Thank You for Not Publishing (Unexamined Patent Applications)

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Since 2000, the U.S. Patent & Trademark Office ("PTO") has published nearly all patent applications as they are submitted by applicants. Scholars and practitioners have praised this practice for providing timely notice of the potential legal rights the application may eventually cover. But maximizing timeliness and transparency in this way can also create significant costs, which may chill innovation and deter the development and funding of new research areas. This Article explores these often-unrecognized costs of publishing unexamined patent applications and proposes solutions that balance the benefits of early notice with the costs of patent system uncertainty.

Published patent applications are essentially an initial guess of what the applicant hopes will become the boundaries of his intangible private property and a speculative attempt at demonstrating its possession. Even if they are never granted, these published applications occupy the patent idea space and can lead to examination and third-party search errors. Published applications can thus contribute to costly unpredictability in the patent system more broadly by preventing others from getting a patent and by creating a temporary cloud of uncertainty around what constitutes excludable private property.

Fortunately, there are solutions. Shifting some of the public notice costs to the applicant can be used to potentially increase the

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quality of information in patent applications, and to reduce the number of lower quality filings. Alternatively, reform efforts can focus on providing the applicant and the PTO with more information in the early stages of examination, enabling them to make an informed choice about whether an application (or a portion thereof) is valuable enough to be published.

CONTENTS

INTRODUCTION

In 1999, Congress passed the American Inventors Protection Act ("AIPA"), which required that all filed patent applications be

made public in eighteen-months' time.[1] In effect, this meant that the U.S. Patent & Trademark Office ("PTO") was now in the business of publishing applications, sometimes years before they are examined,[2] and irrespective of whether they are ever granted.[3] This change was meant to promote notice by informing the public early in the process about what may emerge from the PTO as a legally enforceable right after years of examination.[4] But with their amorphous and uncertain scope,[5] patent applications often illegitimately occupy swaths of the patent idea space and create a chilling effect for other market participants pursuing new technologies. Congress's more recent decision in 2011 to switch to a first-to-file system, which encourages people to run to the Patent Office with half-baked ideas,[6] has the potential to exacerbate this chilling effect further by increasing the number and decreasing the quality of published applications.[7] The consequence of these

1. American Inventors Protection Act of 1999, Pub. L. No. 106–113, 113 Stat. 1536, (1999). Before 2000, only issued patents were published in the United States, while patent applications remained secret to the public. ROBERT PATRICK MERGES & JOHN FITZGERALD DUFFY, PATENT LAW AND POLICY 60, 72 (7th ed. 2017).

Although applicants may opt out of publication if they file in the United States only, this is not estimated to be a common occurrence. Deepak Hegde & Hong Luo, *Patent Publication and the Market for Ideas* 5 (Harv. Bus. Sch., Working Paper No. 14-019, 2016), https://www.hbs.edu/faculty/Publication%20Files/14-019_dbcea57e-c2d1-4d52-9b64-f5c8ec5096bb.pdf (estimating that only a negligible two to five percent of applicants opt out of publication); Sonja Lück, Benjamin Balsmeier, Florian Seliger & Lee Fleming, *Early Disclosure of Invention and Reduced Duplication: An Empirical Test*, 66 MANAGEMENT SCI. 2677, 2677–85 (2020) (estimating that seven percent of applicants opt out of publication); Stuart Graham & Deepak Hegde, *Disclosing Patents' Secrets*, 347 SCI. 236, 236 (2015) (for applications from which a patent issued, less than ten percent opted out of publication); Timothy R. Holbrook, *Possession in Patent Law*, 59 SMU L. REV. 123, 143 (2006) (citing study from 2002 that estimates the opt-out proportion to be eleven percent). It difficult to know for certain because applications that are abandoned will never publish if the inventor opted out of initial publication.

2. *See infra* notes 166–168 and accompanying text.

3. *See* MERGES & DUFFY, *supra* note 1, at 72.

4. *See, e.g.*, *Patent Reform and the Patent and Trademark Office Reauthorization for Fiscal Year 2000: Hearing Before the Subcomm. on Cts. & Intell. Prop. of the H. Comm. on the Judiciary*, 106th Cong. 59 (1999) (statement of Michael K. Kirk, Executive Director, American, Intellectual Property Law Association) (the publication requirement "will allow other U.S. inventors to avoid duplicative research and optimize investment decisions in pursuing technological development."); Mark A. Lemley & Kimberly A. Moore, *Ending Abuse of Patent Continuations*, 84 B.U. L. REV. 63, 80 (2004).

5. *See infra* notes 18–19 and accompanying text.

6. *See infra* notes 79–82 and accompanying text.

7. *See infra* notes 129–130 and accompanying text.

changes in stifling research and development is in direct opposition to the purpose of patent law—promoting innovation.[8]

Scholars have generally exalted the benefits of publishing applications for improving notice and assisting with knowledge diffusion.[9] Reform efforts geared towards the notice function of patent disclosures have heretofore focused primarily on granted patents: the consequences to innovation of having insufficiently substantiated disclosures in granted patents[10] and the unpredictable way in which granted claims (which succinctly describe the legal outer boundaries of the invention in the patent document) are later interpreted.[11] There has been no in-depth

8. *See* Dan L. Burk & Mark A. Lemley, *Policy Levers in Patent Law*, 89 VA. L. REV. 1575, 1591 (2003); FED. TRADE COMM'N, THE EVOLVING IP MARKETPLACE: ALIGNING PATENT NOTICE AND REMEDIES WITH COMPETITION 1 (2011) [hereinafter FTC REPORT], https://www.ftc.gov/sites/default/files/documents/reports/evolving-ip-marketplace-aligning-patent-notice-and-remedies-competition-report-federal-trade/110307patentreport.pdf ("The goal of the patent system is to promote innovation . . . ."). Some scholars argue that patent law is also meant to promote disclosure of useful inventions. *See, e.g.*, Jeanne C. Fromer, *Patent Disclosure*, 94 IOWA L. REV. 539, 539 (2009); Mark A. Lemley, *The Myth of the Sole Inventor*, 110 MICH. L. REV. 709, 745 (2012) ("A traditional subsidiary justification for patent law is to encourage the disclosure of new inventions to the world.").

9. In fact, scholars even argue that applications should be published immediately upon filing in view of these benefits. *See, e.g.*, Colleen V. Chien, *Opening the Patent System: Diffusionary Levers in Patent Law*, 89 S. CAL. L. REV. 793, 848 (2016); Lisa Larrimore Ouellette, *Do Patents Disclose Useful Information?*, 25 HARV. J.L. & TECH. 545, 597 (2012). *But see* Alan Devlin, *The Misunderstood Function of Disclosure in Patent Law*, 23 HARV. J.L. & TECH. 401, 423 (2010) ("[D]isclosure comes at considerable benefit to innovators' rivals and for that reason, disclosure is a source of disutility for the original inventors themselves."). Some argue that all exceptions to publishing, such as requests for non-publication, should be eliminated entirely. *See* Lemley & Moore, *supra* note 4, at 108–09.

10. Janet Freilich, *Ignoring Information Quality*, FORDHAM L. REV. (forthcoming 2021) (manuscript at 22–26), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3739123 (discussing the consequences of erroneous patent rejections and grants based on incorrect patent disclosures); Sean B. Seymore, *Rethinking Novelty in Patent Law*, 60 DUKE L.J. 919, 975 (2011) (discussing examiners' use of "chaff" in prior art patent documents to reject legitimate applications); Christopher A. Cotropia, *The Folly of Early Filing in Patent Law*, 61 HASTINGS L.J. 65, 116 (2009) (discussing how early filing leads to poor quality disclosures, introducing uncertainty of claim scope in granted patents).

11. *See, e.g.*, JAMES BESSEN & MICHAEL J. MEURER, PATENT FAILURE: HOW JUDGES, BUREAUCRATS, AND LAWYERS PUT INNOVATORS AT RISK (2008); Jason Rantanen, *The Malleability of Patent Rights*, 2015 MICH. ST. L. REV. 895, 899 (2015) ("[P]atent rights are malleable . . . the very rights themselves can be altered by the actors who interact with the issued patent."); Tun-Jen Chiang, *Fixing Patent Boundaries*, 108 MICH. L. REV. 523, 525 (2010) ("[A] patentee is permitted to change his claims throughout the life of the patent, generally at-will with few substantive limits."); Peter S. Menell & Michael J. Meurer, *Notice Failure and Notice Externalities*, 5 J. LEGAL ANALYSIS 1 (2013); FTC REPORT, *supra* note 8, at 56.

discussion of the unique harms to innovation caused by the publication of unexamined applications.

Published applications, even those that are later abandoned and potentially of dubious quality,[12] are now often used as evidence (called "prior art") by examiners to prevent others from getting a patent.[13] And the inchoate scope of published applications during their pendency can create a cloud of legal uncertainty for other innovators attempting to pursue research in that space. Both of these effects additionally create a perverse incentive for applicants to "pollute" the patent idea space—to purposefully create a temporary cloud of uncertainty in the pending patent idea space[14] or to permanently occupy the prior art idea space.[15] Uncertainty of the scope of published applications—as prior art or as a pending legal right—undermines the ability of patent law to reward invention[16]—by denying patents to proper claimants—and to incentivize efficient commercialization of nascent technologies[17]—by hindering efforts of third parties to determine what constitutes "private property" in the idea space.

Recognition of these harms also supplies unique reform proposals. Examiners can cite to any part of an application as soon as it publishes, without waiting to see if it becomes a granted patent. And, in view of the inchoate nature of the document, market participants may be forced to analyze the entire patent document, not just the initial claims filed by the applicant, when considering

12. Although some applications are abandoned because the inventor runs out of money, which would not necessarily indicate a poor-quality disclosure.

13. Prior art is the universe of public disclosures (usually published patents and patent applications) made before the patent was filed. It is used by examiners to show that a claimed invention is not patentable because it is not novel or non-obvious over the prior art. 35 U.S.C. §§ 102–03. For simplicity, I am disregarding other forms of evidence that examiners can but rarely do use, such as non-patent literature or evidence of prior sales or public use of an invention. *See* Greg Reilly, *The Complicated Relationship of Patent Examination and Invalidation*, 69 AM. U. L. REV. 1095, 1130, 1132 (2020); *see also infra* notes 32, 114.

14. Pending patent idea (or disclosure) space is a technological information space that consists of pending applications, still enforceable patents, and the remaining space free to use without legal encumbrances.

15. Prior art disclosure (or idea) space is occupied by published patents, published applications, and the remaining space not occupied by those documents. I am ignoring other types of non-patent prior art for simplicity.

16. A. Samuel Oddi, *Un-Unified Economic Theories of Patents – The Not-Quite-Holy Grail*, 71 NOTRE DAME L. REV. 267, 275–77 (1996) (discussing the reward theory of patent law).

17. Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & ECON. 265, 266 (1977) (introducing prospect theory of patent law).

its potential legal impact.[18] Thus, the entire disclosure of a patent application—the claims, the specification, and the figures—serves to occupy the patent idea space when it publishes and defines the application's "scope."[19] Accordingly, reforms must take into account the uncertainty created by the entire application document.

The point of publication also becomes critical. The time before publication, before any party can rely on that information, is when changes can still be made. Changes that would not only improve the quality of granted patents, but also would reduce the unique harms caused by publishing applications. The patent system's current practice of fixing the disclosure (apart from the claims) at the time of filing is not inexorable. We can instead choose to publish and give legal weight to a subset of what is filed by the applicant.

With these considerations in mind, I suggest instituting pre-publication cost-shifting and examination measures to force patent applicants to internalize some of the harms of their "notice pollution"[20] and to reduce the uncertainty of what (if anything) is ultimately published. Although private parties can (and often do) individually hire lawyers to monitor the published patent idea space for threats, it is more efficient if at least some of the work is accomplished by the agency responsible for screening such documents in the first place—the lowest-cost avoider[21]—the PTO.[22] Reforms should consider ways to increase the cost of this pollution, to either prevent the applicant from polluting at all (by incentivizing some applicants to abandon their application before

18. Jason Rantanen, *Patent Law's Disclosure Requirement*, 45 LOY. U. CHI. L.J. 369, 370 (2013) (the disclosure "limits the potential scope of what the applicant can claim."); Gentry Gallery, Inc. v. Berkline Corp., 134 F.3d 1473, 1480 (Fed. Cir. 1998) ("[C]laims may be no broader than the supporting disclosure . . . .").

19. By "scope," I refer to the area that a patent application (as a whole, not just the claims) occupies in disclosure (or idea) space, be it the space of pending disclosures (which includes pending applications and still enforceable patents) or the prior art disclosure space, which includes all published patents or applications (including pending and enforceable ones). *See infra* Section II.A.

20. Menell & Meurer, *supra* note 11, at 5 (coining a similar concept of "notice externality").

21. R.H. Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1, 41 (1960) (introducing the concept of lowest-cost avoider in the pollution context).

22. Reilly, *supra* note 13, at 1121 ("[G]iven the sheer volume of patenting activity and the difficulty in ascertaining claim scope, competitors in many industries do not have incentives to even monitor each other's patent applications . . . ."); Robert P. Merges, *As Many as Six Impossible Patents Before Breakfast: Property Rights for Business Concepts and Patent System Reform*, 14 BERKELEY TECH. L.J. 577, 599–600 (1999) (listing reasons a "public patent authority" may be a cheapest cost avoider).

publication) or reduce the amount of emitted pollutant (by requiring applicants to narrow their application, including the specification, before publication).

Part I of this paper provides background information about the patent examination process. It also summarizes the reasons why even granted patents create legal uncertainty. Part II explains why published patent applications have exacerbated this uncertainty. In particular, I discuss how the unique notice problems created by published applications have affected (1) examination—where a patent examiner needs to determine whether a new patent application[23] should be granted in view of all other published patent documents in existence, and (2) freedom-to-operate searches—where a potential innovator attempts to figure out their legal rights to pursue a new research project. Finally, Part III addresses the tradeoff we have made in our patent system between the timeliness and transparency of notice provided by patent applications (i.e., benefits) versus the quality of such notice (i.e., costs). This Part also suggests some balancing considerations for reform.

I. PATENT UNCERTAINTY

This Part first provides background information about the patent examination process. It then discusses the reasons why granted patents create legal uncertainty and notice failures.

A. Nuts and Bolts of Patent Examination

Patent examination proceeds as follows. A patent application, with an initial set of claims, along with the written disclosure and figures is filed with the PTO.[24] The written disclosure ("specification"[25]) describes the invention with figures, text, and often examples of how the invention may operate in practice.[26] The claims at the end of the document delineate what the inventor believes to be the metes and bounds (i.e., outer periphery) of

23. "New" here means it is the first filing of that application with the PTO. No continuations have yet been filed from this application.

24. 37 C.F.R. § 1.51(b).

25. To avoid confusion, I include drawings in that term, and exclude claims.

26. 37 C.F.R. § 1.71(a) ("The specification must include a written description of the invention or discovery and of the manner and process of making and using the same . . . .").

the invention.[27] The PTO publishes this application as filed, without any substantive changes.[28]

At some point, usually over a year after filing,[29] and many months after publication,[30] substantive examination commences, wherein an examiner determines whether the claims and disclosure meet the statutory criteria for patentability.[31] The examiner searches the "prior art"—most often other published applications and granted patents[32]—to determine whether the claimed invention is new and not obvious in view of what has already been done before the filing date.[33] The examiner also determines if the written description contains sufficient detail to support the scope of the claimed invention.[34]

Most commonly, the examiner issues a "rejection" based on this initial analysis, asserting that the applicant's claims failed to fulfill

27. 35 U.S.C. § 112(b) ("[C]laims [should] particularly point[] out and distinctly claim[] the subject matter which the inventor or a joint inventor regards as the invention.").

