

# Inclusive Patents for Open Innovation

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## Abstract

The post-internet era has greatly affected commercial firms' innovation processes. The complexity and cumulative nature of emerging technologies under the post-internet era has made commercial firms reevaluate their innovation processes and has increased the role of individual innovators. Firms dealing with emerging technologies cannot make products without infringing on patents held by others, as their products are covered by numerous overlapping patents. Many of these firms work with individual innovators and embrace the open-source philosophy that ensures open access to technologies. These firms can no longer use patents for excluding others without risking infringement counterclaims, leading to the development of new uses of patents: defensive use to avoid litigation and proactive use to promote open innovation. The current U.S. patent has become increasingly outdated for failing to take into account these new uses of patents. Although firms have implemented self-help arrangements by retooling patents with licenses and private-ordering mechanisms, the arrangements still fall short as they result in: (1) no defensive function against patent assertion entities (PAEs) and (2) insufficient proactive use if innovators fail to disclose their invention through USPTO, due to expensive patent costs. Patent reform is necessary to overcome such shortcomings. In light of recent changes, this article proposes issuing inclusive patents as an alternative option to current exclusive patents. The proposed inclusive patents allow anyone who licenses their patented inventions to practice the protected invention, and are only enforced defensively when the owners are charged with infringement. The inclusive patents enable owners to request a preliminary procedure to grant a compulsory license in light of the eBay factors when they are charged with infringement of blocking patents. The compulsory license enhances the defensive use of inclusive patents to avoid litigation with PAEs, and guarantees owners the freedom to operate and innovate on their inventions. Because of the limited exclusivity, the USPTO should allow simplified patent applications and issue inclusive patents without examination. With low patent costs, all types of innovators can take advantage of the proactive use of inclusive patents through USPTO disclosures.

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**I. Introduction**

To meet the expected tightening of emissions rules, carmakers are rushing to release their patents in order to take advantage of open innovation through the sharing of their technologies.<sup>1</sup> Carmakers have not been the only commercial firms to release their patents and share technologies. Daikin, a Japanese air conditioning manufacturer, and other firms in the complex technologies sectors (technologies that include a large number of components and functions) have joined carmakers in making their patented technologies publicly available and royalty free.<sup>2</sup> These firms compete in the post-internet era, after the turn of the last century, in which the widely adopted internet changed the way products are developed and manufactured, and

<sup>1</sup> Peter Campbell, *Carmakers’ Designs on Patents for the Future*, FINANCIAL TIMES, (July 8, 2019), <https://www.ft.com/content/8a9613c4-8ac3-11e9-b8cb-26a9caa9d67b>.

<sup>2</sup> *Patent Non-Assertion Pledge for Equipment using Low GWP Refrigerant HFC-32*, DAIKIN (July 1, 2019), <https://www.daikin.com/press/2019/190701/>. See Jorge L. Contreras, *The Evolving Patent Pledge Landscape*, CIGI Papers No. 166 (2018), [https://www.cigionline.org/sites/default/files/documents/Paper%20no.166%20Cover\\_0.pdf](https://www.cigionline.org/sites/default/files/documents/Paper%20no.166%20Cover_0.pdf) (providing a general discussion of the wide adoption of patent pledge); see Justus Baron & Henry Delcamp, *Patent Quality and Value in Discrete and Cumulative Innovation*, 90 SCIENTOMETRICS, 581–606 (2012), <https://hal-mines-paristech.archives-ouvertes.fr/hal-00488275v2/> (providing a definition of complex technologies).

the way services are provided. The majority of valuable goods in the post-internet era is made up of complex technologies, such as products using Information and Communication Technologies (ICT).<sup>3</sup> Such technologies are the result of highly distributed open innovation, where each component and each function is a result of the cumulative innovation process based on generations of prior improvements by different types of innovators. It has been increasingly difficult for firms to make products and provide services without infringing on patents held by others as the gradual innovation process has led to numerous overlapping patents covering such products and services. These firms have developed self-help arrangements to ensure their freedom to operate and innovate through cross-licensing, nonenforcement pledges, and other private ordering mechanisms.

Commercial firms were inspired to develop these mechanisms by new types of innovators, individual users that emerged from post-internet technological advancements, such as the Internet of Things (IoT). With broad access to R&D resources, such as Artificial Intelligence (AI) and Big Data through IoT, individual users can now assume a more important role in the development and improvement of products and services. Among such innovators are programmers, who use open-source methodology to develop software and provide an important source of innovation for commercial firms. These programmers have developed a new application for copyrights by using Open-source Software (OSS) licenses to share technologies. OSS programmers and their communities embrace open-source philosophy—spreading free software and promoting cooperation in the OSS community through copyleft software development.<sup>4</sup> OSS programmers began engaging in highly distributed innovation long before commercial firms shifted their innovation paradigm. In order to share their technologies with OSS programmers and other firms, commercial firms have developed patent-sharing mechanisms by retooling patents with open patent licenses.

Despite dramatic changes in the innovation landscape and new uses of patents, the economic rationale for the patent system is still based on several assumptions rooted in the 18th century, when the system was developed. The incentive to invent theory is the traditional rationale for the current patent system that rewards inventors with supracompetitive prices through enforcement of exclusivity. This theory does not apply to commercial firms in the complex technologies sectors, although

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<sup>3</sup> Robert W. Rycroft & Don E. Kash, *Innovation Policy for Complex Technologies*, 16 ISSUES IN SCI. & TECH. No. 1 (Fall 1999), <https://issues.org/rycroft/>. In 1995, complex technologies made up 82% of the most valuable world goods exports and the portion is expected to rise.

<sup>4</sup> Richard Stallman, *Copyleft: Pragmatic Idealism*, in FREE SOFTWARE, FREE SOCIETY: SELECTED ESSAYS OF RICHARD M. STALLMAN 188 (1st. ed. 2002), <https://shop.fsf.org/books-docs/free-software-free-society-selected-essays-richard-m-stallman-3rd-edition>. The social movement by programmers who embrace the open-source philosophy is called “Free Software,” distinct from “open-source,” which is a development methodology. See Richard Stallman, *Why Open-source Misses the Point of Free Software*, GUN OPERATING SYSTEM, <https://www.gnu.org/philosophy/open-source-misses-the-point.html.en> (Oct. 6, 2020) (distinguishing the social movement by programmers who embrace the open-source philosophy called “Free Software” from the development methodology “open-source”).

these firms constitute the overwhelming majority of commercial firms in the post-internet era. Patents do not give these firms exclusive control over products, and courts seldom award injunctions as remedies for patent infringement for products in complex technologies. In addition, receiving exclusive control of a technology is counterintuitive to members of OSS communities, who embrace open-source philosophy. Even if the patent system's exclusivity seldom gives these firms and innovators incentives to invent, it provides incentives to share their technologies by rewarding them with the freedom to operate and innovate.

The incentive to disclose theory is another rationale for the patent system. The theory is based on the assumption that inventors would keep their inventions secret without patent protection. This rationale is irrelevant to OSS communities, who freely disclose and diffuse their inventions without any compensation. Likewise, many commercial firms do not need any additional incentive to disclose their inventions, as they benefit from disclosing their inventions and find it necessary to share technologies in order to engage in open innovation, as the cost of keeping their inventions secret frequently exceeds the benefits of trade secret protection.

Many aspects of the current patent system are outdated and fail to take into account new uses of patents and the unique factors that motivate new innovators to engage in innovation. In particular, the overemphasis of exclusivity in relation to patent rights unreasonably favors patent owners who do not practice their patents, which makes them immune from counter-patent infringement assertions. The current patent system has several flaws that firms' self-help arrangements cannot overcome: nonpracticing patent owners have no incentive to share their patents; the cost of obtaining patents is too expensive, unless the patents are used for excluding others; and the 18-month delay in publication substantially diminishes patent disclosures as technical information. Patent reform is necessary to address these flaws.

This article examines how the transformation of the innovation landscape has impacted innovation processes and subverted previous economic rationales for the patent system. It also builds on a prior article that discusses the incentive to share theory—a new utilitarian theory based on the creative ways patents are being used by firms in complex technologies and OSS communities.<sup>5</sup> In applying the incentive to invent theory, this article reevaluates patent rights as inclusive rights by focusing on the ability to share inventions through licenses, and proposes to reform the current patent system by including an option to issue inclusive patent rights without substantive examination.

Part I discusses the transformation of the innovation landscape in the post-internet era from closed innovation to highly distributed open innovation. Closed innovation was the prevailing model in the pre-internet era, which embraced exclusive control over every step of delivering an invention to the market as a product or service. Commercial firms dominated the innovation landscape, as individual users had limited access to R&D resources. But IoT, cloud computing and other internet

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<sup>5</sup> Toshiko Takenaka, *Patents for Sharing*, 26 MICH. TECH. L.R. 93 (2019).

emerging technologies have made sharing R&D resources possible for all types of innovators. In the post-internet era, the overwhelming majority of products and services are complex technologies, and firms need to engage in the highly distributed open innovation model by collaborating with other innovators that have different resources and expertise. Such collaborations have resulted in a situation where each component of a product and service, or function of the component, is covered by numerous patents that are held by different patent owners. As a result, firms are no longer able to produce a product or provide a service without infringing another's patents. This has caused a new use for patents to develop: using patents inclusively to share technologies instead of excluding others. This new use fits with the interests of OSS programmers, who have been using copyrights inclusively for sharing software.

Part II criticizes the incentive to invent theory, which is the dominant rationalization for the patent system in the U.S. This theory is based on the ability of patent owners to control their products or services due to closed innovation. In the post-internet era, patents seldom give patent owners the power to exclude others. Instead, firms use patents to ensure the freedom to operate and innovate on their inventions. German and Japanese patent acts expressly endorse inclusive use, and reward patent owners with the freedom to operate and innovate by granting compulsory licenses against blocking patents. The U.S. Patent Act is outdated in its failure to acknowledge inclusive use, as the dominant view of US patent scholars is that patents provide nothing more than the right to exclude others.

This article argues that patent rights should be viewed as inclusive rights, as justified by the incentive to share theory which promotes open innovation by rewarding patent owners with the freedom to operate and innovate.

Part II further examines the incentive to disclose theory, which assumes that patent protection is necessary to prevent inventors from keeping their inventions secret. In the post-internet era, many commercial firms and new innovators, OSS programmers in particular, disclose their inventions through nonpatent defensive publication platforms without patent protection. Part II argues that patent disclosures are more useful than other types of voluntary disclosures because they prevent others from obtaining patents on the disclosed inventions more effectively than other disclosures and promote collaboration among innovators. However, the current system is unaffordable for many innovators due to the high costs associated with patent prosecution and enforcement.

Part III proposes a patent law reform that introduces a new patent option for innovators who want to use patents as inclusive rights to engage in open innovation. The new option would enable a patent applicant to request that the United States Patent and Trademark Office (USPTO) disclose the content of provisional and nonprovisional patent applications immediately after the patent application is accepted, and issue the patent as an inclusive right (hereinafter the proposed patent is called an "inclusive patent"). Under the current patent system, when the content of a patent application is published, the patent owner obtains a provisional right to re-

cover reasonable royalties for unauthorized use of inventions claimed in the application, with actual notice of the published patent application.<sup>6</sup> Patent applicants cannot exercise provisional rights unless their application matures into a patent. In contrast, under the proposed system, the USPTO would grant an inclusive patent when the content of the application is published. Patent owners would be able to enforce their inclusive patents immediately if they are charged with patent infringement, allowing them to use their patents as bargaining chips to settle infringement disputes.

The current patent system's overemphasis on patent exclusivity encourages patent owners to aggressively assert infringement claims and discourages them from practicing their patents due to the risk of counter-infringement claims. Instead, inclusive patents encourage patent owners to practice their patents, as patent owners are guaranteed the right to use and share their inventions with others. The right to use the invention includes the right to request a compulsory license when the inclusive patent owner would otherwise be unable to practice the invention because of blocking patents held by others.

Patent owners can obtain inclusive patents quickly and cheaply as the USPTO would issue the patents without a substantive examination. The proposed inclusive patents can only be enforced defensively, as exclusivity is limited by a new defense that implements the copyleft concept, promoting open innovation. The open innovation defense protects anyone who uses the protected invention, as long as he or she is willing to give a license for his or her patented inventions. This open innovation defense does not apply when the person who uses the invention initiates litigation or brings infringement charges against the inclusive patent owner. Because the open innovation defense grants anyone a transaction-free license to use the invention, inclusive patents reduce litigation and transaction costs for technology sharing.

This article proposes a simplified disclosure reform for individual innovators who would otherwise fail to disclose their inventions due to initial disclosure costs. Such innovators would be able to prepare patent applications by using claims in the "as substantially described" format and incorporating specification software with open-source codes and Computer Aided Design (CAD) files of prototypes. Thus, the proposed reform provides an affordable patent option to all types of innovators, particularly individual innovators. Moreover, the proposed reform reduces social loss resulting from the USPTO examining every invention, regardless of use.

## **II. Impact of the Innovation Landscape Transformation**

### **A. Impact of Post-Internet Technologies**

Emerging technologies spurred by the internet have had a significant impact, not only on how products are produced, but also on how inventions and innovations occur. In particular, technology has changed the way companies deploy R&D resources in innovation by shifting their innovation model.<sup>7</sup> Post-internet technologies

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<sup>6</sup> 35 U.S.C. § 154(d).

<sup>7</sup> In this article, the term "innovation" is used to include activities resulting in improvements, regard-

connect both things and people through advanced high-speed internet, enabling different types of innovators to share resources for research, manufacturing and conducting business. Internet-supported technologies allow small and medium-sized enterprises (SMEs) and individual innovators to share exchange and rent expensive R&D resources without transferring ownership.<sup>8</sup> These practices are often referred to as the “Sharing Economy.”

Sharing has become increasingly popular as it increases business efficiency by reducing transaction costs and maximizes the utilization of goods and services.<sup>9</sup> Even large commercial firms hope to take advantage of this flexibility through access to post-internet technologies, such as the internet of Things (IoT) and Artificial Intelligence (AI). Many choose to rent R&D resources in an effort to avoid the large costs associated with purchasing and maintaining expensive equipment.

This paradigm shift has fostered the emergence of cloud-computing services.<sup>10</sup> Firms and businesses prefer the ease of pay-per-use flexibility, rather than large lump-sum payments for hardware, which often require vast amounts of storage space and additional costs of employing engineers to support the ever-changing hardware and software needs of a dynamic firm. Now that firms can rely on the resources and services provided by cloud-computing providers’ computer specialists, they no longer need to worry about the once-necessary infrastructure required for the production of goods and services.<sup>11</sup> Innovators now have access to a wide variety of software, as well as the ability to customize that software as needed, as long as they can afford to rent storage space from cloud-computing providers.

## B. Traditional Innovators’ Shift of Innovation Model

Flexibility and broad access to resources has democratized the innovation process, allowing non-traditional innovators, such as individual consumers and users,

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less of whether they are patentable. For more discussion on the shift of the innovation model, see I. B.

<sup>8</sup> See generally *Small and Medium-Sized Enterprises (SMES)* entry in *Glossary of Statistical Terms*, OECD, <https://stats.oecd.org/glossary/detail.asp?ID=3123> (Dec. 2, 2005). The Organisation for Economic Co-operation and Development (OECD) provides the following definition of small and medium-sized enterprises (SMEs): “. . . non-subsidiary, independent firms which employ fewer than a given number of employees. This number varies across countries. The most frequent upper limit designating an SME is 250 employees, as in the European Union. However, some countries set the limit at 200 employees, while the United States considers SMEs to include firms with fewer than 500 employees.”

<sup>9</sup> Araz Taeihagh, *Crowdsourcing, Sharing Economies and Development*, 33 J. DEVELOPING SOC’Y 191 (2017).

<sup>10</sup> See generally Katsantonis Konstantinos et al., *Cloud Computing and Economic Growth*, in PROC. OF THE 19TH PANHELLENIC CONFERENCE ON INFORMATICS 209 *passim* (2015) (discussing the social and economic impact of cloud computing and how cloud computing services give users access to a storage space in a high-speed computer and deliver various types of services via the internet).

<sup>11</sup> E.g., *How is Cloud Computing Different from Traditional IT Infrastructure?*, LEADING EDGE, <https://www.leadingedgetech.co.uk/it-services/it-consultancy-services/cloud-computing/how-is-cloud-computing-different-from-traditional-it-infrastructure/> (last visited Mar. 13, 2021) (explaining how cloud computing replaces traditional IT infrastructure such as a variety of hardware connected to a network via a server on the premises).

to participate in the improvement of products and services.<sup>12</sup> These nontraditional innovators can now participate in R&D projects, which were previously limited to large firms in the pre-internet era. Post-internet emerging technologies enhance the innovation capacity of SMEs, which are often the source of radical innovations, by providing access to resources that SMEs lack.<sup>13</sup> The distributed model of innovation, a system where various types of innovators collaborate towards a common goal, is an advanced model of open innovation.<sup>14</sup> The concept of “open innovation” comes from a book by Henry Chesbrough, a professor at UC Berkeley Haas School of Business.<sup>15</sup> He encourages commercial firms to use both inflows and outflows of knowledge to accelerate innovation and expand the markets for external use of their innovations.<sup>16</sup> In short, firms should engage in a distributed innovation process and manage the flows of technical and business knowledge in line with their business models.<sup>17</sup>

However, the innovation model recommended by Chesbrough predates the publication of his book.<sup>18</sup> With the enactment of the Bayh Dole Act in 1980, commercial firms increased their collaboration with universities in order to engage in open innovation.<sup>19</sup> Highly distributed open innovation processes are necessary to develop products and services in complex technologies, such as ICT, because of the large number of components and functions involved. No individual firm can develop all the numerous components and functions involved in complex technologies.

In contrast, closed innovation was the dominant innovation model from the introduction of the U.S. Patent System until the end of the twentieth century.<sup>20</sup> Closed

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<sup>12</sup> For more discussion, see Part I, 4; *see also infra* note 55.

<sup>13</sup> Antoine Pierre & Fernandez Anne-Sophie, *Going Deeper into SMEs' Innovation Capacity: An Empirical Exploration of Innovation Capacity Factors*, 25 J. INNOVATION ECON. & MGMT. 139 (2018), <https://www.cairn.info/revue-journal-of-innovation-economics-2018-1-page-139.htm>; *see* OECD, POLICY NOTE: PROMOTING INNOVATION IN ESTABLISHED SMEs (2018) (prepared for the OECD SME Ministerial Conference; indicating that SMEs are considered an important source of radical innovations, particularly in science-driven sectors).

<sup>14</sup> Garry Gabison & Annarosa Pesole, *An Overview of Models of Distributed Innovation*, at 15, COM, rep. of the JRC (2014), [http://publications.jrc.ec.europa.eu/repository/bitstream/JRC93533/jrc93533\\_ap.pdf](http://publications.jrc.ec.europa.eu/repository/bitstream/JRC93533/jrc93533_ap.pdf).

