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**FROM TELEGRAPHS TO CONTENT PROTECTION: THE
EVOLUTION OF SIGNALS AS PATENTABLE SUBJECT MATTER
UNDER 35 U.S.C. § 101**

*Scott Bloebaum*¹

The patentability of communication signals under 35 U.S.C. § 101 first came before the Supreme Court in relation to Samuel Morse's telegraph. Contrary to the Court's ruling in O'Reilly v. Morse, however, the Federal Circuit recently held in In re Nuijten that useful, man-made signals are unpatentable because they do not fit within any of § 101's enumerated invention categories. As this Comment argues, the holding in Nuijten is based on artificial, overly narrow, and self-contradictory distinctions that are inconsistent with the expansive interpretation of § 101 mandated by the Court in Diamond v. Chakrabarty and Diamond v. Diehr. The holding in Nuijten also conflicts with the WTO's Agreement on Trade-Related Aspects of Intellectual Property Rights ("TRIPS"), and is likely to impact substantive rights of inventors and frustrate important goals of patent reform, a current priority of both Congress and the executive branch.

I. INTRODUCTION

Samuel B. Morse, a Yale-educated portrait painter, built his first telegraph machine in 1835 in his spare time from his position

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as a professor of art at New York University.² Although he did not succeed in making the telegraph work over a significant distance until 1838, Morse applied for his first patent on the telegraph in 1837, which was granted as U.S. Patent No. 1647 in 1840.³ After receiving a grant from Congress in 1842 to develop the invention, Morse finally crossed the threshold of fame in 1844 when he transmitted the now-famous “What hath God wrought” message from the U.S. Supreme Court chambers in Washington, D.C., to his assistant in Baltimore.⁴ Morse’s original patent was reissued with amendments in 1846 and 1848.⁵

Imitation and infringement followed as others attempted to exploit Morse’s invention by installing telegraph systems across the United States.⁶ Morse responded through the courts, filing his first infringement suit in 1849 against Henry O’Reilly, who had installed a telegraph system in Kentucky and Tennessee in 1845.⁷ After the circuit court found Morse’s patent to be valid and infringed,⁸ O’Reilly appealed to the Supreme Court which heard *O’Reilly v. Morse*⁹ in 1853. Although the Court held that Morse’s claim¹⁰ to all use of electromagnetic power distance

² LEWIS COE, *THE TELEGRAPH: A HISTORY OF MORSE’S INVENTION AND ITS PREDECESSORS IN THE UNITED STATES* 28–29 (1993), available at <http://books.google.com/books?id=pzkZPIXm89UC>; Stephen G. Kunin & Bradley D. Lytle, *Patent Eligibility of Signal Claims*, 87 J. PAT. & TRADEMARK OFF. SOC’Y 991, 992 (2005).

³ Kunin & Lytle, *supra* note 2, at 992.

⁴ *Id.* at 993; see also Mary G. Bellis, *The History of the Telegraph and Telegraphy*, <http://inventors.about.com/library/inventors/bltelegraph.htm> (last visited Mar. 5, 2008) (on file with the North Carolina Journal of Law & Technology) (noting that the first message actually was sent from Baltimore to Washington on May 1, 1844, announcing that the Whig Party had selected Henry Clay as its presidential candidate).

⁵ Kunin & Lytle, *supra* note 2, at 992.

⁶ *Id.* at 993.

⁷ *Morse v. O’Reilly*, 17 F. Cas. 871 (C.C.D. Ky. 1848) (No. 9859); see also Kunin & Lytle, *supra* note 2, at 993.

⁸ *Morse*, 17 F. Cas. at 872.

⁹ 56 U.S. (15 How.) 62 (1853).

¹⁰ The claims are the section of a patent that defines the bounds of the actual invention. 35 U.S.C. § 112 (2000) (“The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.”).

communication was overly broad,¹¹ it upheld a claim for a “system of signs . . . for telegraphic purposes.”¹² This decision generally is considered the first instance of a signal being found patentable.¹³

Now fast-forward to the present, where advances such as the transistor, the integrated circuit, and digital computing and communications have relegated the telegraph to the role of a museum artifact. These advances have facilitated the creation of the Internet, a worldwide communications network through which the public can share many different types of information almost instantaneously. While a benefit to society in general, the Internet’s speed and ubiquity presents many challenges to copyright holders by enabling Internet users to propagate content cheaply, easily, and widely. Copyright holders have responded to these challenges in a variety of ways, notably through the use of content-protection techniques generally known as digital rights management (“DRM”).¹⁴ While DRM takes many different forms, the particular form of interest in this discussion is digital watermarking. In digital watermarking, a secondary data signal containing copyright or security information is embedded in a primary data signal containing multimedia content.¹⁵ With knowledge of the watermark, devices receiving a file containing the primary data signal can detect the presence, absence, or modification of the secondary watermark signal and respond

¹¹ *O'Reilly*, 56 U.S. (15 How.) at 119–20.

¹² *Id.* at 86, 95.

¹³ Kunin & Lytle, *supra* note 2, at 994.

¹⁴ See Marc Fisher, *Download Uproar: Recording Industry Goes After Personal Use*, WASH. POST, Dec. 30, 2007, at M05 (describing RIAA’s tactic of threatening legal action against individuals who make “unauthorized” digital copies of legally purchased CDs); Wade Roush, *Inside the Spyware Scandal*, TECH. REV., May 2006, at 48, available at <http://www.technologyreview.com/Biztech/16812/> (describing Sony-BMG’s attempt to distribute CDs with embedded DRM known as “rootkit”); Steve Jobs, Chief Executive Officer, Apple, *Thoughts on Music* (Feb. 6, 2007), <http://www.apple.com/hotnews/thoughtsonmusic> (on file with the North Carolina Journal of Law & Technology) (discussing Apple’s strategy with respect to its proprietary Fairplay DRM).

¹⁵ See Digital Watermarking Alliance, *Frequently Asked Questions*, <http://www.digitalwatermarkingalliance.org/faqs.asp> (last visited Apr. 5, 2008) (on file with the North Carolina Journal of Law & Technology).

appropriately by protecting the content carried on the primary data signal.¹⁶

Just like Morse's telegraph signals in *O'Reilly*, digital watermark signals reached a nexus with patent law in the recent case of *In re Nuijten*.¹⁷ In this case, the Federal Circuit considered the familiar question of whether a signal is patentable subject matter under 35 U.S.C. § 101.¹⁸ In contrast with the Supreme Court in *O'Reilly*, the court in *Nuijten*—despite having the benefit of 150 years of precedent and experiencing firsthand the recent technological revolution in computers and communications—narrowly construed § 101 and held that signals are per se unpatentable because they do not fall into any particular category of invention enumerated in the statute.¹⁹ This Comment argues that the majority in *Nuijten* created artificial, overly narrow, and self-contradictory distinctions between patentable and unpatentable subject matter under § 101. These distinctions are inconsistent not only with the controlling Supreme Court interpretations of § 101, but also with other recent Federal Circuit and Supreme Court case law and Congress's expressed intent behind the patent statutes. Furthermore, by elevating form above substance, the *Nuijten* opinion arguably places unnecessary burdens on both patent applicants and the U.S. Patent and Trademark Office ("USPTO"), thereby frustrating important goals of patent reform, a current priority for both Congress and the executive branch.

Part II of this Comment presents background material including the judicial interpretation of § 101, the definition of a "signal" and its relationship to computer programs, strategies for claiming inventions involving signals, and a brief history of case law on patentability of signals up to and including *Nuijten*. Part III presents a detailed analysis of the majority and dissenting opinions in *Nuijten* in view of the background material discussed in Part II as well as the recent Supreme Court decision in *KSR International*

¹⁶ *Id.*

¹⁷ 500 F.3d 1346 (Fed. Cir. 2007), *reh'g en banc denied*, 515 F.3d 1361 (Fed. Cir. 2008).

¹⁸ *Id.* at 1348.

¹⁹ *Id.* at 1357.

*Co. v. Teleflex, Inc.*²⁰ Part III then discusses how the patentability doctrine in *Nuijten* aligns with European patent law and Congress's intent behind the legislation implementing the TRIPS agreement. The last section of Part III assesses how the holdings of *Nuijten* are likely to impact the rights of inventors, the important goals of patent reform, or perhaps both. Finally, Part IV summarizes the information and analysis presented in Parts II and III and briefly discusses a new case²¹ before the Federal Circuit that eventually may impact the holdings of *Nuijten*.

II. BACKGROUND

The Constitution grants Congress broad powers to enact laws that "promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries."²² Congress first responded to this grant by enacting the Patent Act of 1790, which enabled the executive branch to grant a patent to "any person . . . [who has] invented or discovered any useful art, manufacture, engine, machine, or device, or any improvement therein not before known or used."²³ This initial statute further emphasized that the granting committee²⁴ must find the invention or discovery "sufficiently useful and important" as a prerequisite to granting the patent.²⁵ Congress amended this statutory language several times including significant changes in 1793, 1836, 1870, and most recently, 1952.²⁶

The current statutes governing the granting of patents are contained in various sections of title 35,²⁷ but the main

²⁰ 127 S. Ct. 1727 (2007).

²¹ See *In re Bilski*, No. 2007-1130, 2008 U.S. App. LEXIS 3246 (Fed. Cir. Feb. 15, 2008).

²² U.S. CONST. art. I, § 8, cl. 8.

²³ Patent Act of 1790, ch. 7, § 1, 1 Stat. 109, 109–10 (repealed 1836).

²⁴ This committee initially was composed of the Secretary of State, the Secretary of War, and the Attorney General. *Id.*

²⁵ *Id.*

²⁶ See Sam S. Han, *Analyzing the Patentability of "Intangible" yet "Physical" Subject Matter*, 3 COLUM. SCI. & TECH. L. REV. 2, 8–11 (2002) (describing the history of revisions to the patent statutes).

²⁷ See generally 35 U.S.C. §§ 1–376 (2000).

requirements for patentability are found in four specific sections. First, § 101 specifies the scope of patentable subject matter: “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.”²⁸

The most important “conditions and requirements” mentioned in § 101 are those found in §§ 102, 103, and 112. Section 102 sets forth a number of conditions related to prior public knowledge, sale, use, and patenting of an invention that must be met in order for the invention to be considered “novel” and thus patentable.²⁹ Furthermore, § 103 requires that an invention be “non-obvious” in order to be patentable.³⁰ Finally, § 112 requires the inventor to describe his or her invention to a degree that will “enable any person skilled in the art to which it pertains . . . to make and use” the invention.³¹ This requirement has been referred to as the patent holder’s consideration in the patent bargain.³²

A. *Judicial Interpretation of 35 U.S.C. § 101*

While all of the statutory sections mentioned above contain important requirements for patentability of an invention, § 101 is arguably the most important because it is the initial door through which an applicant must pass.³³ If this door is too narrow or restrictive, the limitations or restrictions of §§ 102, 103, and 112 become almost irrelevant. On the other hand, courts have long been wary of opening the door too widely at the risk of removing from the public domain the “basic tools of scientific and technological work.”³⁴ Consequently, courts have continuously

²⁸ *Id.* § 101 (emphasis added).

²⁹ *Id.* § 102.

³⁰ *Id.* § 103. The Supreme Court recently interpreted the non-obviousness requirement of § 103 in *KSR International Co. v. Teleflex, Inc.*, 127 S. Ct. 1727 (2007). See *infra* Part III.B.

³¹ 35 U.S.C. § 112 (2000).

³² *Bonito Boats, Inc. v. Thunder Craft Boats, Inc.*, 489 U.S. 141, 151 (1989).

³³ *In re Bergy*, 596 F.2d 952, 960 (C.C.P.A. 1979) (“The first door which must be opened on the difficult path to patentability is § 101.”), *vacated as moot sub nom.* *Diamond v. Chakrabarty*, 444 U.S. 1028 (1980) (mem.).

³⁴ *Gottschalk v. Benson*, 409 U.S. 63, 67 (1972).

struggled to define the scope of patentable subject matter under § 101, and as a result two conflicting viewpoints have emerged from Supreme Court and Federal Circuit case law, as discussed in this section below.

The telegraph in *O'Reilly* provided an initial opportunity for the Supreme Court to define the bounds of patentable subject matter. While the Supreme Court allowed Morse's patent claim for the "system of signs," the majority opinion held that the claim covering the "use of the motive power of the electric or galvanic current . . . for marking or printing intelligible characters, signs, or letters, at any distances" was overly broad because it attempted to claim a principle of nature.³⁵ On the other hand, the dissent in *O'Reilly* would have allowed that same claim on the basis that the invention made an existing law of nature "the servant of man . . . [applied] to the perfecting of a new and useful art."³⁶ The Court later clarified this distinction in *Dolbear v. American Bell Telephone Co.*³⁷ by holding that electricity could be patentable subject matter if the invention embodied a particular process of use rather than a general application of a principle of nature, as Morse attempted to do with telegraphy.³⁸

While the Supreme Court's holding in *Dolbear* emphasized practical usefulness as a requirement for patentability, the Court later retreated somewhat from this position in *American Fruit Growers, Inc. v. Brogdex Co.*³⁹ In dealing with a patented process for treating oranges to prevent mold growth, the Court held in *American Fruit* that a useful application of a scientific principle was not necessarily patentable subject matter.⁴⁰ Instead, the invention must produce a change in form, quality, property, character, or use in order to be patentable.⁴¹

³⁵ *O'Reilly v. Morse*, 56 U.S. (15 How.) 62, 112 (1854).

³⁶ *Id.* at 132 (referring to electromagnetism being used for telegraphy).

³⁷ 126 U.S. 1 (1888).

