importunate efforts, the secret may have been wrung from the bosom of Nature, or to what useful purpose it may be applied. Something more is necessary. The new force or principle brought to light must be embodied and set to work, and can be patented only in connection or combination with the means by which, or the medium through which, it operates.").

[283] *See, e.g.*, Collins, *Propertizing Thought*, *supra* note 67, at 317 (exploring the claims at issue in *Lab. Corp. of Am. Holdings v. Metabolite Labs., Inc.*, 599 F.3d 1277 (Fed. Cir. 2010)).

the world. Therefore, the system's structure does not accommodate abstract inventions and also fails to incorporate any built-in safety valves that would effectively respond to risks posed by capturing abstractions through patents. The process in which courts have responded to the development of the knowledge economy by moving away from physicality has been both a blessing and a curse; while courts have tried to accommodate new technologies, the process has not taken into account the structural limits of the patent system in accommodating such inventions.

There are sound policy reasons for being wary of permitting the patent system to encompass abstractions. First, granting patent protection to abstractions represents a fundamental departure from the traditional patent bargain. The Constitution does not expressly state what quid pro quo, if any, the inventor is required to provide in return for the limited-term exclusive right encompassed by a patent. It was only in the decade immediately preceding the Federal Convention in 1787 that the common law courts decided that an inventor was required to provide a patent specification containing an enabling disclosure (an explanation of how to make and how to use the invention).[284] Once the disclosure requirement was established, the patent system bargain became evident: the exchange of public disclosure of the invention for limited term exclusive rights in the claimed particular and tangible inventions.[285]

In contrast, patent claims covering abstractions, rather than specific tangible claims to inventions, are potentially far broader and could be infringed, at times, by mere perception and analysis. This undermines the important policy of public disclosure from the patent because the scope of claims for abstractions are much broader and, unlike tangible inventions claims that disclose an underlying (unpatentable) discovery, abstraction claims do not contribute anything immediately for public use—or at least not as much as the information that is disclosed regarding tangible inventions.

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[284] *See* R. Carl Moy, 2 MOY'S WALKER ON PATENTS § 7:5 (4th ed. 2010).

[285] *See* Collins, *supra* note 83, at 1427–30 (arguing that patentable subject matter is limited by a patentee's disclosure obligations); Kevin Emerson Collins, *Claims to Information Qua Information and a Structural Theory of Section 101*, 4 I/S: J.L. & POL'Y FOR INFO. SOC'Y 11, 23–24 (2008) (arguing the same).

While delaying commercial imitation, the traditional patent bargain guarantees that granting a patent immediately enriches the information base.[286] By requiring full enabling disclosure of how to make and use the invention, and by mandating that this disclosure become freely available as soon as the patent application is published and available, the patent system permits unlicensed use of information about the invention, as distinguished from use of the tangible invention itself. However, this assumes that every patentee enriches the public domain with valuable information that goes beyond the patentee's tangible inventions. An enabling disclosure could provide the public with some underlying concepts or theories that form the basis for a tangible invention. For example, if Morse discloses the concept of electromagnetism and patents certain means for using electromagnetism for communications, the underlying discovery is arguably free for all to use when the patent issues (unlike the tangible application of the concept). Late-comers could rely upon these disclosures and invent around the invention during the lifetime of the patent. When the patentable invention is an abstraction, this gap is arguably narrower. If what is captured by the patent is an abstraction, such as the concept of electromagnetism in the above example, there is arguably less room for inventing around it. In effect, if patents issue that restrict the public from perceiving and analyzing information about the invention, the claim effectively defeats the traditional patent bargain safety valve. This balances the interest of inventors in earning a return on past research investments against the interest of the greater public in promoting future research.

Second, even if some form of intellectual property protection for abstractions is necessary to promote investment in the creation of new types of useful abstractions, one might question whether the patent system is the appropriate model. Unlike other forms of

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[286] *See* J.E.M. Ag Supply, Inc. v. Pioneer Hi-Bred Int'l, Inc., 534 U.S. 124, 142 (2001) ("The disclosure required by the Patent Act is 'the *quid pro quo* of the right to exclude.' "); Vincenzo Denicolo & Luigi A. Franzoni, *The Contract Theory of Patents*, 23 INT'L REV. L. & ECON. 365, 366 (2004) ("[T]he contract theory [of patents] holds that the function of the patent system is to promote the diffusion of innovative knowledge.").

intellectual property protection, such as trade secret and copyright protection, the patent system has very few defenses for patent infringement that favor the public interest over the patentee's rights. For example, in contrast to trade secret law, patent law has no reverse engineering defense for patent infringers. Further, in contrast to trade secret law and copyright law, the independent creation defense is also unavailable. Unlike copyright law, patent law does not offer a fair use defense that allows the public to make certain publicly desirable uses without a license.[287] However, there exists a very narrow research exemption in patent law that is applicable only for non-commercial purposes, such as pure scientific uses.[288] Prior user rights have also been expanded recently through the America Invents Act to exempt patents, not only over business methods, but also any type of invention.

