2017

Towards Patent Standardization

Janet Freilich

Jay P. Kesan

Harvard Journal of Law & Technology
Volume 30, Special Symposium

TOWARDS PATENT STANDARDIZATION

Janet Freilich & Jay P. Kesan***

TABLE OF CONTENTS

I. INTRODUCTION

Among the most important purposes of patents are to provide clear notice to third parties of the patent's boundaries and to disclose helpful information to researchers seeking to replicate or further develop the patented invention. Unfortunately, patents often fail at both of these tasks, in part because of lack of uniformity of language and format.[1] Use of idiosyncratic language in patent claims renders it dif-

* Associate Professor, Fordham Law School.
** Professor and H. Ross & Helen Workman Research Scholar, University of Illinois College of Law.

ficult to find relevant patents and, once a patent is found, to interpret its claims. As there is no customary set of information that must always be included in a patent, researchers often find reading a patent to be a frustrating and fruitless task.

Standardizing the language and format of patents can improve their notice and disclosure functions. Standardization has been discussed at length in many institutional and legal contexts, but has been discussed little in relation to patent content.[2] Similarly, while problems arising from the lack of standardization are well documented, practical suggestions for improving standardization have been absent. This Article provides the first comprehensive discussion of patent content standardization.

The Article's key intuition is that standardization can be achieved through a wide variety of mechanisms. In particular, standardization does not need to be mandated by formal rules; rather, it can arise through voluntary informal mechanisms, which provide an easier goal than statutory or regulatory interventions do. This Article also offers strategies for increasing standardization in less tractable patent environments, such as software.[3] Specifically, the Article discusses representational languages, which are already prevalent in software design, though not in resultant patents, as well as the role of standard setting organizations ("SSOs") and other private organizations in encouraging standardization and the increased use of templates. When patent protection is sought in different countries all over the world, typically through the Patent Cooperation Treaty ("PCT") system, the description of the invention in the patent document stays the same. Consequently, greater standardization in the patent document will also result in greater global uniformity in the description of patented inventions.

Standardization relates to private law, the theme of this Symposium, because standardization is fundamentally about solving problems of notice and disclosure, which are needed to facilitate interactions between private parties. Further, this Article advocates for the

---

We would like to thank the organizers and participants of the Harvard Law School project on the foundations of private law on private law and intellectual property and the JOLT Symposium editors for their comments and suggestions.

1. JAMES BESSEN & MICHAEL MEURER, PATENT FAILURE: HOW JUDGES, BUREAUCRATS, AND LAWYERS PUT INNOVATORS AT RISK 8–11 (2008).

2. The exceptions are Peter S. Menell & Michael J. Meurer, *Notice Failure and Notice Externalities*, 5 J. LEGAL ANALYSIS 1, 32–34 (2013); and FED. TRADE COMM'N, THE EVOLVING IP MARKETPLACE: ALIGNING PATENT NOTICE AND REMEDIES WITH COMPETITION, 83–84 (2011), https://www.ftc.gov/sites/default/files/documents/reports/evolving-ip-marketplace-aligning-patent-notice-and-remedies-competition-report-federal-trade/110307patentreport.pdf [https://perma.cc/TFC5-G4K6]. A brief discussion of standardization can also be found in Jeannie Fromer, *Patent Disclosure*, 94 IOWA L. REV. 541, 579–85 (2009).

3. The challenges posed by lack of standardization in software patents are discussed further in Section II.C, *infra*.

achievement of standardization at least partially through private mechanisms.

Part II provides background on the economics of standardization and problems with patent notice and disclosure. Part III describes currently existing standardization, and is divided between standardization achieved through mandates or formal mechanisms in Section III.A, and standardization achieved through voluntary or informal mechanisms in Section III.B. Section III.C is a case study illustrating how a combination of mandates and voluntary mechanisms contributes to standardized units in patents. The case study is followed in Part IV by a discussion of how further standardization can be achieved, although this Article is merely the beginning of efforts towards standardization. Part V concludes.

II. BACKGROUND

A. Economics of Standardization

There is a large body of literature on the economics of standardization.[4] "Standardization" is used in a variety of ways;[5] here, it is used broadly to refer to a way of doing something that is agreed upon because it is beneficial. Standards reduce certain market externalities. They can promote innovation and economic progress by reducing transaction costs and improving interchangeability and communication through greater transparency.[6] Standards also reduce transaction costs by facilitating division of labor in complex projects.[7] Standards aid knowledge codification by providing a common language, and help knowledge about a field travel easily.[8] For consumers, standards

4. This literature is summarized in several reviews. *See, e.g.*, HENK DE VRIES ET AL., STANDARDIZATION IN COMPANIES AND MARKETS (Wilfried Hesser ed., 2006); Carmen Matutes & Pierre Regibeau, *A Selective Review of the Economics of Standardization*, 12 EUR. J. POL. ECON. 183 (1996); Peter Swann, *The Economics of Standardization: An Update* (2010), https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/461419/The_Economics_of_Standardization_-_an_update_.pdf [https://perma.cc/7HPM-L6WN].

5. For example, while this Article discusses standardization of language and format, standardization may also refer to compatibility or interchangeability of products. *See, e.g.*, Joseph Farrell & Garth Saloner, *Standardization, Compatibility, and Innovation*, 16 RAND J. ECON. 70, 70 (1985).

6. Geoff Meeks & Peter Swann, *Accounting Standards and the Economics of Standards*, 39 ACCT. & BUS. REV. 191, 192 (2009).

7. *Id.*

8. Daniele Benezech et al., *Completion of Knowledge Codification: An Illustration Through the ISO 9000 Standards Implementation Process*, 30 RES. POL'Y 1395, 1400 (2001).

can reduce cost of products and services,[9] allow interoperability of devices,[10] and promote safety and environmental minimums.[11]

The relationship between innovation and standardization is complex.[12] Standards both help and hinder innovation.[13] Standardization constrains potential options, but can also reduce the time required for companies to bring products to market, promote the diffusion of products and ideas, and provide platforms for downstream innovation.[14] Standardized language can influence learning and network externalities.[15]

While some standards are mandated rules, most are not.[16] Many works compare formal and informal standards, also termed institutional and market standards or *de jure* and *de facto* standards.[17] Informal standards need not be backed by a particular entity; standardization can arise because adoption of a system provides increasing returns to the adoptees.[18] Formal standards can be of higher quality and incorporate more stakeholders, but they are also generally slower to implement.[19]

Standards may also contribute to undesirable behavior. They may facilitate the formation of monopolies, create consumer lock-in, or

---

9. Farrell & Saloner, *supra* note 5, at 71 ("There may be a market-mediated effect, as when complementary goods (spare parts, servicing, software . . .) becomes cheaper and more readily available the greater the extent of the (compatible) market. There may be a benefit to having a thicker second-hand (used) market. Finally, compatibility may enhance price competition among sellers.").

10. *Id.* at 70 (devices that function according to the same standards should be interoperable, whereas in the absence of a common standard many devices are not interoperable).

11. Emmanuelle Auriol & Michel Benaim, *Standardization in Decentralized Economies*, 90 AM. ECON. REV. 550, 551 (2000) (standards can include requirements for compliance with safety and environmental specifications).