³⁸ *Id.* at 534 (distinguishing *O'Reilly* from the case before the court); see Han, *supra* note 26, at 21–22.

³⁹ 283 U.S. 1 (1931).

⁴⁰ *Id.* at 11 (noting the principle that an orange could be made resistant to blue mold decay when its skin was impregnated with borax).

⁴¹ *Id.* at 11–13.

The emergence of digital computing brought before the courts a number of questions related to the patentability of algorithms implemented in computer hardware or software. In *Gottschalk v. Benson*,⁴² the Supreme Court considered patent claims relating to a method for converting numbers from one format into another by an algorithm implemented on a digital computer.⁴³ The Court analogized algorithms to laws of nature—in particular Morse’s use of electromagnetism for telegraphy⁴⁴—which under *O’Reilly* and *Dolbear* were unpatentable due to the policy of ensuring that the “basic tools of scientific and technological work” are available to the public.⁴⁵ The Court concluded that the same policy considerations applied to algorithms implemented as computer programs when such algorithms had “no substantial practical application” except when implemented in a computer.⁴⁶ Lower courts, however, have interpreted *Benson* narrowly based on this particular language.⁴⁷

The Supreme Court also considered the scope of § 101 in *Kewanee Oil Co. v. Bicron Corp.*⁴⁸ In considering a conflict between state trade secret law and federal patent law, the Court stated that “no patent is available for a discovery, however useful, novel, and non[-]obvious, unless it falls within one of the express categories of patentable subject matter” in § 101.⁴⁹ Some lower courts have interpreted and applied this language as an additional requirement for inventions to achieve a categorical fit as either a

⁴² 409 U.S. 63 (1972).

⁴³ *Id.* at 65. Interestingly, the Court used the word “signals” to describe the numerical data being converted.

⁴⁴ *Id.* at 68.

⁴⁵ *Id.* at 67.

⁴⁶ *Id.* at 71.

⁴⁷ See *In re Castelet*, 562 F.2d 1236, 1243 (C.C.P.A. 1977) (“Because it did not consider the performance of an algorithm by a computer as constituting a practical application of that algorithm under the rule, the Court must have viewed *Benson*’s claims as effectively claiming the ‘effect,’ principle, or law or force of nature (the algorithm) itself.”).

⁴⁸ 416 U.S. 470 (1974).

⁴⁹ *Id.* at 483.

process, machine, manufacture, or composition of matter in order to pass through the door of § 101.⁵⁰

Nevertheless, there is an important line of precedent that properly takes a more expansive view of the scope of patentable subject matter under § 101 than the line of cases discussed above. In *In re Musgrave*,⁵¹ the Court of Customs and Patent Appeals (“CCPA”) considered a claim for a method for correcting seismic data.⁵² The court held that the only requirement for an invention to be considered patentable subject matter is that it must be among the “technological arts” so as to be aligned with the Constitutional purpose of promoting the progress of “useful arts.”⁵³ This venerable phrase from the Patent Clause also has been interpreted by modern courts to mean “technological innovation.”⁵⁴

The leading case supporting an expansive interpretation of the scope of patentable subject matter is *Diamond v. Chakrabarty*.⁵⁵ In *Chakrabarty*, the Supreme Court considered the patentability of a non-naturally-occurring strain of bacteria that had been developed by a research scientist employed by General Electric.⁵⁶ The Court examined the legislative history of the Patent Act of 1952 and concluded that by enacting those laws, Congress intended § 101 to provide an expansive scope for patentable subject matter—namely “anything under the sun that is made by man.”⁵⁷ The Court noted, however, that § 101 did not include every discovery and reaffirmed three specific exceptions that had been held to be unpatentable in earlier cases—abstract ideas, laws of nature, and mathematical

⁵⁰ *State St. Bank & Trust Co. v. Signature Fin. Group*, 149 F.3d 1368, 1372 (Fed. Cir. 1998) (“[F]or the purposes of a § 101 analysis, . . . [the type of claim is irrelevant] as long as it falls within at least one of the four enumerated categories of patentable subject matter . . .”).

⁵¹ 431 F.2d 882 (C.C.P.A. 1970).

⁵² *Id.* at 884. The CCPA was the predecessor to the Court of Appeals for the Federal Circuit, which was established in 1982.

⁵³ *Id.* at 893.

⁵⁴ *In re Comiskey*, 499 F.3d 1365, 1375 (Fed. Cir. 2007) (quoting *Paulik v. Rizkalla*, 760 F.2d 1270, 1276 (Fed. Cir. 1985) (en banc)).

⁵⁵ 447 U.S. 303 (1980).

⁵⁶ *Id.* at 305.

⁵⁷ *Id.* at 309 (quoting S. REP. NO. 82-1979, at 5 (1952); H.R. REP. NO. 82-1923, at 6 (1952)).

formulas.⁵⁸ Based on these criteria, the Court held that the genetically-engineered organism at issue was patentable under § 101 because it was “a product of human ingenuity having a distinctive name, character [and] use.”⁵⁹ Thus, under *Chakrabarty*, an invention satisfies the “new” requirement of § 101 if it was the result of human ingenuity rather than an already-existing formula or principle that was merely discovered.⁶⁰ Furthermore, the opinion cautioned lower courts to avoid reading limitations into the patent laws unless such limitations are clearly expressed by Congress in the legislative history.⁶¹

The Supreme Court affirmed *Chakrabarty*’s expansive language the following year in *Diamond v. Diehr*.⁶² In *Diehr*, the Court held that an invention incorporating a mathematical algorithm or formula satisfies the requirements of § 101 if the invention “implements or applies that formula in a structure or process which, when considered as a whole, is performing a function which the patent laws were designed to protect.”⁶³ Specifically, if the process has practical utility, the fact that it includes a mathematical algorithm or equation does not remove it from the scope of § 101.⁶⁴ Thus, *Diehr* stands for the proposition that in addition to being a product of human ingenuity, an invention also must have a practical application in order to be patentable⁶⁵—in other words, it must meet the “useful”

⁵⁸ *Id.*

⁵⁹ *Id.* at 310.

⁶⁰ *In re Nuijten*, 500 F.3d 1346, 1363 (Fed. Cir. 2007) (Linn, J., dissenting) (“[T]he term ‘new’ in § 101 [establishes] a separate requirement that statutory subject matter be a type of invention that can be described as a ‘new’ creation rather than the discovery of a pre-existing principle.”), *reh’g en banc denied*, 515 F.3d 1361 (Fed. Cir. 2008).

⁶¹ *Chakrabarty*, 447 U.S. at 308 (citing *United States v. Dubilier Condenser Corp.*, 289 U.S. 178, 199 (1933)).

⁶² 450 U.S. 175 (1981).

⁶³ *Id.* at 192.

⁶⁴ *Id.* at 187–88 (“[W]hen a process for curing rubber is devised which incorporates in it a more efficient solution of the equation, that process is at the very least not barred at the threshold by § 101.”).

⁶⁵ *State St. Bank & Trust Co. v. Signature Fin. Group*, 149 F.3d 1368, 1373 (Fed. Cir. 1998) (“In *Diehr*, the Court explained that certain types of

requirement of § 101. Lower courts generally have followed this interpretation of § 101 in later decisions, including several decisions relating to the patentability of mathematical algorithms implemented in digital computers.⁶⁶

In summary, the key distinction between the expansive and narrow views of patentable subject matter under § 101 is whether the four enumerated categories—process, machine, manufacture, or composition of matter—should be interpreted broadly to be co-extensive with “anything under the sun that is made by man” that has practical utility,⁶⁷ or narrowly as an additional limitation on this broad scope. It is important to note that neither *Chakrabarty* nor *Diehr* explicitly overruled *Benson* and earlier cases supporting the narrow view.⁶⁸ Thus, although the expansive view appears to be dominant in Federal Circuit cases relating to inventions that push the boundaries of § 101,⁶⁹ the narrow view occasionally appears as it did in *Nuijten*.

B. *What Exactly Is a “Signal”?*

A signal may be defined in a technical sense as “any physical quantity that varies with time, space, or any other variable.”⁷⁰ A more functional definition, however, is that a signal is a means to accomplish the fundamental human need to communicate or convey information to others beyond the range of sight or hearing.⁷¹ Fire signals have been used extensively for this purpose

mathematical subject matter, standing alone, represent nothing more than abstract ideas until reduced to some type of practical application . . .”).

⁶⁶ See *infra* Part II.D.

⁶⁷ See 1 DONALD CHISUM, CHISUM ON PATENTS § 1.01 (2007) (“The general purpose of the statutory classes of subject matter is to limit patent protection to the field of applied technology, what the United States Constitution calls ‘the useful arts.’”).

⁶⁸ See Han, *supra* note 26, at 44.

⁶⁹ See *infra* Part II.D; see also CHISUM, *supra* note 67, § 1.01 (“The four old classes of statutory subject matter have proved to be quite flexible. They have been interpreted so as to cover most of the new technologies that evolved during the last 200 years.”).

⁷⁰ JOHN G. PROAKIS & DMITRIS G. MANOLAKIS, DIGITAL SIGNAL PROCESSING PRINCIPLES, ALGORITHMS, AND APPLICATIONS 2 (2d ed. 1992).

⁷¹ COE, *supra* note 2, at 2.

for nearly 2000 years, and accounts from as early as 480 B.C. mention reflected sunlight being used for signaling.⁷² Prior to Morse's electric telegraph, visual telegraph systems involving movable displays and a series of relay towers had been used to transmit information over long distances.⁷³

Morse's electric telegraph invention was groundbreaking in two distinct ways. First, it attempted to harness the invisible force of electricity for an application that previously had been done visually.⁷⁴ Second, Morse's "system of signs" was the first "letter code" in which symbols were assigned to represent individual letters of the English alphabet.⁷⁵ Although not visible, the electric telegraph signals were physical manifestations of electromagnetic energy that directly conveyed intelligible information by variations in electric current caused by Morse's code.⁷⁶

This physical nature is equally apparent in signals used in modern communication systems that transmit information over radio waves, through optical fibers, or on copper wires between chips on a printed circuit board in a digital computer. It is important, however, to distinguish between the signal and its "carrier" in such systems. Although the two are often conflated, the signal is more properly defined as the information component while the carrier represents the electromagnetic wave or energy that conveys the

⁷² *Id.* at 2–3.

⁷³ *Id.* at 5–6.

⁷⁴ Morse's 1848 reissue application included the following statement:

Various modes of telegraphing, or making signs or signals at a distance, have for ages been in use. The signs employed heretofore have had one quality in common. They are evanescent—shown or heard a moment, and leaving no trace of their having existed. . . . I do not, therefore, claim to be the inventor of telegraphs generally. . . . The original and final object of my telegraph is to imprint characters at any distance as signals for intelligence; its object is to mark or impress them in a permanent manner. To obtain this end, I have applied electricity in two distinct ways.

O'Reilly v. Morse, 56 U.S. (15 How.) 62, 87 (1854).

⁷⁵ COE, *supra* note 2, at 9.

⁷⁶ *See O'Reilly*, 56 U.S. (15 How.) at 117 ("Professor Morse . . . has been able, by a new combination of known powers, of which electro-magnetism is one, to discover a method by which intelligible marks or signs may be printed at a distance.").

signal to the intended recipient.⁷⁷ In an FM radio transmission, for instance, the electromagnetic radio wave having a frequency of 91.5 megahertz is the radio-frequency *carrier* that conveys the audible *signal* consisting of speech, music, and other sounds.⁷⁸

This audible signal is an example of an “analog” signal that varies continuously over time.⁷⁹ In order to process this signal with an algorithm implemented in a digital computer, the analog signal must be converted into a digital signal by sampling it at discrete points in time.⁸⁰ This first digital signal can then be processed directly to create a second digital signal,⁸¹ which may be stored for future processing, including conversion back to an analog signal.⁸² While the first digital signal is a direct representation of the analog signal (e.g., speech, music, or video), the second digital signal is a new creation that has been given a new form (e.g., compressed to require less capacity for storage or transmission) or new properties (e.g., embedded with a digital watermark). Likewise, the second

⁷⁷ See ALAN V. OPPENHEIM & RONALD W. SCHAFER, DIGITAL SIGNAL PROCESSING 6 (1975) (defining a signal as “a function that conveys information, generally about the state or behavior of a *physical* system” (emphasis added)); JOHN G. PROAKIS, DIGITAL COMMUNICATIONS 164 (2d ed. 1989) (distinguishing between information and carrier components of a signal).

⁷⁸ There are certain physical signals that do not utilize carriers; these are often referred to as “bitstreams” or “baseband signals.” See PROAKIS, *supra* note 77, at 164. One example of a baseband signal is a stream of digital data that is transmitted between chips on a printed circuit board found in a digital computer.

⁷⁹ PROAKIS & MANOLAKIS, *supra* note 70, at 4.

⁸⁰ *Id.* at 2–4. Note that the term “digital computer” is used broadly here to denote both general- and special-purpose digital computing systems, including those found in consumer devices such as cellular phones, MP3 players, gaming systems, etc.

⁸¹ This step generally describes a field of study known as “digital signal processing,” an area of applied mathematics that has grown rapidly since the 1970s due to the improvements of digital computing technology. See *id.* at 1; see also OPPENHEIM & SCHAFER, *supra* note 77, at 1–5 (discussing the historical development of this field).

