# Corporate Practice Portfolio Series ,Corporate Legal Departments Portfolios ,Portfolio 113_ Artificial Intelligence and Machine Learning ,Detailed Analysis ,II. Considerations for Prosecution Before the USPTO ,C. Section 112 Issues Concerning Disclosure and Claims for AI Technologies

C. Section 112 Issues Concerning Disclosure and Claims for AI Technologies

**Corporate Practice Portfolio Series**
**Corporate Legal Departments Portfolios**
**Portfolio 113: Artificial Intelligence and Machine Learning**
**Detailed Analysis**
**II. Considerations for Prosecution Before the USPTO**

# C. Section 112 Issues Concerning Disclosure and Claims for AI Technologies

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(1) **Introduction** —

Many artificial Intelligence (AI) technologies are algorithmic, and particularly amenable to being described by their functionality. As such, patent practitioners working with AI technology have to contend with several issues concerning the sufficiency of the disclosure and the interpretation of the claims presented in patent applications. Courts and the USPTO have developed rules interpreting Section 112 of the Patent Act[104] that are specifically tailored to software-based inventions. These rules particularly relate to policing the overbreadth of claimed subject matter by applying definiteness standards for claims under § 112(b)[105], sufficiency of the disclosure under § 112(a)[106], and functional claiming under § 112(f).[107]

[104] 35 U.S.C. § 112

[105] Equivalent in substance to pre-AIA 35 U.S.C. § 112, second paragraph.

[106] Equivalent in substance to pre-AIA 35 U.S.C. § 112, first paragraph.

[107] Equivalent in substance to pre-AIA 35 U.S.C. § 112, sixth paragraph.

(a) **Recent trends and developments** —

The Court of Appeals for the Federal Circuit (CAFC) has led the development of the law concerning § 112. As discussed in greater detail below, much of the recent jurisprudence relating to the application of § 112 to computer-based inventions centers around the liberalization of interpreting claim limitations under § 112(f). In the 2015 decision, *Williamson v. Citrix Online, LLC,* the CAFC overruled its previous application of a “strong” presumption that claim limitations lacking the word “means” are not subject to § 112(f)[108].

[108] 792 F.3d 1339, 1349 (Fed. Cir. 2015) (en banc).

(b) **MPEP guidance** —

In January 2019, the USPTO promulgated Examination Guidance focusing on examination of computer-based inventions under § 112. [109] One part of this guidance addresses issues related to the examination of computer-implemented functional claims having means-plus-function limitations under § 112(f). A second part of this guidance addresses written description and enablement issues related to the examination of computer-implemented functional claims that recite only the idea of a solution or outcome to a problem but fail to recite details of how the solution or outcome is accomplished. The MPEP was updated in June 2020 to incorporate this Guidance. [110]

[109] Examining Computer-Implemented Functional Claim Limitations for Compliance With 35 U.S.C. 112, 84 Fed. Reg. 57.

[110] The current MPEP version with these incorporated materials is indicated as [R-10.2019].

Although the 2019 Examination Guidance and commensurate MPEP sections reflect existing laws and do not depart from the established case law, the recent publication of these materials was accompanied by enhanced training initiatives at the USPTO [111] intended to increase the application, by the examining corps, of the policies underlying the applicable rules. The policies may be described as a policing of patentable claim scope to ensure that the breadth of claims is discernable and commensurate with the extent of innovation and teaching of the claimed invention in the specification.

[111] *See, e.g.,* USPTO Examination Guidance and Training Materials web pages, https://www.uspto.gov/patent/laws-and-regulations/examination-policy/examination-guidance-and-training-materials.

(2) **Section 112: Law and examination procedures** —

Section 112 of the Patent Act [112] consists of six paragraphs numbered (a)-(f). Paragraph (a) sets the requirements for the disclosure of the invention in the specification; paragraph (b) sets the requirements for the particularity and definiteness of the claims; paragraphs (c)-(e) relate to the permissible use of dependent and multiple-dependent claiming forms; and paragraph (f) permits functional claiming and sets forth how such claims are to be interpreted. The subsections that follow address paragraphs (a), (b) and (f) as they relate to AI-based technologies to be patented.

