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 nominal supporting structure.[2] At the same time, a trio of aging Supreme Court decisions[3] 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 Supreme Court's laudable goals 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

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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 comper 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).

subject matter to include 'anything under the sun that is made by man.'"[6] The Supreme Court has 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

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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)).
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 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).

held that the method was unpatentable subject matter.[16] Summarizing its reasoning "in a nut-shell," the Court explained that Benson's algorithm had no application outside of digital comput-ers and therefore allowing the patent would "wholly pre-empt the mathematical formula," mak-ing it in effect a patent on an abstract 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] Al-though 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]

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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).
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").

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 historically protected.[29] In dissent, Justice Stevens observed 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") 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

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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.
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).

wholly preempted the algorithm.[33] After *Flook*, 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 and limit claim steps."[35] Finally, after *Diehr*, the CCPA broadened the test in *In re Abele*[36] to require only that the algorithm be applied "in any manner to physical elements or process steps," but noting that field of use limitations and trivial post-solution activity were insufficient to satisfy the standards.[37]

C. The Federal Circuit

The Federal Circuit tried for over a decade 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 Federal Circuit announced a new and broader test, at least in 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

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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. **{TH suggests "quoting *Walter*" here, since that's where the phrase came from. I don't want it because *Walter* didn't say that "any manner" was good enough.}**
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).
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 Douglas Baugh, *WMS Gaming v. International Game Technology*, 15 BERKELEY TECH. L.J. ___ (forthcoming).

subject matter.[41] Instead, the Supreme Court had simply tried to explain 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] Thus, 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 held 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 *Chakrabarty*.[49]

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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. *Id*. at 1373 (quoting *In re* Alappat, 33 F.3d 1526, 1544 (Fed. Cir. 1994)).
48. *See id.*
49. *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 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 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] To understand the issues in the case requires a brief detour into the underlying technology of long distance telephone service.

A. Technical Background of the '184 Patent

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

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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.

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

A telephone subscriber may place any 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]

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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.
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.

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 Boolean[66] (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

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64. *See id*., Abstract. **{How do you cite to the Abstract of a patent?}**
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 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.

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 follow *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 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] Holding that a mere change in the data's format did not suffice to establish patentable subject matter, the court ruled that the asserted claims were unpatentable under section 101.[76] AT&T appealed to the Federal Circuit.[77]

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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)).
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.

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 this case 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 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]

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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 Financial Group*, 149 F.3d 1368, 1372 (Fed. Cir. 1998))).
84. *See id.*
85. *See id.*

The Federal Circuit then 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 explained that supporting structure was necessary for means-plus-function machine claims to satisfy 35 U.S.C. § 112, ¶ 6; when method

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86. *Id.* at 1356.
87. *Id.*.
88. *Id.* at 1358.
89. *See* Part I.A, *supra*.
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).

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 ab-

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92. *See id.* at 1359.
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 the 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.

stract ideas or thought processes will be patented. To prevent this, the courts need to develop new doctrines and use existing ones to keep software patents within reasonable bounds.

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 computer[101] 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 method claims is artificial at best. Inventors may describe their inventions in terms of their own choosing,[103] and virtually any process

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99. *See id*.

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, Comment, *Computer Software Patentability and the Role of Means-Plus-Function Format in Computer Software Claims*, 15 PACE L. REV. 787, 864 (1995).

102. *See* Kass, *supra* note 101, 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.").

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 has little practical effect.

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 must merely 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] Courts[109] and commentators[110] disagree on whether *Diehr*, *Flook*, and *Benson* can be reconciled. Likewise, it is not clear whether the

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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).

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*

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. Furthermore, in upholding Diehr's claims, 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 inconsistency 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, con-

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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.

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).

crete, 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 continuing vitality of the rule against patenting abstract ideas. The purpose of granting patents is "to promote the progress of … the 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 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]

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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* Chisum, *supra* note 10, at § 1.03[6]. Chisum describes the development and curtailment of this doctrine.

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 (1999).

121. *See* 35 U.S.C. § 112 ¶ 6 (1994) ("[S]uch claim [in means-plus-function form] shall be construed to cover the coresponding structure, material, or acts described in the specification …."). Failure to disclose sufficient structure puts the claim in violation of the definiteness requirement of 35 U.S.C. § 112 ¶ 2 (1994) ("The specification

The danger of allowing patents on abstract ideas or thought processes increases when process claims to mathematical algorithms are allowed. 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 Telecom[123] 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. 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 facts[124] would be to prevent the 20,000 employees from thinking a certain combination of thoughts.

The Supreme Court attempted to avoid this danger by holding that process claims are unpatentable subject matter unless they include significant physical activity, but *Excel* has cut off that approach.

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shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.").

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.

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

C. Preventing Patents on Thought

Fortunately, 35 U.S.C. § 101 is not the only applicable statute, 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, para. 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 recite combinations of steps; the difficult issue is determining when a given step is recited in functional rather than descriptive form.[125]

Sufficient case law to guide courts in this area does not yet exist.[126] Because patent drafters have generally avoided process claims for computer algorithms,[127] no existing case discusses the

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

125. *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 § 112 ¶ 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.*

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

127. *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.").

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.[128]

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.[129] 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.[130] 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 performing a Boolean operation to determine the value of the PIC indicator. Since 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

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128. Two (perhaps the only two) known cases involving step-plus-function claims are *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).

129. *See* Goodwin, *supra* note 125, 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 § 112 ¶ 6.

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

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 desperate 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 — novelty[131] and nonobviousness[132] — will become more important.

In determining whether an invention incorporating a mathematical algorithm is novel and nonobvious, the Patent and Trademark Office and the courts[133] should treat the mathematical al-

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131. 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.

132. 35 U.S.C. § 103(a) (1994) provides that "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."

133. 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

gorithm 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*[134] but created confusion by introducing a test of novelty into the 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.*,[135] on remand from the Federal Circuit, the district court found the '184 patent invalid on the alternative grounds of lack of novelty and obviousness.[136] 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. The Federal Cir-

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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).

134. *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)).

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

136. *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.

cuit'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.