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COMPUTER SOFTWARE: PATENTABLE SUBJECT MATTER JURISPRUDENCE COMES OF AGE

by INDIRA SALADI†

*State Street Bank & Trust Co. v Signature Financial Group, Inc.*¹

I. INTRODUCTION

Software, generally, has been considered to be unpatentable subject matter for three reasons: (1) the software patent recited a mathematical algorithm, (2) the software did not have physical aspects or perform physical transformations², or (3) the software fell within the business methods exception. With the Federal Circuit's decision in *State Street*, these three reasons to find software unpatentable subject matter may no longer be valid.³ After *State Street*, the analysis regarding patentability turns on whether software inventions are "useful, concrete, and tangible."⁴ Specifically, the *State Street* decision announced a presumption that software patents which recite mathematical algorithms meet the requirements of subject matter as set out in Section 101 of the Patent Act.⁵ In addition, the historical presumption that patents which recite a mathematical algorithm and therefore must be judged according to the Freeman-Walter-Abel test was struck down as a useless anachronism of a former era.⁶ Finally to more accurately reflect the changing technologi-

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1. 149 F.3d 1368 (Fed. Cir. 1998), *cert. denied* 119 U.S. 851 (1999).

2. These two aspects are collectively termed the physicality requirement for patentable subject matter.

3. The Federal Circuit in *State Street* held that an invention was not unpatentable as a mathematical algorithm because it had practical application. *State Street*, 149 F.3d at 1368.

4. *Id.* at 1374.

5. 35 U.S.C.A. § 101 (1988).

6. *State Street*, 149 F.3d at 1374.

cal landscape, the court concluded that the business methods exception to patent law was obsolete and outdated.⁷ This is a useful shift in subject matter analysis as the decision significantly expands the scope of patentable subject matters available under the patent laws.⁸ The Federal Circuit's decision in *State Street* is a welcome change to the previous decisions regarding computer software. *State Street* introduces a new paradigm for subject matter jurisprudence.

A. THE NEED FOR NEW SOFTWARE PATENTABILITY JURISPRUDENCE

The Patent and Trademark Office ("PTO") estimates that more than 15,000 applications for software patents are currently on file.⁹ Along with the increase in the number of software patents issued, the number of challenges to a patent's validity has increased.¹⁰ There is very little clarity in what types of software can be patented and very little uniformity in the application of the jurisprudence. This lack of clarity has been attributed to the rise in patent litigation.¹¹ According to practitioners, the cost of defending a challenged patent through a trial could cost several hundred thousand dollars, and taking a case to appeal often runs over one million dollars.¹² It is clear that the costs of an unclear rule regarding software patentability are quite high.

With the advent and flourishing of businesses on the Internet, many new patents have been issued for software applications utilizing the Internet. Priceline.com has been issued a patent for reverse sellers' auctions, and CyberGold has received a patent for the practice of paying consumers to look at advertisements on the Internet.¹³ Arguably, neither of the inventions may withstand an attack for inappropriate patentable subject matter.¹⁴ Both inventions use algorithms to perform cer-

7. *Id.* at 1375.

8. Section 101 is no longer used to dismiss software patents, but the software is analyzed under the novelty, non-obviousness, and utility provisions of Sections 102 and 103.

9. See William T. Ellis & Aaron C. Chatterjee, '*State Street*' Sets Seismic Precedent, NAT'L L. J. (Sept. 21, 1998); Jodine Mayberry, *After State Street Bank—Banks Should 'Patent Early, Patent Often'*, 4 NO. 8 ANDREWS' BANK & LENDER LIABILITY LITIG. REP. 14 (Dec. 16, 1998).

10. See Ray Suarez, *Talk of the Nation* (National Public Radio broadcast, Feb. 3, 1998).

11. *Id.*

12. See James Heckman, *Marketers Can Say 'Mine!'; High Court Decision Extends Patent Protection*, MARKETING NEWS (Feb. 15, 1999); Andrew B. Katz, '*State Street*' May Place Start-Ups in Peril, N.Y. L. J. (1999).

13. Brenda Sandburg, *Madness in PTO's E-Commerce Method?*, THE RECORDER, Aug. 27, 1998.

14. Lawrence B. Ebert, *Pfaff in View of State Street: Would You Have Known It If You Could Have Seen It?*, INTELLECTUAL PROPERTY TODAY, Nov. 1998 (discussing the method and apparatus for a cryptographically assisted commercial network system designed to facilitate buyer-driven conditional purchase offers).

tain functions.¹⁵ In addition, both inventions require the use of the Internet as a means to implement their invention, and thus the claims in the invention may not meet a physicality requirement.¹⁶ Finally, both inventions are ways of doing business on the Internet, whereas business was previously done in person. Both, however, are valuable inventions that have spurred quite a bit of controversy regarding their patentability.¹⁷ Since the issuance of Priceline.com's and CyberGold's patents, both inventions have been challenged regarding subject matter validity.¹⁸

II. BACKGROUND

To understand whether these new inventions are appropriate objects of the patent law, one needs to understand the background of the patent law. The origin of United States patent law is Article 1, Section 8, Clause 8 of the United States Constitution, which states that "[C]ongress shall have Power . . . to promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries."¹⁹ The Constitution thereby guarantees rights to the inventor and sets the limits of protection in a single provision.²⁰

Federal patent law is embodied in Title 35 of the United States Code.²¹ In section 101,²² Congress identified patentable subject matter as:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.²³

15. The inventions involve a transformation of data to arrive at a final number. This method was previously performed by hand.

16. The Internet has been compared to "ether," the physical aspects of the invention may be different than in a typical software invention on a general-purpose computer. See Reid Kanaley, *A New, Improved Internet to be Introduced Today: The High-Speed Internet 2 will have Uses Not Yet Invented, But it Won't Yet be Available at Home*, THE PHILADELPHIA INQUIRER, Feb. 24, 1999.

17. See *1998 Developments*, THE CONN. L. TRIB., Dec. 21, 1998 ("An example of a business method patent in the Internet environment is the consumer-driven 'name-your-own-price' electronic commerce business model patent issued to priceline.com, Incorporated in August of this year.").

18. Michael Newman, *Patented Attack: Sightsound.com Claims Its Owed a Fee Every Time Music or Video are Downloaded From the Web*, PITT. POST-GAZETTE, Feb. 7, 1999 at F-1.

19. U.S. CONST. art. I, § 8, cl. 8.

20. *Id.*

21. 35 U.S.C. § 101-376 (1988).

22. *Id.* § 101.

23. *Id.*

Patentable subject matter thereby includes processes, methods, machines, and compositions of matter.²⁴ The term "process" is used interchangeably with the term "method," and the term "machine" is likewise used interchangeably with the term "apparatus."²⁵ The United States Supreme Court has declared that in section 101,²⁶ ". . . Congress intended statutory subject matter to 'include anything under the sun that is made by man.'"²⁷ The courts, however, have restricted this expansive concept of patentable subject matter. Judicially identified exceptions include abstract ideas, laws of nature, and natural phenomena because they constitute basic tools of scientific and technological work.²⁸ The grant of a patent monopoly within this class of subject matter would hinder Article I, Section 8 of the U.S. Constitution, which authorizes the grant of patents to "promote the Progress of . . . useful Arts." 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 have patented his celebrated law that $E = MC^2$; nor could Newton have patented the law of gravity. Such discoveries are "manifestations of . . . nature, free to all men and reserved exclusively to none."²⁹

Patents are granted to promote invention and, inter alia, novel and nonobvious usage of old ideas. This end requires a delicate balance with regard to the scope of patents granted.³⁰ Patents that cover too much subject matter (i.e., that grant a complete monopoly over the tools of invention – laws of nature, natural phenomena, and abstract ideas) will discourage would-be inventors by forcing them to license technology in order to attempt the inventive process. Patents that cover too little sub-

24. *Id.* Note that machine has been distinguished from process.

25. See Fred E. McKelvey, *Patentable Subject Matter: Mathematical Algorithms and Computer Programs*, 1106 OFF. GAZ. PAT. OFFICE 5 (1989).

