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The Field of Invention

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THE FIELD OF INVENTION

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I. INTRODUCTION

The balance of power between the administrative state and the federal courts as guardians of the U.S. innovation system is in significant transition. Amid growing dissatisfaction with the expense and opportunity costs of patent litigation and the perceived strategic advantages that patent owners enjoy in the judicial process, the political branches have placed considerable new authority in the United States Patent and Trademark Office ("USPTO") directly calculated to supplant the primacy of courts in resolving disputes over patent rights.

Amid this shifting balance of power, courts can no longer afford to ignore, assume, or improvise a pervasively important administrative power that the USPTO exercises regularly and capably: technology classification.[1] It is surprising that the problem has persisted for so long in the first place, as technological classification is foundational to the law and policy of the patent system. Patent exceptionalism in administrative law explains some (but not all) of the historical judicial disregard for classification issues, and in any case, the explanation does not justify the error.

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1. *See* Heather J.E. Simmons, *Categorizing the Useful Arts: Past, Present, and Future Development of Patent Classification in the United States*, 106 LAW LIBR. J. 563, 563-64 (2014).

The origins and initial effects of the shifting balance are cause for significant judicial caution as the USPTO grows into its enlarged role, particularly in those matters of administrative process that reveal the boundaries between the agency and the courts. Administrative ascendancy in the patent system was formalized quite recently in 2011, pursuant to the Leahy-Smith America Invents Act.[2] Moreover, the foundations for that formalization are not much older, dating largely from the Supreme Court's 1999 decision in *Dickinson v. Zurko*[3] and contemporaneous legislative and scholarly debates about the USPTO's expertise and exceptional treatment as compared with the main body of administrative law.[4] In other words, the shift toward administrative preeminence is an explicit policy choice of the political branches and is also a relatively new phenomenon whose empirical assumptions and expected effects are still being studied. For these reasons, courts' ongoing scrutiny of their own changing authority is more important than ever, particularly in classification issues, because taxonomy matters deeply to patent law.

Ex ante, the patent system's ability to promote innovation rests on enforcing several sets of requirements for granting patents, and these requirements all depend on classification. For example, patents must be granted only to inventions that are sufficiently inventive.[5] Patents must sufficiently disclose the inventions in operational detail.[6] Patents must present sufficiently clear boundaries of what they do and do not claim.[7] Once granted, patents must be enforced only against accused products and processes that sufficiently overlap with the inventive content over which the patent confers ownership.[8] But, in each respect, sufficient by what standard?

Most of these inquiries are evaluated from the perspective of the "person having ordinary skill in the art" ("PHOSITA") to which the patented invention pertains.[9] Like the "reasonably prudent person" in tort law, the PHOSITA is a frequently debated figure in the patent literature. How should it be characterized? How does it shape the practical effect of patent doctrines individually and in concert with each

2. Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (codified as amended in scattered sections of 35 U.S.C.).

3. 527 U.S. 150 (1999).

4. *See infra* Part II.C.

5. *See* 35 U.S.C. § 101 (2012).

6. *See id.* § 112.

7. *See id.*

8. *See id.* § 103.

9. *Id.*

other? Should it be the only (or even primary) point of reference in the patent system?

Ex post, too, the evaluation by commentators, courts, and ultimately Congress of how well the patent system is fulfilling its instrumental aims and of what reforms may be appropriate relies to a significant extent on underlying taxonomic choices.[10] Among commentators, and in response to patent jurisprudence, a robust economic and legal literature has now emerged reexamining the unitary formal structure of the U.S. patent system, in which the standards of patentability and the parameters and costs of patent acquisition, maintenance, and enforcement are nominally uniform across technology.

Meaningful technological distinctions have long existed, of course, and to take account of them, these uniform standards and parameters are often *applied* in disparate ways. This suggests that patent law may actually be technology-specific as a practical matter and raises the normative possibility that it should be technology-specific as a formal matter as well. At times, Congress has even accepted the invitation to legislate in specific technologies, such as surgical methods and, more recently, business methods, despite the ever-present difficulty of classifying technologies and drawing lines of legal force among them.[11]

Yet, for all the doctrinal debate over the PHOSITA and theoretical development in approaches to technology-specific policy analysis, there has been little systematic discussion on the antecedent question of how the USPTO and the courts should identify the art or technology itself, the field of invention. In this regard, what matters most is not necessarily the "correct" taxonomic method but rather who should decide. In administrative terms, what institutional allocation of authority is most likely to produce desirable outcomes over time?

The lack of discussion on allocating this authority has far-reaching effects. Nearly every major doctrine in patent law relies on the concept of a field of invention, but neither the case law nor the literature explores how legal actors *should* identify the field of a particular invention or even how they *do* make this identification. At times, this determination may be structured and, at other times, improvised. The power to classify, however, pervasively implicates issues of expertise and administrative law exceptionalism that are now animating the shift away from courts and toward the USPTO as the principal locus of patent law and policymaking.

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10. *See infra* Part II.C.1.

11. *See* Fariba Sirjani & Dariush Keyhani, *35 U.S.C. § 287(c): Language Slightly Beyond Intent*, 3 BUFF. INTELL. PROP. L.J. 13, 29-30 (2005); *infra* Part II.C.1.

This Article theorizes that power to classify in three parts.[12] Part II offers a positive account of how the USPTO currently classifies inventions prior to examination and how those classifications fare in judicial review.[13] Prominent in this account are discussions of the USPTO's congressionally authorized system of classification, the USPTO's organization of its patent examiner corps, and the USPTO's institutional competence for assigning the field of invention.[14] To place this account in context, Part II concludes with a historical discussion, both of the USPTO's anomalous status as an expert agency and of the growing salience of patent policy choices that differentiate on the basis of technology.[15] Part III traces the legal and institutional implications of the positive account set forth in Part II by showing that the field of invention underlies virtually all of patent doctrine, from the requirements for obtaining a patent, to the limitations on enforcing a patent, to the policy levers for assessing the health of the patent system.[16] Part IV addresses the proper allocation of taxonomic authority between the USPTO and the courts.[17] Ordinary administrative law principles point toward judicial deference for the USPTO's classification decisions as a means to better balance the aims of accuracy and quality in patent examination with the values of uniformity and predictability in judicial review.[18]

II. IDENTIFYING THE FIELD OF INVENTION

The taxonomic exercise looks quite different in the administrative process than it does in the federal courts. These differences reflect historical court-agency dynamics within patent law and have important normative implications for the health of the patent system. This Part discusses those descriptive differences, implications, and dynamics in three Subparts.[19]

Subpart A reveals that the USPTO, when asked to define the scope of patent rights, exercises its taxonomic authority and identifies the field of invention through a highly structured process involving centralized intake, application of a published comprehensive classification system,

12. *See infra* Parts II–IV.
13. *See infra* Part II.
14. *See infra* Part II.A–B.
15. *See infra* Part II.C.
16. *See infra* Part III.
17. *See infra* Part IV.
18. *See infra* Part IV.B.
19. *See infra* Part II.A–C.

and distribution to patent examiners with appropriate expertise.[20] Yet courts, when asked to evaluate or vindicate patent rights, either make little more than ad hoc findings about the field of invention or overlook the inquiry altogether.[21] Subpart B argues that judicial disengagement from the USPTO's taxonomic efforts is a waste of scarce institutional resources and that remedying the disengagement would produce efficiency gains.[22] Subpart C situates this particular court-agency relationship within the more broadly anomalous and evolving administrative process of the patent system, particularly the growing salience of technology-specific policy and its attendant need for classifications.[23]

A. Current Practice

1. In the Patent Office

The legal sufficiency of patent applications to issue as patents is evaluated in the USPTO by a corps of some 9300 patent examiners.[24] Beyond enforcing procedural formalities, the USPTO must substantively assure that its examiners grasp the technological details of inventions in order to reach meaningful conclusions about whether they represent true advances to the state of knowledge in their respective disciplines.[25] For this reason, the USPTO requires that all of its examiners possess, at minimum, a bachelor's degree in a field of physical science, life science, engineering, or computer science.[26] In this way, examiners serve as the USPTO's institutional proxies for persons having ordinary skill in a wide range of arts.[27] The USPTO's institutional process recognizes, however, that one must first identify the art before determining what ordinary skill in that art might look like and who might possess it.[28]

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20. *See infra* Part II.A.

21. *See infra* text accompanying notes 144-45.

22. *See infra* Part II.B.

23. *See infra* Part II.C.

24. U.S. PATENT & TRADEMARK OFFICE, DEP'T OF COMMERCE, PERFORMANCE & ACCOUNTABILITY REPORT 11 (2014), www.uspto.gov/about/stratplan/ar/USPTOFY2014PAR.pdf.

25. *Id.* at 137-39.

26. *Patent Examiner Positions*, U.S. PAT. & TRADEMARK OFF., https://www.uspto.gov/web/offices/pac/exam.htm (last modified Mar. 11, 2017, 1:44 AM).

27. Daralyn Durie & Mark Lemley, *A Realist Approach to the Obviousness of Inventions*, 50 WM. & MARY L. REV. 989, 1010-11 (2008); *cf.* Rebecca S. Eisenberg, *Obvious to Whom? Evaluating Inventions from the Perspective of PHOSITA*, 19 BERKELEY TECH. L.J. 885, 888 (2004) ("The technological skill of patent examiners may provide a proxy for the tacit knowledge of PHOSITA, but examiners are at best former practitioners whose practical technological skills inevitably decline with time.").

28. *See* Graham v. John Deere Co. of Kan. City, 383 U.S. 1, 17-18 (1966).

Accordingly, before a patent application appears on an examiner's docket, the application is first sent to be classified.[29]

For this, the USPTO maintains the Office of Patent Classification, staffed by technical specialists who initially review applications to determine the fields to which they pertain.[30] Each review includes the patent application specification, with its technical background of the claimed invention, as well as the patent claims themselves.[31] The review also includes the inventor's own characterizations of the field of her invention, provided in a section of the application form entitled "Field of the Invention," which is part of the more general "Background of the Invention" section.[32]

Based on this review, classification specialists assign to the application a primary technology class and several search classes.[33] The purpose of the primary class is to identify directly the application's field of invention.[34] In this way, the primary class becomes the examiner's starting point when searching for prior art within the appropriate field of endeavor.[35] The search classes are related to the primary class and serve the same purpose: for the examiner to locate additional potentially relevant prior art, and to do so more readily and accurately.[36] Only after the Office of Patent Classification identifies the field of invention is the application routed to an examiner with expertise in that relevant field.[37]

Classification specialists make taxonomic identifications upon reference to the U.S. Patent Classification System ("USPC"), a comprehensive hierarchy of technological fields and subfields that is promulgated and maintained by the USPTO.[38] To apply the USPC, classification specialists rely on the USPTO's *Manual of Classification*,

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29. *See* U.S. PATENT & TRADEMARK OFFICE, DEP'T OF COMMERCE, OVERVIEW OF THE U.S. PATENT CLASSIFICATION SYSTEM (USPC) §§ 1.1, 1.4.1 (2012), https://www.uspto.gov/sites/default/files/patents/resources/classification/overview.pdf [hereinafter OVERVIEW OF THE U.S. PATENT CLASSIFICATION SYSTEM].

30. *Id.* §§ 1.1–.4.

31. U.S. PATENT & TRADEMARK OFFICE, MANUAL OF PATENT EXAMINING PROCEDURE § 608.01(a) (9th ed. 2014) [hereinafter MPEP].

32. *Id.* (directing the applicant to provide "background" and "field" information regarding the claimed invention).

33. *See* OVERVIEW OF THE U.S. PATENT CLASSIFICATION SYSTEM, *supra* note 29, §§ 1.5–.6.

34. *Id.*

35. *Id.*

36. U.S. PATENT & TRADEMARK OFFICE, DEP'T OF COMMERCE, HANDBOOK OF CLASSIFICATION 11-12 (2005) [hereinafter HANDBOOK OF CLASSIFICATION].

37. OVERVIEW OF THE U.S. PATENT CLASSIFICATION SYSTEM, *supra* note 29, § 1.8. Examiners themselves are grouped by their broad and specific fields and subfields of expertise, from high-level "technology centers" down to specific "art units." *Id.*

38. *Search Patent Classification Systems*, U.S. PAT. & TRADEMARK OFF., www.uspto.gov/web/patents/classification/index.htm (last visited Apr. 10, 2017).

which is accessible in subject-matter order[39] and alphabetical order of the technology class designations.[40] In developing and updating this taxonomy, the Office of Patent Classification relies on five conceptual grounds to organize technological information: (1) by the industry or use that the technology serves, (2) by the proximate function that the technology accomplishes, (3) by the effect or product that the technology produces, (4) by the structure or physical configuration that the technology reflects, or (5) by some combination of these aspects.[41]

The current classification system consists of 438 numbered classes of utility patents, each containing increasingly specific subclasses.[42] Each class is identified by a unique class number, and each subclass is identified by a subclass number that is unique within a given class, which may contain decimal digits or alpha characters, or both. A class-subclass pair uniquely identifies the precise location of an invention within the taxonomy.[43] For example, U.S. Patent No. 7,052,096 by inventor Nagao Miyazaki claims a vehicle antilock brake control system.[44] It was originally grouped in class 303 (fluid-pressure and analogous brake systems), subclass 123 (for a tractor-trailer type vehicle), and currently remains in that classification.[45]

The USPTO periodically revises the USPC and classification manual to account for the continually evolving nature of technology and systems for classifying technology.[46] A reclassification project may create new classes and subclasses, modify the scope of existing classes and subclasses, and consolidate or abolish obsolete classes and subclasses.[47] The project concludes with an official reclassification order

39. U.S. PATENT & TRADEMARK OFFICE, DEP'T OF COMMERCE, CLASSES WITHIN THE U.S. CLASSIFICATION SYSTEM: ARRANGED BY RELATED SUBJECT MATTER (2012), www.uspto.gov/sites/default/files/patents/resources/classification/classescombined.pdf.

40. U.S. PATENT & TRADEMARK OFFICE, DEP'T OF COMMERCE, CLASSES WITHIN THE U.S. CLASSIFICATION SYSTEM: ARRANGED IN ALPHABETICAL ORDER (2012), www.uspto.gov/sites/default/files/patents/resources/classification/caa.pdf.

41. HANDBOOK OF CLASSIFICATION, *supra* note 36, at 3-5.

42. *Id.* at 5; *Select US Classes by Number with Title Menu*, U.S. PAT. & TRADEMARK OFF., www.uspto.gov/web/patents/classification/selectnumwithtitle.htm (last updated July, 10, 2012, 7:08 AM).

43. OVERVIEW OF THE U.S. PATENT CLASSIFICATION SYSTEM, *supra* note 29, § 1.1; HANDBOOK OF CLASSIFICATION, *supra* note 36, at 4, 20-23; *see also Select US Classes by Number with Title Menu*, *supra* note 42 (listing class numbers and titles).

44. U.S. Patent No. 7,052,096 (filed Aug. 7, 2002) (issued May 30, 2006).

45. '096 Patent. The original classification appears on the face of the patent as it was issued in May, 2006. '096 Patent. The current classification reflects all updates to the USPC since that time, which have not affected the '096 Patent. For images of a given patent as issued and for full-text information of the patent as most recently updated, see *Patent Full-Text Databases*, U.S. PAT. & TRADEMARK OFF., patft.uspto.gov (last modified May 1, 2015).

46. OVERVIEW OF THE U.S. PATENT CLASSIFICATION SYSTEM, *supra* note 29, § 1.1.

47. *Id.* § 1.9.

that lists all the changes that have been made to the USPC, and provides a concordance from the old to new hierarchy.[48] Similarly, if a patent application is amended so substantially during examination that the technological subject matter to which it pertains requires an examiner with sufficiently different expertise, the USPTO also provides for mid-stream reassignment of the primary technology class of the application or the examiner art unit to which the application will go, or both.[49]

In sum, the USPTO's process for identifying the field of invention for a given patent application is highly organized in its structure, systematic in its application, and adaptable to maintain full coverage of technological subject matter over time.