28. 37 CFR § 1.211 (requiring publication at a maximum of eighteen months after filing); *see also* U.S. PAT. & TRADEMARK OFF., MANUAL OF PATENT EXAMINING PROCEDURE § 2120.III (9th ed. revision 10.2019, June 2020) [hereinafter MPEP], https://www.uspto.gov/web/offices/pac/mpep/ (listing only formalities required for a "complete" application).

29. *Patents Data, at a Glance February 2022*, U.S. Pat. & Trademark Off., https://www.uspto.gov/dashboard/patents/ (last visited Apr. 4, 2022) [hereinafter *PTO Dashboard*] (listing current pendency as 18.1 months to first substantive action by examiner).

30. *See infra* note 166 and accompanying text.

31. The general criteria for patentability are novelty and nonobviousness over the prior art. *See* 35 U.S.C. §§ 102–03. An examiner must also determine whether the specification meets the requirements of written description and enablement. *Id.* at § 112(a) ("The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains . . . to make and use the same . . . .").

32. U.S. GOV'T ACCOUNTABILITY OFF., GAO-16-479, INTELLECTUAL PROPERTY: PATENT OFFICE SHOULD STRENGTHEN SEARCH CAPABILITIES AND BETTER MONITOR EXAMINERS' WORK 16 (June 2016), https://www.gao.gov/assets/680/678149.pdf [hereinafter GAO REPORT] (discussing examiner limitations with searching nonpatent literature); *id.* at 17 ("8 of the 18 experts we interviewed suggested examiners focus on searching patent literature and may not thoroughly search nonpatent literature. Similarly, our survey results . . . show that nearly all examiners always or often search for U.S. patents and applications (an estimated 99 percent); we also found that nearly all examiners always or often view this as the most relevant type of art they consider (an estimated 98 percent of examiners)."

33. *Supra* note 31.

34. 35 U.S.C. § 112(a) ("The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains . . . . to make and use the same . . . ."). I will later refer to these as "scope-limiting" disclosure doctrines.

one of the requirements of patentability.[35] In response to these rejections, the applicant often amends the claims to avoid covering the prior art or to otherwise make them patentable.[36] Applicants cannot amend the rest of the written description, however, and instead must narrow the claims if the disclosure as originally filed fails to provide the requisite detail to support the claim scope.[37] If the examiner eventually agrees that the most recent set of proposed claims meets the requirements for a patent,[38] the patent issues for a twenty-year term.[39] After issuance, the patent publishes with the same written disclosure already published in the application,[40] but now with the finalized set of legally enforceable claims.

B. Sources of Uncertainty in Granted Patents

The sources of uncertainty in granted patents can be broken down into two main categories: the legal framework that influences how patent disclosures are written, and weaknesses in how certain legal requirements are enforced during examination. The difficulty in discerning which parts of the written disclosure actually demonstrate "possession" of an invention[41]—the rightful occupation of the patent idea space—or in anticipating the scope of any claims that may originate from that disclosure, leads to a variety of problems. In particular, the uncertainty makes it difficult to search for and analyze relevant patent documents—be it for prior art purposes by examiners or for freedom-to-operate purposes by third parties (i.e., looking to avoid legal encumbrances in a new technology area). These two searching problems are also ones most

35. Mark A. Lemley & Bhaven Sampat, *Examining Patent Examination,* 2010 STAN. TECH. L. REV. 2, 7 (2010) ("86.5% of the PTO's first office actions were non-final rejections.").

36. *Id.* at 12 ("[T]he vast majority of applicants, particularly the applicants who obtain patents and those who are still actively trying to do so, do so in part by amending their claims in response to examiner concerns.").

37. Kristen Osenga, *The Shape of Things to Come: What We Can Learn from Patent Claim Length*, 28 SANTA CLARA COMPUT. & HIGH TECH. L.J. 617, 623 (2012) ("The specification is essentially set at the time of filing, whereas the claims can be amended during patent prosecution.").

38. Issuing a "notice of allowance." 37 C.F.R. § 1.311(a).

39. 35 U.S.C. § 154(a)(2).

40. *See supra* note 37.

41. "[P]ossession . . . serves to demarcate that which is yours and that which is someone else's" and is demonstrated through the disclosure for intangible property by demonstrating that "the author can actually make a functioning device" based on that disclosure. Holbrook, *supra* note 1, at 146–47.

exacerbated and magnified by the addition of published patent applications to the idea space, as discussed in more detail in Part II.

1. Legal Framework

Uncertainty is baked into patent documents because of how legal rights are defined in patent law, as well as how they are acquired.[42] The legally enforceable scope of granted patents, and how they can be used as prior art, are often uncertain because patents have long, sweeping, abstract disclosures and broadly worded claims.

a. The nature of claims. In our patent system, the granted claims at the end of the patent document describe the legal scope[43] of what the inventor can exclude others from doing.[44] But the very nature of claims can lead to notice failures and uncertainty.[45] Claims do not simply describe the "core" of the invention or provide an example of it[46]—they have to define the boundaries of the invention, independently from what may be in the written disclosure and figures.[47] Thus, although the specification helps "inform" what claim terms mean,[48] and must contain enough detail

42. Of course, a fundamental uncertainty of language underlies most legal documents, but that is beyond the scope of this paper.

43. The scope of the patent is "how much intellectual space resides within the metes and bounds of the patent claims." Janet Freilich, *The Uninformed Topography of Patent Scope*, 19 STAN. TECH. L. REV. 150, 161 (2015).

44. Aro Mfg. Co. v. Convertible Top Replacement Co., 81 S. Ct. 599, 600–01 (1961) ("[C]laims made in the patent are the sole measure of the grant."); *see also* 1 ERNEST BAINBRIDGE LIPSCOMB, PATENT CLAIMS § 1:3 (3d ed. 2020).

45. *See* Jeanne C. Fromer, *Claiming Intellectual Property*, 76 U. CHI. L. REV. 719, 762 (2009) ("But despite the assertion that peripheral claims provide clear ex ante content notice to the public, there is a robust stream of criticism undermining this conclusion.").

46. *See* Andres Sawicki, *The Central Claiming Renaissance*, 103 CORNELL L. REV. 645, 657 (2018).

47. 1 LIPSCOMB, *supra* note 44.

48. "[T]he specification 'is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.'" Phillips v. AWH Corp., 415 F.3d 1303, 1315 (Fed. Cir. 2005) (quoting Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1582 (Fed. Cir. 1996)); *see also* Microsoft Corp. v. Multi-Tech Sys., Inc., 357 F.3d 1340, 1347 (Fed. Cir. 2004) ("Although it is improper to read a limitation from the specification into the claims, '[c]laims must be read in view of the specification, of which they are a part.'"(quoting Markman v. Westview Instruments, Inc., 52 F.3d 967, 979 (Fed. Cir. 1995) (en banc), *aff'd*, 517 U.S. 370 (1996)).

to support the full scope of the claims,[49] the claims are not limited to what is specifically described. For example, in determining what the term "baffles" in a claim for vandalism-resistant walls means, one can look to the examples provided in the written description of how baffles can be used.[50] If the description provides examples of baffles deflecting projectiles, providing structural support, and creating compartments, the term can be interpreted broadly as any "load-bearing objects that serve to check, impede, or obstruct flow."[51]

"The overall goal [of applicants] . . . is to make [claims] as broad as the Patent Office will allow."[52] Claims limited to the exact disclosed embodiment[53]—the manner in which the invention was expressed in the specification—would be very limiting.[54] In order to "capture" an infringer's version of your invention in the claim scope[55] (and thus be able to exclude them from it), claims have to be drafted in abstract terms to encompass a variety of physical manifestations of the inventive idea.[56]

This attempt to capture the maximum amount of breadth leads to claims that are written at high levels of abstraction or in functional terms. For example, a "clip" would be claimed as a "fastening means." To provide support for such claims, the written disclosure would also be filled with such phrases. Such abstract and

49. Tun-Jen Chiang, *The Levels of Abstraction Problem in Patent Law*, 105 NW. U. L. REV. 1097, 1113 (2011).

50. *Phillips*, 415 F.3d at 1309.

51. *Id.* at 1325.

52. MERGES & DUFFY, *supra* note 1, at 32; *see also* Freilich, *supra* note 43, at 152.

53. Embodiments are versions of an invention. *See* Gene Quinn, *Tricks & Tips to Describe an Invention in a Patent Application*, IP WATCHDOG (Dec. 26, 2015), https://www.ipwatchdog.com/2015/12/26/tricks-tips-for-describe-an-invention-in-a-patent-application-2/id=64133/. An embodiment is "a manner in which an invention can be made, used, practiced or expressed." *Glossary*, U.S. Pat. & Trademark Off., https://www.uspto.gov/learning-and-resources/glossary#sec-E (last visited Mar. 18, 2022).

54. Chiang, *supra* note 49, at 1115 ("If patent scope is limited to those embodiments that the patentee could build at the time of filing (and thus teach in the specification), then every patent becomes worthless practically from the moment it is issued.").

55. MERGES & DUFFY, *supra* note 1, at 33–34; Freilich, *supra* note 43, at 152 ("[A] patent's scope is generally thought of as the universe of later-developed products that infringe on the patent.").

56. Claims "cover[] a class of embodiments that share only some operating principle or functional idea." Chiang, *supra* note 49, at 1119; *see also* Jeffrey A. Lefstin, *The Formal Structure of Patent Law and the Limits of Enablement*, 23 BERKELEY TECH. L.J. 1141, 1169 (2008).

functional language is harder to understand[57] and the scope of functional claims is harder to predict as it is not constrained by a particular structure.[58]

b. Continuation practice. Another quirk in our patent system also leads to vague claims and sweeping written descriptions—the filing of continuation applications. Any time during examination of a patent application at the Patent Office (i.e., while it is "pending"), the applicant can file one or more "continuation applications" with new claims.[59] The continuation application has the same specification as the original application and dates back to the filing date of the original application.[60] By strategically having an application pending, an applicant can keep filing an infinite number of claims, for up to twenty years, based on the originally filed disclosure.

Applicants file continuing applications for a variety of reasons: to avoid prior art during prosecution,[61] to cover new implementations the inventors discovered after filing,[62] to make the claims more likely to withstand a validity challenge in litigation,[63]

57. Fromer, *supra* note 45, at 762 (comparing "shoelace" to the abstract definition of "mechanism by which to bind tightly around the foot"); *see* Sean B. Seymore, *The Teaching Function of Patents*, 85 NOTRE DAME L. REV. 621, 638–41 nn.89–90 (2010).

58. Mark A. Lemley, *Software Patents and the Return of Functional Claiming*, 2013 WIS. L. REV. 905, 905 (2012); Arti K. Rai, *Improving (Software) Patent Quality Through the Administrative Process*, 51 HOUS. L. REV. 503, 518–19 (2013) ("[I]f software designers actually want to do freedom-to-operate searches for patents, such patents would probably be easier to search (and certainly to understand) if some structure—for example, a detailed algorithm—were included in the specification."). Functional claiming is an especially big problem in certain fields, like software, where structure is not an inherent part of the technology. Kevin Emerson Collins, *Patent Law's Functionality Malfunction and the Problem of Overbroad, Functional Software Patents*, 90 WASH. U. L. REV. 1399, 1402 (2013) ("Software is a powerful technology precisely because it has been engineered at a deep level to ensure that the specification of functional properties does not require the specification of any physical, structural properties.").

59. 35 U.S.C. § 120 (2018); MPEP, *supra* note 28, § 201.07; Cotropia, *supra* note 10, at 101–02.

60. *Id.*

61. *See* Osenga, *supra* note 37, at 620 (discussing amending claims to overcome prior art).

62. Cotropia, *supra* note 10, at 102–03.

63. Osenga, *supra* note 37, at 623 (discussing amending claims to comply with changes in patent law).

or to cover a competitor's product.[64] For an example of the abuse such continuations allow, consider the case of *Rambus Inc. v. Infineon Technologies AG*, 318 F.3d 1081 (Fed. Cir. 2003). In 1990, Rambus filed a very broad disclosure on computer memory technology.[65] In 1992, Rambus joined a standard-setting organization that was developing new technological standards for computer memory to be adopted by its members.[66] By attending the organization's meetings, Rambus was able to gather information about what computer memory standard the organization would select, and to write new claims that captured the standards set by this organization.[67] Using continuation practice, Rambus was able to date these new claims back to its 1990 filing.[68] Rambus then left the organization in 1996 and sued one of the organization's members for using those very same standards set by the organization, as captured by its new claims drafted using insider knowledge.[69] Continuation practice almost seemed to give Rambus the powers of time travel—to go back in time and invest in the right technology that others would later adopt.

This example demonstrates how continuation practice makes it hard to predict what claims will originate from a patent document. Because applicants cannot add "new matter" to the disclosure after filing, there is an incentive to add as much possible detail (however speculative) in the originally filed specification and to cover as much idea space as possible to leave room to file future continuation applications.[70] These overlong and sweeping

64. Menell & Meurer, *supra* note 11, at 14 ("[A] patent applicant gains from being able to update her claims as competitors introduce new products, thereby improving the likelihood that the competitor falls within the scope of the claimed invention."); *id.* ("Nonpracticing entities in the patent world benefit from the difficulty that the developers face in searching the millions of patents and patent claims.").

65. Rambus Inc. v. Infineon Techs. AG, 318 F.3d 1081, 1084 (Fed. Cir. 2003).

66. *Id.* at 1085–86.

67. *Id.*

68. *Id.*

69. *Id.* at 1086; *see also* Herbert J. Hovenkamp, *Patent Deception in Standard Setting: The Case for Antitrust Policy* 6 (Faculty Scholarship at Penn Law, Paper No. 1774, 2008), https://scholarship.law.upenn.edu/faculty_scholarship/1774.

70. Amy R. Motomura explains: "To facilitate later mining of the disclosure . . . original patent applicants are incentivized to use broad, vague language and include undeveloped, speculative post-filing innovation in the original patent application . . . . [which] can obscure the actual invention and contribute to the opacity of patent disclosures . . . ." Amy R. Motomura, *Innovation and Own Prior Art*, 72 HASTINGS L. J. 565, 599 (2021); *see also* Cotropia, *supra* note 10, at 102–03.

disclosures create uncertainty not just in the context of continuation practice, but also in their use as prior art.[71] These problems of overdisclosure have even more significance when juxtaposed with the publication of unexamined applications, as explored in Part II.

c. Constructive reduction to practice. Patents also have significant amounts of speculative information. Granted claims and parts of written disclosures can illegitimately occupy areas of patent idea space—both the prior art idea space and the pending patent idea space—that the inventor never actually possessed.[72] For an egregious example, consider the fact that the Patent Office granted Theranos a patent based on its fraudulent technology claiming to perform broad-range diagnostic tests based on mere finger pricks of blood.[73] In fact, this Theranos patent is still being enforced in infringement lawsuits today.[74]

The reason Theranos was able to get a patent on its fake invention is because an applicant can mentally conceive of an invention without physically performing it and can "constructively" reduce it to practice by filing a patent application.[75] Thus, Theranos simply submitted its *idea* of using microliters of blood for broad-range testing, without verifying that it was in fact possible with its technology. Effectively, an applicant can simply provide hypothetical "prophetic examples" in the application to speculate about how the invention would work in practice to satisfy the disclosure requirements of patentability.[76] And, there's little punishment for bad guesses since claims can

71. Few commentators have recognized the fact that the quality of patents is also important in how it is later used as prior art. *See* Freilich, *supra* note 10, at 22–26; Seymore, *supra* note 10, at 975.