⁸² For example, an analog music signal may be sampled and stored on a compact disk and later processed by an algorithm, known as an encoder, to create an MP3 file that is stored on another disk. This file subsequently may be processed by another algorithm, known as a decoder, to recreate its original analog format for playback to a listener.

digital signal may be transmitted by using it to affect changes to certain properties of a carrier.⁸³

Signals are similar to mathematical algorithms in that both often are expressed entirely as seemingly abstract mathematical formulas.⁸⁴ The two play complementary roles, however, in the context of digital computing and communications. While an algorithm expresses a mathematical function or process to be performed, a digital signal often is the input to or result of that function or process. Furthermore, even though a digital signal may seem abstract, it often is either a direct or indirect representation of a physical process.⁸⁵ These distinctions are important to understanding patentability of signals, as discussed further below.

C. *Claiming Strategies for Inventions Involving Signals*

Although a general discussion on the principles of patent claim drafting is beyond the scope of this Comment, it is helpful for the subsequent analysis to consider various ways in which signals were claimed in patents that were granted prior to *Nuijten*. One approach is to claim a signal that is imposed upon a carrier wave.⁸⁶ This type of claim structure is intended to create a formally tangible embodiment of the signal in the same manner as a claim for a mathematical algorithm encoded on a computer-readable medium.⁸⁷ Prior to *Nuijten*, the USPTO explicitly recognized that “computer data signals embodied in a carrier wave” were patentable subject matter, regardless of whether the embodiment in

⁸³ For instance, the information may be used to produce controlled changes in the frequency of a radio transmission (known as “frequency modulation” or “FM”) or in the intensity or amplitude of a light source used for fiber-optic transmission (known as “amplitude modulation” or “AM”). See PROAKIS, *supra* note 77, at 164.

⁸⁴ See Han, *supra* note 26, at 2.

⁸⁵ See *supra* notes 79–80 and accompanying text describing the digital and analog representations of the music signal.

⁸⁶ Kunin & Lytle, *supra* note 2, at 996.

⁸⁷ *Id.*

an electromagnetic carrier wave was “transitory and ephemeral in nature.”⁸⁸

Another technique that has been successful in obtaining a patent is to claim the signal in the form of structural components, often arranged in a specified order.⁸⁹ In some cases, rather than recite a carrier or any other formalities intended to imply tangibility, the claimed structure has been coupled with an intended function or use.⁹⁰ In other cases, however, a claim combining a signal structure with a carrier wave has been sufficient to constitute patentable subject matter.⁹¹

Finally, a third way to claim a signal is as a product of a series of actions. This type of claim structure is known as “product-by-process” and is generally accepted by the USPTO as a way to claim a product or article by the steps needed to create or produce it.⁹² The claim below illustrates how this approach has been used to claim a digital signal:

A coded video signal generated according to a method, comprising: *recognizing* video objects from video data; *recognizing* instances of a video object at given times as video object planes (VOPs); *assigning* VOPs to one or more video object layers; *coding* data for one of the video object layers, the coding comprising: *generating* a start code that marks the one video object layer, *generating* a layer [ID] field that uniquely identifies the one video object layer, and *coding* the VOPs in

⁸⁸ *Id.* (quoting materials used by the USPTO to train examiners); *Ex parte* Rice, No. 2002-1554, Application No. 08/003,996 (B.P.A.I., argued Feb. 13, 2003) (non-precedential).

⁸⁹ See Kunin & Lytle, *supra* note 2, at 997.

⁹⁰ See, e.g., U.S. Patent No. 6,052,150, col.55 l.16 (filed Dec. 31, 1998) (reciting a “video data signal for use in a video coding apparatus”).

⁹¹ U.S. Patent No. 6,505,032, col.14 l.60 (filed Oct. 10, 2000) (reciting a “computer data signal embodied in a carrierless ultra wideband waveform including wavelets having predetermined shapes”).

⁹² See U.S. PATENT & TRADEMARK OFFICE, MANUAL OF PATENT EXAMINING PROCEDURES § 2113 (8th ed., rev. 6, 2007) [hereinafter MPEP] (noting that product-by-process claims are limited only by the structure implied by the steps, which must be considered when determining patentability under §§ 102 and 103). Note that a product is synonymous with the statutory category of “manufacture” or “article of manufacture.”

the one video object layer; and *outputting* the start code, the layer id field and coded VOP data as the coded data signal.⁹³

The italicized portions indicate the actions used to create the coded video signal product. The signal in this claim is not tied to any particular carrier but rather represents the output of a process, which may be claimed separately in the same patent.⁹⁴ The signal claim at issue in *Nuijten* was written in product-by-process format.⁹⁵

In summary, there are several approaches for claiming signals that have been accepted by the USPTO as compliant with the requirements of § 101. Few of these approaches, however, had been considered by the Federal Circuit or the CCPA prior to *Nuijten*.

D. Patentability of Signals—A Brief Summary of Prior Case Law

After *O'Reilly*, one of the first instances where a court considered the nature and properties of signals was in *In re Musgrave*. The issue before the CCPA in *Musgrave* was the patentability of a method for processing seismic data by using a mathematical approach implemented by computing equipment.⁹⁶ The court distinguished between signals that represent information or data and signals that represent the “state of a physical or material thing,” declaring the former category to be “abstract[] and intangible.”⁹⁷ The court implied that the latter category may be sufficiently physical to be patentable subject matter, at least as part of a method claim.⁹⁸

⁹³ U.S. Patent No. 6,707,949, col.16 l.57 (filed Jan. 6, 2003) (emphasis added); see also U.S. Patent No. 6,556,625, col.14 l.2 (filed Aug. 31, 2001) (reciting a “coded data signal generated according to” a described process).

⁹⁴ See *Ex parte Nuijten*, No. 2003-0853, 2006 WL 3939192, 84 U.S.P.Q.2d (BNA) 1335, 1336 (B.P.A.I. Jan. 24, 2006) (non-precedential) (reciting a patentable method claim corresponding to the signal claim at issue in the case).

⁹⁵ See *In re Nuijten*, 500 F.3d 1346, 1355 (Fed. Cir. 2007), *reh'g en banc denied*, 515 F.3d 1361 (Fed. Cir. 2008).

⁹⁶ *In re Musgrave*, 431 F.2d 882, 887 (C.C.P.A. 1970).

⁹⁷ *Id.* at 886–87.

⁹⁸ Han, *supra* note 26, at 58.

The CCPA encountered the same issue of the patentability of method claims involving signals in *In re Foster*.⁹⁹ The court defined a signal based on its ability to transmit or convey information—either as an “event or occurrence” or a “visual, aural, or other indication.”¹⁰⁰ Applying these definitions and the holding in *Musgrave*, the court held that *methods* involving signals were patentable subject matter regardless of whether the signals were recognized as being “limited to machine implementation.”¹⁰¹ Thus, *Foster* arguably supports the inference that non-physical, information-bearing signals are also patentable subject matter.¹⁰²

Nevertheless, the CCPA seemed to retreat somewhat from this position in *In re Walter*,¹⁰³ in which it considered another invention claiming both a system and a method for processing seismic signals.¹⁰⁴ The court characterized the claimed system for processing signals as “pure mathematics” rather than “any particular art or technology.”¹⁰⁵ The court’s statement appears to be based, at least in part, on the failure of the claims to relate the signals to a representation of a physical quantity.¹⁰⁶ This approach effectively affirmed the “technological arts” criteria for patentable subject matter that the CCPA previously articulated in *Musgrave*.¹⁰⁷

After *Walter*, the CCPA and Federal Circuit heard no other cases related to the patentability of signals under § 101 until *Nuijten*. Nevertheless, the Federal Circuit heard a number of significant cases related to the issue of whether, and under what conditions, computer-implemented algorithms fell within the scope of § 101.¹⁰⁸ While not necessarily controlling on signal patentability,

⁹⁹ 438 F.2d 1011 (C.C.P.A. 1971).

¹⁰⁰ *Id.* at 1016.

¹⁰¹ *Id.*

¹⁰² *Cf.* Han, *supra* note 26, at 58 (stating that *Foster* held that signals are patentable subject matter).

¹⁰³ 618 F.2d 758 (C.C.P.A. 1980).

¹⁰⁴ *Id.* at 760–61.

¹⁰⁵ *Id.* at 770.

¹⁰⁶ *Id.* (distinguishing the claims at issue from those allowed in an earlier case that were directed toward enhancing digital data in seismic records by processing “physical signals representing physical phenomena”).

¹⁰⁷ See *supra* notes 51–53 and accompanying text.

¹⁰⁸ See *infra* notes 110–26 and accompanying text.

the opinions in these cases are nonetheless instructive considering the relationship between digital signals and algorithms, as discussed in Part II.B.¹⁰⁹

In *In re Alappat*,¹¹⁰ the Federal Circuit considered the issue of whether a device that used a computer-implemented algorithm to create a smooth waveform for display on a laboratory instrument was patentable subject matter under § 101.¹¹¹ In reversing the USPTO appeals board, the court stated that the proper test for determining whether an invention fell under the “mathematical formula” exception of *Chakrabarty* was whether the “claimed subject matter as a whole was a disembodied mathematical concept.”¹¹² The court went on to hold that the claimed device met the requirements of § 101 because it was not a disembodied mathematical concept but rather a machine that produced a “useful, concrete, and tangible result.”¹¹³ Furthermore, several of the concurring *Alappat* opinions articulated the proposition that the scope of patentable subject matter is determined by technological utility.¹¹⁴

The Federal Circuit again considered the issue of the patentability of a machine that included a computer-implemented mathematical algorithm in *State Street Bank & Trust Co. v. Signature Financial Group*.¹¹⁵ The invention at issue was a data-processing system, known as “Hub and Spoke,” programmed with software to calculate a daily asset allocation between two or more

¹⁰⁹ It is also important to note that *Musgrave*, *Foster*, and *Walter* were decided before the Supreme Court’s expansive interpretation of § 101 in *Chakrabarty*, while the Federal Circuit cases on patentability of computer algorithms were decided after that landmark case.

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

¹¹¹ *Id.* at 1537.

¹¹² *Id.* at 1544.

¹¹³ *Id.*

¹¹⁴ *Id.* at 1552 (Archer, C.J., & Nies, J., concurring in part and dissenting in part) (stating that “patent law rewards persons for inventing technologically useful applications instead of philosophizing”); *id.* at 1569 (Newman, J., concurring) (stating that “mathematics is . . . a vehicle of applied technology” and noting that the Board’s rejection was improper because it failed to recognize that the invention was a “practical application”).

¹¹⁵ 149 F.3d 1368 (Fed. Cir. 1998).

mutual funds that had pooled their individual assets into a partnership fund.¹¹⁶ The system also provided other financial metrics such as gain, loss, income, expenses, and share price.¹¹⁷ In reversing the district court's holding that the patent was invalid under § 101, the Federal Circuit applied *Alappat* and held that transforming financial data by a machine through a series of mathematical calculations into a final share price was patentable under § 101 because it produced a "useful, concrete, and tangible result."¹¹⁸ The fact that the invention's result was merely a number that was only "momentarily fixed" did not render it abstract or intangible and thus make the invention unpatentable under the *Alappat* test.¹¹⁹ Instead, the determinative factor for the court in *State Street* was the number's practical utility, illustrated by the fact that it was relied upon by regulatory agencies.¹²⁰

In *AT&T Corp. v. Excel Communications, Inc.*,¹²¹ the Federal Circuit considered the related issue of whether a *process* that included a computer-implemented mathematical algorithm was within the scope of patentable subject matter under § 101.¹²² The process at issue generated a data field (the "PIC") that represented a caller's primary long-distance carrier and added the PIC to the record of a long-distance call.¹²³ At the outset, the court stated that the scope of § 101 was the same regardless of whether an invention is claimed as a machine or a process.¹²⁴ The court then applied the *State Street* test and held that the process at issue fell comfortably within the scope of § 101 since, as a whole, it produced a "useful, concrete, and tangible result."¹²⁵ Therefore, even though the PIC

¹¹⁶ *Id.* at 1370–71. The individual mutual funds were the "spokes" while the partnership fund was the "hub" in the arrangement. *Id.*

¹¹⁷ *Id.* at 1371.

¹¹⁸ *Id.* at 1373 (quoting *In re Alappat*, 33 F.3d 1526, 1544 (Fed. Cir. 1994)).

¹¹⁹ *Id.*

¹²⁰ *Id.*

¹²¹ 172 F.3d 1352 (Fed. Cir. 1999).

¹²² *Id.* at 1354.

¹²³ *Id.* at 1353–54. The practical utility of the process was to enable the local phone company to choose which long-distance carrier's facilities over which to route the call. *Id.*

¹²⁴ *Id.* at 1357.

¹²⁵ *Id.* at 1361.

was merely a data field representing a preferred long-distance carrier, it was a “useful, non-abstract result” that facilitated a practical application and made the claimed process fall within the scope of § 101.¹²⁶

In summary, *Alappat*, *State Street*, and *Excel* show that the proper test for whether *any* invention, regardless of type, falls within the broad scope of § 101 is whether the invention as a whole produces a useful, concrete, and tangible result. Such results may be numbers or data provided that they represent non-abstract entities related to a practical application. These principles provide excellent guidance for determining patentability of signals, the question that the Federal Circuit faced in *Nuijten*.

E. *In re Nuijten*

The case in *Nuijten* arose to the Federal Circuit as an appeal of a decision by the Board of Patent Appeals and Interferences (“BPAI”) to reject four claims in a patent application by Petrus A.C.M. Nuijten as being directed toward unpatentable subject matter under § 101.¹²⁷ The invention at issue was a technique for reducing distortion in a desired signal caused by inserting digital watermark information intended to protect against unauthorized copying of the signal from a medium in which it is stored.¹²⁸ Nuijten claimed his invention in several different ways: as a method for embedding supplemental data (i.e., the watermark) in a signal, as an arrangement (i.e., system) for embedding the supplemental data, as a computer-readable storage medium containing a signal with embedded supplemental data, and finally as:

¹²⁶ *Id.* at 1358 (noting that the PIC “facilitates differential billing of long-distance calls”).