Third, and perhaps most formalistically, attempting to capture abstractions through patents could fail to meet important patentability requirements, such as novelty, utility, enablement, and written description. Arguably, capturing abstractions *per se* does not meet the novelty requirement because something that is

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[287] *See* Maureen A. O'Rourke, *Toward a Doctrine of Fair Use in Patent Law*, 100 COLUM. L. REV. 1177, 1180 (2000) (arguing that patent law should adopt a fair use doctrine—modeled after the copyright fair use defense—to help prevent rights from becoming overly broad in the new circumstances of today's high-tech world, and to authorize courts to weigh defined factors in deciding whether or not to excuse an infringement as fair).

[288] *See* John A. Gibby, *Software Patent Developments: A Programmer's Perspective*, 23 RUTGERS COMPUTER & TECH. L.J. 293, 354 (1997) ("If a process does nothing but implement a mathematical equation, and if the equation and the process are so basic and simple that there are few if any alternative ways to solve the equation, then patent protection would indeed inappropriately preempt all uses of the equation."); Robert A. Migliorini, *The Narrowed Experimental Use Exception to Patent Infringement and Its Application to Patented Computer Software*, 10 COMPUTER L. REV. & TECH. J. 135, 155–60 (2006) (suggesting to broaden the scope of the experimental use exception to help maintain technological progress and preserve the U.S. leadership in computer software technology); Richard H. Stern, *Scope of Protection Problems with Patents and Copyrights on Methods of Doing Business*, 10:1 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 105, 151 (1999) (proposing the adoption of the doctrine of *scènes à faire* in patent law as a means for limiting business method patents).

merely discovered is waiting to be revealed, predating its discovery, and is therefore not new. Abstractions also do not meet the substantial utility requirement, as they fail to offer a practical application as it has traditionally been understood. Patents on abstractions would also violate the disclosure requirements, as such a patent would capture all means, including ones the inventor did not necessarily invent and disclose in her application. This analysis is applicable *a fortiori* to laws of nature and natural phenomena rather than to abstract ideas, which do not necessarily raise similar formalistic issues. Abstract processes, such as the ones discussed in *Bilski* and *Comiskey*, could actually embody useful and practical inventions, even if they are intangible.

In summary, there are many concerns raised by patenting abstractions. While some of these concerns are of major importance in particular contexts, they are less relevant in others. Therefore, it is appropriate to carefully consider these issues before deciding whether abstractions may be patentable.

The next Part will explore a few case studies that shed light on the value of this framework. It will discuss the patentability of business methods, computer software, and diagnostic methods.

V. THE FOUR-TIER FRAMEWORK IN CONTEXT: EXPLORING SUBJECT MATTER ELIGIBILITY OF COMPUTER SOFTWARE, BUSINESS METHODS, AND DIAGNOSTIC METHODS

The four-tier framework is a useful approach for analyzing the patentability of abstractions. It demonstrates that although there are many rationales for excluding abstractions, these rationales can be disputed on some grounds and must be applied on a case-by-case basis, exploring the specific abstract invention at issue as well as its costs and benefits. The discussion that follows explores the patentability of some highly contested subject matter using the four-tier framework analysis. It should be emphasized that for the purposes of this Article, the following analysis only provides a general framework regarding the different contested categories; the highly specific nature of the inquiries require factually specific analysis that should be applied on a case-by-case basis.

A. *Patenting Software*

As discussed above, patent offices, courts, and inventors have struggled with the patentability of software since the 1970s.[289] After *Benson*, *Diehr* opened software's door to patentability if the software formed part of a novel process *and* was tied to a specific machine.[290]

After approximately three decades of quiet in the software patents debate, the Federal Circuit decided in *State Street* that the correct inquiry was whether software yielded a "useful, concrete, and tangible result."[291] In setting out a workable definition of "tangible," *State Street* did not dispel the notion that numbers alone could be tangible.[292] Tangibility or physicality could be achieved in software if the process transformed a machine, or if the process was completed by some physical means.[293] However, when, years later, the Federal Circuit addressed the patentability of software again in *In re Bilski*, the majority opinion adhered to *Diehr*'s machine-or-transformation test as the sole filter for distinguishing patentable software.[294] The Supreme Court disagreed, however, finding that the machine-or-transformation inquiry, although a significant clue as to Section 101 patentability, was not the exclusive test.[295] After *Bilski*, the USTPO issued the

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[289] *See, e.g.*, Gottschalk v. Benson, 409 U.S. 63 (1972).

[290] Diamond v. Diehr, 450 U.S. 175, 192 (1981) ("[W]hen a claim containing a mathematical formula implements or applies that formula in a structure or process which, when considered as a whole, is performing a function which the patent laws were designed to protect (e.g., transforming or reducing an article to a different state or thing), then the claim satisfies the requirements of § 101.").

[291] State St. Bank & Trust Co. v. Signature Fin. Grp., Inc., 149 F.3d 1368, 1373 (Fed. Cir. 1998).

[292] *Id.* ("[T]he transformation of data, representing discrete dollar amounts, by a machine through a series of mathematical calculations into a final share price, constitutes a practical application of a mathematical algorithm, formula, or calculation, because it produces 'a useful, concrete and tangible result'—a final share price momentarily fixed for recording and reporting purposes and even accepted and relied upon by regulatory authorities and in subsequent trades.").