72. *See supra* note 41.

73. U.S. Patent No. 8,283,155 (issued Oct. 9, 2012); *Theranos Founder and Former Chief Operating Officer Charged in Alleged Wire Fraud Schemes*, U.S. DEP'T OF JUST. (June 15, 2018), https://www.justice.gov/usao-ndca/pr/theranos-founder-and-former-chief-operating-officer-charged-alleged-wire-fraud-schemes ("[D]efendants claimed the analyzer was able to perform a full range of clinical tests using small blood samples drawn from a finger stick.").

74. Labrador Diagnostics LLC v. BioFire Diagnostics LLC, No. 1:20-cv-00348 (D. Del. Mar. 9, 2020).

75. Seymore, *supra* note 57, at 628–29.

76. Janet Freilich, *Prophetic Patents*, 53 U.C. DAVIS L. REV. 663, 666 (2019) ("The Patent and Trademark Office ('PTO') and the courts explicitly permit made-up experiments and fictional data in patents"); Seymore, *supra* note 57, at 631. *But see* Dmitry Karshtedt, Mark A. Lemley & Sean B. Seymore, *The Death of the Genus Claim*, 35 HARV. J. L. & TECH. 1, 41 (2021) (inoperable embodiments do not always lead to undue experimentation).

encapsulate inoperative embodiments without being rendered invalid.[77] According to Janet Freilich's recent work, thirty-eight percent of chemistry and biology applications filed between 2001 and 2017 had at least one prophetic example in the specification.[78]

d. First-to-file system. Our switch to a first-to-file system in 2011 increased the amount of speculation already present in patents.[79] Previously, patent applicants could back-date their filings to the time of actual invention, and thus worried a little less about the date someone else may have filed a similar application.[80] Under first-to-file, the filing date is all that matters, and no amount of evidence will give you an earlier date of invention.[81] Applicants are now rewarded for filing an application as soon as possible—before they have fully developed the idea or have found the money or time to write it up properly. They race to the patent office to get priority for claiming the invention over later filers and, by definition, to limit the universe of prior art that can be used by the examiner to invalidate their patent.[82]

Patent law provides little downside to filing an application early in the innovation process. Applications remain secret for eighteen months and can remain unpublished forever if the applicant chooses to abandon the application before that time is up.[83] In addition, constructive reduction to practice allows applicants to file vague or speculative disclosures.[84] Thus, an

77. Seymore, *supra* note 57, at 632 n.54 ("According to the Federal Circuit, claims are not necessarily invalid if they encompass inoperative embodiments . . . .").

78. Freilich, *supra* note 76, at 697. This can lead to what Janet Freilich calls "innovation dead zone[s,]" where no other inventor can get a patent "in an area previously described by a prophetic patent." *Id.* at 669.

79. Leahy–Smith America Invents Act, Pub. L. No. 112–29 (2011) (revising 35 U.S.C. § 102(a)); Mark A. Lemley, *Ready for Patenting*, 96 B.U. L. REV. 1171, 1181 (2016) ("The goal of the move to (mostly) first-to-file, besides harmonization, is to encourage inventors to proceed with alacrity to share their invention with the world.").

80. Cotropia, *supra* note 10, at 79 (describing how you may "swear behind" a prior art reference to get an earlier date of invention than your filing date).

81. *Id.* at 82 ("[Under a first-to-file system,] the filing date, not the date of invention, determines priority amongst competing inventors.").

82. *Id.* at 78–79, 82 ("Essentially, the level of technological progress the invention is compared against becomes lower the earlier the date of comparison.").

83. *Id.* at 99 (citing 35 U.S.C. § 122).

84. *See supra* Section I.B.1.c; *see also* Cotropia, *supra* note 10, at 74–75 (discussing the low threshold for meeting the disclosure requirements of patentability); Seymore, *supra* note

inventor does not immediately give up trade secret protection by filing an application early, nor does he significantly risk the validity of the later-issued patent by filing mere guesswork. In the face of uncertainty about the value of an invention and what competitors are working on,[85] it makes sense for an applicant to choose to keep their options open[86] and to file the application in the early stage of its development.

Early filing of applications results in written disclosures that are vague, rambling, and speculative because the inventors themselves are not sure, at the beginning of the inventive process, exactly which implementations of their ideas will work[87] or whether the idea is even any good.[88] The granted claims are also likely poorly supported by these disclosures.[89] Early filing, along with the high-throughput filing scheme of many IP-generating firms,[90] means that patent applications will be not only speculative, but generally uninformative and poorly written.

2. Enforcement Issues

Patent applicants have great incentive to keep as much of their invention secret as possible, while simultaneously claiming the broadest scope of protection. That way, they can get the benefit of suing competitors without entirely losing the advantages of trade secret (i.e., without providing competitors sufficient information to

57, at 639 & n.87 (doubts about enablement are resolved in the patentee's favor during litigation and prosecution).

85. Cotropia, *supra* note 10, at 97–98.

86. *Id.* at 98.

87. *See* Lemley, *supra* note 79, at 1192 ("One concern with early filing is that the very inventors who do not build products will draft the broadest claims, simply because they don't actually know what particular implementations of their idea will work.").

88. Cotropia, *supra* note 10, at 110 ("[E]arly filing leads to more bets—option purchases by way of patent filings—that go bad and have no payout because they cover inventions not worth commercializing.").

89. *Id.* at 116 (discussing how early filing leads to poor quality disclosures, introducing uncertainty of claim scope in granted patents).

90. Jeremy W. Bock, *Patent Quantity*, 38 U. HAW. L. REV. 287, 306–08 (2016) (discussing reasons why firms accumulate patents, including employee compensation structures and the firms' defensive uses of large patent portfolios). In such firms, inventors are not intrinsically motivated to create intellectual property for their company and patent attorneys are paid little per patent application. *Id.* The result is weak applications—those with little detail or experimental verification.

reproduce a viable imitation).[91] The desire for expansive claims and limiting (or hiding) information in the specification naturally leads to applications with broadly worded, vague (and often functional) claims and specifications that hide the ball—making it difficult to assess the scope of protectable intellectual space.

Courts and the PTO have grappled with how to compensate for applicants' incentives to sow uncertainty and the unpredictability bolstered by the nature of claims, continuation practice, and constructive reduction to practice. They have developed scope-limiting disclosure doctrines meant to constrain the breadth of claims and to force applicants to provide support in the specification. But as I discuss here, those substantive doctrines are often unpredictable in outcome and difficult to apply, especially for examiners ex ante.

One reason speculative claims can be granted in patents is the way possession of the invention—by way of disclosure—is evaluated by the courts.[92] In theory, "the patent applicant must demonstrate in the specification to 'any person skilled in the [relevant] art [how] . . . to make and use the [invention]' without 'undue experimentation.'"[93] Applying this "enablement" doctrine in practice, however, is "challenging from a technical, legal, and conceptual perspective; and there are rarely easy answers."[94]

Consequently, as scholars have noted, "[t]he PTO does notoriously little examination or rejection based on enablement."[95] Examiners have to go the extra mile to reject an application based

91. *See* Fromer, *supra* note 8, at 552–53 & n.65.

92. MERGES & DUFFY, *supra* note 1, at 252, 289.

93. Fromer, *supra* note 8, at 546 (quoting 35 U.S.C. § 112 and Monsanto Co. v. Syngenta Seeds, Inc., 503 F.3d 1352, 1360 (Fed. Cir. 2007)).

94. Rantanen, *supra* note 11, at 924–25. I am disregarding a related requirement of written description, which has similar enforcement problems. The problems in enforcement of these doctrines, based on 35 U.S.C. § 112, have also been empirically observed: the proportion of examiner rejections based on these doctrines has not changed significantly over time, despite changes in legal doctrines that should have made it easier for examiners to make such rejections. *See* Colleen V. Chien, Nicholas Halkowski, Maria He & Rodney Swartz, *Parsing the Impact of Alice and the PEG*, 2020 PATENTLY-O PATENT L.J. 20, 25 (2020), https://patentlyo.com/media/2020/11/PatentlyO-LJ-2020-11-02.pdf (showing a lack of significant change in § 112 rejections for computer-implemented technologies despite changes in the law and PTO guidance that lowered the threshold for making such rejections).

95. Karshtedt et al., *supra* note 76, at 97; *see also* Clarisa Long, *Patent Signals*, 69 U. CHI. L. REV. 625, 668 (2002) ("Most of the assertions made by a patent applicant are taken on faith; only rarely does the PTO seek verification of a patent applicant's assertions.").

on this requirement. The use of prophetic examples alone does not raise red flags about enablement.[96] Disclosures are presumed to be enabled and adequate, with the examiner bearing the burden of proving otherwise.[97]

There is another doctrine that is meant to constrain claim scope—indefiniteness.[98] It requires that "claims *particularly point*[] *out and distinctly claim*[] the subject matter which the inventor . . . regards as the invention."[99] This doctrine is meant to limit the vagueness of claims which may artificially increase the "zone of uncertainty" around the claimed language.[100] In theory, the PTO has a high standard for this requirement, finding claims indefinite if they have "more than one reasonable interpretation."[101]

96. *See* Seymore, *supra* note 57, at 631. It is not clear whether prophetic examples weigh against you in an enablement analysis. Janet Freilich, *supra* note 76, at 680 ("The *Wands* factors, which embody the seminal test for enablement, list the presence or absence of 'working examples' as a factor in the analysis, but omit prophetic examples." (citing *In re* Wands, 858 F.2d 731, 737 (Fed. Cir. 1988))).

97. Seymore, *supra* note 57, at 630.

98. A related doctrine of § 112(f) has recently been expanded in its ability to limit functional claim limitations to the disclosed structure. Williamson v. Citrix Online, LLC, 792 F.3d 1339 (Fed. Cir. 2015) (en banc). Some scholars believe that there are still fundamental limitations in its applicability. Kevin Emerson Collins, *The* Williamson *Revolution in Software's Structure*, 31 BERKELEY TECH. L.J. 1597, 1628–29 (2016) (*Williamson* is not sufficient to resolve the problem with functional claiming in software patents since what constitutes "structure" in a software patent is still unsettled.).

99. 35 U.S.C. § 112(b) (emphasis added).

100. Nautilus, Inc. v. Biosig Instruments, Inc., 572 U.S. 898, 899 (2014) ("[A] patent must be precise enough to afford clear notice of what is claimed, . . . in a manner that avoids '[a] zone of uncertainty which enterprise and experimentation may enter only at the risk of infringement claims.'" (quoting United Carbon Co. v. Binney & Smith Co., 317 U.S. 228, 236 (1942))).

101. MPEP, *supra* note 28, § 2173.02.I; U.S. Pat. & Trademark Off., Supplementary Examination Guidelines for Determining Compliance with 35 U.S.C. 112 and for Treatment of Related Issues in Patent Applications, 76 Fed. Reg. 7162, 7164 (Feb. 9, 2011) ("[A] lower threshold of ambiguity is applied during prosecution." (citing *Ex parte* Miyazaki, 89 USPQ2d 1207, 1212 (Bd. Pat. App. & Int. 2008))).

In practice, however, examiners, already strapped for time[102], are unlikely to make indefiniteness rejections.[103]

In sum, the weak enforcement of the scope-limiting doctrines described above fails to counterbalance the applicant's natural tendencies to claim broadly and describe little. This results in overbroad, abstract claims that cover more than the applicant in fact possessed. Moreover, these doctrines are only targeted at making sure granted *claims* are of proper breadth. There is no legal doctrine that polices speculative or inaccurate information in the unclaimed parts of the written disclosure. But those parts of the patent document can still be used as prior art to invalidate other applications or to support new claims in future continuation applications. Poor disclosure quality in granted patents can therefore be harmful.[104] But the effects of overdisclosure and weak enforcement of scope-limiting doctrines on innovation become even more critical when juxtaposed with our current practice of publishing unexamined applications, as discussed next.

II. HOW PATENT APPLICATIONS EXACERBATE PATENT SYSTEM UNCERTAINTY

The publication of patent applications has exacerbated the problems addressed above. In addition to published patents, which have unclear and poorly supported claim scope, the patent idea space is now occupied with unexamined applications. Published applications—even those that are later abandoned and potentially of dubious quality—are often used during examination to prevent others from getting a patent. The inchoate scope of published applications during their pendency can also create a cloud of legal uncertainty for other innovators attempting to pursue research in that space. I will first explain how the uncertainty of an

102. Michael D. Frakes & Melissa F. Wasserman, *Irrational Ignorance at the Patent Office*, 72 VAND. L. REV. 975, 978 (2019) ("On average, a U.S. patent examiner spends only eighteen hours reviewing an application, which includes reading the application, searching for prior art, comparing the prior art with the application, writing a rejection, responding to the patent applicant's arguments, and often conducting an interview with the applicant's attorney.").

103. *See* James Cosgrove, *§ 112 Rejections: Where They Are Found and How Applicants Handle Them*, IP WATCHDOG (May 9, 2017), https://www.ipwatchdog.com/2017/05/09/112-rejections-applicants-handle/id=82668/#:~:text=While%20interviews%20are%20usually%20the,(b)%20rejections%2C%20respectively (showing indefiniteness rejections are made in only twenty-one percent of all applications, while rejections based on prior art are made eighty percent of the time).

104. *See supra* note 71.

application's "scope" can change over time. I will then discuss how the existence of published applications affects examination and freedom-to-operate searches.

A. Uncertainty of Patent Applications Over Time

An unexamined published application is initially at the apex of its information uncertainty. The originally filed claims are likely too broad, covering ideas already in the public domain, because many applicants do not perform any prior art search before filing an application.[105] In addition, because applicants have an infinite number of opportunities to amend the claims during examination,[106] they have little to lose in filing overbroad claims at the beginning of the process. [107]

The infinite ability to amend claims also means that the legally enforceable rights that may stem from an application are inchoate. Simply looking at the initially filed claims provides little information as the claims can easily change. The main limiting factor in what may be claimed from the application thus stems from the written disclosure and figures that are filed with the claims.[108] The claims, written disclosure, and figures together define the "application scope" or "disclosure scope" of the filed application.

105. *See* Michael Risch, *The Failure of Public Notice in Patent Prosecution*, 21 HARV. J.L. & TECH. 179, 200 (2007) ("[B]ecause the applicant is not required to search for prior art, the initial claims represent what the patentee thinks *might* be novel and nonobvious."); Bhaven N. Sampat, *When Do Applicants Search for Prior Art*, 53 J.L. & ECON. 399, 401–02 (2010) (providing empirical evidence that, "in many cases, applicants do not conduct even cursory searches for prior art"); IAIN M. COCKBURN & REBECCA HENDERSON, SURVEY RESULTS FROM THE 2003 INTELLECTUAL PROPERTY OWNERS ASSOCIATION SURVEY ON STRATEGIC MANAGEMENT OF INTELLECTUAL PROPERTY F.8–.9 (2003) [hereinafter IPO Report], http://www.ipo.org/AM/Template.cfm?Section=Home&Template=/CM/ContentDisplay.cfm&ContentFileID=55152 (seventeen percent of responding corporations spent less than one hour, if any, on a patent search before filing an application).

106. As long as they keep paying fees, applicants can keep filing amendments. *See* 37 C.F.R. § 1.114 (after final rejection, the applicant can pay a fee and "request continued examination").

107. Jonathan A. Barney, *A Study of Patent Mortality Rates: Using Statistical Survival Analysis to Rate and Value Patent Assets*, 30 AIPLA Q.J. 317, 328 (2002) ("A patent is not unlike an expensive lottery ticket; you pay your money up front and hope for the big payoff."). Applicants are also more likely to file indefinite claims, creating fuzzier boundaries, as they can always be amended to be more definite.

