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## Measuring the Inventor's Contribution

Christopher S. Storm

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Christopher S. Storm

## Measuring the Inventor's Contribution

21 U.N.H. L. Rev. 167 (2022)

**ABSTRACT.** All inventors should be compensated for the value of their contributions. Inventors contribute both to the patent system and to the technology commercialization process by providing access to a qualifying disclosure describing a qualifying idea. Yet today, a schism divides the patent world and the commercial world over the value of these inventive contributions. Unlike the commercial world, the patent world pays inventors for the contributions of non-inventor technology commercialization roles. In particular, seminal reasonable royalty cases like *Georgia-Pacific* and *TWM Manufacturing* allow patentees to recover infringer profits and proxies thereof—in violation of congressional mandate and the Supreme Court's opinion in *Aro Manufacturing*. These cases perpetuate the schism and contribute to the patent system's most consequential policy issues. Courts can close the schism and address these policy issues by removing measurement errors in reasonable royalty calculations. Instead of “indirectly” measuring compensatory damages based on the value of the infringer's implementation, courts should set reasonable royalties based on “direct” measurements of the inventor's contribution. Unlike indirect measurements, direct measurements ensure compliance with *Aro Manufacturing*. By adopting direct measurement techniques, courts can help all inventors receive compensation for the value of their contributions.

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“We must stay true to that part of the American Dream that says anyone with a great idea can change the world.”<sup>1</sup>

“Good ideas are not scarce—they’re a dime a dozen. Businesses are successful not because of a unique idea but because of extraordinary execution.”<sup>2</sup>

## I. INTRODUCTION

A schism divides the patent world and the commercial world over the value of ideas. The first quote above is from Senator Chris Coons. His quote generally reflects how the patent world values ideas. In this world view, companies are successful because of the inventions implemented at those companies.<sup>3</sup>

The second quote is from Dr. Rob Adams—a venture capitalist, author, and business school professor.<sup>4</sup> His quote generally reflects how ideas are valued outside the patent world.<sup>5</sup> Although ideas are important, they do not ensure

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<sup>1</sup> Press Release, Chris Coons, Senator, Coons, Durbin, Hirono to Introduce Patent Reform Bill to Protect Innovation, Confront Abuse (Mar. 3, 2015), <https://www.coons.senate.gov/news/press-releases/coons-durbin-hirono-introduce-patent-reform-bill-to-protect-innovation-confront-abuse> [https://perma.cc/952B-LJ3G].

<sup>2</sup> ROB ADAMS, A GOOD HARD KICK IN THE ASS, at cover copy (2002).

<sup>3</sup> See, e.g., MICHAEL A. GOLLIN, DRIVING INNOVATION: INTELLECTUAL PROPERTY STRATEGIES FOR A DYNAMIC WORLD 11 (2008) (“Innovation helps some individuals, companies, and nations win, while others lose.”); Amy Landers, *The Interconnections Between Entrepreneurship, Science, and the Patent System*, 2016 UTAH L. REV. 631, 631–32, 642 (2016) (noting how some patent stakeholders have embraced a linear model of innovation that “attempts to force patents into the role of an essential conduit between foundational research and finished products”). But see *infra* notes 280–283 and accompanying text (explaining how most forms of “innovation” exist outside the patent regime).

<sup>4</sup> *Rob Adams Biography*, DR. ROB ADAMS, <https://drrobadays.com/biography> [https://perma.cc/WXW6-3KZ2] (last visited Aug. 6, 2022).

<sup>5</sup> The outside world, of course, is heterogenous, and rhetoric about the value of inventions (and patents) varies across industries. Compare DAN L. BURK & MARK A. LEMLEY, THE PATENT CRISIS AND HOW THE COURTS CAN SOLVE IT 4 (2009) (“In the pharmaceutical industry, there seems to be a strong consensus (at least among innovation rather than generic pharmaceutical companies) that patents are critical to innovation.”), with *id.* (“Lawyers and executives in the information technology industries, by contrast, almost invariably see the patent system as a cost rather than a benefit to innovation.”). Even the pharmaceutical industry, however, recognizes successful commercialization requires more than just a new discovery. See, e.g., Laura Elizabeth Landsdowne, *Exploring the Drug Development Process*, TECHNOLOGY NETWORKS (Mar. 13, 2020), <https://www.technologynetworks.com/drug-discovery/articles/exploring-the-drug->

success.<sup>6</sup> According to this world view, companies are successful because of their execution, not necessarily because of their inventions.

This Article explores this rhetorical schism, starting with a simple, normative premise: (1) all inventors (2) should be compensated for the value (3) of their contributions. Parts II-V address all three elements of this premise in reverse order.

Part II compares technology commercialization research with patent law's inventorship requirements to define the inventor's contribution. "Design thinking" and other technology commercialization theories reveal similarities between inventors in the patent world and "Ideators" in the commercial world.<sup>7</sup> Specifically, inventors/Ideators provide the same contribution to the patent world as to the technology commercialization process: *access to a qualifying disclosure describing a qualifying idea*.<sup>8</sup> This revelation suggests that courts can close the schism between the patent world and the commercial world by accurately measuring the inventor's contribution.

Part III addresses valuation of the inventor's contribution. When setting reasonable royalties, courts measure inventive contributions indirectly by measuring the value of infringer implementations.<sup>9</sup> These indirect measurement approaches, however, contradict congressional mandate and Supreme Court guidance.<sup>10</sup> Indirect measurements also invite errors, which patent owners can exploit to inflate damages awards and capture value created by non-inventor technology commercialization roles.<sup>11</sup> These errors perpetuate the schism and contribute to the patent system's most consequential policy issues. To close the schism and address these policy issues, courts should eschew indirect reasonable royalty measurements in favor of approaches that directly measure the inventor's contribution. Where direct evidence exists, judges should exclude indirect evidence—including infringer profitability and proxies thereof—from jury presentations, expert reports, and their own bench rulings.

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development-process-331894 [https://perma.cc/EJL3-V2AT] (describing the preclinical and clinical trials, regulatory review, manufacturing, marketing, post-marketing, and other work required).

<sup>6</sup> See, e.g., Elena Mazhuha, *Founders, Drop the NDAs—No One Cares About Your Idea*, SIFTED (Feb. 14, 2022), <https://sifted.eu/articles/nda-startup-steal-idea> [https://perma.cc/4THY-S7HJ] ("All ideas are untested hypotheses, which need years of validation, thousands of iterations and might not work eventually.")

<sup>7</sup> See *infra* Part II.

<sup>8</sup> See *infra* Part II.C.

<sup>9</sup> See *infra* notes 169–71 and accompanying text.

<sup>10</sup> See *infra* Part III.A.

<sup>11</sup> See *infra* Part III.A.

Part IV continues the valuation discussion by describing how courts can set reasonable royalties using direct measurement techniques. Part IV.A discusses three examples of direct measurement techniques: the inventor cost method, the reasonable cost method, and the “ex ante” method. The remainder of Part IV discusses payment mechanisms and additional factors courts may consider when adjusting reasonable royalties.

Part V concludes by returning to the first element of this Article’s premise: “all inventors.” Indirect measurement techniques have allowed some patentees to inflate their damages awards.<sup>12</sup> Rather than limit inflationary damages, the patent system reacted by prohibiting other inventors from recovering any compensatory damages.<sup>13</sup> This reaction was reasonable at the time because awarding inflated damages to every inventor would have been untenable.<sup>14</sup> By embracing direct measurement methods, however, courts and policymakers can reopen the patent system to all inventors without fear of inflated damages awards. In time, patents can stop resembling lottery tickets and start reflecting the actual value of the inventor’s contribution.

## II. THE INVENTOR’S CONTRIBUTION

In a fair and balanced patent system, all inventors would be compensated for the value of their contributions. In such a system, patent damages awards would avoid both under-compensation and over-compensation. Under-compensation would be unfair to inventors. Any system desiring to foster innovation should not expect inventors to contribute more value than they receive.<sup>15</sup> On the other hand, over-compensation can be unfair to those responsible for paying such compensation. Any system desiring to encourage economic growth should not tax that growth by requiring operating companies to pay inventors more than the value those inventors provide.<sup>16</sup>

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<sup>12</sup> See *infra* Part III.A.

<sup>13</sup> See *infra* Part IV.

<sup>14</sup> See *infra* notes 256–64 (discussing how overcompensation exacerbates royalty stacking issues).

<sup>15</sup> See *U.S. Patent and Trademark Office*, U.S. DEPT OF COMMERCE, <https://www.commerce.gov/bureaus-and-offices/uspto> [<https://perma.cc/7VWN-6RBD>] (last visited Jan. 31, 2022) (“The mission of the U.S. Patent and Trademark Office (USPTO) is to foster innovation, competitiveness and economic growth, domestically and abroad . . .”).

<sup>16</sup> See *id.*

Part II endeavors to define the inventor's contribution so that its value can be accurately measured. First, Part II.A describes the technology commercialization process to explain how different roles contribute to product development. Part II.B then investigates the inventor's contribution to the U.S. patent system based on the current legal frameworks for inventorship and patentability. Finally, Part II.C defines the inventor's contribution to reflect how inventors contribute both to technology commercialization and to the patent system.

### *A. Introduction to Technology Commercialization*

For purposes of this Article, "technology commercialization" includes those activities required for a firm to successfully launch new technology products.<sup>17</sup> This definition excludes activities that are not performed by the firm responsible for product launch. For example, technology commercialization does not include activities such as outbound licensing or patent monetization.<sup>18</sup>

This section introduces eight "roles" required for technology commercialization. Each role notionally represents one person. However, in many companies, teams of people perform each role. In addition, the same person may serve in multiple roles. Furthermore, roles may interact with each other differently than described in this section, and some roles may perform their required activities in different orders.

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<sup>17</sup> Cf. Andrew J. Nelson & Erik Monsen, *Teaching Technology Commercialization: Introduction to the Special Section*, 39 J. TECH. TRANSFER 774, 774 (2014) (defining "technology commercialization as "the process of acquiring ideas, augmenting them with complementary knowledge, developing and manufacturing saleable goods, and selling the goods in a market" (quoting Will Mitchell & Kulwant Singh, *Survival of Businesses Using Collaborative Relationships to Commercialize Complex Goods*, 17 J. STRATEGIC MGMT. 169, 170 (1996)).

<sup>18</sup> University technology-transfer offices often conflate these concepts. Although universities describe their work as "technology commercialization," they are really licensing outside companies to perform technology commercialization activities. See, e.g., Daniel P. Dern, *How Purdue University Commercializes Its Research*, IEEE SPECTRUM (Apr. 15, 2022), <https://spectrum.ieee.org/yung-hsiang-lu-career> [<https://perma.cc/4V9N-SY6Y>] (discussing how Purdue helps students to start and grow businesses that commercialize technologies developed at Purdue); *Technology Commercialization*, UNIVERSITY OF MINNESOTA, <https://research.umn.edu/units/techcomm/about-us/overview> [<https://perma.cc/29HY-EZ9K>] (last visited Feb. 27, 2022) ("University of Minnesota Technology Commercialization facilitates the transfer of University technology and ideas to licensee companies—both established and startup—for the development of new products and services that benefit the public good, foster economic growth, and generate revenue to support the University's mission.").

