

AT&T CORP. V. EXCEL COMMUNICATIONS, INC.

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In *AT&T Corp. v. Excel Communications, Inc.*,¹ the Federal Circuit formally put an end to an apparent dichotomy in the treatment of patent claims involving computer software. Since 1994, the Federal Circuit has regarded machine claims drafted in means-plus-function format as patentable subject matter, provided that the inventor disclosed some supporting structure.² At the same time, a trio of aging Supreme Court decisions³ indicated that patents claiming processes involving mathematical algorithms must incorporate a significant, if ill-defined, physical component. With its decision in *Excel*, the Federal Circuit eliminated the requirement of physical elements or limitations for process claims, undermining the Supreme Court's attempt to preclude the patenting of abstract ideas or thought processes. This Note contends that after *Excel*, the goal of preventing patents on thought can be achieved by relying on other provisions of existing patent law.

I. BACKGROUND

Courts have broadly interpreted 35 U.S.C. § 101, which establishes the scope of patentable subject matter.⁴ In the famous words of *Diamond v. Chakrabarty*,⁵ "Congress intended statutory subject matter to include 'anything under the sun that is made by man.'"⁶ The Supreme Court has

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1. 172 F.3d 1352 (Fed. Cir. 1999), *cert. denied*, 120 S. Ct. 368 (1999).

2. *See In re Alappat*, 33 F.3d 1526 (Fed. Cir. 1994) (holding that a means-plus-function claim to a computer operating pursuant to software constituted patentable subject matter).

3. *Diamond v. Diehr*, 450 U.S. 175 (1981) (holding that a claim to a process for curing rubber that involved repeatedly solving a mathematical equation constituted patentable subject matter); *Parker v. Flook*, 437 U.S. 584 (1978) (holding unpatentable a claim to a process for updating alarm limits by repeatedly solving a mathematical equation); *Gottschalk v. Benson*, 409 U.S. 63 (1972) (holding unpatentable a claim to a process for converting binary coded decimal numbers to binary).

4. "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." 35 U.S.C. § 101 (1994).

5. 447 U.S. 303 (1980).

6. *Id.* at 309 (quoting S. REP. NO. 82-1979, at 5 (1952); H.R. REP. NO. 82-1923, at 6 (1952)).

consistently read this statute to exclude laws of nature, natural phenomena, and abstract ideas.⁷

With the rise of the digital computer, courts have repeatedly confronted claims involving mathematical algorithms, usually defined as "procedure[s] for solving a given type of mathematical problem."⁸ In analyzing the patentability of these claims, the Supreme Court has consistently stated that, while a mathematical algorithm standing alone is an unpatentable abstract idea, a useful process that incorporates an algorithm may be patentable subject matter.⁹ The courts have had considerably more difficulty in distinguishing abstract algorithms from useful processes.¹⁰

A. The Supreme Court Cases

The Supreme Court has addressed the patentability of processes involving mathematical algorithms in three cases—*Gottschalk v. Benson*,¹¹ *Parker v. Flook*,¹² and *Diamond v. Diehr*¹³—without clearly establishing the criteria for patentability of such processes.

In *Gottschalk v. Benson*,¹⁴ Benson sought patent protection for a method of converting binary-coded decimal numbers into the binary numbers used by digital computers.¹⁵ The Court held that the method was unpatentable subject matter.¹⁶ Summarizing its reasoning "in a nutshell," the Court explained that Benson's algorithm had no application outside of digital computing and therefore allowing the patent would "wholly preempt the mathematical formula," making it in effect a patent on an ab-

7. See, e.g., *Diehr*, 450 U.S. at 185.

8. See *Gottschalk v. Benson*, 409 U.S. 63, 65 (1972).

9. See, e.g., *Diamond v. Diehr*, 450 U.S. 175, 187 (1981) ("It is now commonplace that an application of a law of nature or mathematical formula to a known structure or process may well be deserving of patent protection." (citations omitted)); *Parker v. Flook*, 437 U.S. 584, 590 (1978) ("[A] process is not unpatentable simply because it contains a law of nature or a mathematical algorithm.").

10. See, e.g., *Flook*, 437 U.S. at 589 ("The line between a patentable 'process' and an unpatentable 'principle' is not always clear."). For a survey of lower-court decisions making such distinctions, see 1 DONALD S. CHISUM, PATENTS: A TREATISE ON THE LAW OF PATENTABILITY, VALIDITY, AND INFRINGEMENT § 1.03[6].

11. 409 U.S. 63 (1972).

12. 437 U.S. 584 (1978).

13. 450 U.S. 175 (1981).

14. 409 U.S. 63 (1972).

15. A "binary-coded" decimal number is a representation of a base-ten number in which each digit is replaced by four binary (base-two) digits representing the decimal number. For instance, the base-ten number 53 would be represented by the binary-coded decimal 0101 0011. See *id.* at 66-67.

16. See *id.* at 73 (reversing the lower court decision that the method was patentable).

stract idea—i.e., the algorithm.¹⁷ Thus, the unpatentability of Benson's algorithm followed from the premise that "one may not patent an idea."¹⁸

In *Parker v. Flook*,¹⁹ the Supreme Court determined that process patents that did not preempt an algorithm were equally problematic. Flook claimed a method for updating alarm limits on process variables, such as temperature and pressure, that are used to monitor and control catalytic conversion of hydrocarbons.²⁰ The claimed method included steps of determining the present value of a process variable, using a mathematical algorithm to calculate a new value for the alarm limit based on the present value, and updating the limit using the calculated value.²¹ Although the claims did not pre-empt the algorithm,²² the Court ruled that they were not statutory subject matter.²³ The Court rejected the idea that "conventional or obvious" post-solution activity can transform an unpatentable principle into a patentable process.²⁴

In *Diamond v. Diehr*,²⁵ the Supreme Court seemed to shift its attitude toward patenting mathematical algorithms. Diehr claimed a method for curing rubber articles in a mold, using a well-known equation to calculate how long the mold should remain closed.²⁶ In its analysis, the Court interpreted its earlier decisions in *Benson* and *Flook* as standing for no more than the exclusion of patent protection for laws of nature, natural phenomena, and abstract ideas.²⁷ Diehr had claimed not an abstract algorithm for calculating curing time,²⁸ but an industrial process of the type patents have

17. *See id.* at 71-72.