¹²⁷ *In re Nuijten*, 500 F.3d 1346, 1348 (Fed. Cir. 2007), *reh’g en banc denied*, 515 F.3d 1361 (Fed. Cir. 2008). See generally *Ex parte Nuijten*, No. 2003-0853, 2006 WL 3939192, 84 U.S.P.Q.2d (BNA) 1335 (B.P.A.I. Jan. 24, 2006) (non-precedential). The BPAI is an administrative tribunal within the USPTO.

¹²⁸ *In re Nuijten*, 500 F.3d at 1348. Nuijten’s approach was directed to solve the distortion problem associated with the particular way in which the desired signal was encoded, known as “delta modulation.” *Id.* at 1349.

[Claim] 14. A signal with embedded supplemental data, the signal being encoded in accordance with a given encoding process and selected samples of the signal representing the supplemental data, and at least one of the samples preceding the selected samples is different from the sample corresponding to the given encoding process.¹²⁹

The patent examiner rejected the latter two forms as non-statutory subject matter under § 101.¹³⁰ On appeal, the BPAI reversed the examiner's rejection of the storage medium claim and held that the claim was directed to an article of manufacture and thus within the scope of § 101.¹³¹ The panel, however, upheld the rejection of the signal claim because the signal described had "no physical attributes . . . [and thus was] an 'abstract idea'" unpatentable under *Diehr*, and because it did not fall into any of the four categories enumerated in § 101.¹³²

The Federal Circuit panel split into majority and dissenting opinions after hearing the appeal of the BPAI's decision on the signal claim. The majority opinion first analyzed the actual scope of the signal claim. After concluding that the purpose of a signal is to convey information, the majority stated that in order for a signal to accomplish this purpose, it must have some physical form or carrier, but the nature of the physical carrier is irrelevant to the claims—"any form will do."¹³³ The majority went on to state that even though a signal may have a physical carrier, it will not qualify as patentable subject matter under § 101 if it is "transitory."¹³⁴ Accordingly, radio waves, light pulses through an optical fiber, and electrical pulses through a metal wire are all examples of transitory signals—and as a result unpatentable—regardless of whether they convey information.¹³⁵

The *Nuijten* majority based this holding on an analysis of whether signals fit within any of the four categories of inventions enumerated in § 101.¹³⁶ Easily dispensing with the other three

¹²⁹ *Ex parte Nuijten*, 2006 WL 3939192, at *2, 84 U.S.P.Q.2d at 1336.

¹³⁰ *In re Nuijten*, 500 F.3d at 1351.

¹³¹ *Id.* at 1351–52.

¹³² *Ex parte Nuijten*, 2006 WL 3939192, at *8, 84 U.S.P.Q.2d at 1337–39.

¹³³ *In re Nuijten*, 500 F.3d at 1353.

¹³⁴ *Id.*

¹³⁵ *Id.*

¹³⁶ *Id.*

categories, the court focused its analysis on whether a signal may be considered a “manufacture.”¹³⁷ Relying on a definition from a nineteenth-century dictionary,¹³⁸ the majority determined that manufactures are limited to “tangible articles or commodities [and that a] transient electric or electromagnetic transmission does not fit within that definition.”¹³⁹ According to the majority, a transitory signal does not possess the tangibility needed to fall within one of the enumerated categories of patentable subject matter under § 101, even if the signal is both physical and man-made.¹⁴⁰ Accordingly, the majority affirmed the BPAI’s holding that the claimed signal was unpatentable.¹⁴¹

The *Nuijten* dissent, however, would have found that the claim fit within the broad scope of § 101, which Congress intended to “cover the full scope of technological ingenuity, however it might best be claimed.”¹⁴² The dissent argued that the claimed signal constituted a “manufacture” if that term were interpreted in a manner consistent with the expansive view of § 101 as done in *Chakrabarty* rather than in an overly narrow manner as done by the majority.¹⁴³ The dissent strongly objected to the majority’s introduction of the requirements that a manufacture be tangible and non-transitory in order to be patentable under § 101.¹⁴⁴ Instead, the claimed signal should be patentable because it was created or manipulated by human activity, had practical purpose or usefulness

¹³⁷ *Id.* at 1356 (“The question of whether the claimed signals are ‘manufactures’ is more difficult.”). The court used “manufacture” and “article of manufacture” interchangeably. *Id.* (“The term [‘manufacture’] is used in the statute in its noun form . . . and therefore refers to ‘articles’ resulting from the process of manufacture.”).

¹³⁸ *Id.* (citing 1 CENTURY DICTIONARY 326 (William Dwight Whitney ed., 1895)).

¹³⁹ *Id.*

¹⁴⁰ *Id.* at 1356–57.

¹⁴¹ *Id.* at 1357.

¹⁴² *Id.* at 1362 (Linn, J., dissenting).

¹⁴³ *Id.* at 1363 (noting that *Chakrabarty* “leaves little room for the term ‘manufacture’ to impose additional limitations on the scope of patentable subject matter”).

¹⁴⁴ *Id.* at 1359.

of conveying information,¹⁴⁵ and necessarily had a “physical form.”¹⁴⁶

III. ANALYSIS

Given the background provided in Part II, this section analyzes the Federal Circuit’s *Nuijten* decision in various ways. First, Part III.A explores the majority’s reasoning and how the holdings align with existing Federal Circuit and Supreme Court precedent on § 101. Part III.B then critiques the majority opinion by analogy to the Supreme Court’s recent *KSR* decision interpreting § 103. Part III.C discusses and compares the patentability of signals under European law with the doctrine articulated in *Nuijten*. Finally, Part III.D explores some possible effects of *Nuijten* on the substantive rights of inventors and important patent reform initiatives.

A. *The Underlying Logic of the Nuijten Holdings*

1. *Construction of 35 U.S.C. § 101*

The majority and dissenting opinions in *Nuijten* differed significantly in their interpretations of the scope of patentable subject matter under § 101. The majority generally followed the “narrow view” previously discussed,¹⁴⁷ asserting that a claimed invention will fall outside of the scope of § 101 if it does not fit in any of the four enumerated categories, regardless if the subject matter is both new and useful.¹⁴⁸ This position has two critical flaws. First, the majority cited no authority for this statement and, more alarmingly, completely neglected to cite *Chakrabarty* in its analysis of the scope of patentable subject matter under § 101.¹⁴⁹ As a result, the majority failed to justify its position that the enumerated categories of inventions—process, machine, manufacture, and composition of matter—set more appropriate

¹⁴⁵ *Id.*

¹⁴⁶ *Id.* at 1353 (majority opinion).

¹⁴⁷ See *supra* Part II.A.

¹⁴⁸ *In re Nuijten*, 500 F.3d at 1354.

¹⁴⁹ The majority cited *Chakrabarty* for two relatively minor points: for the use of the same definition of “manufacture” as in an earlier case, and for its definition of “composition of matter.” *Id.* at 1356–57.

bounds for patentable subject matter under § 101 than those set by the Supreme Court in *Chakrabarty*, which were based on solid evidence of Congress's intent.¹⁵⁰ Instead, the majority omitted this step of the analysis and skipped directly to the task of categorizing the invention.¹⁵¹

Second, the majority's position is inconsistent with the principle articulated by the Supreme Court in *Diehr*—that the only bar to patentability under § 101 is when the invention lacks practical utility.¹⁵² In fact, the majority dealt with *Diehr* in much the same way that it dealt with *Chakrabarty*—by neglecting to cite the case in its analysis of the scope of patentable subject matter under § 101.¹⁵³ As previously noted, the Federal Circuit has used *Diehr* as a guidepost for developing its own interpretation of the scope of § 101 in the face of rapid technological change, especially in the area of digital computing and software.¹⁵⁴ Indeed, the Federal Circuit's "useful, concrete, and tangible result" test developed in *Alappat*, *State Street*, and *Excel* has its roots in *Diehr*.¹⁵⁵ But instead of applying *Diehr*'s Federal Circuit progeny in determining whether a signal fits within the broad scope of § 101, the *Nuijten* majority utilized a narrow approach in determining the boundaries of one category of invention. Consequently, the majority concluded that the "useful, concrete, and tangible result" test did not even apply to this category.¹⁵⁶

¹⁵⁰ *Diamond v. Chakrabarty*, 447 U.S. 303, 309 (1980) (noting that the committee reports for the 1952 Patent Act indicated that Congress intended § 101 to "include anything under the sun that is made by man").

¹⁵¹ See *In re Nuijten*, 500 F.3d at 1354–57; see also *infra* Part III.A.2.

¹⁵² See *AT&T Corp. v. Excel Commc'ns, Inc.*, 172 F.3d 1352, 1357 (Fed. Cir. 1999) (citing *Diehr* for this proposition).

¹⁵³ The majority cited *Diehr* in its summary of the procedural history, but only as a source that was cited by the BPAI itself. *In re Nuijten*, 500 F.3d at 1352; *Ex parte Nuijten*, No. 2003-0853, 2006 WL 3939192, at *8, 84 U.S.P.Q.2d (BNA) 1335, 1337 (B.P.A.I. Jan. 24, 2006).

¹⁵⁴ See *Excel*, 172 F.3d at 1356–57 (noting that "this court . . . has struggled to make our understanding of the scope of § 101 responsive to the needs of the modern world" and then citing *Diehr* after noting that "[t]he Supreme Court has supported and enhanced this effort").

¹⁵⁵ See *supra* Part II.D.

¹⁵⁶ *In re Nuijten*, 500 F.3d at 1357 n.7 ("We have never held that a *manufacture* is ever required to produce any result. Thus, the 'useful, concrete,

Such a narrow application was improper considering Congress's intent for the patent laws to have a broad scope.¹⁵⁷

In contrast, the dissent in *Nuijten* took a properly expansive view in its interpretation of § 101, relying extensively on both *Chakrabarty* and *Diehr*.¹⁵⁸ The dissent noted that the “new” and “useful” requirements of § 101 formed the proper basis for determining the scope of patentable subject matter.¹⁵⁹ An invention is “new” if it is man-made rather than pre-existing in nature, and the invention is “useful” if it has a practical application rather than being merely an abstract principle.¹⁶⁰ According to the dissent, this usefulness requirement is derived from the “useful Arts” language of the Patent Clause and applies to technological skill or ingenuity regardless of the form in which it is expressed.¹⁶¹

In summary, the failure to rely on the controlling Supreme Court precedent interpreting the scope of § 101 called into question the *Nuijten* majority's analysis of whether the claimed signal fell within that scope. This analysis became more questionable when the majority narrowly construed the practical utility requirement that runs through *Chakrabarty*, *Diehr*, and their Federal Circuit progeny.¹⁶² As Judge Pauline Newman once stated:

The Board's historical practice of giving § 101 the narrowest possible reading . . . is out of place in a world that has become totally dependent on technology, and in which the laws governing technological innovation have direct consequences for industrial growth. Governmental timidity in the face of scientific and technologic change is not only unnecessary: it is unsupportable.¹⁶³

and tangible result' inquiry is simply inapplicable here.”). The majority appeared to ignore the obvious interpretation that the manufacture itself was the result.

¹⁵⁷ *Diamond v. Chakrabarty*, 447 U.S. 303, 308 (1980).

¹⁵⁸ The dissent cited *Chakrabarty* fifteen times and *Diehr* three times.

¹⁵⁹ *In re Nuijten*, 500 F.3d at 1359.

¹⁶⁰ *See id.* at 1364 (“To be ‘made by man,’ something must not be pre-existing in nature; it must be, literally, an invention.”); *id.* at 1365 (“[I]t is the application rather than the principle itself that must be patented.”).

¹⁶¹ *Id.* at 1361 n.3.

¹⁶² *See supra* notes 152–57 and accompanying text.

¹⁶³ *In re Alappat*, 33 F.3d 1526, 1569 (Fed. Cir. 1994) (Newman, J., concurring).

Although Judge Newman was referring to the USPTO's BPAI, there is no reason why her statement is less applicable to narrowness and timidity in decisions of the Federal Circuit—the BPAI's reviewing court.

2. *The New Patentability Requirements of “Non-Transitory” and “Tangible”*

While the *Nuijten* majority failed to properly consider the full scope of § 101, it did conduct considerable analysis on the requirements for an invention to be considered patentable subject matter under the § 101 category of “manufacture.”¹⁶⁴ Both the majority and dissent agreed that the signal at issue was man-made.¹⁶⁵ Ultimately, however, the majority concluded that for an invention to qualify as a “manufacture” it also had to be “tangible.” Since a signal is “transitory” it cannot meet this requirement and thus is unpatentable.¹⁶⁶ There are several flaws in both this analysis and the majority's ultimate conclusion.

First, the majority went to great lengths to narrowly define what constitutes a “manufacture” under § 101. Using the same nineteenth-century dictionary as the Supreme Court in *Chakrabarty*,¹⁶⁷ the majority defined “manufacture” in its verb form as the production of “articles” from raw or prepared materials by giving them new forms, qualities, properties, or combinations, and defined “article” as “a particular substance or commodity.”¹⁶⁸ Based on these definitions, the majority concluded that a “manufacture” as contemplated by § 101 must be a tangible article or commodity.

¹⁶⁴ See *In re Nuijten*, 500 F.3d at 1356–57.

¹⁶⁵ *Id.* at 1356 (noting that signals were “man-made, in the sense of having been encoded, generated, and transmitted by artificial means”); *id.* at 1368 (Linn, J., dissenting) (“The signal itself is man-made.”).