12. Department of Trade and Industry, *The Empirical Economics of Standards*, DTI Economics Paper 12 (2005), http://webarchive.nationalarchives.gov.uk/20121212135622/http://www.bis.gov.uk/files/file9655.pdf [https://perma.cc/X559-Q84Q].

13. *Id.*

14. Knut Blind, *Standardisation: A Catalyst for Innovation*, Inaugural Address, Rotterdam School of Management, 30 (2009), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1527333 [https://perma.cc/4FRL-8CU5].

15. Marcel Kahan & Michael Klausner, *Standardization and Innovation in Corporate Contracting (Or "Economics of Boilerplate")*, 83 VA. L. REV. 713, 724 (1997) (stating that if a complex term has been used frequently, it "offers significant learning benefits compared to customizing an alternative term"; the term may also offer network benefits because it places the user in the same "network" as other users of the term). The term "network externality" refers to cases where the "utility that a given user derives from the good depends upon the number of other users who are in the same 'network' as is he or she." Michael L. Katz & Carl Shapiro, *Network Externalities, Competition, and Compatibility*, 75 AM. ECON. REV. 424, 424 (1985).

16. PETER SWANN, THE ECONOMICS OF INNOVATION 91–92 (2009).

17. *Id.*

18. *Id.* at 5.

19. Kai Jakobs et al., *Users and Standardisation — Worlds Apart? The Example of Electronic Mail*, 4 STANDARDVIEW 183, 185 (1996) ("the perception of formal standardization processes . . . is that they are costly, cumbersome and time consuming and bring no guarantee of success").

increase switching costs.[20] Compliance with standards is often costly.[21] And the process of standard-setting is fraught with potential problems. It may become a "political or economic power game"[22] and does not always represent all relevant parties — in particular, downstream users are often excluded.[23]

Legal scholars have discussed standards in many contexts.[24] In patent law, standardization appears primarily in the context of SSOs, and the use (and abuse) of patents therein.[25]

B. Notice

A patent must clearly set out the boundaries of its claims, providing notice to third parties of the patent's scope.[26] Adherence to this prescription has become a persistent challenge to patentees, courts, and policymakers.[27] Part of the problem is intrinsic: intangible assets

---

20. TIM WEITZEL, ECONOMICS OF STANDARDS IN INFORMATION NETWORKS 19–20 (2004). The classic example of standardization increasing switching costs is the QWERTY keyboard. Although arranging a keyboard in the QWERTY formation is demonstrably inferior to other arrangements, because QWERTY had become a standard keyboard format, keyboard manufacturers were unable to switch to a more efficient formation of keys as such a switch would have required many people to re-learn how to type. JOSEPH FARRELL & PAUL KLEMPERER, COORDINATION AND LOCK-IN: COMPETITION WITH SWITCHING COSTS AND NETWORK EFFECTS 48–49 (2006).

21. K.E. Maskus et al., *The Cost of Compliance with Product Standards for Firms in Developing Countries*, World Bank Policy Research Working Papers No. 3590 (2005).

22. Sigeru Takahashi & Akio Tojo, *The SSI Story*, 15 COMPUTER STANDARDS & INTERFACES 523 (1993).

23. Jakobs, *supra* note 19, at 186.

24. *See, e.g.*, Katharine Baker, *Homogenous Rules for Heterogeneous Families: The Standardization of Family Law*, 2012 U. ILL. L. REV. 319 (2012); Nestor Davidson, *Standardization and Pluralism in Property Law*, 61 VAND. L. REV. 1598 (2008); Paul T. Hayden, *Putting Ethics to the (National Standardized) Test: Tracing the Origins of the MPRE*, 71 FORDHAM L. REV. 1299 (2003); Nathan Isaacs, *The Standardizing of Contracts*, 27 YALE L.J. 34 (1918); Thomas Merrill & Henry Smith, *Optimal Standardization in the Law of Property: The Numerus Clausus Principle*, 110 YALE L.J. 1 (2000); Margaret Jane Radin, *Online Standardization and the Integration of Text and Machine*, 70 FORDHAM L. REV. 1125 (2002).

25. *See, e.g.*, Jorge L. Contreras, *Fixing FRAND: A Pseudo-Pool Approach to Standards-Based Patent Licensing*, 79 ANTITRUST L.J. 47 (2013); Richard Epstein, F. Scott Kieff, & Daniel Spulber, *The FTC, IP, and SSOs: Government Holdup Replacing Private Coordination*, 8 J. COMPETITION L. & ECON. 1 (2012); Jay P. Kesan & Carol M. Hayes, *FRAND's Forever: Standards, Patent Transfers, and Licensing Commitments*, 89 IND. L.J. 231 (2014); Mark A. Lemley, *Intellectual Property Rights and Standard-Setting Organizations*, 90 CAL. L. REV. 1889 (2002).

26. McClain v. Ortmayer, 141 U.S. 419, 424 (1891); Halliburton Energy Services, Inc. v. MI LLC, 514 F.3d 1244 (Fed. Cir. 2008); Hoganas AB v. Dresser Indus., 9 F.3d 948, 951 (Fed. Cir. 1993).

27. There is a large literature on notice failure. *See, e.g.*, BESSEN & MEURER, *supra* note 1, at 46–73; Christopher A. Cotropia & Mark A. Lemley, *Copying in Patent Law*, 87 N.C. L. REV. 1421, 1442–43 (2009); Alan Devlin, *Improving Patent Notice and Remedies: A Critique of the FTC's 2011 Report*, 18 MICH. TELECOMM. & TECH. L. REV. 539, 552–54 (2012); Timothy R. Holbrook, *Patent, Presumptions, and Public Notice*, 86 INDIANA L.J. 780, 788 (2011); Herbert Hovenkamp, *Notice and Patent Remedies*, 88 TEX. L. REV. 221,

are simply hard to define.[28] Part of the problem is incentives: patentees perceive some benefit from ambiguous boundaries.[29] Poor notice creates externalities, as third parties must either pay to determine boundaries of competitors' products or must pay for inadvertent infringement if they are unable to find and resolve those boundaries.[30]

There are two primary types of notice failure.[31] First, there is the problem of too many patents.[32] There are often thousands of patents relating to a particular technology and, because patentees can choose non-standard language to describe their inventions, keyword searches for patents are challenging and may not be effective.[33] For example, a company trying to find patents on tables might conduct a keyword search for "tables" but may not think to search for "horizontal surfaces capable of supporting dishes." Second, there is the problem of fuzzy boundaries. It is famously difficult to know the precise meaning of terms or words in a patent.[34] For example, if a patent claim contains the term "about 0.9 to 1 inch,"[35] does it encompass products measuring 0.85 inches? 0.8 inches?

C. Enablement and Written Description

Under § 112 of the Patent Act, a patent's specification must contain a written description of the invention, setting forth "the manner and process of making and using it" and employ such "full, clear,

---

222 (2011); Menell & Meurer, *supra* note 2, at 2; Craig Allen Nard, *A Theory of Claim Interpretation*, 14 HARV. J.L. & TECH. 12–14 (2000); Samson Vermont, *Independent Invention as a Defense to Patent Infringement*, 105 MICH. L. REV. 475, 490 (2006).