18. *See id.* at 71.

19. 437 U.S. 584 (1978).

20. During catalytic conversion processes, "process variables" such as temperature, pressure, and flow rates, are continually monitored. Alarms are set off to signal a problem whenever any of these variables exceeds some limit. That limit is called the alarm limit. *See id.* at 585.

21. *See id.*

22. *See id.* at 589.

23. *See id.* at 594 ("Respondent's process is unpatentable under § 101.").

24. *See id.* at 590 (explaining that "[a] competent draftsman could attach some form of post-solution activity to almost any mathematical formula").

25. 450 U.S. 175 (1981).

26. Diehr's process claims included steps of repeatedly monitoring the temperature of the mold, using a well-known equation to calculate the required cure time from the temperature, and automatically opening the mold when the elapsed time equaled the calculated time. *See id.* at 179 and 180 n.5.

27. *See id.* at 185. According to the *Diehr* Court, Benson had tried to patent an abstract formula, and Flook had tried to circumvent the rule against patenting abstract formulas by including a field of use limitation and trivial post-solution activity. *See id.* at 191-92.

28. *See id.* at 187.

historically protected.²⁹ In dissent, Justice Stevens observed that the patentability of Diehr's process depended on whether the Court chose to characterize it as a process for curing rubber or a process for determining a curing time.³⁰ He also lamented the lack of clear rules to guide attorneys in attempting to patent computer-related inventions and the ambiguity in the term "algorithm," which could, in principle, be applied to any process.³¹

B. The Court of Customs and Patent Appeals

The Court of Customs and Patent Appeals ("CCPA"), predecessor of the Federal Circuit, developed its own trio of cases in response to the various Supreme Court decisions. *In re Freeman*³² established that claims that directly or indirectly recited a mathematical algorithm were statutory subject matter unless they wholly preempted the algorithm.³³ In *In re Walter*,³⁴ the CCPA modified the test to allow claims under section 101 only if the mathematical algorithm was used in a machine claim "to define structural relationships between . . . physical elements" or in a process claim "to refine or limit claim steps."³⁵ Finally, after *Diehr*, the CCPA broadened the test in *In re Abele*³⁶ to require "no more than that the algorithm be 'applied in any manner to physical elements or process steps,'" but noted that field of use limitations and trivial post-solution activity were insufficient to satisfy the standards.³⁷

C. The Federal Circuit

For over a decade, the Federal Circuit attempted to apply the Supreme Court's standards and the *Freeman-Walter-Abele* test, with confusing results.³⁸ Then, in 1994, in its en banc decision in *In re Alappat*,³⁹ the Fed-

29. *See id.* at 184.

30. *See Diehr*, 450 U.S. at 206-07 (Stevens, J., dissenting).

31. *See id.* at 219. Stevens advocated sharply restricting the patentability of computer-related inventions and defining "algorithm" as used in *Benson* and *Flook* to mean "computer program." *See id.*

32. 573 F.2d 1237 (C.C.P.A. 1978).

33. *See id.* at 1245.

34. 618 F.2d 758 (C.C.P.A. 1980).

35. *See id.* at 767.

36. 684 F.2d 902 (C.C.P.A. 1982).

37. *See id.* at 907 (quoting *In re Walter*, 618 F.2d 758, 767 (1980)).

38. For a detailed discussion, see Ronald S. Laurie & Joseph K. Siino, *A Bridge over Troubled Waters? Software Patentability and the PTO's Proposed Guidelines (Part I)*, COMPUTER LAW., Sept. 1995, at 6. Laurie and Siino classify each Federal Circuit judge as a "traditionalist," "literalist," or "radical" with regard to software patentability and explain the discrepancies in various decisions based on the compositions of the panels that reached them.

39. 33 F.3d 1526 (Fed. Cir. 1994) (en banc).

eral Circuit announced a new and broader test, at least with regard to machine claims. Alappat claimed a machine that created a smooth waveform display for a digital oscilloscope.⁴⁰ Judge Rich, writing for the majority, noted that in *Benson*, *Flook*, and *Diehr*, the Supreme Court had not designated mathematical algorithms as a distinct category of unpatentable subject matter.⁴¹ Instead, the Supreme Court had simply explained that mathematical subject matter represents nothing more than an abstract idea and is thus not entitled to patent protection until it is “reduced to some type of practical application.”⁴² Therefore, Judge Rich concluded, the “proper inquiry” regarding mathematical subject matter was “whether the claimed subject matter as a whole is a disembodied mathematical concept, . . . which in essence represents nothing more than a ‘law of nature,’ ‘natural phenomenon,’ or ‘abstract idea.’”⁴³ If it was, then the subject matter would be unpatentable.⁴⁴ Applying this test, the court upheld Alappat’s claim on the grounds that “a specific machine to produce a useful, concrete, and tangible result” could not be characterized as an abstract idea.⁴⁵

Four years later, in *State Street Bank & Trust Co. v. Signature Financial Group, Inc.*,⁴⁶ the Federal Circuit confirmed that the mathematical algorithm exception no longer applied to machine claims. Relying on *Alappat*, the court held that an application of an algorithm is patentable if it produces a “useful, concrete, and tangible result.”⁴⁷ The court then concluded that a claimed data processing system for managing investment accounts produced such a result: “a final share price momentarily fixed for recording and reporting purposes.”⁴⁸ The court rejected the *Freeman-Walker-Abele* test’s requirement of physical limitations as having “little, if any applicability to determining the presence of statutory subject matter” in light of *Diehr* and *Diamond v. Chakrabarty*.⁴⁹

40. *See id.* at 1537, 1541. Because Alappat’s claims used means-plus-function language, there was some dispute over whether Alappat had in fact claimed a machine or a process. For a discussion of this aspect of the case, see Bradley D. Baugh, Note, *WMS Gaming v. International Game Technology*, 15 BERKELEY TECH. L.J. 109, 114-15 (2000).