2. In the Courts

By contrast, federal courts faced with patent validity or enforcement issues that implicate the field of invention seldom make the identification at all. When they do make the identification, it is usually in passing and by fiat, with no accompanying analysis.[50] This may take several forms in practice.[51]

One approach is simply to declare the field of invention.[52] For example, the court in *Samsung Electronics Co. v. Quanta Computer, Inc.* stated that U.S. Patent No. 5,333,273 "relates to the field of computer circuitry and, more particularly, keyboard-input processing for ISA [Industry Standard Architecture]-compatible personal computers."[53] As it happens, the patent specification contained its own language, supplied by the inventor, regarding the field of the invention.[54] The overlap of the patent's self-definition with the definition adopted by the court is unclear: "The present invention is in the field of microprocessor-based computer systems, and, more particularly, is in the field of computer

48. *Id.*

49. Alan C. Marco et al., *The USPTO Historical Patent Data Files: Two Centuries of Invention* 6-7 (U.S. Patent & Trademark Office, Economic Working Paper No. 2015-1, 2015), https://www.uspto.gov/sites/default/files/documents/USPTO_economic_WP_2015-01_v2.pdf.

50. *See, e.g.*, Advanced Micro Devices, Inc. v. Samsung Elec. Co., No. C 08-986 SI, 2009 WL 3007916, at *17 (N.D. Cal. Sept. 17, 2009) (stating that the patent related to the field of "data processing").

51. *See, e.g., id.*; B. Braun Melsungen AG v. Terumo Med. Corp., No. 09-347-JJF-LPS, 2010 WL 2219667, at *1 (D. Del. June 3, 2010) (referring to the field of invention as relating to "peripheral intravenous I.V. catheters" without reference to patent's language); *Advanced Micro Devices, Inc.*, 2009 WL 3007916, at *17; Biacore v. Thermo Bioanalysis Corp. 79 F. Supp. 2d 422, 427 (D. Del. 1999) (stating that the subject matter of the patent related to "the field of biosensors").

52. *See, e.g., Advanced Micro Devices, Inc.*, 2009 WL 3007916, at *17; Samsung Elec. Co. v. Quanta Comput., Inc., 2006 WL 2547452, at *1 (N.D. Cal., Sept. 1, 2006).

53. *Samsung Elec. Co.*, 2006 WL 2547452, at *1.

54. U.S. Patent No. 5,333,273 (filed Sept. 3, 1992) (issued July 26, 1994).

systems based upon the Industry Standard Architecture ("ISA") utilizing the Intel 80x86 microprocessors and equivalents."[55] The court retained the patent's reference to the ISA framework, but in place of the patent's specific references to "microprocessors," the court generalized to "computer circuitry."[56] In place of the patent's references to "computer systems," the court narrowed its definition to a certain subset, "personal computers."[57] Finally, and perhaps most importantly, the court limited its definition to a particular mode of processing, "keyboard-input processing," that was not in the inventor's definition of the field of invention.[58]

Similarly, the court in *Advanced Micro Devices, Inc. v. Samsung Electronics Co.* stated that U.S. Patent No. 5,623,434 "relates to the field of data processing."[59] As before, the patent contained its own definition: "The present invention relates to multiplier circuitry for use in a data processing system. In particular, the present invention relates to a structure and method for using an arithmetic and logic unit ("ALU") within a multiplier circuit."[60] The court simply took the most general phrase from this definition, "data processing," and adopted it as the field of invention.[61]

A slightly different approach is to adopt the patent's own expression of the field of invention, either with or without a citation signaling that this is what the court is doing.[62] For example, the court in *Biacore v. Thermo Bioanalysis Corp.* stated that U.S. Patent No. 5,436,161 "relates to 'the field of biosensors,'" and cited to the patent itself.[63] The patent's own definition was as follows:

> The present invention relates to the field of biosensors and is more specifically concerned with methods for providing metal surfaces with surface layers capable of selective biomolecular interactions. The present invention also comprises activated surfaces for coupling a desired ligand; surfaces containing bound ligand; and the use of such surfaces in biosensors.[64]

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55. '273 Patent col. *1* l. 11-15.
56. *See Samsung. Elec. Co.*, 2006 WL 2547452, at *1.
57. *See id.*
58. *See id.*
59. Advanced Micro Devices, Inc. v. Samsung Elec. Co., No. C 08-986 SI, 2009 WL 3007916, at *17 (N.D. Cal. Sept. 17, 2009).
60. U.S. Patent No. 5,623,434 col. *1* l. 10-13 (filed July 27, 1994) (issued Apr. 22, 1997).
61. *Advanced Micro Devices, Inc.*, 2009 WL 3007916, at *17.
62. *See, e.g.*, Biacore v. Thermo Bioanalysis Corp. 79 F. Supp. 2d 422, 427 (D. Del. 1999).
63. *Id.*
64. U.S. Patent No. 5,436,161 col. *1* l. 15-21) (filed July 22, 1994) (issued July 25, 1995).

Meanwhile, the court in *B. Braun Melsungen AG v. Terumo Medical Corp.* stated without citation that U.S. Patent No. 7,264,613 "relates to the field of peripheral intravenous I.V. catheters, and in particular, to the field of safety I.V. catheters."[65] The patent's own definition was as follows: "This invention relates generally to intravenous ("I.V.") catheters, and, in particular, to a safety I.V. catheter in which the needle tip is automatically covered after needle withdrawal to prevent the healthcare worker from making accidental contact with the needle tip."[66] In both cases, the court relied on the inventors' own conceptions of what fields of invention their work advanced.[67]

In none of the cases discussed above, however, did the courts defend or even explain why their taxonomic approaches were appropriate.[68] These courts were not necessarily wrong on the merits of their respective findings about the field of invention in each case. One or more of these courts may even have employed an approach that could be desirable as a general rule. Such a rule might, for example, be to define the field of invention as the inventor does, as was apparently the case in *Biacore* and *B. Braun Melsungen*.[69] Alternatively, the rule might be to define the field of invention using the broadest language that the inventor's own definition can support, as occurred in *Advanced Micro Devices*.[70] With no rule of decision, however, all approaches (and no approach) are possible among the small fraction of cases in which the courts make any specific finding about the field of invention.

B. Implications of the Current Practice

There is, therefore, a significant disparity between the organized classification process of the USPTO and the federal courts' ad hoc or nonexistent determinations of the field of invention. These omissions by the courts create disuniformity and unpredictability both for patent owners who cannot foresee the standards by which the scope of their rights will be determined and for potential infringers who cannot reliably evaluate how patent boundaries, which they must respect in order to avoid liability, will be determined. This phenomenon alone would

65. B. Braun Melsungen AG v. Terumo Med. Corp., No. 09-347-JJF-LPS, 2010 WL 2219667, at *1 (D. Del. June 3, 2010).

66. U.S. Patent No. 7,264,613 col. *1* l. 18-22 (filed May 23, 2003) (issued Sept. 4, 2007).

67. *See B. Braun Melsungen AG*, 2010 WL 2219667, at *2; *Biacore*, 79 F. Supp. 2d at 427.

68. *See B. Braun Melsungen AG*, 2010 WL 2219667, at *15; *Biacore*, 79 F. Supp. 2d at 472-73.

69. *See B. Braun Melsungen AG*, 2010 WL 2219667, at *3-5; *Biacore*, 79 F. Supp. 2d at 436.

70. Advanced Micro Devices, Inc. v. Samsung Elec. Co., No. C 08-986 SI, 2009 WL 3007916, at *18 (N.D. Cal. Sept. 17, 2009).

warrant doctrinal reform to encourage greater judicial discipline in identifying the field of invention.

What is worse, in those rare instances when courts do make findings about the field of invention, in whatever manner, they use that information unsystematically as well. Some courts may take a capacious view of the patent's scope and conclude it is broad enough that the accused product or process infringes one or more of the patent's claims, whatever the litigants and ultimately the court may construe those claims to mean. Claims to a broad field of invention, however, would stand among a commensurately broader population of prior art references that may render the patent invalid altogether. Conversely, other courts may take a narrow view of the patent and find a commensurately smaller population of prior art references to be relevant. In the latter, the patent may survive a challenge to its validity, but its narrow scope may also make it that much less likely to capture otherwise infringing conduct.

To be sure, this tension between a patent's validity and infringeability as competing forces on the breadth of the patent's scope is not inherently problematic but merely part of the formal structure of the patent system.[71] There may properly be broad or narrow patents just as there may be pioneering or incremental inventions to deserve them.[72] The shortcoming in the current judicial practice of ignoring, assuming, or improvising the field of invention is that it evinces no principled rule of decision that might give reasonable certainty to creators, implementers, and consumers of technology about how an important threshold question, with pervasive effects on their rights and obligations, will be answered.

This kind of legal certainty is necessary for a well-functioning market system within which knowledge assets can be commercialized effectively.[73] Although the legal rights that patents represent may be "probabilistic"[74] in the descriptive sense that eventual legal outcomes are not perfectly foreseeable, the patent system's instrumental goals of

71. *See generally* Roger Allan Ford, *Patent Invalidity Versus Noninfringement*, 99 CORNELL L. REV. 71 (2013) (explaining the asymmetries and tradeoffs implicit in the relationship between the validity of patents and the capacity of patents to be infringed).

72. *See* John F. Duffy, *Rethinking the Prospect Theory of Patents*, 71 U. CHI. L. REV. 439, 499-502 (2004). For a comprehensive theoretical treatment of why pioneering inventions ought to receive commensurately broad patent rights, see *id.*

73. John F. Duffy, *Rules and Standards on the Forefront of Patentability*, 51 WM. & MARY L. REV. 609, 610 (2009) ("Patents convey property rights, and a substantial degree of certainty is usually thought to be helpful, or even essential to well functioning property rights."). For a concise set of sources that support this proposition, see *id.* at 610 n.1.

74. *See* Mark A. Lemley & Carl Shapiro, *Probabilistic Patents*, J. ECON. PERSP., Spring 2005, at 75, 85-87.

fostering innovation and economic productivity cannot be met unless legal processes, such as technology classification, that have far-reaching impact throughout patent doctrine are sufficiently certain (i.e., are both clear enough and durable enough) to attract reliance and investment.[75] Empirical estimates bear out this theoretical expectation as well. The resolution of legal uncertainty over patent validity and patent infringement is, on average, worth as much to a patent-owning firm as the initial grant of the patent right is worth.[76] In other words, the unpredictability of judicial decision-making can force the market to discount, by as much as half, how much trust to put in the legal rights that the USPTO regularly issues.[77]

It is perhaps unsurprising, then, that divergent judicial behavior in identifying, and potentially misidentifying, the field of invention has led patent practitioners to caution against providing any succinct information in the patent document about the field of invention.[78] New evidence from an empirical study of issued patents spanning nearly forty years shows a marked decline in the willingness of inventors to disclose their own views of what fields their inventions occupy.[79]

The study examined a random sample of 10,000 patents issued between January 1, 1976, and December 31, 2014.[80] Because the number of patents issued each year has fluctuated in a generally upward trend, the sample was weighted to include patents from each year in proportion to the number of all patents issued that year.[81]

The full text of these patents was then parsed for language reflecting a concise statement of the field of invention.[82] Patent

75. Duffy, *supra* note 73, at 616-23.

76. *See* Alan C. Marco & Saurabh Vishnubhakat, *Certain Patents*, 16 YALE J.L. & TECH. 103, 115-32 (2013) (estimating stock market reactions to the legal outcomes of patent cases sampled over a 20-year period that spans the creation of the Federal Circuit).

77. *See* Saurabh Vishnubhakat, *Ariosa v. Sequenom: In Search of Yes After a Decade of No*, NAT'L L. REV. (Dec. 4, 2015), http://www.natlawreview.com/printpdf/55485 (applying the Marco-Vishnubhakat stock market reaction findings to the value of stability in the Supreme Court's jurisprudence on patent-eligible subject matter).

78. *E.g.*, Stephen G. Kunin & Andrew K. Beverina, KSR*'s Effect on Patent Law*, 106 MICH. L. REV. FIRST IMPRESSIONS 50, 53-54 (2007) ("[A]pplicants should avoid characterizing the field of the invention and avoid identifying problems recognized in the art to be solved in patent applications."). It is fitting that this type of guidance has focused in particular on the nonobviousness requirement for patentability, as the risk of hindsight bias is already most salient where the nonobviousness doctrine is concerned, and the likelihood that courts will use field-of-invention information unpredictably further compounds the risk. *Id.* at 52.

79. *See infra* Figures 1-7.

80. *See infra* Figures 1-7.

81. For example, the patents issued in 1976 represent 1.41% of the nearly five million patents issued during the entire observation period. *See infra* Figures 1-7. Accordingly, patents issued in 1976 also represent 1.41% of the random sample of 10,000 (i.e., 141 patents). *See infra* Figures 1-7.

82. *See supra* note 32 and accompanying text.

documents traditionally include a "field of the invention" section in the background discussion of the specification, and inventors routinely took the opportunity to identify the technological spaces to which their inventions had contributed.[83] Typical language for this concise statement is found, for example, in U.S. Patent No. 7,293,045 in which the specification states, "The present invention relates to synchronizing data."[84] The presence or absence of this kind of statement across a large and representative random sample, therefore, is a reasonable proxy for the tendency of inventors to reveal useful information about the field of invention.

As Figure 1 shows, this tendency of candor was historically quite high, though not universal, among inventors—between eighty percent and ninety percent.[85] Starting in the mid-to-late 2000s, however, the frequency with which issued patents now contain concise statements of what inventors regard as their fields of invention has steadily declined.[86] This decline is consistent with the view, now prevalent among patent practitioners, that such candor can be damaging in downstream litigation.[87] By the end of 2014, nearly half of issued patents omitted this information.[88] Moreover, as Figures 2 to 7 show, this effect persists across all major technology areas.[89]

This study offers evidence of a revealed preference among inventors for progressively less candor in identifying the field of invention.[90] That growing silence coincides with growing skepticism among patent lawyers that courts will use such information in a predictable or principled way, particularly in vague doctrinal subjects such as nonobviousness.[91] Thus, the absence of a structured judicial

83. *See supra* note 32 and accompanying text.

84. U.S. Patent No. 7,293,045 col. 1 l. 23 (filed Oct. 8, 2004) (issued Nov. 6, 2007).

85. *See infra* Figure 1.

86. *See infra* Figure 1.

87. *See* Kunin & Beverina, *supra* note 78, at 53-54; *see also* Ping-Hsun Chen, *From the Unforeseeability Exception to Foreseeability Estoppel: The Federal Circuit's Effort to Limit the Doctrine of Equivalents*, 25 FED. CIR. B.J. 71, 94-96 (2015) (discussing the patentee-supplied field of invention's impact upon the court's ultimate view of the field of invention in *Schwarz Pharma, Inc. v. Paddock Laboratories, Inc.*).

88. *See infra* Figure 1.

89. *See infra* Figures 2-7. The six technology categories are the familiar concordance developed by the National Bureau of Economic Research and keyed to the USPC. *See* Bronwyn Hall et al., *The NBER U.S. Patent Citations Data File: Lessons, Insights and Methodological Tools* 12-13 (Nat'l Bureau of Econ. Research, Working Paper No. 8498, 2001), www.nber.org/papers/w8498.pdf.

90. *See infra* Figure 1.

91. *See, e.g.*, Margo A. Bagley, *Internet Business Model Patents: Obvious by Analogy*, 7 MICH. TELECOMM. & TECH. L. REV. 253, 269-71 (2001); Jeffrey T. Burgess, *The Analogous Art Test*, 7 BUFF. INTELL. PROP. L.J. 63, 70 (2009); Hilary K. Dobies, *New Viability in the Doctrine of*

approach to identifying the field of invention is not an idle shortcoming but rather consistent with an information-suppressing mechanism.