The first five roles discussed below correspond to the five steps in design thinking theory,<sup>19</sup> although the roles also exist in other industries that have not embraced design thinking.<sup>20</sup> The remaining three roles reflect just some of the additional work required to launch technology products.<sup>21</sup>

### 1. The Marketer

The Marketer studies customers and their use cases to identify customer needs that can be addressed through new or improved products.<sup>22</sup> Most customers do not buy products for the purpose of buying products.<sup>23</sup> Rather, customers have a “Job to

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<sup>19</sup> See HASSO PLATTNER INST. OF DESIGN AT STANFORD, AN INTRODUCTION TO DESIGN THINKING 2–6 (2010) (defining the five steps as empathize, define, ideate, prototype, and test); see also *infra* note 81 (addressing the relationship between the five steps of design thinking and the first five technology commercialization roles). Although design thinking theory is relatively new, the design thinking roles have existed for over a century. See, e.g., Tim Brown, *Design Thinking*, HARV. BUS. REV., June 2008, at 85–86 (describing how Thomas Edison's commercialization approach was “an early example of what is now called ‘design thinking’”). Today, some of the world's most inventive companies have embraced design thinking techniques to solve problems. Compare, e.g., *IBM Tops U.S. Patent List for 28th Consecutive Year*, IBM, [https://research.ibm.com/interactive/patents/\[https://perma.cc/N3RD-PBPY\]](https://research.ibm.com/interactive/patents/[https://perma.cc/N3RD-PBPY]) (Jan. 12, 2021) (touting IBM's leadership among patent filers); with *Solve Problems Through Ideation*, IBM, [https://www.ibm.com/garage/method/practices/think/practice\\_ideation/\[https://perma.cc/NGW3-HGGM\]](https://www.ibm.com/garage/method/practices/think/practice_ideation/[https://perma.cc/NGW3-HGGM]) (last visited Feb. 2, 2022) (describing how IBM relies on design thinking to ideate and solve problems).

<sup>20</sup> For example, like in design thinking, the drug development process starts with people who identify commercial needs and define the problem to be solved. See, e.g., Antti Jekunen, *Decision-Making in Product Portfolios of Pharmaceutical Research and Development*, 8 DRUG DESIGN DEV. & THERAPY 2009, 2013 (2014) (discussing how research managers “prioritize available projects and fund the best” project based on whether the resulting drug is likely to have commercial value). After ideating a potential solution, pharmaceutical companies embark on lengthy prototyping and testing processes. Landsdowne, *supra* note 5 (reviewing the drug discovery, development, and approval processes).

<sup>21</sup> Most technology commercialization efforts also include contributions from roles beyond the eight described herein. For example, the author would like to believe that attorneys can be important contributors to the commercialization process, though definitive evidence is limited on this point.

<sup>22</sup> See, e.g., HASSO PLATTNER INST. OF DESIGN AT STANFORD, *supra* note 19, at 2 (“As a design thinker, the problems you are trying to solve are rarely your own—they are those of a particular group of people; in order to design for them, you must gain empathy for who they are and what is important to them.”).

<sup>23</sup> Clayton M. Christensen & Bob Moesta, *Know the Job Your Product Was Hired for (with Help*



Be Done.”<sup>24</sup> When customers discover a Job to Be Done, they search for products they can “hire” to get the job done.<sup>25</sup>

Consider, for example, a milkshake. A company hoping to sell more milkshakes might look for ways to improve their product, such as by making their shakes thicker, chunkier, or more chocolatey.<sup>26</sup> Milkshake customers, however, do not buy milkshakes for their feature sets.<sup>27</sup> Rather, customers “hire” milkshakes to do a job.<sup>28</sup> For example, researchers found that morning customers would purchase milkshakes to make their commutes more interesting and to ensure that they were not hungry at mid-morning.<sup>29</sup> Although these customers may have preferred certain levels of chocolateness, these preferences were not in the “job description” and therefore did not drive sales.<sup>30</sup>

Like milkshake consumers, technology customers buy new products to perform a Job to Be Done.<sup>31</sup> In *Crossing the Chasm*, Geoffrey A. Moore divides technology customers into five groups: innovators, early adopters, the early majority, the late majority, and laggards.<sup>32</sup> “Each group represents a unique psychographic profile—a combination of psychology and demographics that makes its marketing responses different from those of the other groups.”<sup>33</sup> At one end of the spectrum, innovators adopt new technologies because “technology is a central interest in their life, regardless of what function it is performing.”<sup>34</sup> At the other extreme, laggards

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*from Customer Selfies*), HARV. BUS. REV. (Jun. 6, 2016), <https://hbr.org/2016/06/know-the-job-your-product-is-doing-with-help-from-customer-selfies> [https://perma.cc/2LUY-BZX7] (“[C]ustomers make the choices they make to bring a product or service into their lives not because they’re dying to purchase something . . .”).

<sup>24</sup> *Id.*

<sup>25</sup> CLAYTON M. CHRISTENSEN & MICHAEL E. RAYNOR, *THE INNOVATOR’S SOLUTION* 75 (2003).

<sup>26</sup> *Id.* at 76.

<sup>27</sup> *See id.* (“[A restaurant chain] explored whether making the shakes thicker, chocolatey, cheaper, or chunkier would satisfy [customers] better. The chain got clear inputs on what the customers wanted, but none of the improvements to the product significantly altered sales or profits.”).

<sup>28</sup> *Id.*

<sup>29</sup> *Id.*

<sup>30</sup> *Id.*

<sup>31</sup> *See, e.g., id.* at 83 (hypothesizing that customers “hire” handheld devices “to help them be productive in small snippets of time that otherwise would be wasted”).

<sup>32</sup> GEOFFREY A. MOORE, *CROSSING THE CHASM* 15 (HARPERCOLLINS 3D ED. 2014).

<sup>33</sup> *Id.*

<sup>34</sup> *Id.* at 15–16 (emphasis added).

embrace new technologies like dogs embrace medicine—only when hidden inside another product (or in a chunk of cheese).<sup>35</sup> Although innovators and laggards may not have much in common, they both make purchasing decisions in response to personal needs rather than feature sets.<sup>36</sup>

Failure to understand a customer's needs or the Job to Be Done can doom any new product. Over sixty percent of planned new products fail to reach market; of the forty percent that survive, forty percent fail to become profitable.<sup>37</sup> These efforts often fail because the products focus on the “wrong things.”<sup>38</sup> Even great companies will fail to successfully launch innovative new products if “they focus on technical improvements rather than customer needs.”<sup>39</sup>

## 2. The Product Manager

The Product Manager organizes and oversees the product development process. The Product Manager is responsible for issues such as the business strategy behind the product, the product's functional requirements, and work coordination across other functions (e.g., scientists, engineers, and designers).<sup>40</sup> The full scope of a Product Manager's responsibilities can vary, however, depending on the product, the company, and the industry.<sup>41</sup> In addition, some teams may include similar roles in place of or in addition to the Product Manager, including project managers, program managers, and program owners.<sup>42</sup>

One of the Product Manager's most important responsibilities is “orchestrating the various activities associated with ensuring that a product is delivered that meets

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<sup>35</sup> *Id.* at 17 (“The only time they ever buy a technological product is when it is buried deep inside another product—the way, say, that a microprocessor is designed into the braking system of a new car—such that they don't even know it is there.”).

<sup>36</sup> *Id.* at 15–17; *see also* NORBERT AUBUCHON, *THE POWER OF PERSUASION* 34 (1997) (“Your buying process begins when you have an unsatisfied need. None of us does anything without a need. It supplies our motivation.”).

<sup>37</sup> CHRISTENSEN & RAYNOR, *supra* note 25, at 73.

<sup>38</sup> Christensen & Moesta, *supra* note 23; *see also* *The Top 12 Reasons Startups Fail 4*, CB INSIGHTS (Aug. 3, 2021), <https://www.cbinsights.com/research/startup-failure-reasons-top/> [<https://perma.cc/7BML-STXA>] (reporting founder survey data indicating that thirty-five percent of startups fail due to lack of market need).

<sup>39</sup> Christensen & Moesta, *supra* note 23.

<sup>40</sup> *Product Manager*, WIKIPEDIA, [https://en.wikipedia.org/wiki/Product\\_manager](https://en.wikipedia.org/wiki/Product_manager) [<https://perma.cc/8NA8-7HST>] (last visited Feb. 2, 2022).

<sup>41</sup> *See id.*

<sup>42</sup> *Id.*

users' needs."<sup>43</sup> The Product Manager does this by gathering and defining requirements based on the customer needs identified by the Marketer.<sup>44</sup> These requirements define, among other things, the problems that functional members of the product team must solve in order for the end product to satisfy the identified customer needs.<sup>45</sup> In addition, Product Managers also set other requirements that are unrelated to customer needs, such as organizational demands, regulatory restrictions, and budgetary constraints.<sup>46</sup> As a result, not all of the problems identified by the Product Manager may trace back to a customer need.

### 3. The Ideator

The Ideator identifies potential solutions to the problems identified by the Product Manager.<sup>47</sup> The ideation process includes two distinct stages: inspiration and framing.<sup>48</sup> In the inspiration stage, the Ideator thinks of a new idea.<sup>49</sup> In the framing stage, the Ideator transitions the new idea from the conceptual world (i.e., in the Ideator's head), to the real world, where it can be shared with others.<sup>50</sup> The Ideator might frame the idea, for example, by writing it down, sketching it out, or using other media to communicate the idea to others.<sup>51</sup>

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<sup>43</sup> *Id.*

<sup>44</sup> At some companies, the Product Manager may fulfill the role of Marketer by directly meeting with users to identify customer needs as part of the requirements elicitation process. *Id.*

<sup>45</sup> See *Requirement*, WIKIPEDIA, <https://en.wikipedia.org/wiki/Requirement> [<https://perma.cc/9VSC-LTXE>] (last visited Feb. 2, 2022) (summarizing various types of requirements "that could speak to any necessary (or sometimes desired) function, attribute, capability, characteristic, or quality of a system for it to have value and utility to a customer, organization, internal user, or other stakeholder").

<sup>46</sup> *Id.*; see also *Project Management Triangle*, WIKIPEDIA, [https://en.wikipedia.org/wiki/Project\\_management\\_triangle](https://en.wikipedia.org/wiki/Project_management_triangle) [<https://perma.cc/C367-U47X>] (last visited Feb. 2, 2022) (describing how project managers must balance budget, time, and scope restraints in order to ensure project quality).

<sup>47</sup> See, e.g., HASSO PLATTNER INST. OF DESIGN AT STANFORD, *supra* note 19, at 4 ("You ideate in order to transition from identifying problems to creating solutions for your users.").

<sup>48</sup> See, e.g., Emily Elia, *Four Key Stages of Idea Generation for Creative Product Development*, MEDIUM (Jul. 18, 2020), <https://medium.com/creative-cognition/four-key-stages-of-idea-generation-for-creative-product-development-6bf2ca554de0> [<https://perma.cc/6CXX-4FR9>]. The third stage (prototyping) is addressed in Part II.A.4, *infra*, and the fourth stage (validation) is addressed in Part II.A.5, *infra*.