28. Menell & Meurer, *supra* note 2, at 2.

29. Nautilus, Inc. v. Biosig Instruments, Inc., 134 S. Ct. 2120, 2129 (2014) ("We are told[] patent applicants face powerful incentives to inject ambiguity into their claims . . . [the] patent system fosters 'an incentive to be as vague and ambiguous as you can with your claims' and 'defer clarity at all costs.'"). Ambiguity can help patentees adjust to changing circumstances over time and protect against future uncertainty. R. Polk Wagner, *Understanding Patent-Quality Mechanisms*, 157 U. PA. L. REV. 2135, 2149 (2009).

30. Menell & Meurer, *supra* note 2, at 9–10.

31. BESSEN & MEURER, *supra* note 1, at 8–9.

32. *Id.* at 71.

33. Christina Mulligan & Timothy B. Lee, *Scaling the Patent System*, 68 N.Y.U. ANN. SURV. AM. L. 289, 317 (2012). *But see* Ted Sichelman, *Are There Too Many Patents to Search — A Response*, NEW PRIV. L. (July 3, 2015), https://blogs.law.harvard.edu/nplblog/2015/07/02/are-there-too-many-patents-to-search-a-response-ted-sichelman/ [https://perma.cc/HW9B-E2TR] (arguing that it is feasible to conduct patent clearance searches).

34. Dan L. Burk & Mark A. Lemley, *Fence Posts or Sign Posts? Rethinking Patent Claim Construction*, 157 U. PA. L. REV. 1743, 1744 (2009) ("Literally every case involves a fight over the meaning of multiple terms, and not just complex technical ones.") A frustrated judge said, in the context of claim drafting, "[w]e are up against what we must realistically consider a growing inability of speakers and writers, lawyers, technicians, and laymen, to say what they intend to say with accuracy and clarity." ZMI Corp. v. Cardiac Resuscitator Corp., 844 F.2d 1576, 1583 (Fed. Cir. 1988).

35. Accentra Inc. v. Staples, Inc., 851 F. Supp. 2d 1205, 1213 (C.D. Cal. 2011).

concise, and exact terms as to enable any person skilled in the art to which it pertains."[36] In theory, at least, these two requirements constitute the disclosure component of the patent system — the *quid pro quo* for which society is willing to exchange the valuable exclusive rights of a patent.[37] But it is unclear if the disclosure requirement is truly producing valuable dissemination of knowledge that may facilitate further innovation.[38]

A patent should describe useful advances in science and technology. However, patent law struggles with ensuring that patents convey a high-quality and useful description and that others in that technological area are able to use relevant patents in the course of advancing technology and innovation. An empirical study by Professor Lisa Ouellette suggests that patent disclosures in the United States, while not useless to scientists, are likely falling short of the statutory enablement requirement.[39] Authors on high-impact nanotechnology publications were surveyed about their use of patents[40] and, while sixty percent of the patent-reading respondents felt that a given patent contained useful technical information, only thirty-eight percent of the patent-reading respondents felt that the patent's invention could be reproduced.[41]

Often, disclosure problems arise because, while patent law sets out general patentability standards, applying these general standards to an area of technology poses problems specific to that technology. This includes the historical treatment of inventions in that technology under the patent laws and the consistency with which general patent standards are policed in that arena.[42] Computer software is a prominent example of a technological arena where little attention is paid to the standardization of patent disclosure. At the outset, human language is poorly capable of describing software functionality, resulting in notice problems and questions about subject matter eligibility. Changes in the rules for eligible computer software subject matter have exacerbated this problem. A couple of decades ago, patent attorneys disguised software innovations as mechanical inventions to work

---

36. 35 U.S.C. § 112.

37. Nat'l Recovery Techs., Inc. v. Magnetic Separation Sys., Inc., 166 F.3d 1190, 1195–96 (Fed. Cir. 1999) ("The enablement requirement ensures that public knowledge is enriched by the patent . . . to a degree at least commensurate with the scope of the claims.").

38. *See* Rebecca S. Eisenberg, *Patents and the Progress of Science: Exclusive Rights and Experimental Use*, 56 U. CHI. L. REV. 1017 (1989) (discussing the theory that disclosure leads to further innovation).

39. Lisa L. Ouellette, *Do Patents Disclose Useful Information?*, 25 HARV. J.L. & TECH. 545, 601 (2012).

40. *Id.* at 548–49.

41. *Id.*

42. *See, e.g.*, Dan L. Burk & Mark A. Lemley, *Is Patent Law Technology-Specific?* (presented at the Telecommunications Policy Research Conference, Oct. 27–29, 2001), https://arxiv.org/ftp/cs/papers/0109/0109107.pdf [https://perma.cc/7NLJ-QXEX].

around subject-matter eligibility requirements.[43] As a result, prior art software patents are found in many different art units in the U.S. Patent and Trademark Office ("USPTO"). An invention that is primarily a software innovation might be claimed by the patentee as a mechanical invention to avoid being labeled as ineligible subject matter.[44] In the absence of disclosure standards or guidance to facilitate standardization, patentees used different terminology to refer to the similar functionality or techniques and, as a result, it is more difficult to locate relevant patents and to identify useful information within patents.

III. PATENT STANDARDIZATION

Patent standardization could ameliorate notice and disclosure problems. Standardization should make it easier to find and parse relevant patents, reducing search costs and improving the notice function of patents. Linguistic standardization in patent claims could reduce the fuzziness of patent boundaries, further improving a patent's ability to provide notice to third parties. In addition, standardization in the specification may make it easier for scientists to read patents and identify relevant information, improving the disclosure function of patents.

In order to begin work towards standardization, the Article establishes a baseline account of patent standardization as it presently exists. In particular, this Part explains that formal mandates are not necessary — standardization can arise voluntarily through informal agency mechanisms as well as through the translation of industry norms to patent documents and other private mechanisms.

A. Formal Mandates

In certain instances, standardization has been achieved by specific mandates. Three examples are described below.

1. Disclosures of Biological Sequences

The USPTO has promulgated a detailed standard for the disclosure of nucleotide and amino acid sequences in patents,[45] which requires patentees to disclose sequences in a particular computer-

43. For a discussion of drafting claims to satisfy patentable subject matter requirements, see John R. Thomas, *Of Text, Technique and the Intangible: Drafting Patent Claims Around Patent Rules,* 17 J. MARSHALL J. COMPUTER & INFO. L. 219, 257–61 (1998).

44. For example, an invention directed at better software control of the processes in an industrial oven might be claimed as a new kind of oven.