[112] 35 U.S.C. § 112 provides:

1. In General.—

   The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention.

1. Conclusion.—

   The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

1. Form.—

   A claim may be written in independent or, if the nature of the case admits, in dependent or multiple dependent form.

1. Reference in Dependent Forms.—

   Subject to subsection (e), a claim in dependent form shall contain a reference to a claim previously set forth and then specify a further limitation of the subject matter claimed. A claim in dependent form shall be construed to incorporate by reference all the limitations of the claim to which it refers.

1. Reference in Multiple Dependent Form.—

   A claim in multiple dependent form shall contain a reference, in the alternative only, to more than one claim previously set forth and then specify a further limitation of the subject matter claimed. A multiple dependent claim shall not serve as a basis for any other multiple dependent claim. A multiple dependent claim shall be construed to incorporate by reference all the limitations of the particular claim in relation to which it is being considered.

1. Element in Claim for a Combination.—

   An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

(a) **The requirements under 35 U.S.C.§ 112(a)** —

Section 112(a) has three distinct requirements to be met by the patent specification: written description, enablement, and best mode. Each is subject to its own respective inquiry as part of the examination process or as part of a validity challenge in litigation or certain administrative proceedings.

(1) **The written description requirement** —

The written description requirement of 35 U.S.C. § 112(a) requires that the disclosure of the patent application relied upon reasonably convey that the inventor had possession of the claimed subject matter as of the filing date.[113] The written description "must clearly allow persons of ordinary skill in the art to recognize that [the inventor] invented what is claimed[114]." Actual "possession" or reduction to practice outside of the specification is not sufficient to meet the requirement; it is the specification itself that must demonstrate possession.[115] Moreover, it is not a question of whether one skilled in the art might be able to construct the patentee's device from the teachings of the disclosure; rather, it is a question whether the application necessarily discloses that particular device.[116] A description which renders obvious the invention for which an earlier filing date is sought is not sufficient.[117]

[113] *See, e.g.* , *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc).

[114] *Id.* (citations omitted).

[115] *Id* . at 1352; *see also PowerOasis, Inc. v. T-Mobile USA, Inc.*, 522 F.3d 1299, 1306-07 (Fed. Cir. 2008) (explaining that § 112, ¶ 1 "requires that the written description actually or inherently disclose the claim element").

[116] *Lockwood v. Am. Airlines, Inc.*, 107 F.3d 1565, 1572 (Fed. Cir. 1997) (quoting *Jepson v. Coleman*, 314 F.2d 533, 536 (CCPA 1963)).

[117] *Id.*

Moreover, "[the patentee] should describe just what he has invented, and for what he claims a patent."[118] "Thus, a patentee

cannot always satisfy the requirements of Section 112, in supporting expansive claim language, merely by clearly describing one embodiment of the thing claimed." [119] "The description of one method for creating a [particular result] does not entitle the inventor . . . to claim any and all means for achieving that objective." [120]

[118] *Lizardtech, Inc., v. Earth Resource Mapping*, Inc., 424 F.3d 1336, 1346 (Fed. Cir. 2005) (quoting *Bilstad v. Wakalopulos*, 386 F.3d 1116, 1125 (Fed. Cir. 2004) and *Chiron Corp. v. Genentech, Inc.*, 363 F.3d 1247, 1253 (Fed. Cir. 2004)) (citation omitted) (alteration in original).