<sup>49</sup> *Id.*

<sup>50</sup> *Id.*

<sup>51</sup> *Id.*

Unfortunately, there is no consensus theory on the origin of good ideas.<sup>52</sup> Can people consciously innovate by using various techniques for summoning new ideas?<sup>53</sup> Or are ideas mere byproducts of electrical impulses between nerve cells?<sup>54</sup> Maybe Ideators are just “conduits” who communicate new ideas without playing an active role in creating them.<sup>55</sup> Or maybe they are just more hygienic.<sup>56</sup> The possibilities are endless.

Although inspiration may still be a mystery, scholars do understand how the inspiration stage fits into the technology commercialization process. “The caricature of inventors waking up in the middle of the night with a full-blown clever idea to be marketed is just that, a caricature.”<sup>57</sup> Although society once believed that Ideators start the process by making a scientific discovery,<sup>58</sup> subsequent generations have learned that technology commercialization typically starts with either the Marketer identifying needs to address or the Product Manager defining problems to

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<sup>52</sup> See JEF PEETERS ET AL., REFINED METRICS FOR MEASURING NOVELTY IN IDEATION I (2010) (“The idea generation phase is considered an important, although fuzzy, step in product development.”), available at [https://www.researchgate.net/publication/266285529\\_Refined\\_Metrics\\_for\\_Measuring\\_Novelty\\_in\\_Ideation](https://www.researchgate.net/publication/266285529_Refined_Metrics_for_Measuring_Novelty_in_Ideation) [<https://perma.cc/57KX-7WPG>].

<sup>53</sup> See, e.g., Martin Luenendonk, *18 Best Idea Generation Techniques*, CLEVERISM (Aug. 3, 2020), <https://www.cleverism.com/18-best-idea-generation-techniques/> [<https://perma.cc/Q5AL-ABHQ>].

<sup>54</sup> Cf. Anaelle Camarda et al., *Neural Basis of Functional Fixedness During Creative Idea Generation: An EEG Study*, 118 NEUROPSYCHOLOGIA 4 (2018) (measuring brain activity occurring while overcoming fixation effects during ideation).

<sup>55</sup> See Steve Faktor, *The Collision Theory of Innovation*, MEDIUM (Mar. 23, 2019), <https://medium.com/hackernoon/the-collision-theory-of-innovation-b6087aee9368> [<https://perma.cc/W68A-6A5Z>] (hypothesizing that “[i]nnovation happens when two or more unrelated ideas collide to create something new” and that “every invention imaginable is incubating in this infinite global soup”).

<sup>56</sup> Cf., e.g., Linda A. Ovington et al., *Do People Really Have Insights in the Shower? The When, Where, and Who of the Aha! Moment*, 52 J. CREATIVE BEHAVIOR 21, 22 (2018) (analyzing survey data to explain why people may have insights in the shower).

<sup>57</sup> See, e.g., VIJAY K. JOLLY, *COMMERCIALIZING NEW TECHNOLOGIES: GETTING FROM MIND TO MARKET* 55 (1997).

<sup>58</sup> Roy Rothwell, *Towards the Fifth-Generation Innovation Process*, 11 INT’L MARKETING REV. 7, 8 (1994) (defining the “first-generation innovation process” as a societal theory popular after the Second World War that perceived technology commercialization “as a linear progression from scientific discovery, through technological development in firms, to the marketplace”).

solve.<sup>59</sup> Instead of starting the technology commercialization process, Ideators participate in a changing and evolutionary innovation model involving high levels of interaction with other roles.<sup>60</sup>

Despite this modern understanding, some still attempt to start the technology commercialization process with an idea or scientific discovery. For example, university licensing offices often describe the process as beginning with research or invention.<sup>61</sup> In addition, entrepreneurship books provide guidance for those who wish to build a business around a new technology.<sup>62</sup>

Starting the technology commercialization process around an idea or scientific discovery, however, can jeopardize commercial success. Technology-focused research and development “creates the potential for technology development to be misaligned away from market needs.”<sup>63</sup> Even if the developed technology eventually reaches the market, the technology “will likely fall into the valley of death” because the developers failed to empathize with customer needs.<sup>64</sup> To avoid this fate, technology researchers must focus on the customer and the market rather than just the technology itself.<sup>65</sup>

Accordingly, companies cannot skip market research and problem identification when trying to build a product starting with a new idea. Rather, they

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<sup>59</sup> *Id.* at 8–12 (defining the “second-generation innovation process” as a linear process the started with a market need, the “third-generation innovation process” as a coupled model that starts with an identified need and new technology, and the “fourth-generation innovation process” as parallel and integrated processes that start with marketing).

<sup>60</sup> *See, e.g.*, José Carlos Barbieri & Antonio Carlos Teixeira Álvares, *Sixth Generation Innovation Model: Description of a Success Model*, 13 REVISTA DE ADMINISTRAÇÃO E INOVAÇÃO 116, 119 (2016) (summarizing scholarly works by other authors describing the fifth-generation and sixth-generation innovation processes).

<sup>61</sup> *See, e.g.*, *The CTTEC Process*, CARNEGIE MELLON UNIV., <https://www.cmu.edu/cttec/cttec-process/index.html> [<https://perma.cc/R366-LAYK>] (last visited Feb. 2, 2022) (defining the first step of the technology commercialization process as invention disclosure); *Process of Technology Commercialization*, THE UNIV. OF TEXAS AT AUSTIN, <https://research.utexas.edu/otc/process-of-technology-commercialization/> [<https://perma.cc/PYS4-UP7U>] (last visited Feb. 2, 2022) (defining the first two steps as research and invention disclosure). Of course, these universities are not actually describing the process of bringing new technology to market; rather, they are describing how the university outbound licenses technology to companies for them to commercialize.

<sup>62</sup> *See, e.g.*, JOLLY, *supra* note 57, at 15–17 (discussing various models that describe the first commercialization stage as “imagining,” “idea generation,” “concept,” or “idea”).

<sup>63</sup> Minseo Kim et al., *Bridging the Gap in the Technology Commercialization Process: Using a Three-Stage Technology–Product–Market Model*, SUSTAINABILITY, Nov. 2019, at 2.

<sup>64</sup> *Id.*

<sup>65</sup> *Id.* at 3.

must still perform the Marketer and Product Manager roles before proceeding with commercialization. For this reason, technology licensing offices recommend assessing ideas for their value proposition and product-market fit before continuing the technology commercialization process.<sup>66</sup> Similarly, venture capitalists expect entrepreneurs to validate the market and perform customer research before bringing a new product to market.<sup>67</sup> The purpose of this work is to push the commercialization process to a joint understanding of technological capability and market need.<sup>68</sup>

#### 4. The Prototyper

As stated above, the Ideator generates a new idea and frames the idea so it can be communicated to others.<sup>69</sup> The Prototyper builds the first tangible manifestation of the idea based on this communication.<sup>70</sup> Poetically speaking, the Prototyper brings the idea to life.

Prototyping can add value to the initial idea. Ideas rarely work right the first time.<sup>71</sup> Prototypers improve initial ideas through testing and experimentation.<sup>72</sup>

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<sup>66</sup> See, e.g., Brad Zehner & Gary Pletcher, *Successful Technology Commercialization—Yes or No?*, 25 MKTG. OF SCIENTIFIC & RESEARCH ORGS. 81, 93–94 (2017) (discussing the “Quicklook” methodology, which helps university licensing offices determine whether a new technology has market potential or satisfies a potential customer need).

<sup>67</sup> See, e.g., ROB ADAMS, IF YOU BUILD IT WILL THEY COME? 28–30 (2010) (describing a three-step commercialization process in which the first two steps are triaging the market opportunity and performing first-hand research to understand customer needs).

<sup>68</sup> JOLLY, *supra* note 57, at 55; see also Minseo et al., *supra* note 63, at 5 (“The key to bridging the stages is not the developer’s subjective judgment about the value of the technology and its derivative products. Rather, the key is to validate the innovation from the perspective of the consumer; the core value of the technology must be verified at each step.” (citing JOLLY, *supra* note 57)).

<sup>69</sup> See sources cited *supra* notes 48–51 and accompanying text.

<sup>70</sup> See Elia, *supra* note 48 (presenting the “prototyping” step as immediately following the “framing” step).

<sup>71</sup> See, e.g., Brown, *supra* note 19, at 86 (“[Thomas Edison] broke the mold of the ‘lone genius inventor’ by creating a team-based approach to innovation. Although Edison biographers write of the camaraderie enjoyed by this merry band, the process also featured endless rounds of trial and error—the ‘99% perspiration’ in Edison’s famous definition of genius.”).

<sup>72</sup> See, e.g., *Design Thinking*, INTERACTIVE DESIGN FOUND., <https://www.interaction-design.org/literature/topics/design-thinking> [<https://perma.cc/H5F9-DKED>] (last visited Feb. 2, 2022) (defining prototyping as “an experimental phase”); see also TOM KELLEY & JONATHAN LITTMAN, *THE ART OF INNOVATION* 103 (2001) (labeling prototyping as the “shorthand of innovation”).

For example, James Watson and Francis Crick won the 1962 Nobel Prize for discovering the molecular structure of DNA.<sup>73</sup> After conceiving a “nontrivial idea” while drawing fused rings on paper, they tested their hypothesis by building backbone models.<sup>74</sup> After “a week of solid fiddling” with the metal prototypes, Watson and Crick were able to identify the optimal DNA structure.<sup>75</sup>

### 5. The Tester

The Tester analyzes the prototype and tests whether it satisfies the user needs identified by the Marketer.<sup>76</sup> The Tester analyzes the prototype against a variety of relevant metrics.<sup>77</sup> Most obviously, the Tester verifies that the underlying technology works for its intended purpose. In addition, the Tester confirms that the prototype satisfies the customer need identified by the Marketer.<sup>78</sup> The Tester also confirms the business plan and the financial viability of the product.<sup>79</sup> In some industries, the Tester even verifies compliance with various regulatory and policy restrictions.<sup>80</sup>

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<sup>73</sup> KELLEY & LITTMAN, *supra* note 72, at 108–09.

<sup>74</sup> *Id.*

<sup>75</sup> *Id.*

<sup>76</sup> *See, e.g.*, HASSO PLATTNER INST. OF DESIGN AT STANFORD, *supra* note 19, at 6 (“The Test mode is when you solicit feedback, about the prototypes you have created, from your users and have another opportunity to gain empathy for the people you are designing for.”).

<sup>77</sup> *See* Dobrila Rancic Moogk, *Minimum Viable Product and the Importance of Experimentation in Technology Startups*, 2 TECH. INNOVATION MGMT. REV. 23, 24 (1st ed. 2012) (“[Testing] a version of a product against relevant metrics . . . can reveal whether the original idea: i) is valid, in which case development can continue in the same direction or ii) is not valid, in which case the strategy has to change.”).