¹⁶⁶ See *supra* notes 136–40 and accompanying text.

¹⁶⁷ *In re Nuijten*, 500 F.3d at 1356 (citing *Diamond v. Chakrabarty*, 447 U.S. 303, 308 (1980) (additional citations omitted)). The majority justified this choice by noting that Congress had enacted the Patent Act of 1952 after the same definition was used in the *American Fruit* case in which the Supreme Court also interpreted § 101. *Id.* at 1356 n.5 (citing *Am. Fruit Growers, Inc. v. Brogdex Co.*, 283 U.S. 1, 11 (1931)).

¹⁶⁸ *Id.* at 1356.

This conclusion suffers from several weaknesses. As an initial matter, the wisdom of determining the patentability of an invention in the rapidly changing field of information technology based on definitions from a nineteenth-century dictionary is questionable.¹⁶⁹ Certainly this reliance on archaic definitions justifies Judge S. Jay Plager's concern, expressed in *Excel*, that the Federal Circuit has struggled to keep its interpretation of § 101 aligned with the needs and realities of the modern world.¹⁷⁰ Moreover, the majority's reliance on such archaic definitions overly constrains the boundaries on patentable subject matter under § 101. This approach is inconsistent not only with the expansive scope articulated by the Supreme Court in *Chakrabarty* and *Diehr*—which the majority did not address¹⁷¹—but also with Congress's intent when enacting the Patent Act of 1790.¹⁷² This Act contemplated that there would be manufactures that did not fit into any traditional category or mold by providing that the patent applications for such inventions should enable persons “skilled in the art . . . *wherewith it may be nearest connected*” to make and use them.¹⁷³

Furthermore, the majority's application of these definitions is in conflict with *O'Reilly*, which was decided almost forty years before the majority's dictionary of choice was published. In the majority's view, the Supreme Court in *O'Reilly* did not find Morse's invention of a “system of signs” patentable as a manufacture but rather as a method for signaling; this claim thus

¹⁶⁹ Although the Supreme Court cited this definition of “manufacture” in both *Chakrabarty* and *American Fruit*, both cases involved the issue of whether human modifications to a naturally occurring organism would qualify as either a “manufacture” or “composition of matter.” Thus, the issue in these cases related to the requisite amount of change, *not* the tangibility of the manufacture itself that was the issue in *Nuijten*. See *Chakrabarty*, 447 U.S. at 310 (“[T]he patentee has produced a new bacterium with markedly different characteristics from any found in nature.”); *Am. Fruit*, 283 U.S. at 12 (“There is no change in the name, appearance, or general character of the fruit.”).

¹⁷⁰ *AT&T Corp. v. Excel Commc'ns, Inc.*, 172 F.3d 1352, 1356 (Fed. Cir. 1999).

¹⁷¹ See *supra* Part III.A.1.

¹⁷² Patent Act of 1790, ch. 7, § 1, 1 Stat. 109, 110 (repealed 1836).

¹⁷³ *In re Alappat*, 33 F.3d 1526, 1570 (Fed. Cir. 1994) (Newman, J., concurring).

was analogous to Nuijten's method claims that were allowed by the USPTO.¹⁷⁴ While purporting to base the distinction between a "system of signs" and a method for signaling on the description in Morse's application, the majority failed to address the inconsistency between this position and its own requirement that a process claim must contain one or more acts.¹⁷⁵ Thus, using definitions from an archaic dictionary to draw the boundaries of patentable subject matter is inconsistent with both policy and precedent.

Second, the majority's conclusion that signals are not "tangible" conflicts with its position that signals are "physical."¹⁷⁶ The plain meanings of the words "physical" and "tangible" do not support the majority's logic that something physical must also be non-transitory for it to be tangible.¹⁷⁷ "Physical" may be defined as "having material existence; perceptible especially through the senses and subject to the laws of nature."¹⁷⁸ Likewise, "tangible" may be defined as "capable of being perceived especially by the sense of touch" or "substantially real."¹⁷⁹ Both terms imply perceptibility and materiality. It is difficult to see any distinction related to duration of existence when looking at the words' plain meanings.

¹⁷⁴ *In re Nuijten*, 500 F.3d 1346, 1357 n.9 (Fed. Cir. 2007), *reh'g en banc denied*, 515 F.3d 1361 (Fed. Cir. 2008); *see also id.* at 1369 n.8 (Linn, J., dissenting) (noting with apparent surprise that the *O'Reilly* court considered Morse's claim an "art" rather than a "manufacture").

¹⁷⁵ *Id.* at 1357. Morse's entire claim read as follows: "I claim, as my invention, the system of signs, consisting of dots and spaces, and of dots, spaces, and horizontal lines, for numerals, letters, words, or sentences, substantially as herein set forth and illustrated, for telegraphic purposes." *O'Reilly v. Morse*, 56 U.S. (15 How.) 62, 86 (1854). It is difficult to identify "an act or series of acts" in this claim language.

¹⁷⁶ This conclusion can be inferred from the majority's acceptance without comment of both parties' stipulation of that point. *See In re Nuijten*, 500 F.3d at 1353 (noting that "Nuijten and the PTO agree that the claims include physical but transitory forms of signal transmission").

¹⁷⁷ The majority did not provide a dictionary definition of either term.

¹⁷⁸ Merriam-Webster's Online Dictionary, <http://www.m-w.com/dictionary/physical> (last visited Feb. 22, 2008).

¹⁷⁹ Merriam-Webster's Online Dictionary, <http://www.m-w.com/dictionary/tangible> (last visited Feb. 22, 2008).

The majority also attempted to establish a link between a signal's tangibility and its perceptibility while in a transitory form during transmission.¹⁸⁰ The weakness of this argument was apparent, however, when the majority cited propagation through a vacuum as the only example of when a signal would be imperceptible.¹⁸¹ This concern about the inability to measure or perceive a signal in a vacuum is misplaced. The patent laws of title 35 are applicable in the United States, and the Supreme Court has shown a reluctance to extend their jurisdiction extraterritorially.¹⁸² Consequently, the majority's assertion about the applicability of § 101 to the extraterrestrial jurisdiction of outer space is highly speculative at best. Thus, the majority's distinction between "physical" and "tangible" lacks a basis both in language and in law. The fact that the majority went to such great lengths to draw this narrow distinction is contrary to *Chakrabarty*'s proscription against courts reading into patent laws limitations not expressed by Congress.¹⁸³

Finally, the majority's novel interpretation of tangibility and the new requirement for permanence are in conflict with existing Federal Circuit precedent. Both *State Street* and *Excel* dealt with inventions that produced results that, while arguably abstract by themselves, represented physical quantities or entities—the numbers in *State Street*, a share price; the data field in *Excel*, a long-distance operator. In both cases, the Federal Circuit found

¹⁸⁰ *In re Nuijten*, 500 F.3d at 1356 ("Moreover, any tangibility arguably attributed to a signal is embodied in the principle that it is perceptible—e.g., changes in electrical potential can be measured.").

¹⁸¹ *Id.* at 1357. The court defined "vacuum" as a medium that "is devoid of matter," such as outer space. In what may be a first for a federal court, the majority argued that the wave-particle duality theory of quantum mechanics did not undermine its proposition. *Id.*

¹⁸² See, e.g., *Microsoft Corp. v. AT&T Corp.*, 127 S. Ct. 1746, 1760 (2007) ("[I]n view of the expanded extraterritorial thrust AT&T's reading of [35 U.S.C.] § 271(f) entails, our precedent leads us to leave in Congress' court the patent-protective determination AT&T seeks.").

¹⁸³ *Diamond v. Chakrabarty*, 447 U.S. 303, 308 (1980) ("We have also cautioned that courts 'should not read into the patent laws limitations and conditions which the legislature has not expressed.'" (quoting *United States v. Dubilier Condenser Corp.*, 289 U.S. 178, 199 (1933))).

that the results were “useful, concrete, and tangible” because they had a practical utility.¹⁸⁴ The signal itself was the result in Nuijten’s claim, and the majority clearly recognized its practical utility.¹⁸⁵ To the extent that the signal represented a physical quantity like audio, the reasoning of *State Street* and *Excel* suggests that § 101 should not bar its patentability.¹⁸⁶

Likewise, the majority’s holding that “transitory embodiments are not directed to statutory subject matter”¹⁸⁷ is contrary to the decision in *State Street*. In that case, the Federal Circuit considered the numerical result of the claimed computer system and stated that the fact that the number was only “momentarily fixed” did not prevent it from being a “useful, concrete, and tangible result” under the *Alappat* test.¹⁸⁸ There are no principled reasons to find that signals conveyed by a physical carrier are more transitory than financial results calculated by a computer that may overwrite or erase them within microseconds during the execution of the next software instruction.

In summary, there are a number of flaws in the *Nuijten* majority’s determination of whether a signal is a “manufacture,” including the method used to define the term itself, the novel and inconsistent requirements of tangibility and permanence, and the inconsistency with existing Federal Circuit precedent, including *Alappat*, *State Street*, and *Excel*. All of these flaws appear to result from an overly narrow or restrictive view of the patent laws, a view against which the Supreme Court has routinely counseled.¹⁸⁹

¹⁸⁴ See *supra* Part II.D.

¹⁸⁵ *In re Nuijten*, 500 F.3d at 1348–51 (describing in great detail the invention itself along with its practical application and advantages).

¹⁸⁶ The majority explicitly rejected the application of the “useful, concrete, and tangible result” test. *Id.* at 1357 n.7.

¹⁸⁷ *Id.* at 1353.

¹⁸⁸ *State St. Bank & Trust Co. v. Signature Fin. Group*, 149 F.3d 1368, 1374 (Fed. Cir. 1998).

¹⁸⁹ See *Chakrabarty*, 447 F.3d at 308; see also *infra* Part III.B (discussing analogous guidance from the Supreme Court for the interpretation of § 103).

3. *Elevating Form over Substance*

As discussed earlier, the inventor in *Nuijten* claimed the signal-related invention in four different forms.¹⁹⁰ Although the patent examiner rejected claims to the computer-readable medium and the signal itself, the examiner allowed the claims directed towards the method and system for generating the signal.¹⁹¹ If one assumes that the system claims were properly allowed—and there is no evidence of a contrary view within the *Nuijten* court—then it follows that the claimed system must produce a “useful, concrete, and tangible result” in order to pass the test for patentable subject matter articulated in *Alappat* and *State Street*.¹⁹² Since the signal encoded with the supplemental data was the system’s result, then the signal must be “useful, concrete, and tangible.” Likewise, assuming on the same basis that the method claims were properly allowed, then it follows that the method also must produce a “useful, concrete, and tangible result” in order to pass the § 101 patentability test articulated in *Excel*. Since the method produces the same encoded signal result as the system, the same conclusion that the signal is “useful, concrete, and tangible” directly follows. If the result or product of a method or process claim puts that claim within the scope of patentable subject matter, the same result claimed in “product-by-process” form likewise should be within the scope of § 101.¹⁹³ This brief analysis points out a glaring inconsistency in the majority’s characterization of signals—that signals are sufficiently tangible to be patentable subject matter when they are claimed in some ways but not in others.

This conclusion is further supported by the procedural history of the signal-bearing, computer-readable medium claim in *Nuijten*,

¹⁹⁰ The forms included a method for generating the signal embedded with supplemental data, a system for generating the signal, a computer-readable medium containing the signal, and the signal itself. *In re Nuijten*, 500 F.3d at 1351.

¹⁹¹ *Id.* The majority also noted that these claims were not part of the case on appeal.

¹⁹² Recall that the purpose of the digital computer in *Alappat* was to produce a waveform or signal for display, representing a property measured by a laboratory instrument. *In re Alappat*, 33 F.3d 1526, 1537 (Fed. Cir. 1994).

¹⁹³ *Cf.* MPEP, *supra* note 92, § 2113 (noting that courts have rejected product-by-process claims under §§ 102 and 103).

which was initially rejected by the examiner as unpatentable subject matter under § 101.¹⁹⁴ On appeal, the BPAI reversed the rejection, finding that the stored signal was “functional” because a digital computer could use it to produce a “useful result.”¹⁹⁵ Like the method and system claims, this claim was not before the Federal Circuit on appeal but the majority noted its existence and allowance.¹⁹⁶ The BPAI based this reversal primarily on *In re Lowry*,¹⁹⁷ in which the Federal Circuit set guidelines for the patentability of computer-readable media containing particular data structures.¹⁹⁸ The *Lowry* court noted that the data structures at issue were “physical entities” whose functionality derived from their ability to increase the efficiency of a computer that uses them.¹⁹⁹ Given the unclear distinction between the meanings of “physical” and “tangible,”²⁰⁰ it is reasonable to conclude that the data structures in *Lowry* also would be considered “tangible.”²⁰¹ If so, then the encoded data signal stored on the computer-readable medium that was claimed by Nuijten also must be considered tangible. If the stored signal’s usefulness is a result of its functionality, then the analysis of the computer-readable medium claim leads to the same conclusion that signals are sufficiently tangible to be patentable when they are claimed in some ways but not in others.

As this case demonstrates, claims can be drafted in many different forms to cover essentially the same invention. Yet determination of patentability should not be based on the form of

¹⁹⁴ *Ex parte Nuijten*, No. 2003-0853, 2006 WL 3939192, at *5, 84 U.S.P.Q.2d (BNA) 1335, 1339 (B.P.A.I. Jan. 24, 2006) (holding that “an electrical signal *per se* does not fit within any of the statutory categories of 35 U.S.C. § 101”).