[293] *Id.* at 1376.

[294] *In re* Bilski, 545 F.3d 943, 956 (Fed. Cir. 2008) ("[W]e believe our reliance on [*Diehr*'s] machine-or-transformation test as the applicable test for § 101 analyses of process claims is sound.").

[295] Bilski v. Kappos, 130 S. Ct. 3218, 3227, 3235, 3258 (2010).

Amended Guidelines, which facilitated understanding of how to apply *Bilski*.[296] The Amended Guidelines set forth a non-exhaustive list of factors practitioners were to take into account when analyzing potentially abstract process patents.[297] Not surprisingly, the USPTO deemed the machine-or-transformation test as the primary analytic Section 101 test.[298]

Applying these factors months later in *Research Corp. Technologies v. Microsoft Corp.*,[299] the Federal Circuit ruled the petitioner's software claims patentable under Section 101.[300] Interestingly, the *Microsoft Corp.* court avoided applying the machine-or-transformation test altogether, as it suggested that *Bilski* regarded the test as non-statutory.[301]

Exploring the patentability of software generally, and algorithms more particularly, through the lens of the four-tier framework suggests that *State Street*'s approach concerning algorithms *is* the best standard the Federal Circuit could have developed, given the need to accommodate technological innovation through the patent laws.

In considering the economic objections for patenting software, which contend that capturing abstractions can allow very broad

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[296] Interim Guidance for Determining Subject-Matter Eligibility for Process Claims in View of *Bilski v. Kappos*, 75 Fed. Reg. 43,922, 43,923 (July 27, 2010).

[297] A condensed list of factors is provided in the Interim Guidance: "[W]hether the method involves or is executed by a particular machine or apparatus;" "whether the performance of the claimed method results in or otherwise involves a transformation of a particular article;" "whether performance of the claimed method involves an application of a law of nature, even in the absence of a particular machine, apparatus or transformation;" and whether a general concept (which could also be recognized in such terms as a principle, theory, plan or scheme) is involved in executing the steps of the method. *Id.* at 43925–26.

[298] *Id.* at 43925 (noting the machine-or-transformation test remains an investigative tool and is a useful starting point for determining whether a claimed invention is a patent-eligible process under 35 U.S.C. § 101).

[299] 627 F.3d 859, 868–69 (Fed. Cir. 2010).

[300] *Id.*

[301] *Id.* at 868 ("[T]he Supreme Court recently emphasized this statutory framework and faulted this court's 'machine or transformation' test for eligibility as nonstatutory.").

stifling monopolies, some camps believe that software should be *per se* unpatentable because software boils down to algorithms, which are abstract processes.[302] Additionally, it has been argued that there are non-patent rewards for creating software, such as copyright law protection, trade secret protection, and other business models such as first mover advantage.[303] Because of the difficulty in fitting software within traditional patentability requirements, some scholars have proposed creating *sui generis* protection for software.[304] Yet, *sui generis* protection gives rise to its own problems. Affording every emerging technology new and unique protection would crowd the already overlapping and complex field of intellectual property. Additionally, it might prove

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[302] *See* Diamond v. Diehr, 450 U.S. 175, 194 (1981) (Stevens, J., dissenting); Bilski v. Kappos, 130 S. Ct. 3218, 3231–32 (2010) (Stevens, J., concurring).

[303] *See, e.g.*, Martin Campbell-Kelly, *Not All Bad: An Historical Perspective on Software Patents*, 11 MICH. TELECOMM. & TECH. L. REV. 191 (2005) (supporting software patents and suggesting that patents are superior to the alternative mechanisms such as trade secrecy because they encourage disclosure and provide the most economically efficient way of coordinating multiple R&D investments); Pamela Samuelson, Randall Davis, Mitchell D. Kapor & J.H. Reichman, *A Manifesto Concerning the Legal Protection of Computer Programs*, 94 COLUM. L. REV. 2308 (1994) (discussing the attributes and the legal protection of computer software through copyright law); Joseph Robert Brown, Note, *Software Patent Dynamics: Software As Patentable Subject Matter After* State Street Bank & Trust Co., 25 OKLA. CITY U. L. REV. 639 (2000) (supporting software patenting).