<sup>78</sup> *See, e.g.*, HASSO PLATTNER INST. OF DESIGN AT STANFORD, *supra* note 19, at 6 (“Testing is another opportunity to understand your user, but unlike your initial empathy mode, you have now likely done more framing of the problem and created prototypes to test.”).

<sup>79</sup> *See, e.g.*, ERIC RIES, *THE LEAN STARTUP* 93–94 (2011) (explaining how startups can use a minimum-viable product “to test fundamental business hypotheses”); Moogk, *supra* note 77, at 24 (discussing how startups can use a minimum-viable product to test “two important assumptions: the assumption around providing value (i.e., the value hypothesis) and the assumption around growth in the market (i.e., the growth hypothesis)”).

<sup>80</sup> *See, e.g.*, Landsdowne, *supra* note 5 (describing the lengthy drug testing processes for obtaining regulatory approval in the pharmaceutical industry); *Automated Vehicles for Safety*, NAT’L HIGHWAY TRAFFIC SAFETY ADMIN., <https://www.nhtsa.gov/technology-innovation/automated-vehicles-safety> [<https://perma.cc/3PXZ-Q4MD>] (last visited Feb. 27, 2022) (“There is considerable investment into safe testing, development and validation of automated driving systems.”).

This Article's first five technology commercialization roles—Marketer, Product Manager, Ideator, Prototyper, and Tester—closely resemble the five stages of design thinking—empathize, define, ideate, prototype, and test.<sup>81</sup> The design thinking process is iterative—firms iterate “both by cycling through the process multiple times[] and also by iterating within a step.”<sup>82</sup> Similarly, the Marketer, Product Manager, Ideator, Prototyper, and Tester all work iteratively and collaboratively.<sup>83</sup> “The increasing complexity of products, services, and experiences has replaced the myth of the lone creative genius with the reality of the enthusiastic interdisciplinary collaborator.”<sup>84</sup> Although the first five technology commercialization roles each contribute individually, their output is the result of a team effort.

## 6. The Builder

The Builder takes the product from prototype to production.<sup>85</sup> Optimistic companies build new products anticipating customer demand.<sup>86</sup> The Builder is

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<sup>81</sup> See, e.g., HASSO PLATTNER INST. OF DESIGN AT STANFORD, *supra* note 19, at 2–6; Interactive Design Foundation, *supra* note 72. The first stage—empathize—describes how the Marketer “empathize[s] with the needs of the customer.” Minseo et al., *supra* note 63, at 2. The second stage—define—reflects how the Product Manager synthesizes the Marketer’s observations to define the core problem statements. INTERACTIVE DESIGN FOUND., *supra* note 72. The final three stages correspond to the Ideator, Prototyper, and Tester, as those names suggest.

<sup>82</sup> HASSO PLATTNER INST. OF DESIGN AT STANFORD, *supra* note 19, at 6; see also INTERACTIVE DESIGN FOUND., *supra* note 72 (“Design thinking is a non-linear, iterative process that teams use to understand users, challenge assumptions, redefine problems and create innovative solutions to prototype and test.”).

<sup>83</sup> See, e.g., Rothwell, *supra* note 58, at 8–12 (describing the third-generation and fourth-generation innovation processes as highly coupled and integrated); Barbieri et al., *supra* note 60, at 119 (describing fifth-generation and sixth-generation innovation processes as integrated and networked). Defining the “second-generation innovation process” as a linear process the started with a market need, the “third-generation innovation process” as a coupled model that starts with an identified need and new technology, and the “fourth-generation innovation process” as parallel and integrated processes that start with marketing).

<sup>84</sup> See, e.g., Brown, *supra* note 19, at 87.

<sup>85</sup> See, e.g., *Understanding the Prototype to Production Process*, PACIFIC RESEARCH LAB’YS, INC., <https://www.pacific-research.com/understanding-the-prototype-to-production-process-prl/> [https://perma.cc/PDM2-M642] (last visited August 6, 2022).

<sup>86</sup> See, e.g., Moogk, *supra* note 77, at 24 (“A startup operates around a vision that its product will uniquely solve the pressing problems of customers in their target market. The founders often expect that their product will deliver an unprecedented return on their investment.”).



responsible for scaling production to meet this anticipated demand.<sup>87</sup> For example, the Builder may need to forecast demand, build capacity, and establish manufacturing processes and supply chains.<sup>88</sup> The Builder may also manage operations to control quality, cost, standardization, volume, and other key issues.<sup>89</sup> The Builder may even drive business model changes to help the company profitably deliver the right value proposition to its customers.<sup>90</sup> In all, the activities Builders must undertake to bring products to scale are as varied as the products themselves.

Builders must perform all these activities in the face of incredible uncertainty. Customer demand is unpredictable, forecasts are “always inaccurate,” and the marketplace is constantly changing.<sup>91</sup> Some companies must incur significant fixed costs to meet anticipated consumer demand.<sup>92</sup> Companies may also be exposed to highly variable costs and to external events that change anticipated consumer demand.<sup>93</sup> Thus, not only do Builders provide an important contribution to the technology commercialization process, but their work comes with significant financial risk.

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<sup>87</sup> See MARY ANN ANDERSON ET AL., OPERATIONS MANAGEMENT FOR DUMMIES pt. V (2013) (providing guidance on scaling and globalizing operations).

<sup>88</sup> See *id.* at pt. II (discussing how to manage variability and risk while planning for successful operations and managing the supply chain).

<sup>89</sup> See *id.* at chs. 12–13 (discussing how to manage and maintain quality); *id.* at ch. 5 (considering costs, standardization, volume, and flexibility).

<sup>90</sup> See *id.* at 10 (“An organization’s business model should influence operations strategy; likewise, operations strategy drives the business model . . .”).

<sup>91</sup> See *id.* at 122 (“The problem is that customer demand is variable and forecasts of demand are always inaccurate; in many cases, they’re way off . . .”).

<sup>92</sup> See, e.g., Jefreda R. Brown, *4 Reasons Why Airlines Are Always Struggling*, INVESTOPEDIA, <https://www.investopedia.com/financial-edge/0510/4-reasons-why-airlines-are-always-struggling.aspx> [<https://perma.cc/E54U-PRYZ>] (last visited Feb. 2, 2022) (discussing how the airline industry struggles, in part, because airlines must carry high fixed costs like airplane leases and labor expenses).

<sup>93</sup> See, e.g., *id.* (noting the airline industry’s exposure to volatility in oil prices); Leslie Josephs, *US Airlines Are Losing Money for the First Time in Years as Coronavirus Ends Travel Boom*, CNBC (Apr. 23, 2020, 10:53 AM), <https://www.cnbc.com/2020/04/23/coronavirus-us-airlines-set-to-report-their-first-losses-in-years-as-travel-demand-falls.html> [<https://perma.cc/F7VL-9PBA>] (reporting that air travel dropped by more than ninety-five percent after the Covid-19 outbreak).

## 7. The Advertiser

The Advertiser identifies and attracts potential consumers for the production product.<sup>94</sup> Activities may include targeting new potential customers and strengthening relationships with existing customers.<sup>95</sup> Finding consumers for technology products is challenging, however, because “most consumers are resistant to innovation [and] do not have an a priori desire for change.”<sup>96</sup>

As one example, Geoffrey Moore has identified a sales “chasm” that exists between two categories of technology customers: early adopters and the early majority.<sup>97</sup> The chasm exists because early adopters and the early majority have different buying processes and motivations—early adopters want to get a jump on competition, whereas the early majority wants to improve productivity while minimizing discontinuity and disruption.<sup>98</sup> Because of these differences, early adopters do not make good references for the early majority.<sup>99</sup> The early majority requires good references, however, to alleviate concerns about disrupting their organizations.<sup>100</sup> The result is a catch-22: the only suitable reference for an early majority customer is another early majority customer, but no early majority customer will buy without having references from other early majority customers.<sup>101</sup>

Thus, Advertisers must implement innovative strategies to acquire customers who are otherwise predisposed to reject new technologies. In some situations, companies must create entirely new industries to attract customers for their products. For example, Thomas Edison created the electric power industry to sell lightbulbs:

Thomas Edison created the electric lightbulb and then wrapped an entire industry around it. The lightbulb is most often thought of as his signature invention, but Edison understood that the bulb was little more than a parlor trick without a system of electric power generation and transmission to make it truly useful. So he created that, too. Thus

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<sup>94</sup> See, e.g., S.N. MURTHY & U. BHOJANNA, ADVERTISING: AN IMC PERSPECTIVE 44 (2007) (teaching how to target segments of potential consumers and develop marketing programs for each segment).

<sup>95</sup> See, e.g., *id.* at 7 (“Advertising is a major way of establishing communication between the manufacturer and the consumer. Advertising acts as a reminder to the existing consumers and attracts new customers as well.”).

<sup>96</sup> Minseo et al., *supra* note 63, at 3 (footnotes omitted).

<sup>97</sup> MOORE, *supra* note 32, at 25.

<sup>98</sup> *Id.* at 25–26.

<sup>99</sup> *Id.* at 26.

<sup>100</sup> *Id.*

<sup>101</sup> *Id.*

Edison's genius lay in his ability to conceive of a fully developed marketplace, not simply a discrete device. He was able to envision how people would want to use what he made, and he engineered toward that insight.<sup>102</sup>

Thus, the Advertiser contributes more than just commercials and slogans.<sup>103</sup> Rather, the Advertiser role is responsible for bringing the anticipated consumer demand to the product, which necessarily requires removing all the blockers that impede customer adoption.

## 8. The Seller

The Seller sells and delivers the production product to the customer. Like the Marketer and the Advertiser, the Seller must understand customer needs.<sup>104</sup> More broadly, the Seller must understand each customer's buying process and how the customer's needs fit into that process.<sup>105</sup> The Seller must also persuade customers to embrace new technology by, for example, describing how the product meets the customers' needs—without focusing on the technology's features or functions.<sup>106</sup>

The Seller must accomplish all these objectives while meeting the customer's price expectations. Sales prices must balance a variety of conflicting factors, including the company's business model and cost structure, the customer's price sensitivity, and the competitive landscape.<sup>107</sup> For a new technology product, the actual sales price may not even reflect the standalone value of the technology itself because most customers do not buy new products for their technical features.<sup>108</sup> In fact, the sales price may not accurately reflect contributions from any of the

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<sup>102</sup> Brown, *supra* note 19, at 85.

<sup>103</sup> Of course, commercials and slogans are also important. Not only is advertising important for raising product awareness, but they help build a company's overall brand equity and reputation. Brand and reputation, in turn, are important for establishing trust and driving sales. *See, e.g.*, Austin Andrukaitis, *How to Increase Sales by Building Brand Equity and Shaping Brand Perception*, INC., <https://www.inc.com/young-entrepreneur-council/how-to-increase-sales-by-building-brand-equity-shaping-brand-perception.html> [<https://perma.cc/4H4M-NPZR>] (last visited Feb. 2, 2022).

<sup>104</sup> *See, e.g.*, AUBUCHON, *supra* note 36, at 48 ("Of the five steps in the [selling] process, the most important is needs.").

<sup>105</sup> *Id.* at 33–39.

<sup>106</sup> *Id.* at 82–90.