¹⁹⁵ *Id.*

¹⁹⁶ *In re Nuijten*, 500 F.3d 1346, 1357 n.6 (Fed. Cir. 2007), *reh’g en banc denied*, 515 F.3d 1361 (Fed. Cir. 2008).

¹⁹⁷ 32 F.3d 1579 (Fed. Cir. 1994).

¹⁹⁸ *Id.* at 1583–84.

¹⁹⁹ *Id.* at 1584.

²⁰⁰ See *supra* notes 178–79 and accompanying text.

²⁰¹ See *supra* Part III.A.2; see also *In re Lowry*, 32 F.3d at 1584 (noting that the data structures provided “tangible benefits”).

the claim or on the skill of the claim drafter,²⁰² but rather on the ingenuity of the inventor and the usefulness of the invention. By elevating form over substance, the *Nuijten* majority's logic produces precisely the opposite of this desirable result. In his dissent, Judge Richard Linn expressed one practical effect of this inconsistent doctrine:

The signal is either a "new and useful" manufacture or it is not. It is incongruous to treat an individual watching a movie containing the signal . . . in real time as any less of an infringer than someone watching the same movie after a short delay using the recording feature of, for example, a TiVo digital video recorder. A better distinction is made based on the nature of the underlying invention, without regard to the particular way it is claimed.²⁰³

In summary, the practical effect of *Nuijten* is that inventors who create new and useful signals are forced to protect those signals with a diverse set of claims rather than directly claiming the "real underlying invention."²⁰⁴

B. Missed "Signals" from KSR

Even though the Supreme Court's and the Federal Circuit's constructions of other patent statutes are not controlling on the interpretation of § 101, it is relevant to examine these statutes and their judicial constructions for the purpose of information or analogy. In *KSR*, the Supreme Court heard an appeal of a case from the Federal Circuit involving the application of the standard for determining obviousness under § 103.²⁰⁵ The case involved an invention that combined an electronic sensor with a mechanical

²⁰² *In re Nuijten*, 500 F.3d 1346, 1362 (Fed. Cir. 2007) (Linn, J., dissenting) ("Patentability does not depend on which form the claim takes."), *reh'g en banc denied*, 515 F.3d 1361 (Fed. Cir. 2008); *Parker v. Flook*, 437 U.S. 584, 593 (1978) (criticizing the practice of "mak[ing] the determination of patentable subject matter depend simply on the draft[s]man's art").

²⁰³ *In re Nuijten*, 500 F.3d at 1362 (Linn, J., dissenting).

²⁰⁴ *Id.* at 1366.

²⁰⁵ *KSR Int'l Co. v. Teleflex, Inc.*, 127 S. Ct. 1727, 1734–35 (2007). Section 103 provides a bar to patentability when "the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." 35 U.S.C. § 103 (2000).

automobile accelerator pedal—both devices known in the prior art—in a particular manner that prevented the sensor wires from becoming worn with use.²⁰⁶ The district court applied the obviousness test articulated by the Supreme Court in *Graham*²⁰⁷ and found the patent invalid under § 103 because it would have been obvious to someone of ordinary skill in pedal design to combine the particular mechanical pedal with an electronic sensor, such as a sensor for a different pedal type that was described in another patent.²⁰⁸

On appeal, however, the Federal Circuit reversed the district court's invalidity decision because the lower court failed to apply the Federal Circuit's "teaching, suggestion, or motivation" ("TSM") test to identify a particular "principle or understanding . . . that would have motivated one with *no knowledge of the invention*" to combine the pedal and sensor in that particular way.²⁰⁹ Rather than considering broad motivating factors such as the state of the art in the relevant industry, as the district court did, the Federal Circuit required that the motivation come from references that address the "precise problem that the patentee was trying to solve."²¹⁰ The court distinguished the problem solved by the prior art pedal from the particular one at issue in the case.²¹¹

On appeal, the Supreme Court in *KSR* identified and criticized a number of flaws in the Federal Circuit's interpretation of

²⁰⁶ *KSR*, 127 S. Ct. at 1735–36.

²⁰⁷ See *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17–18 (1966). The Court articulated the following test:

Under § 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background the obviousness or nonobviousness of the subject matter is determined. Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented.

Id.

²⁰⁸ See *KSR*, 127 S. Ct. at 1735–38.

²⁰⁹ *Id.* at 1738–39 (emphasis added).

²¹⁰ *Id.* at 1738 (citing *Teleflex, Inc. v. KSR Int'l Co.*, 119 F. App'x 282, 288 (Fed. Cir. 2005)).

²¹¹ *Id.*

§ 103.²¹² These flaws are strikingly similar to those identified in the *Nuijten* majority's interpretation of § 101. The Court began its analysis by rejecting the rigidity of the Federal Circuit's TSM test and affirming the "expansive and flexible approach" established in *Graham* and earlier cases relating to obviousness.²¹³ Moreover, the Court identified the source of the flaw in the TSM test as the Federal Circuit's "narrow conception of the obviousness inquiry" under § 103 that was set forth in *Graham*.²¹⁴ As discussed above, the interpretation of § 101 by the *Nuijten* majority suffers from a similar flaw.²¹⁵ In particular, the majority's narrow approach to patentable subject matter is in conflict with the broad principles of *Chakrabarty* and *Diehr* in a manner closely analogous to how the Federal Circuit's TSM test conflicted with the interpretation of § 103 that the Supreme Court articulated in *Graham* and reaffirmed in *KSR*.

The Court also sharply criticized the Federal Circuit's formalistic approach to determining obviousness under § 103, noting that the § 103 obviousness analysis prescribed by *Graham* "cannot be confined by a formalistic conception of the words teaching, suggestion, and motivation."²¹⁶ Moreover, the Court held that the application of TSM as a "rigid and mandatory formula[]" was incompatible with Supreme Court precedents such as *Graham* because "[t]he diversity of inventive pursuits and of modern technology counsels against limiting the analysis in this way."²¹⁷ These incompatibilities are analogous to those found in the *Nuijten* majority opinion—in particular the rigid use of the enumerated categories and definition of "manufacture," and the resulting formalistic rules that force inventors to claim useful, man-made signals indirectly by repetitive claims to systems, devices, or

²¹² *Id.* at 1738–41.

²¹³ *Id.* at 1739.

²¹⁴ *Id.* at 1741.

²¹⁵ See *supra* Part III.A.1.

²¹⁶ *KSR*, 127 S. Ct. at 1741.

²¹⁷ *Id.*; cf. *eBay Inc. v. MercExchange, L.L.C.*, 547 U.S. 388, 394 (2006) (noting that the Federal Circuit Court of Appeals "erred in its categorical grant of [injunctive] relief" in favor of a patent holder against a party found to infringe the patent).

methods that produce the signals.²¹⁸ Accordingly, the formalistic approach of *Nuijten* conflicts with *Chakrabarty* and *Diehr* in the same manner that the Federal Circuit's TSM test was found to be in conflict with *Graham*.

Although the above analysis focuses on similarities for the purpose of analogy, it is relevant to consider to what extent these analogies with *KSR* and § 103 can be used as guiding rather than controlling principles for lower courts interpreting the scope of § 101. Nothing in *KSR* directly suggests the application of the Court's holdings in that case to § 101. Nevertheless, §§ 101, 102, and 103 are part of a unified determination of patentability; they are a series of doors that an inventor must unlock in order to obtain a patent.²¹⁹ Prior to 1952, the non-obviousness requirement for patentability was a federal common-law doctrine derived from the text of § 101.²²⁰ Specifically, the courts found that the "whoever invents" language of § 101 implied a requirement for patentability that could not be satisfied by an "invention" that was novel under § 102 yet too similar to prior art such as existing inventions.²²¹ The Patent Act of 1952 created the statutory non-obviousness requirement of § 103 by codifying this earlier common-law doctrine.²²² The history of that legislation also indicates, however, that Congress intended the scope of § 101 to cover "anything under the sun that is made by man."²²³ This common legislative history is evidence that in codifying the existing common-law doctrine of obviousness, Congress intended to protect new and useful inventions falling within this extremely broad scope of patentable subject matter.

The existence of a link between §§ 101 and 103 also is supported by the purposes of the patent statutes. According to the

²¹⁸ See *supra* Parts III.A.2 and III.A.3.

²¹⁹ See *In re Bergy*, 596 F.2d 952, 960 (C.C.P.A. 1979), *vacated as moot sub nom.* *Diamond v. Chakrabarty*, 444 U.S. 1028 (1980) (mem.).

²²⁰ *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 11 (1966) (citing *Hotchkiss v. Greenwood*, 52 U.S. (11 How.) 248, 267 (1851)).

²²¹ *In re Bergy*, 596 F.2d at 961–62.

²²² *Graham*, 383 U.S. at 3–4.

²²³ *Diamond v. Chakrabarty*, 447 U.S. 303, 309 (1980) (quoting S. REP. NO. 82-1979, at 5 (1952); H.R. REP. NO. 82-1923, at 6 (1952)).

Supreme Court, promoting “real innovation” is a principal motivation for granting patents.²²⁴ The expansive interpretation of § 101 articulated by the Supreme Court in *Chakrabarty* and *Diehr* encourages and rewards real innovation in areas such as biotechnology and digital communications.²²⁵ According to the Court in *KSR*, however, awarding patents for “advances that would occur in the ordinary course” would hinder innovation and may ultimately diminish the value and utility of previously patented inventions.²²⁶ Consequently, the expansive interpretation of § 103 articulated in *Graham* and *KSR* serves to protect real innovation encouraged by § 101 by prohibiting the grant of patents on mere “predictable uses of prior art elements according to their established functions.”²²⁷

In summary, the common purpose and intertwined legislative history of §§ 101 and 103 provide a rationale for using controlling precedent to interpret one of these sections as an informative resource when construing the other. As such, the interpretation of § 103 offered by the Supreme Court in *KSR* is informative to lower courts interpreting the scope of § 101.²²⁸ Courts that fail to consider the guidance of *KSR* while interpreting § 101, such as the Federal Circuit majority in *Nuijten*, risk upsetting the intended balance between these statutes that can be inferred from the legislative history of the Patent Act of 1952.

²²⁴ *KSR Int’l Co. v. Teleflex, Inc.*, 127 S. Ct. 1727, 1741 (2007).

²²⁵ See *supra* Part II.A; see also Erik S. Maurer, Notes and Comments, *An Economic Justification for a Broad Interpretation of Patentable Subject Matter*, 95 NW. U. L. REV. 1057, 1090–91 (2001) (making an economic argument for a broad scope of patentable subject matter because market forces ensure that “truly valued innovations will be consumed at any price” while “undemanded [sic] patents and their owners suffer the market consequences of natural selection, while society still gains from their teachings and the wealth generation inherent in accumulating knowledge”).

²²⁶ *KSR*, 127 S. Ct. at 1741.

²²⁷ *Id.* at 1740.

²²⁸ See *In re Nuijten*, 515 F.3d 1361, 1362 (Fed. Cir. 2008) (Linn, Newman, & Rader, JJ., dissenting) (“[T]his case raises important questions about the relationship between § 101 and § 103.”).

C. *Lessons from Europe*

While the granting of U.S. patents is governed by the Constitution, statutes, and rules of this country, it is relevant to consider how other regional or national patent offices deal with the patentability of signals. This consideration is particularly relevant given the increasing rate at which inventors are filing patent applications outside of their home countries or regions.²²⁹ The patentability of signals under European law is considered here for comparison in view of the prevalence of European non-residents, including U.S. residents, who file European patent applications.²³⁰ Another motivation for consideration of signal patentability in Europe is that the doctrine appears to be well-developed compared to other jurisdictions, as discussed below.

The European Patent Convention (“EPC”) provides that a patent application may claim inventions in the enumerated categories of “product, process, apparatus, or use.”²³¹ The European Patent Office (“EPO”) has roughly categorized these four categories as being divided between physical entities (i.e., product and apparatus) and activities (i.e., process and use).²³² Furthermore, EPO rules define a “product” expansively as including, but not limited to, “a substance or compositions (e.g. chemical compound or a mixture of compounds) as well as any physical entity (e.g. object, article, apparatus, machine, or system

²²⁹ WORLD INTELLECTUAL PROP. ORG., WIPO PATENT REPORT: STATISTICS ON WORLDWIDE PATENT ACTIVITY § C.4 (2007 ed.), *available at* http://www.wipo.int/ipstats/en/statistics/patents/patent_report_2007.html (noting that 47% and 51% of the patent applications filed in the USPTO and EPO, respectively, were filed by non-residents).

²³⁰ *See id.* § C.2 (showing that in 2005, the European Patent Office had the third-highest number of patent applications filed by non-residents, behind the USPTO and the Chinese patent office); *id.* § C.3 (showing that in 2005, U.S. residents filed more patent applications abroad than residents of any other country).

²³¹ European Patent Convention, Rule 43(2) (13th ed., July 2007), *available at* <http://www.epo.org/patents/law/legal-texts/epc.html> (click “Download PDF version” hyperlink). Note that the “product” category is analogous to the category of “manufacture” enumerated in 35 U.S.C. § 101.

