

Toward a Direct Functional Relationship Requirement for Claims to Software Encoded on a Computer-Readable Storage Medium: Rethinking *In re Beauregard* in Response to the USPTO's Interim Guidelines Regarding the Patentability of Data Signal Claims

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Abstract

As applied to software-related inventions, one of the most difficult and persistent issues in patent law is the appropriate scope of 35 U.S.C. § 101, which defines patentable subject matter. Specifically, the law remains unsettled as to whether claims to computer-readable media containing software (often called “*Beauregard*-type” or “floppy disk” claims) and claims to data signals embodied on carrier waves fall within the scope of § 101 as a general matter. Achieving final resolution of this question has important implications not only for patent law but for a wide swath of the information technology industry, as electronic distribution becomes an increasingly attractive means for dissemination of software. This paper explores the patentability of these *Beauregard*-type stored software claims under §§ 101 – 103 of the Patent Act through examination of several key Federal Circuit cases and policies of the United States Patent and Trademark Office. Ultimately, after discussion of the merits of various alternative distinctions between patentable and non-patentable subject matter, this paper concludes that exclusion of both *Beauregard*-type stored software claims and data signal claims from the sweep of § 101 presents the most consistent and workable solution through the implementation of a direct functional relationship requirement for claims to software encoded on computer-readable storage or transmission media.

I. Introduction

Although use of computers and computer software have become both indispensable and routine, the legal framework providing and protecting intellectual property rights in software remains somewhat uncertain in many respects. In part, this uncertainty can be explained by the mismatch between the rapid pace of technological progress and the much slower evolution of the law. More fundamentally, software eludes categorization in any satisfying manner with respect to the general divisions between the different realms of intellectual property; software is both functional and expressive, making it difficult to determine what protection, if any, software should enjoy under patent and/or copyright law.

Within patent law, one of the most difficult and persistent issues is the appropriate scope of 35 U.S.C. § 101,¹ which defines patentable subject matter, with respect to software-related inventions. Although as a general matter, software as part of a computer can be the subject of a patent,² claims to mathematical algorithms (like software) per se are considered to fall outside the scope of § 101.³ Without some stated relationship to something tangible, such as a computer on which the software can be run, software is merely an abstract idea, not useful itself, and thus not patentable.⁴ These principles are relatively clear from the teachings of the United States Supreme Court and the United States Court of Appeals for the Federal Circuit. However, ambiguities remain as to the type and extent of the functional relationship needed between software and a tangible object for the claimed invention to qualify as patentable subject matter under § 101, as novel under § 102,⁵ and as nonobvious under § 103.⁶ Specifically, the law remains unsettled as to whether claims to computer-readable media containing software (often called “*Beauregard*⁷-type” or “floppy disk” claims)⁸ and claims to data signals embodied on carrier waves fall within the scope of § 101 as a general matter.

This paper explores these ambiguities through examination of several key Federal Circuit cases (Part II) and guidance from the United States Patent and Trademark Office (USPTO) (Part III). Part IV discusses the merits of alternative distinctions between patentable and non-

¹ 35 U.S.C. § 101 (2000).

² See *In re Alappat*, 33 F.3d 1526, 1545 (Fed. Cir. 1994) (en banc).

³ See *State Street Bank & Trust Co. v. Signature Fin. Group Inc.*, 149 F.3d 1368, 1373 (Fed. Cir. 1998).

⁴ See *id.* at 1373. (“Unpatentable mathematical algorithms are identifiable by showing they are merely abstract ideas constituting disembodied concepts or truths that are not ‘useful.’”).

⁵ 35 U.S.C. § 102 (2000 & Supp. II 2002).

⁶ 35 U.S.C.S. § 103 (LexisNexis 2000 & Supp. 2006).

⁷ See *In re Beauregard*, 53 F.3d 1583 (Fed. Cir. 1995).

⁸ Since “*Beauregard*-type claim” is not directly descriptive of the subject matter of a claim, and “floppy disk claim” is somewhat incomplete and limited, as the subject matter comprises both software and a computer-readable medium (not limited to a floppy disk), this article will refer to such claims as “*Beauregard*-type stored software claims.”

patentable subject matter. Part V argues that exclusion of both *Beauregard*-type stored software claims and data signal claims from the sweep of § 101 presents the most consistent and workable solution through the implementation of a direct functional relationship requirement for claims to software encoded on computer-readable storage or transmission media.

II. The Evolving Approach To Patentability of Software-Related Inventions at the Federal Circuit

In 1994, the Federal Circuit issued opinions in *In re Alappat*⁹ and *In re Lowry*.¹⁰ Each case answered key questions about the patentability of software-related inventions while leaving ample uncertainty regarding the ultimate boundaries of § 101 as applied to software. 35 U.S.C. § 101 provides:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefore, subject to the conditions and requirements of this title.¹¹

Although a § 101 rejection was before the court only in *Alappat* and not in *Lowry*, in both cases the court examined whether certain judicially-articulated exceptions to patentability relevant to the § 101 inquiry (abstract ideas, printed matter) were applicable. The third case discussed below, *In re Beauregard*,¹² initially presented patentability questions slightly different from those posed in *Lowry*. However, the Federal Circuit did not have a chance to determine whether *Beauregard*'s claims fell within § 101 as the USPTO dropped its printed matter rejection and asked the court to dismiss the case.¹³

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

¹⁰ 32 F.3d 1579 (Fed. Cir. 1994).

¹¹ 35 U.S.C. § 101 (2000).

¹² 53 F.3d 1583 (Fed. Cir. 1995).

¹³ *Id.* at 1584.