A "process" or "algorithm" is a step-by-step procedure to arrive at a given result. In the patent arena, a "computer process" or "computer algorithm" is a process, i.e. a series of steps, which is performed by a computer. A "computer program" is a sequence of coded instructions for a digital computer. Computer programs are equivalently known as "software." What is sought to be protected by patent is the underlying process.

Id.

26. 35 U.S.C. § 101 (1988).

27. *Diamond v. Diehr*, 450 U.S. 175, 182 (1981) (declaring ultimately that, although mathematical algorithms are themselves unpatentable, the use of such algorithms does not render otherwise patentable subject matter unpatentable) (quoting S. Rep. No. 1979, at 5 (1952)). The term, "statutory subject matter," refers herein to that subject matter that fulfills the requirements of 35 U.S.C. § 101, without falling within a judicially identified exception. *Id.*

28. *Diehr*, 450 U.S. at 185. "Excluded from such patent protection are laws of nature, natural phenomena, and abstract ideas." *Id.*

29. *Id.* at 185 (quoting *Le Roy v. Tatham*, 63 U.S. 132 (1853)).

30. See generally Kenneth W. Dam, *Some Economic Considerations in the Intellectual Property Protection of Software*, CHI. L. & ECON. WORKING PAPERS No. 26 (1994).

ject matter will not provide enough protection to give inventors the incentive to develop new technology with the hope of securing a patent of any value. In the United States Supreme Court's own words:

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 works. . . If there is to be invention from such a discovery, it must come from the application of the law of nature to a new and useful end.³¹

Thus, as a normative matter, the subject matter of patents can be quite expansive.³²

III. EXCEPTIONS TO SUBJECT MATTER PATENTABILITY

Although the Constitutional underpinnings of patent laws suggest an expansive definition for patentable subject matter, three judicially identified exceptions to patentability have arisen: (1) mathematical algorithm, (2) physicality and (3) business methods. This section will discuss the history of these exceptions and set forth the state of the law regarding these exceptions.

A. MATHEMATICAL ALGORITHMS

In three early decisions regarding mathematical algorithms in computer program inventions, the Supreme Court established the metes and bounds for patenting mathematical algorithms. These decisions defined the parameters of subject matter patentability for software, so those patents that were essentially mathematical algorithms were excluded from patentability.

1. *Gottschalk v. Benson*

The first of these cases, *Gottschalk v. Benson*, addressed the issue of patentability of a certain computer program invention Benson claimed an efficient method, implemented on a general-purpose digital computer of any type, for converting a number expressed in binary-code decimal ("BCD") format into the same number expressed in pure binary numerals.³³ Benson's claims were limited by the requirement that they be implemented on a computer. Benson asserted that the claims were

31. *Gottschalk v. Benson*, 409 U.S. 63, 67 (1972).

32. Note that meeting the subject matter requirement is just one requisite to merit a patent. An invention must also meet statutory requirements for novelty, nonobviousness, and utility.

33. See *Benson*, 409 U.S. at 64. A simple example illustrates the conversion involved. BCD expresses each digit with four bits. The number "11," expressed in BCD, is represented by the following bits: 0001 0001. The number "111" would be represented as "0001 0001 0001" and "21" would be "0010 0001." The same number "11," expressed in binary format, is represented in the computer as $1011 (1 * 2^{su'3} + 0 * 2^{su'2} + 1 * 2^{su'1} + 1)$.

patentable under the “process” category. Thus, the issue was whether Benson’s invention was a section 101 “process.”³⁴

The Supreme Court first cited the rule that abstract concepts, principles, mental processes, or scientific truths cannot be patented, but that the practical application of one of these might be patentable.³⁵ In other words, a patent cannot cover the idea of doing a particular process, or the discovery of a new concept. A patent can only cover a particular way of doing that process, or an application of the discovered concept to “a new and useful end.”³⁶ The Court then set out to determine whether the claimed invention was more than an abstract idea or scientific truth.³⁷ It is a scientific truth that numbers in BCD format can be converted to binary form, and this truth clearly cannot be patented. In the Court’s view, however, even the method of effecting this conversion (e.g., by hand on paper or by mechanical process) is also a scientific truth waiting to be discovered.³⁸ From this perspective, a way of doing long division would be a scientific truth waiting to be discovered.³⁹ At first glance, Benson’s claims do not look like a scientific truth; the claims were for a very specific and detailed method, with steps like “masking out said binary ‘1’ in said second position of said register,” and “shifting the signals to the left by two positions.”⁴⁰

Thus, a claim for the BCD-to-binary algorithm by itself (i.e., not implemented on a computer), like a claim for the method of long division, would unquestionably be considered a scientific truth.⁴¹ However, Ben-

See id. at 66-67. Benson’s invention merely converted the 0001 0001 to 1011 in an efficient manner. *See id.*

34. *See id.* at 67-68. *See also* 35 U.S.C. § 100 (b) (1994). Section 100(b) of the Patent Act provides that the “term ‘process’ means process, art or method, and includes a new use of a known process, machine, manufacture, composition of a matter, or material.” *Id.*

35. *See Benson*, 409 U.S. at 63 (“While a scientific truth, or the mathematical expression of it, is not a patentable invention, a novel and useful structure created with the aid of knowledge of scientific truth may be.” (citing *Mackay Radio & Tel. Co. v. Radio Corp. of Am.*, 306 U.S. 86, 94 (1939))). *See generally* *Rubber-Tip Pencil Co. v. Howard*, 87 U.S. 498, 507 (1874) (“An idea of itself is not patentable.”); *LeRoy v. Tatham*, 55 U.S. 156, 175 (1852) (“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.”).

36. *Benson*, 409 U.S. at 67 (quoting *Funk Bros. Seed Co. v. Kalo Inoculant Co.*, 333 U.S. 127, 130 (1948)).

37. *See id.* at 68.

38. *Id.*

39. However, buying airline tickets from Priceline.com may not be.

40. *Benson*, 409 U.S. app. at 73-74.

41. *Id.* at 71-72. This statement is supported by considering the following key observation by the Court: “The [algorithm] involved here has no substantial practical application except in connection with a digital computer, which means . . . the patent would preempt the [algorithm] and in practical effect would be a patent on the algorithm itself.” *Id.* This indicates the Court’s belief that the only thing that might save the claim from unpatentability was its limitation to use on a digital computer. *Id.*

son further limited his claim by specifying that it was for use on a general-purpose digital computer, and he argued that this limitation was sufficient to make the subject matter patentable.⁴²

In considering whether the claimed invention was an abstract idea, the Court noted that the “process” claimed was abstract in that it covered a computer method of converting BCD to binary all by itself and not a method used in a particular application.⁴³ Furthermore, the computer method was not limited to use on a particular computer, rather it covered uses on existing and future computers and could even be performed without a computer.⁴⁴ If a patent were granted, society would give up free access to a general digital computer technique and not just an application of the technique.⁴⁵

Since the method was not associated with any particular machine, the Court considered some situations in which patents have been granted for improvements to processes that had no connection to particular machines.⁴⁶ However, these patents all involved transformation of particular materials to a different state. The Court quoted this language from an earlier Supreme Court case, *Cochrane v. Deener*:⁴⁷ “A process is a mode of treatment of certain materials to produce a given result. It is

42. *See id.* at 64.

43. *See id.* at 68.

44. *See id.* at 67.

45. All inventions incorporate applications of “natural laws.” The more an invention monopolizes a natural law, the higher the price society pays for the invention. Society, through patent law, is willing to allow monopolization of a specific application. Allowing multiple persons to do that particular application would have no utility other than to lower the price through competition. But monopolization of a whole technique takes away much more from society, granting the inventor more control than he needs. The inventor may lack the expertise to use the technique in all applicable situations; he may have to license it to others to fully realize the value of his patent. If he chooses not to license the technology for a reasonable price, patent law policy is thwarted as society loses the benefit of the technology for the twenty-year patent period. On the other hand, new and nonobvious techniques are potentially more valuable than mere applications; hence, providing an incentive for the development of such techniques would make sense. However one answers these philosophical questions, patent law is clear: ideas and general techniques are not patentable; only applications of the ideas are. Unfortunately, as will be illustrated in the discussion of *Parker v. Flook*, it is not always easy to decide what an “application” is.