[119] *Id.*

[120] *Id.*

For evaluating computer-implemented functional claims, the MPEP instructs examiners to determine whether the specification discloses the computer and the algorithm (e.g., the necessary steps and/or flowcharts) that perform the claimed function in sufficient detail such that one of ordinary skill in the art can reasonably conclude that the inventor possessed the claimed subject matter at the time of filing. [121] It is improper to rely on the fact that one skilled in the art could write a program to achieve the claimed function without actually describing how the inventor intends to achieve the claimed function. [122] The MPEP adopts the definition of an algorithm as provided in Microsoft's Computer Dictionary, [123] namely, "a finite sequence of steps for solving a logical or mathematical problem or performing a task." The algorithm may be expressed in any understandable terms including as a mathematical formula, in prose, or as a flow chart, or in any other manner that provides sufficient structure. [124]

[121] MPEP § 2161.01(I) [R-10.2019]

[122] *Vasudevan Software, Inc. v. MicroStrategy, Inc.*, 782 F.3d 671, 681-683, (Fed. Cir. 2015).

[123] 5th ed., 2002.

[124] MPEP § 2161.01(I) (citing *Finisar Corp. v. DirecTV Grp., Inc.*, 523 F.3d 1323, 1340 (Fed. Cir. 2008)).

(2) **The enablement requirement** —

The enablement requirement under § 112(a) calls for the specification to describe how to make and how to use the invention. This is a separate and distinct requirement from the written description requirement. [125] The enablement requirement is satisfied when one skilled in the art, after reading the specification, could practice the claimed invention without undue experimentation. [126] It is the specification — not the knowledge of one skilled in the art — that must supply the novel aspects of an invention in order to constitute adequate enablement. [127] Although the knowledge of one skilled in the art is relevant to the analysis, the novel aspect(s) of a claimed invention must be enabled in the patent. [128]

[125] *Vas-Cath,Inc. v. Mahurkar*, 935 F.2d 1555, 1563, (Fed. Cir. 1991).

[126] *Auto. Techs. Int'l, Inc. v. BMW of N. Am., Inc.*, 501 F.3d 1274, 1282 (Fed. Cir. 2007)

[127] *Id.* at 1283.

[128] *Id.*

The full scope of a patent claim must be enabled. [129] The specification need not describe how to make and use every embodiment of the invention; however, the specification must reasonably enable one of ordinary skill in the art to make and use alternate embodiments that are within the scope of the claims, at the time of the patent's effective filing date. [130] The CAFC has laid out eight factors to consider when determining whether undue experimentation is required: [131]

[129] *Liebel-Flarsheim Co. and Mallinckrodt, Inc. v. Medrad, Inc.*, 481 F.3d 1371, 1379 (Fed. Cir. 2007).

[130] *Id.* at 1380.

[131] *In re Wands*, 858 F.2d 731, 737 (Fed. Cir. 1988).

(1) the quantity of experimentation necessary,

(2) the amount of direction or guidance presented,

(3) the presence or absence of working examples,

(4) the nature of the invention,

(5) the state of the prior art,

(6) the relative skill of those in the art,

(7) the predictability or unpredictability of the art, and

(8) the breadth of the claims.

Where the specification teaches against a purported aspect of an invention, such a teaching "is itself evidence that at least a significant amount of experimentation would have been necessary to practice the invention." [132]

[132] *Liebel*, 481 F.3d at 1379.

(3) **Best mode** —

The best mode requirement is a safeguard against the desire on the part of some people to obtain patent protection without making a full disclosure as required by the statute. [133] The requirement does not permit inventors to disclose only what they know to be their second-best embodiment, while retaining the best for themselves. [134]

[133] MPEP § 2165.

[134] *Id* . (citing *In re Nelson*, 280 F.2d 172 (CCPA 1960)).

The best mode requirement is examined as a two-part inquiry. First, a subjective determination is made as to whether the inventor possessed (as a state of mind) a best mode for carrying out the invention at the time of filing of the patent application. [135] Second, if the inventor possessed the best mode, an objective determination is made as to whether the best mode is described in the specification in such a way that a person skilled in the art could practice it. [136] There is no requirement to designate which one of the described embodiments, among several embodiments disclosed, constitutes the best mode. [137]

[135] MPEP § 2165.

[136] *Id.*

[137] MPEP § 2165.01(III).

The America Invents Act[138] eliminated the best mode requirement as a basis for cancelling, invalidating or deeming a patent unenforceable. This change applies to litigation and validity proceedings under 35 U.S.C. § 282, but not to patent prosecution. Thus, the USPTO continues to enforce the best mode requirement for patent applications governed by the AIA.