108. *See supra* note 37.

As shown in *Figure 1* below, the uncertainty of a new[109] application's scope is highest when filed. Not only are the claims likely too broad, but the specification is probably written in sweeping, vague terms, or perhaps with too many proposed variations of the invention to support the abstract claim language or the potential claim amendments which may be required in response to examiner rejections.[110]

After filing (and publication), the uncertainty of the application's scope shrinks as examination progresses, at least in certain dimensions. As time goes on, and an application is examined, more clarity can be gleaned—about what certain terms mean, what the applicant intends to protect, and the scope of the legal right the application can legitimately capture. With examination, applicants get the benefit of an examiner's search identifying other occupants of the same idea sub-space and are forced to reevaluate the scope of their invention that can actually be supported by the specification. Thus, the claims that are filed with the application will likely be narrowed during the process of examination, and some will be eliminated completely,[111] in view of the examiner's location of the relevant prior art and other rejections. The meaning and significance of portions of the claims and specification accordingly become clearer as the examiner and applicant "negotiate," on public (though difficult-to-access) record, over the scope the application can claim based on the filed disclosure and the prior art.[112]

Upon issuance, the finalized claim language is set for that initial application. (Or, if the applicant entirely abandons this application and files no continuations, the enforceability of the claims, and perhaps the quality of the disclosure, gain more certainty.) For an issued patent, any continuations the applicant files might further clarify which aspects of the specification the applicant intended to claim, or ones the applicant thinks are most important or best supported by the specification. And, finally, litigation sets the final

109. *See supra* note 23.

110. Osenga, *supra* note 37, at 623.

111. *See infra* notes 234–236 for empirical evidence that examination in fact often accomplishes these tasks.

112. The record of this negotiation is made public when the application publishes and can be found on https://portal.uspto.gov/pair/PublicPair.

scope of the claims for a specific enforcement action against a particular party.[113]

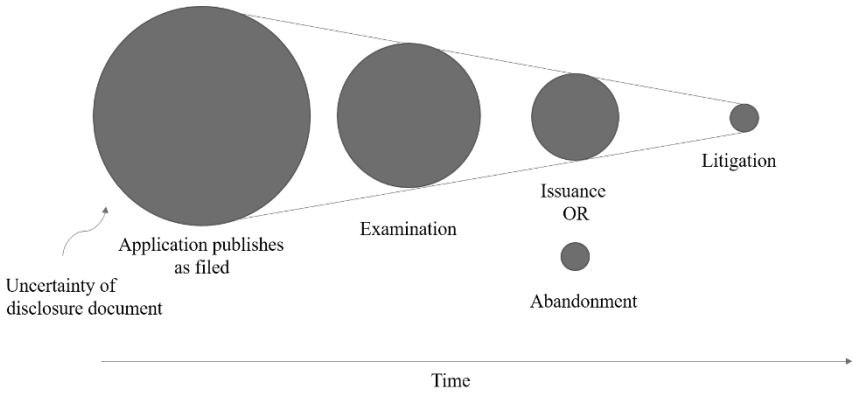

FIGURE 1

In sum, over time, more information is injected into the application's ecosystem. The legal scope of the application's claims becomes clearer. It also becomes clearer which parts of the written disclosure demonstrate possession of an invention, at least if the applicant attempts to use those portions of the disclosure to support a proposed set of claims.

But the luxury of time comes at a cost. Examiners cite applications without finding out whether more information is available about the state of that application—whether it has been abandoned, whether parts of the disclosure were deemed not to support a proposed set of claims, etc. Examiners may not have time for that kind of "deep dive" or that information may not be available in the limited amount of time they have to cite that application as prior art during examination. As far as examiners are concerned, the inchoate state of an application is frozen in time as prior art by publication.

Third parties performing freedom-to-operate searches may have more time to "wait to see" what happens to an application as it progresses through the stages shown in *Figure 1*. But the process

113. Note that this figure is a bit of an oversimplification because different litigations can sometimes result in different scope for the same claims because of differences in the parties and the evidence presented. Post-grant administrative review proceedings at the PTO can also be used to invalidate claims, shrinking the enforceability of certain claims and clarifying the sufficiency of parts of the disclosure.

of "waiting to see" is still extremely costly. Lawyers may be hired to perform this analysis and tracking. And the company may cease investing in that area of research until more certainty is gleaned.

Below I consider in more detail the consequence of publishing unexamined patent applications in (1) examiner validity determinations and (2) market participant freedom-to-operate searches.

B. Patent Applications as Prior Art in Examination Searches

1. How Examination Errors Occur

During examination, the examiner evaluates a new application's proposed claims by searching the prior art patent disclosure space[114]—including all published patents and patent applications published before the filing date of the new application—to determine whether the application being examined is novel and non-obvious.

Figure 2A shows this process in graphic form. The examiner's search results in a prior art patent disclosure sub-space can have an *N* number of inventions (whether or not claimed) from published patents or patent applications. Examiners consider all parts of a prior art application—claims, figures, and specification—and thus look at the "disclosure scope" (represented by radius *R*) of each invention as supported by the entire prior art disclosure.[115] The white space represents everything that is not covered by the prior art.

114. *See supra* note 32; *see also* John R. Allison & Mark A. Lemley, *Who's Patenting What? An Empirical Exploration of Patent Prosecution*, 53 VAND. L. REV. 2099, 2102 (2000) ("The overwhelming majority of the art cited by the patentee and the examiner consists of other patents, even in industries where many inventions are not recorded in that form."); Christopher A. Cotropia, Mark Lemley & Bhaven Sampat, *Do Applicant Patent Citations Matter?*, 42 RSCH. POL'Y 844, 846 (2013) (providing empirical evidence that examiners primarily rely on U.S. patent documents as prior art).

115. *In re* Heck, 699 F.2d 1331, 1333 (Fed. Cir. 1983) ("The use of patents as references is not limited to what the patentees describe as their own inventions or to the problems with which they are concerned. They are part of the literature of the art, relevant for all they contain." (quoting *In re* Lemelson, 397 F.2d 1006, 1009 (C.C.P.A. 1968))).

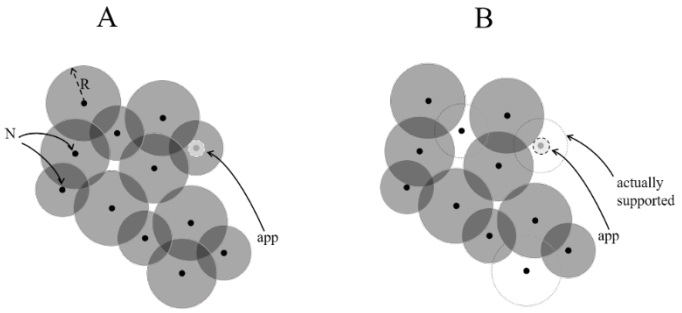

FIGURE 2

The scope of the primary claim of a new application is labeled "app" in the figure. It appears from the figure that the prior art already occupies the area that the "app" is trying to fill. For example, an "app" by inventor Frankson may claim "a medical device [with] . . . a roughened surface that inhibits the adhesion of microorganisms."[116] The examiner can reject this "app" for lacking novelty[117] based on a prior art published application from inventor Hatton—published four years before the filing date of the Frankson application. The Hatton application discusses "substrates having raised structures to inhibit adhesion of microorganisms" where "the raised structures are prepared as a coating on a . . . . medical device."[118] It thus provides some evidence that people already knew how to make the Frankson invention.

Yet, the idea subspace as seen by the examiner in *Figure 2A* may not be accurate. One major source of inaccuracy is the fact that the examiner considers published patent applications as prior art, without considering whether or not those applications have been abandoned. In fact, there is some evidence that examiners like to cite to abandoned applications more than to issued patents.[119] Abandoned applications are of most dubious quality as prior art because the PTO has never determined that the application's

116. U.S. Patent Application Publ'n No. 2017/0036106 claim 1 (published Dec. 21, 2017).

117. Non-Final Office Action, Application No. 15/623,003 (Mar. 1, 2019) (pulled from Public Pair, *see supra* note 112).

118. U.S. Patent Application Publ'n No. 2013/0059113 ¶ [0016] (published Mar. 7, 2013).

119. Although this study also includes applications that were abandoned as continuations, not just new applications that were abandoned. *See* Christopher A. Cotropia & David L. Schwartz, *The Hidden Value of Abandoned Applications to the Patent System*, 61 B.C. L. REV. 2809, 2812 (2020).

written disclosure can support any claim scope whatsoever. No legally enforceable claim has, by definition, ever issued from an abandoned application. The written disclosure of an abandoned application may not be sufficient to demonstrate that the applicant of this abandoned application possessed any invention at the time of filing. Thus, as shown in *Figure 2B*, the accurate scope of an abandoned application may be non-existent, and the examiner can inaccurately reject a new "app" because of an abandoned application that did not actually possess the invention it described.

In fact, in the example provided above, the Hatton application, which was used as prior art to invalidate the Frankson application, was an abandoned application. The Hatton prior art provided little to no detail about how one would use a roughened surface to coat an actual medical device, whether this was possible using the proposed methods, or whether it could be accomplished using safe materials.[120] Perhaps the Frankson "app" actually accomplished these feats and was rightfully claiming a medical device that could prevent bacterial adhesion. Instead, the Frankson application was rejected because of the Hatton prior art and was subsequently abandoned. Thus, if Frankson were a legitimate applicant entitled to a patent, the examiner's lack of scrutiny of (or lack of information about) the Hatton application may have prevented Frankson from being rewarded for her invention or being incentivized to make a commercial version of it. [121]

This type of examiner error—using an abandoned patent application to erroneously reject a new application—is only possible because we publish patent applications. Before 2000, the Hatton application would have never been published and could not have been used by the examiner as prior art. Only issued patents,

120. U.S. Patent Application Publ'n No. 2013/0059113 (published Mar. 7, 2013) (showing all examples only in laboratory conditions, which may not be suitable for in vivo use).

121. *See* Burk & Lemley, *supra* note 8, at 1591. By allowing inventors to recoup costs of their research or providing them an opportunity to get funding for developing the invention into a commercial product, patents financially incentivize the pursuit of new avenues of research and development. *See, e.g.*, *id.* at 1617 ("Strong patent rights are necessary to encourage drug companies to expend large sums of money on research years before the product can be released to the market."); *id.* at 1678 n.390 (discussing use of patents to acquire venture capital financing).

which have undergone some scrutiny by the PTO, would have been available in the prior art patent disclosure space.[122]

This might be an extreme case, however. Perhaps some parts of an application are sufficiently described as to show possession of an invention, and others are not. Thus, the scope of certain patent applications is simply narrower than it appears on its face. This can still result in an improper rejection of a new application, however, as shown in *Figure 3.*

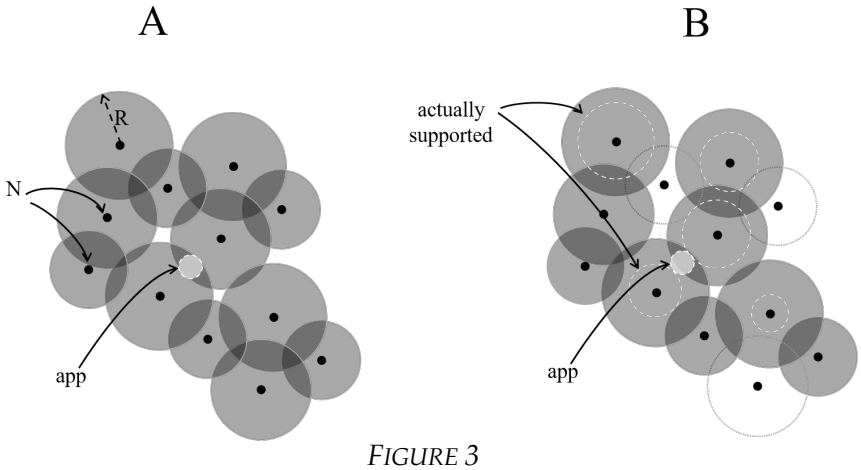

FIGURE 3

As an example, consider a published prior art application, filed by Trepagnier, that initially claimed "[a] non-invasive method of assessing a change in . . . tissue [including] exposing the tissue to radiation . . . [and] detecting fluorescence emitted" to diagnose "cancer, age, [or] diabetes."[123] The application also included a cursory description in the written disclosure to support this claim.[124] This claim did not appear in the patent that issued two years after the application was published.[125] It is likely this claim lacked sufficient disclosure to support such broad language.

122. As well as other non-patent literature, which is cited less often by examiners. *See supra* notes 32, 114 for further detail about the difference between examiner use of published applications and all other sources of prior art.

123. U.S. Patent Application Publ'n No. 2002/0016534 claims 78, 81 (published Feb. 7, 2002).

124. *Id.* at ¶ [0116].

125. U.S. Patent No. 6,721,582 (Apr. 13, 2004).

Nevertheless, an examiner cited[126] this cursory description of detecting diseases to reject a new application, filed by Stamatas, claiming "[a] method of assessing the overall health of an individual [by] . . . exposing an area of skin of each healthy individual to a first exposure radiation to induce said area of skin to emit a . . . fluorescent emission."[127] Again, a prior art document's disclosure (that of Trepagnier) that did not actually "possess" the inventive scope was used to reject an application (by Stamatas) that may have had a legitimate claim to occupy that space. And again, a researcher looking to possibly make good use of unexplored territory may have been thwarted.

This second type of error—rejecting an application based on unsupported parts of a prior art application that may later issue as a patent—is not unique to the use of published applications as prior art. Prior art based on granted patents can also contain unsupported passages. That is because the same disclosure that publishes in an application will again be published in a granted patent, even if parts of the disclosure were noted by the examiner to not provide sufficient support for a proposed claim. The Trepagnier patent discussed above still contained the cursory disclosure from the application that was used to support claims that had been dropped before issuance. Thus, a granted patent can also cause the same havoc during examination when used as prior art. Yet the existence of published applications exacerbates this underappreciated problem of over-disclosure in granted patents by adding even more disclosures of uncertain quality into the prior art,[128] and by making them available for citation by examiners even before an application issues as a patent.

2. Why the Examination Errors Occur

As discussed in section I.B, granted patents already make for bad prior art. Even issued claims can be poorly defined and overbroad in view of the specification. And the specification is not examined for quality except as it is used to support the claims. People rush to the patent office to file speculative disclosures

126. Non-Final Office Action, Application No. 10/986,941 (Aug. 27, 2009) (pulled from Public Pair, *see supra* note 112).

127. U.S. Patent Application Publ'n No. 2005/0203355 claim 21 (filed Nov. 15, 2004).

128. *See supra* note 71.

because of the potential for a high upside and the weak enforcement of scope-limiting doctrines. These filed disclosures are published in patents (along with the issued claims) without any changes and can be used by examiners as prior art.