46. *Benson*, 409 U.S. at 69. The Court cites several cases in which a patent for a process was granted, “irrespective of any particular form of machinery or mechanical device.” *Id.* (quoting *Corning v. Burden*, 56 U.S. 252, 267-68 (1854)). “Process” patents were sustained in *Smith v. Snow*, 294 U.S. 1 (1935); *Waxham v. Smith*, 294 U.S. 20 (1935) (referring to processes for setting eggs in staged incubation); *Expanded Metal Co. v. Bradford*, 214 U.S. 366 (1909) (referring to process for expanding metal); *Tilghman v. Proctor*, 102 U.S. 707 (1880) (referring to process for manufacturing “fat acids and glycerin from fatty bodies by the action of water at a high temperature and pressure”); and *Cochrane v. Deener*, 94 U.S. 780 (1876) (referring to process for manufacturing flour that improved quality).

47. 94 U.S. 780 (1876).

an act, or a series of acts, performed upon the subject-matter to be transformed and reduced to a different state or thing."⁴⁸ Thus, claims involving a particular machine and claims involving transformation of particular materials were concrete and "confined the patent monopoly within rather definite bounds."⁴⁹ The result was patentable subject matter.

2. *Parker v. Flook*⁵⁰

The second of the Supreme Court cases, *Parker v. Flook*,⁵¹ dealt with an invention that implemented a math equation. The invention had certain process-related claim limitations, termed "post-solution activity."⁵² The inventor argued that these limitations avoided preemption of the math equation,⁵³ but the Court found that these limitations did not rise to the level required to make the invention patentable.⁵⁴

Flook involved a method for updating values of alarm limits on process variables involved in the catalyzed chemical conversion of hydrocarbons.⁵⁵ According to the opinion, the patent application did not explain how to choose the predetermined alarm offset (K) or the predetermined value between 0 and 1 (F).⁵⁶ Once the method determined the updated alarm limit, the alarm limit was set to the updated value. The Court found the claim analogous to Benson's algorithm claim.⁵⁷ The only difference was the addition of the "post-solution" activity of updating the alarm limit for a physical process.⁵⁸ The Court held that such conventional, obvious, post-solution activity cannot "transform an unpatentable

48. *Id.* at 787-88.

49. *Benson*, 409 U.S. at 69.

50. 437 U.S. 584 (1978).

51. *Id.*

52. *Id.* at 590.

53. *See id.*

54. *See id.*

55. *See* John A. Gibby, *Software Patent Developments: A Programmer's Perspective*, 23 RUTGERS COMP. & TECH. L. J. 293, 318 (1997). An "updated alarm limit" was defined as $B_{<1>} + K$, where:

$B_{<1>} = B_{<0>} * (1.0 - F) + PVL * F$;

$B_{<1>}$ is the new alarm base;

$B_{<0>}$ is the current alarm base;

K is a predetermined alarm offset;

PVL is the present value of the process variable;

F is a predetermined number between 0 and 1.

Id.

56. *Parker*, 437 U.S. at 586. "The patent application does not purport to explain how to select the appropriate margin of safety, the weighting factor, or any of the other variables."
Id.

57. *Id.* at 588-89.

58. *Id.* at 590.

principle into a patentable process."⁵⁹

Flook went further than *Benson* in cutting back on patentable subject matter. *Flook* stated that no invention could ever be patentable solely due to the novelty of a math algorithm.⁶⁰ *Flook* expressed his idea of how to determine alarm limits as a formula. Since the expression was a formula, like a scientific principle, it expressed a fundamental relationship and thus is inappropriate subject matter for a patent.⁶¹

3. *Diamond v. Diehr*⁶²

The last of the Supreme Court cases on subject matter patentability, *Diamond v. Diehr*, involved "a process for molding raw, uncured synthetic rubber into cured precision products."⁶³ The only novel aspects of the invention were "the continuous measuring of the temperature inside the mold cavity, the feeding of this information to a digital computer, which constantly recalculated the cure time, and the signaling by the computer to open the press. . . ."⁶⁴ However, the invention also had several conventional, process-related elements. For example, the algorithm that recalculated the cure time simply solved the well-known Arrhenius equation,⁶⁵ an equation that qualifies as a natural law or technological building block. Thus, the novel parts of the invention amounted to receiving process inputs, processing them with a mathematical algorithm that was based on a natural law equation, and sending the algorithm outputs back to the physical process. The Court noted that Congress intended a wide range of statutory subject matter under section 101.⁶⁶ The Congressional Committee Reports accompanying the 1952 Patent Act stated that statutory subject matter "includes anything under the

59. *Id.* at 590.

60. *See id.* at 591. This holding ignores the fact that the successful application of a mathematical formula can require novel and non-obvious computer programming, and that, under *Benson*, an algorithm might be patented if its use is limited to a particular application. *See id.*

61. At least one commentator has criticized the *Flook* decision. *See* Gibby, *supra* note 55, at 318 ("It is simply the formulation that *Flook* found useful for the purpose of calculating alarm limits. It has neither a name or widespread usage, like the Arrhenius equation from *Diehr*. There is no policy-based reason to disqualify the algorithm, as there was in *Benson*.").

62. *See Diamond v. Diehr*, 450 U.S. 175 (1981).

63. *Id.* at 177.

64. *Id.* at 179.

65. *See id.* at 177. The Arrhenius equation is " $\ln v = CZ + x$," where v is the total required cure time, C and x are constants, and Z is the temperature in the mold. The equation is solved by computing $CZ + x$, then taking the inverse natural logarithm of that number to obtain the cure time. The inverse natural logarithm is a standard function, generally available on digital computers. *See id.* at 177-78 n.2.

66. *Id.* at 182.

sun that is made by man."⁶⁷

The Court found that Diehr's claimed subject matter was patentable and reaffirmed the *Benson* principle by recognizing that a natural law equation was involved: "[the] process [of curing synthetic rubber] admittedly employs a well-known mathematical equation, but [respondents] do not seek to preempt the use of that equation. Rather, they seek only to foreclose from others the use of that equation in conjunction with all of the other steps in their claimed process."⁶⁸ In other words, the claim in *Diehr* possessed the limitations that *Benson's* claim did not have, thereby avoiding the preemption problem. The Court noted, as did the *Benson* Court, "that an application of a law of nature or mathematical formula to a known structure or process may well be deserving of patent protection."⁶⁹

Because the algorithm in *Diehr*, like the one in *Benson*, implemented a fairly simple equation, the algorithm was little more than the equation itself. The Court therefore equated the algorithm with the mathematical formula. The *Diehr* Court stated *Benson's* holding this way: "[i]n *Benson*, we defined 'algorithm' as a 'procedure for solving a given type of mathematical problem,' and we concluded that such an algorithm, or mathematical formula, is like a law of nature, which cannot be the subject of a patent."⁷⁰ To be more precise, the formula is (or may be) the law of nature, and the algorithm is merely the way to solve that law on a computer. Using an algorithm may or may not preempt future uses of the formula and thus be considered itself a scientific truth. The *Diehr* Court refused to pass judgment as to whether computer programs that were not "algorithms" were patentable subject matter.⁷¹

The Court considered Diehr's process as a whole and concluded that it involved the transformation of an article into a different state or thing, and that such industrial processes ". . . have historically been eligible to receive the protection of our patent laws."⁷² The *Diehr* Court concluded that "[b]ecause we do not view respondents' claims as an attempt to patent a mathematical formula, but rather to be drawn to an industrial process for the molding of rubber products, we affirm the judgment [of patentability] of the Court of Customs and Patent Appeals."⁷³ The Court seemed to suggest a "totality-of-the-circumstances" approach to deter-

67. *Id.* at 182 (quoting S. Rep. No. 82-1979 at 5 (1952), reprinted in 1952 U.S.C.C.A.N. 2394, 2399).