<sup>107</sup> *See, e.g.*, Elizabeth Wasserman, *How to Price Your Products*, INC., <https://www.inc.com/guides/price-your-products.html> [<https://perma.cc/Y7WK-3487>] (last visited Feb. 2, 2022) (providing general advice on pricing strategy).

<sup>108</sup> *See* sources cited *supra* notes 26–36 and accompanying text (discussing how customers hire products to do a job, not necessarily to provide technical features).

technology commercialization roles.<sup>109</sup> For these and other reasons, pricing may be the toughest part of the technology commercialization process.<sup>110</sup>

### *B. The Inventor's Contribution to the U.S. Patent System*

An inventor's contribution to the U.S. patent system can be defined based on the legal requirements for obtaining a patent. The first requirement is, simply stated, to be an inventor.<sup>111</sup> "The threshold question in determining inventorship is who conceived the invention."<sup>112</sup> Any person who fails to contribute to conception is ineligible to be an inventor.<sup>113</sup> Conception is the mental act of forming "a definite and permanent idea of the complete and operative invention."<sup>114</sup> The inventor may consider and adopt materials or suggestions from many sources so long as the inventor maintains "intellectual domination" over the inventive idea.<sup>115</sup>

Second, only certain ideas qualify as inventions. In particular, the idea must qualify as patent-eligible subject matter,<sup>116</sup> be novel,<sup>117</sup> and not be obvious.<sup>118</sup> The idea must also be capable of being distinctly defined in one sentence, among other formalities.<sup>119</sup>

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<sup>109</sup> For example, although the Builder's contributions may improve the quality of the product, quality may not be important depending on the customer or the industry. See ADAMS, *supra* note 67, at 175–76 ("Clearly, if you look at aircraft, heart valves, and car brakes, poor quality just won't cut it. But when used in the context of getting products in the market quickly, the definition of quality needs to be set in the context of how customers will use the offering.").

<sup>110</sup> See Wasserman, *supra* note 107 (describing pricing as "part art and part science").

<sup>111</sup> Prior to 2012, only inventors could be applicants for patent applications. U.S. PAT. & TRADEMARK OFF., MANUAL OF PAT. EXAMINING PROC. § 605 (9th ed., rev. 10.219, June 2020) [hereinafter MPEP]. Today, if the inventors assign their rights in their invention to an assignee, that assignee can file and prosecute a patent application as the applicant. *Id.*

<sup>112</sup> MPEP § 2109 (citations omitted); see also Bd. of Educ. *ex rel.* Bd. of Trs. of Fla. State Univ. v. Am. Bioscience, Inc., 333 F.3d 1330, 1340 (Fed. Cir. 2003) ("Invention requires conception.").

<sup>113</sup> MPEP § 2109 ("Unless a person contributes to the conception of the invention, [that person] is not an inventor.").

<sup>114</sup> *Burroughs Wellcome Co. v. Barr Lab'ys., Inc.*, 40 F.3d 1223, 1228 (Fed. Cir. 1994) (quoting *Hybritech Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1376 (Fed. Cir. 1986)).

<sup>115</sup> MPEP § 2138.04(II).

<sup>116</sup> 35 U.S.C. § 101.

<sup>117</sup> 35 U.S.C. § 102.

<sup>118</sup> 35 U.S.C. § 103.

<sup>119</sup> See 35 U.S.C. § 112(b) (requiring that patent applications include "one or more claims

Finally, the inventor must describe the invention in a qualifying disclosure to the U.S. Patent and Trademark Office (USPTO). According to the Supreme Court, disclosure “is the price paid for the exclusivity secured.”<sup>120</sup> Disclosure is required because the United States does not recognize common law patent rights.<sup>121</sup> Instead, the inventor obtains a patent by submitting a patent application that meets all the various formalities required under the Patent Act and by the USPTO.<sup>122</sup> In particular, the patent application must disclose sufficient information regarding the claimed invention to enable one skilled in the pertinent art to make and use the claimed invention without undue experimentation.<sup>123</sup> This disclosure requirement also establishes that the claimed invention has been “reduced to practice.”<sup>124</sup>

### *C. Defining the Inventor's Contribution*

Of the eight technology commercialization roles, only the Ideator is eligible to be an inventor. U.S. patent law defines inventorship based on who conceives the invention,<sup>125</sup> and the Ideator is the only role responsible for conceiving new ideas.<sup>126</sup> By contrast, the other roles' activities and their contributions fall outside the scope of inventorship. For example, the Product Manager identifies the problem to be

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particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention); MPEP § 608.01(m) (describing various claim formalities, including requirements that each claim be the object of a sentence and that each claim begin with a capital letter and end with a period); MPEP § 2173 (addressing the requirement that claims particularly point out and distinctly claim the invention).

<sup>120</sup> Eldred v. Ashcroft, 537 U.S. 186, 216 (2003) (citing *J.E.M. Ag Supply, Inc. v. Pioneer Hi-Bred Int'l, Inc.*, 534 U.S. 124, 142 (2001)).

<sup>121</sup> See, e.g., Miriam Marcowitz-Bitton & Emily Michiko Morris, *Unregistered Patents*, 95 WASH. L. REV. 1835, 1837 (2020) (discussing how patent law differs from trademark and copyright law in that the patent system does not grant any rights for unregistered inventions).

<sup>122</sup> See 35 U.S.C. § 111–15; MPEP ch. 600 (outlining the required content for provisional and non-provisional applications).

<sup>123</sup> See, e.g., *Martek Biosciences Corp. v. Nutrinova, Inc.*, 579 F.3d 1363, 1378 (Fed. Cir. 2009) (“To meet the enablement requirement, ‘the specification of a patent must teach those skilled in the art how to make and use the full scope of the claimed invention without undue experimentation.’”).

<sup>124</sup> See MPEP § 2138.05 (citing *Hyatt v. Boone*, 146 F.3d 1348, 1352 (Fed. Cir. 1998)) (“The filing of a patent application serves as conception and constructive reduction to practice of the subject matter described in the application. Thus the inventor need not provide evidence of either conception or actual reduction to practice when relying on the content of the patent application.”).

<sup>125</sup> See sources cited *supra* notes 111–115 and accompanying text.

<sup>126</sup> See *supra* Part II.A.3.

solved and supervises the product development process,<sup>127</sup> but these activities do not qualify for inventorship.<sup>128</sup> The Prototyper is responsible for building the first real-world manifestation of the idea,<sup>129</sup> but actual reduction to practice is irrelevant to inventorship.<sup>130</sup> Likewise, the Tester's efforts to confirm whether the idea works for its intended purpose are not required for inventorship.<sup>131</sup> Although a patent specification may happen to describe contributions from the Product Manager, the Prototyper, or the Tester,<sup>132</sup> this additional disclosure is not required for patentability.

The Ideator's contribution to the technology commercialization process parallels the inventor's contribution to the U.S. patent system. The Ideator contributes to the technology commercialization process by (1) thinking of a new idea, and then (2) by communicating that idea to others.<sup>133</sup> This matches the inventor's contribution to the U.S. patent system: (1) conception of a new invention

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<sup>127</sup> See *supra* Part II.A.2.

<sup>128</sup> See *Garrett Corp. v. U.S.*, 422 F.2d 874, 881 (Ct. Cl. 1970) ("One who merely suggests an idea of a result to be accomplished, rather than means of accomplishing it, is not a joint inventor."); JAMIE L. GRAHAM ET AL., INVENTORSHIP: NAVIGATING THE MUDDY WATERS OF INVENTORSHIP DETERMINATION AND CORRECTION 4–5 (2015), <https://kilpatricktownsend.com/-/media/2019/IP-Desk-Reference-2015/Navigating-the-Muddy-Waters-of-Inventorship.ashx> [https://perma.cc/843R-Y8FU] (summarizing conventional wisdom that managing or funding a research project does not constitute inventorship); DONALD A. DEGNAN & LIBBY A. HUSKEY, INVENTORSHIP: WHAT HAPPENS WHEN YOU DON'T GET IT RIGHT? 1 (2006), <https://www.hollandhart.com/files/InventorshipWhatHappens.pdf> [https://perma.cc/EXL9-5QS5] (summarizing conventional wisdom that discovering a problem to be solved, alone, does not constitute an inventive act).

<sup>129</sup> See *supra* Part II.A.4.

<sup>130</sup> See MPEP § 2109 ("Insofar as defining an inventor is concerned, reduction to practice, *per se*, is irrelevant . . .").

<sup>131</sup> See *id.* § 2138.04 (noting that "an inventor does not need to know that the invention will work for there to be complete conception." (citing *Burroughs Wellcome Co. v. Barr Lab'ys., Inc.*, 40 F.3d 1223, 1228 (Fed. Cir. 1994))).

<sup>132</sup> Such may be the case, for example, where the same individual identifies a problem to be solved, ideates a solution to that problem, and builds a prototype for testing the ideated solution. In this example, the individual may choose to describe all this work in a patent application even if the resulting written description exceeds the minimum disclosure requirements.

<sup>133</sup> See *supra* notes 48–51 and accompanying text (introducing the "inspiration" and "framing" steps of ideation).

and (2) disclosure of that invention to the USPTO.<sup>134</sup> The second elements, in particular, are nearly identical: they both require disclosures that enable others to make and use the idea.<sup>135</sup>

The biggest difference between the Ideator's contribution and the inventor's contribution is that there is no restriction on the ideas that the Ideator can contribute. Unlike inventors, Ideators are not bound by the rules of patent-eligible subject matter, novelty, or obviousness.<sup>136</sup> From this perspective, inventors are a subset of Ideators: all inventors are Ideators, but not all Ideators are inventors.

Thus, the proper definition of the inventor's contribution is somewhat narrower than the Ideator's contribution. Rather than disclosing just any idea, an inventor must conceive of a *qualifying* idea under U.S. patent law.<sup>137</sup> Similarly, rather than provide just any enabling disclosure, they must provide a *qualifying* disclosure in compliance with the Patent Act and USPTO rules.<sup>138</sup> Ergo, the inventor's contribution can be defined as *providing access to a qualifying disclosure describing a qualifying idea*.

### III. COMPENSATING FOR THE INVENTOR'S CONTRIBUTION

Superficially, the patent world and the commercial world agree on providing compensation for the value of the inventor's contribution. In the commercial world, companies compensate Ideators for their contributions primarily through salaries

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<sup>134</sup> See sources cited *supra* notes 111–24 and accompanying text; see also BURK & LEMLEY, *supra* note 5, at 67 (citing Julie S. Turner, *Comment, The Nonmanufacturing Patent Owner: Toward a Theory of Efficient Infringement*, 86 CAL. L. REV. 179 (1998)) (“[T]he patent law permits inventors to obtain patents based entirely on a written description of the invention, without actually constructing or selling the products embodying the invention.”).

<sup>135</sup> Compare *supra* notes 48–51 and accompanying text (explaining how Ideators must “frame” their ideas to teach them to others), with *supra* note 123 (discussing how patent specifications must enable one of ordinary skill in the art to make and use the claimed invention).

<sup>136</sup> Compare sources cited *supra* notes 116–119 and accompanying text (noting that only certain ideas qualify for patentability), with *infra* Part III.A.1 (defining the Ideator role under technology commercialization theory without regard to the Patent Act).