These sources of uncertainty for granted patents create even more problems when the publication of unexamined patents is added to the mix. The switch to a first-to-file system means people will feel pressure to file less developed applications in larger numbers and abandon a greater number of them as they determine post-factum which ones are more promising.[129] And publication now allows such applications, even ones that may never grant as patents, to occupy patent prior art idea space. The problem builds on itself every year as more dubious applications flood in.[130]

The sweeping nature of examination comes into tension with the quality of notice derived from patent published applications. Patent examination searches are meant to be comprehensive in finding invalidating prior art because the exclusive power granted by patents is a high cost to the public.[131] Examiners are obligated to look broadly for prior art by interpreting the scope of the proposed claims in a newly submitted application (i.e., the one being examined) as extensively as reasonably possible based on its plain meaning—under the "broadest reasonable interpretation" ("BRI") standard—to pull in a lot of prior art references in the search.[132] The BRI standard is meant to "result in the examiner rejecting vague claims and the applicant clarifying the rejected claims in an

129. Cotropia, *supra* note 10, at 104 ("The early-filing doctrine not only adds additional original applications on the front end—where applications are filed to play it safe—but the doctrine also causes more applications to be filed during the prosecution of the original application to make up for the lack of information on the front-end."); Letter from Ron Katznelson, President of Bi-Level Technologies, to John J. Doll, Acting Director of the U.S. Pat. & Trademark Off.: Comment Letter on Notice of Roundtable on Deferred Examination for Patent Applications 3 (June 5, 2009), https://www.uspto.gov/sites/default/files/web/offices/pac/dapp/opla/comments/deferredcomments/rkatznelson.pdf (showing empirical evidence from the European Patent Office ("EPO") that applications filed under a first-to-file regime result in higher abandonment rates than applications that have had time to "mature").

130. *U.S. Patent Statistics Chart Calendar Years 1963–2020*, U.S. Pat. & Trademark Off., https://www.uspto.gov/web/offices/ac/ido/oeip/taf/us_stat.htm (last visited Feb. 4, 2022) (showing a three-fold increase of filed utility applications since 2000).

131. *See* MERGES & DUFFY, *supra* note 1, at 418 ("Broad protection . . . implies broad anticipation.").

132. MPEP, *supra* note 28, § 2111.01.I; Risch, *supra* note 105, at 183.

amendment,"[133] and to allow examiners to "invalidate [applications] using prior art that is not necessarily the same invention as that described in the [application]."[134]

In addition, examiners do not generally need to concern themselves with whether a prior art reference provides sufficient detail to demonstrate possession of a disclosed invention (i.e., that the reference is "enabled"). Although there is a requirement that prior art is enabled,[135] the standard for prior art enablement is even lower than the already low standard for new applications.[136] Moreover, prior art disclosure is *presumed* to be enabled unless the applicant can present evidence of a lack of enablement.[137] This may often be a high burden, possibly requiring experimental evidence.[138]

Examiners also do not consider any of the details surrounding the application—whether it has been abandoned or whether part of its written description has been found wanting during examination. Those details may also be unavailable at the time the examiner cites the application as prior art.[139] Other information

133. Risch, *supra* note 105, at 193.

134. *Id.* at 214.

135. "Long ago our predecessor court recognized that a non-enabled disclosure cannot be anticipatory (because it is not truly prior art) if that disclosure fails to 'enable one of skill in the art to reduce the disclosed invention to practice.'" Amgen Inc. v. Hoechst Marion Roussel, Inc., 314 F.3d 1313, 1354 (Fed. Cir. 2003) (quoting *In re* Borst, 345 F.2d 851, 855 (C.C.P.A. 1962)); *see also* MERGES & DUFFY, *supra* note 1, at 415.

136. *See e.g.*, *in re* Lukach, 442 F.2d 967, 970 (C.C.P.A. 1971) ("[T]he description of a single embodiment of broadly claimed subject matter constitutes a description of the invention for anticipation purposes, whereas the same information in a specification might not alone be enough to provide a description of that invention for purposes of adequate disclosure."); Matt Lincicum, *A Knot in the Eternal Golden Braid: Searching for Coherence in the Relationship Between Enablement, Anticipation, and Obviousness*, 23 HARV. J.L. & TECH. 589, 595 (2010) ("[P]atentability enablement requires disclosure of how to make and use the invention, whereas anticipatory enablement requires only disclosure of how to make the invention." (citing *In re* Hafner, 410 F.2d 1403, 1405 (C.C.P.A. 1969)); *id.* at 598 ("[A]ny single reference need not be enabling to qualify as prior art for § 103 [obviousness] purposes.").

137. *Amgen*, 314 F.3d at 1355 ("[W]e hold a presumption [of prior art enablement] arises that both the claimed and unclaimed disclosures in a prior art patent are enabled."); *id.* ("In patent prosecution the examiner is entitled to reject application claims as anticipated by a prior art patent without conducting an inquiry into whether or not that patent is enabled or whether or not it is the claimed material (as opposed to the unclaimed disclosures) in that patent that are at issue.").

138. Seymore, *supra* note 10, at 943–44.

139. "A patent publication is typically cited because the underlying application is still pending at the USPTO." Jeffrey Kuhn & Kenneth Younge, *Corrected Measures for Patent Citation Analysis: Accounting for Published Patent Applications* (July 28, 2019), https://ssrn.com/abstract=3428375.

may not be easy for examiners to access, such as the fact that the work disclosed by the application has later been publicly retracted or shown to be fraudulent.[140] Examiners are so strapped for time that this level of scrutiny would be too much for them in any case.[141] This is likely the reason examiners look primarily to patent applications and granted patents as prior art—the standard format and singular location reduce searching costs.[142] Accordingly, any speculation and vague rambling in a patent application, even one that is later abandoned, can become prior art, limiting later efforts by legitimate patent applicants.

The publication of all filed patent applications has also created a perverse incentive to disclose incorrect or vague information in patent applications in the first place—to add "chaff" to already long applications.[143] Because unclaimed subject matter is not reviewed for enablement, as Sean Seymore explains, "disclosing unclaimed subject matter is an excellent 'defensive disclosure' strategy to thwart subsequent patent applicants."[144] With this "spoiler tactic," "you disclose your technology without pursuing patent protection for yourself just to be sure that no one else can have a patent for it either."[145] Other scholars have also noted that patent applications may be packed with detail to obscure the optimal manner of achieving or practicing the invention[146] or are used to mislead rivals

140. Freilich, *supra* note 10, at 12–13 ("An examiner cited the Theranos patent as prior art . . . long after Theranos' inability to make their technology functional had been well-publicized.").

141. *See supra* note 102

142. Dan L. Burk, *The Role of Patent Law in Knowledge Codification*, 23 BERKELEY TECH. L.J. 1009, 1020 (2008) ("Because of statutory and regulatory requirements, as well as common practice among the community of patent attorneys and agents, the format of a patent is relatively uniform."); John R. Thomas, *Collusion and Collective Action in the Patent System: A Proposal for Patent Bounties*, 2001 U. ILL. L. REV. 305, 318 (2001) ("In comparison to much of [non-patent art], patents are readily accessible, conveniently classified and printed in a common format.").

143. Seymore, *supra* note 10, at 926.

144. *Id.* at 945.

145. *Id.* at 946 (quoting Anthony Murphy, *Intellectual Property*, *in* INNOVATION: HARNESSING CREATIVITY FOR BUSINESS GROWTH 92 (Adam Jolly ed., 2003)).

146. *See, e.g.*, Ajinomoto Co. v. Int'l Trade Comm'n, 597 F.3d 1267, 1272–77 (Fed. Cir. 2010) (inventors failed to disclose the preferred host strains of bacteria they used to practice the claimed method).

into pursuing unpromising directions of research.[147] And now, people are using artificial intelligence ("AI") to create even more chaos. A French startup company has already proposed using computer-generated word permutations ("cloems") to serve as defensive prior art "to prevent competitors from claiming rights to the whitespace surrounding the original patent."[148]

These poor disclosures may have been a problem before, as the PTO always published the entire disclosure filed by the applicant in a granted patent. But now, even applications that fail to pass through the examination process are gumming up the works of innovators attempting to get a legitimate patent allowed at the PTO. And this is different from the defensive publication approaches previously used.[149] These are not just blog posts or random journal publications. Applicants, with the cost of a filing fee, can now enter a more respected plane of prior art space (possibly without any intention of pursuing patent rights). Published patent applications are more likely to be cited by examiners as prior art than non-patent literature.[150] Publication of all applications has elevated the status of this "chaff."

C. Patent Applications in Freedom-to-Operate Searches

1. How Search Errors Occur

A company or individual interested in developing a product or service will at some point want to know whether this new research direction would legally infringe others' patent rights.[151] They would thus conduct a "freedom-to-operate" ("FTO") search to

147. Janet Freilich, *Patent Clutter*, 103 IOWA L. REV. 925, 962 (2018) ("[C]ompanies commonly patent numerous inventions or mechanisms in order to hide the 'one good one in a flood of bad inventions.'" (quoting Corinne Langinier, *Using Patents to Mislead Rivals*, 38 CAN. J. ECON. 520, 522 (2005))).

148. Dennis Crouch, *Would You Like 10,000 Cloems with That Patent?*, PATENTLY-O (Oct. 1, 2014), https://patentlyo.com/patent/2014/10/would-cloems-patent.html.

149. *See, e.g.*, Douglas Lichtman, Scott Baker & Kate Kraus, *Strategic Disclosure in the Patent System*, 53 VAND. L. REV. 2175, 2175–76, 2180 (2000) (discussing a competitor's strategic incentive to create prior art in disclosures such as "published journal articles, unpublished but publicly available doctoral dissertations, public demonstrations, and even certain offers of sale.").

150. *See supra* note 114.

151. Dan Ciuriak, *Generalized Freedom to Operate* (N.Y.U L. Inst. Int'l L. & Just. MegaReg Forum Paper No. 2016/3, 2016), https://www.iilj.org/publications/generalized-freedom-operate/.

determine whether there are patents, issued or in the pipeline, which would block their new activity. Because patent applications are published and have the potential to become issued patents, they are often considered as part of any meaningful freedom-to-operate search.[152] The difficulty in predicting the final claims that may originate from a published patent application injects significant uncertainty into FTO searching and any subsequent decisions to invest in a research area.

152. FED. TRADE COMM'N, THE EVOLVING IP MARKETPLACE: THE OPERATION OF IP MARKETS 104, 200–03, 234–36 (Mar. 18, 2009) [hereinafter FTC MARCH 18 TRANSCRIPT] (transcript available at https://www.ftc.gov/news-events/events-calendar/2009/03/evolving-ip-marketplace) (patent counsel at leading firms discuss importance of applications in FTO searching as well as acquisition of new companies); Jamie Sheridan, *New Product Clearance: Freedom to Operate Search and Analysis*, 23 INTELL. PROP. & TECH. L.J. 14, 15 (2011) (recommending an FTO search include "third-party U[.]S[.] patents and patent applications"); Tamsen Valoir, *IP Due Diligence: Top Ten Tasks*, 9 M & A LAW. 18 (2005) (same); *IP and Business: Launching a New Product: Freedom to Operate*, WIPO MAGAZINE (Sept. 2005), https://www.wipo.int/wipo_magazine/en/2005/05/article_0006.html.

I do not address the scenario in which industries are completely overwhelmed with the amount of information in the pending patent idea space and do not consider patents or applications when deciding to pursue a technology. *See, e.g.*, FED. TRADE COMM'N, THE EVOLVING IP MARKETPLACE: THE OPERATION OF IP MARKETS 18 (May 5, 2009) [hereinafter FTC MAY 5 TRANSCRIPT] (transcript available at https://www.ftc.gov/news-events/events-calendar/2009/05/evolving-ip-marketplace) (Daralyn Durie, Partner at Durie, Tangri, Page, Lemley, Roberts & Kent: "In my experience on the IT side, it is virtually impossible to conduct a meaningful patent clearance, if you're talking about a product [that] has a number of different components and that is complex."); Mark A. Lemley, *Ignoring Patents*, 2008 MICH. ST. L. REV. 19, 21 (2008) ("[B]oth researchers and companies in component industries simply ignore patents. Virtually everyone does it."); Menell & Meurer, *supra* note 11, at 33 ("The imprecision of patent claim scope in the software and business method fields is so bad that many developers ignore patents at the front-end and deal with [it in] licensing and litigation."); *id.* at 48 ("The notice problem is so severe that competitors in many high tech fields do not even bother trying to learn about potential encumbrances."). The lack of searching is bad for innovation because those companies may be reinventing the wheel (instead of licensing it) or may be setting themselves up for needless litigation. Published applications produce no unique harm here, however, since the entire space is being ignored—patents and applications alike.

Figure 4A shows a pending patent idea sub-space, which may result from an FTO search of all enforceable patents and pending patent applications relevant to the product or service the innovator is interested in developing. The search returns "N" inventions from patents and applications, with a *claim* scope "R." The claims of the application are the best predictor of future issued claims and are thus the logical initial focus of an FTO search.[153] The white space represents everything that is available for the public to make and use freely (whether because it is already in the public domain or has yet to be invented).

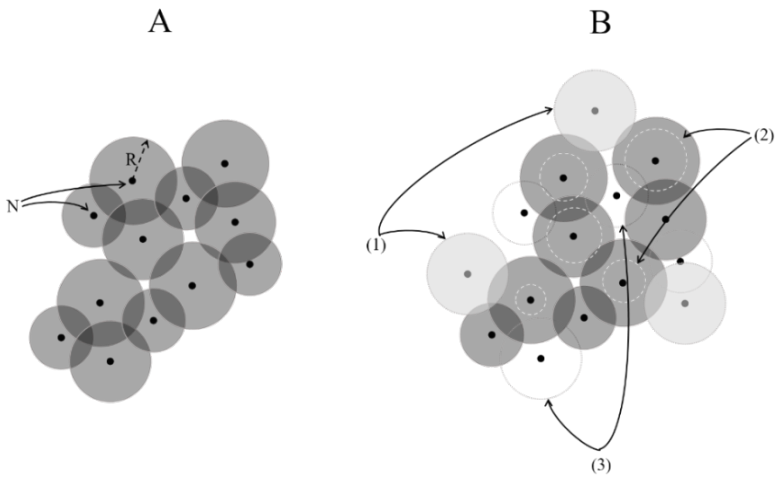

FIGURE 4

Because this search includes new published patent applications,[154] it may be a highly inaccurate prediction of what will actually become a legally enforceable right, as shown in *Figure 4B*. Because of the ability of applicants to file continuation applications or add new claims during examination, even when an FTO search

153. *See, e.g.*, *Freedom to Operate: Everything You Need to Know*, UPCOUNSEL, https://www.upcounsel.com/freedom-to-operate (last visited Feb. 5, 2022) ("The purpose of searching for freedom to operate is to find any published patent applications or approved patents that include *claims* covering the product, process, or technology you plan to target." (emphasis added)); Linda J. Thayer, *When Is a "Freedom to Operate" Opinion Cost-Effective?*, FINNEGAN: TODAY'S GENERAL COUNSEL (Feb./Mar. 2013), https://www.finnegan.com /en/insights/articles/when-is-a-freedom-to-operate-opinion-cost-effective.html ("[A] clearance search is performed for unexpired patents and published applications that may *claim* the various components [of a new product]." (emphasis added)).

154. *Supra* note 109.

accurately locates a relevant application, claims on entirely new inventions, as shown by (1) in *Figure 4B*, may later emerge from that application that were difficult to predict at the time of the search.[155] Alternatively, given the difficulty of searching through the large number of published applications, it is possible that some of these "new" inventions (1), are ones that existed at the time of the FTO search but the search did not accurately identify them as being relevant.[156]

Claims may also be narrowed, as shown by (2) in *Figure 4B*, during prosecution, or may only be enforceable with narrower scope. And the applicant may even abandon some of the claims, leaving that area available for use, as shown by (3). In sum, the available whitespace as it appeared during the FTO search (*Figure 4A*) may not accurately reflect the legal rights that will eventually be protectable (*Figure 4B*).