The taxonomic information that has increasingly been lost from inventors and ignored by the courts is pervasively important throughout patent doctrine, virtually all of which rests explicitly or implicitly on the field of invention.[92] However, if courts can begin to identify patents' fields of invention relatively quickly and cheaply, then the current state of inaction represents an opportunity for improvement. Administrative law principles suggest that such improvement is within reach.[93] Yet, the anomalous and evolving place of patent law within the administrative state is itself a complication in this regard, even though the recent technology-specific turn in patent policy counsels quite strongly in favor of taking taxonomic authority more seriously.

C. Technology Policy in a Second-Class Agency

Although the U.S. patent laws have historically been a set of unitary standards that apply across all technologies, the last two decades have seen a great deal of academic, judicial, and even legislative interest both in identifying the technology-specific effects of facially neutral standards and in developing technology-specific legal distinctions as a formal matter. Necessarily, participants in this debate have begun to confront the difficulty of classifying technologies and drawing lines of legal force among them. To that extent, then, some legal actors in the patent system are already primed to make use of the field-of-invention inquiry that currently takes place in the administrative setting of the USPTO.

For a long time, however, patent law and administrative law were, if not in deliberate tension with each other, quite ignorant of each other.[94] The default rules established in the Administrative Procedure

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Analogous Art, 34 IDEA: J.L. & TECH. 227, 228-42 (1994); Jacob S. Sherkow, *Negativing Invention*, 2011 BYU L. REV. 1091, 1111-12; Brenda M. Simon, *Rules, Standards, and the Reality of Obviousness*, 65 CASE W. RES. L. REV. 25, 33 (2014).

92. *See infra* Part III.

93. *See infra* Part IV.

94. *See, e.g.*, Stuart Minor Benjamin & Arti K. Rai, *Who's Afraid of the APA? What the Patent System Can Learn from Administrative Law*, 95 GEO. L.J. 269, 270 (2007) ("[I]nattention to administrative law principles has long been a striking feature of the patent system."); John F. Duffy, *The FCC and the Patent System: Progressive Ideals, Jacksonian Realism, and the Technology of Regulation*, 71 U. COLO. L. REV. 1071, 1079 (2000) ("[T]he patent system . . . has been customarily ignored in studies of administrative regulation."); Adam Mossoff, *The Use and Abuse of IP at the Birth of the Administrative State*, 157 U. PA. L. REV. 2001, 2002 (2009) ("Throughout the twentieth century, administrative law and intellectual property law seemed as if they were hermetically sealed off from each other in both theory and practice.").

Act ("APA") govern agency actions and judicial review of those actions where an agency's enabling statute has provided insufficient guidance.[95] Still, even though the federal patent statute provides relatively sparse guidance on the conduct of USPTO's agency process, a number of the APA's principles have not been applied to the patent agency.[96] An interrelated body of academic commentary,[97] Supreme Court guidance in *Dickinson v. Zurko*,[98] and recent legislation[99] have done much to bring administrative law and patent law into dialogue with each other. Still, patent exceptionalism persists, due, in significant part, to Federal Circuit decisions leading up to *Zurko*[100] and afterward.[101] The result is that the patent system no longer has even the option of internal coherence outside of administrative law,[102] but neither is it fully situated within the body of administrative doctrine yet. Still, this incompletely reconstructed framework, mercurial though it is, remains best positioned to bring the

95. *See* 5 U.S.C. §§ 551–559, 701–706 (2012).

96. *See* Benjamin & Rai, *supra* note 94, at 280.

97. *See generally id.* (discussing the relationship between administrative law and patent law); Sapna Kumar, *The Accidental Agency?*, 65 FLA. L. REV. 229 (2013) (same); Sarah Tran, *Administrative Law, Patents, and Distorted Rules*, 80 GEO. WASH. L. REV. 831 (2012) (same); Melissa F. Wasserman, *The Changing Guard of Patent Law: Chevron Deference for the PTO*, 54 WM. & MARY L. REV. 1959 (2013) (same).

98. *See* 527 U.S. 150, 154-61 (1999).

99. 35 U.S.C. §§ 257, 301, 311–329 (2012) (codifying new administrative proceedings for reevaluating the validity of issued patents in the USPTO).

100. *See* Sarah Tran, *Patent Powers*, 25 HARV. J.L. & TECH. 609, 617-20 (2012) (tracing the Federal Circuit's increasing constriction of the deference owed to the USPTO, from "a few loose lines of dicta" in *Animal Legal Defense Fund v. Quigg*, 932 F.2d 920, 930 (Fed. Cir. 1991), to the "single damning statement" divesting the USPTO of all substantive rulemaking authority in *Merck & Co. v. Kessler*, 80 F.3d 1543, 1549-50 (Fed. Cir. 1996)); *see also* Kali Murray, *First Things, First: A Principled Approach to Patent Administrative Law*, 42 J. MARSHALL L. REV. 29, 48-54 (2008) (discussing patent exceptionalism within administrative law).

101. *See, e.g.*, Arti K. Rai, *Allocating Power over Fact-Finding in the Patent System*, 19 BERKELEY TECH. L.J. 907, 916-17 (2004) (discussing two post-*Zurko* Federal Circuit decisions that address judicial review of USPTO action, decisions that appear to be at odds with suggestions by the Justices during the *Zurko* oral argument and with dicta in the *Zurko* opinion itself).

102. *See, e.g.*, *Merck & Co.*, at 80 F.3d 1549-50. Whether the particular allocation of legal authority between the USPTO and the courts, especially the Federal Circuit, was *ever* coherent enough has been the subject of considerable academic debate. *Compare* Michael J. Burstein, *Rules for Patents*, 52 WM. & MARY L. REV. 1747, 1776-90 (2011) (challenging the prevailing allocation of authority in the context of agency rulemaking), *and* John M. Golden, *Patentable Subject Matter and Institutional Choice*, 89 TEX. L. REV. 1041, 1054-64 (2011) (same, in the context of defining patent-eligible subject matter), *with* Dan L. Burk & Mark A. Lemley, *Policy Levers in Patent Law*, 89 VA. L. REV. 1575, 1658-60 (2003) (arguing that judicial competence exceeds agency competence in managing the problem of improvidently granted patents), *and* Joseph Scott Miller, *Substance, Procedure, and the Divided Patent Power*, 63 ADMIN. L. REV. 31, 65-67 (2011) (endorsing the Federal Circuit's constrained view of USPTO authority in the substance-procedure distinction).

field of invention out of the USPTO and put it to meaningful use across the patent system.

1. Discrimination by Technology

The patent system, for its part, has a great and growing demand for taxonomy. One prominent illustration of this demand is the systemic preoccupation with patents on business methods and software, through which business method patents are often implemented. Among the agency-centric reforms enacted in the Leahy-Smith America Invents Act was a post-grant mechanism for challenging the validity of specifically business method patents.[103] To this end, the Act included a definition of "covered business methods" eligible for the program (and, by implication, ineligible),[104] authorizing the USPTO to promulgate further definitional regulations.[105] Although the wisdom of carve-outs to patent law in overtly technology-specific ways remains a live debate,[106] there is no doubt that any such differentiation necessarily requires the USPTO to identify the field of invention and other legal actors to rely on the USPTO's identifications.

Since its return to active oversight of the patent system,[107] the Supreme Court has also sent strong signals of a technology-specific approach to patent law. The Supreme Court's 2006 decision in *eBay Inc. v. MercExchange, L.L.C.*, for example, addressed the legal standard for injunctive relief in patent cases.[108] However, the case itself was motivated by concerns about the legal leverage available to entities that do not themselves practice the patented inventions they own but solely

103. 35 U.S.C. § 321 note.

104. *Id.*

105. *Id.*

106. *See, e.g.*, John R. Allison & Starling D. Hunter, *On the Feasibility of Improving Patent Quality One Technology at a Time: The Case of Business Methods*, 21 BERKELEY TECH. L.J. 729, 788 (2006) (arguing, in the context of the USPTO's Second Pair of Eyes ("SPER") internal quality review program, that "it is hard to envision a particular field that might be singled out with the specificity necessary to avoid the problems encountered by the business method SPER initiative"); John R. Allison & Emerson H. Tiller, *The Business Method Patent Myth*, 18 BERKELEY TECH. L.J. 987, 988, 1006 (2003) (concluding that "actions to single out Internet business method patents for special treatment were not only unjustified, but also were probably futile and counterproductive" and, more generally, finding that "fundamental problems associated with ex ante definitions to carve out any particular technology area for different treatment").

107. *See generally* John F. Duffy, *The* Festo *Decision and the Return of the Supreme Court to the Bar of Patents*, SUP. CT. REV., 2003, at 273 (discussing the long salutary neglect of patent law by the Supreme Court, which partly led to the creation of the Federal Circuit as a unifying force in patent doctrine and which eventually ended with the 2002 decision in *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabashuki Co.*, 535 U.S. 722 (2002), signaling the Court's renewed interest in the patent system).

108. eBay Inc. v. MercExchange, L.L.C., 547 U.S. 388, 391-93 (2006).

acquire and enforce patent rights at the threat of litigation.[109] The case provoked a high-profile concurring opinion from Justice Kennedy categorically questioning whether business method-related inventions should even be eligible for patent protection.[110] The opinion's immediate effect was to embolden critics of the patent system with regard to the desirability of a variety of patent licensing and litigation strategies—a debate that continues to the present—but a more subtle and perhaps equally important effect was to highlight the need to be able to identify business method and software patents ex ante. Indeed, since *eBay*, the Court has directly taken up the patent-eligibility of software-related inventions in its 2010 *Bilski v. Kappos*[111] and 2014 *Alice Corp. v. CLS Bank Int'l* decisions.[112]

Economic and legal scholars have actively engaged this interest in technology-specificity through analyses of business method- and software-related patents, advancing an existing debate over taxonomic methodology itself. Two general approaches have emerged in this literature: classifying hierarchically using the USPC and classifying conceptually using keyword searches.[113] Because these approaches are capable of automation and foster replicability in empirical research, several leading methods in the literature reflect one or both of these approaches.

One is the Graham-Mowery method, which takes its definition of software patents from eleven main categories in the International Patent Classification System ("IPC"),[114] a trans-national consensus taxonomy from which a concordance to the USPC allows comparative analysis.[115] Graham and Mowery note that these IPC categories "do not cover all software patents, but they do provide imperfect yet reliable longitudinal coverage of a segment of the overall software industry."[116]

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109. *Id.*

110. *Id.* at 396-97 (Kennedy, J., concurring).

111. 561 U.S. 593, 601-05 (2010). Strictly speaking, the *Bilski* decision was concerned with patents on business method inventions, which are often, though not always, implemented through software. *See id.* at 605-06. Nevertheless, subsequent case law, including the Court's own decision in *Alice*, have applied *Bilski* to a significant extent in software-implemented technologies. Alice Corp. v. CLS Bank Int'l, 134 S. Ct. 2347, 2356-57 (2014).

112. 134 S. Ct. at 2351-53.

113. Simmons, *supra* note 1, at 564-69.

114. *See* Stuart J. H. Graham & David C. Mowrey, *Submarines in Software? Continuations in U.S. Software Patenting in the 1980s and 1990s*, 13 ECON. INNOVATION & NEW TECH. 443, 446 & n.3 (2004). The IPC was established in 1971 pursuant to the Strasbourg Agreement, and it is maintained by the World Intellectual Property Organization of the United Nations. *See International Patent Classification (IPC)*, WORLD INTELL. PROP. ORG., www.wipo.int/classifications/ipc/en (last visited Apr. 10, 2017).

115. *See* Graham & Mowrey, *supra* note 114, at 446 & n.3.

116. *Id.* at 446 n.3.

By contrast, the Bessen-Hunt method eschews the USPC (or any other formal classification system) in favor of a keyword-based search.[117] To mitigate the problem of false-positive results that may arise in hierarchical methods, Bessen and Hunt proposed searching broadly for the keyword "software" or the keywords "computer" and "program" in the specifications of issued U.S. patents—and excluding patents whose titles contain the keywords bus, chip, circuit, circuitry, or semiconductor, and patents whose specifications contain the keywords antigen, antigenic, or chromatography.[118] Because it does not rely on a priori agency classifications, the Bessen-Hunt method is less likely to produce false-negative results (i.e., less likely to ignore relevant patents by undercounting). Yet, this benefit comes at the cost of significant risk for false-positive results or overcounting patents to include irrelevant patents, as a number of prominent critiques have pointed out.[119]

A leading mixed approach is the Hall-MacGarvie method, which begins with a set of all those U.S. patent classes and subclasses that contain issued patents owned by fifteen leading software firms.[120] The method then combines these USPC classes and subclasses with the Graham-Mowery IPC classes and subclasses and finds the set of all patents that meet this combined definition.[121] The method concludes by taking the intersection of this set with the set of patents defined by a Bessen-Hunt keyword search.[122]

A fourth and recent leading alternative is the Graham-Vishnubhakat method, which works solely from a priori classifications in the USPC, just as Graham-Mowery worked from classifications in the IPC, as a

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117. James Bessen & Robert M. Hunt, *An Empirical Look at Software Patents*, 16 J. ECON. & MGMT. STRATEGY 157, 163, 185 (2007). The Bessen-Hunt article received considerable attention prior to formal publication, while it was still a working paper. *See, e.g.*, Michael Noel & Mark Schankerman, *Strategic Patenting and Software Innovation* 27 (Ctr. for Econ. Performance, Discussion Paper No. 740, 2006), http://cep.lse.ac.uk/pubs/download/dp0740.pdf.

118. James Bessen & Robert M. Hunt, *An Empirical Look at Software Patents* 42 (Fed. Reserve Bank of Phila., Working Paper No. 03-17/R, 2004), www.researchoninnovation.org/swpat.pdf. The full Bessen-Hunt analysis matches the patents found in this manner to the firms that own those patents, and further to research and development-related as well as financial data about those firms. *Id.* at 167-68. Much of this broader methodology was the subject of criticism. *E.g.*, Robert W. Hahn & Scott Wallsten, A Review of Bessen and Hunt's Analysis of Software Patents 2-8 (Nov. 2003) (unpublished manuscript), www.ssrn.com/abstract=467484. The present discussion refers only to the initial Bessen-Hunt keyword search. Bessen & Hunt, *supra* at 185.

119. *E.g.*, Bronwyn H. Hall & Megan MacGarvie, *The Private Value of Software Patents* 15-16 (Nat'l Bureau Econ. Research, Working Paper No. 12915, 2006), http://www.nber.org/papers/w12195.pdf. Hahn and Wallsten's general critique includes this discussion as well. *See* Hahn & Wallsten, *supra* note 118, at 2-4.

120. Hall & MacGarvie, *supra* note 119, at 15.

121. *Id.* at 13-14.

122. *Id.*

means for reproducibility as well as facility with large-scale empirical analyses.[123] The Graham-Vishnubhakat method is considerably more finely grained than prior hierarchical definitions, drawing from dozens of individual USPC classes and subclasses that USPTO classification experts identified as being likely to contain "patent applications or issued patents containing some element of either general purpose software or software that is specific to some form of hardware."[124] As a result, the method much more effectively mitigates (but by no means eliminates) the problem of over- and under-inclusivity.[125]

Beyond hierarchical or keyword-based approaches, a third approach has produced noteworthy analyses, though its lack of replicability has limited its application to systematic adoption in patent policy: hand-coding based on human judgment.[126] A leading adopter of this approach has been Professor John Allison, who, with co-authors, has empirically analyzed business method-related patents[127] and software-related patents,[128] as well as a host of other technologies.[129] The preference for hand-coding generally arises from dissatisfaction with the USPC—indeed, sometimes with the notion of a priori classification itself—and trades reproducibility for accuracy, given hand-coding's potential for avoiding false-positive and false-negative results.[130] Whatever the merits of this tradeoff, however, human evaluation is unlikely to be an institutionally appropriate solution for identifying the field of invention. Courts are ill-resourced to carry out accurate-but-irreproducible studies of this kind, and relying on litigants or third parties to do so reflects the initial problem of finding analysis that is both principled and disinterested.[131] By contrast, the field-of-invention inquiry can be both, insofar as it is the product of agency expertise and worthy of judicial deference under generally applicable doctrines of administrative law.