41. *See Alappat*, 33 F.3d at 1543.

42. *Id.*

43. *Id.* at 1544.

44. *See id.*

45. *See id.*

46. 149 F.3d 1368 (Fed. Cir. 1998).

47. *See id.* at 1373 (quoting *In re Alappat*, 33 F.3d 1526, 1544 (Fed. Cir. 1994)).

48. *See id.*

49. *See id.* at 1374.

Both *Alappat* and *State Street Bank* addressed machine claims, where structure omitted from the claim may be supplied from the disclosure.⁵⁰ The Supreme Court cases, in contrast, addressed process claims and emphasized the presence or lack of physical elements. Thus, it was not clear whether the Federal Circuit would apply its expansive *Alappat* test to process claims.

II. CASE HISTORY

In *AT&T Corp. v. Excel Communications, Inc.*,⁵¹ the Federal Circuit confronted process claims. AT&T sued Excel Communications, Excel Communications Marketing, and Excel Telecommunications (collectively "Excel") for infringement of ten of the method claims of U.S. Patent No. 5,333,184 ("the '184 patent").⁵² Excel moved for summary judgment on the grounds that the '184 patent did not meet the statutory requirements for patentable subject matter under 35 U.S.C. § 101.⁵³

A. Technical Background of the '184 Patent

The '184 patent involves an improvement in the technology used to calculate the price of direct-dialed long-distance telephone calls. Thus, understanding the issues in the case requires a brief detour into the underlying technology of long distance telephone service.

1. Telephone service and billing: a crash course

Telephone subscribers sign up with a local exchange carrier ("LEC"), such as Pacific Bell.⁵⁴ The LEC provides a network for local telephone calls and access to the networks of long-distance, or interexchange, carriers ("IXCs"), such as AT&T or Sprint, which route calls between local service areas.⁵⁵ "Facilities-based" IXCs, such as AT&T, "own, operate, lease, or otherwise control" the networks they use to route calls, while "re-

50. See 35 U.S.C. § 112 ¶ 6 (1994) ("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 structure, 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.").

51. 172 F.3d 1352 (Fed. Cir. 1999).

52. See *id.* at 1354.

53. See *AT&T Corp. v. Excel Communications, Inc.*, No. CIV.A. 96-434-SLR, 1998 WL 175878, at *1 (D. Del. March 27, 1998), *rev'd*, 172 F.3d 1352 (Fed. Cir. 1999), *cert. denied*, 120 S. Ct. 368 (1999).

54. See *Excel*, 172 F.3d at 1353.

55. See U.S. Patent No. 5,333,184, at col. 1, ll. 41-45 (issued July 26, 1994). LECs are required to provide access to all IXCs. See *Excel*, 1998 WL 175878, at *1.

sellers," such as Excel, provide billing and other services to customers but do not own or control network equipment.⁵⁶

A telephone subscriber may place a long-distance call using any IXC.⁵⁷ However, each subscriber chooses one long-distance service provider as her primary interexchange carrier ("PIC"), meaning that whenever the subscriber dials long distance directly (using 1+ the number), the LEC routes the call to the network of her PIC.⁵⁸

Whenever a subscriber places a long-distance telephone call, a switch within the telephone network, usually belonging to the IXC carrying the call, generates a message record that includes the telephone numbers of the caller and the recipient, as well as the duration of the call.⁵⁹ The switch then transmits this message record to an accumulation system.⁶⁰ The accumulation system, in turn, periodically distributes the message records it has received to a processing system, which converts each message record into exchange message interface ("EMI") format.⁶¹ The processing system forwards each EMI message record to a rating system, which computes the charges for the call and adds that information to the message record.⁶² Telephone service providers subsequently retrieve EMI message records and use them to generate customers' bills.⁶³

2. *The '184 patent*

U.S. Patent No. 5,333,184 ("the '184 patent"), held by AT&T, teaches a method for enhancing an EMI message record by adding a new field called a "PIC indicator."⁶⁴ The '184 patent discloses several possible formulas for determining the value to be stored in the PIC indicator, all of which depend on the caller's and the recipient's PICs. In a particularly simple form, the PIC indicator may be a numerical code that identifies the recipient's PIC.⁶⁵ Alternatively, the PIC indicator may have a Boolean⁶⁶

56. See *Excel*, 1998 WL 175878, at n.1.

57. See '184 patent, *supra* note 55, at col. 4, ll. 23-29.

58. See *id.* at col. 1, lines 35-39; *Excel*, 172 F.3d at 1353.

59. See '184 patent, *supra* note 55, at col. 1, ll. 12-16, 45-49.

60. See *id.* at col. 1, ll. 14-18.

61. See *id.* at col. 1, ll. 18-22. EMI is an industry-wide standard format. See *id.*

62. See *id.* at col. 1, ll. 22-26.

63. See *id.* at col. 1, ll. 26-29.

64. See *id.* at col. 1, ll. 52-55.

65. See *id.* at col. 4, ll. 14-16.

66. "Having to do with logical (true, false) values." MICROSOFT PRESS COMPUTER DICTIONARY: THE COMPREHENSIVE STANDARD FOR BUSINESS, SCHOOL, LIBRARY, AND HOME 50 (2d ed. 1994). "Boolean algebra" is a method of manipulating variables that can have the values "true" or "false" by performing logical operations, such as "A AND B"

(true or false) value indicating whether the recipient's PIC is or is not the IXC that carried the call.⁶⁷ Accordingly, for calls carried by AT&T, the PIC indicator would be set to "true" if the recipient is an AT&T subscriber and to "false" otherwise. In a third implementation, the PIC indicator has a Boolean value indicating whether both the caller and recipient have as their PIC the IXC that carried the call.⁶⁸ In this implementation, the PIC indicator for calls carried by AT&T would be set to "true" only if both caller and recipient were AT&T subscribers.