<sup>137</sup> See sources cited *supra* notes 116–119 and accompanying text.

<sup>138</sup> See sources cited *supra* notes 120–124 and accompanying text.

and bonuses.<sup>139</sup> Today, the job market for Ideators is competitive,<sup>140</sup> and ideation experience can help workers find better jobs and earn higher salaries.<sup>141</sup>

Likewise, the patent world ostensibly agrees that reasonable royalties should be based on the value of the inventor's contribution.<sup>142</sup> Section 284 expressly states that patent damages are compensatory.<sup>143</sup> As such, "it is the 'value of what was taken' that measures a 'reasonable royalty' under 35 U.S.C. § 284."<sup>144</sup> The "value of what was taken" standard seemingly describes the value of the inventor's contribution, just rephrased to reference the infringer's actions instead of the inventor's actions.<sup>145</sup>

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<sup>139</sup> See, e.g., Michael D. Van Loy et al., *Patent 101: Key Considerations and Activities for Establishing a Patent Program (Part 1 of 3)*, NAT'L L. REV. (July 7, 2021), <https://www.natlawreview.com/article/patent-101-key-considerations-and-activities-establishing-patent-program-part-1-3> [<https://perma.cc/7T6H-2X7H>] (explaining how companies can implement inventor rewards programs to motivate employees to conceive new inventions and disclose those inventions to the company's patent team).

<sup>140</sup> See generally ANDREA MANERA, *COMPETING FOR INVENTORS: MARKET CONCENTRATION AND THE MISALLOCATION OF INNOVATIVE TALENT 2* (Jan. 17, 2022), <https://github.com/andmanera/Job-Market/blob/main/draft/draft.pdf> [<https://perma.cc/2865-R5P9>] (studying how "big-tech firms are attracting a large share of highly-educated, highly-skilled workers, potentially subtracting these resources from more dynamic and competitive sectors").

<sup>141</sup> Cf. Indeed Editorial Team, *How to Include a Patent on Your Resume*, INDEED (Aug. 25, 2021), <https://www.indeed.com/career-advice/resumes-cover-letters/patent-on-resume> [<https://perma.cc/LzRP-UHQL>] (encouraging job applicants to list patent information on their resumes).

<sup>142</sup> See, e.g., *Ericsson, Inc. v. D-Link Sys., Inc.*, 773 F.3d 1201, 1233 (Fed. Cir. 2014) ("In other words, the patent holder should only be compensated for the approximate incremental benefit derived from his invention.").

<sup>143</sup> 35 U.S.C. § 284 (2011) (emphasis added) ("Upon finding for the claimant the court shall award the claimant damages adequate to *compensate* for the infringement, but in no event less than a reasonable royalty for the use made of the invention by the infringer, together with interest and costs as fixed by the court."). The Patent Act also allows for enhanced damages, but the statute limits enhanced damages to a function of the compensatory damages. *Id.* ("[T]he court may increase the damages up to three times the amount found or assessed.").

<sup>144</sup> *Ericsson*, 773 F.3d at 1226 (quoting *Dowagiac Mfg. Co. v. Minn. Moline Plow Co.*, 235 U.S. 641, 648 (1915)).

<sup>145</sup> See *Power Integrations, Inc. v. Fairchild Semiconductor Int'l, Inc.*, 904 F.3d 965, 977 (Fed. Cir. 2018) (equating the "value of what was taken" with "the value that the infringing features contribute to the value of an accused product"); *Ericsson*, 773 F.3d at 1226 (describing the "value of what was taken" in terms of the "incremental value that the patented invention adds to the end product"). But see *infra* note 164 and accompanying text (explaining how courts like *Power Integrations* erred by equating the value of the inventor's contribution with the value of technology).



Congress enacted the modern version of Section 284 to focus damages inquiries on the value that the inventor lost, not the value infringers gained. Prior to 1946, courts calculated patent damages based on the value of the infringer's profits.<sup>146</sup> The courts also allowed plaintiffs to shift the burden of proof to defendants, thereby requiring defendants to present evidence defending the entirety of their profits.<sup>147</sup> Thus, rather than focusing on the value lost by the patent owner, damages cases became complicated inquiries into the infringer's business:

Frequently a suit for patent infringement involves the infringement of only an improvement in a complex machine, and it is impossible to apportion profits due to the improvement. In such circumstances the proceedings before masters, which are conducted in accordance with highly technical rules and are always expensive, are often protracted for decades and in many cases result in complete failure of justice.<sup>148</sup>

The net effect of these proceedings was to treat each infringer as a "trustee for the plaintiff in respect of profits."<sup>149</sup>

In response, Congress amended the patent statute in 1946 to eliminate disgorgement of infringer profits.<sup>150</sup> As the Supreme Court explained in *Aro Manufacturing*, "[t]he purpose of the change was precisely to eliminate the recovery of profits as such and allow recovery of damages only."<sup>151</sup> According to the Court,

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<sup>146</sup> Pamela Samuelson et al., *Recalibrating the Disgorgement Remedy in Intellectual Property Cases*, 100 B.U. L. REV. 1999, 2070–73 (2020).

<sup>147</sup> *Id.* at 2070.

<sup>148</sup> *Id.* (quoting H.R. REP. NO. 79-1587, pt. 1, at 2 (1946)).

<sup>149</sup> *Id.* (quoting *Westinghouse Elec. & Mfg. Co. v. Wagner Elec. & Mfg. Co.*, 225 U.S. 604, 619 (1912)).

<sup>150</sup> *Id.* at 2070–71; *see also* *Georgia-Pacific Corp. v. U.S. Plywood Corp.*, 243 F. Supp. 500, 524 n.22 (S.D.N.Y. 1965) ("Congress's attention was primarily focused on the evils attendant on the recovery of 'profits' rather than on the obstacle in the path of a patent owner seeking a reasonable royalty."); Daniel Harris Brean, *Ending Unreasonable Royalties: Why Nominal Damages Are Adequate to Compensate Patent Assertion Entities for Infringement*, 39 VT. L. REV. 867, 893–98 (2015) (summarizing the legislative history of the 1946 Act and how the Act eliminated recovery of infringer profits).

<sup>151</sup> *Aro Mfg. Co. v. Convertible Top Replacement Co.*, 377 U.S. 476, 505 (1964) (Brennan, J., plurality opinion); *id.* at 502 n.18 (alternation in original) ("This Part [IV] of the opinion expresses the views of Justices Brennan, Stewart, White, and Goldberg. Mr. Justice Harlan considers ...the matters here dealt with are not ripe for decision and should be left for determination in the future course of this litigation."); *id.* at 523–24 (Black, J., dissenting) (agreeing with the majority that "a patentee can get only one recovery for one infringement," which was discussed by Justice Brennan in Part IV, but disagreeing with the majority's decision to allow the district court to determine whether the plaintiff has already received a complete recovery of its damages); *see also* *SCA Hygiene Prods.*

“the language, the legislative history, and the prior law” clearly show that Section 284 “allows the award of a reasonable royalty, or of any other recovery, only if such amount constitutes ‘damages’ for the infringement.”<sup>152</sup> By restricting financial recoveries only to “damages,” Congress limited patent owners to “compensation for the pecuniary loss [the patentee] has suffered from the infringement, *without regard to the question whether the defendant has gained or lost by his unlawful actions.*”<sup>153</sup> Although Congress has had the opportunity since then to change patent law’s compensatory damages regime to reflect infringer profits, it has declined to do so.<sup>154</sup>

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*Aktiebolag v. First Quality Baby Prods., L.L.C.*, 580 U.S. 328, 341 (2017) (citing *Aro Mfg. Co.*, 377 U.S. at 505) (“The remedy of damages seeks to compensate the victim for its loss, whereas the remedy of an accounting, which Congress abolished in the patent context in 1946, sought disgorgement of ill-gotten profits.”); *Nike, Inc. v. Wal-Mart Stores, Inc.*, 138 F.3d 1437, 1442 (Fed. Cir. 1998) (quoting *Aro Manufacturing* for the proposition that patentees can only recover losses under Section 284); David O. Taylor, *Using Reasonable Royalties to Value Patented Technology*, 49 GA. L. REV. 79, 133, 133 n.222 (2014) (quoting *Aro Manufacturing* as precedent indicating that courts must measure reasonable royalties based on the value lost by the patent owner). To some, *Aro Manufacturing’s* discussion of Section 284 is an advisory opinion lacking precedential weight. See John Shaeffer, *Equitable Disgorgement: An Unused Power that Courts Retain to Make Willful Patent Infringement Unprofitable*, 22 INTELL. PROP. & TECH. L.J. 14, 15 (2010) (dismissing *Aro Manufacturing* as “nothing more than an advisory opinion”). Even if true, *Aro Manufacturing* still constitutes persuasive authority that has been cited—although not necessarily followed—by foundational patent damages cases, including *Georgia-Pacific* and *TWM Manufacturing*. See *infra* note 209 and accompanying text (noting that both cases cited *Aro Manufacturing*); Brean, *supra* note 150, at 901–07 (explaining how *Aro Manufacturing* correctly interpreted Section 284 as prohibiting recovery of infringer profits).

<sup>152</sup> *Aro Mfg. Co.*, 377 U.S. at 505.

<sup>153</sup> *Id.* at 507 (emphasis added) (quoting *Coupe v. Royer*, 155 U.S. 565, 582 (1895)).

<sup>154</sup> See, e.g., Patent Reform Act of 2005, H.R. 2795, 109th Cong. § 6 (2005) (emphasis added) (proposing new reasonable royalty language that would require courts to “consider, ... among other factors, the portion of the realizable *profit* that should be credited to the inventive contribution . . . .”); see also Amy L. Landers, *Let the Games Begin: Incentives to Innovation in the New Economy of Intellectual Property Law*, 46 SANTA CLARA L. REV. 307, 368 (2006) (emphasis added) (“In contrast to the current *Georgia-Pacific* factors, which examine myriad issues, including the patentee’s market of the patented invention, the proposed legislation’s use of the term ‘profit’ appears to focus the valuation inquiry on the profit of the of the infringing device made by the infringer. To the extent that this reflects a legislative preference for using an infringer’s gain as a major factor in determining a reasonable royalty, the proposed legislation reflects pre-1946 law that permitted recovery of a defendant’s profits as a separate item.”).

Thus, patent damage inquiries must focus on the inventor's lost value, not the value gained or created by infringers.<sup>155</sup> Patent owners are only entitled to compensatory damages, not damages based on theories of restitution or unjust enrichment.<sup>156</sup> "[T]he purpose of compensatory damages is not to punish the infringer, but to make the patentee whole."<sup>157</sup> If punishment or additional deterrence is warranted in a particular case,<sup>158</sup> Congress authorized courts to increase compensation up to three times the amount of the compensatory damages.<sup>159</sup> Courts are not authorized, however, to inflate compensatory damages rates based on a desire to punish or to create additional deterrence.<sup>160</sup>

This is undoubtedly the correct approach. Setting compensation at an amount lower than the value the inventor lost would be unfair to inventors, whereas setting compensation at an amount higher than the value the inventor lost would be unfair

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<sup>155</sup> See *Georgia-Pacific*, 243 F. Supp. at 516 ("There is no necessary correlation between the amounts of [the infringer's] profits and [the patent owner's] losses."); see also Peter Lee, *Distinguishing Damages Paid from Compensation Received: A Thought Experiment*, 26 TEX. INTEL. PROP. L.J. 231, 234 (recognizing a gap between compensation that patentees should receive based on the patentee's losses and the amount that infringers pay based on the value of the infringer's implementation).