45. 37 C.F.R. §§ 1.821–25. Note that the rules only apply to unbranched nucleotide sequences with ten or more bases and unbranched, non-D amino acid sequences with four or more amino acids. Manual of Patent Examining Procedure [hereinafter "MPEP"] § 2421.02.

readable format using a uniform shorthand code.[46] The USPTO's motivation for this standard was to "improve quality and efficiency of the examination process, promote conformity with usage of the scientific community, and improve dissemination of sequence data in electronic format."[47] The USPTO hoped that its database could be a powerful tool for research and thought standardization would "improve[] public data access and dissemination."[48] Additionally, standardization would encourage others to "include sequences appearing in patents in their databases," thereby integrating patent information into databases that collate other sources of information such as scientific articles.[49]

2. Patent Classification Systems

The USPTO and other national patent offices[50] have developed standard classification systems for patents.[51] Recently, patent offices from around the world have agreed to work towards use of a unified standard.[52] The goals of standardized classification systems include "enhance[d] examination efficiency," "improve[d] access to more

46. For example, the symbol "Ala" is used to represent the amino acid "Alanine." World Intellectual Property Organization, *Standard St.25: Standard for the Presentation of Nucleotide and Amino Acid Sequence Listings in Patent Applications* (2009), http://www.wipo.int/export/sites/www/standards/en/pdf/archives/03-25-01arc2009.pdf [https://perma.cc/YCJ3-FAEG].

47. Requirements for Patent Applications Containing Nucleotide Sequence and/or Amino Acid Sequence Disclosures, 55 F.R. 18230-01 (May 1, 1990).

48. *Id.*

49. *Id.* Many databases collect this information from patents. *See, e.g.*, Genome Quest LifeSciences, *Capabilities/Features*, https://www.gqlifesciences.com/genomequest/capabilities-features/ [https://perma.cc/8J9P-TEPR] (stating that over 3 million sequences from patents have been incorporated into the database as of August 2016); STN, *Patent Searching on STN*, https://www.cas.org/training/stn/patent [https://perma.cc/NU8D-Q63E] (describing several different databases within the CAS and STN systems that index patent information). *See also* Osmat A. Jefferson et al., *Transparency Tools in Gene Patenting for Information Policy and Practice*, 31 NATURE BIOTECHNOLOGY 1086, 1086 (2013) (describing the "Biological Lens" database that has collected close to 150 million sequences from patent documents).

50. For example, the European Patent Office formerly used the European Classification System ("ECLA"). European Patent Office, *European Classification System*, ESPACENET, https://worldwide.espacenet.com/help?topic=ecla&method=handleHelpTopic&locale=en_ep [https://perma.cc/D9US-R2R7].

51. United States Patent and Trademark Office, *Handbook of Classification*, https://www.uspto.gov/sites/default/files/web/offices/opc/documents/handbook.pdf [https://perma.cc/JM32-HT3Z]. For example, the CPC class "A61J 1/00" covers "Containers specially adapted for medical or pharmaceutical purposes." *Cooperative Patent Classification*, UNITED STATES PATENT & TRADEMARK OFFICE, https://www.uspto.gov/web/patents/classification/cpc/html/cpc-A61J.html [https://perma.cc/K2GB-VBPP].

52. *Classification Standards and Development*, UNITED STATES PATENT & TRADEMARK OFFICE, https://www.uspto.gov/patents-application-process/patent-search/classification-standards-and-development [https://perma.cc/5PFW-8YRF].

documents from patent offices," and "improve[d] consistency of classified search results."[53]

3. The Patent Document

The patent document itself is a standardized way to disclose and claim inventions. Inventions are routinely disclosed in all sorts of ways — in oral discussions between collaborators, in journal articles, in books, and even, allegedly, on the back of napkins.[54] You cannot, however, send any of these disclosure forms to the USPTO and receive a patent. Rather, you must describe your invention in the patent document, a written disclosure with various rules prescribing its content and form. For example, the document must conclude with "one or more claims particularly pointing out and distinctly claiming" the invention.[55] The document must include various sections such as the "background of the invention" and "brief summary of the invention."[56] There are a substantial number of other standards for formatting the patent disclosure, both general and specific.

B. Voluntary Mechanisms

Standardization can also be achieved by voluntary mechanisms, three of which are described below.

1. Industry Norms in the Chemical and Life Sciences

In general, the language used to describe inventions in the chemical and life sciences is standardized. A Federal Trade Commission report on the challenges of clarifying patent language and boundaries repeatedly attests to this. In "biotech and chemistry there is a 'relatively predictable set of terminology' or nomenclature for describing inventions."[57] Biotechnology has a "very standardized vocabulary" that is "very easily searchable."[58] The report praises certain guidelines "for bringing uniformity to descriptions of the structural aspect of inventions."[59] As discussed below, much of the standardization seen

53. *Frequently Asked Questions*, COOPERATIVE PATENT CLASSIFICATION, http://www.cooperativepatentclassification.org/faq.html [https://perma.cc/JBB2-W5NS].

54. Compaq may have been started after its founders "drew up plans for a new IBM-compatible portable computer on a napkin in a Houston restaurant." Ken Popovich, *Compaq Shareholders Approve HP Deal*, PC MAGAZINE (Mar. 20, 2002), http://www.pcmag.com/article2/0,2817,80142,00.asp [https://perma.cc/Q2XE-FQPD].

55. 35 U.S.C. § 112.

56. 37 C.F.R. 1.77(b).

57. FED. TRADE COMM'N, *supra* note 2, at 84.

58. *Id.* at 92.

59. *Id.* at 111.

in patents in these industries is the result of "soft standardization," or industry norms that create incentives to standardize.

These industries have long recognized the need for standardized vocabularies, and have repeatedly formed voluntary, non-profit associations to do so. In 1919, a coalition of academics and industry scientists formed the International Union of Pure and Applied Chemistry ("IUPAC") to address "the need for international standardization in chemistry."[60] Today, IUPAC nomenclature is a widely used standard for naming molecules.[61] Other organizations such as Chemical Abstracts Service[62] and the Merck Index[63] have also developed widely used methods for identifying and indexing molecules. In 1950, the World Health Organization resolved to create a nomenclature for small molecule pharmaceuticals, called the International Nonproprietary Names ("INN") system,[64] to allow for "clear identification [of medicines] . . . and for communication and exchange of information among health professionals and scientists worldwide."[65] More recently, other organizations such as the Human Genome Organization and The Gene Ontology Project have "work[ed] to create a common vocabulary for researchers' exchange of information about the structure, processes, and functions of genes."[66]

Not only do various organizations create standardized vocabularies, other institutions also ensure that terms in these vocabularies have well-defined boundaries that facilitate notice and disclosure. Many chemical and life sciences terms have only one meaning and the boundaries of that meaning are well established and widely recog-

---

60. *Our History*, IUPAC, https://iupac.org/who-we-are/our-history/ [https://perma.cc/CY8Y-43YF].

61. K.J. THURLOW, CHEMICAL NOMENCLATURE 103 (1998).

62. This organization provides unique identifiers for molecules, called CAS Registry Numbers. David W. Weisgerber, *Chemical Abstracts Service Chemical Registry System: History, Scope, and Impacts*, 48 J. AM. SOC'Y FOR INFORMATION SCIENCE 349, 349 (1997). CAS Registry Numbers have "become a standard for substance identification throughout the industrial world, bridging the many differences in systematic, generic, proprietary, and trivial substance names." *Id.* at 357. Chemical Abstracts Service is a division of the American Chemical Society. *See About CAS*, CAS, https://www.cas.org/about-cas [https://perma.cc/J6R2-6SND].