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123. Stuart Graham & Saurabh Vishnubhakat, *Of Smart Phone Wars and Software Patents*, 27 J. ECON. PERSP., Winter 2013, at 67, 75-76.

124. *Id.* at 75.

125. *Id.*

126. *See* John R. Allison & Emerson H. Tiller, *Internet Business Method Patents*, *in* PATENTS IN THE KNOWLEDGE-BASED ECONOMY 259, 266 n.19 (Wesley M. Cohen & Stephen A. Merrill eds., 2003).

127. *Id.* at 261-63, 266-78.

128. *See* Arti K. Rai et al., *University Software Ownership and Litigation: A First Examination*, 87 N.C. L. REV. 1519, 1534-44 (2009).

129. *See* John R. Allison & Mark A. Lemley, *Who's Patenting What? An Empirical Exploration of Patent Prosecution*, 53 VAND. L. REV. 2099, 2108-13 (2000).

130. *Id.* at 2109 ("[B]ecause [the authors] found the PTO's subject matter classification scheme inadequate for [their] purposes, [they] classify the patents in [thei]r sample into areas of technology that [they] have defined [them]selves.").

131. *See supra* Part II.A.2.

All the other methodologies discussed have taken varying positions on the relative importance of two strategies for defining a technology as a collection of related inventions, publications, and products: hierarchical searching and keyword-based searching.[132] As Part III.C discusses, these two strategies map directly to the evolution of patent doctrine, particularly the question of whether an invention is truly "inventive" in light of the prior art, as well as to the evolution of how innovation itself is conducted.[133]

For present purposes, however, the question is not which classification method is the correct one but rather who should do the classifying and when and how. What these recent technology-specific developments across the patent system show is considerable structural appetite for the taxonomic expertise that the USPTO already possesses and exercises. One may fairly ask why, given this appetite, courts do not already avail themselves of the USPTO's expertise through ordinary administrative law principles of deference. The obstacle is, in a word, exceptionalism.

2. Expertise Without Deference

The basic justification for judicial deference to the actions of most agencies—that agencies have expertise in the subject matter that they are charged to administer—certainly applies to the USPTO.[134] The modern patent system, in the sense of a bureaucratic institution to which Congress entrusts the substantive evaluation of inventions for patentability, dates from nearly 180 years ago.[135] It is true that the Patent Office of 1836, for all its empowerment under the transformative Patent Act passed that year, was not rationalized on the basis of expertise.[136] Indeed, that era's broader Jacksonian ferment regarding the role of

132. *See* Simmons, *supra* note 1, at 569-71 (giving an overview of navigating the USPC through hierarchical searching and keyword-based searching).

133. *See infra* Part III.C.

134. *See* Benjamin & Rai, *supra* note 94, at 280-308. The Federal Circuit's own predecessor court, the Court of Customs and Patent Appeals ("C.C.P.A."), frequently cited the USPTO's expertise as a reason to give deference to the agency's findings—when, of course, the C.C.P.A. actually deferred. *See id.* at 280 n.50.

135. Patent Act of 1836, ch. 357, 5 Stat. 117; *see* Duffy, *supra* note 94, at 1138-39. Although the first Patent Act, enacted in 1790, required a Patent Board to grant patents to inventions or discoveries deemed "sufficiently useful and important," the time-intensive nature of examination soon overwhelmed the Board. *Id.* at 1125. In reply, the 1793 Patent Act abolished the "sufficiently useful and important" requirement and ushered in a period of registration rather than examination: patents were freely issued ex ante, and courts bore the burden ex post of filtering worthy patents from unworthy ones. *Id.* It was only after four decades of growing dissatisfaction with common law, rather than agency-based, administration of the patent laws that the 1836 Patent Act restored substantive examination in a more robustly empowered Patent Office. *Id.* at 1125-29.

136. *Id.* at 1138-39.

administrative authority favored brief tenures and frequent rotation in administrative posts so that Congress would more readily delegate discretion to executive branch officers, who were now disciplined by routine political removal—but this necessarily came at the expense of opportunities to cultivate expertise through long service.[137] Yet, just as surely, the patent system soon partook, albeit unevenly, of Progressive-era reforms that were specifically calculated to foster agency expertise and, for better or worse, favored broadly delegated power and potentially long tenures as means to that end.[138]

The expected upshot of agency expertise would be that courts ought to defer considerably to an agency's findings of fact, where specialized knowledge and competence are of particular importance.[139] This is, in fact, the ordinary administrative law standard: factual findings in formal agency proceedings should survive judicial scrutiny so long as those findings are supported by "substantial evidence"[140] and those in informal agency proceedings so long as they are not "arbitrary, capricious, [or] an abuse of discretion."[141] Whether these standards are meaningfully different is an open question in Supreme Court jurisprudence,[142] but both standards appear to entail *more* deference than the Federal Circuit's own former doctrine, overturned by *Zurko*, that a factual finding of the USPTO could be overturned on appeal so long as the finding was "clearly erroneous."[143]

Even after *Zurko*, the Federal Circuit has somewhat puzzlingly held that USPTO findings of fact in the ex parte and relatively informal patent examination process is subject to the substantial evidence review

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137. *Id.*

138. *Id.* at 1139-40.

139. Benjamin & Rai, *supra* note 94, at 312-13. Benjamin and Rai argue that, in theory, courts ought to defer relatively less to agency findings regarding law or policy, where courts are more capable of providing meaningful review. *Id.* In this regard, the *Chevron* doctrine's deference toward formal agency adjudications is undoubtedly a deviation, but a tolerable one inasmuch as formal adjudications with their trial-type procedures foster transparency, guard against bias, and enable effective judicial review through decision-making based on a well-developed evidentiary record. *Id.* at 313. It is in *Chevron* deference for informal rulemaking that Benjamin and Rai find a "significant exception" to the normatively desirable administrative framework. *Id.* at 312-13.

140. 5 U.S.C. § 706(2)(E) (2012).

141. *Id.* § 706(2)(A).

142. *Compare* Dickinson v. Zurko, 527 U.S. 150, 158 (1999) (mentioning that *Ass'n of Data Processing Service Organizations., Inc. v. Board of Governors of the Federal Reserve System.*, 745 F.2d 677, 683-84 (D.C. Cir. 1984) held that "substantial evidence" review and "arbitrary and capricious" review entail the same level of judicial scrutiny), *with* Am. Paper Inst., Inc. v. Am. Elec. Power Serv. Corp., 461 U.S. 402, 412-13, 412 n.7 (1983) (suggesting that "substantial evidence" review entails greater judicial scrutiny than "arbitrary and capricious" review does).

143. *In re* Zurko, 142 F.3d 1447, 1449-50 (Fed. Cir. 1998), *rev'd sub nom.* Dickinson v. Zurko, 527 U.S. 150 (1999).

that formal adjudications usually receive, not to the arbitrary and capricious review that informal fact adjudications usually receive.[144] It has also taken the view, contrary to the suggestive dicta of *Zurko*, that substantial evidence review is a less deferential standard than arbitrary and capricious review.[145] It is not clear whether this latter move is an attempt to scale back *Zurko*'s actual holding that USPTO fact finding is entitled greater deference than it has received.

What is clear is this: the USPTO has clear expertise in classification. The courts do not, and their mix of wholesale neglect and occasional ad hoc taxonomic declarations coincide with a notable trend of information suppression about the field of invention among patent applicants.[146] To remedy the situation, the courts need only look to what the USPTO is already doing, but despite relevant Supreme Court guidance on the matter, the anomalous place of the patent system within administrative law has stood in the way thus far. As Part III traces, this failure of administrative process has far-reaching doctrinal and institutional implications, for the field of invention underlies virtually all of patent law and policy.[147]

III. THE FIELD OF INVENTION AS CORNERSTONE

The basic claim of this Article is that the manner in which the USPTO and the courts currently classify inventions (when they do so at all) is a useful but under-explored subject for inquiry. In order to defend this claim, it is necessary to demonstrate that existing patent law doctrines implicate the field of invention in a way, or to an extent, that would influence, or possibly even determine, legal outcomes differently than is currently the case.[148] This Part does so in three Subparts.[149]

Subpart A explains how the full range of doctrinal requirements concerning the validity of patents requires an inquiry into the PHOSITA and so implicates the field of invention.[150] Subpart B then discusses what additional doctrinal work the field of invention would do as to each of

144. *In re* Gartside, 203 F.3d 1305, 1312-13 (Fed. Cir. 2000). Strictly speaking, the Federal Circuit in *Gartside* did not conclude that the USPTO's agency process is informal yet nevertheless deserving of substantial evidence review. *Id.* at 1315 n.7. Rather, the court disputed the informality issue itself and characterized the proceeding as a case that was, indeed, "reviewed on the record of an agency hearing provided by statute" under § 706(2)(E) of the APA—and was therefore deserving of substantial evidence review. *Id.* at 1313.

145. *See id.*

146. *See supra* Part II.A.2, B.

147. *See infra* Part III.

148. *See infra* Part III.

149. *See infra* Part III.

150. *See infra* Part III.A.

these requirements.[151] In particular, Subpart B argues that patent law's current lodestar—identifying the PHOSITA—is not always enough to resolve the validity questions raised by these doctrines.[152] Subpart C discusses a limited attempt in patent law toward identifying the field of invention, the analogous arts doctrine, and explains how identifying the field of invention goes further.[153]

A. Patent Validity

To be patentable, an invention must satisfy six major conditions that are codified in the patent statute.[154] It must be new (novel),[155] nonobvious,[156] and useful.[157] It must be described well enough in the written patent disclosure[158] to enable its practice.[159] And it must be claimed with definiteness.[160] Each of these conditions requires characterizing the PHOSITA and, therefore, implicates the field of invention. Some of these statutory conditions are expressly structured to take account of the PHOSITA. Nonobviousness, enablement, and written description take this form. Others are nominally viewpoint-neutral, though, as further discussed below, these conditions require recourse to the PHOSITA as well. Novelty, utility, and definiteness take this latter form.

Moreover, evaluating whether a claimed invention satisfies these statutory conditions for validity or enforcement requires determining first what the claimed invention *is*.[161] The modern U.S. patent system defines an invention by reference to the textual claims that delineate the invention in the patent document.[162] Because the patent claims set forth the "metes and bounds" of the patented invention,[163] construing these

151. *See infra* Part III.B.
152. *See infra* Part III.B.
153. *See infra* Part III.C.
154. *See* 35 U.S.C. §§ 101–103, 112(a)–(b) (2012).
155. *Id.* § 102.
156. *Id.* § 103.
157. *Id.* § 101.
158. *Id.* § 112(a).
159. *Id.*
160. *Id.* § 112(b).
161. *See, e.g.*, Home Diagnostics, Inc. v. LifeScan, Inc., 381 F.3d 1352, 1355-56 (Fed. Cir. 2004).
162. *See* 35 U.S.C. § 112(b) (requiring "one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention").
163. Corning Glass Works v. Sumitomo Elec. U.S.A., Inc., 868 F.2d 1251, 1257 (Fed. Cir. 1989). A "heavy presumption" favors the ordinary and customary meaning, though departures toward other meanings are allowed when "the patentee has acted as his own lexicographer" or has otherwise used terminology in non-ordinary ways in order to preserve the validity of the invention

claims is a necessary prerequisite to any doctrinal assessment of the invention. And the goal of the claim construction exercise is to ascertain what a claim term would mean "to a person of ordinary skill in the art."[164] A fortiori, inquiry into the PHOSITA for claim construction doubly implicates the field of invention in addition to any PHOSITA inquiry that may already be inherent in the doctrinal requirement. The following discussion illustrates these points.

1. Innovation

An invention must be novel, which is to say it must not be anticipated by a single "prior art" reference—most commonly an earlier patent, printed publication, product, or process—that was available to the public before the effective filing date of the claimed invention.[165] Anticipation requires complete identity between the claimed invention and the asserted prior art, so that a single missing element in the prior art reference is enough to render the claimed invention novel.[166] Accordingly, the analysis of anticipation usually proceeds as an element-by-element comparison.[167]

For example, in *Carman Industries, Inc. v. Wahl*, Carman challenged Wahl's patent as invalid for, among other things, a lack of novelty.[168] The invention was a device that attached to the base of a storage bin or hopper to improve the outflow of solids that otherwise flowed poorly.[169] Asserted as prior art was an earlier patent that addressed the same problem of poor outflow.[170] The following Table summarizes the element-by-element approach used by the district court and affirmed by the court of appeals:

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in light of all the relevant prior art. *Home Diagnostics*, 381 F.3d at 1355 (quoting CCS Fitness, Inc. v. Brunswick Corp., 288 F.3d 1359, 1366 (Fed. Cir. 2001)).

164. L.B. Plastics, Inc. v. Amerimax Home Products, Inc., 499 F.3d 1303, 1308 (Fed. Cir. 2007).

165. 35 U.S.C. § 102(a).

166. *See* Glaverbel Societe Anonyme v. Northlake Marketing & Supply, Inc., 45 F.3d 1550, 1554 (Fed. Cir. 1995).

167. Lindemann Maschinenfabrik GMBH v. American Hoist and Derrick Co., 730 F.2d 1452, 1458 (Fed. Cir. 1984).

168. Carman Industries, Inc., v. Wahl, 724 F.2d 932, 937 (Fed. Cir. 1983).

169. *Id.* at 934.

170. *Id.* at 937.

TABLE 1: ANTICIPATION ANALYSIS IN CARMAN INDUSTRIES, INC. V. WAHL[171]

Wahl Patent	*Prior Art Patent*
Conical storage portion to receive material.	Conical storage portion to receive material.
Baffle plate at the top of the conical storage portion.	Baffle plate at the top of the conical storage portion.
Agitation apparatus to shake solids through.	Agitation apparatus to shake solids through.
Multiple concave surfaces in a series with abrupt breaks in slope between them.	*One or more concave surfaces connected in a continuous slope.*
Outlet.	Outlet.

Because Wahl's invention contained an element that was absent from the asserted prior art, the prior art did not anticipate Wahl's invention, and Wahl's invention was novel.[172]

At first blush, this mode of analysis may seem viewpoint-neutral, accessible even to an educated layperson. Yet, anticipation may arise by inherency, which does look to the PHOSITA. The inherency doctrine holds that a prior art reference may be anticipatory even without expressly disclosing an element of the claimed invention if that element is inherent in the prior art reference.[173] Historically, an element has been deemed inherent if that element is "necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill."[174]

For example, in *MEHL/Biophile International Corp. v. Milgraum*, Milgraum argued that MEHL/Biophile's patent was, among other things,

171. *Id.* at 934-36.

172. *Id.* at 938.