For example, an initial claim in an application may be to "[a]n article comprising a superoleophobic surface."[157] Superoleophobic surfaces repel oil and allow it to easily roll off the surface.[158] *Figure 5A* shows the scope of this initial "application claim" in graphic form. By reading only the claim, you may suppose that the inventors possess the entire idea space of these types of surfaces, excluding all others from practicing this invention without a license. Yet the examiner in this example found a prior art application that also disclosed superoleophobic surfaces and rejected the initial application's claim.[159] In the end, what issued from this application was a much narrower claim, based on the specific surface structure disclosed in the specification. The granted invention only allowed the inventors to possess, and exclude others from making, using, or selling, a superoleophobic surface with a

155. FTC MAY 5 TRANSCRIPT, *supra* note 152, at 114 (Michelle Lee, Patent Counsel at Google: "[W]e are routinely surprised with what we read in the written description and what the patent owner claims the coverage is.").

156. FTC REPORT, *supra* note 8, at 91 ("Panelists explained that 'it is impossible to achieve any degree of certainty by clearance searches with today's [search] systems.' Vague or stretched claims might 'never [be] found doing any type of searching.'" (second alteration in original)).

157. U.S. Patent Application Publ'n No. 2010/0316842 claim 1 (published Dec. 16, 2010).

158. Boxun Leng, Zhengzhong Shao, Gijsbertus de With & Weihua Ming, *Superoleophobic Cotton Textiles*, 25 LANGMUIR 2456, 2456 (2009) ("Only those surfaces with . . . low roll-off angles for oil droplets can be regarded as truly superoleophobic surfaces.").

159. Final Office Action, App No. 12/599,465 (Feb. 14, 2017) (pulled from Public Pair, *see supra* note 112).

"fluorinated" surface chemistry and a specific structure of "portru[sions]" "includ[ing] flat caps."[160] *Figure 5B* shows the scope of this "granted" (and narrower) claim in graphic form.

A potential inventor may be dissuaded or significantly delayed, based on the high levels of uncertainty stemming from an initial application claim, from spending resources on something he believes will shortly be blocked by a patent.[161] In the example above, perhaps there may be delays in the development of other types of superoleophobic surfaces, labeled as "new product" in *Figure 5A–B*. Or the inventor may instead divert funding from research to pay attorneys to analyze or track competitors' patent applications,[162] to the extent such searching is feasible in view of the volume of patenting activity and ability to predictably determine claim scope in that field.[163] An attorney may be hired after an initial FTO search to review the entirety of certain applications to determine the scope of the claims that may originate from them. In our example above, an attorney may advise that the application claiming all superoleophobic surfaces only provided one example of a superoleophobic surface, which is likely all the applicant will be able to claim in a granted patent.

160. U.S. Patent No. 10,202,711 (issued Feb. 12, 2019) (claim 1).

161. FTC MARCH 18 TRANSCRIPT, *supra* note 152, at 200 (Carl Horton, Chief IP Counsel of General Electric, discussing the strategy of "watch[ing]" an application before deciding whether to proceed with the product design or to license the invention).

162. *Id.* at 201–02 (counsel of various firms discussing the resources required to track applications as they proceed through the PTO).

163. *See* Reilly, *supra* note 13, at 1121.

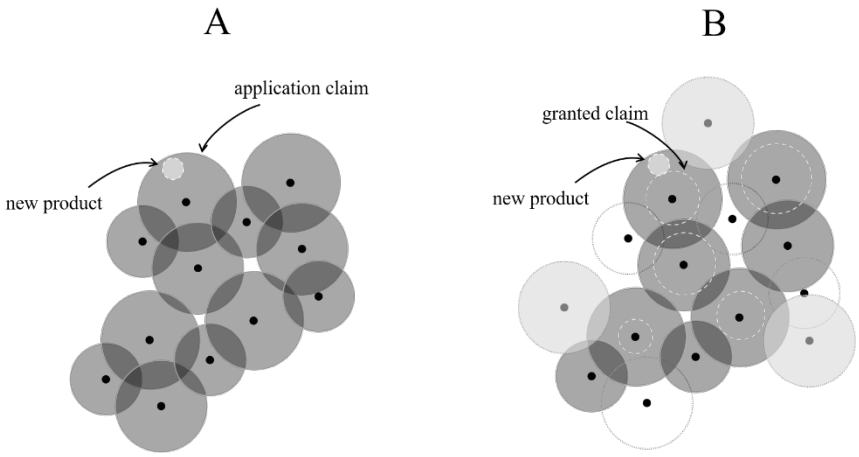

FIGURE 5

Sometimes, the application's final claim scope is even less predictable than in the provided example, and attorneys have to wait until more information is available before they can predict the outcome of an application.[164] As examination proceeds, more information about the prior art and the reasonable claim scope that can be supported by the specification emerges.[165] But the delays to gain this information can be considerable. On average, nineteen percent of applications, are still pending nine months after publication without *any* substantive examiner input.[166] And the examiner's input can only be located in a highly inaccessible format—a slow government website with non-searchable PDFs of the examination history.[167] More than twenty-two months pass on average until the PTO officially publishes a final, indexed, searchable version of any patent that issues from that application filing.[168]

164. *See supra* note 161.

165. *See supra* Section II.A.

166. *PTO Dashboard*, *supra* note 29 (showing first action pendency to be an average of 15.4 months); John F. Martin, *The Myth of the 18-Month Delay in Publishing Patent Applications*, IP WATCHDOG (Aug. 3, 2015), https://www.ipwatchdog.com/2015/08/03/the-myth-of-the-18-month-delay-in-publishing-patent-applications/id=60185/ (nineteen percent of applications publish at six months after filing).

167. *See supra* note 112.

168. *PTO Dashboard*, *supra* note 29 (showing total pendency to be an average of 22.9 months).

This may be an eternity for competitors to operate with so little information about an application.[169]

2. Why Search Errors Occur

For market participants that perform FTO searches, pending applications are seen as "maintaining a 'cloud' over a field of activity and continuing uncertainty about the scope of potential claim coverage."[170] Part of the uncertainty existed before the PTO published applications. Claim boundaries of granted patents were always unclear, and courts unpredictably applied legal doctrines governing the sufficiency of disclosure in supporting claim scope.[171] But now that all applications are published, participants are forced to grapple with higher levels of uncertainty as they sift through overbroad claims and sweeping, overlong disclosures of published applications, many of which will be abandoned or significantly limited in legal scope.

As explained in section II.A, the initial claims in an application are overbroad because (1) the goal of patent applicants is to get the broadest claim one can get away with,[172] (2) applicants are often not aware of the relevant prior art,[173] and (3) because there is little downside to overbroad claiming because of the infinite opportunities to amend claims. Filed claims are thus likely to be of indefinite scope and to be purely functional. Because the applicant can simply amend a claim to render it less vague or to add structure, there is every incentive to file a vague and functional

169. Especially in industries with short product cycles, such as high tech. *See* FTC REPORT, *supra* note 8, at 91.

170. Letter from Jimmy Jackson, Vice President of Pub. Pol'y & Commc'ns of Biocom, to the Off. of the Deputy Comm'r for Pat. Examination Pol'y, at 3 (May 29, 2009) (available at https://www.uspto.gov/sites/default/files/web/offices/pac/dapp/opla/comments/deferredcomments/biocom.pdf); *see also* Letter from Tom DiLenge, Gen. Couns., Biotechnology Indus. Org., to the Hon. John J. Doll, Acting Dir. of the U.S. Pat. & Trademark Off., at 6 (May 29, 2009) (available at https://www.uspto.gov/sites/default/files/web/offices/pac/dapp/opla/comments/deferredcomments/bio.pdf) (discussing that pending patent applications can create "uncertainty about freedom-to-operate for manufacturing or development businesses.").

171. *See* Rantanen, *supra* note 11, at 924–25.

172. R. Polk Wagner, *Reconsidering Estoppel: Patent Administration and the Failure of* Festo, 151 U. PA. L. REV. 159, 215 (2002) ("[T]he patentee has both the motive and the opportunity to behave strategically" in the hopes that "the PTO will 'miss something' and allow the unwarranted scope.").

173. Again, this may be a strategic decision. *See* Wagner, *supra* note 172, at 215 n.193.

claim—which are often broader than the scope of the application in fact allows—and see whether the examiner even bothers rejecting it. For example, the claim of a superoleophobic surface discussed earlier is purely functional because it describes the desired properties of a material. Examination forced the applicant to add structural details to reduce the scope of this overbroad claim. The rush to the patent office because of our switch to a first-to-file system also makes overbroad claiming even more likely as the initial invention is even less developed, and the applicant is even less informed about the prior art.

Even if a third party decides to invest effort into looking at the written disclosure of an application, and not just the claims (i.e., the entire "application scope"), it is still difficult to predict which claims will originate from it. The way Rambus was able to attack a competitor, by amending its pending claims to match a new technology standard, is just one example of this unpredictability.[174] Clearly, it is not as trivial, as some scholars argue, to "derive the broadest claim scope supportable by any application[]" "by reading a patent application's original disclosure[.]"[175]

One reason is the difficulty in predicting how much disclosure will be deemed sufficient during examination to support various claims. That is because the requirement that the specification support the claims is not a literal one.[176] It is a standard, not a rule. Claims encompass a broader idea,[177] while the specification only provides examples that show the applicant really knew or "possessed" the invention at the time of filing[178] and could teach

174. *See supra* notes 65–69 and accompanying text.

175. F. Scott Kieff, *Case for Preferring Patent-Validity Litigation over Second-Window Review and Gold-Plated Patents: When One Size Doesn't Fit All, How Could Two Do the Trick*, 157 U. PA. L. REV. 1937, 1960 (2009).

176. Ariad Pharm., Inc. v. Eli Lilly & Co., 598 F.3d 1336, 1352 (Fed. Cir. 2010) (explaining that there is no requirement that "the specification recite the claimed invention in *haec verba[.]*").

177. *Compare* Chiang, *supra* note 49, at 1102 ("The specification describes the invention created by the patentee so that others can make and use it."), *with id.* at 1103 ("In contrast, a claim describes only the key inventive features of the invention—those that form the essence of the patentee's idea.").

178. *Ariad Pharm.*, 589 F.3d at 1351 ("[T]he specification must describe an invention understandable to that skilled artisan and show that the inventor actually invented the invention claimed.").

others how to use and make it.[179] Accordingly, claims of various levels of abstraction and of different combinations of disclosed elements can arise from the same specification.[180]

Applicants can also provide mere speculation to support their claims. Such speculation means that a market participant performing an FTO search may erroneously conclude that a certain intellectual subspace is occupied—due to speculative guessing in the patent application—and choose not to pursue that area of inquiry. The public is thus deprived of any actual, experimental information that may be gained from such pursuit, and is left only with the speculation in the original application.[181]

Predicting which claims will originate from an application is also difficult because written disclosures are written to be long and sweeping, often encompassing many inventions, to provide support for any future amendments.[182] The applicant may amend, remove, or add claims an infinite number of times during examination. This makes the patent application an ever-shifting legal document, with claims of varying scope appearing and disappearing, leaving market participants uncertain of their findings despite a thorough FTO search.

On top of the analytic difficulty of anticipating the scope of any claims that may be supported by a specification, market participants can never be sure of how an examiner will view that application. Examiners have limited resources when determining proper claim scope and enforcing the sufficiency of the disclosure.[183] Many applications can simply slip through the cracks. This examination weakness also creates a feedback loop in incentivizing poor quality filings. Since few patents are ever

179. 35 U.S.C. § 112(a) ("The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains . . . to make and use the same . . . .").

180. Chiang, *supra* note 49, at 1105 ("[T]he specification embodiment embodies the claimed idea, but the claimed idea may be reflected in countless other embodiments; conversely, the specification embodiment also embodies countless other ideas in addition to what is claimed.").

181. *See* Lemley, *supra* note 79, at 1182.

182. Or continuation applications. But continuations may be less problematic than new applications because there is information available about earlier versions of the application: the examination history, which claims already issued from the application, etc.

183. *See supra* notes 139–141 and accompanying text.

litigated,[184] and many industries do not acquire patent rights with the intent to enforce them,[185] applicants may be encouraged by this low level of scrutiny from examiners to draft vague and speculative applications. Slapdash examination thus results in low-quality disclosures and high uncertainty for third parties attempting to make predictions.

These effects are exacerbated by the growing number of patent applications filed at the PTO every year, given that the PTO will publish almost all of them.[186] Moreover, because of our switch to the first-to-file regime, it is likely that many of these applications are of lower quality and less likely to issue as valid patents.[187] With every new published application, the cost and difficulty of performing an FTO search increase.[188]

III. STEPS TOWARDS REFORM

As discussed above, the decision to publish unexamined patent applications has created a perfect storm with the transition to a first-to-file system and the ever-increasing number of filed applications. We allow published applications, even ones that are never granted, to create a temporary cloud of uncertainty in the pending patent idea space or to permanently occupy the prior art idea space. Both effects chill innovation and deter the development and funding of new research areas. Consequently, there is an unrecognized tradeoff in the decision to publish all applications—a tradeoff between the timeliness and transparency of notice provided by patent applications (i.e., benefits) versus the quality of such notice (i.e., costs).

A. Qualifying the Public Benefits of Early Disclosure

Generally, publishing patent disclosures is important for the patent system. As Jason Rantanen puts it, "[i]nformation is the

184. Mark A. Lemley, *Rational Ignorance at the Patent Office*, 95 NW. U. L. REV. 1495, 1501 (2001) ("[I]t is reasonable to estimate that at most only about two percent of all patents are ever litigated, and less than two-tenths of one percent of all issued patents actually go to court.").

185. *See infra* note 222.

186. *See supra* note 1.

187. *See supra* note 129 and accompanying text.

188. Bock, *supra* note 90, at 289; BESSEN & MEURER, *supra* note 11, at 10 ("Clearance costs are affected by the number of prospective rights that must be checked for possible infringement.").

lifeblood of innovation."[189] Some scholars argue that our patent system requires disclosure as a quid pro quo for the exclusivity granted to the patentee (disclosure theory).[190] They also point out that publishing patent disclosures is important for the diffusion of scientific knowledge,[191] and that it allows others to avoid wasting effort on what has already been done,[192] instead building on what has been published.[193] Others argue that patents promote other "peripheral disclosures," which also benefit society.[194] For example, it allows firms that have obtained a patent to market their goods by touting the details of how their product or process works, and even distributing free samples, without fear of being copied.[195] Litigants are also able to more openly discuss details of an invention during patent infringement suits in court.[196]

More fundamentally (and perhaps less controversially[197]), however, the disclosure is necessary because it is the only way to

189. Jason Rantanen, *Peripheral Disclosure*, 74 U. PITT. L. REV. 1, 4 (2012).

190. Pfaff v. Wells Elecs., Inc., 525 U.S. 55, 63 (1998) ("[T]he patent system represents a carefully crafted bargain that encourages both the creation and the public disclosure of new and useful advances in technology, in return for an exclusive monopoly for a limited period of time."); Rantanen, *supra* note 189, at 5 ("That information is part of the quid-pro-quo exchange with inventors: in return for the exclusive right to practice their invention, inventors must describe that invention in the patent and explain how it is made and used.").

191. Daniel K. N. Johnson & David Popp, *Forced Out of the Closet: The Impact of the American Inventors Protection Act on the Timing of Patent Disclosure*, 34 RAND J. ECON., 96, 96 (2003); Seymore, *supra* note 10, at 974 (warning that "[m]ost information disclosed in patents is never published elsewhere" and that "[i]f an inventor withholds knowledge, it will likely be lost."); *see also* Fromer, *supra* note 8, at 554 ("Much of the information contained in—or that ought to be in—patents is not published elsewhere.").

192. Cotropia, *supra* note 10, at 85 ("The earlier patent law ends the race between multiple researchers seeking to invent the same technology, the fewer resources are then devoted to a duplicative effort.").

193. *See* Burk & Lemley, *supra* note 8, at 1607–10 (discussing theory of cumulative innovation).