63. Run by the Royal Society of Chemistry, the Merck Index indexes a wide range of molecules. *The Merck Index Online: Chemistry's Constant Companion*, THE MERCK INDEX ONLINE, https://www.rsc.org/Merck-Index/info/rsc-database-introduction [https://perma.cc/H245-4SXC].

64. World Health Organization, *Guidelines on the Use of International Nonproprietary Names (INNs) for Pharmaceutical Substances* (1997), http://apps.who.int/medicinedocs/pdf/h1806e/h1806e.pdf [https://perma.cc/9MMR-UP95].

65. *Guidance on INN*, WORLD HEALTH ORGANIZATION, http://www.who.int/medicines/services/inn/innquidance/en/ [https://perma.cc/3L7P-BZXF].

66. Suzanne Shema, *The Need for Distinct Claims* 2 (May 4, 2009), https://www.ftc.gov/sites/default/files/documents/public_events/evolving-ip-marketplace/sshema.pdf [https://perma.cc/75VP-MM8F].

nized.[67] Definitions of terms are often controlled by national and international industry groups and by government agencies. For example, the Food and Drug Administration ("FDA") regulates any products calling themselves "omeprazole"[68] (Prilosec®), and the FDA strictly defines "omeprazole" as a specific molecule with a particular structure.[69] Because chemical and pharmacological terms often have clear definitions, there is rarely any question of whether or not a particular chemical is in fact omeprazole.[70]

Although the USPTO does not require that vocabulary in patents match any of these standards, and the patentee is her own lexicographer,[71] the industries' widespread use of standardized vocabulary lowers the cost of using standard nomenclature and increases the cost of using nonstandard nomenclature. First, if everyone uses the same name for a molecule, that name will be in the mind of the inventor as she drafts a patent, and it simply takes more effort to choose a different term where one does not already exist. Second, many journals mandate the use of these standard terminologies,[72] and many patented inventions are also disclosed in journal articles. Thus, the easiest course is to use the same vocabulary for both articles and patents. In some instances, agencies other than the USPTO mandate standardization. For example, the FDA requires use of INN names for pharmaceuticals in packaging and other documents, although proprietary names may be used as well. In essence, because standardized vocabularies are the norm in these industries, it becomes costly to adopt a new vocabulary for patents alone.

---

67. *See* FED. TRADE COMM'N, *supra* note 2, at 84 (explaining that "in biotechnology and chemistry there is a 'relatively predictable set of terminology' or nomenclature for describing inventions" which is "[a] major contributor to clarity.").

68. *Omeprazole*, U.S. FOOD AND DRUG ADMINISTRATION (last updated Mar. 2015), http://www.fda.gov/drugs/scienceresearch/researchareas/pharmacogenetics/ucm283066.htm [https://perma.cc/SZ46-B89E].

69. *Highlights of Prescribing Information* 1 (Dec. 2014), http://www.accessdata.fda.gov/drugsatfda_docs/label/2014/022056s017lbl019810s101lbl.pdf [https://perma.cc/834Y-JJKW].

70. Note that definitions are somewhat fuzzier for biologics. Additionally, there are many areas within the chemical and life sciences where definitions are far from clear. For example, although there are mechanisms to define the meanings of terminology relating to diseases, it is often challenging to determine if a particular situation is in fact a given disease.

71. Texas Digital Systems, Inc. v. Telegenix, Inc., 308 F.3d 1193, 1204 (Fed. Cir. 2002).

72. For example, the journal *Macromolecules* states that "authors should use systematic names similar to those used by Chemical Abstracts Service and the International Union of Pure and Applied Chemistry." *2016 Guidelines for Authors*, MACROMOLECULES, http://pubs.acs.org/paragonplus/submission/mamobx/mamobx_authguide.pdf [https://perma.cc/ZF46-YXCN]. The *Journal of Organic Chemistry* requires authors to "furnish a correct systematic name, following International Union of Pure and Applied Chemistry (IUPAC) conventions." *Journal of Organic Chemistry Guidelines for Authors*, JOC, http://pubs.acs.org/paragonplus/submission/joceah/joceah_authguide.pdf [https://perma.cc/EXC3-JM86].

2. Informal USPTO Guidance

The USPTO occasionally issues non-binding recommendations with suggestions for how patentees might more easily describe particular technologies. Although this in no way requires that applicants standardize their applications, in practice the USPTO's recommendations have been followed by a rush to add the recommended language to patent applications. For example, after the Federal Circuit held that transitory electrical and electromagnetic signals were not patentable,[73] the USPTO recommended that patentees add the limitation "non-transitory" to claims drawn to a "computer-readable medium that covers both transitory and non-transitory embodiments."[74] In the years after this recommendation, the percentage of all patents containing the limitation "non-transitory" increased from zero percent to four percent.[75] The availability of the USPTO guidance was evidently a strong incentive to include the language in patents.

3. Private Standardization Mechanisms

Private organizations routinely generate standards in all manner of situations.[76] This practice has limited parallels in patent standardization. For example, several technology transfer offices already provide templates, among them Stanford[77] and MIT.[78] In addition, an increasing number of companies offer patent-drafting software that is generally based on templates.[79] If widely adopted, these have the potential to lead to significant standardization. However, at this time the use of templates and patent drafting software is still limited.

C. The Power of Standardization: A Case Study

In this Section, we present an exemplary case study to illustrate how voluntary measures at standardization in the patent document

---

73. In re Nuijten, 500 F.3d 1346, 1352 (Fed. Cir. 2007).

74. David J. Kappos, *Subject Matter Eligibility of Computer Readable Media*, 1351 OFF. GAZ. PAT. OFFICE 212 (Feb. 23, 2010).

75. Dennis Crouch, *Non-Transitory Patent Claims*, PATENTLY-O (Oct. 1, 2015), http://patentlyo.com/patent/2015/10/transitory-patent-claims.html [https://perma.cc/QG6C-TVVV].

76. There are many technology standards development organizations such as the IEEE, ETSI, and W3C to name a few, made up of members predominantly from the private sector who then jointly develop technology standards such as 3G, 4G and 5G cellular standards and the 802.11 family of Wi-Fi standards.

77. Stanford's template is available at https://perma.cc/2T3U-2VT7.

78. MIT's template is available at https://perma.cc/MY88-J5L6.

79. There are many examples of patent drafting software. One example is PatentWizard. *PatentWizard*, PATENTWIZARD, http://www.patentwizard.com [https://perma.cc/6JBY-B7A4].

brought about by USPTO regulations took hold over a period of decades and resulted in greater uniformity in the manner in which temperature units (degrees Celsius versus degrees Fahrenheit) were employed in issued patents. This case study, focusing on a simple unit of measurement, demonstrates how a gradual evolution in patent practice can initially come about through voluntary and then subsequently through mandatory measures, promoting greater patent standardization.