68. See *Diamond v. Diehr*, 450 U.S. 175, 187 (1981).

69. *Id.*

70. *Id.* at 186 (quoting *Gottschalk v. Benson*, 409 U.S. 63, 65 (1972)).

71. *Id.* at n.9.

72. *Id.* at 184.

73. *Id.*

mining whether the patent claim is merely a formula.⁷⁴

4. *The Freeman-Walter-Abele Test*

The Court of Customs and Patent Appeals ("CCPA") (the predecessor court to the Court of Appeals for the Federal Circuit) struggled with the implications of the above three Supreme Court cases and eventually articulated the two-part Freeman-Walter-Abele ("FWA") test.⁷⁵ The purpose of the test was to determine whether a claimed invention is a non-statutory "mathematical algorithm" or a mere calculation.⁷⁶

The test poses two queries. First, does the invention recite a mathematical algorithm, formula or mental step? If not, then the claim is for statutory subject matter because non-mathematical algorithms are statutory.⁷⁷ If on the other hand, a mathematical algorithm is part of the claim, then the second prong is evaluated. The second prong asks whether the invention involves the application of the algorithm to specific physical elements or processes. An invention that includes a mathematical algorithm is statutory only if the mathematical algorithm is "applied in any manner to physical elements or process steps."⁷⁸

On its surface, the FWA test is consistent with the *Benson*, *Flook* and *Diehr* trilogy. Unfortunately, this test was not applied in a corresponding manner. The CCPA and the Federal Circuit were never able to develop a satisfactory definition of an "algorithm" to satisfy the first part of the test. These courts ruled that everything from a "mathematical procedure for solution of a specified mathematical problem" (*Benson*) to "simple summing" (*In re Schrader*⁷⁹) constituted an algorithm.⁸⁰ When the Federal Circuit applied the FWA test for the last time in *In re Schrader* it found that a method for summing auction bids was unpatentable

74. See *Diamond v. Diehr*, 450 U.S. 175, 184 (1981).

75. *Arrhythmia Research Technology, Inc. v. Corazonix Corp.*, 958 F.2d 1053, 1058 (Fed. Cir. 1992). Determination of statutory subject matter has been conveniently conducted in two stages, following a protocol initiated by the Court of Customs and Patent Appeals in *In re Freeman*, 573 F.2d 1237 (C.C.P.A. 1978); modified after the Court's *Flook* decision by *In re Walter*, 618 F.2d 758 (C.C.P.A. 1980); and again after the Court's *Diehr* decision by *In re Abele*, 684 F.2d (C.C.P.A. 1982). *Id.* at 1058.

76. *In re Diehr*, 602 F.2d 987 (1979). "The focus of the inquiry should be whether the claim, as a whole, is directed essentially to a method of calculation or mathematical formula." *Id.*

77. See *Paine, Webber, Jackson & Curtis Inc. v. Merrill Lynch, Pierce, Fenner & Smith Inc.*, 564 F. Supp. 1358 (1983). "The CCPA [has] . . . held that a computer algorithm, as opposed to a mathematical algorithm, is patentable subject matter." *Id.* at 1367.

78. US Congress, Office of Technology Assessment, *Finding a Balance: Computer Software, Intellectual Property, and the Challenge of Technological Change*, OTA-TCT-527 p.133 (1992).

79. *In re Schrader*, 22 F.3d 290 (Fed. Cir. 1994) (holding that a method for competitively bidding on related items was not statutory subject matter).

subject matter. Schrader's invention concerned a method for competitively bidding on several items, such as contiguous tracts of land.⁸¹ The items are offered to bidders who bid on one, some, or all of the items are received and entered into a "record."⁸² A "completion" is the particular combination of bids which "would complete a sale of all of the items being offered at the highest offered total price."⁸³ The items are sold in accordance with the "completion."⁸⁴ The court, in applying the FWA test, determined that a mathematical algorithm was implicit in the claim and that the algorithm expressed a law of nature.⁸⁵ It held that this algorithm was the kind of "law of nature" intended by *Benson* as a basic building block of technology.⁸⁶ The *Schrader* court stretched this concept to include the "laws" that "potential buyers naturally may submit bids on one, some, or all of the items for sale, and that sellers naturally choose that combination of bids that maximizes their profits."⁸⁷

As this analysis indicates, the Federal Circuit went to great pains to apply the mathematical algorithm exception. Without significant modification, the FWA test threatened to significantly limit patentability of software inventions. This was a far cry from the Supreme Court's decision in *Diehr* which allowed for the patentability of "anything under the sun that is made by man."⁸⁸

B. INVENTIONS NOT MEETING "PHYSICALITY"

Another rationale that has been used to strike down software as unpatentable is the requirement that the invention have physical attributes, i.e., that a physical transformation take place or the invention be performed on physical apparatus. This physicality requirement stems from language in *Benson*, *Flook*, and *Diehr*⁸⁹ and has been enshrined in

80. See *Arrhythmia*, 958 F.2d at 1053 (stating that lack of a solid definition made the two-prong test difficult to apply). See also Donald S. Chisum, *The Patentability of Algorithms*, 47 U. PITT. L. REV. 1009, 1020 (1986).

Maintenance of such an arbitrary and unclear line between mathematical and nonmathematical algorithms is necessary only because of the assumption of the continued vitality of *Benson*. *Benson* held that 'something' is per se unpatentable but failed to provide reasoning that could be applied to determine the scope of the per se rule.

Id.

81. *Schrader*, 22 F.3d at 291.

82. See *id.*

83. *Id.*

84. See *id.*

85. See *id.* at 293.

86. See *Gottschalk v. Benson*, 409 U.S. 63, 67 (1972).

87. *Schrader*, 22 F.3d at 293 n.8.

88. *Diamond v. Diehr*, 450 U.S. 175, 182 (1981).

89. The requirement of physical transformation for processes involving mathematical algorithms has been termed the "physicality requirement." See generally Jur Strobos,

step two of the FWA test. In *Diehr*, the Court stated that the “transformation of something physical into a different state or thing constitutes patentable subject matter, and the inclusion of a mathematical formula does not necessarily render such a process unpatentable.”⁹⁰ This language has been used to read a requirement of physicality into the subject matter inquiry.

1. *Physical Transformation*

A careful examination of the Supreme Court’s opinions in *Flook* and *Diehr* reveals what is required by the physical transformation requirement. Both *Flook*’s and *Diehr*’s inventions have a similar structure. They receive process information inputs that run information through an algorithm and send the algorithm outputs back to the process.⁹¹ However, the algorithm in *Diehr*’s invention plays a central role in the utility of the physical process.

The algorithm determines when the rubber mold presses will open. By necessity, the *Diehr* invention had to tune parameters of the algorithm to the physical process. On the other hand, *Flook*’s invention did not tune any parameters. The regulated chemical process worked with or without the alarm function until something about the process went wrong and the operator needed to intervene. Furthermore, *Flook*’s invention did not include claims about how to tune and adapt the alarm function to the particular process.⁹² Thus, *Diehr*’s algorithm is inseparable from and limited by the accompanying physical process. Moreover, *Diehr*’s algorithm is useless without the rest of *Diehr*’s process steps. It is not useful apart from the rubber molding process. On the other hand, *Flook*’s alarm updating process would be independently useable on any type of system that could use process variable monitoring. Thus, again, *Diehr*’s algorithm is more inseparable from and limited by the rest of the physical process than *Flook*’s algorithm. This analysis reveals that the invention in *Diehr* involved physical transformation whereas the invention in *Flook* did not.

Stalking the elusive Patentable Software: Are There Still Diehr or Was it Just a Flook?, 6 HARV. J.L. & TECH. 363 (1993) (examining the roots of the physicality requirement for software patentability and suggesting the abandonment of the requirement in favor of a normative approach that considers software execution speed and performance).

90. *Diehr*, 450 U.S. at 184-185 (1981).

91. *Flook*’s input was the present value of a process variable such as temperature. The output was an updated alarm limit value.

92. See Maximilian R. Peterson, *Now You See it, Now you Don’t: Was it a Patentable Machine or an Unpatentable “Algorithm”?* On Principle and Expediency in Current Patent Law Doctrines Relating to Computer-Implemented Inventions, 64 GEO. WASH. L. REV. 90, 104 (1995).