<sup>156</sup> See Brean, *supra* note 150, at 907 (interpreting *Aro Manufacturing*).

<sup>157</sup> *Pall Corp. v. Micron Separations, Inc.*, 66 F.3d 1211, 1223 (Fed. Cir. 1995) (citing *Aro Mfg. Co. v. Convertible Top Replacement Co.*, 377 U.S. 476, 507 (1964)); see also *Integra Lifesciences I, Ltd. v. Merck KGaA*, 331 F.3d 860, 870 (Fed. Cir. 2003) (citing *Riles v. Shell Exploration & Prod. Co.*, 298 F.3d 1302, 1312 (Fed. Cir. 2002)) ("[Reasonable royalties], like lost profits, are compensatory damages, not punitive.").

<sup>158</sup> The Patent Act already deters infringement by allowing for injunctions and compensatory damages. See *King Instruments Corp. v. Perego*, 65 F.3d 941, 950 (Fed. Cir. 1995) ("Section 284 attempts to ensure this result by deterring infringers and recouping market value lost when deterrence fails."). Absent extraordinary circumstances, there is no reason for courts to inflate compensatory damages to create even more deterrence. See *Halo Elecs., Inc. v. Pulse Elecs., Inc.*, 136 S. Ct. 1923, 1932 (2016) (noting that enhanced damages should be "generally reserved for egregious cases of culpable behavior").

<sup>159</sup> 35 U.S.C. § 284 (2011) ("[T]he court may increase the damages up to three times the amount found or assessed.").

<sup>160</sup> See Landers, *supra* note 154, at 336 (describing how some courts have ignored the statutory limit on reasonable royalty awards and imposed inflated awards to deter infringement and secure "justice" for patentees); Brian J. Love, *The Misuse of Reasonable Royalty Damages as a Patent Infringement Deterrent*, 74 MO. L. REV. 909, 912 (2009) ("Although traditional black-letter patent law states that damages for patent infringement are intended only to compensate patent owners, the Federal Circuit has shaped the law of reasonable royalty damages to incorporate an additional deterrent function.").

to those responsible for compensating the inventor.<sup>161</sup> Furthermore, setting compensation at the value contributed by the inventor is consistent with the quid pro quo theory of patent law. If disclosure “is the price paid for the exclusivity secured,”<sup>162</sup> then inventors (or their successors-in-interest) should be compensated based on the value of their contributed disclosure.<sup>163</sup>

Modern damages calculations, however, deviate from the value of the inventor’s contribution in at least two respects. First, courts tend to mischaracterize the inventor’s contribution. For example, the Federal Circuit describes the “value of what was taken” in terms of “technology.”<sup>164</sup> This is incorrect. Inventors, like other Ideators, contribute disclosure of an idea.<sup>165</sup> Technology, however, is the real-world application of an idea.<sup>166</sup> Converting an idea into technology requires contributions from the Prototyper and the Tester, among others.<sup>167</sup> By referencing technology, courts overstate the value of the inventor’s contribution.

Second, courts have gradually shifted reasonable royalty calculations back to the infringer-focused inquiries previously banned by Congress.<sup>168</sup> This shift away from

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<sup>161</sup> See *supra* notes 15–16 and accompanying text.

<sup>162</sup> *Eldred v. Ashcroft*, 537 U.S. 186, 216 (2003) (citing *J.E.M. Ag Supply, Inc. v. Pioneer Hi-Bred Int’l, Inc.*, 534 U.S. 124, 142 (2001)).

<sup>163</sup> The alternative—compensating inventors for more than the value of their contribution—would require one to believe that Congress created statutory reasonable royalties to overpay inventors for their disclosures.

<sup>164</sup> See, e.g., *Power Integrations, Inc. v. Fairchild Semiconductor Int’l, Inc.*, 904 F.3d 965, 977 (Fed. Cir. 2018) (citing *Ericsson, Inc. v. D-Link Sys., Inc.*, 773 F.3d 1201, 1226 (Fed. Cir. 2014)) (“As a substantive matter, it is the ‘value of what was taken’ that measures a ‘reasonable royalty’ under 35 U.S.C. § 284. . . . And in the context of a utility patent, it is only the patented technology that is taken from the owner, so the value to be determined is only the value that the infringing features contribute to the value of an accused product.”).

<sup>165</sup> See *supra* Part II.C.

<sup>166</sup> See, e.g., *Technology*, BLACK’S LAW DICTIONARY (11th ed. 2019) (defining “technology” as either “[m]odern equipment, machines, and methods based on contemporary knowledge of science and computers” or “[t]he practical, esp. industrial use of scientific and mathematic discoveries”).

<sup>167</sup> See *supra* Parts II.A.4–5; cf. *Commonwealth Sci. & Indus. Rsch. Org. v. Cisco Sys., Inc.*, No. 11-CV-00343-LED, 2014 WL 3805817, at \*11 (E.D. Tex. July 23, 2014) (“The benefit of the patent lies in the idea, not in the small amount of silicon that happens to be where that idea is physically implemented.”); Mark Lemley, *Distinguishing Lost Profits from Reasonable Royalties*, 51 WM. & MARY L. REV. 655, 663 (2009) (“Even if there are no other relevant patents, the defendant’s know-how, materials, and marketing efforts almost always contribute some value, and usually the most significant part of the value of an infringing product.”).

<sup>168</sup> See *infra* Part III.A.

compensatory damages is the root cause of the schism between the patent world and the commercial world. The commercial world recognizes the value contributed by each of the technology commercialization roles, whereas the patent world pays inventors for the work done by the other roles.

Part III.A positively explains how modern reasonable royalty calculations rely on evidence of the infringer's profits, and proxies thereof, rather than evidence of the patentee's compensable loss. Part III.B then explores how these flawed reasonable royalty calculations contribute to many of the patent industry's biggest policy issues. Finally, Part III.C transitions to a normative discussion of how courts should adhere to *Aro Manufacturing* and disregard the value of the infringer's implementation when calculating reasonable royalties. By ignoring the infringer's implementation and focusing instead on the value of the inventor's contribution, courts can close the schism and help resolve the patent policy issues discussed in Part III.B.

***A. Measurement Errors Prevent Reasonable Royalties from Reflecting the Value of the Inventor's Contribution***

Measurement is the act of assigning a specific value to a variable associated with an object.<sup>169</sup> Measurements can either be "direct" or "indirect." A direct measurement quantifies the variable by using direct evidence of the object.<sup>170</sup> An indirect measurement, on the other hand, quantifies the variable by measuring items other than the object being measured.<sup>171</sup> For example, one could directly measure the volume of a box by measuring the length, width, and height of the box; alternatively, one could indirectly measure the volume of the box by tossing the box in a pool of water and measuring how much water is displaced.<sup>172</sup>

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<sup>169</sup> RICHARD S. FIGLIOLA & DONALD E. BEASLEY, THEORY AND DESIGN FOR MECHANICAL MEASUREMENTS 2 (Linda Ratts ed., John Wiley & Sons, Inc. 6th ed. 2015); see also Hari Iyer, *Statistical Calibration and Measurements*, in 22 HANDBOOK OF STATISTICS 731 (Ravindra Khattree & Calyampudi Radhakrishna Rao eds., Elsevier Science 2003) ("A measurement is a numerical quantification of the 'amount' or 'degree' of an attribute possessed by an object or an artifact.").

<sup>170</sup> Iyer, *supra* note 169, at 731.

<sup>171</sup> *Id.* at 732; see also SEMYON RABINOVICH, MEASUREMENT ERRORS: THEORY AND PRACTICE 150 (1993) ("Indirect measurements are measurements in which the value of the unknown quantity sought is calculated using matched measurements of other quantities related with the measured quantity by some known relation.").

<sup>172</sup> See *Displacement (Fluid)*, WIKIPEDIA, [https://en.wikipedia.org/wiki/Displacement\\_\(fluid\)](https://en.wikipedia.org/wiki/Displacement_(fluid)) [<https://perma.cc/6XWP-ZEMN>] (last visited Feb. 2, 2022) (discussing how displacement methods can measure the volume of a solid object).

Today, courts rely on indirect measurement methods when setting royalty rates. Instead of directly measuring the “value of what was taken” from the inventor, as reflected by the inventor’s contribution,<sup>173</sup> courts set royalty rates by measuring the value of the infringer’s implementation. Indirect measurements, however, invite more opportunities for error. For example, indirect measurement of an object will be inaccurate if the indirect measurement model does not match the object being measured.<sup>174</sup> The three valuation methods discussed in Parts III.A.1–3 all suffer from these measurement errors because they each measure something other than the value of the inventor’s contribution. Although the apportionment doctrine could theoretically remediate these indirect measurement errors, Part III.A.4 explains why judicial application of the apportionment doctrine has been insufficient.

### 1. The Georgia-Pacific Factors

In 1970, Judge Charles Henry Tenney identified fifteen evidentiary factors that he believed were relevant to the determination of a reasonable royalty.<sup>175</sup> These factors, known as the *Georgia-Pacific* factors, have guided courts for the past half-century.<sup>176</sup> Although the Federal Circuit has declined to endorse the *Georgia-Pacific* factors as a test for royalty calculations, the court considers the factors as describing admissible evidence.<sup>177</sup>

Rather than restate all fifteen factors, this Article will group them into the following categories: infringer profitability and proxies thereof (“Category A”: factors six, eight, nine, ten, eleven, twelve, and thirteen); the effect of licensing on the licensor’s business (“Category B”: factors four, five, six, nine, and ten); circular evidence (“Category C”: factors one, two, fourteen, and fifteen); the nature, scope,

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<sup>173</sup> See *supra* note 145 and accompanying text (noting that the “value of what was taken” standard notionally describes the value of the inventor’s contribution).

<sup>174</sup> See, e.g., RABINOVICH, *supra* note 171, at 152–78 (explaining errors resulting from incomplete correspondence between the model and the object of measurement).

<sup>175</sup> See *Georgia-Pacific Corp. v. U.S. Plywood Corp.*, 318 F. Supp. 1116, 1120 (S.D.N.Y. 1970).

<sup>176</sup> See Daralyn J. Durie & Mark A. Lemley, *A Structured Approach to Calculating Reasonable Royalties*, 14 LEWIS & CLARK L. REV. 627, 628–29 (2010) (noting how the *Georgia-Pacific* test has become the “gold standard for calculating reasonable royalty damages”).