A. *In re Alappat*: Software + General Purpose Computer = Patentable

The Federal Circuit's *en banc* majority opinion in *In re Alappat*¹⁴ laid important groundwork for the expansion of software patentability. The invention in *Alappat* generally related to a means for improving the appearance of waveforms displayed on the screen of digital oscilloscopes.¹⁵ More specifically, the invention used mathematical algorithms to modulate the intensity of illumination of digital display screen pixels, based on the distance between the center of each pixel and the trajectory of the waveform to give the displayed waveforms a smooth, continuous appearance.¹⁶ Claim 15, the only independent claim at issue on appeal, provided:

A rasterizer for converting vector list data representing sample magnitudes of an input waveform into anti-aliased pixel illumination intensity data to be displayed on a display means comprising:

- (a) means for determining the vertical distance between the endpoints of each of the vectors in the data list;
- (b) means for determining the elevation of a row of pixels that is spanned by the vector;
- (c) means for normalizing the vertical distance and elevation; and
- (d) means for outputting illumination intensity data as a predetermined function of the normalized vertical distance and elevation.¹⁷

Claim 15 as well as dependent claims 16-19¹⁸ were rejected during prosecution by the patent examiner under 35 U.S.C. § 101 as directed to non-statutory subject matter.¹⁹

In evaluating the § 101 eligibility of claims 15-19, the Federal Circuit used a two-step process: first, whether the claim at issue fell preliminarily within one of the § 101 categories; and second, whether an exception to § 101 applied. With respect to the first step, the court noted that

¹⁴ 33 F.3d 1526.

¹⁵ *Id.* at 1537.

¹⁶ *Id.*

¹⁷ *Id.* at 1538-39.

¹⁸ Claims 16-19 each depended directly from claim 15. Each of these dependent claims further limited claim 15 by specifying a particular structure for carrying out one of the “means” limitations of claim 15. *See id.* at 1541.

¹⁹ *Id.* at 1531. Although initially reversed by a three-member panel of the Board of Patent Appeals and Interferences (Board), an expanded panel of the Board reinstated the § 101 rejection. The expanded Board panel concluded that claim 15 was directed to “the mathematical algorithm itself, rather than an application of the mathematical algorithm to an otherwise statutory process or apparatus.” *Ex parte Alappat*, 23 U.S.P.Q.2d (BNA)1340, 1347 (B.P.A.I. 1992).

the rasterizer of claim 15 was a specific type of machine, thus falling within one of the categories of patentable inventions enumerated in § 101.²⁰ The court followed this facial and rather perfunctory analysis with a more thorough exploration of the judicially-articulated exceptions to § 101, namely “laws of nature, natural phenomena, and abstract ideas,” the three categories discussed by the Supreme Court in *Diamond v. Diehr*.²¹ The Federal Circuit lamented the lack of any consistent explanation from the Supreme Court regarding the patent eligibility of certain types of mathematical subject matter, and how (or if) mathematical subject matter fit within any of the three *Diehr* categories.²² The Federal Circuit concluded that the Supreme Court’s various decisions regarding mathematical subject matter²³ suggested that rather than creating a fourth exception to § 101, these cases explained that “certain types of mathematical subject matter, standing alone, represent nothing more than abstract ideas until reduced to some type of practical application, and thus that subject matter is not, in and of itself, entitled to patent protection.”²⁴

Working within this rubric, as well as under the Supreme Court’s directive in *Diehr* to focus on the claim as a whole, rather than only on its constituent parts, in the court evaluated the applicability of § 101 or its exceptions.²⁵ The Federal Circuit concluded that even though many (or possibly all) of the means limitations of claim 15 represented circuitry elements that performed mathematical calculations, “the claimed invention as a whole is directed to a combination of interrelated elements which combine to form a machine . . . [t]his is not a

²⁰ *Alappat*, 33 F.3d at 1541-42.

²¹ *Id.* at 1542-43 (quoting *Diamond v. Diehr*, 450 U.S. 175, 185 (1981)).

²² *Id.* at 1543 n19.

²³ *Id.* at 1543 (citing *Diehr*, 450 U.S. 175 (1981); *Parker v. Flook*, 437 U.S. 584 (1978); *Gottschalk v. Benson*, 409 U.S. 63 (1972)).

²⁴ *Id.* at 1543.

²⁵ *Id.* at 1543 (citing *Diehr*, 450 U.S. at 192).

disembodied mathematical concept which may be characterized as an ‘abstract idea,’ but rather a specific machine to produce a useful, concrete, and tangible result.”²⁶

Furthermore, the court rejected the notion that claim 15 was unpatentable merely because it read on a general purpose computer programmed to carry out the patented invention, as programming in effect makes a special purpose computer out of a general purpose computer.²⁷ Ultimately, the Federal Circuit concluded that a computer is an apparatus rather than simply mathematics, and that “a computer operating pursuant to software may represent patentable subject matter.”²⁸

B. *In re Lowry*: Memory Management Software + Memory = Patentable

Decided less than two months after *Alappat*, *In re Lowry*²⁹ provided further detail regarding the patentability of computer-related inventions. Lowry’s invention “provide[d] an efficient, flexible method of organizing stored data in a computer memory” by optimizing both the functional and structural expressiveness of data models.³⁰ During prosecution, the examiner rejected claims 1-5 of Lowry’s application under § 101 as directed to non-statutory subject matter.³¹ Claim 1 recited “a memory for storing data for access by an application program, comprising: a data structure stored in said memory . . .” and several additional limitations.³² The examiner also rejected claims 1-19 under 35 U.S.C. § 103 as obvious over the prior art, and claims 20-29 under 35 U.S.C. § 102(e) as anticipated by the prior art.³³

²⁶ *Id.* at 1544.