In 1974, as part of a general trend towards attempting to standardize the United States' units of measurement with the rest of the world, the Commissioner of Patents announced that the USPTO would encourage applicants to use "only metric (S.I.) units . . . . This practice, however, is not being made mandatory at this time."[80] Use of the metric system increased over time. In 1988, Congress established the metric system as the "preferred system of units for United States trade and commerce,"[81] and an Executive Order required federal agencies to use the metric system in "procurement, grants, and other business related activities."[82] The USPTO responded by reiterating the provision encouraging applicants to use metric units and noted that while the measure was still voluntary, "at some future time . . . the PTO will consider making it a requirement that patent applicants use metric units in patent applications."[83] By 1995, the USPTO had done so. The qualifier that metric units are not "mandatory" was removed in September of 1995.[84] The Manual of Patent Examining Procedure ("MPEP") now requires the use of both metric and English units.[85]

Figure 1 below shows the use of Celsius and Fahrenheit temperature units in the description portion of the patent specification from 1976–2014.[86] The data was obtained by searching the Patent and Trademark Office database for the number of patents issued each year having the term "Celsius," "Fahrenheit" or both "Celsius" and "Fahrenheit."[87] The graph shows the frequency of these occurrences as a

---

80. C. Marshall Dann, *Use of Metric System of Measurements in Patent Applications*, OFF. GAZ. PAT. OFFICE, July 1, 1974. This policy was added to the MPEP in July of 1974. MPEP 3rd Edition, Rev. 40, at 98 (1974).

81. Pub.L. 94-168, § 2, 89 Stat. 1007, Aug. 23 1988.

82. Executive Order 12770, July 25, 1991, 56 F.R. 35801.

83. Harry F. Manbeck, Jr., *Use of Metric System of Measurements in Patent Applications*, 1135 OFF. GAZ. 55 (Jan. 15, 1992), https://www.uspto.gov/web/offices/com/sol/og/con/files/cons069.htm [https://perma.cc/99YF-32V6].

84. *See* MPEP § 608.01, at 39 ("In order to minimize the necessity in the future for converting dimensions given in the English system of measurements to the metric system of measurements . . . all patent applicants should use the metric (S.I.) units followed by the equivalent English units.").

85. *Id.*

86. The searchable USPTO database only goes back to 1976, therefore earlier years can unfortunately not be sampled.

87. The search string used was: boolean (Celsius AND Fahrenheit).

percentage of all patents issued each year with the term "Celsius" or the term "Fahrenheit."[88]

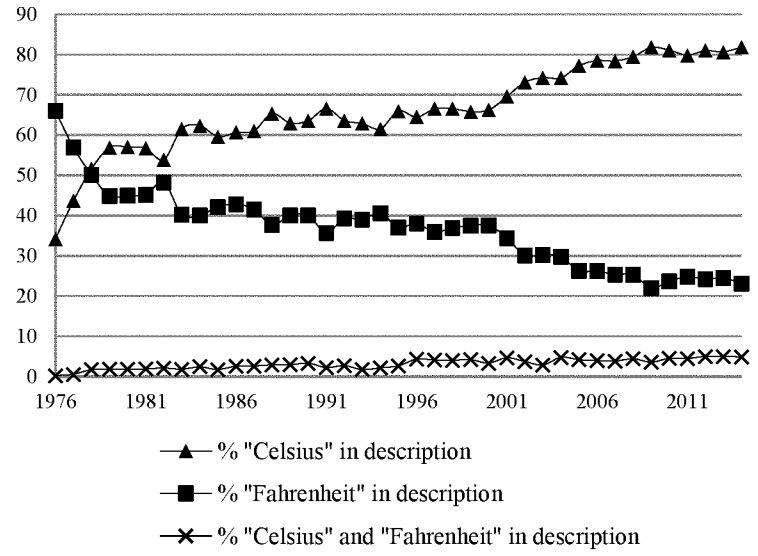

Figure 1: Changes in the Occurrence of the Terms "Celsius" and "Fahrenheit" in Issued Patent Documents Containing Temperature Units from 1976–2014

We then performed a difference-in-difference ("D-i-D") statistical analysis of the data to determine whether the specific policy changes in 1988 and 1995 respectively brought about a statistically significant increase in the use of Celsius compared to Fahrenheit. Tables 1 through 3 show the results of the difference-in-difference analysis.[89] The two policy changes in 1988 and 1995 have a lagged effect, instead of an immediate effect. In other words, these policy changes take some time to take effect. As a result, the tables show the effect of the policy change three years after they were promulgated, in 1991 and 1998 respectively.

88. The search string used was: boolean (Celsius OR Fahrenheit). Frequency is expressed as a percentage because the number of patents issued each year is increasing, so the use of percentages makes the years more easily comparable than raw numbers.

89. Difference-in-Difference is a quantitative method to study a differential effect through a comparison of two groups for two time periods. One group is selected as a treatment group and the other group is selected as a control group. Both groups' data are observed in each time period and the difference of the average values of each group within the second period is compared to their difference within the first period. It removes some biases, such as selection bias or reverse causality.

Table 1: Difference of Means in Use of Temperature Units in Issued Patents Before and After 1988 and 1995 Policy Changes

Variables	1991	1998	1991 & 1998
% "Celsius" in Description After 1991	30.05** (3.410)		15.22** (4.076)
% "Celsius" in Description After 1998		31.32** (3.105)	20.95** (3.999)
% "Fahrenheit" in Description After 1991 Compared to Before 1991	-14.88** (3.389)		-7.50** (3.252)
% "Fahrenheit" in Description After 1998 Compared to Before 1998		-15.25** (3.391)	-10.07** (3.449)
% "Celsius" in Description Compared to % "Fahrenheit" in Description Before 1991	11.34** (2.675)		11.34** (2.299)
% "Celsius" in Description Compared to % "Fahrenheit" in Description Before 1998		16.18** (2.050)	
"Temperature" in Description	-0.0000400 (0.000532)	-0.0000407 (0.000428)	-0.0000512 (0.000464)
Total Issued Patents	0.0000204 (0.000166)	0.0000187 (0.000136)	0.0000216 (0.000143)
Constant	45.09** (4.032)	42.83** (3.705)	45.31** (3.811)
R-Squared	0.848	0.869	0.891

** Has p-value of less than 0.01.
Note: Based on 78 observations. Standard deviations are in parentheses.

Table 2: Means of Use of Temperature Units Before and After 1988 Policy Change

Time Horizon	%Celsius in Description (Treatment)	%Fahrenheit in Description (Control)	Difference of Means**	Standard Deviations of Difference
Before 1991	56.428	45.087	11.341	2.674
After 1991	71.606	30.211	41.396	2.114
Difference in Difference			30.055	3.408

** The p-values of the difference of means are less than 0.01.
Note: The estimation counts the covariates of "temperature" in the description in issued patents.

Table 3: Means of Use of Temperature Units Before and After 1995 Policy Change

Time Horizon	%Celsius in Description (Treatment)	%Fahrenheit in Description (Control)	Difference of Means**	Standard Deviations of Difference
Before 1998	59.008	42.825	16.183	2.049
After 1998	75.083	27.578	47.505	2.331
Difference in Difference			30.055	3.408

** The p-values of the difference of means are less than 0.01.
Note: The estimation counts the covariates of "temperature" in the description in issued patents.