[304] *See, e.g.*, Dan L. Burk & Mark A. Lemley, *Is Patent Law Technology-Specific?*, 17 BERKELEY TECH. L.J. 1157, 1205 (2002) (suggesting that patent law be adapted to accommodate software by tailoring the PHOSITA standard in a way that is detached from the sections 103 and 112 inquiries); Peter S. Menell, *Tailoring Legal Protection for Computer Software*, 39 STAN. L. REV. 1329, 1364–66, 71 (1987) (suggesting that Congress creates a new kind of hybrid patent law system specifically for software where the standards would be "novelty, nonobviousness, and usefulness," and the term of protection would be shorter and would allow a limited amount of reverse engineering); Samuelson, *supra* note 71, at 1134–35, 1149–50 (arguing that computer software should not be patentable and that a *sui generis* scheme for protecting software should be introduced, and suggesting that original object code and program source code be protectable, providing software developer an exclusive right to control copying and distribution of the code, preventing conversion of software program from one language to another, limiting the term of protection to twenty years, and other important features).

redundant over time, as many industries can remain profitable without any form of intellectual property protection by simply relying on innovative business models. To date, there has been no evidence to show that patenting algorithms has had devastating effects upon the industry, and there are no clear economic conclusions on the effects of patenting software.[305]

A software algorithm is a detailed method for solving a specific computer problem.[306] Examples of software algorithms include methods for sorting, searching, fitting a curve to a set of points, compressing files, encryption and decryption data, and maintaining balance trees for data retrieval purposes. Patenting narrow algorithms does not pose many problems. A software developer has a choice of many algorithms when attacking a specific problem, and most algorithms are also in the public domain.[307]

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[305] Robert P. Merges, *Software and Patent Scope: A Report from the Middle Innings*, 85 TEX. L. REV. 1627, 1633 (2007) ("So my observation amounts to this: patents have not killed software. . . . By almost any measure, the software industry in the United States is doing quite well. Whether this is because software patents are really in the end *good* for the industry, or whether the industry has just learned to get by with them and maybe at times put them to useful ends, no one really knows . . . . But the simple point is that the industry has survived the onslaught of patents, at least reasonably well and at least so far."). *Compare* STUART J. H. GRAHAM & DAVID C. MOWERY, *Software Patents: Good News or Bad News?*, *in* INTELLECTUAL PROPERTY RIGHTS IN FRONTIER INDUSTRIES: SOFTWARE AND BIOTECHNOLOGY 45 (Robert Hahn ed., 2005) (reviewing economic evidence regarding software patents and suggesting that there is really no evidence that innovation was weak in the pre-patent period in the U.S. or that innovation slowed down in the post-patent period and arguing that rather than pursuing *sui generis* solutions to the challenges of patenting in software, a broader effort to strengthen administrative procedures for strengthening patent quality seems desirable), *with* James Bessen & Michael J. Meurer, *Lessons for Patent Policy from Empirical Research on Patent Litigation*, 9 LEWIS & CLARK L. REV. 1, 2, 25–27 (2005) (arguing that patenting software has bad effects on innovation in the field, bringing about high litigation rates), *and* JAMES BESSEN & MICHAEL J. MEURER, PATENT FAILURE 187–214 (Princeton University Press, 2008) (suggesting that the major problems with software patents are their low quality and failure to offer clear boundaries, which in turn generates more lawsuits and higher litigation costs).

[306] *See* Terry M. Walker, Fundamentals of Computer Science 8 (1975).

[307] *Algorithm: A Very Brief Introduction*, THE LINUX INFORMATION PROJECT, http://www.linfo.org/algorithm.html (last visited Dec. 3, 2012) (providing a basic explanation of algorithms, including why they are critical to programming,

Thus, because of these characteristics (and the fact that, in most cases, patenting one specific and narrow algorithm will not impact other developers in their ability to create the same result with a different algorithm), the likelihood that patenting an algorithm will create a broad stifling monopoly is unlikely.

The lack of impact also explains why there have not yet been any devastating effects for follow-up developers of software.[308] However, there has been no thorough discussion regarding the possible effects of patenting software in software cases. With the exception of a few cases discussing the preemptive effects of an algorithm,[309] most cases fail to explore this aspect in addition to other economic dimensions.[310]

As for justice/property-based rationales, patenting algorithms potentially allows patentees to gain monopolies over means which they did not invent. Additionally, algorithms appear to be closer to the discovery side of the spectrum rather than the invention side. However, courts seem to proceed cautiously in exploring this question, denying protection in instances of entire preemption of an algorithm, as in *Benson* and *Flook*, while allowing the patenting of an algorithm in instances where an application of an algorithm was patented, as in *State Street* and *Diehr*.[311] And the argument

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and suggesting that more than one algorithm can address the same problem).

[308] *See* Jeffrey S. Goodman, *The Policy Implications of Granting Patent Protection to Computer Software: An Economic Analysis*, 37 VAND. L. REV. 147, 173 (1984) ("[N]ot all computer software algorithms are equivalent to unpatentable natural laws. Rather, courts should view software algorithms, like other scientific processes, as lying on a continuum between clearly patentable and clearly unpatentable processes."); *cf.* Eric W. Petraske, *Non-Protectible Elements of Software: The Idea/Expression Distinction is Not Enough*, 29 IDEA 35, 49 n.28 (1988) ("In the field of programming, there are also collections of stock routines that perform commonly-used functions.").

[309] *E.g.*, Parker v. Flook, 98 S. Ct. 2522, 2522 (1978); Gottschalk v. Benson, 93 S. Ct. 253, 258 (1972).

[310] *E.g.*, State St. Bank & Trust Co. v. Signature Fin. Grp., Inc., 149 F.3d 1368, 1371 (Fed. Cir. 1998).