²⁷ *Id.* at 1545.

²⁸ *Id.*

²⁹ 32 F.3d 1579 (Fed. Cir. 1994).

³⁰ *Id.* at 1580.

³¹ *See id.*

³² *Id.* at 1581.

³³ *Id.* at 1580.

The Board likewise rejected all of Lowry's claims, though it affirmed only the § 102(e) and § 103 rejections while reversing the § 101 rejection.³⁴ As such, Lowry's appeal of the Board's decision to the Federal Circuit was limited to the § 102(e) and § 103 rejections. Except to note that the Board concluded that claims 1-5, as a whole, were "directed to a memory containing stored information," "recited an article of manufacture," and as such were directed toward statutorily patentable subject matter, the Federal Circuit did not address the § 101 issue specifically.³⁵

The Board based its affirmation of the §102(e) and § 103 rejections on a comparison of Lowry's claimed data structures to printed matter.³⁶ As explained by the Manual of Patent Examining Procedure, "a mere arrangement of printed matter, though seemingly a 'manufacture,' is rejected as not being within the statutory classes."³⁷ As for the relevance of printed matter to § 102 and § 103, the "critical question" according to the Federal Circuit in both *Lowry* and *In re Bernhart* "is whether there exists any new and unobvious functional relationship between the printed matter and the substrate."³⁸

Applying these principles to Lowry's claimed invention, the court distinguished Lowry's data structures from printed matter in several respects. First, the court stated that the printed matter cases, which focused on claims directed to "certain novel arrangements of printed lines or characters, useful and intelligible only to the human mind," were not factually relevant for inventions with claims requiring a machine to process the information.³⁹ Second, unlike printed matter, Lowry's data structures did not simply represent underlying information; instead the data

³⁴ *Id.*

³⁵ *Id.* at 1582.

³⁶ *Id.*

³⁷ U.S. PATENT & TRADEMARK OFFICE, MANUAL OF PATENT EXAMINING PROCEDURE § 706.03(a) (8th ed. Oct. 2005) (internal citations omitted).

³⁸ *Lowry*, 32 F.3d at 1582 (quoting *In re Gulack*, 703 F.2d 1381, 1386 (Fed. Cir. 1983)).

³⁹ *Id.* at 1583 (quoting *In re Bernhart*, 417 F.2d 1395, 1399 (C.C.P.A. 1969)).

structures “dictate[d] how application programs manage information.”⁴⁰ Therefore, the data structures had a functional relationship to the claimed memory. Third, rather than claiming the information content of the memory itself as an abstract idea, Lowry’s claims “require[d] specific electronical structural elements which impart a physical organization on the information stored in memory.”⁴¹ The court recognized that Lowry’s stored data did not adopt a physical structure per se, but rather constituted “the essence of electronic structure.”⁴² Again referencing *Bernhart*, the court reiterated the following key point: “if a machine is programmed in a certain new and unobvious way, it is physically different from the machine without that program; its memory elements are differently arranged. The fact that these physical changes are invisible to the eye should not tempt us to conclude that the machine has not been changed.”⁴³ Finally, the court pointed out that even if Lowry’s data structures were analogous to printed matter, a printed matter rejection was still inappropriate because the USPTO had not established a prima facie case of unpatentability showing that the data structures lacked a new and nonobvious functional relationship to the memory.⁴⁴ If the so-called “printed matter” performs a function, such a rejection would be improper.⁴⁵

Although only the § 102(e) and § 103 rejections were on appeal to the Federal Circuit in *Lowry*, as discussed *supra*, the court’s analysis of the inequivalence of printed matter and computer software is nonetheless relevant to the questions posed by software-related claims under § 101. For the most part, the court’s analysis regarding applicability of the printed matter doctrine was generalized; rather than focusing specifically on the printed matter doctrine as

⁴⁰ *Id.*

⁴¹ *Id.*

⁴² *Id.*

⁴³ *Id.* (quoting *Bernhart*, 417 F.2d at 1400).

⁴⁴ *In re Lowry*, 32 F.3d 1579, 1584 (Fed. Cir. 1994).

⁴⁵ *Id.* (citing *In re Gulack*, 703 F.3d 1381, 1386 (Fed. Cir. 1983)).

applied to novelty (§ 102) or nonobviousness (§ 103), the court discussed the overall relevance of the printed matter doctrine to the patentability of Lowry's data structures. However, looking at *Lowry* in isolation, extension of the principles articulated therein is arguably somewhat difficult given the particular nature of the software aspects of Lowry's invention. Lowry's data structures and their attendant unique features functioned to manage and improve the efficiency of the memory on which it was stored, unlike general software programs which merely use memory as a storage medium and a platform from which to run. Thus, Lowry's data structures were functional, as related to the memory, in a way in which most software may not be. On the other hand, the court's analysis is structured so that it seems that the question of functionality of the printed matter in relationship to the substrate is only asked in the context of the printed matter rejection; if no printed matter rejection is warranted (e.g. based on the need for machine-readability in *Lowry*), then arguably functionality in relation to the substrate is irrelevant since the element of the claimed invention at issue is not printed matter. The other two reasons for inapplicability of a printed matter rejection articulated by the court in *Lowry*, that the software could only be read by a machine and that a computer becomes a different machine upon programming, seem germane to machine claims rather than article of manufacture claims. However, this distinction is of limited relevance, as the court noted in a later case that the scope of § 101 does not change with the form of the claim: "[w]hether stated implicitly or explicitly, we consider the scope of § 101 to be the same regardless of the form- machine or process- in which a particular claim is drafted."⁴⁶ Once it can be determined that a claim is directed to at least one of the four § 101 categories of statutory subject matter, the key inquiry focuses not on