[138] Section 15 of the Leahy-Smith America Invents Act (AIA), Public Law 112-29, 125 Stat. 284 (September 16, 2011).

(b) **The requirements under 35 U.S.C. § 112(b)**

(1) **Overview of the two requirements under § 112(b)** —

35 U.S.C. § 112(b) provides that the specification must have one or more claims at the end that particularly point out and distinctly claim the subject matter which the inventor or a joint inventor regards as the invention. MPEP § 2171 recognizes two separate inquiries to be made in assessing patentability under this provision: (i) the claims must set forth the subject matter that the inventor or joint inventor regards as the invention; and (ii) the claims must particularly point out and distinctly define the metes and bounds of the subject matter to be protected by the patent grant.

Under requirement (i), it is imperative for patent practitioners to ensure that the inventor(s) is in agreement with the content of the claims to be presented in an application. This is a determination based on the subjective understanding of the inventor(s). Grounds for rejection based on this requirement most often arise in cases where certain subject matter is indicated in the specification as being essential, but is then left out, or not interrelated with other essential features, of a claim in question.[139]

[139] *See* MPEP § 2172.01.

Under requirement (ii), the claims must be definite, i.e., clear, precise, correct, and unambiguous. A decision on whether a claim is indefinite under § 112(b) requires a determination of whether those skilled in the art would understand what is claimed when the claim is read in light of the specification.[140] The USPTO examiner can properly reject a claim as indefinite if the claim is ambiguous, vague, incoherent, opaque, or otherwise unclear.[141]

[140] MPEP 2173.02 (citing *Power-One, Inc. v. Artesyn Techs., Inc.*, 599 F.3d 1343, 1350).

[141] *In re Packard*, 751 F.3d 1307, 1311 (Fed. Cir. 2014).

(2) **Standards for interpretation of claim language** —

Examiners are instructed to analyze the definiteness of claim language in light of (A) The content of the particular application disclosure; (B) The teachings of the prior art; and (C) The claim interpretation that would be given by one possessing the

ordinary level of skill in the pertinent art at the time the invention was made.[142] Notably, the USPTO does not interpret claims when examining patent applications in the same manner as the courts.[143] During examination, the USPTO construes claims by giving them their *broadest reasonable interpretation* ("BRI").[144] Under BRI, claims are interpreted using the "broadest reasonable meaning of [a claim's] words in their ordinary usage as they would be understood by one of ordinary skill in the art, taking into account whatever enlightenment by way of definitions or otherwise that may be afforded by the written description contained in the applicant's specification."[145] The prosecution history should also be considered.[146]

[142] MPEP 2173.02(II).

[143] MPEP § 2173.02(I) (citing *In re Packard* , 751 F.3d 1307, 1312, 110 (Fed. Cir. 2014); *In re Morris*, 127 F.3d 1048, 1054 (Fed. Cir. 1997); and *In re Zletz*, 893 F.2d 319, 321-22 (Fed. Cir. 1989).

[144] *See* MPEP § 2111 *et seq*.

[145] *In re Morris* at 1054.

[146] *Microsoft Corp. v. Proxyconn, Inc.*, 789 F.3d 1292, 1298 (Fed. Cir. 2015) ("Even under the broadest reasonable interpretation, the Board's construction 'cannot be divorced from the specification and the record evidence'").

The "*Phillips*" standard is used to construe claims by the U.S. Federal Courts, and the International Trade Commission ("ITC").[147] The Patent Trial and Appeal Board of the USPTO also applies the *Phillips* standard for *inter partes* review ("IPR"), post-grant review ("PGR"), and covered business method patents ("CBM") proceedings.[148] Under the *Phillips* standard, claims are given their ordinary and customary meaning as understood by a person of skill in the art at the time of the invention and in light of the specification and prosecution history.[149]

[147] *Cuozzo Speed Techs., LLC v. Lee* , 136 S. Ct. 2131, 2134 (2016) (quoting *Phillips v. AWH Corp.* , 415 F.3d 1303, 1314 (Fed. Cir. 2005)).