[311] Goodman, *supra* note 308, at 180 (suggesting that patent protection should extend to computer software also because "the Court failed to recognize that not all software algorithms are equivalent to natural laws" and that "like other scientific processes" they are "lying on a continuum between clearly patentable and clearly unpatentable processes").

that the patentee simply engaged in a discovery rather than inventorship of algorithms is not persuasive. Although algorithms are simply logic-based ways to solve problems, the human intervention in discovering and expressing this relationship involves manipulation, innovation, and labor. Courts have not addressed these inquiries explicitly or implicitly in many of the cases that have discussed software patents, and accordingly, more guidance is necessary.

The introduction of software patents initially raised many constitutional issues. However, since the *Alappat* and *State Street* line of cases, these concerns have been deemphasized by the courts. A particularly vexing issue in software patents is the extent to which software may monopolize mental processes because of the potentially sweeping nature of its implications.[312] Even mental processes that involve post-solution activity[313] are not rendered patentable as a result.[314] Yet software involving post-solution activity with some practical application may be patentable under Section 101.[315] These concerns could be easily avoided if the applications are limited to computer implementation, thus allowing the public to continue using mental processes without running the risk of infringing them. Additionally, there is no evidence which suggests that software patents have had any devastating effects on the development of software.

Furthermore, even if patents covering preemptive broad algorithms, such as the algorithm described in *Benson*, are weeded out, concerns regarding the structural constraints of the patent system still exist. The major problem with patenting software is the long-term protection it allows for products with a very short

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[312] *Gottschalk*, 93 S. Ct. at 255 ("[M]ental processes . . . are not patentable, as they are the basic tools of scientific and technological work.").

[313] I.e., activity after solution of the equation or algorithm set out in the claim.

[314] *Flook*, 98 S. Ct. at 2525 ("The notion that post-solution activity, no matter how conventional or obvious in itself, can transform an unpatentable principle into a patentable process exalts form over substance.").

[315] *Gottschalk*, 93 S. Ct. at 257 (finding that because the patent had "no substantial practical application except in connection with a . . . computer, . . . the patent would wholly pre-empt the mathematical formula and in practical effect would be a patent on the algorithm itself").

shelf life. These patents tend to be the result of very low investment (especially compared to the more expensive types of inventions, such as pharmaceuticals inventions), which arguably makes patent protection redundant and risky for future innovation.[316]

One could ask whether the machine-or-transformation test hinges patentability on claim drafting as opposed to the substance of the invention. Because this test remains central to the Section 101 analysis, the same issues remain even after *Bilski*: What degree of specificity suffices as to a machine or apparatus? If a general personal computer suffices, would such superficial machines render once abstract processes (e.g., the method in *Benson*) patentable? If so, perhaps the patentability of future software patents would depend chiefly on artificial distinctions as to whether they are claimed as being tied to a computer, as opposed to depending upon the inventive substance governing the software. As to software and non-software patents, should the individual inquiries under Section 101 differ depending on the technology?

These open questions suggest that patentability cannot depend on formalistic distinctions, such as drafting tactics. Algorithms can be patentable, assuming they do not raise any of the concerns discussed above. This could be decided on a case-by-case basis, as *State Street* correctly suggested.[317]

B. *Patenting Business Methods*

Business method patents can pertain to abstract business methods, making this category particularly intriguing under the application of the four-tier framework. Applying the framework to

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[316] BESSEN & MEURER, *supra* note 305, at 187–214 (showing empirically how patent protection for software brought about more litigation and other inefficient results); Robert E. Thomas, *Debugging Software Patents: Increasing Innovation and Reducing Uncertainty in the Judicial Reform of Software Patent Law*, 25 SANTA CLARA COMPUTER & HIGH TECH. L.J. 191 (2008–2009) (reviewing the genesis of the patentability of software patents, analyzing the social welfare implications of recognizing software as patentable subject matter, and examining recommendations for reform).

[317] *See supra* Part II.D for the discussion of *State Street Bank*.

business methods shows that they can and should be patentable, assuming they do not run afoul of the risks identified by applying the four-tier framework.[318]

Exploring the patentability of business methods through the lens of the four-tier framework suggests that many of the concerns regarding granting patent protection to business methods are not necessarily more significant or any different from concerns raised by other classical and traditional subject matter categories. However, business is largely driven by profit to the extent that creative business methods will continue to develop in the absence of patent protection.[319] As such, patent protection may disrupt the competitive developmental balance which was struck by business methods prior to *State Street*. Within that argument, business methods may be more suited for trade secret protection, or even under the traditional first-mover advantage doctrine.[320]

Another major objection common to patenting in general and patents on business methods is an economic one: Business method patents may be harmful to the business world in general by conferring too broad a monopoly.[321] This objection was raised in

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[318] *See supra* Part IV.

[319] *See* Vincent Chiappetta, *Defining the Proper Scope of Internet Patents: If We Don't Know Where We Want to Go, We're Unlikely to Get There*, 7 MICH. TELECOMM. & TECH. L. REV. 289, 322 (2001) (suggesting that "industrial arts innovation, even when spawned by a 'eureka' insight, normally requires substantial empirical follow-up investment to move from abstraction to implementation" whereas "competitive arts innovation often only requires a substantially more modest investment").