Regardless of the method used to calculate it, the PIC indicator is added to the EMI message record for each call.⁶⁹ The rating system can then use PIC information when it computes the charges for the call.⁷⁰ Thus, AT&T could use its patented method to offer its subscribers a discount on calls to other AT&T subscribers.⁷¹

B. The District Court Decision

In *AT&T Corp. v. Excel Communications, Inc.*,⁷² the district court granted Excel's summary judgment motion. Having determined that "the claims at issue implicitly recite a mathematical algorithm,"⁷³ the court attempted to apply *Diehr* by asking "whether the process claimed 'is performing a function which the patent laws were designed to protect.'"⁷⁴ The court observed that in the claimed invention, "information that is already

(true only when both A and B are true) or "A OR B" (true when at least one of A and B is true). *See id.* at 50-51.

67. *See* '184 patent, *supra* note 55, at col. 4, ll. 16-19.

68. *See id.* at col. 4, ll. 19-22.

69. *See id.* at col. 4, ll. 40-43.

70. *See id.* at col. 4, ll. 44-46.

71. *See id.* at col. 4, ll. 53-56.

72. No. CIV.A. 96-434-SLR, 1998 WL 175878 (D. Del. March 27, 1998).

73. *Id.* at *6.

Claim 1, which is representative of the asserted claims, reads:

A method for use in a telecommunication system in which interexchange calls initiated by each subscriber are automatically routed over the facilities of a particular one of a plurality of interexchange carriers associated with that subscriber, said method comprising the steps of:

generating a message record for an interexchange call between an originating subscriber and a terminating subscriber, and

including, in said message record, a primary interexchange carrier (PIC) indicator having a value which is a function of whether or not the interexchange carrier associated with said terminating subscriber is a predetermined one of said interexchange carriers.

'184 patent, *supra* note 55, at col. 7, ll. 2-16.

74. *Excel*, 1998 WL 175878, at *6 (quoting *Diamond v. Diehr*, 450 U.S. 175, 192 (1981)).

known within a telecommunications system . . . is simply retrieved for an allegedly new use” and that in the generation of the PIC indicator, the substantive data remained the same despite being changed from an analog to a digital format.⁷⁵ On the grounds that patentable processes must transform the substance, not merely the form, of input data, the court ruled that the asserted claims were unpatentable under section 101.⁷⁶ AT&T appealed to the Federal Circuit.⁷⁷

C. The Federal Circuit Decision

In *AT&T Corp. v. Excel Communications, Inc.*,⁷⁸ the Federal Circuit upheld the method claims of the '184 patent against the section 101 challenge. Judge Plager, writing for the unanimous panel, justified the decision on the grounds that patent law must “adapt to new and innovative concepts, while remaining true to basic principles.”⁷⁹

1. *No distinction between process and machine claims*

Because Excel did not own or control the telecommunications equipment over which its subscribers placed calls, AT&T could allege infringement only of the method claims of the '184 patent.⁸⁰ The Federal Circuit refused to distinguish *Excel* from *Alappat* and *State Street Bank*, which involved machine claims, holding instead that “we consider the scope of section 101 to be the same regardless of the form—machine or process—in which a particular claim is drafted.”⁸¹ In support of the court’s position, Judge Plager cited Judge Rader’s concurrence in *Alappat*⁸² and language from *State Street Bank*.⁸³ Judge Plager then claimed that the Supreme Court cases, all of which involved method claims, provided the

75. *See id.*

76. *See id.* at *7.

77. *See AT&T Corp. v. Excel Communications, Inc.*, 172 F.3d 1352, 1353 (Fed. Cir. 1999). While AT&T’s appeal was pending, the Federal Circuit issued its decision in *State Street Bank*. *See id.* at 1358.

78. 172 F.3d 1352 (Fed. Cir. 1999).

79. *Id.* at 1356.

80. *See AT&T v. Excel Communications*, No. CIV.A. 96-434-SLR, 1998 WL 175878, at *1 n.1 (D. Del. March 27, 1998).

81. *Excel*, 172 F.3d at 1357.

82. *See id.* at 1357-58 (“[W]hether the invention is a process or a machine is irrelevant.” (quoting *In re Alappat*, 33 F.3d 1526, 1581 (Fed. Cir. 1994) (Rader, J., concurring))).

83. *See id.* at 1358 (“[F]or the purposes of a section 101 analysis, it is of little relevance whether claim 1 is directed to a “machine” or a “process.”” (quoting *State Street Bank & Trust v. Signature Fin. Group*, 149 F.3d 1368, 1372 (Fed. Cir. 1998))).

principles applied to machine claims in *Alappat* and *State Street Bank*.⁸⁴ On that basis, the Federal Circuit felt "comfortable" in extending the *Alappat* rule to cover process claims.⁸⁵

The Federal Circuit reviewed and applied the mathematical algorithm analysis of *State Street Bank*. It noted that every process claim "involves an 'algorithm' in the broad sense of the term."⁸⁶ Because section 101 states that processes can be patented, any proscription against patenting algorithms must be "narrowly limited to mathematical algorithms in the abstract."⁸⁷ Thus, the court concluded that AT&T's claimed process was a useful application of Boolean algebra that did not attempt to preclude other applications of the Boolean principle and that the process therefore "comfortably falls within the scope of section 101."⁸⁸

2. *No physical limitations required*

The Supreme Court cases had treated the presence of a physical element in a process claim as crucial,⁸⁹ and the Federal Circuit had previously rejected process claims involving algorithms unless the claim could be characterized as involving a physical transformation.⁹⁰

In *Excel*, however, the Federal Circuit rejected this approach. It stated that a physical transformation was "not an invariable requirement, but merely one example" of how an algorithm can be applied to achieve a useful, concrete, and tangible result.⁹¹ The court then went further, rejecting *Excel*'s argument that because the patent disclosure did not set forth physical limitations, its method claims were unpatentable.⁹² Judge Plager

84. *See id.*

85. *See id.*

86. *Id.* at 1356.

87. *Id.*

88. *Id.* at 1358.

89. *See* Part I.A, *supra*. *See also* Lawrence Kass, Comment, *Computer Software Patentability and the Role of Means-Plus-Function Format in Computer Software Claims*, 15 PACE L. REV. 787, 848-49 (1995) (distinguishing *Diehr* from *Flook* and *Benson* on the grounds that *Diehr*'s claimed process involved a physical transformation, while the other claimed processes transformed only data).