In addition, the Federal Circuit has read the Supreme Court cases to require a physical transformation. In *Schrader*, it held that a section 101 "process" must involve a transformation of materials.⁹³ Later in that same opinion, the court held that a "process" must involve some kind of transformation or reduction of subject matter.⁹⁴ The court restated *Benson's* principle that "transformation and reduction of an article 'to a different state or thing' is the clue to the patentability of a process claim. . . ."⁹⁵ As will be discussed later, the Court in *Benson* never stated such a principle.

2. *Physical Means*

The Federal Circuit in *In re Alappat*⁹⁶ held that computer software becomes physical apparatus when run on a general-purpose computer. Thus, computer software that is configured to run on a general-purpose computer is considered to be patentable subject matter.⁹⁷ Citing *Benson*, the majority stated that a "computer operating pursuant to software may represent patentable subject matter, provided, of course, that the claimed subject matter meets all of the other requirements of Title 35."⁹⁸

The ramifications of requiring physical means are enormous. Some have stated that the preference, if not the demand, to produce a recitation of physical structure has created a new type of claim drafting. Practitioners have developed the means-plus-function⁹⁹ drafting approach to satisfy the *Benson*, *Flook*, and *Diehr* physicality requirement. This entails linking the algorithm or program with otherwise patentable subject matter to pigeonhole the invention into the statutory "machine" category.¹⁰⁰ Indeed, Title 35, United States Code, 112, paragraph 6 sanctions such an approach:

An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of struc-

93. *In re Schrader*, 22 F3d 290, 295 (Fed. Cir. 1994).

94. *Id.*

95. *Id.* (quoting *Benson*, 409 U.S. at 70).

96. 33 F.3d 1526 (Fed. Cir. 1994).

97. However, the patent application claims must be drafted in means-plus-function language.

98. *Alappat*, 33 F.3d at 1545 (citing *Benson*, 409 U.S. at 71).

99. Instead of claiming step one of an algorithm (determining A) and step two of the algorithm (adding it to B), claimants claim a means for accomplishing step one and a means for accomplishing step two. See Maria T. Arriola *In Re Alappat and Beyond: A New Approach To The Patentability Of Mathematical Algorithms And Computer Programs In The United States?* 5 FED. CIR. B. J. 293, 298 (1995).

100. Stephen A. Becker, *Drafting Patent Applications on Computer-Implemented Inventions*, 4 HARV. J.L. & TECH. 237 (1991). Computer program claim forms have included means-plus-function claims, hardware-specific claims, method claims, and the inclusion of flowcharts or pseudo-code. *Id.* at 255-56.

ture, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.¹⁰¹

By using means-plus-function claims, the invention, which may or may not have physical attributes, is patterned into a physical apparatus. Thus the physicality requirement for subject matter patentability is met.¹⁰²

C. BUSINESS METHODS

The third exception to patentability is based on the assumption that so-called "business methods" or "business systems" are not patentable. The notion that business "plans" and "systems" are unpatentable abstract ideas is not a new idea.¹⁰³ The earliest decision in this area held that systems for transacting business, such as bookkeeping systems, were unpatentable because they were abstract and did not reside in a process.¹⁰⁴ However, this doctrine had a somewhat tortuous history because subsequent decisions, purportedly decided on the business method exception were, in fact, decided on other grounds.¹⁰⁵ The exception has been berated as an unwarranted encumbrance to the definition of statutory subject matter.¹⁰⁶

It is commonly believed that the genesis of the business method exception was in *Hotel Security Checking Co. v. Lorraine Co.*,¹⁰⁷ although there are cases involving methods of doing business that predate it.¹⁰⁸ *Hotel Security* is emphasized because it has led to the fallacy that all

101. 35 U.S.C. § 112.

102. For a good example of turning a method claim into an apparatus claim, see *State Street Bank & Trust Co. v. Signature Financial Group, Inc.*, 927 F. Supp. 502, 511 n.4 (D. Mass. 1996). The district court in *State Street* transformed into an apparatus a "method of converting signals from binary coded decimal form into binary." *Id.* This was the method claim at dispute in *Gottschalk v. Benson*, 409 U.S. 63, 73 (1972). *See id.* The district court in *State Street* noted the absurdity of treating the apparatus claim formed from the *Benson* method claims any differently from the way it treated the method claims themselves. *See id.*

103. *See* Rinaldo Del Gallo, III, *Are 'Methods of Doing Business' Finally Out of Business as a Statutory Rejection?* 38 IDEA 403 (1998).

104. *Hotel Security Checking Co. v. Lorraine Co.* 160 F.467 (2nd Cir. 1908).

105. *See, e.g., In re Howard*, 394 F.2d 869 (C.C.P.A. 1968) (finding that patent claims invalid for lack of novelty and therefore did not have to reach the issue of whether a method of doing business is inherently unpatentable).

106. *In re Schrader*, 22 F.3d 290, 296-98 (Fed. Cir. 1994) (Newman, P., dissenting).

107. 160 F. 467 (2nd Cir. 1908).

108. For instance, in *United States Credit System Co. v. American Credit Indemnity Co.*, 53 F. 818 (C.C.S.D.N.Y. 1893), a means for insuring a bad debt was found invalid for lack of novelty. *In Ex parte Abraham*, 1869 C.D. 59, it was held, "it is contrary to the spirit of the patent law construed by the Office for years, to grant patents for methods or analogous systems of bookkeeping."

business systems are per se unpatentable. In *Hotel Security*, the method involved was designed to prevent fraud and speculation by waiters and cashiers in hotels and restaurants.¹⁰⁹ The court did not find the invention new and useful. The invention worked as follows: a head waiter was to assign every waiter a number; the waiters were to be equipped with slips with their numbers on them; on a separate piece of paper, the head waiter maintained records of the food each waiter was taking from the kitchen; when the waiter or customer paid for the meal, the head cashier took the slip; so by comparing the food taken from the kitchen to the amount paid, indicated by the returned slips, it could be ascertained if a waiter was pocketing the cost of the meal as well as his tip.

The court stated that, "[t]he fundamental principle of the system is as old as the art of bookkeeping, i.e., charging the goods of the employer to the agent who takes them."¹¹⁰ In short, the patent was struck for lack of novelty and invention, not because it was improper subject matter for a patent. The *Hotel Security* court unwittingly gave birth to the business method exception by proclaiming:

A system of transacting business disconnected from the means for carrying out the system is not, with the most liberal interpretation of the term, an art. Advice is not patentable. . . . No mere abstraction, no idea, however brilliant, can be the subject of a patent irrespective of the means designed to give it effect.¹¹¹

The seemingly clear import of the opinion was that an invention of a process had to be directed to appropriate "means." However, the opinion would be, for nearly a century, enshrined as holding that all business systems were per se unpatentable.

Courts would declare that there must be a physical nexus by the employment of an inventive physical means.¹¹² These cases would then be fallaciously recited for the principle that business methods are not patentable.¹¹³ As time passed, these misinterpreted cases were queued up by authors to lend support to the myth that business systems or methods are per se improper subject matter for patents.¹¹⁴ A phantasmal body of law had been created.¹¹⁵ *Hotel Security* concluded by stating that there was "no patentable novelty . . . in the physical means" of the invention, implying the shrewdness of the mental steps was of no conse-

109. *Hotel Security*, 160 F. at 467.

110. *Id.* at 469.

111. *Id.* at 469

112. See Del Gallo, III, *supra* note 103, at 409.

113. *Id.*

114. *Id.*

115. *Id.* While the edict that "businesses systems" are per se unpatentable may be correct if one were to adopt the confined view that a "system" is only the mental calculation to be used in a method, the more common meaning of "system" is the interaction of physical forces and bodies, as well as perhaps the mental reactions and processes invoked.

quence in determining patentability.¹¹⁶ *Hotel Security* was recited decade after decade for its wooden holding that all business methods are unpatentable—even though the case in which the system included novel physical means and transformations and may even have been void of human judgment and decision making—when in fact the court had no concern that the method related to doing business.¹¹⁷

Thus, the stage was set for the Federal Circuit to clarify these issues relating to software patentability. The facts in *State Street* presented just the right opportunity to address these issues.