173. Finisar Corp. v. DirecTV Group, Inc., 523 F.3d 1323, 1334 (Fed. Cir. 2008).

174. Continental Can Co. USA, Inc. v. Monsanto Co., 948 F.2d 1264, 1268 (Fed. Cir. 1991). Recently, the Federal Circuit has signaled a possible shift away from requiring that a PHOSITA would have known or appreciated the inherency. *E.g.*, Schering Corp. v. Geneva Pharm., 339 F.3d 1373, 1377 (Fed. Cir. 2003). The shift has been controversial and may reflect a new paradigm of anticipation in which elements or inventions are inherent if the public already gets the benefit of them in some way. *See generally* Dan L. Burk & Mark A. Lemley, *Inherency*, 47 WM. & MARY L. REV. 371 (2005) (arguing that inherency in an invention should depend on whether the public already benefits from a claimed element of that invention). The shift has also been questioned, however, for its potentially drastic expansion of accidental infringement liability, to the unwarranted detriment of the public. *See* Saurabh Vishnubhakat, *An Intentional Tort Theory of Patents*, 68 FLA. L. REV. 571, 598-620 (2016).

inherently anticipated by a prior art manual.[175] The invention was a process for laser hair removal by targeting skin cells at the base of hair follicle.[176] Asserted as prior art was a technical laser manual that described how to use the laser to remove tattoos (i.e., to target skin cells that are pigmented with tattoo ink).[177] The court found that someone who targeted pigmented skin cells according to the manual *could* thereby target hair follicle cells as well, but this need not necessarily be true.[178] "Occasional results are not inherent," the court explained, and MEHL/Biophile's patent was found not to be anticipated by the prior art manual.[179]

Beyond inherency, moreover, to determine whether a prior art reference anticipates the claimed invention, one must first construe the claims.[180] This too brings the PHOSITA into the anticipation analysis.[181]

In addition to being novel, an invention must be nonobvious to one of ordinary skill in the art in light of the prior art.[182] Like novelty, nonobviousness is a measure of how inventive the claimed invention is by comparison to what was previously known.[183] Unlike anticipation, however, a finding of obviousness need not be limited to a single prior art reference. Multiple references may, and almost always are, asserted in combination.[184] The statutory text of the nonobviousness inquiry also expressly incorporates the viewpoint of the PHOSITA.[185] As with anticipation, however, the inquiry first requires that the relevant patent claims be construed,[186] which entails identifying the PHOSITA.[187]

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175. MHEL/Biophile Int'l Corp. v. Milgraum, 192 F.3d 1362, 1363 (Fed. Cir. 1999).

176. *Id.* at 1364.

177. *Id.* at 1365.

178. *Id.*

179. *Id.*

180. *Id.*

181. *See supra* text accompanying notes 161-64.

182. 35 U.S.C. § 103 (2012).

183. *See* Graham v. John Deere Co. of Kan. City, 383 U.S. 1, 14 (1966). For a historical overview of the nonobviousness doctrine as an inquiry into the "inventive faculty" that must be demonstrated for patentability, see *id.* at 10-12. It was also in *Graham* that the Court articulated the familiar three-factor analysis and additional considerations for evaluating nonobviousness:

> [T]he 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. . . . 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. at 17-18.

184. Lear Siegler, Inc. v. Aeroquip Corp., 733 F.2d 881, 889 (Fed. Cir. 1984).

185. 35 U.S.C. § 103 ("[A]re such that the claimed invention as a whole would have been obvious . . . to a person having ordinary skill in the art.").

186. Key Pharm. v. Hercon Labs. Corp., 161 F.3d 709, 714 (Fed. Cir. 1998).

187. *See supra* text accompanying notes 161-64.

For example, in *Ryko Manufacturing Co. v. Nu-Star, Inc.*, Nu-Star defeated a charge of infringement by arguing that Ryko's patent was invalid for obviousness.[188] The invention was an automatic car wash activation system employing an electrical numeric keypad, superior to prior mechanical activation systems such as those that accepted coins, cards, or other tangible inputs and required burdensome maintenance.[189] Asserted as prior art were the individual components of the combination, including automatic car wash equipment itself, automatic activation in general, the use of numeric keypad devices in general as means for electronic signal input, and the use of computers and digital circuitry in the car wash industry.[190] The court of appeals affirmed the district court's findings that all this cited prior art was relevant, that the salient differences between this prior art and the challenged invention were such that the prior art did "suggest[] the claimed combination," and that the relevant level of skill in the art was of "an engineer with low to medium capability in the technology of powered system activation devices."[191] Though Ryko's invention apparently solved a long-felt industry need for automatic car wash activators, succeeded where others had previously failed, and enjoyed commercial success on the basis of its merits (rather than unrelated sources of success such as marketing), these secondary considerations were not enough to overcome the finding that the prior art suggested the desirability of the claimed invention, and Ryko's invention was obvious.[192]

In addition to being novel and nonobvious, an invention must also be useful,[193] though the utility requirement does not mean that an invention must be an improvement or that it must be an optimal or exclusive way to achieve a result.[194] Rather, it must operate as intended.[195] In this regard, achieving even one stated objective of the claimed invention is sufficient to establish utility.[196] As to how useful an invention must be, it must have "specific and substantial utility."[197] An invention's utility is substantial when one skilled in the art can use the invention to provide some "significant and presently available benefit to

188. 950 F.2d 714, 715-16, 719-20 (Fed. Cir. 1991).
189. *Id.* at 715.
190. *Id.* at 716-17.
191. *Id.* at 717-19.
192. *Id.* at 719-20.
193. 35 U.S.C. § 101 (2012).
194. Stiftung v. Renishaw PLC, 945 F.2d 1173, 1180 (Fed. Cir. 1991).
195. *See id.*
196. Raytheon Co. v. Roper Corp., 724 F.2d 951, 958-59 (Fed. Cir. 1983).
197. *In re* Fisher, 421 F.3d 1365, 1370-71 (Fed. Cir. 2005).

the public."[198] An invention's utility is specific when the benefit that it provides to the public is "well-defined and particular."[199] Utility, like novelty, incorporates the viewpoint of the PHOSITA into its inquiry implicitly. As with novelty and nonobviousness, determining utility also requires first construing the claim to specify what the invention is,[200] which proceeds from the PHOSITA's perspective as well.

For example, in *Raytheon Co. v. Roper Corp.*, Raytheon challenged several aspects of Roper's patent as being inoperable and therefore invalid for a lack of utility.[201] The primary embodiment of the invention was a common cavity oven for thermal cooking, microwave cooking, and self-cleaning all using the same chamber.[202] The court of appeals affirmed the district court's finding that the invention, as correctly construed, could not have operated in self-cleaning mode without contaminating the airflow, though this was what the patent claimed.[203] The phenomenon that supposedly accounted for this surprising and desirable behavior "does not and physically cannot happen," meaning that the invention-as-claimed was inoperable, lacking utility.[204]

2. Disclosure

Beyond the innovation-related requirements that a claimed invention be new, nonobvious, and useful, patent law imposes disclosure-related requirements to disseminate this innovative knowledge to the public.[205] The first of these disclosure requirements is that the patent document must enable one of ordinary skill in the art to practice the invention.[206] For a patent disclosure to be adequately enabling, it must not require the PHOSITA to engage in "undue experimentation" in order to make and use the full scope of the claimed invention.[207] As might be intuitive, to determine whether the disclosure

198. *Id.* at 1371 (clarifying Nelson v. Bowler, 626 F.2d 853, 856 (C.C.P.A. 1980)).
199. *Id.*
200. *Raytheon Co.*, 724 F.2d at 956.
201. *Id.* at 955, 957-58, 961-62.
202. *Id.* at 953.
203. *Id.* at 956-58.
204. *Id.* at 957.
205. 35 U.S.C. § 112 (2012).
206. *Id.* § 112(a).
207. Genentech, Inc. v. Novo Nordisk A/S, 108 F.3d 1361, 1365 (Fed. Cir. 1997). To evaluate whether any required experimentation is undue, courts look to a variety of factors including as follows:

> (1) [T]he 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.

In re Wands, 858 F.2d 731, 736-37 (Fed. Cir. 1988).

adequately enables the full scope of the invention also requires claim construction to determine what the scope of the invention is,[208] and this also inquires from the viewpoint of the PHOSITA.

For example, in *MagSil Corp. v. Hitachi Global Storage Technologies, Inc.*, Hitachi defeated MagSil's claim of infringement by arguing that the asserted patent was invalid for lack of enablement.[209] The invention was a set of sensors for digital data storage and broadly encompassed certain devices wherein an electrical current tunnels in quantum-mechanical fashion from one electrode to another.[210] The court of appeals affirmed the district court's finding that applying a small amount of electromagnetic energy to the tunnel junction would, indeed, change the junction resistance by at least 10%, as the patent claimed, but that the maximum change was 11.8% under the conditions described.[211] The patent claimed more broadly, however, that the invention contemplated changes in resistance upwards of 100% and even 1000%.[212] As the specification did not sufficiently teach how to achieve these dramatically higher changes in electrical resistance (but the patent claimed them just the same), practicing the full scope of the invention would require undue experimentation, and so, the invention was not enabled.[213]

Related to enablement is the requirement that the patent disclosure contain a written description of the invention.[214] The written description resides in a portion of the patent document called the specification, which contains, for example, a narrative discussion of the technical background of the claimed invention, the problem sought to be solved, previous attempts to solve it, and which concludes with the patent claims themselves.[215] This is the same disclosure that is evaluated for adequate enablement, but the written description requirement must do more than "merely explain how to 'make and use'"—it must, more broadly, "convey with reasonable clarity to those skilled in the art that, as of the filing date sought, [the inventor] was in possession of *the invention*."[216]

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208. *See, e.g.*, Process Control Corp. v. HydReclaim Corp., 190 F.3d 1350, 1352, 1354-57 (Fed. Cir. 1999) (evaluating enablement with respect to the relevant patent claims only as "correctly construed").

209. 687 F.3d 1377, 1380, 1384 (Fed. Cir. 2012). MagSil was not itself the inventor or owner of the patent but rather the exclusive licensee. *Id.* at 1378. For simplicity, however, the discussion refers to "MagSil's invention" and "MagSil's patent."

210. *Id.* at 1378-79.

211. *Id.* at 1381.

212. *Id.*

213. *Id.* at 1384.

214. 35 U.S.C. § 112(a) (2012).

215. MPEP, *supra* note 31, § 608.01(a) (citing 37 C.F.R. § 1.77(b) (2012)).

216. Vas-Cath Inc. v. Mahurkar, 935 F.2d 1555, 1563-64 (Fed. Cir. 1991).

As with enablement, the "invention is, for purposes of the 'written description' inquiry, *whatever is now claimed*," inviting claim construction as a threshold matter.[217] The written description requirement, then, also proceeds from the perspective of the PHOSITA.

For example, in *Moba, B.V. v. Diamond Automation, Inc.*, FPS Food Processing Systems ("FPS") challenged Diamond Automation's patents as being invalid for, among other reasons, failure to satisfy the written description requirement.[218] The invention was a high-speed egg processing machine, and the dispute was both whether the invention specifically included lifting eggs from a moving conveyor (as the challengers' systems did) and, if so, whether Diamond Automation's patent specification showed that the inventor possessed this feature of the invention.[219] Challenger FPS argued that the specification did not do so because it did not disclose a conveyor mechanism.[220] The court of appeals, however, explained that not every particular functional feature need be recited in order to satisfy the written description requirement, and affirmed the district court's finding that the specification described every element of the disputed claim term in enough detail that a skilled artisan could recognize the inventor's possession of the invention.[221] Accordingly, the invention did satisfy the written description requirement.[222]

3. Boundary Notice

Whereas the enablement and written description requirements effectuate the teaching function of patents,[223] the patent claims themselves must also be definite (i.e., point out and distinctly claim what the inventor considers to be the invention).[224] By requiring sufficiently precise claim language, the definiteness requirement provides notice of the boundaries of the invention—of what subject matter lies inside and

217. *Id.* at 1564.

218. 325 F.3d 1306, 1319-21 (Fed. Cir. 2003). More precisely, FPS, as well as Moba, B.V., and Staalkat, B.V.—all competitors of Diamond Automation—sought declaratory judgment that Diamond Automation's patents were invalid and not infringed. *Id.* at 1312. For simplicity, the discussion addresses only the written description-based validity challenge made by FPS on appeal.

219. *Id.* at 1319-21.

220. *Id.* at 1319.

221. *Id.* at 1320-21.

222. *Id.* at 1321.

223. *See* Univ. of Rochester v. G.D. Searle & Co., 358 F.3d 916, 922 n.5 (Fed. Cir. 2004) (distinguishing notice about what the invention is and how to practice it, from notice about the boundaries of what the patent allows one to exclude others from doing).

224. 35 U.S.C. § 112(b) (2012).

what lies outside.[225] Patent claims are indefinite when they "fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention."[226] Here, again, the definiteness inquiry requires recourse to the PHOSITA.[227]

For example, in *Ethicon Endo-Surgery, Inc. v. Covidien, Inc.*, Covidien challenged several of Ethicon's ultrasonic surgical instrument patents as being invalid for indefiniteness.[228] Ethicon's invention, in essence, was a set of surgical shears that both use the energy of blades vibrating at ultrasonic frequencies to cut vascular tissue and rely on the heat generated by the vibrating blade to cauterize the relevant blood vessels.[229] The court of appeals rejected the district court's finding that "nothing in the specification or understanding in the art" specified what, where, and how to measure certain clamping forces necessary for using the surgical invention.[230] Appellate reevaluation of the evidence, particularly testimony about well-understood principles of biophysics, revealed that the specification would have given reasonable certainty about the scope of the claims to a skilled artisan, and so, the invention was not indefinite.[231]

B. Clarifying, and Going Beyond, the Person Having Ordinary Skill in the Art

The major patentability requirements are all explicitly or implicitly adjudicated by reference to the PHOSITA. Most also require an initial claim construction to ascertain the meaning of the claims and determine what the claimed invention actually is, and this also is done from the perspective of the PHOSITA. In these ways, the above-discussed

225. Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co., 535 U.S. 722, 730-31 (2002) (restating the well-established explanation of the boundary notice function that a patent grant is "a property right, and like any property right, its boundaries should be clear") (internal quotations omitted).

226. Nautilus, Inc. v. Biosig Instruments, Inc., 134 S. Ct. 2120, 2124 (2014).

227. *Id.* at 2130. The usual necessity for an initial claim construction, in order to decide whether the standard is satisfied, is not so simple here. Under the Federal Circuit's prior standard, claims were indefinite only if they were so imprecisely worded as to be "insolubly ambiguous." Datamize, LLC v. Plumtree Software, Inc., 417 F.3d 1342, 1347-48 (Fed. Cir. 2005). The standard of insoluble ambiguity was fundamentally in tension with the very exercise of construing claims, and if a claim was at all amenable to construction, then it necessarily could not be indefinite. Bancorp Services, L.L.C. v. Hartford Life Ins. Co., 359 F.3d 1367, 1371 (Fed. Cir. 2004). For present purposes, it is enough that the role of the PHOSITA is on solid doctrinal ground within the definiteness standard itself.

228. 796 F.3d 1312, 1314-15 (Fed. Cir. 2015).

229. *Id.* at 1315.

230. *Id.* at 1316-22.

231. *Id.*

requirements implicate the field of invention as well. Yet, these two inquiries fare quite differently in practice. Identifying the PHOSITA is a pervasive step both in the ex ante examination of patent applications[232] and in the ex post adjudication of issued patents. As Part II discussed, identifying the field of invention is a structured process in the USPTO but a largely ad hoc and underutilized doctrinal tool in the federal courts.[233] The effects of this judicial underutilization are significant for two reasons.

First, identifying the field of invention would help courts to clarify the PHOSITA inquiry itself. Courts currently resolve questions of patent validity and infringement, and identify the PHOSITA on which these questions rest, within an adversarial system of adjudication. That is to say, they take their cues from the result-oriented arguments of parties who have specific interests at stake in characterizing the PHOSITA as having, for example, a certain level of education, experience, or creativity, in accordance with desired outcomes. The import of this adversarial framework for the court's task is that the hypothetical PHOSITA, already an elusive perspective to access, becomes even more unlikely to be identified correctly. By engaging first in an evaluation of what the underlying field of invention actually is—or, more precisely, *was* at the relevant time in the past—courts would be able to create a more objective baseline from which to identify the PHOSITA.