[148] Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, final Rule, 83 FR 51340 (2018).

[149] *Phillips*, 415 F.3d at 1314.

The BRI standard is generally understood to produce a broader claim construction.[150] Thus, in the context of patent examination under the BRI standard, ambiguity under § 112(b) is more likely to be found than in the context of a proceeding in which the *Phillips* standard is applied.[151]

[150] *Facebook, Inc. v. Pragmatus AV, LLC*, *2014 WL 4454956*, 4 (Fed. Cir. 2014) (nonprecedential). See also Kevin Greenleaf, et al, *How Different Are the Broadest Reasonable Interpretation and Phillips Claim Construction Standards?* , Intellectual Property Owners Association (2018), *available at* https://ipo.org/wp-content/uploads /2018/10/BRI-v-Phillips-Final-1.pdf.

[151] *In re Packard*, 751 F.3d at 1323-24 (Plager, J., concurring).

(3) **MPEP provisions relevant to § 112(b) and AI-based inventions** —

Section 2173.05 of the MPEP provides a number of subsections containing various topics of guidance for examining claims under § 112(b). Those topics which may be particularly pertinent to patent applications directed to AI concepts are discussed as follows.

(i) **New Terminology** —

Section 2173.05(a) addresses the use of new terminology. The meaning of every term must be apparent. Applicants are permitted to define their own terms and change or adapt the meanings of existing terms; however, such new or changed terminology must be clearly defined. Also, when there is more than one meaning for a term, the applicant must make clear which meaning is intended.

(ii) **Functional claiming** —

MPEP section 2173.05(g) relates to functional claim terms. A functional claim term is one that recites a feature by what it does rather than by what it is. [152] A functional limitation is often used in association with an element, ingredient, or step of a process to define a particular capability or purpose that is served by the recited element, ingredient or step. [153]

[152] *Id* . (citing *In reSwinehart*, 439 F.2d 210, 212 (CCPA 1971)).

[153] *Id.* (citing In *Innova/Pure Water Inc. v. Safari Water Filtration Sys. Inc.*, 381 F.3d 1111, 1117-20 (Fed. Cir. 2004)).

Notably, this subsection provides that there is nothing inherently wrong with defining some part of an invention in functional terms, and functional language does not, in and of itself, render a claim improper. A claim may be written in purely functional form (i.e., without stating the structure that performs the recited function) as expressly permitted under § 112(f) [154] , or it may be written to recite some structure followed by its function [155] . A functional limitation must be evaluated and considered, just like any other limitation of the claim, for what it fairly conveys to a person of ordinary skill in the pertinent art in the context in which it is used. [156]

[154] *Id.* (citing *Phillips v. AWH*, 415 F.3d at 1311).

[155] Id. (citing *In re Schreiber*, 128 F.3d 1473, 1478 (Fed. Cir. 1997).

[156] MPEP § 2173.05(g).

On the other hand, when claims merely recite a description of a problem to be solved or a function or result achieved by the invention, the boundaries of the claim scope may be unclear. [157] In addition, a claim may be deemed indefinite under § 112(b) when the functional language results in such breadth (without structural limits) that the scope of the claim cannot be ascertained. [158] This type of rejection may be especially difficult to overcome when the claim feature in question falls under § 112(f) (discussed below) and fails include a description of sufficient material, structure, or acts in the specification corresponding to that feature.

[157] *Id* . (citing *Halliburton Energy Servs*., Inc. v. M-I LLC, 514 F.3d 1244, 1255 (Fed. Cir. 2008)).

[158] *Id* . (citing *Ariad*, 598 F.3d at 1353 and *Datamize LLC v. Plumtree Software Inc*., 417 F.3d 1342 (Fed. Cir. 2005)).