IV. A NEW PARADIGM FOR SUBJECT MATTER INQUIRY: STATE STREET BANK

A. BACKGROUND

State Street Bank and Trust (“State Street”) and Signature Financial Group, Inc. (“Signature”) both serve as administrators and accounting agents for mutual funds.¹¹⁸ Signature is the assignee of U.S. Patent No. 5,193,056 (the ‘056 patent) entitled “Data Processing System for Hub and Spoke Financial Services Configuration.”¹¹⁹ The patent is directed to an investment system that allows an administrator to monitor and record financial information flow and make all calculations necessary for maintaining a partnership portfolio and partner fund (Hub and Spoke) financial services configuration.¹²⁰

The data processing system claimed by the ‘056 patent facilitates pooling of assets from various mutual funds (“Spokes”) into a single investment portfolio (“Hub”) organized as a partnership.¹²¹ The Hub and Spoke configuration consolidates the costs of administering the funds and also provides the tax advantages of operating as a partnership.¹²²

More specifically, the patented data processing system allows a mutual fund administrator to: (1) monitor and record the financial information flow and make all calculations necessary for maintaining a partner fund configuration; (2) allocate the assets for two or more Spokes invested in the same Hub on a daily basis; (3) determine the percentage share that each Spoke maintains in the Hub; (4) consider daily changes

116. *See id.* The more accurate holding of *Hotel Security* is that physical manipulation, not mental steps (the manipulation of numbers or ideas by humans), is the proper subject matter of a method claim. Note that this more accurate holding may have been eroded by the Court’s decisions in *Benson*, *Flook*, and *Diehr*. *Id.*

117. *See* Del Gallo, III, *supra* note 103, at 408.

118. *State Street Bank & Trust Co. v. Signature Financial Group, Inc.*, 149 F.3d 1368, 1370 (1998).

119. *Id.*

120. *Id.*

121. *Id.*

122. *Id.*

in the valuation of the Hub's investment securities and calculate the relative value of each Spoke's assets; (5) allocate among the Spokes the Hub's daily income, expenses and net realized and unrealized gain or loss to determine a true asset value of each Spoke and accurately calculate the allocation ratio between or among the Spokes; and (6) track all relevant data for the Hub and each Spoke on a daily basis so that income, expenses, gains, or losses can be calculated at year end for accounting and tax purposes for the Hub and for each publicly traded Spoke.¹²³ The system operates on a personal computer including software capable of performing the various functions recited in the claims of the '056 patent.¹²⁴

B. DISTRICT COURT

Following unsuccessful efforts to negotiate a license agreement for the '056 patent, State Street brought a declaratory judgment action in Massachusetts District Court asserting invalidity, unenforceability, and non-infringement of the '056 patent, followed by a motion for partial summary judgment for failure to claim statutory subject matter under 35 U.S.C. Section 101, which was ultimately granted by the District Court.¹²⁵ In reaching its decision, the District Court applied the Freeman-Walter-Abele test, finding that although the '056 patent claims do not directly recite a mathematical formula, the data processing system is an apparatus specifically designed as a means for solving a mathematical problem.

Under the second prong of the test, the court found that the invention provided no further physical activity sufficient to warrant patentability.¹²⁶ "Quite simply, it involves no further physical transformation or reduction than inputting numbers, calculating numbers, outputting numbers and storing numbers. The same functions could be performed, albeit less efficiently, by an accountant armed with pencil, paper, calculator and a filing system."¹²⁷

C. FEDERAL CIRCUIT

On appeal by Signature, the Court of Appeals for the Federal Circuit ("CAFC") reversed the decision and remanded the case to the District Court. Writing for the panel, Judge Giles S. Rich first commented on the District Court's claim construction of the patent's "machine" claims writ-

123. *Id.* at 1371.

124. *State Street*, 149 F.3d at 1371.

125. *See id.* at 1370.

126. *Id.* at 1370.

127. *State Street Bank & Trust Co. v. Signature Financial Group, Inc.*, 927 F. Supp. 502, 515 (D. Mass. 1996); *rev'd*, 149 F.3d 1368 (1998).

ten in means-plus-function form.¹²⁸ Exemplary portions of the broadest claim (Claim 1) include: (a) computer processor means, (b) storage means, (c) initialization means, and (d)-(g) means for processing the daily data regarding assets in the portfolio and allocating such data among each fund.¹²⁹

The CAFC pointed out that the District Court construed the claims (specifically, independent claim 1) as reciting a means for solving a series of mathematical problems, i.e., a process claim, as distinguished from a machine claim, with the “means” clause comprising the various steps in the process.¹³⁰ Only where the patent specification does not include supporting structure for the means recited in the claims should a machine claim be viewed as a process claim. Since the specification of the ‘056 patent included ample structural support for the means recited in independent claim (1), that claim, properly construed, defines a machine. However, the CAFC noted that the District Court’s error was of no matter as long as claim (1) falls within one of the four enumerated classes of statutory subject matter, of which “machine” and “process” were both included.¹³¹

Judge Rich next addressed the District Court’s conclusion that the patent claimed a mathematical algorithm or a business method, both of which were excluded from patent protection.¹³² Pointing to the expansive nature of 35 U.S.C. Section 101, as well as the repetitive use of the broad term “any” in the statute, the court concluded that it is improper to read any limitations into the Supreme Court’s pronouncement that Section 101 is to extend to “anything under the sun that is made by man.”¹³³ With that background, Judge Rich expanded on the mathematical algorithm exception.

The court noted that not every mathematical algorithm is precluded from patent protection—only those that are nothing more than abstract ideas.¹³⁴ Where a mathematical algorithm is reduced to a practical application that produced “a useful, concrete and tangible result,” patent protection is available. Previous examples of patentable algorithms include the use of mathematical calculations to control a computer display and produce a specific output, and transformation of electrocardiograph signals using mathematical calculations.

Thus, the transformation of data representing discrete dollar amounts by a machine through a series of mathematical calculations

128. *State Street*, 149 F.3d at 1370.

129. *Id.* at 1371-2.

130. *Id.* at 1371.

131. *Id.* at 1375.

132. *Id.*

133. *Id.* at 1373 (quoting *Diamond v. Chakrabarty*, 447 U.S. at 309-10).

134. *State Street*, 149 F.3d at 1376.

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.¹³⁵ The court further noted that the FWA test, has little if any applicability to determining the presence of statutory subject matter.¹³⁶ Instead, the focus in this inquiry should be directed to the essential characteristics of the invention, and in particular, whether the invention has practical utility.¹³⁷

With the *State Street* decision, the CAFC clearly and unequivocally held that an invention involving inputting, calculating, outputting, and storing of numerical data (i.e., crunching numbers) is patentable so long as the invention produces "a useful, concrete and tangible result." This is so even where the useful result is "expressed in numbers, such as price, profit, percentage, cost or loss," as is the case with the data processing system claimed by the '056 patent. *State Street* also laid to rest any continued misunderstanding as to the applicability of the FWA test for determining the presence of statutory subject matter. After *State Street*, physicality is no longer a necessary prerequisite for patenting of computer-driven software.

Finally, in discussing the inapplicability of the business method exception to statutory subject matter, the court laid "this ill-conceived exception to rest."¹³⁸ The court took a close look at the case law and found that no such exception existed: "Business methods have been, and should have been, subject to the same legal requirements for patentability as those applied to any other process or method."¹³⁹

The mere fact that the claimed subject matter does "business" instead of something else should not be determinative of whether claims are directed to statutory subject matter. Whether patent claims are directed to business methods is not determinative of patentability. Rather, normal precepts of patentability apply. Since the Patent Act was enacted, "business methods have been, and should have been, subject to the same legal requirements for patentability as applied to any other process or method."¹⁴⁰ The court noted that since the Patent Act's inception, the "business method" exception has merely represented "the application of some general, but no longer applicable legal principle."¹⁴¹

135. *Id.* at 1373.