²³² EUROPEAN PATENT OFFICE, GUIDELINES FOR EXAMINATION, § C-III 3.1 (Dec. 2007), *available at* http://www.epo.org/patents/law/legal-texts/html/guicx/e/c_iii_3_1.htm.

of co-operating apparatus) which is *produced by a person's technical skill*.”²³³

The EPO's Board of Appeal (“the Board”) is responsible for making case-by-case determinations of what falls within this expansive definition of “product.”²³⁴ The Board first considered the patentability of signals in *BBC/Colour Television Signal T163/85*,²³⁵ in which the applicant claimed a “television signal adapted to generate a picture.”²³⁶ The Board reversed the examiner's rejection of the claim as unpatentable subject matter, stating, “The T.V. signal as claimed would [not be subject to certain exclusions] because it is a physical reality which can directly be detected by technological means and, therefore, cannot be considered as an abstract entity, despite its transient character.”²³⁷ In addition, the Board stated that the signal “inherently comprises the technical features of the television system in which it is being used.”²³⁸ Thus, the Board recognized that a signal is useful as the key ingredient of a television system, is concrete because it is non-abstract, and is tangible because it is a physical reality.

The Board's subsequent opinions have affirmed this holding. In *PHILIPS/Record Carrier T1194/97*,²³⁹ the Board considered a claim for a “record carrier” for use in a picture retrieval system.²⁴⁰ While reversing the examiner's rejection of the claim as unpatentable subject matter, the Board stated that “no distinction regarding patentability should be made between the claim categories of a signal and a record carrier.”²⁴¹ Furthermore, the

²³³ *Id.* (emphasis added).

²³⁴ European Patent Convention, *supra* note 231, art. 21 ¶ 1 (“The Boards of Appeal shall be responsible for the examination of appeals from decisions of the Receiving Section, the Examining Divisions and Opposition Divisions, and the Legal Division.”).

²³⁵ [1990] E.P.O.R. 599.

²³⁶ *Id.* at 601.

²³⁷ *Id.* at 603.

²³⁸ *Id.*

²³⁹ [2001] E.P.O.R. 25.

²⁴⁰ *Id.* at 195. This type of claim is analogous to the “computer-readable medium” type of claim allowed by the USPTO. See *supra* Part II.E.

²⁴¹ *PHILIPS*, [2001] E.P.O.R. at 198.

Board recognized that the information structure contained in a signal “represented a functional, technical feature.”²⁴² Accordingly, the EPO recognizes that a signal’s patentability derives—at least in part—from its underlying information structure that is a product of an inventor’s technical skill and serves a useful function or purpose.²⁴³ This view is much more consistent with the dominant Federal Circuit doctrine of patentable subject matter expressed in *Alappat*, *State Street*, and *Excel* than the narrow view articulated by the majority in *Nuijten*.²⁴⁴

One of the main purposes of the World Trade Organization (“WTO”) Agreement on Trade-Related Aspects of Intellectual Property Rights (“TRIPS”) is to “reduce distortions and impediments to international trade, [while] taking into account the need to promote effective and adequate protection of intellectual property rights.”²⁴⁵ In particular, TRIPS article 27(1) states that “patents shall be available for any inventions, whether products or processes, in all fields of technology, provided that they are new, involve an inventive step and are capable of industrial application.”²⁴⁶ TRIPS has been incorporated into the EPC²⁴⁷ and the EPO appears to be interpreting “product” as having an expansive scope extending into “all fields of technology,” including those where signals have important and useful purposes.²⁴⁸

²⁴² *Id.*

²⁴³ *Id.* (citing *BBC* and noting that in that case, “the Board did grant a carrier characterised by a representation of information because its *content* had a technical function in the TV receiver” (emphasis added)).

²⁴⁴ See *supra* Part II.D.

²⁴⁵ Agreement on Trade-Related Aspects of Intellectual Property Rights, Preamble, Apr. 15, 1994, 33 I.L.M. 81 [hereinafter TRIPS], available at http://www.wto.org/english/docs_e/legal_e/27-trips.pdf. The importance of this purpose is evident from the empirical evidence showing substantial numbers of patent applications being filed by foreign nationals. See *supra* note 229 and accompanying text.

²⁴⁶ TRIPS, *supra* note 245, art. 27 ¶ 1.

²⁴⁷ See, e.g., European Patent Convention, *supra* note 231, art. 87 ¶ 1(b) (noting that any person who has filed a patent application in a WTO-member country may use that filing as a priority date in the EPO).

²⁴⁸ In *IBM/Computer Program T935/97*, [1999] E.P.O.R. 301, the Board addressed the question of how the EPC should be interpreted for patentability of

In 1994, Congress enacted the Uruguay Round Agreements Act in order to implement a number of trade-related provisions, including TRIPS.²⁴⁹ Although the Act amended several sections of title 35,²⁵⁰ § 101 was not among them and the Act did not otherwise address any potential effects of TRIPS on the scope of patentable subject matter. While testifying before a congressional subcommittee, however, USPTO Commissioner Bruce Lehman noted that under TRIPS, “[p]roduct patents will be available for pharmaceuticals and agricultural chemicals in all WTO countries, as well as *for all other fields of technology*, subject to a short list of permissible exclusions.”²⁵¹ Since the USPTO is the agency responsible for administering the TRIPS-related changes to the patent laws, it is reasonable to infer that Congress gave weight to Lehman’s interpretation. If after hearing his testimony, Congress did not see the need to amend § 101 when enacting legislation implementing TRIPS, then it is also reasonable to infer that Congress believed that § 101 already complied with TRIPS requirements.²⁵² If so, then this is evidence that Congress intended the § 101 category of “manufacture” to be interpreted consistent with the analogous TRIPS category of “product,” such that patentability is non-

computer programs in light of TRIPS. The Board first noted that the EPO had expressed a clear desire to apply the EPC in conformity with TRIPS. *Id.* at 306. Citing *BBC*, the Board further stated that computer programs should be treated in the same manner as signals, thereby implying that the EPO treated patentability of signals in a manner consistent with TRIPS. *Id.*

²⁴⁹ Uruguay Round Agreements Act, Pub. L. No. 103-465, 108 Stat. 4809, §§ 501–534 (1994).

²⁵⁰ See, e.g., 35 U.S.C. § 154(a)(2) (2000) (amended in 1995 to comply with the twenty-year patent term requirement of TRIPS).

²⁵¹ *GATT and Intellectual Property: J. Hearing Before the Subcomm. on Patents, Copyrights and Trademarks of the S. Comm. on the Judiciary and Subcomm. on Intellectual Property and Judicial Administration of the H. Comm. on the Judiciary*, 103d Cong., 2d Sess. (1994) (statement of Bruce A. Lehman, Assistant Secretary of Commerce and Comm’r of Patents and Trademarks) (emphasis added). The noted exclusions relate to “diagnostic, therapeutic and surgical methods” and “plants and animals other than micro-organisms.” TRIPS, *supra* note 245, art. 27 ¶ 3.

²⁵² See RESTATEMENT (THIRD) OF FOREIGN RELATIONS § 115(2) (1987) (“A provision of a treaty of the United States that becomes effective as law of the United States supersedes as domestic law any inconsistent preexisting provision of a law or treaty of the United States.”).

discriminatory with respect to the field of technology. In failing to construe the language of § 101 in this manner, the Federal Circuit has created unnecessary impediments for inventors who wish to obtain patent protection in both the United States and Europe—a result directly contrary to the intent of TRIPS.

D. Implications of Nuijten for Patent Policy and Practice

While the discussion thus far has focused on the legal doctrine for patentability of signals, it also is important to understand the practical motivations for signal claims and the practical implications of their prohibition under *Nuijten*. Furthermore, this prohibition may come in conflict with the policy goals of the ongoing congressional and administrative reforms of the patent system. Since signal claims may be useful as a means to protect any invention involving communication of information,²⁵³ these implications and effects are potentially very broad. For instance, signal claims may be effective in asserting that a patent should be included in a patent licensing pool.²⁵⁴ These pools often are used to license patents essential for industry standards related to audio, video, and communications technologies.²⁵⁵ These types of standards are becoming increasingly important to the modern economy.²⁵⁶

²⁵³ Kunin & Lytle, *supra* note 2, at 998.

²⁵⁴ *Id.* at 999.

²⁵⁵ See *id.* at 999–1000. For examples of such pools, see Introduction to MPEG-LA's AVC Patent Portfolio License, <http://www.mpegla.com/avc> (last visited Feb. 1, 2008) (on file with the North Carolina Journal of Law & Technology) (describing patent pool for H.264 Advanced Video Codec ("AVC") standard); Introduction to MPEG-LA's ATSC Patent Portfolio License, <http://www.mpegla.com/atsc> (last visited Feb. 1, 2008) (on file with the North Carolina Journal of Law & Technology) (describing patent pool for Advanced Television Standards Committee ("ATSC") high-definition television signal standard); and Overview of MPEG-2 AAC Standard Licensing Program, http://www.vialicensing.com/Licensing/MPEG2AAC_index.cfm (last visited Feb. 3, 2008) (on file with the North Carolina Journal of Law & Technology) (describing patent pool for MPEG-2 Advanced Audio Codec ("AAC") standard).

²⁵⁶ U.S. DEP'T OF JUSTICE & FED. TRADE COMM'N, ANTITRUST ENFORCEMENT AND INTELLECTUAL PROPERTY RIGHTS: PROMOTING INNOVATION AND COMPETITION 33 (2007), available at <http://www.ftc.gov/reports/index.shtml#2007> (noting that

Relative to other types of claims, signal claims have advantages in terms of protecting the patent holder's rights against a broader range of infringers.²⁵⁷ For instance, claiming the invention as a signal rather than as a computer-readable medium bearing the signal may account for the additional situations where the infringing signal is never stored (e.g., broadcast) and where the infringing signal is produced outside the United States.²⁵⁸ One possible example of this scenario is an Internet radio broadcast from Canada that is received in the United States. Relative to a medium claim, a signal claim also has the advantage of being directly infringed by both entities when one transmits the signal and another records it to a medium.²⁵⁹ For example, this situation would occur when a telecommunications or Internet service provider ("ISP") carried the infringing signal on its network to an end user who recorded it on the hard drive of his or her laptop computer or media player.²⁶⁰ By using a signal claim, the inventor has a greater chance of being successful in an infringement suit against the service provider, which may be the only economically feasible claim.²⁶¹

For a similar reason, a signal claim may be more effective than a claim for the method of encoding the signal. If such a method is implemented in software, the entity providing the software would not directly infringe the method claim but may be liable for active inducement or contributory infringement only if direct infringement by the user can be proven.²⁶² Even if suing the user

"[i]ndustry standards are widely acknowledged to be one of the engines of the modern economy").

²⁵⁷ Kunin & Lytle, *supra* note 2, at 991.

²⁵⁸ Brief of Amicus Curiae Intellectual Prop. Owners Ass'n in Support of Neither Party at 14, *In re Nuijten*, 500 F.3d 1346 (Fed. Cir. 2007) (No. 2006-1371).

²⁵⁹ *Id.*

²⁶⁰ See Kunin & Lytle, *supra* note 2, at 999 ("Telecommunications companies and internet service providers face a high risk of infringement liability.").

²⁶¹ *Id.*

²⁶² See *Joy Tech., Inc. v. Flakt, Inc.*, 6 F.3d 770, 773-74 (Fed. Cir. 1993) (noting that a method or process claim is directly infringed only when the process is performed, but that a supplier of goods that perform the claimed

for direct infringement is a rational choice, the patent holder faces a higher burden of proof for the claims against the software supplier,²⁶³ who may be a competitor and thus the desired target of the suit. Claiming the method as a signal gets around these difficulties.²⁶⁴

Signal claims also may have the advantage of significantly reducing the number of claims needed to cover all anticipated infringing uses of the invention. This point is best illustrated by considering the different types of claims that an inventor may need to use without the benefit of a signal claim. First, the inventor must claim the invention as a system for encoding the signal to cover infringement by a supplier of a signal transmitter. Similarly, the inventor also must claim the invention as a system for decoding the signal to cover infringement by a supplier of a signal receiver. In order to cover infringement by a company that supplies software that encodes and/or decodes the signal, the inventor must claim the invention as a method for encoding and/or decoding the signal. Finally, the inventor must claim the invention in the computer-readable medium format to cover infringement by those who would attempt to store the signal on a hard drive, such as an online music service or a supplier of DVDs. Even with these four different claims, the inventor still may not be able to cover all of the potential infringers, such as the hypothetical ISP discussed above. The one thing that all of these potential infringers have in common is that they all use the signal itself in some manner. By using one or more properly drafted signal claims,²⁶⁵ the inventor

process may be liable under 35 U.S.C. § 271(b)–(c), provided that direct infringement can be shown to exist).

²⁶³ See 5 CHISUM, *supra* note 67, §§ 17.03–.04 (discussing the need to prove knowledge and/or intent in order to prevail on claims under § 271(b)–(c)).

²⁶⁴ See Kunin & Lytle, *supra* note 2, at 999.

²⁶⁵ Multiple signal claims may be needed for at least two reasons. First, any signal likely will need to be claimed as one independent claim along with several other claims depending on it, similar to most other types of inventions. Second, the signal may need to be claimed in both structural and functional formats, as described in Part II.C *supra*. See also Kunin & Lytle, *supra* note 2, at 999 (noting that signal claims may be drafted in both structural and functional formats).

can cover the entire range of uses of the signal, which lies at the core of his or her invention.

Thus, by discarding function in favor of formalism, the Federal Circuit effectively has increased the number of claims required to cover an invention relating to a signal. This increase has implications for inventions in a broad range of multimedia and communications technologies.²⁶⁶ At a minimum, it will increase the cost for inventors to obtain patents for their inventions since the USPTO assesses a per-claim surcharge for patent applications when the number of claims exceeds certain thresholds.²⁶⁷ In addition, the need for more claims is likely to increase the complexity of the preparation and prosecution of the patent application, which may result in higher attorney's fees for the inventor.²⁶⁸ An increase in prosecution complexity also implies an increase in complexity of the USPTO examination of the application, possibly leading to longer delays between the filing of the application and the granting of the patent.²⁶⁹

When viewed together with other recent developments, however, the Federal Circuit's formalistic claim requirements also may impact the substantive property rights of inventors. During the last five years, reform of the patent system has emerged as a high-profile policy initiative of both the legislative and executive branches. The House of Representatives passed the Patent Reform Act of 2007 in September 2007, while the Senate currently is

²⁶⁶ Kunin & Lytle, *supra* note 2, at 998 (noting that signal claims are "useful for any invention that involves the communication of information").