⁴⁶ AT&T Corp. v. Excel Commc'ns, Inc., 172 F.3d 1352, 1357-58 (Fed. Cir. 1999) (citing *In re Alappat*, 33 F.3d 1526, 1581) (Fed. Cir. 1994) (Rader, J., concurring)).

categorizing the claim within one of the four categories but rather on the “essential characteristics of the subject matter, in particular, its practical utility.”⁴⁷

C. *In re Beauregard*: Software + Memory = Patentable (By Default, At Least)

Like the claims in *Lowry* discussed in Part II.B., the claims at issue in *In re Beauregard* were also directed toward a computer program embedded on a computer-readable medium.⁴⁸ However, in *Beauregard*, some of the claims were explicitly drafted as article of manufacture claims.⁴⁹ During prosecution, *Beauregard*’s claims were rejected under § 101 as directed toward non-statutory subject matter and under § 103 as obvious over “ ‘well-known data processing techniques of storing ‘program code means’ on storage media for later use by a computer.’ ”⁵⁰ The Board affirmed the examiner’s § 101 and § 103 rejections, concluding that the computer program, which operated to instruct a computer system to fill a polygon on a graphics display, was merely printed matter with no functional relationship to its substrate (the computer-readable medium).⁵¹ In denying *Beauregard*’s request for reconsideration, the Board concluded: “[i]n the final analysis, appellants’ invention differs from other substrates only by the informational content of the series of computer instructions embodied or printed thereon. As such, the printed matter exception to statutory subject matter under § 101 applies in the present case.”⁵²

Although *Beauregard* appealed the Board’s decision to the Federal Circuit, the court did not have the opportunity to review the appeal on its merits. The Commissioner of the United

⁴⁷ *Street Bank & Trust Co. v. Signature Fin. Group Inc.*, 149 F.3d 1368, 1375 (Fed. Cir. 1998).

⁴⁸ *In re Beauregard*, 53 F.3d 1583, 1584 (Fed. Cir. 1995).

⁴⁹ *Ex parte Beauregard*, Appeal No. 93-0378 (B.P.A.I. July 29, 1993). *Beauregard*’s patent eventually issued as U.S. Pat. No. 5,710,578 (filed May 9, 1990).

⁵⁰ *Ex parte Beauregard*, Appeal No. 93-0378 (B.P.A.I. July 29, 1993), (*quoting* Examiner’s statements during prosecution.) *Beauregard*’s claims were also rejected under § 112, first paragraph, as insufficiently enabled by the specification, § 112, second paragraph, as indefinite, and for obviousness-type double patenting over a related patent directed to method and apparatus claims, though these rejections were reversed by the Board.

⁵¹ *Ex parte Beauregard*, Appeal No. 93-0378, 1993 Pat. App. LEXIS 40, at *2 (B.P.A.I. Sept. 29, 1993).

⁵² *Ex parte Beauregard*, Appeal No. 93-0378, 1994 Pat. App. LEXIS 9, at *5-6 (B.P.A.I. Aug. 4, 1994) (request for reconsideration).

States Patent and Trademark Office moved to dismiss the appeal: “ ‘computer programs embodied in a tangible medium, such as floppy diskettes, are patentable subject matter under 35 U.S.C. § 101 and must be examined under 35 U.S.C. §§ 102 and 103.’ ”⁵³ The Commissioner also agreed with *Beauregard* that the printed matter doctrine was inapplicable.⁵⁴ Since no case or controversy remained, the court vacated the Board’s decision and remanded the case for further proceedings.⁵⁵ Therefore, whether *Beauregard*-type stored software claims, sometimes referred to as “floppy disk” claims,⁵⁶ are permissible under § 101 remains ambiguous.

III. Evolution of the USPTO’s Approach to Patentability of *Beauregard*-type Stored Software Claims and Data Signal Claims

In the dozen or so years since the Federal Circuit’s decisions in *Alappat* and *Lowry*, the USPTO has provided a fair amount of guidance to examiners on how to approach the patentability of software-related inventions. In its 1996 “Examination Guidelines for Computer-Related Inventions” (1996 Guidelines),⁵⁷ the USPTO addressed software patentability systemically, exploring issues ranging from claims to software per se to *Beauregard*-type stored software claims. Later that year, the USPTO issued its “Computer-Related Invention Guidelines” (1996 Training Materials), which indicated that claims to computer data signals embodied on carrier waves would be patentable subject matter under § 101.⁵⁸ Almost a decade

⁵³ *In re Beauregard*, 53 F.3d 1583, 1584 (Fed. Cir. 1995).

⁵⁴ *Id.*

⁵⁵ *Id.*

⁵⁶ *See, e.g.*, Richard H. Stern, *An Attempt to Rationalize Floppy Disk Claims*, 17 J. MARSHALL J. COMPUTER & INFO. L. 183, 183 (1998).

⁵⁷ United States Patent & Trademark Office, Examination Guidelines for Computer-Related Inventions, 61 Fed. Reg. 7478 (Feb. 28, 1996) [hereinafter 1996 Guidelines].