The dependent variable is the value of percentage Celsius (%Celsius) or percentage Fahrenheit (%Fahrenheit) in the patent description shown in Figure 1. %Celsius in the description is the treated group and %Fahrenheit in the description is the control group in the D-i-D analysis. The values of %Fahrenheit in the description and %Fahrenheit and %Celsius in the description are controlled as covariates in the estimations. After the 1988 and 1995 policy interventions, the % of (Celsius/Fahrenheit) in the description on average increased, and the extent of the increase is greater after 1995 as opposed to the extent of the increase after 1988. Overall, %Celsius in the description on average is higher than %Fahrenheit in the description during the 39 years.

When we observe the two policy changes independently and control the values of %Fahrenheit in the description and %Fahrenheit and %Celsius in the description as constant at their average level, %Celsius before 1991 is higher on average by 11.341 compared to %Fahrenheit. As shown in Table 2, this is statistically significant. After 1991, the difference grows to 41.396, which is also statistically significant. The coefficient of the D-i-D effect with respect to the 1988 policy intervention is 30.055 and is also statistically significant. Before 1998, %Celsius is on average higher by 16.183 compared to %Fahrenheit to a statistically significant degree. Table 3 shows that after 1998, the difference grows to 47.505 and is also statistically significant. The coefficient of the D-i-D effect with respect to the 1995 policy intervention is 31.321 and is also statistically significant.

When we compare both of the policy changes analyzed together, Table 1 column 3 presents how the data after 1988 to 2014 is affected by the mandatory change of policy in 1995. The 1988 policy intervention's D-i-D effect is 15.22, which is smaller than the 1995 policy intervention's D-i-D effect, which is 20.95, and the values of %Fahrenheit in the description and %Fahrenheit and %Celsius in the description are controlled as constant at their average level. The D-i-D effect of the 1988 policy is lower when the effect of the D-i-D effect

from the 1995 policy change is added, suggesting that the 1995 effect significantly affects the outcome — the occurrence of %Celsius or %Fahrenheit in the patent description.

Over the past 35 years, patents have increasingly used Celsius units rather than Fahrenheit units to specify temperature. The trend towards using Celsius units began many years prior to the USPTO's forced mandate to use metric units, although the large increase beginning in approximately 2001 may be the result of applications filed after the 1995 mandate was issued. The trend's early start suggests that voluntary measures incentivized the trend — perhaps the USPTO's suggestion to use metric units, or perhaps outside factors such as the standard use of metric units in the sciences or the desire to file the same application internationally without the need to convert units. It is significant that applicants use metric units, even though it is far from clear that this practice benefits the applicant. If a patent application expresses a numerical value in common units, it is easy for the examiner to compare the value to a wide range of literature also using that value and potentially reject the application. Conversely, if the patent applicant chooses to use a less common unit, the examiner must convert the value into different units to compare to potential prior art, possibly making it less likely that the examiner will find relevant prior art. In this manner, standardizing units aids examiners in reviewing patents and helps the public read and find patents. Thus, this case study shows how a mix of voluntary standards and mandates can work towards achieving patent standardization.

IV. TOWARDS STANDARDIZATION

A. Previous Work

As noted earlier in Part I, there are attempts to bring greater standardization to patent claims than what already exists in the MPEP. For example, Menell and Meurer[90] have proposed that the USPTO require patent applicants to indicate the following:

(1) Whether the claim preamble is a limitation;
(2) Whether a claim term is intended to be a "means-plus-function" claim element;
(3) The precise "corresponding structure, material, or acts" associated with "means-plus-function" claim limitations via hypertext;
(4) Whether embodiments in a claim are intended as illustrations/examples or limitations;

90. Menell & Meurer, *supra* note 2.

(5) How to parse claims in a standardized format claim chart; and
(6) Support (via hypertext) for each claim restriction in the specification.[91]

Menell and Meurer also urge the USPTO to subsidize the development, maintenance, and evolution of intellectual property registry search tools and portals through public-private partnerships: for example, by forming a partnership with Google.[92]

B. New Methods

This Section develops several new voluntary methods for achieving standardization. It focuses on measures outside of formal processes because it is challenging to pass new statutes or regulations to mandate standardization. Further, complete standardization is not the goal; the goal is to make it easier and more appealing for individual applicants to choose standardization during the drafting process. In this way, the methods outlined below may achieve incremental progress towards eventual widespread standardization.

1. Representational Language in Software Patents

To make plain what the inventive features of a software-based invention are, patentees should be encouraged to describe software functionality in the same manner as they would describe it to a fellow software programmer. Like patentees, patent examiners who are reviewing patent applications in the computer arts are likely educated and skilled in the field of computer software.

One way to increase the transparency and understandability of software-based inventions would involve encouraging the use of representational languages in the specification of computer software patents. A general-purpose representational language is a language that expresses software or computer functionality in real-world terms.[93] Such disclosures would enable patent examiners to better comprehend the inventive features in the software for which patent protection is being sought. Over a period of time, such practices will result in a significantly more useful and technically discernable software patent repository.[94]

---

91. Menell & Meurer, *supra* note 2, at 34.
92. *Id.* at 47.
93. *See infra* notes 96 and 99.
94. BESSEN & MEURER, *supra* note 1, at 200 (explaining that software patents' general disclosures can "map onto an uncertain set of technologies").

Encouraging the use of representational languages for software inventions ensures better compliance with specification and claim requirements, such as the written description, enablement, and claim definiteness requirements of 35 U.S.C. § 112, ¶¶ 1–2. As noted above, this approach has been accepted in the chemical and biopharmaceutical arts. Use of chemical formulae, listing of nucleotide sequences, and producing deposits and specimens, when necessary, have been routine requirements specified by the USPTO. Representational languages convey the structure of a program in a human-readable form.[95] They allow a Person Having Ordinary Skill in the Art ("PHOSITA") to understand the steps of an algorithm without regard to the specific implementation or platform underlying the function.

A representational language may be used to illustrate the elements and interconnection between elements of a method, technique, or algorithm. Generally speaking, representational languages in computer software may refer to object-oriented languages, modeling languages, pseudocode, or knowledge representation. For example, an object-oriented language is a language that organizes software "as a collection of discrete objects that incorporate both data structure and behavior."[96] This includes details about the language's structure and rules that enable a programmer to effectively depict the details of his computer program, thereby communicating the essential features of the program at a level that makes reproduction of the underlying software functionality reasonably possible. For example, an object-oriented approach includes organizational constructs such as identity, classification, polymorphism and inheritance to realize effective software representation.[97]

As another example, a modeling language can employ various types of models such as state diagrams, object diagrams, and data flow diagrams to illustrate a system.[98] Pseudocode is another example of the representation of a computer algorithm in the form of English words and mathematics.[99] While the computer code implementation may vary depending upon the particular system and computing environment, pseudocode allows the programmer to identify basic program concepts and program flow, and it is a standard tool in computer program design.[100]

The MPEP mentions block diagrams and flow charts as methods of describing software process claims, but they are only casually men-

95. JAMES RUMBAUGH ET AL., OBJECT-ORIENTED MODELING AND DESIGN 1–6 (1991).
96. *Id.* at 1.
97. *Id.*
98. *Id.* at 1–6.
99. R. SCHNEYER, MODERN STRUCTURED PROGRAMMING: PROGRAMMING LOGIC, STYLE, AND TESTING 35 (1984).
100. *Id.*

tioned and no guidance is provided as to what is a "reasonably detailed" flow chart or diagram.[101] The Federal Circuit has shied away from addressing the sufficiency of the technical disclosure in a flow chart or diagram and instead found high-level, functional descriptions to be sufficient.[102]

A representational language such as a representational modeling language may be able to provide an invention's structure and details in a readable disclosure that is useful to patent examiners, courts, improvers, competitors, and other PHOSITAs. Software system designers are already accustomed to modeling and other representational languages in the initial phase of program design. Programmers put their concepts into words and basic steps before implementing them in computer code. Programmers also employ multiple levels of representation before arriving at the final computer language implementation. Hence, it is not overly burdensome for inventors or programmers to employ the same language representations they otherwise use in each software patent application.