<sup>15</sup> HENRY WILLIAM CHESBROUGH, *OPEN INNOVATION: THE NEW IMPERATIVE FOR CREATING AND PROFITING FROM TECHNOLOGY* (2003); Carliss Y. Baldwin, *Organization Design for Distributed Innovation* 1 (May 4, 2012), <https://www.hbs.edu/research/pdf/12-100.pdf> (HBS Working Paper 12-100; explaining that systems of distributed innovation are coined with the concept of “business ecosystem”).

<sup>16</sup> Henry William Chesbrough, *Everything You Need to Know About Open Innovation*, FORBES (Mar. 21, 2011), <https://www.forbes.com/sites/henrychesbrough/2011/03/21/everything-you-need-to-know-about-open-innovation/#313b99d775f4>.

<sup>17</sup> Henry Chesbrough & Marcel Bogers, *Explicating Open Innovation: Clarifying an Emerging Paradigm for Understanding Innovation*, in *NEW FRONTIERS IN OPEN INNOVATION* 3–28 (H. Chesbrough et al. eds., 2014).

<sup>18</sup> Gabison & Pesole, *supra* note 14, at 14.

<sup>19</sup> Joel West, *Does Appropriability Enable or Retard Open Innovation*, in *OPEN INNOVATION: RESEARCHING A NEW PARADIGM* 109–133 (H. Chesbrough et al. eds., 2006).

<sup>20</sup> Jens Frøslev Christensen, *Withering Core Competency for the Large Corporation in an Open Innovation World?*, in *OPEN INNOVATION: RESEARCHING A NEW PARADIGM* 35-61 (H. Chesbrough,

innovation embraces exclusive control over products and services, as all the steps for delivering the products and services to market are performed within a single commercial firm. The very first Federal Patent Act was enacted in 1790,<sup>21</sup> in the decade after the initial industrial revolution in England.<sup>22</sup> At that time, firms dealt with products and services in discrete technologies (*i.e.*, technological sectors dealing with products consisting of few components), each covered by a single patent and held by one patent owner engaging in the closed-innovation model.<sup>23</sup> When the number of components and functions increased with technological advancement, firms vertically integrated upstream and downstream stages of the value chain within their organizational boundaries and continued to engage in closed innovation.<sup>24</sup> Post-internet technological advances have enhanced open innovation by making it possible for smaller, more specialized firms to compete with large firms in innovation, leading to the disintegration and modulation of large firms, as well as collaboration with small firms, expanding open innovation.<sup>25</sup>

Oftentimes, highly distributed open innovation results in components or functions being covered by a number of patents held by different patentees; this is because pioneering inventions are improved on and successively commercialized by multiple innovators through a cumulative process.<sup>26</sup> Such components are typically combined with numerous other components to make technologically complex products, such as smartphones.<sup>27</sup> As the complexity of products escalates, firms increasingly need to collaborate by learning, integrating and applying knowledge from other firms.<sup>28</sup>

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W. Vanhaverbeke & J. West eds., 2006).

<sup>21</sup> Patent Act of 1790, ch. 7, 1 Stat. 109.

<sup>22</sup> In Europe and Asia, the notion “Industry 4.0” is well established among industry leaders and politicians to describe the industrial revolution spurred by the internet technologies. The notion stems from the images showing the historical progress of the manufacturing industry in four phases from the first industrial revolution to the present. The initial industrial revolution began with the invention of the first mechanical loom in 1784. For an example of the images, see Joaquín Fuentes-Pila et al., BEST PRACTICES FOR IMPROVING ENERGY EFFICIENCY (IN AGRO-INDUSTRIES) 58 fig. 32 (2015), [https://www.researchgate.net/publication/303767337\\_Best\\_Practices\\_for\\_Improving\\_Energy\\_Efficiency\\_in\\_agro-industries](https://www.researchgate.net/publication/303767337_Best_Practices_for_Improving_Energy_Efficiency_in_agro-industries); see Takenaka, *supra* note 5 (providing additional discussions about the notion of “Industry 4.0”).

<sup>23</sup> See Baron & Delcamp, *supra* note 2, at 3 (the definition of discrete technologies).

<sup>24</sup> CHESBROUGH, OPEN INNOVATION, *supra* note 15, at 29; see also Natalie Rodet-Kroichvili et al., *New Insights into Innovation: The Business Model Approach and Chesbrough’s Seminal Contribution to Open Innovation*, 15 J. INNOVATION, ECON. & MGMT. 79, 82 (2014).

<sup>25</sup> Christensen, *supra* note 20, at 13.

<sup>26</sup> See generally Kevin J. Boudreau & Karim R. Lakhani, “Open” Disclosure of Innovations, Incentives and Follow-On Reuse: Theory on Processes of Cumulative Innovation and a Field Experiment in Computational Biology, 44 RES. POL’Y 4 (2015), <https://doi.org/10.1016/j.respol.2014.08.001> (a discussion of cumulative innovation).

<sup>27</sup> See generally Wesley M. Cohen et al., *Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (or Not)* 19 (2000), <https://www.nber.org/papers/w7552> (National Bureau of Economic Research, Working paper No. 7552; a general discussion on complex technologies).

<sup>28</sup> Rycroft & Kash, *supra* note 3, at 2.

With complex technologies, firms do not enjoy exclusive control over their products. Because the technologies necessary to manufacture a product are frequently covered by a number of patents held by different parties, a patent owner can no longer produce a product without infringing patents held by others, making it impossible to produce products in a closed model without the involvement of other firms.<sup>29</sup> Instead of excluding others, firms use patents as inclusive rights to share technologies and engage in open innovation.<sup>30</sup> A good example is the use of open patent licenses to retool patent rights.<sup>31</sup> These open patent licenses share two common features: (1) using patents to share technologies with other members and defend against patent infringement assertions; and (2) using standard public licenses to minimize transaction costs.

### C. New Uses of Patents in Complex Technologies

Firms have developed a variety of private ordering mechanisms to share their complex technologies through current patents. Such mechanisms include the defensive patent pool created by the defensive patent license (DPL), in which a patent owner (including a potential patent owner) gives all other DPL members a worldwide, royalty-free, nonexclusive license to technologies in their entire, and future, patent portfolio.<sup>32</sup> The creative common public patent license is another mechanism for sharing technologies.<sup>33</sup> Anyone can accept the license offer, without further negotiation, once it is publicized online, although the license may include a license fee or royalty requirement.<sup>34</sup> Some mechanisms are developed with the particular aim of sharing technology, such as the patent pool administered by the Open Invention Network (OIN).<sup>35</sup> Through their open patent license, OIN members exchange their technologies through cross-licenses in the “Linux System”, one of the most successful OSS products.<sup>36</sup>

Firms also use patent license pledges and nonassertion pledges to share their technologies. More than 250,000 patents held by different patent owners have been

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<sup>29</sup> Peter Grindley & D.J. Teece, *Managing Intellectual Capital: Licensing and Cross-Licensing in Semiconductors and Electronics*, 39 CAL. MGMT. REV. 8 (1997).

<sup>30</sup> See Takenaka, *supra* note 5, at 119 (regarding the new use of patents in the complex technologies).

<sup>31</sup> Natacha Esteves, *Open Models for Patents: Giving Patents a New lease on Life*, 21 J. WORLD INTELL. PROP. 2, 2–3 (2018), <https://doi.org/10.1111/jwip.12089>.

<sup>32</sup> *Preface*, DPL, <https://defensivepatentlicense.org/license> (last visited Mar.13, 2021); see Jason Schultz & Jennifer M. Urban, *Protecting Open Innovation: The Defensive Patent License as a New Approach to Patent Threats, Transaction Costs, and Tactical Disarmament*, 26 HARV. J.L. & TECH. 1, 5–6 (2012), <https://scholarship.law.berkeley.edu/facpubs/2149/> (for a general discussion on the defensive patent license).

<sup>33</sup> *Model Patent License*, CC, [https://wiki.creativecommons.org/wiki/Model\\_Patent\\_License](https://wiki.creativecommons.org/wiki/Model_Patent_License) (last updated Oct. 19, 2010).

<sup>34</sup> *Id.* at pt. 3 (“Fees”).

<sup>35</sup> *OIN License Agreement*, OPEN INNOVATION NETWORK, <https://www.openinventionnetwork.com/joining-oin/oin-license-agreement/> (last visited mar. 13, 2021) (at section 1 “License”).

<sup>36</sup> *What is Linux?*, OPENSOURCE.COM, <https://opensource.com/resources/linux>; JONATHAN CORBET & GREG KROAH, 2017 LINUX KERNEL DEVELOPMENT REPORT (2017), <https://www.linuxfoundation.org/2017-linux-kernel-report-landing-page/> (the summary).

declared essential for generations of standardized telecommunication technologies.<sup>37</sup> Components of such technologies are interdependent in order to ensure compatibility.<sup>38</sup> Firms developed a private ordering mechanism, requiring owners of essential patents to commit to standards-development organizations that they give (fair) reasonable and non-discriminative ((F)RAND) licenses to all prospective users, ensuring sector-wide compatibility and the freedom to operate the technologies.<sup>39</sup> Tesla and Daikin use a patent nonassertion pledge to share their technologies.<sup>40</sup> In contrast, Toyota uses a royalty-free license pledge on patents in their hybrid technology.<sup>41</sup>

These firms did not abandon the pledged patents, as they still use these patents defensively to avoid infringement litigation and reduce patent search costs. Firms that produce products and provide services in complex technologies risk counter-infringement assertions when they assert their own patents because their products and services are covered by a thicket of interdependent overlapping patents.<sup>42</sup> Having a strong patent portfolio deters others from asserting patent infringement.<sup>43</sup> Most patent owners who practice their patents are reluctant to assert patent infringement due to the risk of counter-infringement assertions, and prefer royalty-free cross-licenses or stalemates, where multiple infringers independently decide not to sue each other in order to avoid the high costs of litigation or the transactional costs of calculating royalties.<sup>44</sup> Even if a competitor begins litigation, having a strong patent

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<sup>37</sup> Tim Pohlmann, *Industry Report—How to Count and Value Standard-Essential Patents*, IAM MAGAZINE (Nov. 15, 2017), <https://www.iam-media.com/how-count-and-value-standard-essential-patents>; Tim Pohlmann & Knut Blind, *Landscaping Study on Standard Essential Patents*, EU REPORT (2016), [https://ec.europa.eu/growth/content/landscaping-study-standard-essential-patents-europe-0\\_en](https://ec.europa.eu/growth/content/landscaping-study-standard-essential-patents-europe-0_en).

<sup>38</sup> Baron & Delcamp, *supra* note 2, at 582–583.

<sup>39</sup> Takenaka, *supra* note 5, at 110 (the discussion of (F)RAND license); *see also* Jorge L. Contreras, *A Brief History of FRAND: Analyzing Current Debates in Standard Setting and Antitrust Through a Historical Lens*, 80 *Antitrust L.J.* 39, 39–40 (2014).

<sup>40</sup> Elon Musk, *All Our Patent are Belong to You*, TESLA.COM: BLOG (June 12, 2014), <https://www.tesla.com/blog/all-our-patent-are-belong-you>; *See also* Serguei Netessine & Karan Girotra, *Tesla Goes Big, Not Home*, HARV. BUS. REV. (June 17, 2014), <https://hbr.org/2014/06/tesla-goes-big-not-home> (for a general discussion on Tesla’s pledge); Daikin Global, *Daikin’s Patent Pledge for HFC-32 Equipment*, DAIKIN, <https://www.daikin.com/patent/r32/pledge/> (last visited Mar. 13, 2020) (Daikin’s pledge).

<sup>41</sup> *Toyota Promotes Global Vehicle Electrification by Providing Nearly 24,000 Licenses Royalty Free*, TOYOTA (April 3, 2019), <https://pressroom.toyota.com/toyota-promotes-global-vehicle-electrification-by-providing-nearly-24-thousand-licenses-royalty-free/>.

<sup>42</sup> Carl Shapiro, *Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard-Setting*, 1 *INNOVATION POL’Y AND ECON.* 119, 121 (2001); BRONWYN HALL ET AL., *TECHNOLOGY ENTRY IN THE PRESENCE OF PATENT THICKETS* 1 (2016), <https://www.ifs.org.uk/uploads/publications/wps/wp201602.pdf> (Inst. for Fiscal Stud., Working Paper W16/02).

<sup>43</sup> PASCAL CORBEL & CHRISTIAN LE BAS, *THE EVOLUTION OF PATENT FUNCTIONS: NEW TRENDS, MAIN CHALLENGES AND IMPLICATIONS FOR FIRM STRATEGY* 6, 11, <https://halshs.archives-ouvertes.fr/halshs-00569239/document> (Groupe d’Analyse et de Théorie Economique Lyon St-Étienne, Working Paper No. 1106, 2011).

<sup>44</sup> EDWARD J. EGAN & DAVID J. TEECE, *UNTANGLING THE PATENT THICKET LITERATURE* 7,8, <http://www.bakerinstitute.org/research/untangling-patent-thicket-literature/> (Tusher Center for

portfolio maximizes the chances of settling a dispute early because of the ability to cross-license patents that the competitor is infringing or is interested in practicing, allowing the defendant to maintain their own freedom of operation.<sup>45</sup>

These firms also use patents proactively to promote open innovation and facilitate technology sharing.<sup>46</sup> Commercial firms that make products and provide services work with a variety of partners, including customers, suppliers, competitors and other complementary partners. As part of a highly distributed open innovation process, firms discover ideas for improvements through external sources or outsource to commercialize the ideas through multiple innovation models.<sup>47</sup> Some firms actively seek out external information about their inventions so that their inventions can be effectively commercialized.<sup>48</sup> Other firms may not have sufficient complementary assets for commercialization, and may need to find partners with supplemental assets in order to commercialize their inventions, allowing them to enjoy large profits from selling the products or services in the open marketplace.<sup>49</sup> Firms that engage in open innovation use their patents to include others in the innovation process by coordinating technology transfers and facilitating collaborations.<sup>50</sup>

Through patent disclosures, patent owners can advertise and demonstrate their technological information and expertise to prospective partners and licensees.<sup>51</sup> This

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Management of Intellectual Capital, Working Paper, July 2015); see also Julien Pénin & Daniel Neicu, *Patents and Open Innovation: Bad Fences Do Not Make Good Neighbors*, 25 J. INNOVATION ECON. MGMT. 57, 68,74 (2018), <https://www.cairn.info/revue-journal-of-innovation-economics-2018-1-page-57.htm>.

<sup>45</sup> William Kingston, *Innovation Needs Patents Reform*, 30 RES. POL'Y 403, 407 (2001), [https://doi.org/10.1016/S0048-7333\(00\)00090-1](https://doi.org/10.1016/S0048-7333(00)00090-1).

<sup>46</sup> Corbel & Le Bas, *supra* note 43, at 12. *Toyota's Royalty Free Patents Result in New Revenues From Fuel Cell Equipment Sales and Know How*, IP CHECKUPS (Apr. 24, 2019), <https://www.ipcheckups.com/blog/toyota-royalty-free-patents-generate-revenue/> (Toyota successfully attracted collaborators and made up with lost revenues of license fees with the revenues from selling equipment and know-how to the collaborators.).

<sup>47</sup> MARCEL BOGERS & JOEL WEST, CONTRASTING INNOVATION CREATION AND COMMERCIALIZATION WITHIN OPEN, USER AND CUMULATIVE INNOVATION 7–9 (2010), <http://dx.doi.org/10.2139/ssrn.1751025> (a working paper presented at the Academy of Management Meeting 2010).

<sup>48</sup> Keld Laursen & Ammon Salter, *Open for Innovation: The Role of Openness in Explaining Innovation Performance among U.K. Manufacturing Firms*, 27 STRATEGIC MGMT. J. 131, 134–135 (2006), <https://doi.org/10.1002/smj.507>.

<sup>49</sup> David J. Teece, *Profiting from Technological Innovation: Implications for Integration, Collaboration, Licensing and Public Policy*, 15 RES. POL'Y 285, 288–289 (1986), [https://doi.org/10.1016/0048-7333\(86\)90027-2](https://doi.org/10.1016/0048-7333(86)90027-2), [hereinafter, Teece, Profiting] (for innovators to receive profits from commercialization, they must have complementary assets).

<sup>50</sup> Patrick Cohendet & Julien Pénin, *Patents to Exclude vs. Include: Rethinking the Management of Intellectual Property Rights in a Knowledge-Based Economy*, 1 TECH. INNOVATION MGMT. REV. 12, 14 (2011), <http://www.beta-umr7522.fr/IMG/UserFiles/Penin/Cohendet%20Penin%20TIM%202011.pdf>; Deepak Hegde & Hong Luo, *Patent Publication and the Market for Ideas*, 64 MGMT. SCI. 652 (2018), <https://doi.org/10.1287/mnsc.2016.2622> (discussing the benefits of patent disclosure: the reduced information cost between sellers and buyers of technological information through the publication of an invention in a credible, standardized and centralized repository).

<sup>51</sup> Cohendet & Pénin, *supra* note 50, at 13. Colleen Chien, *Opening the Patent System: Diffusionary*

signaling effect is particularly important for technology startups seeking access to external funding.<sup>52</sup> Patents articulately describe technological information as property rights through patent claims, which reduce transaction costs for technology licensing or joint venture contracts.<sup>53</sup> Patents also reduce the risk of free-riders appropriating their inventions, encouraging innovators to engage in discussions about technological information with potential partners.<sup>54</sup> In short, patents play a variety of proactive roles in open innovation.

#### D. Increased Influence of New Innovators

In contrast to Chesbrough's producer-focused innovation model, Eric von Hippel, a professor at MIT Sloan School of Management, has advanced a model that focuses on the roles played by nontraditional innovators. Specifically, he identified the part that users and individuals play in the innovation process.<sup>55</sup> Von Hippel categorized firms and individual innovators in terms of their functional relationship with a given product by looking at how the innovators benefit from it.<sup>56</sup> Innovators are considered users if they benefit from using products or services, and are distinguishable from producers, whose benefit arises from making and selling the products or services.<sup>57</sup> Von Hippel found that individual users, not producers, account for much of the major product innovation in certain fields, including complex technologies such as semiconductors and printed board circuits.<sup>58</sup> In particular, individual users have made significant improvements to products in the software and household sectors, and are more willing to freely disclose their improvements without patent protection.<sup>59</sup>

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*Levers in Patent Law*, 89 S. CAL. L. REV. 793, 811 (2016), [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2624692](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2624692) [hereinafter Chien, Opening]; Jay Kesan, *Economic Rationales for the Patent System in Current Context*, 22 GEO. MASON L. R. 897, 911 (2015), <http://www.georgemasonlawreview.org/wp-content/uploads/2015/06/KesanEconomicRationales.pdf>.