⁵⁸ United States Patent & Trademark Office, Computer-Related Invention Guidelines, <http://www.uspto.gov/web/offices/pac/dapp/oppd/patoc.htm> (1996) (no longer available), *archived at* <http://web.archive.org/web/19980529122936/http://www.uspto.gov/web/offices/pac/dapp/oppd/patoc.htm> (last visited May 23, 2006) [hereinafter 1996 Training Materials].

later, the USPTO changed course in its 2005 Interim Guidelines, suggesting that such data signal claims fall outside the scope of § 101.⁵⁹

A. USPTO 1996 Guidelines: Reaffirming *Beauregard*

To understand the USPTO's approach to interpreting *Beauregard*-type stored software claims, it is helpful to first examine the approach taken in the 1996 Guidelines with respect to the patentability of software claimed merely as such, without corresponding elements providing some connection to a computer or a computer-readable medium. Specifically, the 1996 Guidelines addressed the rationale for excluding claims to software alone from the realm of statutory subject matter as follows:

[C]omputer programs claimed as computer listings per se, i.e., the descriptions or expressions of the programs, are not physical "things," nor are they statutory processes, as they are not "acts" being performed. Such claimed computer programs do not define any structural and functional interrelationships between the computer program and other claimed aspects of the invention which permit the computer program's functionality to be realized.⁶⁰

The USPTO's emphasis on physical "things" was drawn from a prior characterization of the § 101 machine, manufacture, and composition of matter categories as "things," in contrast to the "action" performed by a process, the fourth § 101 category.⁶¹

As for the interpretation of claims involving computer software but not directed to software per se, the USPTO began by providing a multi-tiered framework consistent with its ultimate position in *Beauregard*. First, the USPTO divided "descriptive material," (an umbrella term comprising natural phenomena, abstract ideas, and laws of nature) into two categories:

⁵⁹ United States Patent & Trademark Office, *Interim Guidelines for Examination of Patent Applications for Subject Matter Eligibility*, 1300 Off. Gaz. Pat. Off. 142 (Nov. 22, 2005), available at http://www.uspto.gov/web/offices/pac/dapp/opla/preognotice/guidelines101_20051026.pdf [hereinafter 2005 Interim Guidelines].

⁶⁰ 1996 Guidelines, *supra* note 57, at 7481-82.

⁶¹ *Id.* at 7481.

functional and non-functional.⁶² Under the 1996 Guidelines, both functional descriptive material (e.g. computer programs, data structures) and non-functional descriptive material (e.g. music, literary works) are non-statutory when claimed per se. However, “when functional descriptive material is recorded on some computer-readable medium it becomes structurally and functionally interrelated to the medium and will be statutory in most cases.”⁶³ In contrast, when “non-functional descriptive material is recorded on some computer-readable medium, it is not structurally and functionally interrelated to the medium but is merely carried by the medium. Merely claiming non-functional descriptive material stored in a computer-readable medium does not make it statutory.”⁶⁴ Functionality, in turn, can be “as part of the stored data or as part of the computing processes performed by the computer.”⁶⁵ The data structures affecting the efficient organization of computer memory in *Lowry* would therefore fall into the first category (functionality as part of the stored data), whereas the polygon-filling software of *Beauregard* would fall into the second (functionality as part of the processes performed by a computer).

Notably, the 1996 Guidelines did not rely explicitly on the printed matter doctrine to distinguish between statutory and non-statutory subject matter. Instead, the concept of functionality, expressed in the printed matter doctrine as an exception to the non-statutory nature of such inventions in which a functional relationship existed between the printed matter and the substrate, was recrystallized in the 1996 Guidelines as the key attribute dividing potentially statutory descriptive material (if claimed as part of a storage medium or a computer) from non-statutory non-descriptive material.

⁶² *Id.*

⁶³ *Id.*

⁶⁴ *Id.*

⁶⁵ *Id.* at 7482.

The recasting of the functionality distinction in the 1996 Guidelines with regard to descriptive materials rather than printed materials clarified the focus of the § 101 subject matter inquiry for software-related inventions, as can be demonstrated through revisiting the claimed data structures of *In re Lowry*, discussed in Part II.B. In *Lowry*, the importance of the functional relationship between the data structures and the computer memory on which they were stored was somewhat unclear. The court addressed the functional relationship issue in the context of the printed matter doctrine, in essence as an exception or defense, whereby printed material could be combined with some substrate to qualify as statutory subject matter if the printed material had a functional relationship to the substrate. Since the court found that *Lowry*'s data structures were not printed material because they could be processed only by a machine and not by the human mind like traditional printed matter,⁶⁶ one might conclude that little guidance is provided as to the importance of functionality outside the context of the printed matter doctrine. However, the court went on to state that *Lowry*'s data structures were not *analogous* to printed matter due to the functional relationship between the software and the substrate: rather than representing “merely underlying data in a database,” the data structures in the claims at issue “define[d] functional characteristics of the memory.”⁶⁷

The importance of the functional relationship of a claimed element to its substrate in determining whether the claimed element is analogous to printed matter articulated by the Federal Circuit in *Lowry* seems consistent with the functional/non-functional descriptive material rubric articulated by the USPTO in the 1996 Guidelines. In both cases, determining whether a functional relationship exists between some claim element that might be analogous to printed

⁶⁶ *In re Lowry*, 32 F.3d 1579, 1583 (Fed. Cir. 1994).

⁶⁷ *Id.*

matter (as in *Lowry*) or the descriptive material (under the 1996 Guidelines), and its substrate (as in *Lowry*) or computer-readable medium (under the 1996 Guidelines), is the central question.