[320] *See* Robert Hulse, Note, *Patentability of Computer Software After* State Street Bank & Trust Co. v. Signature Financial Group, Inc.*: Evisceration of the Subject Matter Requirement*, 33 U.C. DAVIS L. REV. 491, 498–99 (2000) ("As with purely scientific theory, the patent system does not protect advances in the liberal arts. Liberal arts, such as economics and other social sciences, are fields outside the technological arts. Because they are not 'useful arts' in the constitutional sense, they are outside the scope of the patent system."); Sandra Szczerbicki, Comments, *The Shakedown on* State Street, 79 OR. L. REV. 253, 276–79 (2000) (suggesting that *State Street* was wrongly decided because other forms of intellectual property protection exist to incentivize the creation of business methods and software such as trade secrets or copyright protection).

[321] For example, has FedEx been harmed because they were unable to patent their methods of efficient shipping or would patenting said shipping method

Bilski, where it was argued that Claim 1 of the patent application at issue, which claimed a three-step method for a broker to hedge risks for purchaser-users of an input of a product or service (termed a commodity), would allow a broad patent over the concept of hedging in general.[322]

The arguments against business method patents have not been empirically proven with regard to every business method. In the example of the hedging method described in *Bilski*, it is difficult to see how the method and its steps are broader or riskier than other tangible inventions. The process pertains to a very specific context and describes a very specific set of actions that need to be taken. It also affects a limited field of business. The absence of tangible elements in this process usually causes the courts and the USPTO to automatically exclude the claims as abstract ideas,[323] suggesting that the courts and the USPTO accept the risks in such patents even though there is no specific empirical proof.

Thus, compared to other classically patentable tangible processes, it is difficult to see how such a process could create a stifling monopoly. In *Bilski*, the application of business methods is well-defined and known at the time of filing, and as a result arguably does not introduce any meaningful risks. If, however, the patentee would have attempted to patent the concept of hedging generally without limiting its application to any set of circumstances, it would have posed greater risks, and could have potentially created a stifling monopoly.

As for the existence of other incentives for creating such methods, this argument could be made with regard to other types of patentable inventions. Additionally, it is unclear whether the current production of business methods is optimal from a societal perspective and whether patent protection will incentivize the creation of even more business methods.

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stifle the efficiency of parcel shipping and deprive society of the benefits afforded by having competitors such as DHL or UPS in the field?

[322] Bilski v. Kappos, 130 S. Ct. 3218, 3224 (2010).

[323] *See, e.g.*, *id*. at 3231 ("The concept of hedging, described in claim 1 and reduced to a mathematical formula in claim 4, is an unpatentable abstract idea, just like the algorithms at issue in *Benson* and *Flook*.").

Another set of rationales commonly invoked against patenting business methods are constitutional concerns. Abstractions are perceived in intellectual property jurisprudence as a critically important resource for learning, innovation, and democratic discourse because they are critical and essential to human activity at any level—including innovative activity. However, it is difficult to see why providing patent protection for the hedging method at issue in *Bilski* would have devastating effects on further innovation. It is also difficult to perceive business methods as basic tools of science. Much like a mechanical device that affects a designated industry, a business method affects a specific business community. It is difficult to see why the impact of the latter, provided it is concrete, useful, and properly limited in its applicability would be any different to that of the former.

Business method patents, however, raise some significant structural concerns regarding the inability of the patent system to accommodate abstractions. One recurring issue in judging the patentability of business methods is the limited pool of prior art.[324] With minimal patented business methods in existence, the USPTO has simply struggled to distinguish patentable business methods from obvious ones. Time is one cure for this issue because the USPTO gains more experience as it examines more applications claiming business methods. Other possibilities for curing the problem include third party prior art submissions that have been incorporated into the recent America Invents Act amendments and that can significantly improve the quality of patents issued.[325] Last,

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[324] *See* Kevin M. Baird, Note, *Business Method Patents: Chaos at the USPTO or Business as Usual?*, 2001 U. ILL. J.L. TECH. & POL'Y 347, 348 (2001) (suggesting to impose an affirmative duty on business method applicants to search the prior art); Andrew Kopelman, Note, *Addressing Questionable Business Method Patents Prior to Issuance: A Two-Part Proposal*, 27 CARDOZO L. REV. 2391, 2393 (2006); Bronwyn H. Hall, *Business Method Patents, Innovation, and Policy* 16 (Nat'l Bureau of Econ. Research, Working Paper No. 9717, 2003) ("[T]here is widespread agreement among legal scholars that the nonobviousness test has not been applied carefully enough in the case of internet and business method patents and that lack of prior art databases have led to many invalid patents issuing in software and business methods . . . .").

[325] Leahy-Smith America Invents Act, Pub. L. No. 112-29, § 8, 125 Stat. 284, 316 (2011) ("Any third party may submit for consideration and inclusion in the

prior user rights, which provide a defense to patent infringement, also constitute a built-in safety valve under certain circumstances, provided that the conditions of Section 273 are met.[326]

In conclusion, patenting abstract business methods must be explored on a case-by-case basis, considering the different implications that capturing such methods might have on the business world and other fields. While some business method patents might have devastating economic consequences, others might be limited enough to an extent that does not impede further innovation.