Second, identifying the field of invention would also have a valuable disciplining effect on how courts evaluate a patent's scope and breadth apart from any identification of the PHOSITA. Courts have expressed concern, for example, that patents exploiting natural phenomena or natural laws in too basic a fashion may foreclose follow-on innovation in a wide range of research endeavors that may rely on the phenomenon or law in question; that this would be undesirable; and that so broad a patent should, therefore, be struck down as invalid.[234] This is patent law's preemption doctrine (not to be confused with federal-state

232. Patent examiners are generally understood to be proxies for the PHOSITA. *See, e.g.*, Benjamin & Rai, *supra* note 94, at 277-78 (2007) ("[T]o the extent that the PTO examiner is herself one of ordinary skill, she simply needs to be made aware of all prior art."); Dan L. Burk & Mark A. Lemley, *Is Patent Law Technology-Specific?*, 17 BERKELEY TECH. L.J. 1155, 1187-88 (2002) (noting that identification of the PHOSITA ought to be "an ultimate conclusion of law based upon evidence, not dictated by the capabilities or knowledge of the Patent Office examiner"); Eisenberg, *supra* note 27, at 898 (arguing that patent examiners' experience is in patent examination rather than in the technological fields that they supposedly represent and, therefore, that examiners generally "have less technological skill" than the PHOSITA would).

233. *See supra* Part II (describing the current practice of the USPTO and the courts in identifying the field of invention).

234. *See, e.g.*, Mayo Collaborative Servs. v. Prometheus Labs., Inc., 132 S. Ct. 1289, 1293-94, 1296-98 (2012).

preemption under the Supremacy Clause of the Constitution) and seeks to avoid "upholding patents that claim processes that too broadly preempt the use of a natural law."[235] Of course, every patent forecloses *some* use of the natural law or process on which the claimed invention relies,[236] and so, the problem must be one of degree—and, ultimately, of the appropriate level of generality. Identifying the field of invention to which the patented invention pertains, and doing so by deferring presumptively to the USPTO's classification choices, offers a principled solution to this question. The field of invention specifies *which* scientific community's work must be protected from the unduly broad preemptive effect of the patent in dispute.[237]

C. Analogous Arts and the Nature of Innovation

The above-discussed criteria of patentability have, in some form, been in place all along, and policy concerns such as preemption are as old as the Supreme Court's mid-19th century Morse telegraph patent case[238] and as current as its 2012 medical diagnostic patent case.[239] So it is perhaps not surprising that patent doctrine has (somewhat) been here before. Recognizing that there is value to specifying ex ante the universe of information from which prior art might reasonably be taken, courts articulated the doctrine of "analogous arts" as early as the late-1870s in order to guide the efficient and accurate evaluation of a given invention against relevant existing knowledge.[240] The analogous arts doctrine pertains specifically to evaluating an invention's nonobviousness and holds that a prior art reference ought to be considered only if it comes either from the field of endeavor or is reasonably pertinent to the problem that the inventor was trying to solve.[241] Whether a prior art reference that is outside the field of endeavor is, indeed, reasonably pertinent is to be decided from the perspective of the PHOSITA.[242]

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235. *Id.* at 1294.

236. *Id.*

237. *Id.* at 1293-94, 1297-99.

238. O'Reilly v. Morse, 56 U.S. (15 How.) 62, 132-33 (1854).

239. *Mayo Collaborative Servs.*, 132 S. Ct. at 1293-95, 1297-98.

240. *See, e.g.*, Crowell v. Harlow, 4 F. 140, 142 (C.C.D. Mass. 1880); Bridge v. Excelsior Mfg. Co, 4 F. Cas. 94, 94-95 (C.C.E.D. Mo. 1879) (No. 1,859). In *Bridge*, for example, the court examined the state of the art in the field of the stove-oven invention alone, "without going into the state of the art in analogous devices." *Bridge*, 4 F. Cas. at 94-95. Similarly, in *Crowell*, the court illustrated its view of inventiveness with the example that "to cure hams by salting and smoking would not sustain a patent if the virtues of salt and smoke were well known, and had been applied in analogous arts." *Crowell*, 1 F. at 142.

241. *In re* Kahn, 441 F.3d 977, 986-87 (Fed. Cir. 2006).

242. *Id.* at 987.

There is self-evident difficulty in avoiding hindsight when deciding to include or exclude prior art for having been reasonably pertinent to a problem whose solution the invention itself now embodies.[243] Even aside from this difficulty, however, the major premise of the analogous arts doctrine is that an inventor in a field of invention is familiar with the full range of prior art in that field, as though the inventor were "working in his shop with the prior art references—which he is presumed to know—hanging on the walls around him."[244] The potentially large scale of this imputed body of knowledge makes it very important, as a threshold matter, to characterize the field of invention correctly.

Not coincidentally, the conceptual structure of the analogous arts doctrine maps directly to the two approaches that patent examiners use in searching for prior art and, indeed, inventors themselves use to familiarize themselves with the universe of information for which they will be held accountable: hierarchical searching and keyword-based searching.[245] The more closed-ended field of endeavor corresponds to the taxon-bound hierarchical approach whereas the more open-ended set of all prior art that may be reasonably pertinent to the inventive problem at hand corresponds to the cross-cutting keyword-based approach.[246]

In fact, the very existence of numerous competing methodologies for defining and classifying business method- and software-related patents,[247] all of which are partly or fully reducible to a hierarchical or keyword-based strategy, reflects why business method and software are such excellent illustrations of the need for a structured administrative law approach to making judicial findings about the field of invention. Business methods and software are general-purpose technologies that can, and do, act as inputs into a wide range of other technologies.[248] As a result, their taxonomic character is both highly difficult to characterize ex ante, though the USPTO makes its systematic effort, and highly prone to rapid change over time, creating particular risk of hindsight bias and other errors ex post in the courts.

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243. *See* Simon, *supra* note 91, at 31. For a systematic discussion of how the analogous arts doctrine tends in particular to discriminate against inventions that arise from "long toil and experimentation" rather than from a "flash of genius," see Sherkow, *supra* note 91, at 1120-26 (quoting 35 U.S.C. § 103 (2006) (1952 Revision Notes)).

244. *See In re* Winslow, 365 F.2d 1017, 1020 (C.C.P.A. 1966).

245. *See supra* text accompanying note 132.

246. *See* Hal Milton, *How the Internet Has Removed the Historical Rationale for "Non-Analogous Arts,"* 13 J. MARSHALL REV. INTELL. PROP. L. 68, 89-90 (2013).

247. *See supra* Part II.C.1.

248. *See* Graham & Vishnubhakat, *supra* note 123, at 74-75; *see also* Timothy F. Bresnahan & Manuel Trajtenberg, *General Purpose Technologies 'Engines of Growth'?*, 65 J. ECONOMETRICS 83, 97-102 (1995).

But such risk is present even in simple technologies, suggesting that the analogous arts doctrine cannot fully resolve the level-of-generality problem even in the limited context of nonobviousness. For example, in the leading analogous arts case of *In re Bigio*, the Federal Circuit invalidated a patent on a type of bristled hairbrush, finding the invention obvious in light of a prior bristled toothbrush.[249] Significantly, the case turned not on whether one of ordinary skill in hairbrush technology would have found the bristled hairbrush obvious in light of the bristled toothbrush but rather on whether someone building a better hairbrush should reasonably be expected to look to innovations in toothbrush design for guidance.[250] Over a commonsense dissent from Judge Newman,[251] the court answered yes.[252] Yet, the same question could also have been resolved by defining the field of endeavor more broadly (e.g., things with bristles), leaving no need at all to evaluate reasonably pertinent prior art outside that field. The underlying question of how to define the field of invention remained unanswered in *Bigio*.

Accordingly, even this limited judicial flirtation with the field of invention, in the context of a single patentability requirement, has been justly criticized as an incomplete and unrealistic attempt to capture how innovation actually takes place.[253] The analogous arts doctrine has been described by some commentators as forgivable in the USPTO but inappropriate in the courts[254] or even wholly obsolete.[255]

The central role that the field of invention occupies across patent doctrine[256] suggests, however, that if the doctrine of analogous arts has a flaw, it is not that the doctrine attempts too much but that its limited applicability to nonobviousness attempts too little. For their part, courts continue to rely on it as a meaningful doctrinal guidepost toward resolving the ever-difficult issue of placing oneself in the position of the inventor,[257] perhaps recognizing implicitly the unavoidability of *some* taxonomic exercise, however limited. Accordingly, the basic normative claim of this Article is that technological classification cannot be

249. 381 F.3d 1320, 1326-27 (Fed. Cir. 2004).

250. *Id.* at 1326.

251. *Id.* at 1327-28 (Newman, J., dissenting) (arguing on the analogousness issue that "[a] brush for hair has no more relation to a brush for teeth than does hair resemble teeth").

252. *Id.* at 1326-27.

253. *See* Laura G. Pedraza-Fariña, *Patent Law and the Sociology of Innovation*, 2013 WIS. L. REV. 813, 861-67.

254. *See* Simon, *supra* note 91, at 32, 49-50, 55-58.

255. Milton, *supra* note 246, at 70-73.

256. *See supra* Part III.A.

257. Circuit Check Inc. v. QXQ Inc., 795 F.3d 1331, 1334-37 (Fed. Cir. 2015).

avoided and so ought to be undertaken in a principled fashion across all the patent doctrines that rely on it. The question is how.

IV. TAKING TAXONOMIC AUTHORITY SERIOUSLY

Part II argues that the USPTO determines the field of invention in a systematic fashion, that the courts do little or nothing with this useful information, and that the result is needless inefficiency and doctrinal confusion.[258] This suggested that courts might reengage readily with USPTO taxonomic choices, and at an acceptable institutional cost, but as Part II concludes, such reengagement has been hamstrung by a patent exceptionalism in administrative law.[259] Part III then traces the effects of this constellation of problems and hurdles across patent doctrine and policy.[260] This Part discusses how the proposed judicial reengagement with USPTO classifications should proceed.[261] The proposal, in brief, is for a doctrine of express judicial deference to USPTO determinations of the field of invention.[262]

Subpart A sets forth two related arguments about the contours of deference.[263] First, USPTO classification decisions are best understood as informal adjudications of fact.[264] Second, although it is not impermissible for juries to review USPTO classification decisions, it is preferable for judges to do so.[265] Building on these premises, Subpart B argues that the mode of judicial review appropriate to a USPTO classification decision is the deferential arbitrary and capricious standard, though, under current Federal Circuit doctrine, a presumption in favor of the USPTO classification, rebuttable either by substantial evidence or by clear and convincing evidence, may be a likely second-best solution—and achieve similar, if not identical, results.[266]

A. Characterizing the Act of Classification

Under administrative law principles, the deference that courts owe to agency actions turns on three considerations: whether the action is legislative or adjudicative; whether the action is formal or informal; and

258. *See supra* Part II.
259. *See supra* Part II.
260. *See supra* Part III.
261. *See infra* Part IV.A–B.
262. *See infra* Part IV.B.
263. *See infra* Part IV.A.
264. *See infra* Part IV.A.1.
265. *See infra* Part IV.A.2.
266. *See infra* Part IV.B.

whether the action pertains to a legal issue or a factual one.[267] The modern patent law practice of jury review also bears on how deference may operate upon USPTO technological classifications.[268] This Subpart addresses each issue in turn.[269]

1. Classification as Informal Adjudication of Fact

Administrative decision-making generally falls into two categories: rulemaking and adjudication.[270] Rulemaking generally describes an agency's articulation of generally applicable principles with prospective effect and a policy orientation.[271] By comparison, adjudication refers to an agency's resolution of individual disputes.[272] The classification actions that the USPTO takes with respect to incoming patent applications is best understood as an adjudication because it resolves the taxonomic inquiry for individual patent applications.[273] What is generally applicable, has prospective effect, and reflects the agency's policy judgment of how to classify inventions is not any individual classification choice but rather the USPC hierarchy itself.

Adjudications, in turn, may be formal or informal depending on what procedural requirements must be satisfied.[274] Formal adjudications require trial-like procedures with a host of safeguards, including notice of the factual and legal matters asserted, opportunity to submit and consider facts and arguments, and opportunity to propose findings and conclusions to the adjudicator.[275] Informal adjudications, however, require far less.[276] Though quite structured and systematic, the patent classification process does not contain any of the indicia of formal adjudication, and no requirement compels the USPTO to provide such indicia.[277] Therefore, the classification process is best understood as an informal adjudication.[278]

Doctrinally, of course, courts must know whether the issue that is actually resolved in the classification process (i.e., what the field of

267. *See infra* Part IV.A.1.
268. *See infra* Part IV.A.2.
269. *See infra* Part IV.A.1–2.
270. 2 CHARLES H. KOCH, JR., ADMINISTRATIVE LAW AND PRACTICE § 5:1 (3d ed. 2010).
271. 1 *id.* § 4:1.
272. 2 *id.* § 5:1.
273. *See supra* Part II.A.1.
274. 2 KOCH, *supra* note 270, § 5:1.
275. Pension Benefit Guar. Corp. v. LTV Corp., 496 U.S. 633, 655 (1990) (summarizing the procedural safeguards of formal adjudication under 5 U.S.C. §§ 554, 556–557 (2012)).
276. 2 KOCH, *supra* note 270, § 5:1.
277. OVERVIEW OF THE U.S. PATENT CLASSIFICATION SYSTEM, *supra* note 29, § 1.1.
278. 2 KOCH, *supra* note 270, § 5:1.

invention actually is) is a legal issue or a factual one.[279] At bottom, the act of classification locates the salient attributes of a particular invention within an ontological scheme of all technologies and so makes a descriptive claim about the physical world. This suggests that identifying the field of invention is a finding of fact. Precedent from antitrust law supports this conclusion as well, as the similar taxonomic exercise of defining a relevant market before analyzing effects upon competition is also regarded as a finding of fact rather than of law.[280]

Not least, the informal—indeed, highly routine—character of the USPTO's taxonomic exercise does not exempt the agency from the need to enable meaningful judicial review of its fact finding, either on direct appeal when patent applications have been denied or on collateral review when issued patents are being reevaluated as to their validity.[281] In this regard, the very assignment of a primary class and, what is less directly important, assignment of search classes to a patent application constitute the USPTO's findings regarding the fact of what the field of invention is. This may prove to be enough, as the "searching and careful" review that courts are to give to agency actions is nevertheless "a narrow one. The court is not empowered to substitute its judgment for that of the agency."[282] However, if a court were to require more, then the USPTO could formalize its classification straightforwardly in an interstitial order to be placed in the prosecution file of the patent application.[283]

2. Juries and Judges as Reviewing Authorities

Ordinarily, it would be sufficient for deference purposes to know that the USPTO makes an informal adjudication of fact when it identifies the field of invention and classifies an application accordingly.[284] However, modern patent practice contains an additional feature that bears on what form of deference courts may give to the

279. *See, e.g.*, Markman v. Westview Instruments, Inc., 52 F.3d 967, 976-79 (Fed. Cir. 1995).

280. U.S. Anchor Mfg., Inc. v. Rule Industries, Inc., 7 F.3d 986, 994 (11th Cir. 1993); Borough of Lansdale v. Phila. Elec. Co., 692 F.2d 307, 311-12 (3d Cir. 1982); Twin City Sportservice, Inc. v. Charles O. Finley & Co., Inc., 676 F.2d 1291, 1299 (9th Cir. 1982); Pinder v. Hudgins Fish Co., 570 F.2d 1209, 1219-20 (5th Cir. 1978). For detailed discussion of the relationship of the market definition concept to intellectual property, see Mark A. Lemley & Mark P. McKenna, *Is Pepsi Really a Substitute for Coke? Market Definition in Antitrust and IP*, 100 GEO. L.J. 2055, 2059-75 (2012).

281. *See* Citizens to Preserve Overton Park, Inc. v. Volpe, 401 U.S. 402, 416-17 (1990) (noting that judicial review of agency findings of fact "is to be searching and careful" and that such review may be "hampered by [an agency actor's] failure to make such findings").