194. Rantanen, *supra* note 189, at 7 ("[P]eripheral disclosure . . . refer[s] to the disclosure of information that would not occur in the absence of a patent system.").

195. *See id.* at 27–28, 34–37.

196. *Id.* at 32–33.

197. There is still much debate about the validity of the quid pro quo model of disclosure. Devlin, *supra* note 9, at 410 ("But is disclosure actually society's primary benefit from the patent bargain?"); Holbrook, *supra* note 1, at 132 ("[The teaching function of] disclosure is, in fact, in considerable tension with [other] justifications for the patent system."). There is also no consensus about the value of patent documents as sources of technological information. *See, e.g.*, Fromer, *supra* note 8, at 560 ("Notwithstanding the primacy of the patent document as a publicly available repository of information about a patented invention, a good deal of evidence suggests that technologists do not find that it

delimit the intangible idea of the invention—it "communicates to the world exactly what the innovator has created" and demarcates his possession of it.[198] It thus serves an important notice function, allowing others to design around,[199] license,[200] or invest[201] in a patented invention.

Scholarship in the field, while recognizing that the quality of patent documents creates notice failures,[202] seem to exalt the various social benefits of universal publication of patent applications. The touted benefits include promoting knowledge diffusion for cumulative innovation,[203] timeliness of notice to competitors[204] and examiners,[205] and reduction of duplicative research efforts.[206] Scholars argue that even applications that are

contains pertinent information for their research."); *id.* at 554–55 n.73 (acknowledging that patents may not be the sole source of disclosure of technical information—"some recent economic work demonstrates that inventors sometimes publish a scientific article and secure a patent on the same invention"); Devlin, *supra* note 9, at 403 ("[T]he extent to which patent documents successfully teach the inner workings of cutting-edge technologies is quite limited."); Lisa Larrimore Ouellette, *Who Reads Patents?*, 35 NATURE BIOTECHNOLOGY 421, 422–23 (2017) (Supplementary Figure 3) (only forty percent of scientific researchers from different technical fields found most recent patents read to be "very" or "moderately" useful for "[i]nstructions on how to make the patented invention").

198. Holbrook, *supra* note 1, at 146.

199. Fromer, *supra* note 8, at 539.

200. Rantanen, *supra* note 189, at 33–34 (patent disclosures expedite licensing negotiations).

201. *See* Burk & Lemley, *supra* note 8, at 1678 n.390 (discussing use of patents to acquire venture capital financing).

202. *See, e.g.*, Fromer, *supra* note 8, at 543 (recognizing "disclosure's current inadequacy in the patent system."); Risch, *supra* note 105, at 180 ("Despite complex interpretive rules, patent law has failed to accomplish one of its essential missions: allowing interested parties to understand a patent's scope in a consistent and predictable manner."); BESSEN & MEURER, *supra* note 11, at 10; Christina Mulligan & Timothy B. Lee, *Scaling the Patent System,* 68 N.Y.U. ANN. SURV. AM. L. 289, 309 (2012); *cf.* Seymore, *supra* note 10, at 974 ("[T]he nature and quality of the information under consideration is important.").

203. MERGES & DUFFY, *supra* note 1, at 73 (knowledge diffusion); Fromer, *supra* note 8, at 554 (knowledge diffusion); *see also* Johnson & Johnston Assocs. Inc. v. R.E. Serv. Co., 285 F.3d 1046, 1071 (Fed. Cir. 2002) (Newman, J., dissenting) (recognizing the "[i]nformation dissemination" function of patent disclosures, arguing that these documents should be protected from any "legal obstacles to the disclosure of scientific and technologic information.").

204. Lemley & Moore, *supra* note 4, at 90–92 (reducing abusive continuation tactics).

205. Kuhn & Younge, *supra* note 139, at 2 (examiner citations to published applications "may be more likely to target recent prior art because pending patent applications are generally more recent than granted patents."). *But see* Wagner, *supra* note 172, at 165 n.16 (discussing how "overclaiming" in patent applications increases search costs for the PTO).

206. Lück, *supra* note 1, at 2678 (showing a reduction in examiner's prior art rejections after the U.S. began publishing applications as an indication "that at least some inventors

ultimately abandoned by the applicant, can still be used as publicly available, easily searchable prior art during examination to "generate an administrative disclosure that prevents the issuance of broader patent rights to other applicants."[207] In view of these benefits, some have contended that applications should be published immediately upon filing,[208] and that all exceptions to publishing, such as requests for non-publication, should be eliminated entirely.[209]

Thus, there is no general recognition that there are both public benefits *and* costs to publishing unexamined patent applications.[210] Or that the uncertainty of the scope of published applications—as prior art or as a pending legal right—may deprive proper claimants of patent rights or hinder efforts of third parties to determine what constitutes "private property" in the idea space. Any proposal for reforming notice failures caused by these patent documents must consider both.

For administrative expediency, and because substantive examination takes time, we have chosen to publish applications without any examination in order to provide timely notice and transparency. But both timing and application scope uncertainty are continuous variables. Since unexamined applications are often of poorer notice quality than applications that have undergone some examination, perhaps their immediate publication is not as valuable as one would assume. There may be a way to change our examination system to achieve a better compromise of both timing and quality of notice. At the extreme end, if an application does not disclose anything patentable, it provides no useful notice information, and perhaps should never be published (at least not as a PTO-sanctioned document).

B. Reframing the Costs of Publishing Unexamined Applications

Another way of looking at the public cost of publishing all applications is to realize that many of the benefits of the generated

and/or their lawyers will read or become aware of and use the disclosed applications to avoid competition and overlap with already claimed technologies").

207. *See* Cotropia & Schwartz, *supra* note 119, at 2842.

208. Chien, *supra* note 9, at 848; Ouellette, *supra* note 9, at 597.

209. Lemley & Moore, *supra* note 4, at 108–09.

210. *See* Freilich, *supra* note 43, at 154 n.14 ("[P]redictive errors in patent law will often fall on the public.").

notice failures flow to the individual applicant. Having a published patent application is a privilege. Applicants can reap tangible benefits from the uncertainty that their applications can create.

First, the publication of an application has legal significance. It is notice to the outside world that the applicant has secured a filing date with the PTO, and that the application is in the administrative pipeline for a patent. Moreover, if the application's claims issue as "substantially identical" patent claims, then the patentee could get damages for infringement of the claims as of the time of *publication*, if the infringer had actual notice of them.[211] All of these factors elevate the status of published applications above all non-patent publications in the eyes of potential competitors.

Second, the zone of uncertainty created around the scope of a patent application can benefit the applicant even without actual notice to competitors. Everyone who performs an FTO search will remain in the dark about the eventual scope of what the applicant intends to claim. Thus, the applicant can dominate a large swath of "idea" space for an extended amount of time without incurring significant costs. The zone of uncertainty can increase even further if one files multiple applications in the same area or describes many inventions in a single application.

Third, no matter what ultimately happens to the application during examination, the publication of the entire disclosure means that the applicant gets to defensively use the zone of uncertainty created by the application indefinitely. All the speculative and overbroad statements in the initial published application may knock out any later-filed applications by their competitors as prior art. A similar result could not be achieved from simply posting random ramblings in a blog post, for instance. It is the examiners' heavy use of PTO applications in prior art searching that provides this defensive advantage.

Fourth, published patent applications can be used to acquire funding and attract potential investors. They can serve as a signal to investors "that the company is well managed, is at a certain stage

211. 35 U.S.C. § 154(d) (requiring "actual notice" to the infringer and "substantially identical" claims).

in development, and has defined and carved out a market niche."[212] Published applications can also increase opportunities for licensing.[213]

In sum, publishing patent applications comes with substantial, tangible benefits to individual applicants. In a way, applicants benefit from polluting the published patent idea space with uncertainty. These benefits come at a cost to the public at large. Proposals for reform can thus equitably consider shifting some of these costs to applicants.

C. Reform Proposals

Publishing unexamined patent applications can come at increased social costs to public notice and reaps tangible benefits to patent applicants. This new recognition of the cost of publishing applications brings up two considerations for reform: (1) that the entire disclosure, not just the claims, creates uncertainty around published applications, and (2) that the point of publication is critical—it is the point at which third parties (including examiners) can first rely on the information. Thus, possible reforms should focus on (1) forcing applicants to internalize some of the "notice pollution" costs created by their *entire* disclosure, and (2) providing the PTO with tools to improve the quality of applications *before publication*.

1. Cost-Shifting

One way to potentially increase the quality of the information in patent applications, and to reduce the number of lower quality filings, is to shift some of the public notice costs to the applicant (i.e., force internalization of the costs). The ability to constructively reduce an invention to practice, the ability to amend claims ad infinitum, the lack of any requirement to perform a prior art search, and the weak enforcement of disclosure sufficiency requirements governing claim scope all significantly lower the costs of filing (and thus publishing) a patent application "just to see how it goes."

212. Lemley, *supra* note 184, at 1505–06.

213. Cotropia & Schwartz, *supra* note 119, at 2835–36. In some fields, applications are used more often than patents to get a license. *See, e.g.*, FTC MARCH 18 TRANSCRIPT, *supra* note 152, at 35 (Jon Soderstrom, Ph.D., Managing Director, Office of Cooperative Research, Yale University: "In the area of life sciences in particular, we find that most everything that we license is in the form of a patent application . . . .").

Having the PTO review long-shot applications is generally a waste of public resources, even before one considers all the other harms these kinds of published applications can cause to innovation.

The general theory of raising filing costs (or adding a publication cost) is that applicants will only choose to go forward with applications they think are worthwhile, elevating the quality of filed applications.[214] This may mitigate at least the most egregious cases, in which an applicant is likely to abandon an application because the quality is so low. That mitigation may help avoid the costliest type of "pollution" to the patent idea space—an application that creates blocking prior art and chilling effects without having any value to the applicant or to knowledge diffusion.

A general elevation of filing fees, or simply adding another fee to have examination continue, may be too blunt of an instrument in many cases, however. It would disadvantage smaller businesses, while allowing larger ones to continue filing speculative applications with overbroad claims. Even if costs are made progressive in terms of the size of the filer,[215] this reform is overinclusive. It would be difficult to use it precisely enough to incentivize higher quality filings. It would indiscriminately reduce all filings, potentially harming legitimate research investments, particularly in technology sectors such as the life sciences that do not tend to produce the most pollutant.[216]

The cost-shifting solution, however, can be tuned to better solve the problem of the uncertain scope created by published applications. The PTO already charges higher fees for larger claim sets, which should decrease the potential scope of applications. The PTO could also set a word limit on applications, with increased costs for extra length. This would be more finely tuned to the problems caused by lengthy applications disclosing too many, perhaps speculative, embodiments and the uncertain way they are

214. Merges, *supra* note 22, at 598 ("[W]here the probability of receiving a patent is low, the value of the invention low, and the cost of applying for the patent high, prospective applicants will choose not to file.").

215. *See* 35 U.S.C. § 41(h)(1) ("[filing, examination, and maintenance] fees charged . . . [are] reduced by 50 percent with respect to their application to any small business concern . . . .").

216. *See, e.g.*, FTC REPORT, *supra* note 8, at 89 ("On the other hand, panelists from the life sciences indicated that they are 'very capable of reading a specification [in an application] and being able to tell what kind of claims might come out.'" (quoting panelist Shafmaster at 235, from Mar. 18, 2009 transcript).

used to support amendments or as prior art. This may nevertheless still be a rather blunt instrument for the problem.

Another solution is to make it more expensive to publish applications that are the most costly in terms of notice. Thus, patent applications that create fewer notice problems, such as those with easily searchable structures, those using standardized terminology,[217] or those with the least number of hypothetical (prophetic) examples (or a low working-to-prophetic-example ratio) would be less costly to publish. Examples that use poor experimental design—"small sample sizes, no statistical analysis, and failure to blind the investigators or randomize the subjects"[218]—can also be considered more costly, because they indicate that the invention may not actually work and is therefore not entitled to occupy patent idea space.

Focusing on prophetic examples and the replicability criteria listed above would reduce some speculative or broadly worded applications. Given some of the difficulties that examiners have in deciding whether applications meet the disclosure sufficiency requirements at the time of examination, this may be a quick and dirty way to reduce their numbers.[219]

The proposal to increase fees for applications lacking structural details and for those lacking standardized terminology could be more problematic, however. It may disadvantage software patents over chemical and biotech ones.[220] There is literature showing that patent law is potentially functioning as it should in the chemical arts and life sciences,[221] while failing in other tech sectors.[222] But this

217. *See* Mulligan & Lee, *supra* note 202, at 289, 297.

218. Freilich, *supra* note 10, at 21, 21 n.124.

219. A few scholars have recognized that patent applications make for poor prior art but have proposed procedural reforms that would require unrealistically high levels of scrutiny from examiners. *See, e.g.*, Wagner, *supra* note 172, at 159, 210 (proposing information-forcing mechanism during examination); Freilich, *supra* note 10, at 32–36 (same); Seymore, *supra* note 10, at 966–69 (proposing that examiners have initial burden of proof in showing enablement of prior art).

220. *See* Mulligan & Lee, *supra* note 202, at 298.

221. *See supra* note 216.

222. *See* BESSEN & MEURER, *supra* note 11, at 15–16. For example, in industries such as semiconductors and manufacturing, patents may not necessarily be acquired to be enforced, but may be meant to be used defensively or as market signaling devices, reducing the need for high-quality applications. *See* R. Polk Wagner, *Understanding Patent-Quality Mechanisms*, 157 U. PA. L. REV. 2135, 2157 (2009) ("As more patentees adopt these nontraditional

may still be a difficult reform to enact, given lobbying forces and the fact that it may run counter to the TRIPS agreement, which does not allow discrimination based on "field of technology."[223] Moreover, a push for language standardization could be seen as punishing a patentee for acting as his own lexicographer, which may be necessary for pioneering inventions and is a well-established right in our patent system.[224]

The proposal to increase costs for publishing non-standard terms is not completely outlandish, however. The PTO ran a Patent Glossary Patent Pilot program from 2014 to 2016 for software-related applications,[225] demonstrating its willingness to single out particular technology sectors for reform. The specific idea adopted—use of a glossary of terms in the application—would ameliorate some but not all of the notice issues with published patent applications. By increasing costs for filing applications with non-standardized terminology in the first place, it generally aligns with the proposal above. And the glossary would help examiners interpret terms in patent applications when those applications are

approaches, we can expect patent quality to drop."); Wesley M. Cohen, Richard R. Nelson & John P. Walsh, *Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (or Not)* 17 (Nat'l Bureau of Econ. Rsch., Working Paper No. 7552, 2000), http://www.nber.org/papers/w7552 (finding that eighty-two percent of respondents to a survey listed "blocking rival patents on related innovations" as a motive for patenting); *cf.* Janet Freilich, *Patent Shopping*, 10 U.C. IRVINE L. REV. 619, 643–44 (2020) ("Defensive aggregators acquire large numbers of patents in order to guarantee that their clients will not be sued for infringement of those patents."). And software and business method patents, though frequently litigated, are considered to be of low disclosure quality because they inherently lack the structure of mechanical or chemical patents and are frequently invalidated in court. *See* Collins, *supra* note 98, at 1607 ("Software inventions are, at least as a practical matter and for the purpose of patent law, a purely functional technology."); Merges, *supra* note 22, at 581 ("[B]usiness methods are not tied to particular machinery or devices . . . ."); John R. Allison, Mark A. Lemley & Joshua Walker, *Patent Quality and Settlement Among Repeat Patent Litigants*, 99 GEO. L.J. 677, 695–97 (2011) (discussing invalidation rates).