90. *See, e.g., In re Schrader*, 22 F.3d 290. (Fed. Cir. 1994). In *Schrader*, the Federal Circuit rejected claims to a method of conducting an auction, on the grounds that "there is nothing physical about bids per se." *See id.* at 294. The court distinguished *Schrader* from previous cases in which it had upheld process claims involving algorithms, explaining that the claims it had upheld "involved the transformation or conversion of subject matter representative of or constituting physical activity or objects." *See id.*

91. *See AT&T Corp. v. Excel Communications, Inc.*, 172 F.3d 1352, 1358 (Fed. Cir. 1999).

92. *See id.* at 1359.

explained that supporting structure was necessary for means-plus-function machine claims to satisfy 35 U.S.C. § 112 ¶ 6; when method claims are at issue, “a structural inquiry is unnecessary.”⁹³ The court then proceeded to dismiss as “unhelpful” its own earlier decisions in *In re Grams*⁹⁴ and *In re Schrader*,⁹⁵ where it had rejected method claims directed to algorithms for lack of sufficient physical steps.⁹⁶

3. Policy points

Plager ended by asserting, with little elaboration, that the “useful, concrete and tangible result” test resolved the concerns raised by Justice Stevens in his dissent in *Diehr*.⁹⁷ According to Judge Plager, the lack of clear rules “should be less of a concern today” in view of the refocused section 101 analysis.⁹⁸ Furthermore, under the new test, any ambiguity in the term “algorithm” becomes insignificant because the presence of an algorithm is no longer the focus of the inquiry.⁹⁹

III. DISCUSSION

In *Excel*, the Federal Circuit took another step toward establishing clear rules regarding the patentability of algorithm-related inventions by applying to process claims the same “useful, concrete, and tangible” result test it had previously applied to machine claims. But this increase in clarity comes with problems of its own: a doctrine that broadly allows process claims for mathematical algorithms without requiring physical elements or structure increases the risk that abstract ideas or thought processes will be patented. To prevent this, courts need to develop new doctrines and use existing ones to keep software patents within reasonable bounds.

93. *Id.*

94. 888 F.2d 835 (Fed. Cir. 1989) (holding unpatentable an inventor’s claims to a method of diagnosing an abnormal condition in a patient by combining results of a number of unspecified lab tests according to a vaguely specified formula, on the grounds that the claims lacked sufficient physical steps).

95. 22 F.3d 290, 293-94 (Fed. Cir. 1994) (holding unpatentable an inventor’s claim to a method for conducting an auction that consisted of collecting and manipulating bids for arbitrary subsets of the items in order to maximize the proceeds, on the grounds that “there is nothing physical about bids per se”).

96. *See Excel*, 172 F.3d at 1360.

97. *See id.* at 1360-61. Justice Stevens’s concerns are described in Part I.A, *supra*.

98. *See Excel*, 172 F.3d at 1361.

99. *See id.*

A. The Virtues of the Federal Circuit's Decision

The Federal Circuit's decision eliminates a pointless inconsistency in the treatment of process and machine claims and clarifies the doctrine of patentable subject matter. In these respects, it improves the state of the law.

1. Consistent treatment of process and machine claims

In the wake of *Alappat*, "any competent draftsman" could claim software-implemented algorithms by claiming an apparatus in means-plus-function form.¹⁰⁰ The legal fiction that a programmed general-purpose computer is a different machine from an unprogrammed general-purpose computer¹⁰¹ makes it trivial to provide enough structure to support means-plus-function claims: a few lines of code in a microprocessor become a logic circuit.¹⁰²

Given the ease with which acceptable means-plus-function claims to software can be drafted, applying different standards to process claims than to machine claims is artificial at best. Inventors may describe their inventions in terms of their own choosing,¹⁰³ and virtually any process claim can be redrafted as a machine claim in means-plus-function form.¹⁰⁴ Furthermore, a person skilled in the computer arts can implement almost any functionality using either a dedicated circuit or software.¹⁰⁵ Thus, continuing to apply the algorithm rule to exclude software when claimed as a process would have little practical effect.

100. See David L. Bohan, Note, *Computer Programs: Abstract Ideas or Patentable Subject Matter?*, 29 SUFFOLK U. L. REV. 809, 833 (1995).

101. See *In re Alappat*, 33 F.3d 1526, 1545 (Fed. Cir. 1994) ("[A] general purpose computer in effect becomes a special purpose computer once it is programmed to perform particular functions pursuant to instructions from program software."). Many commentators describe this rule as a legal fiction. See, e.g., Lawrence Kass, *supra* note 89, at 864 (1995).

102. See Kass, *supra* note 89, at 863-64.

103. See *Alappat*, 33 F.3d at 1583 (Rader, J., concurring) ("Whether an inventor calls the invention a machine or a process is not nearly as important as the invention itself."); *In re Johnson*, 589 F.2d 1070, 1077 (C.C.P.A. 1978) ("[T]he form of the claim is often an exercise in drafting.").

104. Comparing claims 1 and 30 of the '184 patent demonstrates how easy this is. Claim 1 is quoted *supra* at note 73. Claim 30 is worded identically to claim 1, with these minor alterations: (1) the word "apparatus" has been substituted for "method;" (2) the phrase "the steps of" has been deleted; and (3) each step is preceded by the phrase "means for." See '184 patent, *supra* note 55, at col. 10, ll. 30-45.

105. See *Alappat*, 33 F.3d at 1583 (Rader, J., concurring) (noting that a software process is often interchangeable with a hardware circuit).

Moreover, the distinction between process and machine claims has no statutory basis. Section 101 refers to processes and machines on an equal basis, requiring only that they be “new and useful.”¹⁰⁶ To satisfy this subject matter requirement, a machine claim merely needs to describe a specific machine and have a practical application.¹⁰⁷ Imposing additional physicality requirements on process claims that are within the useful arts treats the two categories inconsistently.