C. *Patenting Diagnostic Methods*

Last, applying the framework to the patentability of diagnostic methods, which have recently presented a challenge to courts, suggests that their eligibility and the possible impact of patenting them should be cautiously considered. As one might imagine, problems can relate to any number of fields, including problems with safety hazards, product development, or cancer research. For example, in *Corazonix*, the method at issue sought to protect the process of measuring and analyzing signals related to heart conditions.[327] The Federal Circuit deemed the method patentable because the signals exhibited sufficient discernible physicality.[328]

Yet patentability of diagnostic methods does not always hinge upon whether the data measured is physical. In *LabCorp*, the diagnostic method at issue involved a method of detecting B_{12} deficiency by correlating the levels of other substances.[329] The novel element at issue was this correlative step. As such, *LabCorp*

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record of a patent application, any patent, published patent application, or other printed publication of potential relevance to the examination of the application . . .").

[326] *See* Defense to Infringement Based on Prior Commercial Use, 35 U.S.C. § 273(b) (2011).

[327] *See* Arrhythmia Research Tech. v. Corazonix Corp., 958 F.2d 1053, 1054 (Fed. Cir. 1992).

[328] *Id.* at 1059 ("These claimed steps of 'converting,' 'applying,' 'determining,' and 'comparing' are physical process steps that transform one physical, electrical signal into another.").

[329] *See* Lab. Corp. of Am. Holdings v. Metabolite Labs., Inc., 126 S. Ct. 2921, 2921 (2006) (per curiam).

struggled with patenting observable correlations between discernible indicators in the context of a problem and achieving a solution. Thus, if facts are unpatentable because they are discoverable and discoveries of facts lead to solutions of known problems, can diagnostic tests designed to discover facts be patentable?[330] If the answer is no, would this discourage researchers in any field from forging ahead with their research if their novel, nonobvious research methods were not protectable?

After the Supreme Court's denial of certiorari in *LabCorp*, *Association for Molecular Pathology v. USPTO*[331] (*Myriad*) emerged as a particularly relevant case in parsing the boundaries of diagnostic methods.[332] In *Myriad*, the petitioners' process claims related to a method of measuring breast and cervical cancer risks and testing treatment of these cancers[333]—processes which were certainly within the scope of the Patent Act. At first glance, however, *Myriad*'s processes appeared to be nothing short of complex data gathering—mining data and utilizing mental steps to correlate this data into some result without any transformative steps or tie to a machine. In construing the process claims, the Federal Circuit was mindful as to whether the methods physically transformed the articles or whether the method claims were "manifestly abstract" to the extent that they claimed only a scientific principle.[334] The court found the method claims patentable because they were transformative and physical.[335]

Most recently, the Supreme Court issued its decisions in *Prometheus* and the *Myriad* cases, which took a different approach than that taken by the Federal Circuit in *Myriad*. In *Prometheus*, the Supreme Court found that the personalized medicine dosing process invented by Prometheus was not eligible for patent

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[330] *See, e.g.*, Michael Meehan, *The Handiwork of Nature: Patentable Subject Matter and* Laboratory Corporation v. Metabolite Labs, 16 ALB. L.J. SCI. & TECH. 311, 323 (2006) (suggesting that the claim at issue in *LabCorp* was not patentable subject matter because it captures an unpatentable discovery).

[331] 653 F.3d 1329 (Fed. Cir. 2011).

[332] *Id.* at 1357.

[333] *Id.* at 1339.

[334] *Id.* at 1358.

[335] *Id.* at 1358–59.

protection because the process was *effectively* an unpatentable law of nature.[336] Interestingly, the Court reasoned that the alleged physical and transformative elements of the invention were not "genuine applications of those laws [but] rather . . . drafting efforts designed to monopolize the correlations."[337] As to the claimed application of the law of nature, the Court found it relevant and important that the additional steps were already known in the art.[338] In *Myriad*, the Supreme Court addressed only the patentability of DNA and cDNA, aspects that go beyond the scope of this Article, and suggested that "[a] naturally occurring DNA segment is a product of nature and not patent eligible merely because it has been isolated, but cDNA is patent eligible because it is not naturally occurring."[339]

Applying the four-tier framework to the patentability of diagnostic methods raises more concerns than the previous applications to software and business method patents. Starting with the economic rationales for excluding abstractions, there is no doubt that capturing diagnostic methods such as those at issue in *Myriad*, *LabCorp*, and *Prometheus* raises major concerns as to whether doing so would lead to huge stifling monopolies. The claims in these cases simply tried to capture a natural discovery. Granting such a monopoly could be very costly for follow-up inventors and society in general, as illustrated by *Myriad*.[340] Such a patent would provide protection for an invention—the boundaries of which are undefined—and arguably every possible means of employing the discovery even though it was not invented by the discoverer. However, if diagnostic tests, such as those considered in *LabCorp*, *Prometheus*, or *Myriad*, are in fact unpatentable, future researchers could be discouraged from developing new tests due to their fear of lack of protection, with the result that the research or diagnosis of diseases will suffer and create the concomitant cost to society. Government subsidies have provided