<sup>52</sup> Joan Farre-Mensa et al., "What Is a Patent Worth? Evidence from the U.S. Patent 'Lottery,'" 75 J. FIN. 639–640 (2020), <https://doi.org/10.1111/jofi.12867>.

<sup>53</sup> Ashishi Arora et al., *Markets for Technology and their Implications for Corporate Strategy*, 10 INDUS. CORP. CHANGE, 419, 431 (2001), <https://doi.org/10.1093/icc/10.2.419>.

<sup>54</sup> Chien, Opening, *supra* note 51, at 835. Kenneth Arrow, *Economic Welfare and the Allocation of Resources for Invention*, in *THE RATE AND DIRECTION OF INVENTIVE ACTIVITY: ECONOMIC AND SOCIAL FACTORS* (H. M. Groves ed., 1962), <http://www.nber.org/chapters/c2144.pdf>; James J. Anton & Dennis A. Yao, *Expropriation and Inventions: Appropriable Rents in the Absence of Property Rights*, 84 AM. ECON. REV. 190, 190–191 (1994), <https://www.jstor.org/stable/2117978>; Bruno Biais & Enrico Perotti, *Entrepreneurs and New Ideas*, 39 RAND J. ECON. 1105, 1106 (2008), <https://doi.org/10.1111/j.1756-2171.2008.00052.x>.

<sup>55</sup> ERIC VON HIPPEL, *THE SOURCES OF INNOVATION 3* (1988), <https://ssrn.com/abstract=712763> [hereinafter VON HIPPEL, SOURCES]; ERIC VON HIPPEL, *DEMOCRATIZING INNOVATION 1* (2005), <http://web.mit.edu/evhippel/www/books/DI/DemoInn.pdf> [hereinafter VON HIPPEL, DEMOCRATIZING]; ERIC VON HIPPEL, *FREE INNOVATION 2* (2017), <https://mitpress.mit.edu/books/free-innovation> [hereinafter VON HIPPEL, FREE].

<sup>56</sup> VON HIPPEL, SOURCES, *supra* note 55, at 3.

<sup>57</sup> VON HIPPEL, DEMOCRATIZING, *supra* note 55, at 3.

<sup>58</sup> VON HIPPEL, SOURCES, *supra* note 55, at 43–57.

<sup>59</sup> VON HIPPEL, FREE, *supra* note 55, at 19–35.

The advent of modern computers and the internet has emphasized the importance of user innovation, enabling nontraditional innovators, such as individual computer programmers, to participate in the development of the OSS innovation model. The underlying idea of the OSS innovation model was born in the 1980s and was led by a programmer at MIT's AI Lab, Mr. Richard Stallman, who created a free operating system called "GNU."<sup>60</sup> Mr. Stallman created the concept of copyleft, the idea of using copyright licenses to keep source code for software open, thereby securing the freedom of any user to copy or modify the software.<sup>61</sup> His copyleft concept included the development of derivative works based on his original software, with the license requiring derivative works to be redistributed under the same conditions that governed the sharing of his original software.<sup>62</sup> In 1989, Mr. Stallman drafted and released the first version of the General Public License (GNU GPL), which included copyleft provisions that effectively prevented derivative works from making their way into proprietary software. Many programmers shared Mr. Stallman's philosophy, represented by the copyleft concept, and joined his effort to improve the GNU software, leading to the creation of the Free Software Foundation. However, some programmers preferred more flexible copyleft concepts and developed permissive licenses, such as the BSD and Apache licenses, allowing licensees to decide whether to share their derivative works.<sup>63</sup>

Open-source software was originally developed as the best example of a highly distributed open innovation model run by and for users without the involvement of commercial production firms.<sup>64</sup> Nowadays, commercial firms have increasingly become involved in the OSS innovation model by developing their businesses around various OSS projects.<sup>65</sup> Different groups of programmers from the OSS community

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<sup>60</sup> DAVID BRETTHAUER, *OPEN-SOURCE SOFTWARE: A HISTORY* 7 (2001); see HEATHER J. MEEKER, *THE OPEN-SOURCE ALTERNATIVE: UNDERSTANDING RISKS AND LEVERAGING OPPORTUNITIES* (2012) (a general discussion of Open-source Software Licensing); LAWRENCE ROSEN, *OPEN-SOURCE LICENSING: SOFTWARE FREEDOM AND INTELLECTUAL PROPERTY LAW* (2004).

<sup>61</sup> Robert W. Gomulkiewicz, *How Copyleft Uses License Rights to Succeed in the Open-source Software Revolution*, 36 HOUS. L. REV. 179, 181–182 (1999); Christopher S. Brown, *Copyleft, the Disguised Copyright: Why Legislative Reform is Superior to Copyleft Licenses*, 78 UMKC L. REV. 749, 761 (2010).

<sup>62</sup> Copyleft concepts can spread in proprietary software because any software combined with copyleft-licensed software is transformed to be distributed under a copyleft license. This extension of copyleft license to other software is called contamination. Heather Meeker, *Open source licensing: What every technologist should know*, OPENSOURCE.COM (September 21, 2017), <https://opensource.com/article/17/9/open-source-licensing>.

<sup>63</sup> See Greg R. Vetter, *Opportunistic Free and Open-source Software Development Pathways*, 30 HARV. J.L. & TECH. 167 *passim* (2017) (describing licenses which adopt more permissible approaches than the licenses including the copyleft concept).

<sup>64</sup> Eric von Hippel, *Innovation by User Communities: Learning from Open-Source Software*, 42 MIT SLOAN MGMT. REV. 82, 82 (2001); Eric von Hippel, *Horizontal Innovation Networks—By and For Users*, 16 INDUS. CORP. CHANGE 293, 294 (2006), [hereinafter von Hippel, *Horizontal*]; Greg R. Vetter, *The Collaborative Integrity of Open-Source Software*, 2004 UTAH L. REV. 563, 594–620 (2004).

<sup>65</sup> See David McGowan, *Legal Implications of Open-Source Software*, 2001 U. ILL. L. REV. 241, 284 (2001); Greg R. Vetter, *Commercial Free and Open-source Software: Knowledge Production, Hybrid Appropriability, and Patents*, 77 FORDHAM L. REV. 2087, 2123 (2009); Stephen M. Maurer,

engage in transaction-free interactions, often bound by GPL or GPL-inspired copyright licenses.<sup>66</sup> The copyleft concept has been influential in developing open patent licenses, as the intention of these licenses is to incentivize the OSS community's involvement in producer innovation projects, as exemplified by the licenses used by OIN to promote innovation on the Linux System.<sup>67</sup>

Many programmers who participate in OSS projects are individual users spread across the horizontal innovation network. Their connection through the internet allows them to take advantage of innovations developed by others and, in turn, to share their own innovations.<sup>68</sup> Although many technologies were developed by users in the pre-internet era,<sup>69</sup> these users were mainly commercial firms with access to vast R&D resources.<sup>70</sup> Due largely to the growing number of resources available via the internet, both individual users and consumers can independently or collaboratively participate in the innovative process across various technological fields.<sup>71</sup>

Commercial production firms began to recognize the OSS communities as great sources of innovation.<sup>72</sup> Working with user innovators increases efficiency, as commercial firms need the information on technical problems that users usually have in order to provide solutions and engage innovation.<sup>73</sup> Moreover, firms want to take advantage of free innovations developed by users.<sup>74</sup> OSS programmers, SMEs, and individual user innovators often disclose their innovations without attempting to obtain patents or other types of intellectual property, as the benefits of disclosing their innovations outweigh the potential benefits from either keeping them as trade secrets or obtaining patents and licensing them.<sup>75</sup>

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*The Penguin and the Cartel: Rethinking Antitrust and Innovation Policy for the Age of Commercial Open-source*, 2012 UTAH L. REV. 269, 269 (2012).

<sup>66</sup> Carliss Y. Baldwin, *Where Do Transactions Come From? Modularity, Transactions and the Boundaries of Firms*, 17 INDUS. CORP. CHANGE 155, 181 (2008).

<sup>67</sup> *About Us*, OIN, <https://www.openinventionnetwork.com/about-us/> (last visited Mar. 13, 2021).

<sup>68</sup> von Hippel, *Horizontal*, *supra* note 64, at 2.

<sup>69</sup> VON HIPPEL, *SOURCES*, *supra* note 55.

<sup>70</sup> David J. Teece, *Firm Organization, Industrial Structure, and Technological Innovation*, 31 J. ECON. BEHAV. ORG. 193, 196 (1996). [hereinafter, Teece, *Firm Organization*]

<sup>71</sup> Carliss Baldwin & Eric von Hippel, *Modeling a Paradigm Shift: From Producer Innovation to User and Open Collaborative Innovation*, 22 ORG. SCI. 1399, 1399 (2011); Eric von Hippel et al., *Comparing Business and Household Sector Innovation in Consumer Products: Findings from a Representative Survey in the United Kingdom*, 58 MGMT. SCI. 1669, 1669 (2012); Ruth Stock et al., *Impacts of Hedonic and Utilitarian User Motives on the Innovativeness of User-Developed Solutions*, 32 J. PROD. INNOVATION MGMT. 1, 7 (2014); Ruth Stock et al., *Impacts of Personality Traits on Consumer Innovation Success*, 45 RES. POL'Y 757, 757 (2016).

<sup>72</sup> See OIN, *supra* note 35 and accompanying text.

<sup>73</sup> Eric von Hippel, *"Sticky Information" and the Locus of Problem Solving: Implications for Innovation*, 40 MGMT. SCI. 429, 436–37 (1994).

<sup>74</sup> VON HIPPEL, *FREE*, *supra* note 55, at 19; Dietmar Harhoff et al., *Profiting from Voluntary Information Spillovers: How Users Benefit by Freely Revealing Their Innovations*, 32 RES. POL'Y 1753, 1753 (2003).

<sup>75</sup> See Baldwin & Von Hippel, *supra* note 71, at 1400-01. For empirical evidence on relative low licensing returns, C. T. TAYLOR & Z. A. SILBERSTON, *THE ECONOMIC IMPACT OF THE PATENT*

In working with users, commercial firms must be aware of users' unique motives for innovation. Users, in particular programmers in the OSS communities, enjoy noncommercial benefits, such as improved reputation among peers through the disclosure of publicly available source code,<sup>76</sup> as well as enhanced value and desirability in the job market.<sup>77</sup> Likewise, they are motivated by their own enjoyment of learning and creating, and often feel the need to give back to the community because they, too, have received source code for free.<sup>78</sup> Moreover, it is unlikely that such programmers would suffer from free-riders copying their source code.<sup>79</sup> Instead, individual programmers can benefit by distributing source code through free disclosure, rather than enforcing royalty-bearing licenses.<sup>80</sup>

Commercial production firms and individual users are aligned in their interest of using patents as inclusive rights to share technologies, ensuring the freedom to operate and innovate.<sup>81</sup> Commercial firms are willing to develop strong patent portfolios that protect individual users from aggressive patent assertions in exchange for access to free user innovations, although the risk of patent assertions against individual users is low due to these users' lack of funding.<sup>82</sup>

### III. Failures of Patent Theories

#### A. Incentive to Invent

##### 1. *The Incentive to Invent Theory Relies on Outdated Assumptions*

It is a well-established rule in the United States that patents are exclusive rights that give patent owners the ability to exclude others.<sup>83</sup> Utilitarianism is the dominant

SYSTEM: A STUDY OF THE BRITISH PATENT SYSTEM (1973); Charles W. L. Hill, *Strategies for Exploiting Technological Innovations – When and When Not to License*, 3 ORG. SCI., 428–441 (1992).

<sup>76</sup> ERIC S. RAYMOND, *THE CATHEDRAL & THE BAZAAR: MUSINGS ON LINUX AND OPEN-SOURCE BY AN ACCIDENTAL REVOLUTIONARY* 22 (1999).

<sup>77</sup> Josh Lerner & Jean Tirole, *Some Simple Economics of Open-source*, 50 J. INDUS. ECON. 197, 213 (2003).

<sup>78</sup> K. Lakhani & R. Wolf, *Why Hackers do What They Do; Understanding Motivation and Effort in Free/Open-source Software Projects*, in PERSPECTIVES ON FREE AND OPEN-SOURCE SOFTWARE 12 (J. Feller et al. eds., 2005); H. Baytiyeh & J. Pfaffman, *Open-source Software: A Community of Altruists*, 26 COMPUTERS IN HUM. BEHAV. 1345, 1346 (2010); GNU Operation System, *Motives for Writing Free Software*, <https://www.gnu.org/philosophy/fs-motives.en.html>.

<sup>79</sup> Lakhani & Wolf, *supra* note 78, at 15–16.

<sup>80</sup> Harhoff et al., *supra* note 74, at 7.

<sup>81</sup> With the rise of software related patents, OSS licenses began to include patent license provisions which implement the copyleft concept. Vetter, *Opportunistic*, *supra* note 65, at 187.

<sup>82</sup> A survey conducted on various sizes of companies indicated patent infringement assertions by nonpracticing entities concentrated on large companies. Mark A. Lemley et al., *The Patent Enforcement Iceberg*, 97 TEX. L. REV. 802, 810 (2019).

<sup>83</sup> *Oil States Energy Servs., LLC v. Greene's Energy Group, LLC*, 138 S. Ct. 1365, 1369 (2018) (the Supreme Court “recognizes patent rights as the ‘private property of the patentee.’”). See also Dan L. Burk & Mark A. Lemley, *Policy Levers in Patent Law*, 89 VA. L. REV. 1575, 1597–99 (2003) (“[C]ourts and commentators widely agree that the basic purpose of patent law is utilitarian[;] . . . [a]greement on basic utilitarian goals has not, however, translated into agreement on how

economic theory for rationalizing these exclusive rights.<sup>84</sup> The Copyright and Patent Clause of the U.S. Constitution supports this theory, granting exclusive rights “to promote the progress of science and the useful arts.”<sup>85</sup> U.S. courts and legal scholars have interpreted this clause to mean that Congress has adopted a utilitarian theory that incentivizes invention by rewarding inventors with exclusive rights.<sup>86</sup>

This inventor-centric reward theory was developed during the early stages of the industrial economy.<sup>87</sup> At the beginning of the industrial revolution, when the first federal patent act was enacted, inventors of pioneering inventions were awarded broad patent protections that covered their entire products and allowed them to exercise significant market power by being the exclusive seller of their patented products.<sup>88</sup> As intended by the founders of the U.S. patent system,<sup>89</sup> inventor-entrepreneurs could sell their products or services at supra-competitive prices during the temporary period of exclusivity, allowing them to recoup their development costs and enjoy profits.<sup>90</sup> This reward system was based on the traditional innova-

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to implement them.”).

<sup>84</sup> There are philosophical justifications based on natural rights theories, including the labor theory by John Locke, the personhood theory by George Hegel, and the functional theory by Immanuel Kant. ROBERT P. MERGES, *JUSTIFYING INTELLECTUAL PROPERTY* (2011) [hereinafter MERGES, *JUSTIFYING*]; ROBERT P. MERGES ET AL., *INTELLECTUAL PROPERTY IN THE NEW TECHNOLOGICAL AGE 2* (6th ed. 2012) [hereinafter MERGES, *NEW TECHNOLOGICAL AGE*]; Edwin C. Hettinger, *Justifying Intellectual Property*, 18 PHIL. PUB. AFF. 31, 47 (1989); Justin Hughes, *The Philosophy of Intellectual Property*, 77 GEO. L. J. 287 (1988); Tom G. Palmer, *Are Patents and Copyrights Morally Justified? The Philosophy of Property Rights and Ideal Objects*, 13 HARV. J.L. & PUB. POL’Y 817, 819–820 (1990).

<sup>85</sup> U.S. Const., art. I, § 8, cl. 8. Literature on the incentive theory published by U.S. economics and legal scholars is numerous. E.g., WILLIAM M. LANDES & RICHARD A. POSNER, *THE ECONOMIC STRUCTURE OF INTELLECTUAL PROPERTY LAW* 305 (2003); Jeanne C. Fromer, *Expressive Incentives in Intellectual Property*, 98 VA. L. REV. 1745, 1750–52 (2012); Mark A. Lemley, *Ex Ante Versus Ex Post Justifications for Intellectual Property*, 71 U. CHI. L. REV. 129, 129–30 (2004).

<sup>86</sup> E.g., *Mazer v. Stein*, 347 U.S. 201, 219 (1954) (“The economic philosophy behind the clause empowering Congress to grant patents and copyrights is the conviction that encouragement of individual effort by personal gain is the best way to advance public welfare through the talents of authors and inventors in ‘Science and useful Arts.’ Sacrificial days devoted to such creative activities deserve rewards commensurate with the services rendered.”); *Diamond v. Chakrabarty*, 447 U.S. 303, 307 (1980) (“The patent laws promote this progress by offering inventors exclusive rights for a limited period as an incentive for their inventiveness and research efforts. The authority of Congress is exercised in the hope that ‘[the] productive effort thereby fostered will have a positive effect on society through the introduction of new products and processes of manufacture into the economy, and the emanations by way of increased employment and better lives for our citizens.’”)

<sup>87</sup> See Takenaka, *supra* note 5, at 114 (providing more critiques of the traditional utilitarian theory).

<sup>88</sup> For example, the Wright brothers obtained patent claims that covered the entire aircraft, thus granting the firm monopoly power. Carl Zollmann, *Patent Rights in Aircraft*, 11 MARQ. L. REV. 216, 220 (1927), <http://scholarship.law.marquette.edu/mulr/vol11/iss4/4>.

<sup>89</sup> Jefferson’s letter to his daughter reveals his intent to encourage U.S. inventors to invent and commercialize those inventions through the patent system. See HENRY R. NOTHHAFT, *HENRY GREAT AGAIN: REVITALIZING AMERICA’S ENTREPRENEURIAL LEADERSHIP* 71 (2011); DAVID KLINE, *THE INTANGIBLE ADVANTAGE: UNDERSTANDING INTELLECTUAL PROPERTY IN THE NEW ECONOMY* 15 (2016), <https://documents.com/s-the-intangible-advantage.pdf>.