B. USPTO 1996 Training Materials: Beyond *Beauregard*, Endorsing Data Signal Claims

Not long after issuing the 1996 Guidelines, the USPTO provided Training Materials to address certain aspects of the patentability and examination of computer-related inventions in greater detail. Among the examples given in the 1996 Training Materials was the following sample Claim 13:

A computer data signal embodied in a carrier wave comprising:

- a. a compression source code segment comprising [recites self-documenting source code]; and
- b. an encryption source code segment comprising [recites self-documenting source code].⁶⁸

According to the 1996 Training Materials, the carrier wave of claim 13 *is* a computer-readable medium.⁶⁹ As such, and because claim 13 recites a specific article of manufacture, the 1996 Training Materials concluded that claim 13 is directed to statutory subject matter,⁷⁰ assuming that the claimed data signal does not occur as a natural phenomenon.⁷¹ Also in 1996, an article co-authored by the Solicitor of the USPTO and an Associate Solicitor noted that “[i]n the future, the PTO is expected to interpret ‘computer-readable medium’ broadly, perhaps to include a carrier wave for a data signal.”⁷² This article provided the identical exemplary claim as the 1996 Training Materials to a computer data signal embodied in a carrier wave, as shown above, and stated that “[p]resuming that the signal is manufactured, as opposed to naturally

⁶⁸ 1996 Training Materials, *supra* note 58, at Claim Examples- Compression/Encryption Examples, Claims 37 (bracketed text in original).

⁶⁹ *Id.* at Claim Examples- Compression/Encryption Examples, Claim Analysis 4.

⁷⁰ *Id.*

⁷¹ *Id.* at Claim Examples- Compression/Encryption Examples, Claims 39. The examiner has the burden to prove that the data signal is a natural phenomenon.

⁷² Nancy J. Linck & Karen A. Buchanan, *Patent Protection for Computer-Related Inventions*, 18 HASTINGS COMM. & ENT. L. J. 659, 677 (1996).

occurring, there appears to be little basis for rejecting such a claim— it is specific software embodied in a computer-readable medium. It also has a practical application in the technological arts...”⁷³

C. USPTO 2005 Interim Guidelines: A Reversal on Data Signal Claims

In stark contrast to its endorsement of exemplary data signal claims as described in the 1996 Training Materials, the USPTO’s Interim Guidelines for Examination of Patent Applications for Subject Matter Eligibility, published in 2005, suggested that such claims “appear[]” to fall outside the ambit of § 101 because they do not fit any of the § 101 categories.⁷⁴ Quickly dispensing with the possibility that a data signal claim could be a process (such a claim does not recite a series of steps), the 2005 Interim Guidelines relied on the “traditional” requirement of “*physical* structure or material” for claims directed toward products (machines, compositions of matter, and manufactures).⁷⁵

With respect to articles of manufacture, the § 101 categorization attributed to signal claims in the 1996 Guidelines, the 2005 Interim Guidelines provided a number of definitions of “manufacture” used by courts over time as a basis for exploring the meaning of the term with respect to signal claims. Most notably, the Interim Guidelines quoted a dictionary definition of “manufacture” utilized by the Supreme Court in both *American Fruit Growers, Inc. v. Brogdex Co.* and *Diamond v. Chakrabarty*: “the production of articles for use from raw or prepared materials by giving to these materials new forms, qualities, properties, or combinations, whether by hand-labor or by machinery.”⁷⁶ The Interim Guidelines interpreted this and other definitions

⁷³ *Id.*

⁷⁴ 2005 Interim Guidelines, *supra* note 59.

⁷⁵ *Id.* (emphasis added).

⁷⁶ *Id.* (quoting *Diamond v. Chakrabarty*, 447 U.S. 303, 308 (1980) (quoting *American Fruit Growers, Inc. v. Brogdex Co.*, 283 U.S. 1, 11 (1931))).

of “manufacture” to require physicality.⁷⁷ Since a data signal is comprised of energy and not physical matter, the 2005 Interim Guidelines concluded that a data signal claim is therefore not an article of manufacture or other product, and thus not within the scope of § 101.⁷⁸

Nonetheless, the Interim Guidelines went further, noting the similarity between data signal claims and *Beauregard*-type stored software claims:

from a technological standpoint, a signal encoded with functional descriptive material is similar to a computer-readable memory encoded with functional descriptive material, in that they both create a functional interrelationship with a computer. In other words, a computer is able to execute the encoded functions, regardless of whether the format is a disk or a signal.⁷⁹

Presumptively in recognition of the tension between the different outcomes in terms of § 101 between software encoded on a computer-readable memory (statutory) and software encoded on a carrier wave (non-statutory), the 2005 Interim Guidelines asked for public comment to assist with further evaluation of the matter,⁸⁰ with comments to be submitted by June 30, 2006.⁸¹

IV. Where to Draw the Patentable Subject Matter Line?

The USPTO’s abrupt change of heart regarding the patentability of data signal claims clearly invites the question of whether such signal claims are or should be within the scope of § 101. In asking this seemingly narrow question, however, one risks stepping across an event horizon and becoming trapped in the black hole of reevaluating the patentability of software-related claims more generally. If data signal claims are outside the scope of § 101, what about *Beauregard*-type stored software claims? If *Beauregard*-type stored software claims fall outside

⁷⁷ 2005 Interim Guidelines, *supra* note 59.

⁷⁸ *Id.*

⁷⁹ *Id.*

⁸⁰ *Id.*

⁸¹ Request for Comments on Interim Guidelines for Examination of Patent Applications for Patent Subject Matter Eligibility, 70 Fed. Reg. 75,451 (Dec. 20, 2005).

§ 101, why not the data structure claims in *Lowry*? On the other hand, if data signal claims are within § 101, just how ephemeral can the “manufacture” be? Why shouldn’t claims to software per se be patentable?