2. Private Ordering Mechanisms

Private ordering mechanisms such as standard setting organizations (for example, IEEE, ETSI, W3C, and IETF) bring market participants and technology developers together to develop detailed specifications for achieving a technological objective. For example, a group of companies may become members (or observers) of a SSO, agree to abide by the SSO's policies, and work together to develop a technical specification for a particular standard such as the XML standard, the 802.11b standard, or the 4G standard. The standards development process involves understanding the technologies developed by the members of the particular standards group in a discovery process and then choosing the technologies and features that eventually become part of the standard adopted by the participating members (that is, a process of certification). The standard is then eventually used by third-party implementers deploying products compliant with the standard.

SSOs develop Intellectual Property Rights ("IPR") policies that companies engaged in a standard-setting process agree to comply with. These IPR policies specify disclosure requirements regarding patent coverage for the technologies at issue, Fair, Reasonable, and Non-Discriminatory ("FRAND") obligations, penalties for non-compliance with IPR policies, and the like.[103] As a result, SSOs are

101. MPEP at § 2400 *et seq.*

102. *See, e.g.*, Fonar Corp. v. Gen. Elec. Co., 107 F.3d 1543, 1549 (Fed. Cir. 1997).

103. *See, e.g.*, *Annex 6: ETSI Intellectual Property Rights Policy*, ETSI, http://www.etsi.org/images/files/IPR/etsi-ipr-policy.pdf [https://perma.cc/69UN-2VNC].

uniquely positioned to provide guidelines for patent disclosures in different technological areas that their members may adopt when patenting innovations that are (or expected to be) part of a technology standard. If, as part of their IPR policies, SSOs could be encouraged to include guidelines for patent disclosures that must be followed by SSO members, there could be substantial progress towards greater standardization in patents. Efforts by SSOs to encourage standardization will be particularly effective since the patents incorporated into a standard (so-called standard essential patents ("SEPs")) are very likely to be the more valuable.[104]

3. Increased Use of Templates or Standardized Disclosure Sections

Though some templates already exist, their use does not appear to be widespread. Although templates will not be an option for all inventions, particularly those that are pioneering and far from current technology, they may be able to improve patent language and form in some instances. Because attorney time is one of the largest costs of obtaining a patent,[105] templates that reduce attorney time and facilitate inventor drafting would be readily adopted by many patent applicants. There are a number of groups who might have an interest in producing templates facilitating standardization, including university technology transfer offices or SSOs. Templates could be a valuable tool even in the chemical and life sciences, where there is already substantial standardization.[106] Specific ways in which templates could be used include:

- *Linking Patent Information to Existing Standards*: Templates could include drop-down menus of options to classify certain information in patents such as the field of the invention. The menu could be linked to a standard, and perhaps include a symbol indicating that a standard was being used. For example, templates for patents on medical inventions could link to a list of Medical Subject Heading ("MeSH") terms.[107] This would vastly facilitate patent searches according to subject

104. Josh Lerner & Jean Tirole, *Standard-Essential Patents*, 123 J. POL. ECON. 547, 547–48 (2015) (noting that "[s]tandards play a key role in many industries, including those critical for future growth and [i]ntellectual property (IP) owners vie to have their technologies incorporated into standards, so as to collect royalty revenues").

105. Mark A. Lemley, *Rational Ignorance at the Patent Office*, 95 NW. U. L. REV. 1495, 1498 (2001).

106. In particular, although language is mostly standardized in the chemical and life sciences, format of patents varies, as does the information included in patents. Standardization could improve patent disclosures in these areas.

107. MeSH terms are a controlled vocabulary thesaurus for indexing medical articles. *MeSH*, NCBI, http://www.ncbi.nlm.nih.gov/mesh (last visited Jan. 15, 2017).

areas and improve already existing efforts to link patents to established taxonomies such as MeSH.[108]

- *Identifying Experimental Data*: Templates could include a standard heading to identify experimental data. This would be useful for researchers using patent disclosures to guide experimental methods.[109] A template could additionally provide, where applicable, specific sections such as "Materials" and "Results," such that a researcher seeking to find either uses for or methods to produce particular materials could do so.
- *Identifying Function*: Templates could provide easily identifiable headers or sentence structures to describe preferred (non-limiting) functions of the invention. This may be, for example, a sentence with the following structure: "A function of an embodiment is ____." Functional sentences could also be linked to standardized vocabularies; for example, a patent on a drug that suppressed the immune system could be categorized using the MeSH term "immunosuppression."[110] As another example, an aspect of the invention describing how a user might provide various inputs to a software program could be categorized under "user interface," or "UI". This would allow automated cataloging of patents by function.

V. CONCLUSION

Standardization has the potential to improve the ability of patents to fulfill notice and disclosure requirements by improving transparency and understandability. It is, however, challenging to achieve. The first step towards standardization is understanding what standardization currently exists in patents and how it arose. This will illuminate where additional standardization is needed and mechanisms by which that might most practicably be accomplished. This Article demonstrates that standardization is achieved through a wide variety of mechanisms, including "soft standardization," or voluntary measures towards standardization initiated by private parties, which can achieve many of the advantages of standardization and may be more feasible than mandated standardization. This is true even in industries such as

108. There are numerous efforts to index patents in the medical field according to Medical Subject Headings. *See, e.g.*, Daniel Eisinger et al., *Automated Patent Categorization and Guided Patent Search Using IPC as Inspired by MeSH and PubMed*, 4 J. BIOMED SEMANTICS S3 (2013); TD Griffin et al., *Annotating Patents with Medline MeSH Codes Via Citation Mapping*, 2010 ADV. EXP. MED. BIOL. 680 (2010).

109. Ouellette, *supra* note 39.

110. U.S. National Library of Medicine, *Mesh Tree Structures — 2015*, NIH, https://www.nlm.nih.gov/mesh/2015/mesh_trees/E02.pdf [https://perma.cc/EWY9-7GWL].

software where patents presently have little standardization. In particular, the use of representational languages and patent templates, and the creation of disclosure standards by private ordering mechanisms are paths towards achieving standardization.