223. General Agreement on Tariffs and Trade—Multilateral Trade Negotiations (the Uruguay Round): Agreement on Trade-Related Aspects of Intellectual Rights, art. 27, ¶ 1, Dec. 15, 1993, 33 I.L.M. 81 (1994) (hereinafter "TRIPS"); *see also* Stefania Fusco, *Trips Non-Discrimination Principle: Are* Alice *and* Bilski *Really the End of NPEs?*, 24 TEX. INTELL. PROP. L.J. 131, 158 (2016).

224. 5A DONALD S. CHISUM, CHISUM ON PATENTS § 18.03[3] (2020) ("It is well settled that "[a] patentee is his own lexicographer . . . .").

225. *USPTO Launches New Glossary Pilot Program to Promote Patent Claim Clarity*, U.S. Pat. & Trademark Off., http:// www.uspto.gov/about-us/news-updates/uspto-launches-new-glossary-pilot-program-promote-patentclaim-clarity (last modified Dec. 11, 2014, 5:09 PM); GAO REPORT, *supra* note 32, at 33–34.

being used as prior art, reducing that type of notice failure. The glossary would not, however, necessarily make it easier to search pending applications (for FTO purposes) in fields with non-standardized terminology. And it would certainly not result in shorter disclosures.

2. Not Publishing Everything

Ultimately, cost-shifting may not provide sufficient incentives for applicants to file higher quality applications. Instead of simply increasing costs to the applicant, reform can instead aim to provide the applicant and the PTO with more data so they can make an informed choice about whether an application (or a portion thereof) is valuable enough to be published.

Reforms may involve delaying publication or, as described below, finding ways to achieve both timely and higher quality notice. But, in any case, the system may be better off if some applications (or portions thereof) are never published. Twenty percent of applicants eventually decide that their patent application was not worth pursuing *at all*,[226] with over ten percent abandoning their application early in the process.[227] Even granted patents contain throw-away disclosures that would not be sufficient to support any claim. To the extent we can identify such information early in the examination process, why should the PTO even publish it? Why publish speculative information, with the imprimatur of the PTO, that creates blocking prior art and chilling effects and has no value to the applicant or to knowledge diffusion? The following sub-sections consider a variety of approaches that the PTO could undertake to reduce the publication of speculative information.

a. Pre-publication examination: In general. How can we provide timely notice of applications but still take time to improve their quality? One way to allow for both timely and higher quality notice

226. *See* Cotropia & Schwartz, *supra* note 119, at 2846. This number includes continuation applications that have been abandoned, *id.* at 2846 n.234, and thus overestimates the number of applications that were abandoned after filing without any subsequent filings.

227. *See* Letter from Ron Katznelson, President of Bi-Level Techs., to John J. Doll, Acting Dir. of the U.S. Pat. & Trademark Off., Comment Letter on Notice of Roundtable on Deferred Examination for Patent Applications at App'x p. 14 (May 29, 2009), https://www.uspto.gov/sites/default/files/web/offices/pac/dapp/opla/comments/deferredcomments/rkatznelson.pdf.

is to eliminate the provisional application period—in which an applicant uses a one-year placeholder document (that is never examined) to secure a filing date at the PTO.[228] This would allow the PTO to immediately examine all applications. Applications would still publish "on time"—within eighteen months of the filing date. Thus, notice would be as timely as it is in the current regime, but there would now be enough time to allow for substantive examination. The first published document (if it publishes at all) would therefore not be the originally filed application, but an application that has undergone at least some examination. This is a more radical approach,[229] and an empirical study is likely necessary to evaluate if it correctly balances the costs and benefits of publishing unexamined patent applications. But this paper provides an initial theoretical underpinning of the reasoning for this approach.

Examining applications before publication would encourage more filers to abandon their lower-quality applications before the eighteen-month publication deadline. These abandoned applications would consequently not be allowed to illegitimately occupy patent idea space. There is evidence that this would work: because many inventors do not perform any prior art search before filing an application,[230] even one round of rejections may convince some applicants that the prior art the examiner finds cannot be overcome. For example, at the European Patent Office, at least six percent of applicants withdraw their applications after getting the preliminary search results from the examiner.[231] In the United States, over ten percent of applications abandon their application after an initial rejection from the examiner.[232]

228. *See* MERGES & DUFFY, *supra* note 1, at 70–71.

229. *See, e.g.*, Peter G. Dilworth, *Some Suggestions for Maximizing the Benefits of the Provisional Application*, 78 J. PAT. & TRADEMARK OFF. SOC'Y 233, 233 (1996) (reciting benefits of the earlier filing date provided by provisional applications); Sean B. Seymore, *Patent Asymmetries*, 49 U.C. DAVIS L. REV. 963, 1014 n.347 (2016) ("[T]he provisional patent provides an easy and inexpensive mode of entry into the U.S. patent system."); MERGES & DUFFY, *supra* note 1, at 70 ("Provisional applications could be thought of as somewhat simpler and cheaper versions of a regular application.").

230. *See supra* note 105.

231. George Lazaridis & Bruno van Pottelsberghe de la Potterie, *The Rigour of EPO's Patentability Criteria: An Insight Into the "Induced Withdrawals"*, 29 WORLD PAT. INFO. 317, 317, 320 (2007) (a total of 30% of applications are withdrawn, with 20% of those withdrawn after the initial search report; 30% x 20% = 6%).

232. Letter from Ron Katznelson, *supra* note 227, at App'x p.13.

Further, the applications that are published would go through at least some examination before publication. This may result in some narrowing of the claims to a more realistic scope, and to a reduction in the number of published claims. In fact, contrary to the view of some legal scholars,[233] examination does bring about meaningful change to applications. In sixty-nine percent of applications resulting in issued claims, the applicant will have made an amendment altering one or more elements in the main independent claim as a result of examination.[234] Combining this with another study that shows that granted patent claims are on average forty-five words (or about forty percent) longer at grant than publication,[235] there is strong empirical evidence that examination actually leads to meaningfully narrower claims. Empirical studies also show that examination may sometimes cause applicants to completely abandon certain independent claims, as granted patents on average lose 0.4 independent claims between publication and issuance.[236]

If the examiner can successfully reject a claim based on insufficient disclosure or vagueness,[237] claims that do publish might not just be of narrower scope but may also incorporate more structure. This may ameliorate some of the problems plaguing many patent disclosures: functional and abstract claiming. In extreme cases, if there is an egregious lack of support of the claims in the specification, the PTO could even reserve the right to decline

233. Mark A. Lemley & Bhaven Sampat, *Is the Patent Office a Rubber Stamp?*, 58 EMORY L.J. 181, 181–82 (2008) (discussing the view that "far from serving as an effective gatekeeper, the PTO is effectively rubber-stamping private efforts to seek immunity from competition"); Lemley, *supra* note 184, at 1495 n.1 (2001) ("The PTO has come under attack of late for failing to do a serious job of examining patents, thus allowing bad patents to slip through the system.").

234. Andrew F. Christie, Christ Dent & John Liddicoat, *The Examination Effect: A Comparison of the Outcome of Patent Examination in the US, Europe and Australia*, 16 J. MARSHALL REV. INTELL. PROP. L. 21, 28, 31 (2016) (Figure 4 shows that examination resulted in an "integral change" in the first claim in 69% of applications).

235. Alan C. Marco, Joshua D. Sarnoff & Charles A. deGrazia, *Patent Claims and Patent Scope* 13 (USPTO Off. of Chief Economist, Econ. Working Paper No. 2016-04, 2016), https://ssrn.com/abstract=2844964. Claims are on average approximately 111 words long at publication, and an addition of forty-five words thus represents a forty percent increase. *Id.* at Table 3.

236. *Id.* at 13.

237. "Vagueness" can refer to an indefiniteness rejection or a rejection of a functional claim. *See supra* text accompanying notes 98–100.

to publish some applications in their entirety. For example, if no actual working examples or structures are provided.

Proposals from other scholarly work that focus generally on improving patent examination can also be informative in the pre-publication examination context. Such proposals include providing examiners more time to review applications[238] and with incentives[239] and tools[240] to look at the applications more closely in the first instance.

b. Super-divisional requirement. The above solution would only fix the problem of overbroad claiming in applications, and not the problem of speculative disclosure in the rest of the document. In an even more radical pre-publication examination approach, the PTO may consider imposing requirements to "clean up" the rest of the written description before it publishes. The length and number of inventions in patent documents makes searching through them difficult. Market participants cannot predict what a certain disclosure will produce in terms of claims, and applicants can dump all sorts of things in the application, in an attempt to create "spoiler" prior art or in anticipation of future amendments.

Currently, examiners have the ability to require applicants to split up the claims of a submitted application into multiple applications (called "divisionals") if the examiner finds that there are multiple inventions disclosed.[241] However, the same specification follows all these different divisional applications—three identical specifications are published for different claim sets.

But if a reform can create a delay in publishing an application, examiners may be able to force the applicant to split up their claims *and* their specification into separate applications—one per each

238. Frakes & Wasserman, *supra* note 102, at 981, 985 (providing empirical evidence that greater time allotment to examiners improves quality of output).

239. Steven M. Reid & Courtenay C. Brinckerhoff, *New Patent Office Examination Procedures: Bane or Boon?*, 79 PAT. TRADEMARK & COPYRIGHT J. (BNA) 173, 174 (2009) (discussing a change in the internal achievement metric structure that would incentivize examiners to spend more time on a new application).

240. Freilich, *supra* note 10, at 33–36 (proposing new information-forcing tools for examiners).

241. 35 U.S.C. § 121 ("If two or more independent and distinct inventions are claimed in one application, the Director may require the application to be restricted to one of the inventions.").

filed invention—forcing them to file them simultaneously (if at all).[242] This would be a type of super-restriction requirement.[243]

The super-restriction requirement should result in shorter, more focused applications. The divided applications would perhaps result in fewer claim amendments and continuations because the specifications would be more narrowly focused on each claim set. Filers would maybe choose not to pursue certain lower-value (or "spoiler") inventions at all, to avoid immediately paying additional fees for the different divisional applications.

The super-divisional requirement also has the benefit of putting the decision partly in the hands of the applicant, who may be in a better position to decide the value of their application at the time of filing.[244] If an examiner also performs an initial prior art search before requiring restriction, both the examiner and the filer would have more information about whether a restriction is appropriate and what inventions are worth pursuing.

A scheme to avoid abuse, where an applicant cannot just file the same specification for each application, may need to be devised. Intelligent concept searching could assist with this. If nothing else works, capping the length of divisional specifications would provide a rough stopgap on abusive tactics.

c. Sticking points. One glitch with this particular early examination scheme is the elimination of the provisional application. For one, this solution may require the involvement of other WTO countries in order to work fairly.[245]

A bigger potential problem with this early examination scheme is that U.S. applicants would lose the cheap hold period of

242. Or risk losing the filing date for each invention.

243. Strangely, the PTO seems to have interpreted the "independent *and* distinct" statutory language as "independent *or* distinct." *See* MPEP, *supra* note 28, §§ 802.01, 803 ("Under the statute, the claims of an application may properly be required to be restricted to one of two or more claimed inventions only if they are able to support separate patents and they are either independent *or* distinct." (citations omitted) (emphasis added)). This seems to provide the PTO with sufficient discretion to expand the reach of restriction requirements.

244. Akin to a Pigouvian tax being preferable to a command-and-control regulation. *See* Jonathan S. Masur & Eric A. Posner, *Toward a Pigouvian State*, 164 U. PA. L. REV. 93, 95 (2015).

245. Otherwise, foreign applicants would still get the benefit of their earlier, unexamined, foreign-filed placeholder applications since many other countries have a provisional application system as well. *See* MERGES & DUFFY, *supra* note 1, at 70–71. The

provisionals, a period they currently use to consider whether to pursue their inventions further.[246] This loss is arguably a positive side-effect, however, as the scheme would reduce the filing of more speculative, uncertain inventions. Reducing filing of poor-quality inventions, and having some sort of pre-publication examination, might elevate the status of U.S. applications that do end up being published, as compared to foreign-filed ones. Applicants would be able to monetize this elevated status, by enticing investors or in warning competitors, for example. This could compensate for the loss of provisional placeholders and encourage filing in the United States.

Moreover, there is a potential argument that applicants should not be able to have a "placeholder" application if they have not yet developed an idea worth patenting. If, under the proposed pre-publication examination system, an applicant attempts to cheat by filing an application they have no intention of immediately prosecuting, then the PTO can develop ways to punish this behavior. For example, they could deem an application abandoned (and not publish it) if the applicant is not making a good faith effort to respond to the examiner's rejections.

d. An AI alternative. If the loss of provisional applications is seen as too costly based on the discussion above, especially if the problem of notice quality is found to be limited only to certain technology sectors,[247] a compromise would be to retain the placeholder period but to run applications through an automated screening system before they are allowed to be published. The screening can require applicants to address certain issues and amend the application accordingly. The use of AI in automating examination is still in its infancy, but it shows great promise in

alternative is to delay publishing applications past eighteen months (perhaps something other countries would be more willing to agree to) and implement the above proposal. Such delay would result in other notice failures, however, such as reducing knowledge diffusion and a lack of information to competitors about secret, blocking prior art.

246. For example, in 2011, 72,000 applicants decided to abandon their provisional applications. Dennis Crouch, *Abandoning Provisional Applications*, PATENTLY-O (Jan. 2, 2013), https://patentlyo.com/patent/2013/01/abandoning-provisional-applications.html. And reliance on provisionals in the United States is increasing. *See* Dennis Crouch, *Percent of US-Originated Patents that Claim Priority to a Provisional Application*, PATENTLY-O (Oct. 17, 2017), https://patentlyo.com/patent/2017/10/originated-provisional-application.html.

247. *See supra* notes 216, 222.

finding relevant prior art[248] and spotting certain issues with claims, such as indefiniteness.[249] It can also easily find proposed objective metrics corresponding to poor notice quality, such as a lack of working examples, use of non-standardized terminology,[250] or a lack of correlation between claim and specification terms.[251] In time, AI could even be used to impose the supra-divisional requirement I proposed above or to spot functional claim language. It is doubtful, however, that AI will be able to replace human examination for spotting issues with the sufficiency of the disclosure in supporting claim scope, given the complexity of that task.

In any case, if an AI system can be designed to accomplish even a subset of the above tasks, the initial screening mechanism for applications would still significantly improve their quality of notice, perhaps without significant compromise in the timing of their publication.

* * *

Pre-publication examination of patent applications can provide a mechanism for reducing the incidence of overbroad claims and speculative disclosures in the patent idea space. It can help competitors perform more accurate FTO searches and would not elevate disclosure of "chaff" to the level of highly cited prior art.

CONCLUSION

There is a cost to publishing unexamined patent applications. Published applications create legal uncertainty for market participants and permanently occupy the prior art idea space. Both effects can deter research into new technology areas. In the interest of transparency and timeliness, we have sacrificed quality of notice.

Providing the Patent Office and the applicant with the incentives and information to improve (or perhaps abandon) the patent document before it publishes would reduce the levels of

248. *See generally* Aaron Abood & Dave Feltenberger, *Automated Patent Landscaping*, 26 A.I. & L. 103 (2018) (describing a new approach to finding prior art that utilizes machine learning with an initial human-selected set of patents).

249. Dean Alderucci, *The Automation of Legal Reasoning: Customized AI Techniques for the Patent Field*, 58 DUQ. L. REV. 50, 76–81 (2020).

250. *Id.* at 79.

251. *Id.* at 78–79.

"notice pollution" that applications contribute to the patent idea space. There is room for reform, and the possibility of achieving higher quality notice, without losing most of the benefits of timely notice and transparency. An empirical study is needed to determine the extent to which the notice failures created by publishing unexamined applications harm innovation and to select the appropriate level of reform.