To make this inquiry more manageable, it is helpful to limit the search for an appropriate distinction between statutory and non-statutory subject matter to solutions that are reasonably in keeping with the decisions of the Supreme Court and the Federal Circuit, as well as with the language of § 101. As such, it is relatively simple to dismiss two of the aforementioned options. First, to suggest that banishing signal claims from the realm of § 101 would also require dispensing with claims of the type in *Beauregard* and particularly *Lowry* would obviously conflict with the Federal Circuit’s decision on the merits in *Lowry*. Second, claims to software per se, untethered to any means of storing, transmitting, or using the software, are also problematic; without a computer (or arguably a storage medium), software remains merely a set of abstract ideas, not reduced to any practical application. In the words of the Federal Circuit, there must be “an examination of the contested claims to see if the claimed subject matter as a whole is a disembodied mathematical concept... or if the mathematical concept has been reduced to some practical application rendering it ‘useful.’”⁸² In addition to the utility/practical application issue, inclusion of per se software claims would seem to stretch four categories of patentable subject material enumerated in § 101 a bit too much.

After eliminating these two extreme options, three more realistic options (absent legislative change) remain. Option 1: inclusion of both *Beauregard*-type stored software claims and data signal claims in § 101 (as per the 1996 Training Materials); Option 2: inclusion of *Beauregard*-type stored software claims, but not data signal claims (as per the 2005 Interim

⁸² AT&T Corp. v. Excel Commc’ns, Inc., 172 F.3d 1352, 1357 (Fed. Cir. 1999) (citing *In re Alappat*, 33 F.3d 1526, 1544 (Fed. Cir. 1994) (en banc)).

Guidelines); and Option 3: exclusion of both *Beauregard*-type stored software claims and data signal claims. Each of these Options will be discussed in turn.

A. Evaluating Option 1: § 101 encompasses both *Beauregard*-type stored software claims and data signal claims.

At first glance, the inclusion of both types of claims in the § 101 family seems like an attractive option. First, allowing for the patentability of both *Beauregard*-type stored software claims and data signal claims would avoid the unsettling, form-over-function distinction discussed by the USPTO in the 2005 Interim Guidelines⁸³ and restated in Part III.C. As noted by the USPTO, the similarity from a “technological standpoint”⁸⁴ between *Beauregard*-type stored software claims and data signal claims is undeniable; both function to deliver a computer program to a computer. Second, inclusion of both types of claims would seem to comport nicely with the expansive “anything under the sun that is made by man” approach to patentable subject matter.⁸⁵

On the other hand, if data signal claims, given their lack of physicality, are patentable, arguably there is little difference between a data signal claim and a claim to software per se. Including both *Beauregard*-type stored software claims and data signal claims within the realm of § 101 fails to provide a meaningful outer boundary on patent eligible subject matter. Whether such a boundary exists at data signals or beyond, to some future claim involving some technology even more removed from the functionality of the computer than a memory storage device or a carrier wave, yet not so far as to software claims per se, would be unclear under this approach.

⁸³ 2005 Interim Guidelines, *supra* note 59.

⁸⁴ *Id.*

⁸⁵ *Diamond v. Chakrabarty*, 447 U.S. 303, 310 (1980) (internal citations omitted).

B. Evaluating Option 2: § 101 encompasses *Beauregard*-type stored software claims but *not* data signal claims.

As discussed *supra* with regard to Option 1, drawing the § 101 line between *Beauregard*-type stored software claims and data signal claims would emphasize formality over the similarity of the storage/transmission technologies employed in the two claim types, since both technologies provide a means for software developers and sellers to distribute their software to customers (through sale of a disk or through transmission over the Internet). This formality is dissatisfying for a number of reasons. First, legal distinctions drawn between fact patterns that do not comport with meaningful technical distinctions are a poor foundation for the development of subsequent jurisprudence, ultimately risking the development of a body of law that is out of touch with reality. Second, such a distinction could distort incentives for innovation by protecting one form of software distribution (disks) but not another (downloads).

Moreover, the reasons articulated by the USPTO in the 2005 Interim Guidelines rely on fuzzy “traditional” notions that manufactures under § 101 require physicality,⁸⁶ rather than on arguments grounded in logic or clear direction from the courts. The USPTO’s reliance on tradition in this case seems misplaced, given that none of the definitions necessarily excluded non-physical inventions. Additionally, the primary definition discussed by the USPTO was cited by the Supreme Court in 1931 in *American Fruit Growers*,⁸⁷ long before the advent of modern software-related inventions, so the Court’s failure to note the possibility of non-physical “manufactures” does not seem particularly meaningful. Even the Court’s reuse of this definition in 1980 in *Chakrabarty*⁸⁸ is not dispositive with regard to a physicality requirement, given that

⁸⁶ 2005 Interim Guidelines, *supra* note 59.

⁸⁷ *Id.* (quoting *Chakrabarty*, 447 U.S. 303, 308 (1980) (quoting *American Fruit Growers, Inc. v. Brogdex Co.*, 283 U.S. 1, 11 (1931)).

⁸⁸ *Id.*

the facts of that case involved decidedly physical subject matter. The USPTO's struggle between its 1996 Training Materials and its 2005 Interim Guidelines to reach a conclusion regarding the patent eligibility of data signal claims suggests that distinguishing between *Beauregard*-type stored software claims and data signal claims on the basis of functionality is difficult, perhaps because neither type of claim directly affects the medium on which the software is stored/transferred.