<sup>90</sup> For the basic economics of patent protection and reward, see FRANÇOIS LÉVÊQUE & YANN MÉNIÈRE, *THE ECONOMICS OF PATENTS AND COPYRIGHT* 1 (2004),

tion theory advanced by Joseph Schumpeter,<sup>91</sup> and presumes a closed innovation model. In this model, entrepreneurs invent, commercialize and market a new product during every stage of the value chain.<sup>92</sup>

This presumption no longer applies to the majority of commercial firms that deal with complex technologies in the post-internet era. With a patent thicket, patent owners are reluctant to use patents to exclude others because of the risk of infringement counter-assertions. Even for firms that are willing to assert patent infringement in order to exclude others, their chances of obtaining an injunction have been significantly reduced by the *eBay* decision.<sup>93</sup> The likelihood of obtaining an injunction is particularly small for patent owners in complex technologies, as infringing patents usually only cover a small component of the entire product, inclining US courts to deny injunctions.<sup>94</sup>

The incentive to invent theory does not apply to individual user innovators, who play an important role in open innovation. In many cases, these user innovators do not need, or may even dislike, the rewards provided by patent exclusivity.<sup>95</sup> Unlike production firms, which benefit from selling products and services, user innovators benefit by developing and improving products and services that they use. These benefits encourage individual users and commercial firms to disclose their inventions without patent protection, allowing others to freely use their inventions.<sup>96</sup> This sharing philosophy is particularly important for OSS programmers, who have already adapted the copyright framework as a tool for sharing software through the copyleft concept.<sup>97</sup> Thus, commercial firms that work with the programmers share patents through open patent licenses instead of using the patents to exclude others.

## 2. *Incentive to Share: Restructuring Patents as Inclusive Rights*

Because the incentive theory is based on the outdated assumption that exclu-

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<https://ssrn.com/abstract=642622>.

<sup>91</sup> JOSEPH A. SCHUMPETER, *THE THEORY OF ECONOMIC DEVELOPMENT: AN INQUIRY INTO PROFITS, CAPITAL, CREDIT, INTEREST, AND THE BUSINESS CYCLE* *passim* (1934).

<sup>92</sup> Teece, *Firm Organization*, *supra* note 70, at 198 (“The ‘Schumpeterian’ view of the innovation processes appears to be on that involves full integration, from research, development, manufacturing and marketing.”); See JOSEPH A. SCHUMPETER, *THE THEORY OF ECONOMIC DEVELOPMENT: AN INQUIRY INTO PROFITS, CAPITAL, CREDIT, INTEREST, AND THE BUSINESS CYCLE* *passim* (1934) (the Schumpeterian view).

<sup>93</sup> *eBay Inc. v. MercExchange, L.L.C.*, 547 U.S. 388, 395–397 (2006) (Kennedy, J., concurring) (describing the effects of the majority’s decision).

<sup>94</sup> *Id.* at 396 (“[W]hen the patented invention is but a small component of the product the companies seek to produce and the threat of an injunction is employed simply for undue leverage in negotiations, legal damages may well be sufficient to compensate for the infringement and an injunction may not serve the public interest.”); see Christopher Seaman, *Permanent Injunctions in Patent Litigation after eBay: An Empirical Study*, 101 IOWA L. REV. 1949, 1984 (2016), <https://ilr.law.uiowa.edu/assets/Uploads/ILR-101-5-Seaman.pdf> (providing an empirical study on permanent injunction after the *eBay* decision).

<sup>95</sup> Katherine J. Strandburg, *Users as Innovators: Implications for Patent Doctrine*, 79 U. COLO. L. REV. 467, 467 (2008), <https://ssrn.com/abstract=1141386>.

<sup>96</sup> VON HIPPEL, *SOURCES*, *supra* note 55, at 4-5, 19-35.

<sup>97</sup> See *supra* notes 61 and 62 and accompanying text (for the discussion of the copyleft concept).

sivity incentivizes innovation, it fails to rationalize patents in the majority of industry sectors in the post-internet era. Despite lacking the power to exclude others, firms continue to invent and file for patent protection.<sup>98</sup> To explain these activities, the incentive theory should be reevaluated in light of innovators' motives to patent inventions and the new uses of patents in complex technologies. This author proposed a new utilitarian theory, the "incentive to share", which focuses on the current motivations for firms' patenting activities. Namely, those patents incentivize firms to share their technologies and reward them with the freedom to operate and innovate on their inventions.<sup>99</sup> For patent owners that engage in open innovation, patents promote the progress of useful arts by including others in the innovation process.<sup>100</sup>

This new use of patents as inclusive rights goes against the definition of patents under the current U.S. Patent Act, which defines a patent as a negative right "to exclude others from making, using, offering for sale or selling the invention."<sup>101</sup> Such a clear definition may eliminate the room to interpret patents as granting inclusive rights to use and share inventions.<sup>102</sup> Under this exclusion regime, using licenses to use and share patented inventions is viewed as a privilege, instead of a legal entitlement.<sup>103</sup> As a result, the Patent Act does not provide any mechanism for navigating conflicts among patent owners in a way that would ensure the freedom to operate and innovate on their inventions. To fill the gap, patent owners in complex technologies have developed private ordering mechanisms through voluntary contracts to resolve conflicts.

However, early U.S. patent statutes defined patents as positive rights that allowed owners to use their inventions, which nineteenth-century courts interpreted as the right to use and dispose of inventions.<sup>104</sup> Adam Mossoff, a property theorist and professor at George Mason University's Antonin Scalia Law School, advances the interpretation that, based on a nineteenth-century court's interpretation comparing property and patent theory side-by-side, patents grant their owner a substantive right to use the patented invention and give licenses to others.<sup>105</sup> He follows a recent trend among property theorists, challenging the view that property, at its core, is the right to exclude others.<sup>106</sup> Mossoff views property, including intellectual property,

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<sup>98</sup> The number of patent applications filed with USPTO has been steadily increasing. WORLD INTELLECTUAL PROPERTY ORGANIZATION (WIPO), WORLD INTELLECTUAL PROPERTY INDICATORS 2019 26 (2018), [https://www.wipo.int/edocs/pubdocs/en/wipo\\_pub\\_941\\_2018.pdf](https://www.wipo.int/edocs/pubdocs/en/wipo_pub_941_2018.pdf)

<sup>99</sup> Takenaka, *supra* note 5, at 123.

<sup>100</sup> Pénin & Neicu *supra* note, 44, at 58.

<sup>101</sup> 35 U.S.C. § 154(a).

<sup>102</sup> Adam Mossoff, *Exclusion and Exclusive Use in Patent Law*, 22 HARV. J.L. & TECH. 321, 340 (2008), <https://ssrn.com/abstract=1239182> ("[I]n fact, scholars and courts typically cite § 154 in their various restatements of the exclusion concept of patents. Such clear statutory language seems to leave no room for ambiguity as to the legal entitlement secured by a patent—the right to exclude, nothing more, nothing less.") [hereinafter, Mossoff, Exclusion].

<sup>103</sup> *Id.* at 364.

<sup>104</sup> *Id.* at 344.

<sup>105</sup> *Id.* at 325–26.

<sup>106</sup> Daniel B. Klein & John Robinson, *Property: A Bundle of Rights? Prologue to the Property Symposium*, 8 ECON J. WATCH 8, 193 (2011), <https://econjwatch.org/articles/property-a-bundle-of->

as use rights in a tangible or intangible thing.<sup>107</sup> In his view, fundamental use rights include the rights of acquiring, using and deposing possession of a thing, and that the right to exclude is a secondary right derived from fundamental rights.<sup>108</sup>

Other theorists view property as more substantial than a negative right solely used to exclude others. Larissa Katz, a property theorist at the University of Toronto, advances a view that property grants owners an agenda-setting authority, allowing for the exclusion of others in order to harmonize their interests with the agenda set by the owner.<sup>109</sup> These theorists distinguish an exclusive right to use from a right to exclude, and urge lawyers and judges to reevaluate the concept of property, as any difference between the two distinctive rights significantly impact the definition and application of the current legal rules concerning property.<sup>110</sup>

It is helpful to examine how the Patent Acts of TRIPS member states define patent rights, as the U.S. and other member states are under the same obligation to meet minimum standards for IP protection.<sup>111</sup> Like the U.S. Patent Act, TRIPS defines rights conferred to patent owners as exclusive rights.<sup>112</sup> The provision of the U.S. Patent Act that defines what a patent is was revised in 1994 to meet TRIPS obligations.<sup>113</sup> In contrast to the definitions in TRIPS and the U.S. Patent Act, patent systems in many European and Asian countries, including Japan and Germany, define a patent as an exclusive right to use the patented invention as opposed to merely a negative right to exclude others. Both the German and Japanese Patent Acts (“the Acts”) clearly state that patents give the patent owner a right to practice the patented invention.<sup>114</sup> The Acts also give a patent owner the right to exclude others from using the patented invention, as the patent owner has the exclusive right to practice the invention.<sup>115</sup>

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rights-prologue-to-the-property-symposium.

<sup>107</sup> Adam Mossoff, *What is Property? Putting the Pieces Back Together*, 45 ARIZ. L. REV. 371 (2003), <https://ssrn.com/abstract=438780> [hereinafter, Mossoff, *What is Property?*].

<sup>108</sup> *Id.*, at 390.

<sup>109</sup> Larissa Katz, *The Regulatory Function of Property Rights*, 8 ECON J. WATCH, 236, 237 (2011), [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1957115](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1957115); Larissa M. Katz, *Exclusion and Exclusivity in Property Law*, 58 U. Toronto L.J. 275, 277–78 (2008), <http://dx.doi.org/10.3138/utlj.58.3.275>.

<sup>110</sup> *E.g.*, Mossoff, *What is Property?*, *supra* note 107, at 377.

<sup>111</sup> TRIPS: Agreement on Trade-Related Aspects of Intellectual Property Rights art. 31(i), Apr. 15, 1994, 1869 U.N.T.S. 299, 33 I.L.M. 1197.

<sup>112</sup> *Id.* at art. 28.

<sup>113</sup> Karen Tripp & Linda Stokley, *Changes in U.S. Patent Law Effected by the Uruguay Round Agreements Act—The GATT Implementation Legislation*, 3 Tex. Intell. Prop. L. J. 315, 315 (1995).

<sup>114</sup> Patentgesetz [PatG] [German Patent Act], Dec. 16, 1980, BGBL I at 1, § 9, last amended by Gesetz [G], Oct. 8, 2017, BGBL I at 3546, art. 4 (Ger.) (“The patent shall have the effect that the proprietor of the patent alone shall be entitled to use the patented invention within the scope of the law in force.”); *see* PATENT LAW: A HANDBOOK ON EUROPEAN AND GERMAN PATENT LAW 733 (M. W. Haedicke & H. Timmann eds., 2014) (for the positive right to use a patented invention); Tokkyohō [Japanese Patent Act], Act No. 121 of 1959, art. 68, [http://www.wipo.int/wipolex/en/text.jsp?file\\_id=188310#LinkTarget\\_1442](http://www.wipo.int/wipolex/en/text.jsp?file_id=188310#LinkTarget_1442) (Japan) (“A patentee shall have the exclusive right to work the patented invention as a business.”).

<sup>115</sup> Patentgesetz § 9; Tokkyohō art. 68.

The Japanese Patent Act expressly allows patent owners to grant exclusive or nonexclusive licenses to practice their patented inventions.<sup>116</sup> The German Patent Act permits any rights derived from the patent to be transferred, and expressly allows patent licenses, as evidenced by the ability of patent owners and licensees to register exclusive licenses.<sup>117</sup> These countries define patent rights positively and affirmatively, with the view that patents are two-sided property rights—one side to exclude others (exclusive side) and the other side to practice the patented invention and include others using licenses (inclusive side), in parallel to all other types of property rights under the German and Japanese legal systems.<sup>118</sup>

In guaranteeing the right to use an invention, the German and Japanese Patent Acts provide compulsory licenses for blocking patents.<sup>119</sup> In Germany, patent owners of follow-on inventions can file an action with the Federal Patent Court to request a compulsory license.<sup>120</sup> In Japan, if a request is filed with the Japan Patent Office (JPO), the commissioner should grant a license.<sup>121</sup> Many patent systems in Europe and Asia acknowledge patent owners' positive interests in their inventions and incorporate a mechanism for coordinating the conflicting ownership interests of overlapping patents, ensuring these patent owners the freedom to operate and innovate.<sup>122</sup>

European scholars advanced new views of patents as property rights; such views allow patents restructured as inclusive rights, leading to new uses of patents, by focusing on the incentive to share technologies through licenses.<sup>123</sup> An extreme example of such a view seeks to completely strip patents' rights to exclude, leaving only the right to include through licensing.<sup>124</sup> These proposals provide a helpful

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<sup>116</sup> Tokkyohō arts. 77 and 78.

<sup>117</sup> Patentgesetz [German Patent Act] § 15.

<sup>118</sup> Geertrui Van Overwalle, *Inventing Inclusive Patents. From Old to New Open Innovation*, in KRITIKA: ESSAYS ON INTELLECTUAL PROPERTY, 206, 235–36 (P. Drahos et al. ed., 2015).

<sup>119</sup> Patentgesetz § 24; Tokkyohō arts. 72 and 92. See also Robert Merges, *Intellectual Property Rights and Bargaining Breakdown: The Case of Blocking Patents*, 62 TENN. L. REV. 75, 104 (1994) [hereinafter, Merges, *Bargaining*].

<sup>120</sup> Patentgesetz § 24(1)

<sup>121</sup> Tokkyohō art. 92(3).

<sup>122</sup> EUROPEAN PATENT ACADEMY, COMPULSORY LICENSING IN EUROPE: A COUNTRY-BY-COUNTRY OVERVIEW 3 (2018), [www.epo.org/compulsory-licensing](http://www.epo.org/compulsory-licensing); Vikas Asawat, *Existing Provisions on Compulsory Licensing in Countries of Asia-Pacific*, SSRN (Dec. 29, 2012), [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2194321](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2194321).

<sup>123</sup> Van Overwalle, *supra* note 118, at 234–36; Séverine Dusollier, *The Commons As a Reverse Intellectual Property: From Exclusivity to Inclusivity*, in CONCEPTS OF PROPERTY IN INTELLECTUAL PROPERTY LAW 258, 267–70 (H. Howe & J. Griffiths eds., 2013) [hereinafter Dusollier, *Commons*]; Séverine Dusollier, *Inclusivity in Intellectual Property*, in INTELLECTUAL PROPERTY AND GENERAL LEGAL PRINCIPLES – IS IP A LEX SPECIALIS? 101, 116–17 (G. Dinwoodie ed., 2015) [hereinafter Dusollier, *Inclusivity in Property*].

<sup>124</sup> Van Overwalle, *supra* note 118, at 30. See also Geertrui Van Overwalle, *Turning Patent Swords into Shares*, 330 SCIENCE 1630 (2010), <http://doi.org/10.1126/science.1189592>; Geertrui Van Overwalle, *Smart Innovation and Inclusive Patents for Sustainable Food and Health Care: Redefining the Europe 2020 Objectives*, in CONSTRUCTING EUROPEAN INTELLECTUAL PROPERTY: ACHIEVEMENTS AND NEW PERSPECTIVES 231 (C. Geiger ed., 2013),

guideline for restructuring U.S. patents, but, in applying the incentive to share theory, the right to exclude others should remain, as it will facilitate collaboration by encouraging patent owners to share their inventions through cross-licenses or non-assertion pledges.<sup>125</sup> Instead, U.S. patents should be restructured as inclusive rights, ensuring patent owners the right to practice their patented inventions through compulsory licenses, which is not currently possible, as present-day U.S. patent rights only grant a right to exclude.<sup>126</sup>

U.S. scholars frequently cite blocking patents as evidence that patents only provide a negative right to exclude.<sup>127</sup> The U.S. system's lack of compulsory licenses for blocking patents is predicated on the assumption that patent owners of prior and follow-on inventions should be able to reach agreements that are mutually beneficial.<sup>128</sup> Such bargaining can only occur if the follow-on invention adds significant value to the prior invention and will lead to a sufficient profit for the owner of the prior invention. To guarantee a fair bargain for both parties, TRIPS requires that follow-on inventions involve an important technical advance of considerable economic significance in comparison with the advances of the prior invention.<sup>129</sup> Thus, the patent owner of a follow-on invention should have bargaining leverage through her patent exclusivity, even if she is unable to practice the follow-on invention without a license from the pioneer patent owner.<sup>130</sup> In addition, high litigation and royalty calculation costs encourage both patent owners to reach an agreement with a royalty-free cross license.

However, under the standard economic theory, such an assumption does not apply to a bargain between Patent Assertion Entities (PAE), firms that primarily acquire patents and generate revenue by asserting them against accused infringers rather than practicing the patents,<sup>131</sup> and a follow-on patent owner who practices their patents. Regardless of the economic significance of follow-on inventions, PAEs would not be interested in royalty-free cross-licensing or any discount in royalty rates. The failure of prior and follow-on patent owners to reach a cross-licensing agreement has the potential to significantly delay commercialization of new technologies and create significant losses in general welfare.<sup>132</sup>

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<https://ssrn.com/abstract=2409250>.

<sup>125</sup> Pénin & Neicu *supra* note 44, at 61.

<sup>126</sup> In a recent paper, the author has proposed to introduce a compulsory license in the current patent system so that the inclusive and exclusive sides of U.S. patents should be balanced. Takenaka, *supra* note 5, at 134–37.

<sup>127</sup> Mossoff, *Exclusion*, *supra* note 102, at 330. *E.g.*, 5 DONALD S. CHISUM, CHISUM ON PATENTS § 16.02[1] (2020).

<sup>128</sup> Merges, *Bargaining*, *supra* note 119, at 78.

<sup>129</sup> TRIPS, art. 31(1)(i). Almost all UN member states including the U.S., the EU member states and Japan are signatories of TRIPS and are under obligations to meet the minimum standard for IP protection set forth in TRIPS.

<sup>130</sup> Robert P. Merges & Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 COLUM. L. REV. 839, 862 (1990).

<sup>131</sup> See Federal Trade Commission (FTC), PATENT ASSERTION ENTITY ACTIVITY: AN FTC STUDY 7 (2016)

<sup>132</sup> See *id.* at 24, 87–88.

Shifting our understanding of patents towards inclusive rights should result in rules that favor patent owners who practice their inventions and provide products and services in the market.<sup>133</sup> Combined with private ordering mechanisms, a new understanding of patent rights will allow patent owners in complex technologies to share their patented inventions, ensuring their freedom to operate and innovate on patented inventions. Unfortunately, such understanding is irrelevant to PAEs. Because the retooling does not incentivize PAEs to share their inventions, the U.S. should learn from Germany and Japan and adopt new legal mechanisms to coordinate patent owners' shared exclusive rights to practice their inventions, like the shared use rights in tangible subject matter.<sup>134</sup>

## B. Incentive to Disclose

### 1. *Disclosures Without Patent Incentive*

Since the beginning of U.S. patent case law, the Supreme Court has used the incentive to disclose theory to rationalize the patent system.<sup>135</sup> In a recent decision where the Court justified trade secret protection, they also reaffirmed their endorsement of the incentive to disclose theory based on their interpretation of the constitution.<sup>136</sup> Economists endorse the theory based on the perceived benefits of disclosure over concealment of inventions, arguing that disseminating information about an invention enables others to improve upon that invention.<sup>137</sup> This dissemination prevents redundant investments into developing the same invention, and encourages inventors to employ new solutions in order to design around the disclosed invention.<sup>138</sup> This emphasis on the dissemination of information has a strong relation to the copyleft concept shared by programmers in the OSS communities.<sup>139</sup> Moreover, once a patent expires, the public will have full access to freely practice the invention.<sup>140</sup>

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<sup>133</sup> In contrast, understanding patents as exclusive rights only favors PAEs and encouraged their aggressive patent assertion. See Takenaka, *supra* note 5, at 133.