282. *Id.*

283. 2 KOCH, *supra* note 270, § 5:17(b).

284. 3 *id.* § 10:12.

USPTO's classification choices as a practical matter. That feature is jury review.[285]

As a pair of articles have recently discussed in depth, jury review of patent validity is somewhat anomalous, though not unprecedented, in administrative law.[286] Nearly seventy years ago, the Supreme Court decided in *Cox v. United States* that there was no constitutional right to jury review of an administrative decision,[287] even in cases properly before a jury where the invalidity of the agency decision would be a defense.[288] This squarely describes patent litigation, where the invalidity of the patent being asserted is a defense and where the patent grant itself reflects the USPTO's determination as an agency that the patent was, indeed, valid.[289]

For present purposes, the upshot of these commentaries is that the history of administrative practice in civil cases offers little precedent and no constitutional guarantee of jury review,[290] but that a more complete view of the relationship between administrative law and historical safeguards in criminal law reveals that "[j]ury review of executive and administrative actions is precedented and possible, *but not preferred*."[291] As Professor John F. Duffy has explained, jury review is appropriate as a backstop when no other mechanism exists for reviewing the legality of executive action, though "across broad areas of law, our legal culture has pushed to replace [the inconveniences of jury review] with a combination of executive branch decisionmaking coupled with judicial oversight."[292]

On this view, the modern patent system may be well rid of jury review of patent validity because the USPTO offers a range of new administrative post-grant proceedings to reevaluate the validity of patents previously issued by the agency[293] and because these proceedings (as well as the USPTO's traditional patent examination) are subject to robust judicial oversight by the Federal Circuit.[294] It is true

285. *See* John F. Duffy, *Jury Review of Administrative Action*, 22 WM. & MARY BILL RTS. J. 281, 298 (2013).

286. *Id.* at 286-90; Mark A. Lemley, *Why Do Juries Decide if Patents Are Valid?*, 99 VA. L. REV. 1673, 1704-12 (2013).

287. 332 U.S. 442, 448-49 (1947).

288. Duffy, *supra* note 285, at 285 & n.3 (first citing 1 KENNETH CULP DAVIS, ADMINISTRATIVE LAW TREATISE § 8.16, at 597 (1958); and then citing LOUIS L. JAFFE, JUDICIAL CONTROL OF ADMINISTRATIVE ACTION 394 (1965)).

289. *See* Ford, *supra* note 71, at 78.

290. *See* Lemley, *supra* note 286, at 1707-08.

291. Duffy, *supra* note 285, at 285.

292. *Id.*

293. *See* 35 U.S.C. §§ 311–319, 321 (2012).

294. 28 U.S.C. § 1295(a)(1), (a)(4) (2012).

that reevaluation in the courts of a patent's validity is not purely a review of the administrative record, as is usually the case—new evidence of invalidity such as unconsidered prior art may be introduced—but the complexity of reviewing patent validity does still appear to lie outside the competency of lay jurors.[295]

Nevertheless, the administrative law of the patent system currently deviates in a number of important ways from the general body of administrative law,[296] including jury review of the USPTO's findings of patent validity.[297] If this deviation persists, then any deference to the USPTO's antecedent findings about the field of invention must rest on this current doctrine, second best though it may be.

B. Deference to United States Patent and Trademark Office Classifications

As Subpart A explains, the USPTO's individual technological classifications of patent applications are best understood as informal adjudications of fact that ought to be reviewed by a judge but that may, under current patent-administrative law doctrine, be reviewed instead by a jury.[298] These considerations all point toward a doctrine of highly deferential review of the USPTO's classification decisions.

1. The General Case for Deference

As a general matter, there are at least three reasons why the courts should look to the USPTO's technological classifications with deference. One reason is that the USPTO has the technical expertise necessary to devise, maintain, and adapt a comprehensive taxonomy of technological subject areas. The USPTO also has long institutional experience with this task. The first USPC scheme was promulgated in 1900,[299] and the USPTO has issued more than 1800 reclassification orders beginning in 1947 and concluding most recently in 2012.[300] This demonstrated record of expertise illustrates the USPTO's relative competence over that of the courts and counsels in favor of deference.[301]

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295. Duffy, *supra* note 285, at 297-98.

296. Benjamin & Rai, *supra* note 94, at 284-308.

297. Duffy, *supra* note 285, at 297-98.

298. *See supra* Part IV.A.

299. HANDBOOK OF CLASSIFICATION, *supra* note 36, at 1.

300. *See* U.S. PATENT & TRADEMARK OFFICE, DEP'T OF COMMERCE, U.S. PATENT CLASSIFICATION: CLASSIFICATION ORDERS ARCHIVAL REPORT (CLASSIFICATION ORDERS 1 THROUGH 1919) (2013), www.uspto.gov/sites/default/files/patents/resources/classification/archive rpt.pdf.

301. Richard J. Pierce & Sidney A. Shapiro, *Political and Judicial Review of Agency Action*, 59 TEX. L. REV. 1175, 1194 (1981) (reciting the established principle that "courts appropriately

A second reason is that the classification of inventions has long been delegated to the USPTO by organic statute. Congress first gave this authority to the USPTO in 1898 and directed the agency to exercise that authority immediately.[302] Subsequently, in the 1952 Patent Act, Congress increased the USPTO's discretion in this regard by leaving intact the USPTO's authority while withdrawing the command to exercise it, a state of affairs that has existed to the present day.[303] This statutory history demonstrates a clear and sustained congressional intent that the USPTO be the patent system's prime mover in matters of classification.[304] This, too, counsels in favor of deference.

A third reason is that the USPTO is closer in time, sometimes considerably closer, to a given act of invention than the courts are. It is unavoidable that even "[p]atent examination is necessarily conducted by hindsight, with complete knowledge of the applicant's invention."[305] For courts, however, the scale of hindsight is far longer. The pendency of a patent application through the examination process has risen to over three years at the median,[306] and nearly two-thirds of asserted patents are not asserted until five years or more after issuance from the USPTO.[307] Therefore, the USPTO is better positioned than the courts are to identify a given patent's field of invention accurately and to do so without the added complication of partisan arguments driven by high litigation

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accord the greatest deference to an agency's factual findings, since these are largely the product of technical expertise").

302. 35 U.S.C. § 6 (1946) (Revision of Classification of Letters Patent and Printed Publications; Additional Personnel). Congress provided:

> That for the purpose of determining with more readiness and accuracy the novelty of inventions for which applications for letters patent are or may be filed in the United States Patent Office, and to prevent the issuance of letters patent of the United States for inventions which are not new, the Commissioner of Patents is hereby authorized and directed to revise and perfect the classification, by subjects-matter, of all letters patent and printed publications in the United States Patent Office which constitute the field of search in the examination as to the novelty of intentions for which applications for patents are or may be filed.

Id.

303. 35 U.S.C. § 9 (1952). Congress provided: "The Commissioner may revise and maintain the classification by subject matter of United States letters patent, and such other patents and printed publications as may be necessary or practicable, for the purpose of determining with readiness and accuracy the novelty of inventions for which applications for patent are filed." *Id.*

304. *Id.*

305. *In re* Oetiker, 977 F.2d 1443, 1447 (Fed. Cir. 1992).

306. BENJAMIN MITRA-KAHN ET AL., UK INTELLECTUAL PROP. OFFICE & U.S. PATENT & TRADEMARK OFFICE, PATENT BACKLOGS, INVENTORIES AND PENDENCY: AN INTERNATIONAL FRAMEWORK 31-32 (2013), https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/311239/ipresearch-uspatlog-201306.pdf.

307. Dennis Crouch, *Age of Patents When Asserted*, PATENTLY-O (Oct. 31, 2012), http://patentlyo.com/patent/2012/10/age-of-patents-when-asserted.html.

stakes. The USPTO's greater capacity for accuracy in this regard also warrants deference as a normative matter.

2. Judicial Review of United States Patent and Trademark Office Classifications

Just how much deference the courts should show to the USPTO turns on the nature of the classification decision as an informal adjudication of fact.[308] Generally, review of informal adjudications tolerates all agency actions except those that are arbitrary and capricious.[309] A court may use the somewhat less deferential standard of substantial evidence review when an adequate administrative record is available,[310] but even so, "[t]he higher reasonableness standard expressed by the substantial evidence language does not apply to individual adjudications"[311] such as determining technological classifications. Accordingly, when reviewing agency action for arbitrary and capricious behavior, "the court should undertake a searching inquiry *while ultimately accepting the risk of error expressed by the arbitrariness standard*."[312]

Although ordinary principles of administrative law counsel a highly deferential arbitrary and capricious review of USPTO classification decisions, patent law's idiosyncratic body of administrative doctrine may pose doctrinal problems in two contexts.[313] One is direct court-agency review of USPTO decisions to deny patent applications.[314] The other is collateral review by courts of the validity of patents that the USPTO has already issued.[315]

In direct court-agency review of denied patent applications, Federal Circuit precedent regards USPTO examination to be sufficiently formal as to warrant substantial evidence review, in contrast to suggestions—especially by Justice Breyer—in the *Zurko* oral argument that USPTO

308. *See supra* Part IV.A.1.

309. 3 KOCH, *supra* note 270, § 10:12.

310. *Id.*

311. *Id.*

312. *Id.* (emphasis added) (citing Duke Power Co. v. U.S. Nuclear Regulatory Comm'n, 770 F.2d 386, 389-90 (4th Cir. 1985)).

313. *See supra* text accompanying note 306.

314. Procedurally, a patent examiner's final rejection of a patent application undergoes administrative review in the USPTO Patent Trial and Appeal Board ("PTAB") (previously the Board of Patent Appeals and Interferences), and the PTAB decision is subject to judicial review in the Court of Appeals for the Federal Circuit. Only denials are reviewed: an agency decision to *grant* a patent is not subject to direct administrative or judicial review.

315. This type of collateral judicial review may arise either as an accused infringer's defense in an infringement litigation or else as a potential infringer's suit for declaratory judgment.

examination is an informal proceeding and should receive arbitrary and capricious review.[316] Meanwhile, in collateral review by a court of patent validity, Federal Circuit precedent is well established that a duly issued patent is presumed valid[317] and that an alleged or potential infringer who challenges the patent's validity in court bears the burden of rebutting that presumption.[318] To do so, the challenger must prove the subsidiary facts of invalidity by clear and convincing evidence.[319]

Within these frameworks, then, it is arguable that the USPTO's factual finding about the field of a given invention should survive direct court-agency review ex ante unless substantial evidence is lacking and should survive collateral review ex post unless clear and convincing evidence to the contrary is presented. As Part II discusses, the field of invention informs the inquiry into the PHOSITA and underlies virtually all the major doctrinal requirements of patent validity.[320] The ultimate conclusion of patent validity is an issue of law,[321] and although some requirements such as nonobviousness[322] and enablement[323] are also issues of law, while other requirements such as utility[324] and novelty[325] are issues of fact, the technological classification that underlies all of these issues would undoubtedly be a subsidiary fact.

These precedents are questionable as a matter of administrative law, but even so, they are unlikely to make a significant difference in the outcome. With respect to USPTO classification decisions, substantial evidence review,[326] as well as clear and convincing evidence review,[327] should be approximately as deferential as arbitrary and capricious review.[328] Substantial evidence review, for its part, relies by definition on the agency record.[329] Meanwhile, successful showings of clear and convincing evidence tend in practice to rely on new information that was

316. *Compare In re* Gartside, 203 F.3d 1305, 1313-15 (Fed. Cir. 2000), *with* Transcript of Oral Argument at *4-*8, Dickinson v. Zurko, 527 U.S. 150 (1999) (No. 98-377), 1999 WL 190969. *See also supra* Part II.C.2 (discussing the Federal Circuit's refusal both before and after *Zurko* to defer to USPTO fact-finding under a standard of arbitrary and capricious review).

317. 35 U.S.C. § 282(a) (2012).

318. Microsoft Corp. v. i4i Ltd. P'ship, 564 U.S. 91, 100 (2011).

319. *Id.*

320. *See supra* Part II.

321. Graham v. John Deere Co. of Kan. City, 383 U.S. 1, 17 (1966).

322. Key Pharm. v. Hercon Labs. Corp., 161 F.3d 709, 714 (Fed. Cir. 1998).

323. AK Steel Corp. v. Sollac and Ugine, 344 F.3d 1234, 1238 (Fed. Cir. 2003).

324. *In re* Fisher, 421 F.3d 1365, 1369 (Fed. Cir. 2005).

325. Trintec Indus., Inc. v. Top-U.S.A. Corp., 295 F.3d 1292, 1294 (Fed. Cir. 2002).

326. 3 KOCH, *supra* note 270, § 10:12, at 398-99.

327. Benjamin & Rai, *supra* note 94, at 284.

328. Pierce & Shapiro, *supra* note 301, at 1184-86.

329. 5 U.S.C. § 706(2)(E) (2012).

not before the USPTO, such as newly discovered prior art.[330] However, where classifying a patent application is concerned, the relevant standard would simply be the publicly available USPC,[331] and the relevant technological facts on which the classification decision were based would be contained entirely within the four corners of the patent application document itself—this, after all, is what the USPTO's own classification decision was based on. With no new information to present nor any new fact-finding for the court to conduct in this regard, judicial (or jury) review would amount merely to a reevaluation of the administrative record, if any, pertaining to the classification process. Thus, whether in substantial evidence review[332] of the record or clear and convincing evidence review[333] of the record, the net effect would likely be the same high likelihood of affirmance as with the deferential arbitrary and capricious review.[334]

3. Operationalizing Deference

Thus far, this Subpart has discussed *why* the federal courts should defer to USPTO determinations of the field of invention and what level of deference courts should give.[335] Also important are the mechanics of *how* judicial deference would actually play out in practice. As an initial matter, courts that defer to the USPTO must be able to translate the agency's classification decision into a narrative expression of the field of invention.[336] For example, in the earlier-discussed U.S. Patent No. 7,052,096 on a vehicle antilock brake control system, a court would see that the patent belongs to class 303 and subclass 123 (which may otherwise appear as 303/123).[337] One possible approach for the court is to define the field of invention at the level of the primary class which, for this patent, would be "fluid-pressure and analogous brake systems."[338] Another possible approach is to define the field of the invention at the fullest level of classification that the USPTO provides

330. Microsoft Corp. v. i4i Ltd. P'ship, 564 U.S. 91, 110-11 (2011) (noting that "new evidence supporting an invalidity defense may 'carry more weight' in an infringement action than evidence previously considered by the PTO" because "if the PTO did not have all material facts before it, its considered judgment may lose significant force").

331. HANDBOOK OF CLASSIFICATION, *supra* note 36, at 1.

332. 3 KOCH, *supra* note 270, § 10:12, at 398-99.

333. Benjamin & Rai, *supra* note 94, at 284.

334. Pierce & Shapiro, *supra* note 301, at 1184-86.

335. *See supra* Part IV.B.1–2.

336. *See supra* Part IV.B.1–2.

337. U.S. Patent No. 7,052,096 (filed Aug. 7, 2002) (issued May 30, 2006).

338. *Class Schedule: Class 303: Fluid-Pressure and Analogous Brake Systems*, U.S. PAT. & TRADEMARK OFF. (Aug. 11, 2011, 9:44 PM), https://www.uspto.gov/web/patents/classification/uspc303/sched303.htm.

which, including the class and subclass for this patent, would be "fluid-pressure and analogous brake systems for a tractor-trailer type vehicle."[339] Still another possible approach is to rely not only on the *primary* class (and, perhaps, subclass) but also on the *search* classes (and, perhaps, subclasses) that the USPTO assigned to the patent.

Upon translating the USPTO classification decision into a finding of what the field of invention was, the court must then be able to apply that finding to its further taxonomy-relevant decisions, particularly whether to include or exclude prior art. As the example of the antilock brake patent illustrates, the set of prior art references that would be relevant would be quite different depending on the level of generality at which the field of invention were drawn. Using the entire primary class would sweep in more prior art than using the primary class and subclass. Likewise, using the primary class as well as search classes would sweep in more prior art than using only the primary class.