C. Evaluating Option 3: § 101 encompasses neither *Beauregard*-type stored software claims nor data signal claims.

Given the lack of a decision on the merits by the Federal Circuit in *In re Beauregard*, discussed in Part II.C., whether claims to software encoded on a memory storage device are within the scope of § 101 remains unclear. Even though the USPTO dropped its rejections to *Beauregard*'s claims in the wake of the Federal Circuit's decision in *In re Lowry*, the differences between the types of claims at issue in *Lowry* and *Beauregard* suggest that a decision adverse to the USPTO in *Beauregard* was not necessarily a foregone conclusion. To the contrary, a closer analysis of these two cases as well as the USPTO's 1996 Guidelines, which provided a framework for applying *Lowry* and other related cases to patentability issues, suggests that the distinction between *Lowry* and *Beauregard* may also be the logical place to draw the line between statutory and non-statutory subject matter under § 101.

In defining the permissible functional relationship between the descriptive material and the computer readable medium either "as part of the stored data or as part of the computing processes performed by the computer,"⁸⁹ as discussed in Part III.A., the 1996 Guidelines embraced the types of claims at issue in both *Lowry* and *Beauregard*. Nonetheless, as embodied in the quotation above, the 1996 Guidelines recognized some distinction between the two types

⁸⁹ 1996 Guidelines, *supra* note 57, at 7482.

of claims. Lowry's data structures functionally affected the operation of the claimed memory (through altering the organization of the information stored in the memory), while Beauregard's polygon-filling software functionally affected the operation of an unclaimed computer on which the claimed memory would be run, rather than the functionality of the memory itself.

In other words, from the point of view of the memory-storage device, the effect of the polygon-filling software from *Beauregard* on the operation of the memory when run by a computer would be indistinguishable from the effect of any other software or data (including non-functional descriptive material, such as a music file or a database file) stored on the memory. In contrast, the presence of the data structures from *Lowry* on a memory storage device would make that memory storage device more efficient in storing other, unrelated information and would improve the overall computing efficiency. Thus, the functionality of the software in relationship to its substrate in a *Beauregard*-type claim is quantifiably more attenuated than the functionality in a *Lowry*-type claim.

V. Conclusion: Merits of the Direct Functional Relationship Inquiry for Assessment of Patentability of Software-Related Inventions

Drawing the § 101 line for software-related claims between *Lowry* and *Beauregard* would provide a number of advantages. First, requiring a direct functional relationship between software and substrate would provide a much-needed jurisprudential handhold to break the seemingly inevitable slide toward per se software claims, or at least toward the acceptance of ever-more ephemeral articles of manufacture, to data signal claims and beyond. Also, this distinction would appear to be in keeping with both the Federal Circuit's decisions and with technical distinctions and similarities among different types of software, given the emphasis of both the courts and the USPTO on the practical application and function of software, at least to a greater extent than any of the other options explored in Part IV. Third, by providing some

stability to the application of § 101, the direct functional relationship standard outlined above would provide predictability for patent applicants. Finally, a direct functional relationship would provide a basis for further discussion regarding needed reforms to the proper scope and depth of patent protection for software-related inventions, demarcating the patentable aspects of software in contrast to those aspects that are more amenable to copyright protection.

Alternatively, the direct functional relationship between software and substrate could be addressed through an inquiry under § 102 or § 103 rather than as a threshold § 101 issue as advocated herein, particularly given that the Federal Circuit's *Lowry* decision addressed § 102 and § 103 rejections, not a § 101 rejection. One commentator, though recognizing the technical differences between the claims at issue in *Lowry* and those of *Beauregard*, concluded that claims to software on a computer-readable medium such as those in *Beauregard* are statutory subject matter, "simply because the storage of the computer instruction turns a computer readable medium into a functional component which directly cooperates with the processor."⁹⁰ The computer-readable medium, however, may be a functional component which operates with the processor even in the absence of software stored on the medium. The medium can operate as a vessel onto which the processor can direct the storage of information, including software, and thus a combination of software and storage medium should not qualify as § 101 subject matter absent a direct functional relationship between the two. If the software or data structures embedded on the computer-readable medium do not change the function of the medium itself, then the software should instead be claimed in conjunction with a computer, whose function is changed by the software. However, if courts were to conclude that *Beauregard*-type stored software claims and possibly data signal claims were within the scope of § 101, the direct

⁹⁰ Jeffery S. Draeger, Comment, *Are Beauregard's Claims Really Valid?*, 17 MARSHALL J. COMPUTER & INFO. L. 347, 363 (1998).

functional relationship inquiry could still be used to invalidate both types of claims under either § 102 or § 103. If certain software does not affect the function of a computer-readable medium as such, the specific nature of that software is irrelevant to the function of the medium and arguably does not create a “new” medium, thus possibly justifying rejection under § 102. A stronger rejection would be available under § 103: if the precise nature of the software is irrelevant to the function of the computer-readable medium as such, it would be obvious to substitute one software program for another on the computer-readable medium.

However, functionality is also a question of utility, which is addressed under § 101. In § 101, “useful” modifies the four categories of patentable subject matter. By requiring the software component of a storage device, carrier wave, or other “manufacture” to be directly functional with respect to the manufacture itself rather than only to an unclaimed computer or other machine on which the software will ultimately operate, drawing the line between *Lowry* and *Beauregard* to define statutory and non-statutory subject matter would respect the text and construction of § 101 in a way that comports with the teachings of case law. This would also avoid drawing legal distinctions between types of technologies (e.g. storage devices and carrier waves) that perform nearly identical functions with respect to the distribution of computer software. Ultimately, inquiring as to whether a direct relationship exists between software and the computer-readable medium on which it is stored or transmitted, whether as part of the analysis under § 101, § 102, or § 103, could serve as a basis for meaningfully separating patentable from non-patentable stored software-related inventions.