²⁶⁷ 37 C.F.R. § 1.16(i)–(j) (2007).

²⁶⁸ *Cf.* AM. INTELLECTUAL PROP. LAW ASS'N, AIPLA REPORT ON THE ECONOMIC SURVEY 2007 I-78, I-79 (July 2007) (noting that the median cost for a utility patent application prepared by a law firm of seventy-six or more attorneys increases from \$8,000 for an invention of ten claims or less to \$14,500 for a "relatively complex electrical/computer" invention).

²⁶⁹ Changes to Practice for Continued Examination Filings, Patent Applications Containing Patentably Indistinct Claims, and Examination of Claims in Patent Applications, 72 Fed. Reg. 46,716, 46,720–21 (Aug. 21, 2007) [hereinafter Proposed USPTO Rules] ("A number of patent applications contain a large number of claims, which makes efficient and effective examination of such applications problematic.").

considering its own Patent Reform Act.²⁷⁰ The two bills contain many of the same provisions but differ in some respects.²⁷¹ Nevertheless, if the bills are harmonized and signed into law by the President, the result arguably will be the most sweeping reforms to the U.S. patent system since the nineteenth century.²⁷² These reforms include a number of provisions intended to reduce the number of poor-quality patents, which Congress views as a hindrance to future innovation.²⁷³

Meanwhile, the USPTO has taken its own initiative to improve the quality of issued patents. One of the factors identified by the USPTO as impacting patent quality is the inadequate amount of time that examiners are allotted for each application.²⁷⁴ The USPTO has found that applications containing a large number of claims absorb an inordinate amount of patent examination resources,²⁷⁵ and thus play a role in diminishing the quality of issued patents. Initially, the USPTO proposed rules that would limit the number of claims per application to ten or less, but later, in response to public comments, relaxed that limit to five independent claims and twenty-five total claims per application.²⁷⁶ The inventor may exceed this limit, however, if he or she provides additional information in the form of an examination support document (“ESD”).²⁷⁷ This exception to the limit has been met with strong

²⁷⁰ See Patent Reform Act of 2007, H.R. 1908, 110th Cong. (as passed by House, Sept. 10, 2007); Patent Reform Act of 2007, S. 1145, 110th Cong. (as reported by S. Comm. on the Judiciary, July 19, 2007).

²⁷¹ For a table comparing the two bills, see JOHN R. THOMAS & WENDY H. SCHACHT, PATENT REFORM IN THE 110TH CONGRESS: INNOVATION ISSUES 14 (Cong. Res. Serv., Jan. 10, 2008).

²⁷² *Id.* at Summary.

²⁷³ H.R. REP. NO. 110-314, at 20 (2007).

²⁷⁴ NAT’L RESEARCH COUNCIL OF THE NAT’L ACADS., A PATENT SYSTEM FOR THE 21ST CENTURY 51 (2004) (“One reason for suspecting that quality has suffered is that . . . the number of patent examiners in recent years has not kept pace with the increase in workload represented not only by the enormous growth in the number of applications . . . but also by the growing complexity of applications as represented by the growth in the number of claims and prior art citations per application.”).

²⁷⁵ Proposed USPTO Rules, 72 Fed. Reg. 46,716, 46,721 (Aug. 21, 2007).

²⁷⁶ *Id.*

²⁷⁷ *Id.*

criticism from many commentators due to its potential negative impact on both the cost of obtaining a patent and the enforceability of a patent obtained using an ESD.²⁷⁸ The USPTO also has proposed new rules limiting the number of continuation and divisional applications that can be derived from a “parent” application.²⁷⁹ When combined with the per-application claim limit, the effect is to limit the total number of claims available for an applicant to use in establishing the rights to his or her invention. Both large companies and individuals have recognized the potential impact of these rules and have challenged them in court.²⁸⁰

²⁷⁸ The ESD requires the applicant to identify the closest prior art and distinguish the invention from that art. *Id.* Some practitioners believe this effectively requires the applicant to examine his or her own invention, thereby creating potential defenses to be used against the applicant if he or she tries to assert the granted patent in the future against alleged infringers. *See* Patently-O Patent Law Blog, USPTO Guidelines for Examination Support Documents (ESD) (Sept. 13, 2007), <http://www.patentlyo.com/patent/2007/09/uspto-guideline.html> (on file with the North Carolina Journal of Law & Technology). Of particular concern is the defense of inequitable conduct, which the Federal Circuit has expanded recently. *See* McKesson Info. Solutions, Inc. v. Bridge Med., Inc., 487 F.3d 897 (Fed. Cir. 2007) (finding inequitable conduct for failing to disclose to the USPTO a reference cited by the same examiner in another patent application by the same applicant). *But cf.* H.R. REP. NO. 110-314, at 42–43 (Sept. 4, 2007) (proposing to codify the law of inequitable conduct in order to increase certainty for this defense). Additionally, some authorities have estimated that filing an ESD will substantially increase the overall cost of a patent application. *See* CONG. BUDGET OFFICE, COST ESTIMATE OF S. 1145 PATENT REFORM ACT OF 2007 10 (2008) (estimating an added cost between \$5,000 and \$10,000 per application for required “search reports, analysis, and other information”); Leon Radomsky & Andrew S. Baluch, *Provision of Reform Bill Will Triple Cost of Patents*, IP LAW360, Feb. 20, 2008 (estimating a cost between \$14,250 and \$23,500 per EDS). In summary, it is likely that the cost and uncertainty of the new ESD requirement will provide a strong disincentive toward exceeding the claim limits imposed in the new rules.

²⁷⁹ Proposed USPTO Rules, 72 Fed. Reg. at 46,718–20.

²⁸⁰ *See* *Tafas v. Dudas*, Nos. 1:07cv846(JCC) & 1:07cv1008(JCC), 2008 U.S. Dist. LEXIS 26086, at *34–35 (E.D. Va. Apr. 1, 2008) (granting a permanent injunction prohibiting the USPTO from enacting the proposed rules in a case consolidated from separate suits filed by individual Tafas and pharmaceutical company GlaxoSmithKline). The basis for the court’s decision in *Tafas* was

Consequently, the combination of the new USPTO rules and the Federal Circuit's holding in *Nuijten* places the inventor of a new and useful signal between the horns of a dilemma. On one hand, the inventor may choose to forego claiming his or her invention in certain forms or embodiments, thereby reducing or eliminating the right to exclude use of the signal—the core of the invention—by certain entities. On the other hand, the inventor can try to maximize his or her right to exclude by claiming the signal in many different forms. In doing so, however, the inventor likely will need to follow the expensive, untested exception path to the new USPTO rules, which may be littered with defenses against claims of infringement.²⁸¹ Also, by choosing this second path, the inventor's application requires more USPTO examination resources, which negatively impacts a key factor in overall patent quality.²⁸² Thus, the *Nuijten* majority's formalistic and narrow approach to patentable subject matter under § 101 ultimately may frustrate the USPTO's policy initiatives to improve patent quality. On the contrary, the dissent's functional and expansive approach toward defining the scope of § 101 for signals provides inventors better means to protect their inventions and is aligned with the USPTO's initiatives to improve patent quality.

IV. CONCLUSION

More than 150 years after the Supreme Court in *O'Reilly* decided that Samuel Morse's man-made telegraph signals were patentable under U.S. law, the Federal Circuit in *Nuijten* considered the patentability of man-made signals used in the modern application of digital content protection. In contrast to the Court in *O'Reilly*, however, the majority in *Nuijten* narrowly construed § 101 and broadly held that signals are per se unpatentable because they do not fall into any of the four

that the USPTO lacks substantive rulemaking authority, *id.* at *34, but the patent reform legislation passed by the House would expressly overrule this holding if enacted, *see* Patent Reform Act of 2007, H.R. 1908, 110th Cong. (as passed by House, Sept. 10, 2007) (granting substantive rulemaking authority to the USPTO).

²⁸¹ *See supra* note 278 (discussing the implications of the ESD).

²⁸² Proposed USPTO Rules, 72 Fed. Reg. at 47,621.

categories of inventions enumerated in § 101. Rather than being based on the expansive view of patentability articulated by the Supreme Court in *Chakrabarty* and *Diehr*, this holding was based on artificial, overly narrow, and self-contradictory distinctions that have little basis in language, law, or policy. Moreover, this holding failed to take into consideration the Supreme Court's recent guidance in *KSR* on the interpretation of § 103, which is relevant and informative to the interpretation of § 101 due to the links between the two statutes based on common legislative history and complementary purposes.

The *Nuijten* decision on the patentability of signals is likely to have several other implications for patent policy and practice. First, the narrow approach of the *Nuijten* majority requiring signals to be claimed in multiple indirect forms is in direct conflict with the EPO's liberal approach permitting signals to be claimed directly. This conflict creates additional costs and other unnecessary impediments for an inventor trying to obtain patents for his or her invention in both the United States and Europe. Such impediments are contrary to the intent of the TRIPS agreement. Second, the *Nuijten* majority's narrow interpretation of the § 101 category of "manufacture" conflicts with the broader meaning of the analogous TRIPS category of "product." Congress's intent for "manufacture" to be interpreted in the same broad manner arguably may be inferred from the lack of any changes it made to § 101 in the implementation of TRIPS, even with full knowledge of the TRIPS terminology and its meaning. If so, the narrow definition of "manufacture" that excludes from patentability a useful, man-made signal is in opposition with Congress's intent. Finally, when coupled with new USPTO initiatives to improve patent quality by limiting the number of claims per patent application, *Nuijten*'s formalistic requirements for claiming signal-related inventions may place inventors between the horns of a dilemma. The inventor may be forced to choose between foregoing protection of his or her invention against all possible infringing uses and choosing an expensive, untested exception path to obtaining a patent that may yield an apparently broad property right that is ultimately illusory when the inventor tries to enforce it. Moreover, achieving the broadest possible property right by using this second path may

conflict with the important objective of improving patent quality, which currently is a priority of both Congress and the USPTO.

Since the Federal Circuit recently denied a request for an en banc rehearing of *Nuijten*,²⁸³ the signal claim at issue may have seen its last day in court unless the Supreme Court grants certiorari. Nevertheless, the case of *In re Bilski*²⁸⁴ that is currently before the Federal Circuit may have some important implications for the patentability of signals. *Bilski* came before the Federal Circuit as an appeal from the BPAI, which considered the patentability of a claim relating to a method for managing the price risk of energy trading.²⁸⁵ The feature that distinguished this claim from the inventions held patentable in *State Street* and *Excel* was that the method was “non-machine-implemented”—in other words, it was neither claimed nor described as requiring a digital computer and could be performed entirely by human mental activity.²⁸⁶ The BPAI, however, found the invention unpatentable under § 101 not because the claim failed to recite a computer but because the claimed process neither produced a physical transformation nor tied the abstract idea of risk management to a practical application.²⁸⁷ The BPAI also provided an extensive discussion of various tests for patentable subject matter under § 101, including the “useful, concrete, and tangible result” test applied in *State Street* and *Excel*.²⁸⁸

After hearing arguments but prior to issuing a decision, the Federal Circuit issued sua sponte an order for an en banc hearing of the appeal.²⁸⁹ In addition to the specific claim at issue, the court also requested parties to file supplemental briefs on broader issues

²⁸³ *In re Nuijten*, 515 F.3d 1361, 1361 (Fed. Cir. 2008) (order denying petition for rehearing en banc).

²⁸⁴ No. 2007-1130, 2008 U.S. App. LEXIS 3246 (Fed. Cir. Feb. 15, 2008) (order granting en banc hearing of appeal).

²⁸⁵ *Ex parte Bilski*, No. 2002-2257, Application No. 08/833,892, slip op. at 2 (B.P.A.I. Mar. 8, 2006).

²⁸⁶ *Id.* at 6.

²⁸⁷ *Id.* at 58, 62 (“[A] method can be statutory subject matter without a machine.”).

²⁸⁸ *Id.* at 5–34.

²⁸⁹ *In re Bilski*, No. 2007-1130, 2008 U.S. App. LEXIS 3246, at *1 (Fed. Cir. Feb. 15, 2008).

such as the standard for determining when a process is patentable under § 101 and whether any holdings of *State Street* or *Excel* should be reconsidered or overruled.²⁹⁰ Although nominally directed toward the patentability of processes rather than manufactures as in *Nuijten*, the en banc decision in *Bilski* may set a broad standard for patentability of computer-related processes that may provide relevant guidelines for future Federal Circuit panels considering issues similar to those raised in *Nuijten*. Furthermore, the issues in *Bilski* are framed broadly enough that an eventual appeal of the en banc ruling to the Supreme Court would not be unanticipated. If this does occur, then it would provide a perfect opportunity for the Court to affirm *Chakrabarty* and *Diehr* and further clarify the scope of patentable subject matter under § 101 as it did for the non-obviousness requirement of § 103 in *KSR*. In particular, the Court would do well to articulate whether the enumerated categories in the statute are merely another way to divide “new and useful” inventions. If it does, then future Federal Circuit cases involving patentability of signals may be decided in a manner more consistent with *O’Reilly* than with *Nuijten*.

²⁹⁰ *Id.* at *2.