2. Clarification of the law of patentability

Furthermore, the Supreme Court’s attempts to impose physicality requirements on process claims under section 101 have only confused the courts.¹⁰⁸ Courts¹⁰⁹ and commentators¹¹⁰ disagree on whether *Diehr*, *Flook*, and *Benson* can be reconciled. Likewise, it is not clear whether the holding in *Excel* can be reconciled with the Supreme Court cases. In its discussion of *Flook*, the *Diehr* Court reiterated the view that a field of use limitation and trivial post-solution activity did not suffice to confer patentability on a claim to a process involving a mathematical algorithm.¹¹¹ Claim 1 of the ’184 patent is limited to the field of telecommunications systems and recites only a conventional step (generating a message record) and a trivial post-solution step (including the PIC indicator in the record).¹¹² These features suggest that claim 1 would have been rejected under the Supreme Court’s analysis. Moreover, in upholding *Diehr*’s claims,

106. See 35 U.S.C. § 101 (1994) (“Whoever invents or discovers any new and useful process, machine, . . .”).

107. See U.S. PATENT & TRADEMARK OFFICE, MANUAL OF PATENT EXAMINING PROCEDURE §2106, Part IV.B.2.a.ii (7th ed. 1998) (“A claim limited to a specific machine or manufacture, which has a practical application in the technological arts, is statutory.”). In the computer context, limiting a claim to a specific machine requires that the applicant disclose elements of the computer, indicate their configuration, and perhaps supply a few lines of code. See *id.*

108. In this respect, Justice Stevens’s dissent in *Diehr* was most accurate. See *supra* text accompanying note 31.

109. Compare, e.g., *In re Alappat*, 33 F.3d 1526, 1582 (Fed. Cir. 1994) (Rader, J., concurring) (explaining that *Diehr* confined *Benson* and *Flook* to their facts), with *Alappat*, 33 F.3d at 1557 (Archer, C.J., dissenting) (reading the three cases as perfectly consistent).

110. Compare, e.g., Gregory J. Maier, *Software Protection—Integrating Patent, Copyright, and Trade Secret Law*, 69 J. PAT. & TRADEMARK OFF. SOC’Y 151, 153-56 (1987) (*Diehr*, *Flook*, and *Benson* are irreconcilable), with Jur Strobos, *Stalking the Elusive Patentable Software: Are There Still Diehr or Was It Just a Flook?*, 6 HARV. J.L. & TECH. 363, 365 (1993) (Supreme Court’s view of software patentability has not changed).

111. See *Diamond v. Diehr*, 450 U.S. 175, 193 n. 14 (1981).

112. See *supra* note 73.

the Court emphasized that the claimed process physically transformed an article,¹¹³ while the PIC indicator does not. Yet the *Benson* court insisted that a process that did not transform articles or materials and was not tied to particular machines might nevertheless be patentable,¹¹⁴ so the lack of a physical transformation is not dispositive. What most strongly suggests that *Excel* is inconsistent with *Diehr*, *Flook*, and *Benson* is that the process of the '184 patent does not transform anything outside the computer that performs it.

To resolve the confusion, Justice Stevens advocated an unequivocal statement that computer algorithms are unpatentable subject matter.¹¹⁵ The Federal Circuit has taken the opposite approach, reading section 101 to cover any application of an algorithm to produce a useful, concrete, and tangible result, at the price of arguably ignoring the unclear dictates of the Supreme Court.¹¹⁶

B. The Danger in the Federal Circuit's Decision

The decision in *Excel* creates a risk to the vitality of the rule against patenting abstract ideas. The purpose of granting patents is "to promote the Progress of . . . useful Arts."¹¹⁷ Granting a patent on an abstract idea would impede this purpose. Abstract ideas are basic tools of technological progress,¹¹⁸ and as such must be freely available to all would-be inventors. A similar rationale underlies the "mental steps" doctrine, which courts have occasionally invoked to prevent patents on thought processes.¹¹⁹ To be able to invent, one must be free to think.¹²⁰ By making nonphysical

113. See *Diehr*, 450 U.S. at 192, and Part I.A., *supra*.

114. See *Gottschalk v. Benson*, 409 U.S. 63, 71 (1972) ("It is argued that a process patent must either be tied to a particular machine . . . or must operate to change articles or materials to 'a different state or thing.' We do not hold that no process patent could ever qualify if it did not meet [these requirements].").

115. See *Diehr*, 450 U.S. at 219 (Stevens, J., dissenting).

116. A discussion of the relative merits of Justice Stevens's and the Federal Circuit's approaches is beyond the scope of this Note.

117. U.S. CONST. art. 1, § 8, cl. 8.

118. See *Benson*, 409 U.S. at 67.

119. The mental steps doctrine has been described as a "vague and troublesome family of related rules," the basic idea of which is that a patent cannot be obtained for a process if "human mental participation" is an essential component of the process. See 1 CHISUM, *supra* note 10, § 1.03[6]. Chisum then details the courts' development and curtailment of this doctrine. See *id.*

120. The prohibition on patenting thought could also be justified on First Amendment grounds. See Robert A. Kreiss, *Patent Protection for Computer Programs and Mathematical Algorithms: The Constitutional Limitations on Patentable Subject Matter*, 29 N.M. L. REV. 31, 86-87 (1999).

processes patentable, the Federal Circuit has created a danger that abstract ideas or thought processes could be patented.

As long as inventors were compelled to use means-plus-function language, this danger was relatively remote. The use of a means-plus-function claim puts the inventor under a burden to disclose sufficient structure corresponding to the means.¹²¹ At a minimum, this rule confines the claims to computer implementations.¹²²

The danger of allowing patents on abstract ideas or thought processes increases when process claims directed to mathematical algorithms are allowed.¹²³ After *Excel*, it appears that a process claim to an algorithm need not be supported or limited by any structure or physical elements, as long as it produces a useful, concrete, and tangible result without preempting other uses of the algorithm. A claim not limited by any physical element or structure could become, in effect, a patent on an abstract idea or a process of thought.

To understand the danger, consider the following (admittedly implausible) hypothetical. Suppose that Excessive Telecom¹²⁴ decides to engage in a differential-billing plan. Cursed with poor business judgment, Excessive opts to hire 20,000 people to examine its EMI message records, look for each call recipient's phone number in a directory of Excessive's subscribers, and add a Boolean indicator to the message record with a value of "true" if the recipient is an Excessive subscriber and "false" otherwise.