136. *Id.* at 1374.

137. *Id.* at 1375.

138. *Id.* at 1374.

139. *Id.* at 1373.

140. *State Street*, 149 F.3d at 1375.

141. *Id.*

D. "USEFUL, CONCRETE AND TANGIBLE" ANALYSIS

The ramifications of the *State Street* decision are enormous. No longer does software need to be judged according to the FWA test for presence of a mathematical algorithm nor does the software have to be tailored to an apparatus to meet a physicality requirement. Additionally, software that solves business problems or is within the business domain can no longer be swiftly ruled inappropriate subject matter for a patent. By shifting the paradigm to patents that are "useful, concrete and tangible," the Federal Circuit has changed the focus of the subject matter analysis quite dramatically. The *State Street* decision significantly limits the mathematical algorithm analysis, erodes the physicality requirement, and signals the end of the business methods exception for patentable subject matter. This section will discuss the ramifications of the paradigm shift.

1. *Limitation of Mathematical Algorithm Analysis*

The Federal Circuit limited mathematical algorithm analysis by circumventing the FWA test in the court's analysis of the '056 patent.¹⁴² In contrast to the district court, the Federal Circuit stated that the "test has little, if any, applicability to determining the presence of statutory subject matter."¹⁴³ The *State Street* court equates unpatentable mathematical algorithms with abstract ideas.¹⁴⁴ As the court notes: "[t]his means that to be patentable an algorithm must be applied in a "useful way."¹⁴⁵ The measure of this requirement, and therefore of patentable subject matter question, is whether the idea has been "reduced to some type of practical application, i.e., "a useful, concrete and tangible result."¹⁴⁶

An overriding concern is whether circumventing the FWA test is appropriate given the Supreme Court's jurisprudence. Even though the court's opinion is sketchy, it is consistent with the Supreme Court's analysis in *Benson*, *Flook*, and *Diehr*. The *Benson* Court was troubled by basic mathematical operations, akin to a natural laws¹⁴⁷ such as the law of gravity or the theory of magnetism.¹⁴⁸ The *Benson* Court listed several

142. *Id.*

143. *Id.* at 1374.

144. *Id.* at 1375.

145. *Id.* at 1373.

146. *State Street*, 149 F.3d at 1373.

147. See *Gottschalk v. Benson*, 409 U.S. 63, 67 (1972).

148. The Court then listed several possible uses for the algorithm, such as use in the operation of a train, verification of drivers' licenses, or researching law books for precedents. *Id.* at 68.

varied, possible uses for the Benson algorithm.¹⁴⁹ The Supreme Court was concerned with claims like those addressed in *O'Reilly v. Morse*,¹⁵⁰ where the Court denied telegraph inventor Samuel Morse's claim of the use of "electromagnetism, however developed for marking or printing intelligible characters, signs, or letters, at any distances."¹⁵¹ Just as Morse tried to preempt future uses of electromagnetism, the Court saw Benson's claim as an attempt to preempt future uses of the BCD-to-binary conversion algorithm. The *Benson* Court observed that such natural laws have never been patentable, "as they are the basic tools of scientific and technological work."¹⁵² Thus, the Court found the subject matter unpatentable.¹⁵³ The lack of limitation of the claims was central to this holding.

State Street addresses the *Benson* concerns by limiting patentable subject matter to "useful, concrete, and tangible" inventions. Although the court's analysis is cryptic, the requirement of "useful, concrete, and tangible" seems to serve as a limitation on the claims so that future uses of algorithms will not be preempted. The language in *State Street* suggests that the court is seeking a way to differentiate between merely theoretical notions (*Benson* concerns) and "things" that have actual existence and interactive consequences (*State Street's* domain).

Practically speaking, most computer programs are merely a programmer's specific solution to a specific problem. Even though the program may contain formula, it is still an application of the formula for a specific application, even if that application may be quite broad. Consider the algorithm involved in implementing the "reverse auction" that is the subject of Priceline.com's patent. Such an algorithm could comprise hundreds of lines of code. That code is compiled and converted into executable machine-language instructions that direct a microprocessor on how to proceed. It is hard to see how this end result is like a law of nature. It is merely one solution to a specific problem. While all computer programs are algorithmic, the manipulation of numbers transforms these computer algorithms into mathematical algorithms.¹⁵⁴

149. *Id.* The Court found that possible end uses of the algorithm "vary from the operation of a train to verification of drivers' licenses to researching the law books for precedents." *Id.* at 68.

150. 56 U.S. 62 (1853).

151. *Id.* at 112.

152. *Benson*, 409 U.S. 63, 67-68, 71-72 (1972).

153. *Id.* at 73.

154. For instance, the court in *In re Maucorps*, 609 F.2d 481(1972), disallowed a claim that was directed to "a computer-implemented model of a sales organization. [The system] determines the optimum number of times a sales representative for a business should visit each customer over a period of time, the optimum number of sales representatives the organization should have, and the optimum organization of sales representatives." *Id.* at n.180. Because business systems rely heavily on mathematics, the future development of

Indeed, many computer programs are not *Benson* “algorithms,” and have nothing to do with laws of nature.¹⁵⁵ Prior to *State Street*, the definition of unpatentable mathematical algorithm was so broad as to encompass a large portion of virtually any kind of technology.¹⁵⁶ Thus, the Federal Circuit rightly erodes the mathematical algorithm exception to software patentability.

2. *Erosion of Physicality Analysis*

State Street changes the focus of the discussion from the physicality requirement as articulated in the second step of the FWA test to whether the claimed invention produces a “useful, concrete, and tangible result.”¹⁵⁷ The Federal Circuit eroded the physicality requirement by circumventing the FWA test in the court’s analysis of the ‘056 patent. In downplaying the role of FWA test, the court effectively minimized the emphasis placed on physical steps in the patentability inquiry. In addition, the court did not draw any distinction between process claims (claims to the computer program itself) and apparatus claims (a machine programmed to perform a specific function). Instead, the court emphasized that, as a whole, the invention produce a “useful, concrete, and tangible result.”¹⁵⁸ *State Street* explicitly states:

[t]he question of whether a claim encompasses statutory subject matter should not focus on which of the four categories of subject matter a claim is directed to – process, machine, a manufacture, or composition of matter – but rather on the essential characteristics of the subject matter, in particular its practical utility.¹⁵⁹

This is an appropriate result since the previous state of affairs was to place emphasis on whether the invention was drafted in means-plus-function format or effectuated a physical transformation.

A dominant concern is whether eroding the physicality requirement is appropriate given the Supreme Court’s jurisprudence. It should be noted that the *Benson* Court stopped short of holding that a process patent must be tied to a particular machine or operate to change materials

the law related to computer-implemented business systems may closely track developments in mathematical algorithmic case law in general. Further complicating the abjectly complicated, the degree to which a computer algorithm is mathematical lies on a spectrum about which reasonable people can disagree. Many commentators have noted that all computer programs have at least some mathematical content since all computer programs manipulate ones and zeros.

155. See *In re Freeman*, 573 F.2d 1237, 1245 (C.C.P.A. 1978).

156. See *In re Schrader*, 22 F.3d 290, 296-98 (Fed. Cir. 1994).

157. *State Street Bank & Trust Co. v. Signature Financial Group, Inc.*, 149 F.3d 1368, 1373 (1998).

158. *Id.*

159. *Id.* at 1375.

to a different state or thing.¹⁶⁰ By avoiding a specific holding that a claim must include physical aspects to be a section 101 process, the Court implied that a section 101 process might not have to have physical aspects.¹⁶¹ Additionally, none of the Supreme Court cases were faced with interpreting machine claims. Consequently, the Court has not demonstrated whether machine or apparatus claims should be treated differently from process or method claims. Nor should the Court make that distinction. If a mathematical formula is insufficiently limited to a particular use (as in *Benson*) it is not "useful" in the Constitutional sense. That is, a natural law such as $E = MC^2$ (Einstein's law for Energy equals mass times the speed of light squared) is not "useful" or practical in that general form; it must be put to use as a machine, article of manufacture, process, or composition of matter to be "useful." The purposes of the patent system require such limitation, but those purposes do not require that a "machine" or "process" have physical aspects. Such a requirement distracts from the core requirements of usefulness, novelty, and non-obviousness. Furthermore, the requirement over-simplifies the *Benson* requirement that the invention be sufficiently limited to not monopolize a natural law or an abstract idea.