Although there is no a priori reason to favor one of these approaches necessarily over another, the principle of cognitive economy in classification counsels in favor of defining at the level of the primary class alone, rather than narrowing the field to the subclass or include any search classes.[340] Defining at the detailed level of class and subclass would likely result in an unmanageably atomistic collection of narrow subjects. By contrast, setting definitions solely at the level of technology class (rather than including subclass) would not result in too few categories. Each category would be broader, but not so broad that the field of invention could not be meaningfully focused. The reason is that the USPC currently contains hundreds of utility patent classes, allowing ample detail even without delving into subclasses.[341] Search classes, meanwhile, do not represent the USPTO's view of the field to which the invention pertains but rather answer the corollary question of what other fields might contain information that would be relevant to an assessment of the invention's contribution to the state of knowledge.[342]

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339. U.S. PATENT & TRADEMARK OFFICE, DEP'T OF COMMERCE, CLASS DEFINITION: CLASS 303, FLUID-PRESSURE AND ANALOGOUS BRAKE SYSTEMS (2012), https://www.uspto.gov/web/patents/classification/uspc303/defs303.pdf.

340. Cognitive economy refers simply to the basic goal of taxonomy: obtaining "a great deal of information about the environment while conserving finite resources as much as possible." Eleanor Rosch, *Principles of Categorization*, *in* COGNITION AND CATEGORIZATION 28-29 (Eleanor Rosch & Barbara B. Lloyd eds., 1978).

341. *Select US Classes by Number with Title Menu*, *supra* note 42.

342. OVERVIEW OF THE U.S. PATENT CLASSIFICATION SYSTEM, *supra* note 29, § 1.5.1. Doctrinally, the primary class and the set of search classes may be understood as aligning respectively with the analogous arts doctrine's two-part inquiry into the field of endeavor and into fields likely to turn up information that would have been "reasonably pertinent" to the problem sought to be addressed by the inventor in making the invention.

If the prior art reference in question were a patent, that patent's own primary class number would indicate whether it does or does not belong to the field of invention of the patent-in-suit. If the prior art were non-patent literature instead—such as a scientific journal article, a trade publication, a publicly available product, or the like—then the court could turn to the USPTO's class definition and associated notes to determine whether a particular reference fit the definition or not.[343]

In this way, the courts could engage in a useful taxonomic practice that would focus nearly all its subsequent tasks and, by using a framework of judicial deference to agency expertise, would not impose additional institutional costs on the judicial process. Identifying the field of invention would not likely impose any greater financial costs on the litigants, either. It is certainly to be expected that making the field of invention would cause litigants to reallocate their resources to this threshold issue. The additional clarity to be gained from the court's determination, however, would considerably narrow the scope of later disputes within the litigation, and this narrowed scope would likely bring greater savings in the long run.

V. CONCLUSION

The dramatic current reallocation of institutional authority in the U.S. patent system has had a number of far-reaching effects provoking much scrutiny and debate. It is appropriate and timely, then, that the taxonomic inquiry that underlies nearly every major doctrine in patent law should be a salient part of this structural dialogue. The principal contribution of this Article is to describe that taxonomic inquiry, to explain that administrative law exceptionalism (itself under increased attack) is a likely reason that courts fail to use the taxonomy, and to propose clear and simple principles for reform.[344]

By expressly identifying the field of invention and doing so through deference to the USPTO's expert determination, the federal courts can reap immediate benefits for the patent system.[345] A clear and principled statement of what the art actually is would lend discipline to the ubiquitous but difficult inquiry into the PHOSITA, and this discipline would have a salutary effect on the quality of virtually all patentability

343. *See, e.g.*, U.S. PATENT & TRADEMARK OFFICE, DEP'T OF COMMERCE, *supra* note 43. For the anti-lock brake patent, the class definition for primary class 303 is as follows: "This class relates to the distribution of fluid to brake motors, i.e., the utilization of fluid-pressure in the operation of brakes." *Id.*

344. *See supra* Parts II.C, IV.

345. *See supra* Part IV.

determinations, which rely on the PHOSITA construct.[346] Ordinary administrative law principles already point the way, and a shift is already proceeding away from the historically crabbed and isolated view of how the patent system fits, and ought to fit, within the administrative state.[347]

The result is that a powerful and largely ignored source of valuable information and much-needed clarity is available for the courts in their engagement with issues of patent validity and enforcement.[348] What ought to make this Article's call for courts to pay closer attention to the field of invention particularly attractive is that the invitation entails little judicial cost.[349] The USPTO already carries out the taxonomic exercise in a highly structured fashion that it has refined over more than a century.[350] Courts, relying either on ordinary principles of administrative law or even on idiosyncratic principles of administrative law within the patent system, need only to stop ignoring the fruits of the USPTO's labors. Through a doctrine of judicial deference to the USPTO's classification decisions, the courts can restore considerable certainty to the expectations of patent owners and can restore the public's confidence that the scope of patents will be more manageably stable over time.[351]

346. *See supra* Part III.A.
347. *See supra* Part II.C.2.
348. *See supra* Part IV.B.
349. *See supra* Part IV.B.3.
350. *See supra* Part II.A.
351. *See supra* Part IV.A.

APPENDIX

FIGURE 1: TENDENCY OF INVENTORS TO CHARACTERIZE THE FIELD OF INVENTION (RETROSPECTIVE TWELVE-MONTH AVERAGE)

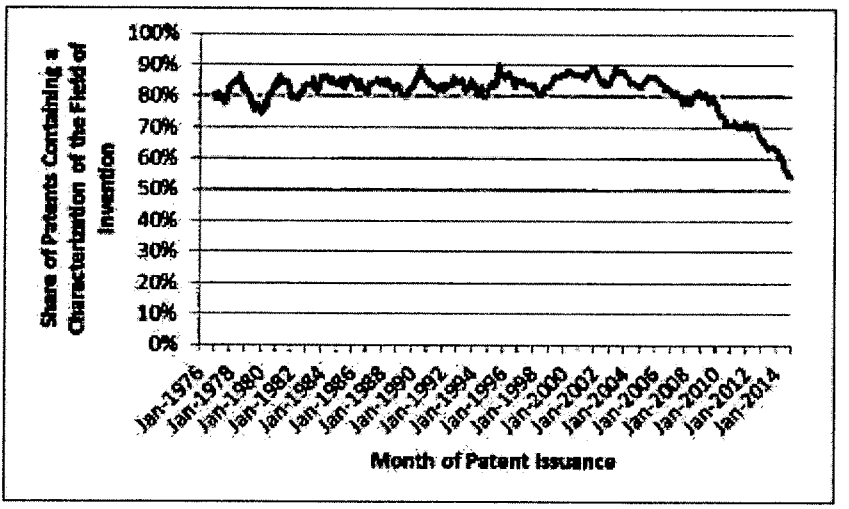


FIGURE 2: TENDENCY OF INVENTORS TO CHARACTERIZE THE FIELD OF INVENTION: CHEMISTRY (RETROSPECTIVE TWELVE-MONTH AVERAGE)

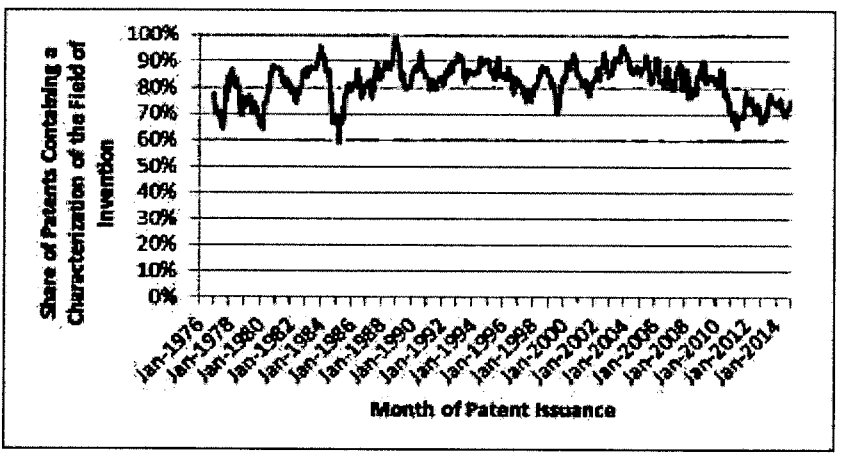


FIGURE 3: TENDENCY OF INVENTORS TO CHARACTERIZE THE FIELD OF INVENTION: COMPUTERS & COMMUNICATIONS ARTS (RETROSPECTIVE TWELVE-MONTH AVERAGE)

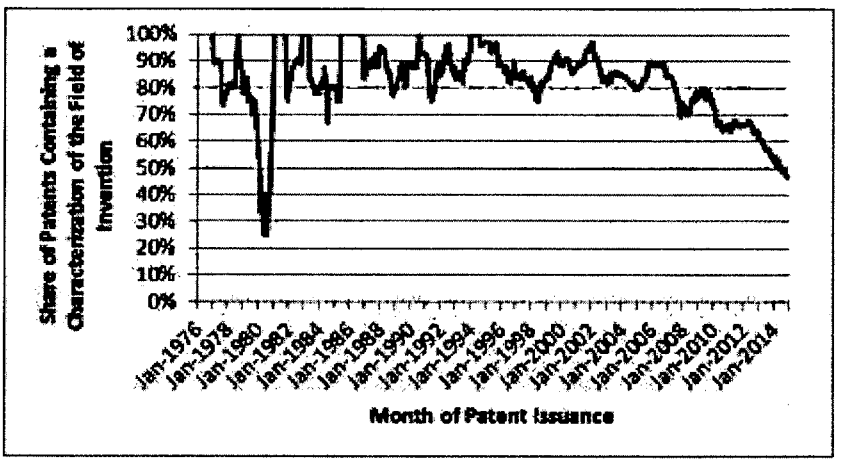


FIGURE 4: TENDENCY OF INVENTORS TO CHARACTERIZE THE FIELD OF INVENTION: DRUGS & MEDICAL (RETROSPECTIVE TWELVE-MONTH AVERAGE)

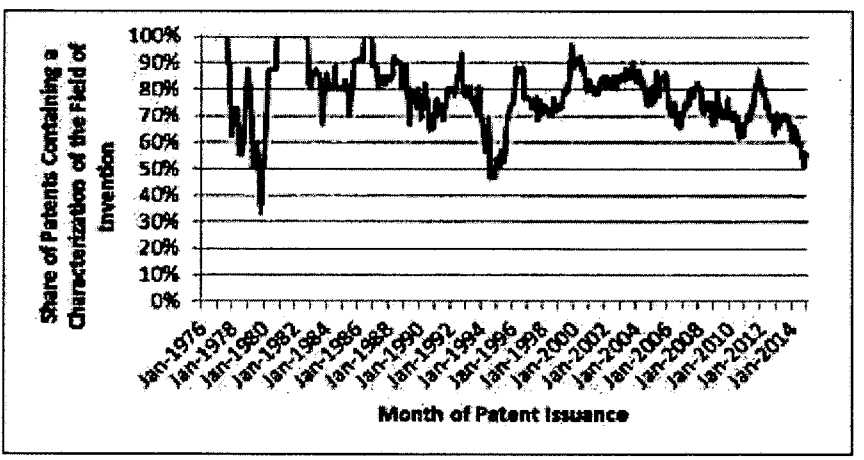


FIGURE 5: TENDENCY OF INVENTORS TO CHARACTERIZE THE FIELD OF INVENTION: ELECTRICAL AND ELECTRONIC (RETROSPECTIVE TWELVE-MONTH AVERAGE)

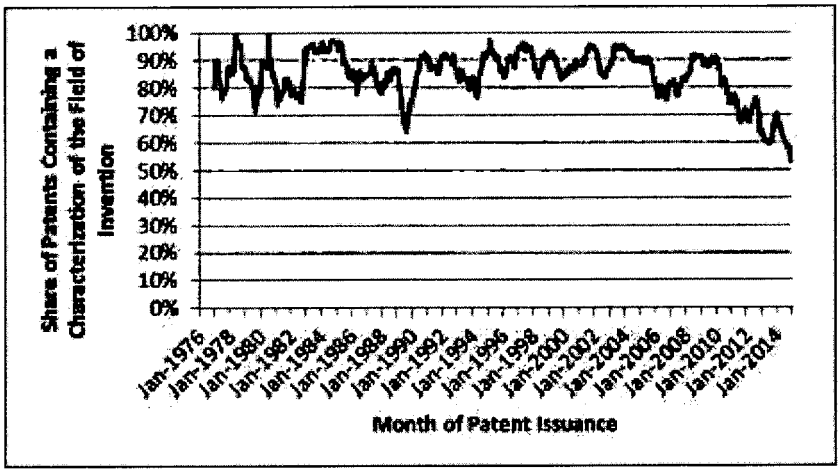


FIGURE 6: TENDENCY OF INVENTORS TO CHARACTERIZE THE FIELD OF INVENTION: MECHANICAL (RETROSPECTIVE TWELVE-MONTH AVERAGE)

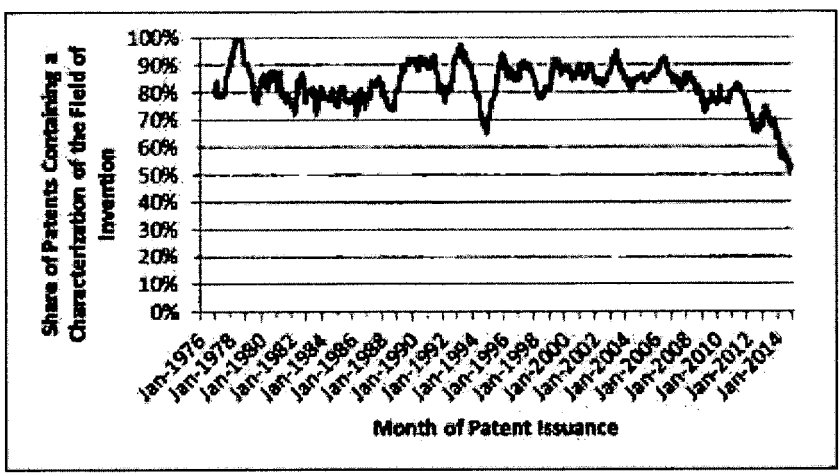
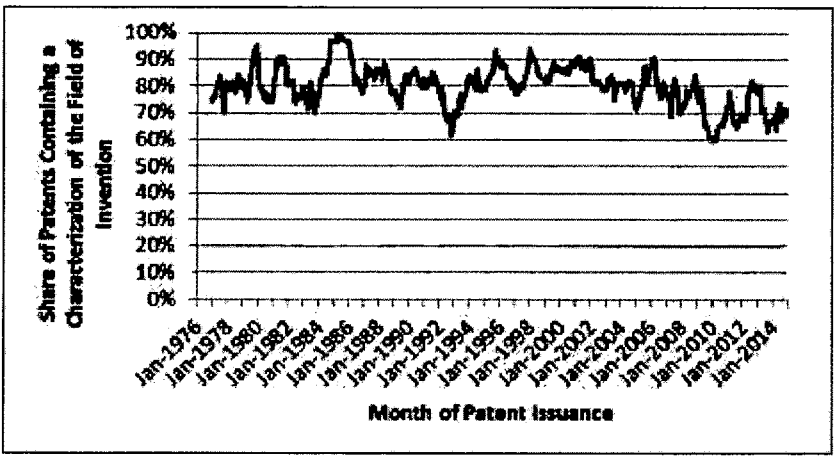


FIGURE 7: TENDENCY OF INVENTORS TO CHARACTERIZE THE FIELD OF INVENTION: OTHERS (RETROSPECTIVE TWELVE-MONTH AVERAGE)



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