<sup>134</sup> See Mossoff, *Exclusion*, *supra* note 102, at 333.

<sup>135</sup> *Pennock v. Dialogue*, 27 U.S. 1, 19 (1829). The patent system's main purpose is to promote the progress of useful art "by giving the public at large a right to make, construct, use, and vend the thing invented, at as early a period as possible."

<sup>136</sup> *Kewanee Oil Co. v. Bicron Corp.*, 416 U.S. 470, 480–81 (1974). For more U.S. Supreme Court cases citing the disclosure policy, see Lisa Larrimore Ouellette, *Do Patents Disclose Useful Information*, 25 HARV. J.L. & TECH. 545, 557 n.63 (2012)

<sup>137</sup> Corinne Langinier & GianCarlo Moschini, *The Economics of Patents: An Overview* 9 (Ctr. for Agric. Rural Dev. (CARD), Working Papers 335, 2002), [http://lib.dr.iastate.edu/card\\_workingpapers/335](http://lib.dr.iastate.edu/card_workingpapers/335). See also Benjamin N. Roin, *The Disclosure Function of the Patent System (or Lack Thereof)*, 118 HARV. L. REV. 2007, 2014–17 (2005); Vincenzo Denicolò & Luigi A. Franzoni, *The Contract Theory of Patents*, 23 INT'L REV. L. & ECON. 365, 365–66 (2004).

<sup>138</sup> Langinier & Moschini, *supra* note 137, at 5. Some scholars argue that duplicative researches are not necessarily wasteful. Robert K. Merton, *The Matthew Effect in Science*, 159 SCIENCE 56, 60 (1968).

<sup>139</sup> For copyleft concept, see *supra* note 62 and accompanying text.

<sup>140</sup> Robert P. Merges, *Commercial Success and Patent Standards: Economic Perspectives on Innovation*, 76 CAL. L. REV. 803, 808 (1988).

In spite of U.S. Courts' emphasis on the benefits of patent disclosures, many economists have been skeptical about the incentive to disclose theory.<sup>141</sup> A classic argument is that inventions will eventually be revealed without the need to grant a patent, as it is difficult to keep an invention secret for long or because another inventor will independently invent and disclose the same invention.<sup>142</sup> Some argue that inventors will conceal their inventions, regardless of whether they are granted a patent, if they believe concealment would be more profitable than a patent grant.<sup>143</sup> This view is supported by empirical evidence that shows firms view secrecy and lead time as more important than patent protection for innovations.<sup>144</sup>

The incentive to disclose is based on the outdated assumptions that products and services are developed in the closed innovation system, concealment incurs little to no cost, and disclosure causes harm and has no benefits. Although there is no initial cost for securing trade secret protection, and no registration is necessary, maintaining and enforcing trade secrets can be very costly.<sup>145</sup> Trade secret protection is traditionally tied to economic value from concealment.<sup>146</sup> It is likely that concealment costs exceed profits from concealment, as maintenance costs increased significantly when commercial firms shifted from the closed to open innovation model. These firms also benefit from disclosing their inventions, regardless of patent protection, as disclosure prevents others from obtaining a patent on the published inventions and provides the benefits of promoting open innovation by helping to identify collaborators.<sup>147</sup> Thus, firms frequently disclose their inventions through a defensive publication mechanism, outside the patent system, by entering the inventions into the public domain when the disclosure benefits exceed those from concealment or obtaining a patent.<sup>148</sup> For firms who engage in open innovation, the benefits of using patents proactively likely exceed the cost of concealment.<sup>149</sup>

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<sup>141</sup> E.g., Ted M. Sichelman, *Commercializing Patents*, 62 STAN. L. REV. 341, 378–80 (2010).

<sup>142</sup> Fritz Machlup & Edith Penrose, *The Patent Controversy in the Nineteenth Century*, 10 J. ECON. HIST. 1, 26 (1950).

<sup>143</sup> David Friedman et al., *Some Economics of Trade Secret Law*, 5 J. ECON. PERSP. 61, 63 (1991).

<sup>144</sup> Richard C. Levin et al., *Appropriating the Returns from Industrial Research and Development*, 18 BROOKINGS PAPERS ON ECON. ACTIVITY 783, 796 (1987); Cohen et al., *supra* note 27, at 9–10; Edwin Mansfield, *Patents and Innovation: An Empirical Study*, 32 MGMT. SCI. 173, 174 (1986); Ouellette, *supra* note 136, at 555 (reviewing these studies and other studies conducted on small firms and firms outside the U.S.).

<sup>145</sup> DONALD A. DEGNAN & JOSEPH T. JAROS, THE PRESENT VALUE OF TRADE SECRET PROTECTION: DO THE COSTS OUTWEIGH THE BENEFITS? 2–3, 4–5, 6 (2004).

<sup>146</sup> To be qualified as a trade secret, information must derive independent economic value, actual or potential, from concealment. Uniform Trade Secret Act § 1, 14 U.L.A. 529–695 (2005). TRIPS also requires commercial value from concealment. TRIPS, *supra* note 111, at Art. 39(2)(a).

<sup>147</sup> Pénin & Neicu, *supra* note 44, at 61.

<sup>148</sup> E.g., IBM revealed information about its innovation on copper interconnect technology to encourage commercialization of semiconductor manufacture process. Harhoff et al., *supra* note 74, at 1757; see also Kwanghui Lim, *The Many Faces of Absorptive Capacity: Spillovers of Copper Interconnect technology for Semiconductor Chip*, 18 INDUS. CORP. CHANGE 1249, 1259 (2009).

<sup>149</sup> For discussions of using patent proactively for promoting open innovation, see text accompanying *supra* notes 46 to 50 and accompanying text. Exclusivity of patents can be used for introducing technical ideas into and licensing improved ideas out of the corporate boundary. See Pénin &

Individual innovators are often more willing to enter their inventions into the public domain through nonpatent disclosure mechanisms for non-commercial reasons.<sup>150</sup> However, due to the costs of preparing disclosures for their inventions, innovators who work individually are less likely to disclose their inventions than innovators who work collaboratively with others, such as those in the OSS communities.<sup>151</sup> No available mechanism reduces the initial disclosure cost for innovators.<sup>152</sup> In short, the incentive to disclose theory does not apply to individual innovators, who are willing to disclose their inventions without any incentive, and to many firms that engage in open innovation. The current patent system fails to promote the progress of useful arts through the dissemination of information by failing to provide a disclosure mechanism for many innovators who are willing to disclose their inventions.

Moreover, because it is expensive to file a patent with the USPTO, firms often use nonpatent defensive publication mechanisms to disclose their inventions, resulting in high search costs for innovators looking to find technical information, as the innovators need to search a variety of disclosure sources. The high costs of prosecuting and enforcing patents is a significant hurdle for innovators with limited financial resources, often preventing them from taking advantage of the current patent system.<sup>153</sup> The U.S. Patent Office gives a discount to innovators that qualify as a small entity or micro entity.<sup>154</sup> When using the patent system as a defensive publication mechanism, a small entity must pay a total fee of \$910 (\$455 for a micro entity) to file a non-provisional utility patent application electronically. A basic filing fee of \$160 (\$80) must be accompanied by a utility patent search fee of \$350 (\$175) and an examination fee of \$400 (\$200).<sup>155</sup> Under the current patent regime, patent attorneys prepare the majority of patent applications with the expectation of enforcement after issuance, except for provisional patent applications.<sup>156</sup> The USPTO patent filing guide describes a patent application as a complex legal document, and encourages inventors to seek assistance from a trained person to prepare the appli-

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Neicu *supra* note 44, at 61.

<sup>150</sup> Nicole Ziegler et al., *Why Do Firms Give Away Their Patents for Free?* 37 WORLD PATENT INFO. 19, 19 (2014); VON HIPPEL, *SOURCES*, *supra* note 55, at 26.

<sup>151</sup> Jeroen P.J. de Jong et.al, *Market Failure in the Diffusion of Consumer-Developed Innovations: Patterns in Finland*, 44 RES. POL'Y 1856, 1856–1858 (2015), <https://www.sciencedirect.com/science/article/pii/S0048733315001122>.

<sup>152</sup> See VON HIPPEL, *FREE*, *supra* note 55, at 435 (urging policy makers to create an affordable mechanism for user innovation diffusion).

<sup>153</sup> Rebecca S. Eisenberg, *Patent Costs and Unlicensed Use of Patented Invention*, U. CHI. L. REV. 53, 56 (2011) (“Costs faced by patent applicants and owners tend to restrict the effective reach of the patent system, creating a gap between what is patentable and the effective assertion of patent rights.”).

<sup>154</sup> USPTO, MPEP at Ch. 0500 § 509.02 (9th ed. rev. Jan. 2018).

<sup>155</sup> *USPTO Fee Schedule*, USPTO (effective January 2, 2021), [https://www.uspto.gov/learning-and-resources/fees-and-payment/uspto-fee-schedule#Patent Exam Fee. Filing a non-provisional application is \\$140 \(\\$70\) but will not be published unless the application is converted to a non-provisional application within one year from the filing date. 35 U.S.C. §111\(b\)\(5\).](https://www.uspto.gov/learning-and-resources/fees-and-payment/uspto-fee-schedule#Patent Exam Fee. Filing a non-provisional application is $140 ($70) but will not be published unless the application is converted to a non-provisional application within one year from the filing date. 35 U.S.C. §111(b)(5).)

<sup>156</sup> 35 U.S.C. § 111(b).

cation.<sup>157</sup> An attorney will usually charge \$7,000 to prepare an original application.<sup>158</sup>

Even many large commercial firms have found the current patent system unaffordable and have reduced their investments in obtaining and enforcing patents.<sup>159</sup> In *Alice Corp. v. CLS Bank Int'l*,<sup>160</sup> the Supreme Court adopted a new standard for patent eligibility, which lower courts and the USPTO began applying retroactively to patents that had been examined and issued under the old, more lenient, standard. Industry leaders and academics extensively criticize the standard as being “vague, subjective and unpredictable.”<sup>161</sup> Under the new standard, the cost of securing patents in the ICT sector has soared. Applications claiming software related inventions are frequently rejected for lack of eligibility due to the difficulty of applying the new standard, causing attorneys to spend significant time overcoming the rejections.<sup>162</sup> The retroactive application of the new standard has made the USPTO’s efforts in examining patent applications under the old standard a waste. A substantial portion of the USPTO’s current efforts under the new standard will be wasted, as it is likely that many patents in the ICT sector will not be enforced unless patent owners are charged with infringement.

The scope of claims from applications that manage to overcome rejections are likely limited to only cover algorithms disclosed in the specification, as such claims are frequently found to describe the invention by functional terms. An element in a claim for combination expressed in the functional language, without sufficient structural limitation, is construed to cover the disclosed structure that performs the recited function in the claim element and the equivalents of the disclosed structure.<sup>163</sup> For software patents where the recited function is performed by a special purpose computer, the structure is an algorithm.<sup>164</sup> The scope is so narrow that com-

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<sup>157</sup> *A Guide to Filing a Utility Patent Application: Introduction*, USPTO (January 2014), <https://www.uspto.gov/patents-getting-started/patent-basics/types-patent-applications/nonprovisional-utility-patent>.

<sup>158</sup> AMERICAN INTELLECTUAL PROPERTY LAW ASSOCIATION (AIPPLA), 2017 REPORT OF THE ECONOMIC SURVEY 30 (2017), <https://www.aippla.org/detail/journal-issue/economic-survey-2017>.

<sup>159</sup> Jonathan Barnett, *Property as Process: How Innovation Markets Select Innovation Regimes*, 119 YALE L. J., 384, 395–396 (2009).

<sup>160</sup> 573 U.S. 208. The Supreme Court requires something more or significantly more than a patent upon the ineligible subject matter or an inventive concept sufficient to make patent ineligible subject matter eligible. This something more standard is extensively criticized.

<sup>161</sup> CONG. RESEARCH SERV., PATENT ELIGIBLE SUBJECT MATTER REFORM IN THE 116TH CONGRESS, 20 (Sept. 17, 2019), <https://fas.org/sgp/crs/misc/R45918.pdf>.

<sup>162</sup> Samuel Hayim & Kate Gaudry, *Eligibility Rejections are Appearing in Greater Frequency Across all Computer Related Technology Centers*, IPWATCHDOG (May 24, 2018), <http://www.ipwatchdog.com/2018/05/24/eligibility-rejections-greater-frequency-uspto/id=97615/>; Mark Summerfield, *New USPTO Data Set Reveals Extent of Patent-Eligibility Confusion and Carnage*, PATENTOLOGY (Dec. 4, 2017), <https://blog.patentology.com.au/2017/12/new-uspto-data-set-reveals-extent-of.html>.

<sup>163</sup> 35 U.S.C. § 112(f); *Williamson v. Citrix Online LLC*, 792 F.3d 1339, 1347 (Fed. Cir. 2015) (en banc).

<sup>164</sup> *Williamson v. Citrix Online LLC*, 792 F.3d at 1352 (Fed. Cir. 2015); *Aristocrat Techs. Austl. Pty Ltd. v. Int'l Game Tech.*, 521 F.3d 1328, 1333 (Fed. Cir. 2008); *WMS Gaming, Inc. v. Int'l Game*

petitors can easily circumvent the patent by adopting a different algorithm that performs the same function.<sup>165</sup> As a result, many commercial firms resort to non-patent defensive publication mechanisms as an intellectual property strategy.<sup>166</sup>

In contrast, patent systems outside the United States provide a disclosure mechanism that is much more affordable than the one used in the United States. In patent systems in Europe and Asia, applications are much less expensive than in the United States because application fees do not include an examination fee, as patent offices do not examine applications unless applicants file a request for examination. For example, the German Patent Office only charges 40 Euros for filing a patent application online, and 30 Euros for filing a utility model application.<sup>167</sup> The content of the application will be published 18 months from the filing date, or earlier with the applicant's request.<sup>168</sup> German firms frequently use the patent system for defensive publication because of the low costs of national patent applications.<sup>169</sup> U.S. firms are disadvantaged and face a barrier to filing defensive publications in affordable foreign patent systems, as these systems do not publish an application unless a translation in their language is filed.<sup>170</sup>

## 2. *Quality of Patent Disclosure for Open Innovation*

The incentive to disclose theory does not apply to innovators that benefit from disclosing their inventions. Moreover, their choice to disclose their inventions through nonpatent defensive publication mechanisms evidences that the current U.S. patent system is not serving these innovators. The quality of patent disclosure information is much better for promoting innovation than nonpatent disclosure information, when evaluated under the following key conditions: (1) readiness to search the information; (2) readiness to understand the information; and (3) readiness to find stakeholders in the information.<sup>171</sup> First, patent disclosures are maintained by an easy-to-use database with well-established classifications, free of charge. Thus, innovators are able to find relevant technical information with minimal cost. Information in patent disclosures is arguably easier to understand than information from unregulated nonpatent disclosure mechanisms, as the information in patent disclosures is codified in a format that allows any person skilled in the art of

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Tech., 184 F.3d 1339, 1348 (Fed. Cir. 1999).

<sup>165</sup> *Enfish, LLC v. Microsoft Corp.*, 822 F.3d 1327, 1346 (Fed. Cir. 2016) (The patent owner's claims survived the defendant's eligibility-based validity challenge but were found not infringing because the defendant adopted an algorithm different from the algorithm disclosed in the specification of the asserted patent.)

<sup>166</sup> See generally Schultz & Urban, *supra* note 32. Joachim Henkel & Stefanie M. Lernbecher (né Pangerl), *Defensive Publishing—An Empirical Study* (May 2008).

<sup>167</sup> *Patent Fees*, GERMAN PATENT AND TRADE MARK OFFICE, <https://www.dpma.de/english/services/fees/patents/index.html> (last visited Mar. 13, 2021).

<sup>168</sup> Patentgesetz, *supra* note 114, § 32.

<sup>169</sup> Henkel & Lernbecher (né Pangerl), *supra* note 166, at 14–15.

<sup>170</sup> For example, German Patent and Trademark Office receives an application in English but a German translation must be filed within 15 months from filing. With such filing, an application is deemed abandoned and thus will not be published. Patentgesetz, *supra* note 114, § 35a.

<sup>171</sup> Pénin & Neicu *supra* note 44, at 61.

the invention to make and use the disclosed invention.<sup>172</sup> In other words, information in patent documents is codified through standardized terminology, minimizing the knowledge-transfer costs, and maintained in easily accessible and searchable online databases, minimizing search costs.<sup>173</sup> A full record of stakeholders, such as the inventor and assignee–applicant, is available from the patent office, enabling innovators to directly approach the stakeholders in order to collaborate.<sup>174</sup>

Patent disclosure information is particularly important for US innovators, as inventions in many papers and articles published in foreign languages are published in English when they are filed with USPTO, which exclusively receives patent applications in English.<sup>175</sup> Patent disclosures in a collection are valuable as sources for data mining, making them more important than the information in individual disclosures for understanding the current status and future direction of a technology sector.<sup>176</sup> In the 1960s, the Japanese industry developed the patent map analysis method of securing patents by avoiding prior patents held by U.S. and European industries.<sup>177</sup> The JPO has been instrumental in encouraging Japanese researchers, in both the public and private sectors, to obtain patent information using patent map analyses, and in spreading patent map analysis to researchers in developing countries—these researchers use it for various purposes, including selecting research topics, learning what competitors are doing, and understanding market needs.<sup>178</sup> Because developing a patent map requires expert knowledge, in both the technology sector and patent law, JPO uses patent map analyses to develop and publish annual reports

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<sup>172</sup> 35 U.S.C. § 112(a).

<sup>173</sup> Dan Burk, *The Role of Patent Law in Knowledge Codification*, 23 BERKELEY TECH. L.J. 1009, 1020 (2008), <http://scholarship.law.berkeley.edu/btlj/vol23/iss3/2>. The USPTO maintains a database for published patents and patent applications, <https://www.uspto.gov/patents-application-process/search-patents>. The European Patent Office’s database covers published patents and patent applications worldwide, <https://www.epo.org/searching-for-patents.html>.

<sup>174</sup> Under the current U.S. system, it is often difficult to find stakeholders once a patent is issued. COLLEEN CHIEN, *THE WHO OWNS WHAT PROBLEM IN PATENT LAW 2* (2012), <http://digitalcommons.law.scu.edu/facpubs/190> (Santa Clara Univ. Legal Studies Research Paper No. 03-12).