It is well recognized that either hardware or software can do almost any function in a computer; an algorithm may be executed through a computer program or through hard-wired circuitry. It is argued that because the hardware is patentable the software should be patentable.¹⁶² The *State Street* decision makes sense, because if inventions as methods, which only transform data are implemented by general purpose computers, do not satisfy patentable subject matter requirements, then one might argue that drafting such inventions as machine claims should not make them patentable.¹⁶³ Software patentability should not turn on the skills of the draftsman, but rather on the characteristics of the invention.¹⁶⁴

While embodiment as a physical machine is a way to limit an invention and make it practical, it is a mistake to conclude this is the only way. As the patent laws continue to adhere to this artificial distinction and to stretch it to accommodate the needs of software patents, the rules

160. See *Gottschalk v. Benson*, 409 U.S. 63, 71 (1972).

161. The Court emphatically stated that it did not hold that "a patent for any program servicing a computer" was precluded. *Id.*

162. See Arriola, *supra* note 99, at 299-300.

163. Lawrence Kass, *Comment: Computer Software Patentability and the Role of Means-plus-Function Format in Computer Software Claims*, 15 PACE L. REV. 787, 849 (1995).

164. When the focus of the discussion is the invention, the questions naturally lead to issues of novelty, usefulness, and nonobviousness, and not to the hair-splitting claims-drafting distinctions. See Vincent Chiappetta, *Patentability of Computer Software Instruction as an "Article of Manufacture: Software as Such as the Right Stuff*, 17 J. MARSHALL J. COMPUTER & INFO. L. 89 (1998).

grow increasingly and unnecessarily complex. This causes a dilemma. One may want to seek patent protection for the abstract steps of a computer-implemented business system rather than for the actual code so that the underlying algorithm cannot be performed on any general computer with equivalent specific programming code that can accomplish the underlying algorithm.¹⁶⁵ By viewing the abstract software of a business system as an algorithm and not an "invention," many computer-implemented business systems will not be deemed to be proper, patentable subject matter. Since the principal function of today's business systems is number crunching, the nature of business exacerbates the problem, unless the subject matter inquiry places less focus on the physicality requirement.¹⁶⁶

The current law effectively requires patent prosecutors to claim computer programs as machines instead of processes.¹⁶⁷ The patent statute, however, states that new and useful processes, as well as machines, constitute patentable subject matter.¹⁶⁸ Therefore, the patentability of a computer program should not depend upon whether the draftsman claims it as a machine or a process.¹⁶⁹ Forcing software claims into a "hardware" based mold in order to clear subject matter requirements operates against the evolution of the technology itself. Computer technology continues to move away from hardware implementations. A large portion of all new development is done exclusively in software. As improvements are made, new versions or replacement products substitute software implementations for existing hardware solutions. Additionally, the software solutions themselves are becoming increasingly independent of their hardware operating platforms. Having a physicality requirement only retards the advance of computer technology rather than encourage it. A world that is increasingly technologically dependent requires a broader interpretation of the patent statute than the physicality requirement jurisprudence allows.

165. But by eliminating allusions to specific code, the business system claim will be treated as a process claim; the process will not relate to the technological arts, and a patent will not issue.

166. *State Street Bank & Trust Co. v. Signature Financial Group, Inc.*, 149 F.3d 1368, 1374 (1998).

167. See *In re Alappat*, 33 F.3d 1526, 1544-45 (1994) (hinging patentability on classification of invention as new machine). The *Alappat* court concluded that "programming creates a new machine." *Id.* at 1545.

168. See 35 U.S.C. § 101 (1994) (defining patentable subject matter as "any new and useful process, machine, manufacture, or composition of matter").

169. See *Alappat*, 33 F.3d at 1581-83 (Rader, J., concurring) (arguing patentability should not hinge on classification as machine or process).

3. *End of Business Methods*

By explicitly overruling the business methods exception to subject matter jurisprudence, the Federal Circuit ended an era of reliance on the exception to find software patent unpatentable. Software used in business is subject to the same rules and requirements that all other inventions are subject to.¹⁷⁰ As mentioned previously, the focus of the inquiry is now "whether the claimed invention produces a "useful, concrete, and tangible result,"¹⁷¹ rather than whether the invention falls within the business methods exception to patentability.

Before *State Street*, the courts had found a device for transforming numerical values into smooth waveform data displayed on an oscilloscope (*Alappat*)¹⁷² and a method for measuring, processing, and displaying heart activity on a screen (*Arrhythmia*)¹⁷³ as patentable inventions. The invention in *State Street* claims a method for monitoring and recording the information flow and data, and making "all calculations necessary for maintaining a . . . financial services configuration."¹⁷⁴ As there is no functional difference between these inventions (i.e. in all three systems, data are collected, processed, and displayed on a screen) there should not be a difference in the treatment of subject matter jurisprudence. To make the rule that distinguishes *Alappat* and *Arrhythmia* from *State Street* that computer-implemented data systems are patentable when the data they produce are used in science, but not patentable when the data they produce are used in business is to place unnecessary emphasis on the domain of the invention. Such a rule exalts form over substance. It obsesses with the adherence to a recognized exception and pays no heed to the aim and purpose of patent law. Thus, the Federal Circuit rightly overruled the business methods exception to software patentability.

4. *New Analysis*

By expanding the net of appropriate subject matter for patentability, the *State Street* decision effectively turns the analysis to whether a software invention meets the other requirements of Title 35.¹⁷⁵ The *Diehr* Court observed that where an invention meets section 101 requirements for subject matter the focus of the analysis turns to whether sec-

170. These other requirements are the statutory requirements of novelty, nonobviousness, and utility.

171. *State Street*, 149 F.3d at 1373.

172. *In re Alappat*, 33 F.3d at 1542-43.

173. *Arrhythmia Research Technology v. Corazonix Corp.*, 958 F.2d 1053, 1058 (Fed. Cir. 1992).

174. *State Street*, 149 F.3d at 1371.

175. These include novelty, nonobviousness, utility, and adequacy of disclosure and notice.

tion 102 and 103 requirements of "novelty" and "non-obviousness" are satisfied.¹⁷⁶ The section 103 question of non-obviousness has been obscured by the Supreme Court's protracted consideration of statutory subject matter for software inventions. The dissent in *Diehr* argued that Diehr simply used a digital computer to automate a process when that technology became available.¹⁷⁷ This is true, but it goes to the non-obviousness of the invention, not to whether the process is patentable subject matter. Given enough time, a skilled programmer should be able to program a computer to do anything that has been done before mechanically. Therefore, mere automation of previously mechanical processes should rarely pass the section 103 standard for software inventions.

Section 103's appropriately high standard for software inventions would go a long way toward solving programmers' objections to the patent system. Modern programming languages such as "C" and "C++" combined with efficient program development environments on fast computers have resulted in prolific software production. Once a skilled programmer understands the problem to be solved, it is often just a matter of time before she may be able to write a program to solve the problem. Therefore, a high standard is required for what is non-obvious for software inventions. Proper application of the section 103 non-obviousness standard to these inventions is imperative to preserve the policies of the patent law in the software area.

V. CONCLUSION

In summary, the Court of Appeals for the Federal Circuit in *State Street* updated the subject matter jurisprudence for software patents by limiting the mathematical algorithm exception, eroding the physicality requirement, and laying to rest the business methods exception. The ruling is a refreshing change in subject matter jurisprudence. *State Street* changes the focus of software patents from subject matter to the other requirements of patentability, such as novelty, nonobviousness, and utility. *State Street* modernizes the Patent Act by applying traditional patent law principles to apply to rapidly expanding and evolving high technology industries.

176. *Diamond v. Diehr*, 450 U.S. 175, 184 (1981)

177. *See id.* at 208-09 (Stevens, J., dissenting).