121. See *In re Donaldson Co., Inc.*, 16 F.3d 1189, 1195 (Fed. Cir. 1994) ("[I]f one employs means-plus-function language in a claim, one must set forth in the specification an adequate disclosure showing what is meant by that language.").

122. 35 U.S.C. § 112 ¶ 6 extends claim coverage to equivalents of the disclosed structure. Once an inventor has disclosed a programmed computer as a structure, virtually any other computer implementation would probably be considered equivalent. See *In re Alappat*, 33 F.3d 1526, 1545 (acknowledging that "a general purpose computer programmed to carry out the claimed invention" would be within the scope of the claims). See also Dennis S. Karjala, *The Relative Roles of Patent and Copyright in the Protection of Computer Programs*, 17 J. MARSHALL J. COMPUTER & INFO. L. 41, 58 (1998) ("If the patent [claiming a "means for" element and disclosing a programmed computer] is valid, then any computer programmed to do the same thing in conjunction with the other elements will infringe, even if the second program is completely different from the first.").

123. See, e.g., Pamela Samuelson, *Benson Revisited: The Case Against Patent Protection for Algorithms and Other Computer Program-Related Inventions*, 39 EMORY L.J. 1025, 1126-28 (1990) (hypothesizing that if an algorithm for resolving contract disputes were patented, a judge's use of that algorithm in resolving a case might infringe); Allen Newell, *Response: The Models Are Broken! The Models Are Broken!*, 47 U. PITT. L. REV. 1023, 1026-28 (1986) (hypothesizing that allowing patents on algorithms could prevent people from doing calculations).

124. Any resemblance to a real company is purely coincidental.

The Excessive employees are doing exactly what AT&T is entitled to prohibit under the literal language of the '184 patent. Yet to find infringement on these facts¹²⁵ would be to prevent the 20,000 employees from thinking a certain combination of thoughts.

In *Benson*, the Supreme Court recognized this danger and held unpatentable claims that would read on any implementation of an algorithm, including human activity.¹²⁶ In *Diehr* and *Flook*, the Supreme Court emphasized the presence or absence of significant physical activity in process claims involving algorithms, arguably in an effort to prevent patent claims from extending to human activity.¹²⁷ By upholding AT&T's claim as patentable subject matter despite its lack of physical limitations, *Excel* has cut off that approach.

C. Preventing Patents on Thought

Fortunately, 35 U.S.C. § 101 is not the only applicable statutory provision, and courts can use other provisions of Title 35 to prevent process claims from amounting to patents on thought. For instance, 35 U.S.C. § 112 ¶ 6 can be used to limit the scope of process claims, much as it is now used for machine claims. In addition, judicious application of the other statutory requirements for patentability (novelty and non-obviousness) can help to keep software patents within appropriate limits.

1. Step-plus-function claims

Now that courts cannot reject broadly worded process claims divorced from physical elements under section 101, courts should apply the rarely used step-plus-function language in section 112, paragraph 6. That section provides that "[a]n element in a claim for a combination may be expressed as . . . [a] step for performing a specified function without the recital of structure, materials, or acts in support thereof." Almost all process claims

125. Assuming that AT&T would bother asserting its rights, given that Excessive will likely go broke on its own.

126. See *Gottschalk v. Benson*, 409 U.S. 63, 67 ("The conversion of BCD numerals to pure binary numerals can be done mentally.").

127. While the holdings of *Diehr* and *Flook* are not explicitly based on the mental steps doctrine, language in each opinion suggests that the Court was alert to the potential problem of patenting thought. Compare *Diamond v. Diehr*, 450 U.S. 175, 187 (1981) (pointing out that the claimed process includes "constantly recalculating the appropriate cure time through the use of a digital computer" (emphasis added)) with *Parker v. Flook*, 437 U.S. 584, 586 (1978) ("Using the formula, an operator can calculate an updated alarm limit. . . ." (emphasis added)).

On the basis of such language, Jur Strobos argues that the Supreme Court intended the pre-emption test to involve "analysis of whether human or mental activity falls within the scope of the claim." See Strobos, *supra* note 110, at 376-89.

recite combinations of steps; the difficult issue is determining when a given step is recited in functional rather than descriptive form.¹²⁸

Sufficient case law to guide courts in this area does not yet exist.¹²⁹ Because patent drafters have generally avoided process claims for computer algorithms,¹³⁰ no existing case discusses the application of section 112, paragraph 6 to steps in such a claim. Even outside the field of computers, few cases involving step-plus-function claims exist.¹³¹

The courts should take this opportunity to shape a doctrine of step-plus-function claims that properly limits the scope of process claims that do not specify physical structures or actions. A full discussion of the possibilities inherent in step-plus-function claims is beyond the scope of this Note, which offers only two illustrative examples.

As one example, some process claims imply, rather than recite, steps, and a court could justifiably limit such implied steps to actions disclosed in the specification.¹³² For instance, claim 1 of the '184 patent recites a step of "including . . . a [PIC] indicator having a value which is a function of" the recipient's PIC.¹³³ The wording implies, but does not state, that the value of the PIC indicator must be calculated, and does not specify any actions for performing the calculation. A court could limit this claim to actions disclosed in the specification. In this case, the '184 patent describes only a computer (the "rating system") accessing a database and

128. See Lawrence B. Goodwin, *Computer Patent Issues: Use and Avoidance of Section 112, Paragraph 6, to Make Your Case*, 78 J. PAT. & TRADEMARK OFF. SOC'Y 809, 827-28 (1996). Goodwin observes that the Federal Circuit does not condone convenient ways to avoid section 112 paragraph 6; he then points out that in the computer context it may be possible to interpret all steps in process claims as step-plus-function elements, "a result that may not be entirely satisfactory." *Id.*

129. See *id.* at 825 (no known cases interpreting step-plus-function elements in an infringement context).

130. See, e.g., Bohan, *supra* note 100, at 833 ("[A] wise patent drafter should draft computer program claims as apparatus claims in means-plus-function language.").