<sup>175</sup> For people who only speak English, patent disclosures are important source of information which was originally published in other language such as German or Japanese. Moreover, 80% of the information in patents is not available elsewhere. ANTHONY TRIPPE, *GUIDELINES FOR PREPARING PATENT LANDSCAPE REPORTS 8* (2015), [http://www.wipo.int/edocs/pubdocs/en/wipo\\_pub\\_946.pdf](http://www.wipo.int/edocs/pubdocs/en/wipo_pub_946.pdf); see also ESTEBAN BURRONE ET AL., *INTELLECTUAL PROPERTY (IP) RIGHTS AND INNOVATION IN SMALL AND MEDIUM-SIZED ENTERPRISES 3* (2004), [https://www.wipo.int/edocs/pubdocs/en/sme/917/wipo\\_pub\\_917.pdf](https://www.wipo.int/edocs/pubdocs/en/sme/917/wipo_pub_917.pdf) (“It has been estimated that patent documents contain 70% of the world’s accumulated technical knowledge and that most of the information contained in patent documents is either never published elsewhere or is first disclosed through the publication of the patent application.”).

<sup>176</sup> Pénin & Neicu *supra* note 44, at 67.

<sup>177</sup> Takao Ōgiya, *Sengo Nippon No Inobe-Shon 100 Sen To Tokkyo Jōhō No Katsuyō [100 Postwar Japanese Innovations and Exploitation of Patent Information]*, JAPIO YEAR BOOK 64 (2016), [http://www.japio.or.jp/00yearbook/files/2016book/16\\_1\\_09.pdf](http://www.japio.or.jp/00yearbook/files/2016book/16_1_09.pdf).

<sup>178</sup> SHIN-ICHIRO SUZUKI, *INTRODUCTION TO PATENT MAP ANALYSIS 3* (2011), [https://www.jpo.go.jp/torikumi\\_e/kokusai\\_e/training/textbook/pdf/Introduction\\_to\\_Patent\\_Map\\_Analysis2011.pdf](https://www.jpo.go.jp/torikumi_e/kokusai_e/training/textbook/pdf/Introduction_to_Patent_Map_Analysis2011.pdf).

in selected technological fields for the Japanese industry.<sup>179</sup>

Patent data is also useful in learning innovative processes. Historically, researchers have applied empirical methodologies in analyzing the role of patents on innovation and policy proposals.<sup>180</sup> Patent data is one of the best sources for economic analysis due to its long-term availability and variety of useful purposes.<sup>181</sup> To facilitate research, the World Intellectual Property Office (WIPO) and patent offices around the world publish innovation related statistics.<sup>182</sup> The USPTO created the Office of the Chief Economist to advise policy leaders on the economic implications of patent policies.<sup>183</sup> Such policies may fail to account for user innovations, unless such innovations are included in the data as patent disclosures.

In short, the incentive to disclose theory is outdated in the post-internet era, as individual innovators, and firms that engage in open innovation, are willing to disclose without the incentive of patents. The cost of patent applications prevents otherwise willing innovators from using the current U.S. patent system to disclose their inventions. The incentive to disclose theory should be updated to account for the proactive role patent disclosures play in promoting open innovation. In applying this updated theory, the patent system should be reformed to incentivize all types of innovators to disclose their inventions through the patent system, allowing them to take advantage of defensive and proactive benefits that are only available if the disclosure is made through the USPTO as a patent disclosure.

#### IV. Proposal: Inclusive Patents

##### A. New Patent Option for Open Innovation

This article acknowledges the shortcomings of outdated patent theories and proposes a hybrid patent reform that would introduce a new option to issue patents as inclusive rights, giving owners the ability to practice and grant licenses on the patented invention, while limiting their right to exclude others (“an inclusive patent”). The proposed reform introduces inclusive patents as an alternative option and maintains the current system’s exclusive patents. With the introduction of compulsory licenses for blocking patents, inclusive patent owners are rewarded with access to patents held by others who would otherwise be unwilling to give cross-licenses, ensuring the freedom of inclusive patent owners to operate and innovate on their patented inventions. With the introduction of a new defense that limits the exclusive rights of the proposed patents (“open innovation defense”), inclusive patent owners can share their technologies with others using transaction-free cross licenses. By

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<sup>179</sup> JPO, *Tokyo Shutsugan Gijutsu Dōkō Chōsatō Hōkoku* [Patent Application Technology Trends Reports] (2018), <https://www.jpo.go.jp/cgi/link.cgi?url=/shiryō/gidou-houkoku.htm>.

<sup>180</sup> Petra Moser, *Patents and Innovation in Economic History*, 8 ANN. REV. ECON. 241, 255 (2016), <https://www.nber.org/papers/w21964>.

<sup>181</sup> RAFAT WISTA, PATENT DATA IN ECONOMIC ANALYSIS 66 (2017), <http://doi.org/10.5772/68100>.

<sup>182</sup> *Data for Researchers*, WIPO, [https://www.wipo.int/econ\\_stat/en/economics/research/](https://www.wipo.int/econ_stat/en/economics/research/) (last visited Mar. 14, 2021).

<sup>183</sup> *Office of the Chief Economist*, USPTO, <https://www.uspto.gov/about-us/organizational-offices/office-policy-and-international-affairs/office-chief-economist> (last visited Mar. 14, 2021).

converting patent rights into inclusive property rights, the proposed inclusive patent system aims to provide a public law mechanism for solving the problems that self-help private ordering mechanisms cannot, and it is a better fit for promoting open innovation. Moreover, inclusive patents provide an affordable disclosure mechanism that prevents parties that are unwilling to share their technologies from obtaining patents.

Under the current patent system, the proposed inclusive patent option can be viewed as a reform that grants provisional rights after the pre-grant publication of the application.<sup>184</sup> This provisional right allows patent owners to recover a reasonable royalty, once a patent is granted, from any person who engages in infringement during the period of pre-grant publication to the date of patent issuance.<sup>185</sup> The proposed system converts current provisional rights into inclusive property rights, as patent owners' rights to practice their inventions are guaranteed by compulsory licenses. In contrast, the right to exclude others is limited, as the open innovation defense protects others from infringement liability, except for those who enforce their patents against the inclusive patent owner. In other words, the right to recover a reasonable royalty is replaced with the right to enforce the property right defensively.

Because the inclusive patent's exclusivity is very limited, the patent is issued with no substantive pre-grant examination. In focusing on the removal of the examination requirement, the proposed inclusive patents can be viewed as a type of utility model right, like those that can be acquired in many European and Asian countries.<sup>186</sup> The proposed system provides the ability to convert an inclusive patent into a regular exclusive patent any time during the term of protection. An invention disclosed in the regular patent application can take the benefit of the filing date of the inclusive patent if the invention meets the enablement and written description requirements.<sup>187</sup> An inclusive patent is reissued as a regular patent after the examination. Thus, the proposed system, with inclusive and exclusive patent options, can be viewed as having deferred examination. After an inclusive patent is examined as being filed as a regular patent application based on a request for conversion, a patent with full exclusivity will be issued. However, anyone already using the patented invention prior to the issuance of the exclusive patent is protected by intervening rights and can continue to use the invention.

Since the proposed inclusive patents mainly address the needs of those who use patents inclusively, such as commercial firms and individual user innovators, innovators that engage in closed innovation will likely continue to obtain regular patents that provide exclusivity, allowing them to profit from the sale of goods and

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<sup>184</sup> 35 U.S.C. § 154(d).

<sup>185</sup> *Id.* § 154(d)(1).

<sup>186</sup> For utility model systems, see generally Mark D. Janis, *Second Tier Patent Protection*, 40 HARV. INT'L L.J. 151 (1999), <https://www.repository.law.indiana.edu/facpub/543/> (providing a general discussion about utility model systems). This author proposed converting German utility model system to issue an inclusive right. Toshiko Takenaka, *Breathing New Life into the German Utility Model System in the Industry 4.0 Era*, GRUR Int'l (Forthcoming 2021).

<sup>187</sup> 35 U.S.C. § 120.

services with supracompetitive prices. The proposed new option is based on the incentive to share theory proposed by this article's author.<sup>188</sup> The author, in a previous article, has already proposed to introduce a compulsory license for blocking patents, limiting the exclusivity of current patents and incentivizing unwilling patent owners to share.<sup>189</sup> The proposed compulsory licenses would result in, at most, marginal effects on the exclusivity of regular patents held by innovators that practice their patents and provide products and services on the market.<sup>190</sup> Owners of both exclusive and inclusive patents could request a compulsory license if the owner of a blocking patent is unwilling to give a license.<sup>191</sup> The inclusive patents promote open innovation more effectively, by issuing a property right to practice and granting licenses on protected inventions quickly, increasing the transactional efficiency of collaboration among innovators.<sup>192</sup>

IP scholars have proposed various regimes for promoting open innovation, both within and outside the current intellectual property regime. For example, New York University Professor Katherine J. Strandburg's proposed system, which is outside the current intellectual property regime, promotes innovation through a patent-free, or property right-free, model.<sup>193</sup> She suggests that governments and charitable foundations can invest in user communities, facilitating production and peer diffusion of embodiments.<sup>194</sup> In contrast, the proposed inclusive patent system uses the USPTO's existing patent publication mechanism to promote the diffusion of technical information and embodiments of user innovations, allowing the USPTO to use data on user innovation for policy making. In contrast to a property-free regime, having property rights, with limited exclusivity, facilitates interaction among innovators in the open innovation model.<sup>195</sup>

Santa Clara University Professor Colleen Chien and University of Leuven Professor Geertrui Van Overwall have proposed a new property regime, within the current intellectual property schema, as an alternative option to the current patent system.<sup>196</sup> The proposed inclusive patent system is similar to Chien and Van Overwall's regime, in that they both promote the sharing of technologies among innovators by creating an option of protecting intellectual property that promotes open innovation and user innovation. The proposed inclusive patents are similar to the patents proposed by Chien, which can only be used defensively, although her

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<sup>188</sup> Takenaka, *supra* note 5, at 123–28.

<sup>189</sup> *Id.* at 134.

<sup>190</sup> *Id.* at 137.

<sup>191</sup> See text accompanying *infra* notes 200–207 for more discussions of the proposed compulsory license.

<sup>192</sup> Daniel F. Spulber, *How Patents Provide the Foundation of the Market for Inventions*, 11 J. COMPETITION L. & ECON. 271, 279 (2015).

<sup>193</sup> Katherine J. Strandburg, *Users, Patents and Innovation Policy*, in THE OXFORD HANDBOOK OF INTELLECTUAL PROPERTY LAW (R. Dreyfuss & J. Pila eds., 2018).

<sup>194</sup> *Id.* at 21.

<sup>195</sup> Exclusivity increases the trust among collaborators by preventing free-riding. Pénin & Neicu *supra* note 44, at 61.

<sup>196</sup> Chien, Opening, *supra* note 51, at 846; Van Overwall, *supra* note 118, at 29.

proposal does not address the problem of patent prosecution costs, as her proposed patents are examined like regular exclusive patents.<sup>197</sup> The advantages of defensive-only patents are limited to discounts on any patent issuance costs and annual fees.<sup>198</sup>

The inclusive patent system is different from Van Overwalle's regime, as Van Overwalle's regime completely eliminates the right to exclude others, whereas inclusive-patent owners retain the right to exclude others when they are sued.<sup>199</sup> The proposed system also encourages commercial firms to take advantage of lower prosecution costs, and allows the flexibility to convert between proposed inclusive and regular exclusive patents by adopting open-close intellectual property management strategies.<sup>200</sup> Open innovation advocates may view such strategies as gamesmanship.<sup>201</sup> The proposed system encourages gamesmanship by allowing patent owners to choose and switch between the two types of patents based on their business strategies and the nature of the inventions, which may work well in the exclusion regime.<sup>202</sup> It is essential that commercial firms participate in the proposed regime, as their application and annual fees would subsidize the costs of small innovators' applications, allowing the current patent system to function as a platform for promoting interactions between the user and producer innovation paradigms, maximizing social welfare.<sup>203</sup>

The inclusive patent system was inspired by prior proposals that aimed to create an affordable intellectual property entitlement for small innovators with limited financial resources.<sup>204</sup> Such affordable intellectual property regimes have long existed outside the United States, in the utility model and the petit patent systems.<sup>205</sup> The proposed system is particularly attractive for innovators who provide software-related products or services, as it would significantly reduce the delay and costs of prosecuting software-related patents that have been caused by recent case law de-

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<sup>197</sup> Colleen Chien, *Comparative Patent Quality*, 50 ARIZ. ST. L.J. 71, 136 (2018)[hereinafter, Chien, Comparative]; Chien, Opening, *supra* note 51, at 859–61.

<sup>198</sup> Chien, Opening, *supra* note 51, at 859–60.

<sup>199</sup> Van Overwalle, *supra* note 118, at 29. She defined her proposed patent as “a temporary permit to exploit monopoly rights under fair and reasonable conditions, investing technology owners with the authority to invent and share.”

<sup>200</sup> See Marcus Holgersson et al., *The Evolution of Intellectual Property Strategy In Innovation Ecosystems: Uncovering Complementary and Substitute Appropriability Regimes*, 51 LONG RANGE PLANNING 303, 314 (2018).

<sup>201</sup> Schultz & Urban, *supra* note 32, at 33 (describing the patent holder's practice to offer only some relevant patents for sharing as gamesmanship.)

<sup>202</sup> Chien, Opening, *supra* note 51, at 846; Van Overwalle, *supra* note 118, at 29.

<sup>203</sup> Alfonso Gambardella et al., *The User Innovation Paradigm: Impacts on Markets and Welfare*, 63 MGMT. SCI. 1450, 1451 (2017), <https://doi.org/10.1287/mnsc.2015.2393>.

<sup>204</sup> Van Overwalle, *supra* note 118, at 29.

<sup>205</sup> See *Utility Models*, WIPO, [https://www.wipo.int/patents/en/topics/utility\\_models.html](https://www.wipo.int/patents/en/topics/utility_models.html) (last visited Mar. 14, 2021) (see FAQ section), for countries where utility model protection is available; see also DAN PRUD'HOMME, CREATING A “MODEL” UTILITY MODEL PATENT SYSTEM: A COMPARATIVE ANALYSIS OF THE UTILITY MODEL PATENT SYSTEMS IN EUROPE AND CHINA 1, 54, 61 (2014) (IP Key Working Paper for China's State Intellectual Property Office 2014), [https://www.researchgate.net/publication/308786070\\_Creating\\_a\\_model\\_utility\\_model\\_patent\\_system\\_A\\_comparative\\_analysis\\_of\\_the\\_utility\\_model\\_patent\\_systems\\_in\\_Europe\\_and\\_China](https://www.researchgate.net/publication/308786070_Creating_a_model_utility_model_patent_system_A_comparative_analysis_of_the_utility_model_patent_systems_in_Europe_and_China).

velopments.<sup>206</sup> Because the proposed system would be incorporated as part of the current patent system, it is unique and different from the utility model system. The patent terms, and conditions for protection, under the utility model and petit patent systems are different than those under the established patent system. In contrast, inclusive patents are the same as regular patents, except for the open innovation defense and the lack of a substantive examination requirement.

#### B. Inclusive Rights with Limited Exclusivity

According to Mossoff and other property theorists who view property rights as substantive rights, the proposed inclusive patents provide a property right, allowing their holders to grant use rights in an invention, including the rights to use and dispose of the invention.<sup>207</sup> In viewing the property right as positively endorsing the ability to practice and grant a license, as done by the German and Japanese Patent Acts, the patent owner's right to practice the patented invention should be guaranteed by a compulsory license.

This author has already proposed introducing compulsory licenses into the established exclusive patent system in order to enhance the inclusive side of current patent rights as property rights.<sup>208</sup> Under the proposed reform, the revised Patent Act would authorize U.S. district courts to grant compulsory licenses to patent owners of follow-on inventions, allowing them the freedom to operate under certain conditions required by TRIPS (*i.e.*, if the follow-on invention involves an important technical advance of considerable economic significance when compared to the technical advance of the prior invention claimed in the prior patent).<sup>209</sup> Under the definition of compulsory licenses accepted by U.S. courts and scholars, compulsory licenses allow *any party under congressional authority* to practice an invention if he or she meets certain conditions and pays a reasonable royalty, in contrast with ongoing royalty orders, which allow *a particular party, a defendant-infringer of a patent-infringement case*, to practice patented inventions *without congressional authority*, with the payment of an ongoing royalty.<sup>210</sup>

Despite this distinction, the ongoing royalty is a *de facto* compulsory license that creates a right to practice a patented invention without consensus from the patent owner.<sup>211</sup> TRIPS does not adopt this distinction, as it does not require authority given by the government and does not permit any party to practice an invention.<sup>212</sup>

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<sup>206</sup> Takenaka, *supra* note 5, at 112 (discussing the increased cost of prosecution in contrast to the limited scope of protection for software related patents).

<sup>207</sup> See *supra* notes 105–110 and accompanying text.

<sup>208</sup> Takenaka, *supra* note 5, at 132–139.

<sup>209</sup> TRIPS, *supra* note 111, at art. 31.

<sup>210</sup> Andrew C. Mace, *TRIPS, eBay and Denials of Injunctive Relief: Is Article 31 Compliance Everything?*, 10 COLUM. SCI. & TECH. L. REV. 232, 244 (2009) (citing Paice, L.L.C. v. Toyota Motor Corp., 504 F.3d 1293, 1313 n.13 (Fed. Cir. 2007)).

<sup>211</sup> Christopher Anthony Cotropia, *Compulsory Licensing under TRIPS and the Supreme Court of the United States Decision in eBay v. MercExchange*, in PATENT LAW AND THEORY 557, 573 (T. Takenaka ed., 2008).

<sup>212</sup> TRIPS Art. 31(k) deals with a compulsory license given by a court as a remedy for anticompetitive

The compulsory licenses proposed by the author should be excluded from the well-established definition of compulsory licenses, as they merely limit remedies and are only applicable to *particular infringing parties who are owners of regular exclusive patents*, functioning as a denial of a permanent injunction by allowing infringing inclusive patent owners to continue practicing protected inventions without consent from the prior-blocking patent owners.<sup>213</sup>

In the previous article, the author proposed limiting remedies, only allowing reasonable royalties for the owner of a prior-blocking patent. However, under the previously proposed reform, courts would still need to decide infringement, which is time-consuming and expensive. Moreover, the period of infringement would continue until the infringement is decided. This article proposes a reform that would add a preliminary procedure to decide, under the *eBay* equitable analysis test, whether the prior patent owner is entitled to injunction without an infringement determination when the prior patent owner threatens an injunction during license negotiation. The right to continue practicing the invention guarantees the inclusive patent owner the ability to reach a fair agreement on a license. The proposed procedure allows prior-blocking patent owners requesting a preliminary injunction to stop infringement immediately during the preliminary proceeding.