MPEP section 2173.05(g) instructs examiners to consider the following factors when examining claims that contain functional language to determine whether the language is ambiguous: (1) whether there is a clear cut indication of the scope of the subject matter covered by the claim; (2) whether the language sets forth well-defined boundaries of the invention or only states a problem solved or a result obtained; and (3) whether one of ordinary skill in the art would know from the claim terms what structure or steps are encompassed by the claim. The primary inquiry is whether the language leaves room for ambiguity or whether the boundaries are clear and precise. [159]

[159] *Id.*

(iii) **Product-by-process claims** —

A product-by-process ("p-b-p") claim is one that claims a product, such as a system or an article of manufacture, not by its structure or function, but by the process that was used in its creation or manufacture. MPEP § 2173.05(p) provides that this form of claiming is not improper under § 112(b). [160] P-b-p claims may be useful in situations where the structure or composition of the product is unknown, or the product is otherwise difficult to describe directly, but where the product may be reproduced when the defined process is carried out. In the context of AI inventions that may be claimed, a machine-learning system may perform supervised learning, reinforcement learning, or unsupervised learning, resulting in specific structural reconfigurations of the system (e.g., variations in nodal connectivity, weighting, or biasing) that may be difficult or impractical to express in a conventional patent claim directed to a system or apparatus. Accordingly, there may be instances where such an invention is best defined by the operations that led to its useful configuration.

[160] MPEP § 2173.05(p) (citing *Purdue Pharma v. Epic Pharma*, 811 F.3d 1345, 1354 (Fed. Cir. 2016)).

The USPTO determines the patentability of p-b-p claims by the product itself, and not by the process steps stated in the claim. [161] In other words, a p-b-p claim may be rejected on prior-art grounds as obvious over, or anticipated by, a same or similar product known in the prior art even if that same or similar product is made by a different process.

[161] MPEP § 2113.

Note, however, that courts apply a different interpretation of the scope of p-b-p claims than the USPTO. In particular, infringement and validity of a p-b-p claim is determined by courts based on the product itself and on the recited process steps. [162] Thus, a p-b-p claim is considered to be broader during patent prosecution than during litigation. As a consequence of the different standards applied between the USPTO and the courts, a patentee pursuing a p-b-p claim faces the challenge of prosecuting a relatively broader claim scope, and also the challenge of capturing an accused infringer with a relatively narrower claim scope.

[162] *Abbott Labs. v. Sandoz, Inc.*, 566 F.3d 1282, (Fed. Cir. 2009).

(iv) **Claims referencing figures or tables** —

MPEP § 2173.05(s) sets the criteria for permitting incorporation by reference to a specific figure or table in the claims. It is permitted only in exceptional circumstances where there is no practical way to define the invention in words, and where it is more concise to incorporate by reference than duplicating a drawing or table into the claim. Reference to figures or tables may be practical for claiming certain AI subject matter such as decision systems that are configured with certain training data. Such training data may be impractical to recite in the claim itself, necessitating a reference to a table or figure.

(c) **Functional claiming under 35 U.S.C. § 112(f)** —

As discussed above, some patent claims have elements that are purely functional. Section 112(f) allows a patentee to recite a function to be performed without describing the structure or materials for performing that function in the claim itself. Traditionally, patentees have invoked § 112(f) using "means-plus-function" or "step-plus-function formulations" in claims. Such claim elements are construed to cover the corresponding structure, materials, or acts described in the specification and equivalents thereof. [163] Thus, pure functional claiming under § 112(f) is a statutorily authorized form of central claiming. Applied on a feature-by-feature basis, claim limitations falling under § 112(f) define the scope of their corresponding features not by the functional language, but by the structures, materials, or operations that carry out the recited functions, as described in the specifications.