131. Three known cases involving step-plus-function claims are *In re Roberts*, 470 F.2d 1399 (C.C.P.A. 1973) (involving a process step of reducing the coefficient of friction of a plastic film to a specified value, where the disclosure described three techniques that could be used to achieve this result); *Noll v. O.M. Scott & Sons Co.*, 467 F.2d 295 (6th Cir. 1972) (involving a method for controlling the growth of crabgrass described in terms of its effects) and *Ex parte Zimmerley*, 153 U.S.P.Q. (BNA) 367 (Bd. App. 1966) (involving a step of raising the pH of a chemical mixture).

132. See Goodwin, *supra* note 128, at 827. Goodwin argues that *Noll* and *Zimmerley* suggest that reciting a result rather than an intermediate step brings elements of process claims within the meaning of section 112 paragraph 6.

133. See '184 patent, *supra* note 55, at col. 7, ll. 11-16. For the full text of claim 1, see *supra* note 73.

performing a Boolean operation to determine the value of the PIC indicator. Because a person is neither a computer nor its equivalent, this application of section 112 would prevent a finding that Excessive Telecom and its 20,000 employees had infringed AT&T's patent.

As another example, a court could limit the scope of a claim or step that recites no physical elements to the physical elements that were actually disclosed. For instance, neither step in claim 1 of the '184 patent recites any physical elements. A court could apply section 112, paragraph 6 to limit the coverage of the claim to the use of physical components of the long-distance network to generate the message record.

Eventually, the courts will have to decide how to identify and limit step-plus-function claims under section 112, paragraph 6. The *Excel* decision will almost certainly lead to increased use of process claims in software patents. As infringement actions based on these process claims become more common, some defendant will inevitably raise a section 112, paragraph 6 defense. A doctrine of step-plus-function claims shaped by wise judicial decisions could replace and improve upon the Supreme Court's failed attempt to use section 101 to prevent algorithm claims from becoming patents on thought. Such a doctrine would also provide a natural parallel to the treatment of machine claims, where failure to adequately disclose structure supporting the claims can lead to a rejection for indefiniteness.

2. *Novelty and nonobviousness requirements*

As section 101 fades into relative insignificance, the other threshold requirements of patentability—novelty¹³⁴ and nonobviousness¹³⁵—will become more important.¹³⁶

134. 35 U.S.C. § 102 (1994) provides that "A person shall be entitled to a patent unless (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent." The remaining subsections provide additional tests related to establishing novelty.

135. A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

35 U.S.C. § 103(a) (1994).

136. For other proposals regarding the definition of novelty and nonobviousness in the context of algorithm patents, see Karjala, *supra* note 122, at 59 ("No patent should issue if the programmer simply applies straightforward programming principles or practice to the well understood art of solving mathematical problems on [a] computer.");

In determining whether an invention incorporating a mathematical algorithm is novel and nonobvious, the Patent and Trademark Office and the courts¹³⁷ should treat the mathematical algorithm as prior art. Doing so would be consistent with the notion that a mathematical algorithm is an abstract idea, which belongs in the public domain as a tool of scientific thought. The Supreme Court suggested such an approach in *Flook*¹³⁸ but created confusion by introducing a novelty test into a subject matter inquiry.

Using this rule, a claim involving a useful application of an algorithm would fail for lack of novelty if the only “new” element was the algorithm, or for obviousness if, given knowledge of the algorithm, a person skilled in the art would have readily arrived at the claimed invention. Indeed, in the most recent development in *AT&T Corp. v. Excel Communications, Inc.*,¹³⁹ on remand from the Federal Circuit, the district court found the ’184 patent invalid on the alternative grounds of lack of novelty and obviousness.¹⁴⁰ This outcome demonstrates that courts need not rely on subject matter alone to invalidate patents that should never have been granted.

IV. CONCLUSION

The Supreme Court attempted to use the subject matter requirement of 35 U.S.C. § 101 to prevent patents on computer-implemented algorithms from becoming patents on abstract ideas or thought processes. The Court’s efforts produced, in the end, an ill-defined physical transformation requirement that lower courts struggled for years to understand and apply.

Note, *Computer Intellectual Property and Conceptual Severance*, 103 HARV. L. REV. 1046, 1063 (1990) (proposing high standards of innovation for software and algorithm patents in order to prevent overprotection).

137. Ideally, the Patent and Trademark Office (“PTO”) prevents patents that do not meet the statutory requirements from issuing. However, the PTO has a distressingly poor track record in the area of software patents. For a discussion of this point, see Robert P. Merges, *As Many as Six Impossible Patents before Breakfast: Property Rights for Business Concepts and Patent System Reform*, 14 BERKELEY TECH. L.J. 577, 578-91 (1999).

138. See *Parker v. Flook*, 437 U.S. 584, 591-92 (1978) (“Whether the algorithm was in fact known or unknown at the time of the claimed invention, as one of ‘the basic tools of scientific and technological work,’ it is treated as a familiar part of the prior art.” (citation omitted)).

139. No. CIV.A. 96-434-SLR, 1999 WL 1050064 (D. Del. Oct. 25, 1999).

140. *Id.* at *23. The court first found that MCI’s Friends & Family program, which used an indicator in MCI’s message records to identify selected calls from MCI subscribers to MCI subscribers, anticipated the claims. See *id.* at *17-*21. To preempt further argument over one questionable element, the court went on to find that the Bellcore EMI standard, published in 1990, in combination with the Friends & Family program, made the claims obvious. See *id.* at *21-*23.

The Federal Circuit's decision in *Excel*, by allowing computer-related processes to be patented without regard for physical limitations or elements, undoes the Supreme Court's efforts. Fortunately, other provisions of existing patent law can serve the same purpose, perhaps more effectively than the section 101 requirement did. With the final demise of section 101 limits on software patents, an increasing number of software process claims will confront the courts. In response, the courts will need to fashion new doctrines for interpreting these claims. The step-plus-function language of 35 U.S.C. § 112 ¶ 6 provides courts with a potentially powerful tool for keeping software patents within reasonable limits.