The *eBay* equitable analysis test requires winning patent owners to establish the following four factors: (1) an irreparable injury; (2) inadequacy of remedies at law, such as damages; (3) the balance of hardship between the patentee and defendant; and (4) public interest.<sup>214</sup> U.S. courts have likely taken the economic significance of prior and follow-on inventions into account, as required by TRIPS, in their hardship balancing analysis. It is likely that courts would reach the same conclusion for granting preliminary and permanent injunctions because factors (1), (3), and (4) overlap with the factors that patent owners must establish to request a preliminary injunction.<sup>215</sup> In particular, courts should be able to grant a compulsory license, confirming the party's right to practice the disputed invention, if the prior-blocking patent covers a small component of the entire product, or is held by a PAE.<sup>216</sup> Inclusive patent owners who are accused of infringement bear the burden of establishing all four factors under the equitable analysis test, unlike a permanent injunction, which must be proven by the patent owner after the court finds infringement.<sup>217</sup> In contrast, prior-blocking patent owners must establish that they are likely to succeed on the merits of infringement which is not part of the *eBay* factors if they request a

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acts and applies to a particular party—the defendant of anti-trust cases. TRIPS, *supra* note 111.

<sup>213</sup> Takenaka, *supra* note 5, at 137.

<sup>214</sup> *eBay Inc. v. MercExchange, L.L.C.* 547 U.S. 388, 391 (2006).

<sup>215</sup> Patent Owners must establish: (1) likelihood of success on the merit; (2) irreparable harm; (3) the balance of equities; and (4) the public interest. *Luminara Worldwide, LLC v. Liown Elecs. Co.*, 814 F.3d 1343, 1352 (Fed. Cir. 2016).

<sup>216</sup> See *supra* note 94 and accompanying text. Injunctions are granted significantly less often for patents held by PAEs. See Seaman, *supra* note 94, at 1988.

<sup>217</sup> *Nichia Corp. v. Everlight Americas, Inc.*, 855 F.3d 1328 (Fed. Cir. 2017) (citing *eBay*, 547 U.S. at 391, 395 (Roberts, J. concurring)).

permanent injunction.

The proposed inclusive patents include the right to exclude others, although that right is limited by the open innovation defense. The open innovation defense converts current patents into inclusive patents, achieving the goal of open patent licenses, sharing technologies by retooling patent rights.<sup>218</sup> The Patent Act should be revised to create this defense, giving anyone a right to make, sell, use and engage in all excluded acts, with respect to the protected invention, under certain conditions, as modeled after the first inventor defense under the current Patent Act.<sup>219</sup> A copyleft concept should be incorporated, only allowing the open innovation defense to be used for defensive purposes. For example, to claim the defense, a person must agree to license their current and future inventions when they hold patents that would otherwise block the inclusive patent owner from practicing the protected invention and improving on it.<sup>220</sup> The Revised Patent Act should retroactively eliminate the open innovation defense if a person that uses the protected invention initiates patent litigation or brings infringement charges against the inclusive patent owner. In other words, inclusive patent owners can retain exclusivity against patent infringement assertions and increase their chances of avoiding litigation through cross-licenses.

In addition, such exclusivity can be used to protect licensees. Although anyone can use the statutory open innovation defense to practice inventions covered by inclusive patents, a party should formally receive a license because information from a patent disclosure is often insufficient for collaboration, as the transfer of tangible and intangible assets, such as knowhow, data, materials and equipment, are necessary for improving on and commercializing the invention.<sup>221</sup> While the inclusive patent owner can receive royalties for licensing these assets, licensees should seek to negotiate the inclusion of an indemnity clause requiring patent owners to use their patents defensively against patent infringement assertions.

The proposed inclusive patent system is a “fully codified regime” that retools current patents to incentivize willing, and unwilling, patent owners to share their technologies through statutory defenses or licenses to ensure universal access to the protected invention, in contrast to “semi-codified regime,” where the current patents are combined with private ordering mechanisms, such as open patent licenses, to ensure access.<sup>222</sup> This article has proposed revising the Patent Act in order to convert current patents into inclusive patents by incorporating a statutory defense or license (open innovation defense) that functions like copyleft provisions, ensuring access to protected inventions. The codified open innovation defense allows willing

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<sup>218</sup> For the discussion of open patent licenses, *see supra* note 31 and accompanying text.

<sup>219</sup> 35 U.S.C. § 273.

<sup>220</sup> For the copyleft concept, *see supra* notes 61 and 62 and accompanying text.

<sup>221</sup> *See Teece, Profiting, supra* note 49, at 287; Mark A. Lemley & Robin Feldman, *Patent Licensing, Technology Transfer, and Innovation*, 106 AM. ECON. REV. 188, 188, <https://www.aeaweb.org/articles?id=10.1257/aer.p20161092>.

<sup>222</sup> Van Overwalle, *supra* note 118, at 3.

firms to share technologies through transaction-free cross-licenses, and ensures their freedom to operate and innovate. Patent owners can use their inclusive patents defensively for infringement counterclaims, or as bargaining chips if they are sued for infringement by a patent practicing firm that is willing to share their technologies and avoid litigation costs. Firms that do not practice their patents and would otherwise be unwilling to collaborate, such as PAEs, are forced to share their technologies through compulsory licenses.

### C. No Substantive Examination

Like many utility model systems, including those in Germany and Japan,<sup>223</sup> the proposed inclusive patent system grants a property right in the invention without a substantive examination, substantially reducing patent application fees by eliminating the costs associated with a search and pre-grant examination. A patent system needs substantive examination to eliminate social-welfare costs, such as patenting trivial improvements that would have been invented without a grant of exclusive rights.<sup>224</sup> Issuing inclusive patents without examination would not harm social welfare, as the open innovation defense prevents inclusive patent owners from keeping competitors out of the marketplace. Even if there is harm, an analysis by a law and economics scholar supports the theory that the social costs of having pre-grant substantive examination are higher than the costs of post-grant invalidity challenges in courts.<sup>225</sup> This view is supported by another scholar, who shows that the low rates of asserting patents against competitors justify having less rigorous examinations.<sup>226</sup> Inclusive patents further reduce this risk by limiting patent assertion for defensive purposes only.

Moreover, a rigorous examination does not necessarily guarantee the ability to successfully assert IP rights through litigation. A recent empirical study on European industrial design rights revealed very high validity and infringement rates for litigated design rights, despite having no pre-grant examination.<sup>227</sup> This study shows

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<sup>223</sup> Gebrauchsmustergesetz [GebraMG] [Utility Model Act], May 5, 1936 BGBL I at 1455, last amended by Gesetz [G], Oct. 19, 2013, BGBL I at 3830, art. 2 (Ger.); Jitsuyō shin'anhō [Japanese Utility Model Act] Act No. 123 of 1959 (Japan).

<sup>224</sup> Jonathan Masur, *Process as Purpose: Administrative Procedure, Costly Screens and Examination at the Patent Office*, 2 J. LEGAL ANALYSIS 687, 706 (2008) (A costly examination should effectively eliminate a class of low private/low social value patents such as the patent thicket and nuisance patents.) See also Jonathan Masur & David Fagundes, *Costly Intellectual Property*, 65 VAND. L. REV. 677, 685–705 (2012).

<sup>225</sup> F. SCOTT KIEFF, THE CASE FOR REGISTERING PATENTS AND THE LAW AND ECONOMICS OF PRESENT PATENT-OBTAINING RULES 22, <http://dx.doi.org/10.2139/ssrn.392202> (Harvard Law and Economics Discussion Paper No. 415; Washington U School of Law Working Paper No. 03-04-03, 2003) (arguing that “the costs of providing the information needed to decide validity and the costs of “correct” adjudication with that information are likely to be lower if done in litigation than if done in a patent office”).

<sup>226</sup> Mark A. Lemley, *Rational Ignorance at the Patent Office*, 95 NW. U. L. REV. 1495, 1497 n.1 (2001).

<sup>227</sup> Among litigated design cases, courts found 77.7% of design rights valid; see Oliver Church et al., *An Empirical Analysis of the Design Case Law of the EU Member States*, 50 IIC 685, 700 (2019), <https://link.springer.com/article/10.1007/s40319-019-00813-0>.

that IP holders are likely to conduct due diligence on validity, and will only enforce strong IP rights, regardless of a pre-grant examination. Making a robust generalization from this example would require further work, but the study offers tentative evidence that inclusive patents operate in the same way as European design rights.

The proposed inclusive patent system provides a solution for the USPTO's high administrative burden and backlog issues<sup>228</sup> by channeling patent applications into a system that does not require substantive examination.<sup>229</sup> In response to criticism, the USPTO has substantially increased pre-grant-examination resources by hiring patent examiners annually and improving their retention rates.<sup>230</sup> Even with increased resources, the USPTO is struggling to keep up with the increasing number of patent applications.<sup>231</sup> Although the USPTO has achieved its accuracy goal in issuing office actions,<sup>232</sup> the retroactive application of new patentability standards has wasted the USPTO's pre-grant examination resources and created additional burdens on post-grant examinations by requiring them to review the patentability of issued patents in light of the changes to case law prior to post-grant proceedings.<sup>233</sup> Moreover, the Supreme Court's unclear instructions on patentability standards,<sup>234</sup>

<sup>228</sup> Reducing the unexamined application backlog is a focus of the USPTO's 2014–2018 strategic plan. USPTO, 2014–2018 STRATEGIC PLAN 2 (2014), [https://www.uspto.gov/sites/default/files/documents/USPTO\\_2014-2018\\_Strategic\\_Plan.pdf](https://www.uspto.gov/sites/default/files/documents/USPTO_2014-2018_Strategic_Plan.pdf).

<sup>229</sup> One U.S. patent scholar proposes a second-tier patent regime for reducing the examination backlog problem. HAROLD C. WEGNER, A HYBRID REGISTERED PATENT SYSTEM: REFOCUS ON BACK-END REVIEW 2, 14 (2014), <http://www.laipla.net/wp-content/uploads/2014/12/HybridRegisteredPatentSystem2014.pdf>.

<sup>230</sup> USPTO, 2014–2018 STRATEGIC PLAN, *supra* note 228, at 2, 25.

<sup>231</sup> Kevin Maney, *Examiners Can't Keep Up with Patent Applications*, USA TODAY (Sept. 20, 2005), [http://www.usatoday.com/tech/columnist/kevinmaney/2005-09-20-patent-office\\_x.htm](http://www.usatoday.com/tech/columnist/kevinmaney/2005-09-20-patent-office_x.htm) (comments of John Doll, Commissioner for Patents, USPTO). The USPTO plans to hire 390 examiners a year from FY2018 through FY 2023 offset by approximately 330 attritions each year. USPTO, FISCAL YEAR 2019 CONGRESSIONAL JUSTIFICATION 6, 45 (2018), <https://www.uspto.gov/sites/default/files/documents/fy19pbr.pdf>.

<sup>232</sup> USPTO, PERFORMANCE & ACCOUNTABILITY REPORT FISCAL YEAR 2017 53 (2017), <https://www.uspto.gov/sites/default/files/documents/USPTOFY17PAR.pdf> (the report shows the results in correctness of office action 92.4% to 96.5% with respect to utility, eligibility, novelty, nonobviousness and disclosure requirements).

<sup>233</sup> The new standards resulting from the new case law include eligibility. *See generally* *Bilski v. Kappos*, 561 U.S. 593 (2009); *Ass'n for Molecular Pathology v. Myriad Genetics, Inc.*, 569 U.S. 576 (2013); *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66 (2012); *Alice Corp. v. CLS Bank Int'l*, 573 U.S. 208 (2014)). The standards include nonobviousness. *See generally* *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398 (2007). They include written description. *See generally* *Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1340 (Fed. Cir. 2010) (en banc). They include claim definiteness. *See generally* *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 909–910 (2014); *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1348 (Fed. Cir. 2015) (en banc).

<sup>234</sup> *E.g.*, *Mayo Collaborative Servs.*, 566 U.S. at 72–73 (“[A] process that focuses upon the use of a natural law also contain other elements or a combination of elements, sometimes referred to as an ‘inventive concept,’ sufficient to ensure that the patent in practice amounts to significantly more than a patent upon the natural law itself.” (emphasis added)); *See also* David O. Taylor, *Amending Patent Eligibility*, 50 U.C. DAVIS L. REV. 2149, 2156 (2017) (“[T]he Court has labeled this analysis as the search for an ‘inventive concept’ — a concept that sufficiently ensures that the patent in practice amounts to significantly more than a patent upon the ineligible concept itself. The problem

and flexible approach to these standards,<sup>235</sup> has substantially increased the USPTO's administrative burden by revising examination guidelines, causing the USPTO to publish memorandums instructing examiners on how to follow these new guidelines.<sup>236</sup>

It is likely that the USPTO unnecessarily examined a significant portion of applications, wasting administrative resources. The first-to-file system adopted with the enactment of the AIA has added to the USPTO's administrative burden by increasing the number of valueless inventions filed, as the system has made it more difficult for applicants to spend the necessary amount of time to fully evaluate the technical and commercial value of their inventions before filing a patent application.<sup>237</sup>

In contrast, patent systems outside the United States, which are also based on the first-to-file system, do not start a substantive examination unless an applicant files a separate request for examination.<sup>238</sup> Deferred examinations give applicants more time to make technical and commercial value assessments, resulting in lower rates of valueless applications being examined.<sup>239</sup> In particular, a significant portion of European patent applications are withdrawn without substantive examination after the applicants receive a search report and learn the value of their inventions.<sup>240</sup>

Without deferred examinations, U.S. applicants are often unable to determine the value of their inventions before the issuance of a patent, as it is difficult to identify an invention's value due to the changing nature of technological trends.<sup>241</sup> As a result, U.S. applicants seek to extend the pre-grant examination period until an innovation's value is identified by using continuation applications (CA) and requests for continued examination (RCE) and filing different sets of claims and RCE re-

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is no one can agree upon what the Supreme Court meant by 'inventive concept,' let alone what is an 'inventive concept.'").

<sup>235</sup> *E.g.*, KSR Int'l Co. 550 U.S. at 415. ("We begin by rejecting the rigid approach of the Court of Appeals. Throughout this Court's engagement with the question of obviousness, our cases have set forth an expansive and flexible approach inconsistent with the way the Court of Appeals applied its TSM test here.").

<sup>236</sup> USPTO frequently issue memorandums to discuss impacts of Federal Circuit decisions on eligibility standard and update list of decisions holding claims eligible or non-eligible. *Subject matter eligibility*, USPTO, <https://www.uspto.gov/patent/laws-and-regulations/examination-policy/subject-matter-eligibility> (last updated Aug. 20, 2020).

<sup>237</sup> Brad Pedersen & Vadim Braginsky, *The Rush to a First-to-File Patent System in the United States: Is a Globally Standardized Patent Reward System Really Beneficial to Patent Quality and Administrative Efficiency?*, 7 MINN. J. L. SCI. & TECH. 757, 758–59 (2006).

<sup>238</sup> *E.g.*, European Patent Convention Art. 94(1), Oct. 5, 1973; Tokkyohō, *supra* note 114, at art. 48-2.

<sup>239</sup> See USPTO, IP5 STATISTICS REPORT 2016 EDITION 76 (2017), <https://www.fiveipoffices.org/statistics/statisticsreports/2016edition/IP5SR2016full.pdf> (noting that deferred examination allows more time to evaluate whether or not to proceed further).

<sup>240</sup> Chien, Comparative, *supra* note 197, at 107, 138.

<sup>241</sup> Kimberly A. Moore, *Worthless Patents*, 20 BERKELEY TECH. L.J. 1521, 1551 (2005), <https://doi.org/10.15779/Z38PQ4J> ("The data demonstrate that patent owners are able to identify the innovative value of technology as soon as three and a half years after a patent issues, likely because of decreased uncertainty in the technology.").

quests.<sup>242</sup> This ever-extended examination practice increases the USPTO's administrative burden and creates an environment with a high tolerance for examiners' mistakes.<sup>243</sup>

The proposed system functions like a deferred examination system by allowing inclusive patents to be converted into regular exclusive patents. After examination, an invention covered by an inclusive patent is reissued as a regular exclusive patent, functioning like a request for examination at foreign patent offices,<sup>244</sup> although those already using the invention may obtain an intervening right when a conversion results in a reissued regular patent.<sup>245</sup> The conversion option gives inclusive patent owners flexibility in situations where they discover the commercial value of their inventions through a third party's use and commercialization of the invention. Such patent owners can choose to collaborate with the other party by using the converted patent exclusively, or by using the inclusive patent to share with others.

#### D. Disclosure

Scholars have identified the market's failure to account for disclosure costs. The proposed patent reform aims to address this failure by providing a mechanism that eliminates, or substantially reduces, innovators' costs associated with information disclosure and diffusion. Inclusive patents are the "cheap and easy form of intellectual property" that scholars are looking for to address this market failure.<sup>246</sup> By incorporating inclusive patents into the current patent system, commercial firms can supplement the disclosure costs of small inventors by using staggered filing fee schedules based on the size of the innovators, while the open innovation defense ensures technology sharing transactions are free.

Only reducing official fees paid to the USPTO will not create an affordable intellectual property regime for small inventors. Professor Mark Janis at Indiana University Bloomington is correct that acquiring patent rights is not affordable to small inventors regardless of official fees, as attorney fees are more substantial than such fees.<sup>247</sup> To avoid the attorney fees, the proposed inclusive patent system should incorporate mechanisms aimed at reducing the cost of preparing disclosures, so that

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<sup>242</sup> Mark A. Lemley & Kimberly A. Moore, *Ending Abuse of Patent Continuation*, 84 B.U. L. REV. 63, 65 (2004).

<sup>243</sup> Chien, Comparative, *supra* note 197, at 110x.

<sup>244</sup> At the EPO, applicants can file a request of examination and defer examination up to 6 months after the European Search Report. IMPLEMENTING REGULATIONS TO THE CONVENTION ON THE GRANT OF EUROPEAN PATENTS, Rule 70 (Oct. 1973). At the JPO, such request must be filed within 3 years from the filing date. Tokkyohō, *supra* note 114, at art. 48-3.

<sup>245</sup> 35 U.S.C. § 252; Wegner, *supra* note 229, at 11. A party who practiced the invention prior to the issue of the reissued exclusive patent is protected by two separate defenses: "Absolute" intervening rights are available for a party that "prior to the grant of a reissue, made, purchased, offered to sell, or used within the United States, or imported into the United States, anything patented by the reissued patent," and "equitable" intervening rights may be provided where "substantial preparation was made before the grant of the reissue." *BIC Leisure Prods., Inc., v. Windsurfing Int'l, Inc.*, 1 F.3d 1214, 1220 (Fed. Cir. 1993).

<sup>246</sup> VON HIPPEL, FREE, *supra* note 55, at 74.

<sup>247</sup> See Janis, *supra* note 186, at 180.

innovators can prepare and file patent applications themselves. Such mechanisms would be developed and maintained by the fees received from commercial firms' applications.