[163] *Northrup Grumman Corp. v. Intel Corp.*, 325 F.3d 1346, 1350 (Fed. Cir. 2003)

"Once a court establishes that a means-plus-function limitation is at issue, it must identify and construe that limitation, thereby determining what the claimed function is, and what structures disclosed in the written description correspond to the 'means' for performing that function." [164] Thus, interpretation of claims under § 112(f) involves a two-step analysis in which a first determination must be made as to whether § 112(f) applies (on a feature-by-feature basis) and, if § 112(f) does apply for each respective feature, what structures, materials, or acts are described in the specification that correspond to the recited function. [165] Concomitant to this analysis is a further determination of whether the description of such corresponding structure, material, or acts is adequate. [166] An inadequate disclosure of such corresponding structure, material, or acts is deemed a failure to particularly point out and distinctly claim the invention as required by the 35 U.S.C. § 112(b).

[164] *Lockheed Martin Corp. v. Space Systems/Loral, Inc.,* 324 F.3d 1308, 1319 (Fed. Cir. 2003).

[165] *Williamson*, 792 F.3d at 1348.

[166] *In re Donaldson Co.*, 16 F.3d 1189, 1195 (Fed. Cir. 1994) (en banc).

(1) **Determination of the application of 112(f) to functional language in a claim** —

A claim limitation is presumed to invoke 35 U.S.C. § 112(f) when it explicitly uses the term "means" or "step" and includes functional language. The presumption that 35 U.S.C. § 112(f) applies is overcome when the limitation further includes the structure, material or acts necessary to perform the recited function. [167] Lack of use of the word "means" creates a rebuttable presumption that Section 112(f) does not apply. [168] The *Williamson* court recognized that generic terms such as "mechanism," "element," and "device," are mere "nonce" words that are tantamount to using the word "means," because they typically do not connote definite structure. [169] Notably, the *Williamson* court overturned prior jurisprudence that considered these presumptions to be strong presumptions.

[167] *See, e.g., TriMed, Inc. v. Stryker Corp.*, 514 F.3d 1256, 1259-60 (Fed. Cir. 2008).

[168] *Williamson*, 792 F.3d at 1349.

[169] *Id.* at 1350-51 (holding that the word "module" used in the phrase "distributed learning and control module" is a nonce word substitute for "means).

Even when a claim limitation uses the term "means" or a generic placeholder for the term "means," a limitation will not invoke § 112(f) if there is a structural modifier that further describes the term "means" or the generic placeholder. [170] Importantly, the application of § 112(f) is driven by the claim language, not by applicant's intent or mere statements to the contrary included in the specification or made during prosecution. [171]

[170] *See, e.g .*, *Greenberg v. Ethicon Endo-Surgery, Inc.*, 91 F.3d 1580, 1583 (Fed. Cir. 1996).

[171] *See In re Donaldson Co.*, 16 F.3d at 1194.

The MPEP instructs examiners to determine whether a word, term, or phrase coupled with a function denotes structure by checking whether: (A) the specification provides a description sufficient to inform one of ordinary skill in the art that the term denotes structure; (B) general and subject matter specific dictionaries provide evidence that the term has achieved recognition as a noun denoting structure; and (C) the prior art provides evidence that the term has an art-recognized structure to perform the claimed function. See MPEP § 2181, subsection I, for more guidance on generic placeholders. [172]

[172] MPEP § 2181(I).

(2) **Adequacy of disclosure for computer-based claims that fall under § 112(f)** —

The proper test for meeting the definiteness requirement under § 112(b) is that the corresponding structure (or material or acts) of a means- (or step-) plus-function limitation must be disclosed in the specification in a way that one skilled in the art will understand what structure (or material or acts) will perform the recited function. [173] For a computer-implemented claim feature determined to fall under § 112(f), the specification must disclose an *algorithm* for performing the claimed specific computer function, or else the claim is indefinite under 35 U.S.C. § 112(b). [174] For such claimed features, a microprocessor alone can serve as structure for a recited function only where that function is coextensive with a microprocessor itself. [175] The sufficiency of the algorithm is determined in view of what one of ordinary skill in the art would understand as sufficient to define the structure and make the boundaries of the claim understandable. [176] Reliance on the understanding of one skilled in the art does not relieve the patentee of the duty to disclose sufficient structure to support means-plus-function claim terms; a patentee cannot avoid providing specificity as to structure simply because someone of ordinary skill in the art would be able to devise a means to perform the claimed function. [177]

[173] *See, e.g., Atmel Corp. v. Information Storage Devices, Inc.*, 198 F.3d 1374, 1381 (Fed. Cir. 1999).