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[336] Mayo Collaborative v. Prometheus Labs., 132 S. Ct. 1289, 1305 (2012).
[337] *Id.* at 1291.
[338] *See id.*
[339] Ass'n for Molecular Pathology v. Myriad Genetics, 133 S. Ct. 2107, 2111 (2013).
[340] *Myriad*, 653 F.3d at 1355–56.

a major source of funding for basic research in order to address the lack of incentives to conduct basic research and in order to avoid the possibility of patenting its results. Therefore, as with a growing patent thicket, if patent protection were extended to research and product development, the grant of protection might stifle, not promote, the progress of science because it could potentially capture very broad monopolies.[341] If patent protection comes at too high a cost, perhaps a reduced, *sui generis* scheme should be extended to diagnostic methods to help foster balanced, protected research. If so, the same problems would complicate an already overcrowded field of intellectual property rights.

Patenting diagnostic methods also raises justice-based and constitutional law concerns. Because discoveries do not originate in the discoverer, the discoverer's property interest is weak. Additionally, from a constitutional standpoint, patenting diagnostic methods could potentially violate doctors' and others' freedom of expression to process information by affecting their freedom to think and process information mentally.

Last, patenting diagnostic methods also raises additional structural concerns stemming from the design of the patent system. Capturing discoveries through patents is problematic when no safety valves exist in the patent system for alleviating constitutional concerns, which could permit the public to make certain socially valuable uses.[342]

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[341] Rebecca S. Eisenberg, Noncompliance, Nonenforcement, Nonproblem? Rethinking the Anticommons in Biomedical Research, 45 HOUS. L. REV. 1059, 1079 (2008).

[342] *See generally* Rebecca S. Eisenberg, *Wisdom of the Ages or Dead-Hand Control? Patentable Subject Matter for Diagnostic Methods After In re* Bilski, 3 CASE W. RES. J.L. TECH. & INTERNET 1 (2012) (discussing diagnostic methods and suggesting that patentable subject matter doctrine performs functions that are not entirely distinct from other patent law doctrine and are also not entirely redundant to them); Joshua D. Sarnoff, *Patent Eligible Medical and Biotechnology Inventions After* Bilski*,* Prometheus*, and* Myriad, 19 TEX. INTELL. PROP. L.J. 393 (2011) (suggesting that acknowledging the confusion in existing subject matter eligibility regarding diagnostic and other biotechnological inventions and recognizing the prior art status of excluded subject matter, such as laws of nature underlying diagnostic method patents, will bring about better preservation of the public domain and resolution of the challenges regarding

VI. CONCLUSION

The four-tier framework provides a better and more nuanced scheme for assessing the patentability of abstractions. It sheds light on the complexity of patenting abstractions and suggests that rather than deny protection outright, the role of the patent system in an evolving world should be reconsidered, particularly with regard to subject matter eligibility.

State Street is the Federal Circuit's best response to society's ever-changing technological environment. Abandoning the physicality anchor and keeping an open mind regarding subject matter eligibility, as is reflected in the liberal "useful, concrete and tangible" result test, have been two major milestones established by *State Street*.[343] Federal Circuit jurisprudence, however, has lacked guidance and coherence regarding the policy rationales for such a move, failing to bring about the adoption of its policy. As a result, it is not at all surprising that the Supreme Court's *Bilski* decision failed to follow the *State Street* eligibility test and give any guidance regarding subject matter eligibility.[344] Today, even more vagueness exists in this highly uncertain field. Denying protection to Bilski's invention without any robust policy analysis will require the Supreme Court to provide more guidance in future decisions. One hopes that the Court will respond to this challenge by addressing these concerns in its future rulings, and follow the legacy of Jefferson, who believed that law should keep pace with the progress of the human mind:

> I am certainly not an advocate for frequent and untried changes in laws and constitutions. I think moderate imperfections had better be borne with; because, when once known, we accommodate ourselves to them, and find practical means of correcting their ill effects. But I know also, that laws and institutions must go hand in hand with the progress of the human mind. As that becomes more developed, more enlightened, as new discoveries are made, new truths disclosed, and manners and

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diagnostic methods patentability).

[343] *See supra* Part II.D.

[344] *See supra* Part II.E.

> opinions change with the change of circumstances, institutions must advance also, and keep pace with the times.[345]

[345] Thomas Jefferson, *Reform of the Virginia Constitution to Samuel Kercheval* (July 12, 1816), *available at* http://etext.virginia.edu/etcbin/toccer-new2?id=JefLett.sgm&images=images/modeng&data=/texts/english/modeng/parsed&tag=public&part=244&division=div1; *accord* Alan L. Durham, *"Useful Arts" in the Information Age*, 1999 BYU L. REV. 1419, 1527 (1999) ("[W]e must ensure that the patent system continues to function, even in areas of technology that the Framers would hardly have recognized.").