The U.S. patent system has already adopted provisional patent applications as a low-cost mechanism that allows nonlawyers to file patent applications and establish priority.<sup>248</sup> Roughly a quarter of utility applications are originally filed as provisional applications.<sup>249</sup> In addition, the USPTO has already provided a variety of low-cost patent prosecution mechanisms, including online filing guides, to assist individuals and SME innovators in filing application by themselves,<sup>250</sup> and legal assistance through law school clinics.<sup>251</sup> Innovators can download all the necessary forms and file an application online.<sup>252</sup> Innovators who have developed a prototype can submit photographs.<sup>253</sup> Because a do-it-yourself patent drafting software service is already available,<sup>254</sup> the USPTO should develop a machine-assisted patent drafting software program for inventors to use.

These mechanisms may not sufficiently reduce the initial disclosure burden for programmers who are not used to describing their software in words. The inclusive patent system should allow applicants to incorporate digital embodiments as part of the disclosure, such as software with open-source codes and CAD files of prototypes, as a replacement for written descriptions of such embodiments. By including the embodiments, the inclusive patent provides a peer-to-peer diffusion mechanism for innovators who embrace open-source philosophy.

Many nonlawyer innovators are currently unable to use the U.S. patent system for defensive publication due to requirements in preparing a claim and filing a non-provisional application. Drafting claims is the most challenging part of preparing a patent application for non-patent lawyers. Nonlawyer innovators can file provision-

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<sup>248</sup> See 35 U.S.C. § 111(b). For the legislative intents and benefits of provisional applications, see Patricia Montalvo, *How Will the New Twenty-Year Patent Term Affect You? A Look at the Trips Agreement and the Adoption of a Twenty-Year Patent Term*, 12 SANTA CLARA HIGH. TECH. L.J. 139, 152 (1996).

<sup>249</sup> USPTO, PERFORMANCE & ACCOUNTABILITY REPORT FY17 168 (2017), <https://www.uspto.gov/sites/default/files/documents/USPTOFY17PAR.pdf>.

<sup>250</sup> *Provisional Application for Patent*, USPTO, <https://www.uspto.gov/patents-getting-started/patent-basics/types-patent-applications/provisional-application-patent> (last updated Jan. 12, 2015).

<sup>251</sup> See *Intellectual Property Legal Assistance Programs*, USPTO, <https://www.uspto.gov/learning-and-resources/patent-and-trademark-practitioners/intellectual-property-legal-assistance> (last updated Jun. 15, 2018); see also THE OFFICE OF ENROLLMENT AND DISCIPLINE OF THE USPTO, REPORT ON THE LAW SCHOOL CLINIC CERTIFICATION PROGRAM (2016), [https://www.uspto.gov/sites/default/files/documents/USPTO\\_Law\\_School\\_Clinic\\_Cert\\_Program\\_Report-Dec\\_2016.pdf](https://www.uspto.gov/sites/default/files/documents/USPTO_Law_School_Clinic_Cert_Program_Report-Dec_2016.pdf).

<sup>252</sup> *File Online*, USPTO, <https://www.uspto.gov/patents-application-process/file-online> (last updated Mar. 7, 2021).

<sup>253</sup> See USPTO, MPEP, *supra* note 154, § 608.02.

<sup>254</sup> Do-it-yourself software is already available. E.g., *The Invent + Patent System – Do It Yourself Provisional Patent Filing made Easy*, IPWATCHDOG, <http://www.ipwatchdog.com/patent/invent-patent-system/> (last visited Mar. 14, 2021).

al applications without including claims.<sup>255</sup> However, they cannot use a provisional application as a defensive publication mechanism, as provisional applications are not published.<sup>256</sup> For a patent application to be published, a provisional application must be converted to a nonprovisional application within one year from the filing date, which requires an applicant to draft and include claims in a nonprovisional application.<sup>257</sup> As a result, a substantial portion of provisional applications are never published.<sup>258</sup>

The proposed system would publish these provisional patent applications regardless of whether there was nonprovisional application, allowing innovators to use the U.S. patent system for defensive publication. To enhance the diffusion of technical information, Chien urges a reform to disclose both provisional and nonprovisional applications by default through publication upon filing, although applicants can opt out of publication.<sup>259</sup> The reform proposed by this article adopts Chien's view that provisional applications should be disclosed either by default or at the request of an applicant, providing innovators with a mechanism to disclose their inventions without drafting claims.

To request to issue an inclusive patent, the proposed system requires filing a nonprovisional application, although innovators can simply state "as substantially described" in a claim to define their inventions in the nonprovisional application. Because the same property rules that require a delineated boundary of protected subject matter between the property owner and the public apply to both the proposed inclusive patents and regular exclusive patents, inclusive patents should include a claim to delineate that boundary.<sup>260</sup> In the patent context, claims delineating the boundary of the invention function to define the subject matter, as examined by the USPTO, and notify the public of the limits of the patent's exclusivity.<sup>261</sup> Because inclusive patents are not examined by the USPTO, and their exclusivity is limited, it is not necessary for claims to clearly describe that boundary. When an applicant requests an issuance of an inclusive patent, the USPTO should apply a lenient standard to claims in their assessment of the definiteness requirement.<sup>262</sup>

Under this lenient standard, any innovator should be able to draft a claim without a lawyers' assistance by using a simple claiming format that defines the invention "as substantially described," adopting central claiming. This format was used in the early period of the U.S. patent system until U.S. claim drafting moved to peripheral claiming.<sup>263</sup> The boundary of the invention, as defined by central claims, is

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<sup>255</sup> 35 U.S.C. § 111(b)(2).

<sup>256</sup> 37 C.F.R. § 1.211(b).

<sup>257</sup> See 35 U.S.C. § 111(b)(5).

<sup>258</sup> See Chien, *Opening*, *supra* note 51, at 830–31.

<sup>259</sup> *Id.* at 847–48.

<sup>260</sup> Jeanne C. Fromer, *Claiming Intellectual Property*, 76 U. CHI. L.R. 719, 724–726, (2009), <https://pdfs.semanticscholar.org/3ec3/923ebd59143e3ab19e49f82d9218d6957870.pdf>.

<sup>261</sup> *Warner-Jenkinson Co. v. Hilton Davis Co.*, 520 U.S. 17, 29 (1997).

<sup>262</sup> See 35 U.S.C. § 112(b).

<sup>263</sup> Toshiko Takenaka, *Interpreting Patent Claims: The United States, Germany and Japan* 113–34

determined by exemplar based on embodiments disclosed in the application.<sup>264</sup> The U.S. system abolished the claim format, but has retained central claiming when an element in a claim for a combination is defined as a function instead of a structure, material or act (*i.e.*, means-plus-function claims, which are frequently used for defining software).<sup>265</sup> The proposed system does not require specifying functions, or any element in the claim, instead postponing delineation of the invention within the boundary signified by the “as substantially described” language until adjudication, where the disclosed embodiments and the defendant’s product or process are compared based on whether they are identical or substantially the same, as done in design patents and copyrights.<sup>266</sup>

If the lenient claim standard raises serious public notice concerns, the revision allowing the “as substantially described” claim format may not be necessary. With the advent of AI, claim drafting is no longer an art of patent specialists. Some suggest using AI to standardize claim drafting.<sup>267</sup> The USPTO has run an initiative to develop glossaries of patent specification.<sup>268</sup> Including a glossary of defined claim terms is particularly helpful for compact prosecution and claim clarity, when such terms describe claim elements by their function.<sup>269</sup> Most of the applications that take advantage of this initiative are from the software field.<sup>270</sup> It is likely that inventions with the digital embodiments that the inclusive patent system aims to facilitate disclosure are best fit for this standardized claim drafting. Providing a template should give innovators the ability to draft means-plus-function claims by selecting the elements that they regard as part of their inventions, further developing a glossary of definitions based on written descriptions that explain the respective elements by structure, material, or act.

#### E. Summary: Advantages of the proposed regime

Professor Jason Schultz at New York University and Professor Jennifer Urban at UC Berkeley identified the following principles as a means of evaluating their

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(1995) (17 IIC Studies-Studies in Industrial Property and Copyright Law).

<sup>264</sup> Fromer, *Claiming Intellectual Property* *supra* note 260, at 725–726.

<sup>265</sup> 35 U.S.C. § 112(f); Mark A. Lemley, *Software Patents and the Return of Functional Claiming*, 2013 WIS. L. REV. 905, 905, 907–908 (2013), <https://repository.law.wisc.edu/s/uwlaw/item/19685>.

<sup>266</sup> Fromer, *Claiming Intellectual Property*, *supra* note 260, at 759.

<sup>267</sup> Tao Zhang, Daniel J. Sherwintner & Dov Greenbaum, *Call for Standardization in Patent Claim Drafting*, 34 Santa Clara High Tech. L.J. 290, 314 (2018), <https://digitalcommons.law.scu.edu/chtlj/vol34/iss3/2>.

<sup>268</sup> *Glossary Initiative*, USPTO, <https://www.uspto.gov/patent/initiatives/glossary-initiative> (last updated Apr. 3, 2016); MANNY SCHECTER & ALISON MORTINGER, USING ANALYTICS TO GENERATE GLOSSARIES IN PATENT APPLICATIONS 29 (Nov./Dec. 2013), [https://www.uspto.gov/sites/default/files/patents/init\\_events/swglossary\\_e\\_ibm\\_2013oct03att.pdf](https://www.uspto.gov/sites/default/files/patents/init_events/swglossary_e_ibm_2013oct03att.pdf) (for a general discussion).

<sup>269</sup> See Shawn S. Chang & Amanda K. Murphy, *Glossary Pilot Report – It’s a Matter of Semantics?*, FINNEGAN PROSECUTION FIRST BLOG (Mar. 22, 2016), <https://www.finnegan.com/en/insights/blogs/prosecution-first/glossary-pilot-report-its-a-matter-of-semantics.html>.

<sup>270</sup> *Id.*

proposed defensive patent strategy framework for the OSS communities: (1) freedom to operate and innovate; (2) commitment to openness; (3) distributed costs and benefits; and (4) reliability.<sup>271</sup> These principles are useful for evaluating the proposed inclusive patent system, as programmers in the OSS communities, and the commercial firms that work with these programmers, are the main target groups for these new patents. The proposed regime provides a transaction-free mechanism, through the open innovation defense and compulsory licenses, to secure the freedom to operate and innovate. Quick disclosures can be secured through the USPTO website with minimal delays due to examination of formal requirements, guaranteeing openness of information. Statutory provisions are transparent and easy to understand if they are written in plain language for nonlawyers, lessening the risk of uncertainty in enforceability.

Through compulsory licenses with limited exclusive rights to be used in infringement counter-claims and as bargaining chips, the proposed inclusive patents are expected to significantly reduce prosecution and transaction costs, while increasing both the benefits from the early disclosure of inventions and access to practice patented inventions. Chien's proposal has the benefits of early disclosure, but will not reduce prosecution costs, as her "defensive only" patents will still require examination.<sup>272</sup> Her "defensive only" patents function like patents under the licenses-of-rights scheme adopted by European countries.<sup>273</sup> Thus, a formal license is required if a party wants to practice the protected invention. Her proposal would keep the patent system unaffordable for many innovators, especially individual innovators.

As a codified defense, the rights provided by the open innovation defense are reliable and guarantee the right to practice the patented invention throughout the term of protection. The fully-codified-public-law regime proposed by this author is more reliable than the hybrid, public-private constructed, semi-codified regime proposed by Van Overwalle.<sup>274</sup> Her proposed system is not transaction free because it needs to use contracts through open patent licenses for sharing technologies. Currently, a variety of open patent licenses are available, although it is unlikely that small innovators, with limited legal assistance, understand how these licenses interact with respect to different situations in the R&D process.<sup>275</sup> Moreover, it is unclear whether a provision that maintains the freedom to use and improve on patented in-

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<sup>271</sup> Schultz & Urban, *supra* note 32, at 21.

<sup>272</sup> Chien, *Comparative*, *supra* note 197, at 136.

<sup>273</sup> *Id.*, at 137. Many European countries adopt the scheme, Catherine Jewell & Charlotte Tilbury, *Licences of Right in European Patent Convention (EPC) Territories and with respect to European Unitary Patents*, (2017), <https://www.beckgreener.com/licences-right-european-patent-convention-epc-territories-and-respect-european-unitary-patents>.

<sup>274</sup> Van Overwalle, *supra* note 118, at 30.

<sup>275</sup> Daniel A. Almeida et al., *Do Software Developers Understand Open-source Licenses?*, CIPC'17 PROC. THE 25<sup>TH</sup> INT'L CONF. ON PROGRAM COMPREHENSION 1, 2 (2017), <https://dl.acm.org/citation.cfm?id=3101416> (their survey indicates difficulties that software developers face to understand how different types of open-source licenses interacts and lack of knowledge to tease apart license interactions across multiple situations).

ventions, through open patent licenses, is enforceable.<sup>276</sup> In contrast, the proposed inclusive patent system codifies the copyleft concept in the Patent Act, ensuring freedom and uniform enforcement without any transaction costs.

Innovators will have the freedom to use protected inventions throughout the term of patent rights, even if inclusive patents are converted to regular exclusive patents, as innovators who begin using registered inventions before conversion are protected by intervening rights. The proposed inclusive patent system satisfies all four of the principles identified by Profs. Schultz and Urban<sup>277</sup> and should attract both innovators in the OSS communities and individual users who will take advantage of the disclosure mechanism provided by this regime. If the USPTO provides mechanisms to reduce the costs of initial disclosure, innovators should prefer to disclose their inventions through the inclusive patent system, rather than through private defensive publication mechanisms.

Moreover, the proposed hybrid inclusive and exclusive patent system rewards commercial firms with two options: (1) sharing their inventions through inclusive patents or (2) converting their inclusive patents into regular exclusive patents, which can be used to exclude others for profit. Individual innovators usually do not have the resources to determine the commercial value of their inventions, and as a result, may fail to disclose and diffuse their innovations without assistance.<sup>278</sup> Publishing such inventions as inclusive patents incentivizes commercial firms to assist inclusive patent owners who will likely collaborate with firms for commercialization purposes when the firms find commercial value in the inventions.

Interactions between commercial firms and individual innovators increase social welfare.<sup>279</sup> To encourage these interactions, the proposed patent system is designed to be neutral to any innovators that engage in open innovation. Commercial firms in complex technologies have been using their patents defensively to share technologies and secure their freedom to operate and innovate, the same patent uses preferred by the OSS communities. These firms find inclusive patents useful as mechanisms to secure their freedom to operate and innovate without using open patent licenses. Through compulsory licenses, inclusive patents ensure PAEs share their patents. In particular, the quick disclosure and attachment of property rights encourages open innovation.

Inclusive patents are not designed for commercial firms in discrete technologies that engage in closed innovation and use patents to exclude others, although

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<sup>276</sup> Sara Boettiger & Dan L. Burk, *Open-source Patenting*, 1 J. INT'L BIOTECH. L., 221, 226, (2004), <https://ssrn.com/abstract=645182>.

<sup>277</sup> Schultz & Urban, *supra* note 32, at 21. See the text accompanying *supra* note 273.

<sup>278</sup> See generally Eric von Hippel et al, *Market Failure in the Diffusion of Clinician-Developed Innovations: The Case of Off-Label Drug Discoveries*, 44 SCI. PUB. POL'Y 121 (2017), <https://academic.oup.com/spp/article/44/1/121/2525545>. Von Hippel proposes to provide services to assist innovators to estimate likely demand, which is most effectively provided by producers in the field of application of their technology.

<sup>279</sup> Gambardella et al., *supra* note 203, at 23.

these firms may still find the proposed patents attractive in instances where they do not know the commercial value of their inventions and want to take advantage of deferred examination to reduce prosecution costs. The inclusion of the compulsory licenses aims to ensure inclusive patent owners have the freedom to operate and innovate on their inventions, especially when operating in areas with patents held by firms that do not practice their patents, such as PAEs. The changes will marginally impact firms that practice their patents.

Finally, inclusive patent owners should be able to enjoy a twelve-month priority period as a duly filed application under the Paris Convention.<sup>280</sup> The internet has given rise to a sharing society that has made innovation activities borderless. With limited resources, it is very unlikely that SMEs and individual users will be able to file patent applications in major markets. However, securing inclusive patents will enable small innovators to join patent commons and contribute to sharing activities within borderless innovation communities, which may counteract the shortcomings of the territoriality principle, which dominates all types of intellectual property systems.<sup>281</sup>

## V. Conclusion

That patents give control over the means of producing or servicing complex technologies is a myth. Nor do patents bestow power to exclude others, except for PAEs that do not practice their patents and have no risk of counter-infringement assertions. Instead, patent owners that practice their inventions develop self-help arrangements to use patents inclusively to share technologies with others through cross-licensing and other private ordering mechanisms in order to avoid patent litigation and promote open innovation. The current patent system, which only views patents as exclusive rights, is outdated for not taking into account new uses of patents. The system also fails to incentivize innovators to disclose their inventions through the system, as the current system is unaffordable for many innovators that are willing to disclose their inventions. The current patent system was developed based on the outdated assumption that innovators engage in closed innovation, and only profit by selling products and services, as was standard in the pre-internet era. Patent owners' self-help arrangements for sharing their technologies cannot remedy all shortcomings of the outdated system. As such, this article has proposed a reform

<sup>280</sup> Paris Convention for the Protection of Industrial Property, as last revised at the Stockholm Revision Conference, Mar. 20, 1883, 21 U.S.T. 1583, 828 U.N.T.S. 305, art. 4.

<sup>281</sup> The U.S. Supreme Court emphasized the territoriality principle and applied the presumption against extraterritorial reach of U.S. patents. *E.g.*, *EEOC v. Arabian Am. Oil Co.*, 499 U.S. 244, 248 (1991); *Microsoft Corp. v. AT&T Corp.*, 550 U.S. 437, 441, 454–55 (2007); *see generally* Timothy R. Holbrook, *Boundaries, Extraterritoriality, and Patent Infringement Damages*, 92 NOTRE DAME L. REV. 1745 (2017), <https://scholarship.law.nd.edu/cgi/viewcontent.cgi?article=4716&context=ndlr> (for a general discussion on treatment of territoriality principle in intellectual property laws in the U.S. and Germany); Alexander Peukert et al., *Beyond Territoriality: Transnational Legal Authority in an Age of Globalization*, QUEEN MARY STUD. IN INT'L L. (2012), [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1592263](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1592263).

to address the changes necessary to remedy shortcomings that the self-help mechanism cannot remedy. A further study may be necessary to reevaluate the role of the patent office to disclose and disseminate inventions and examine patentability in order to promote open innovation through disclosing inventions early and granting inclusive patents, based on an understanding of patents as inclusive rights for sharing technologies. This new insight on property rights as substantive use rights may lead to future research endeavors in reexamining current IP systems.