[174] *Net MoneyIN, Inc. v. Verisign. Inc.*, 545 F.3d 1359, 1367 (Fed. Cir. 2008); *In re Aoyama*, 656 F.3d 1293, 1297 (Fed. Cir. 2011).

[175] *EON Corp. IP Holdings LLC v. AT&T Mobility LLC*, 785 F.3d 616, 621-22 ("It is only in the rare circumstances where any general-purpose computer without any special programming can perform the function that an algorithm need not be disclosed").

[176] *Noah*, 675 F.3d at 1313.

[177] *Blackboard, Inc. v. Desire2Learn, Inc.*, 574 F.3d 1371, 1384 (Fed. Cir. 2009).

(d) **Overview of trends in § 112 jurisprudence and practical considerations for practitioners** —

Over the last 15 years, there has been an unmistakable increase in invalidation of patent claims under § 112(b). [178] Following the decision of *Williamson v. Citrix*, there has been a sharp rise in patent claims that fall under § 112(f), particularly with the weakening of the presumptions that had been applied in determining the applicability of § 112(f). Patentees, particularly those in the AI and other software technologies space, would be well advised to write patent applications proactively with an eye toward managing claim interpretation under this rule.

[178] *See, e.g.,* Brian M. Buroker and David A. Kelly, *First Datamize and Now Aristocrat and Finisar: Electrical and Software Patent Invalidations For Indefiniteness Sharply on the Rise*, Patent Trademark & Copyright Journal, Vol. 75, No. 456, (February 29, 2008).

One proactive approach, where practicable, would be to write at least one independent claim that recites the operations of a key algorithm with the purpose of including sufficient structure in the claim itself. Other independent claims and the specification should be written with the presumption that 112(f) will be applied. Applicants should note that commonly used phrases, such as

“configured to,” “adapted to,” “programmed to,” and the like, are likely to be deemed as equivalent to “means for” formulations, particularly in the absence of recited structure. In the context of software, such structure resides in the algorithms more so than in the software architectures.

Accordingly, the specification should include a hierarchy of operations described at a high level (i.e., the software architecture) and, for each of these operations, one or more algorithms (each as a series of operations, preferably with decisions and branching flows to emphasize detail). A key objective in preparing this type of detailed description is to clearly set apart the description of the function (the “what”) and the series of operations that are necessary for carrying out that function (the “how”). When drafting applications, an inventory of widely encompassing operations — such as “controlling,” “coordinating,” “determining,” “computing,” “deriving,” and the like — may be taken, and algorithmic sequences of operations that make up each instance of such operations should be described and, preferably, shown in the drawings.

Certain types of software operations may be described and claimed using well-known analogs from the field of electronics. For instance, a decision subroutine may be described and claimed as a “comparator” or “filter.” This approach may not be dispositive on the question of whether the claim has “sufficient structure” to perform a recited function, but it would seem to provide at least a colorable argument to that effect.

On the other hand, practitioners should take care when using mathematical terminology and concepts, as these may result in a narrower claim construction than intended. Whenever practical, mathematical formulas and expressions that are presented as equations (or in mathematical notation) should also be written in prose. This presents opportunities for the practitioner to distill the mathematical formula to its core concept.

Applicants may want to consider expressly demonstrating their subjective possession of the desired scope of the claims. In describing embodiments of the invention, a diversity of examples of different implementations are more likely to adequately support broad claim scope than examples with small variations.

For claiming machine-learning (ML) inventions such as deep neural networks where the inner workings of some of the functional blocks are unknown, practitioners may want to consider suitable ways of reciting some aspect of the operations of those elements, perhaps in terms of their inputs and outputs. For instance, consider reciting “a plurality of layers operative to produce activations of nodes based on feature sets derived from _____, and to further produce an output based on the activations, the output representing _____.”