<sup>177</sup> See *Energy Transp. Grp. v. William Demant Holding A/S*, 697 F.3d 1342, 1357 (Fed. Cir. 2012) (“Once again, this court does not endorse *Georgia-Pacific* as setting forth a test for royalty calculations, but only as a list of admissible factors informing a reliable economic analysis.”).

and term of the license (“Category D”: factors three and seven); and the “nature of the patented invention” (“Category E”: factor ten).<sup>178</sup>

Category A is the most problematic. Factors eight, twelve, and thirteen directly capture infringer profits,<sup>179</sup> even though patent owners are not entitled to compensation based on the infringer’s profits.<sup>180</sup> Although the Federal Circuit has criticized use of factor eight,<sup>181</sup> the court still considers profitability evidence to be admissible.<sup>182</sup> Factor six takes profitability even further, expressly allowing plaintiffs to capture the infringer’s profits from sales of non-infringing products.<sup>183</sup> Factor thirteen at least attempts to distinguish the “non-patented elements, the

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<sup>178</sup> Factors six and ten are listed in multiple categories because they contain unrelated clauses that merit separate categorization. Factor nine is listed in Categories A and B due to its ambiguity. For example, factor nine refers to the “utility and advantages of the patent property,” but it never states whether this factor is referring to the advantages of the patented invention to the licensor, to the licensee, or to some other party. See Taylor, *supra* note 151, at 133 (noting the importance of asking “value to whom” when valuing reasonable royalties); see also Christopher S. Storm, *Standard Essential Patents Versus the World: How the Internet of Things Will Change Patent Licensing Forever*, 30 TEX. INTEL. PROP. L.J. 259, 296–00 (2022) (explaining why patent license value should be measured based on the “value to the patent owner, independent of the value of the infringer’s implementation or use case.”).

<sup>179</sup> *Finjan, Inc. v. Secure Computing Corp.*, 626 F.3d 1197, 1209–10 (2010) (affirming the trial court’s reasonable royalty calculation even though the plaintiff’s expert calculated royalties based on company-wide profits).

<sup>180</sup> *Aro Mfg. Co. v. Convertible Top Replacement Co.*, 377 U.S. 476, 507 (1964).

<sup>181</sup> See *Ericsson, Inc. v. D-Link Sys., Inc.*, 773 F.3d 1201, 1231 (Fed. Cir. 2014) (criticizing the use of *Georgia-Pacific* factor eight, profitability of the product, in standard-essential patent (SEP) disputes); *Lucent Techs., Inc. v. Gateway, Inc.*, 580 F.3d 1301, 1335 (Fed. Cir. 2009) (acknowledging that *Georgia-Pacific* factor eight would support a higher reasonable royalty in the instant case but that such evidence cannot overcome the other evidence suggesting that a lower reasonable royalty is more appropriate).

<sup>182</sup> See *supra* note 177.

<sup>183</sup> See, e.g., *Micro Chem., Inc. v. Lextron, Inc.*, 317 F.3d 1387, 1393 (Fed. Cir. 2003) (recognizing that the plaintiff could not include sales of nonpatented products in the royalty base but allowing the plaintiff to capture this value anyways through the *Georgia-Pacific* factors); *Interactive Pictures Corp. v. Infinite Pictures, Inc.*, 274 F.3d 1371, 1385 (2001) (citing *Deere & Co. v. Int’l Harvester Co.*, 710 F.2d 1551, 1559 (Fed. Cir. 1983)) (“The jury was entitled to rely on evidence of bundling and convoyed sales in determining the proper scope of the royalty base.”); *State Indus., Inc. v. Mor-Flo Indus., Inc.*, 883 F.2d 1573, 1580–81 (Fed. Cir. 1989) (allowing plaintiffs to include the “value of collateral sales” in its proposed royalty rate and to calculate royalty rates based on the defendant’s gross profits); *Trans-World Mfg. Corp. v. Al Nyman & Sons, Inc.*, 750 F.2d 1552, 1568 (Fed. Cir. 1984) (overturning the trial court’s exclusion of evidence that the defendant used the patented invention in promoting sales of nonpatented products and reasoning that “the extent of the profits from such sales could be relevant in determining the amount of a reasonable royalty”).

manufacturing process, business risks, or significant features or improvements added by the infringer,” but factor thirteen still uses infringer profits as its starting position.<sup>184</sup> These factors effectively shift the burden to the defendant to provide evidence defending its earned profits,<sup>185</sup> which is exactly the problem Congress was trying to solve with the Patent Act of 1946.<sup>186</sup>

Plaintiffs can use these *Georgia-Pacific* factors to achieve “partial disgorgement”<sup>187</sup> and capture large percentages of the infringer’s profits.<sup>188</sup> In fact, “an infringer’s net profit margin is not the ceiling by which a reasonable royalty is capped.”<sup>189</sup> Instead, if the infringer’s profits are too low, the Federal Circuit believes that “[t]he infringer’s selling price can be raised if necessary to accommodate a higher royalty rate.”<sup>190</sup> This justification, of course, defies business logic. If companies could simply raise their prices without sacrificing consumer demand, every company would do it. As the Seller would say, pricing may be the toughest

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<sup>184</sup> *Georgia-Pacific Corp. v. U.S. Plywood Corp.*, 318 F. Supp. 1116, 1120 (S.D.N.Y. 1970).

<sup>185</sup> *See, e.g.,* *Finjan, Inc. v. Secure Computing Corp.*, 626 F.3d 1197, 1204 (2010) (allowing the plaintiff’s expert to include both infringing and non-infringing products in the royalty base under factor 6 because the defendant could not provide evidence separating the infringing products from the non-infringing products); *see also* *Brean*, *supra* note 150, at 909 (“Because PAEs have no business aside from patent assertion, they shift the fact finder’s focus onto the success of the accused infringer instead of the harm to themselves.”).

<sup>186</sup> *See supra* notes 146–49 and accompanying text.

<sup>187</sup> *See* *Samuelson*, *supra* note 146, at 1999, 2004 (footnotes omitted) (“Under the prevailing interpretation of utility patent law, disgorgement of infringer profits is never available, although awards of a reasonable royalty can, as a practical matter, effect a partial disgorgement of profits.”).

<sup>188</sup> *See, e.g.,* *Exergen Corp. v. KAZ USA, Inc.*, 725 F. App’x 959, 970 (Fed. Cir. Mar. 8, 2018) (nonprecedential) (affirming the trial court’s decision to award 71% of the infringer’s projected profit to the plaintiff); Alan Cox, *The Damages Testimony of VLSI Technologies v. Intel*, PATENTLYO (Mar. 19, 2020), <https://patentlyo.com/patent/2021/03/damages-testimony-technologies.html> [<https://perma.cc/43NN-EB8E>] (explaining how the plaintiff’s damages expert in *VLSI Technology LLC v. Intel Corp.* used the *Georgia-Pacific* factors to justify attributing 79.3 percent of Intel’s “increased” profits to VLSI).

<sup>189</sup> *Douglas Dynamics, L.L.C. v. Buyers Prods. Co.*, 717 F.3d 1336, 1346 (Fed. Cir. 2013) (citing *Golight, Inc. v. Wal-Mart Stores, Inc.*, 355 F.3d 1327, 1338 (Fed. Cir. 2004)) (holding “the district court clearly erred by limiting the ongoing royalty rate based on [the infringer’s] profit margins” and “by ensuring the ongoing royalty rate it awarded would ‘leave some room for profit’” for the infringer); *see also* *Aqua Shield v. Inter Pool Cover Team*, 774 F.3d 766, 772–73 (Fed. Cir. 2014) (finding that the trial court committed the same error as committed by the district court in *Douglas Dynamics*).

<sup>190</sup> *Douglas Dynamics*, 717 F.3d at 1346 (suggesting that forcing the infringer to raise its prices “may be the only way to adequately compensate the patentee for the use of its technology”).



part of the technology commercialization process.<sup>191</sup> Most companies cannot simply raise their prices when patent owners impose high technology prices because, among other reasons, prices are constrained by customer price sensitivity, and most customers do not value products for their technical features.<sup>192</sup>

Similarly, factors nine through eleven under Category A refer to the benefits gained by the infringer. For example, factors ten and eleven consider “the benefits to those who have used the invention” and “[t]he extent to which the infringer has made use of the invention.”<sup>193</sup> According to *Aro Manufacturing*, however, compensatory patent damages must be determined “without regard to the question whether the defendant has gained or lost by his unlawful acts.”<sup>194</sup> Factors nine through eleven ignore this guidance and encourage judges and juries to consider evidence that they should disregard.<sup>195</sup>

The Category A factors contribute most to the schism between the patent world and the commercial world. A company’s profitability reflects the contributions of all technology commercialization roles, not just the inventor or Ideator. Yet the Category A factors redistribute this value from the other technology commercialization roles to the inventor. If, for example, the Marketer discovers a previously unknown customer need that can be served by repurposing existing technology into a new use case, Category A attributes that value to the inventor rather than to the Marketer. If the Builder improves profitability by reducing defects during the manufacturing process, Category A credits the inventor instead of the Builder. If the Seller discovers an opportunity to charge certain customer segments more for the same technology product,<sup>196</sup> Category A allows the inventor to claim this additional value.

The schism grows when the Category A factors are cited during litigation. Consider a patent dispute between a patent-assertion entity (PAE) and an operating

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<sup>191</sup> See *supra* notes 107–110 and accompanying text.

<sup>192</sup> *Id.*

<sup>193</sup> *Georgia-Pacific*, 318 F. Supp. at 1120.

<sup>194</sup> *Aro Mfg. Co.*, 377 U.S. at 507 (quoting *Coupe v. Royer*, 155 U.S. 565, 582 (1895)).

<sup>195</sup> Courts may consider factor nine so long as they are using “utility and advantages of the patent over old modes or devices” to assess patent quality rather than utility or advantages to the infringer. *Cf.* Maayan Perel, *An Ex Ante Theory of Patent Valuation: Transforming Patent Quality into Patent Value*, 14 J. HIGH TECH. L. 148, 219 (2014) (explaining how factor nine may reflect patent quality).

<sup>196</sup> See *What Is Price Discrimination?*, INVESTOPEDIA, [https://www.investopedia.com/terms/p/price\\_discrimination.asp](https://www.investopedia.com/terms/p/price_discrimination.asp) [<https://perma.cc/WJS2-J8DP>] (last visited Feb. 2, 2021) (“Price discrimination is a selling strategy that charges customers different prices for the same product or service based on what the seller thinks they can get the customer to agree to.”).

company. From a value perspective, a lawsuit between a PAE and an operating company basically involves a plaintiff that performs one role (inventor) and a defendant that performs all the technology commercialization roles. When a court uses the Category A factors to redistribute value from the other technology commercialization roles to the inventor, the court effectively requires the other technology commercialization roles to pay the inventor for work they themselves performed.<sup>197</sup> Such requirements force the operating company to pay for the same work twice: once to the people who performed the other technology commercialization roles, and again years later after the PAE invokes the Category A factors.<sup>198</sup>

Categories B and C are problematic for other reasons. Category B focuses on the commercial relationship between the parties and how the invention contributes to the licensor's sales. Although potentially important in a lost profits analysis,<sup>199</sup> these factors do not reflect the value of the inventor's contribution—providing access to a qualifying idea as described in a qualifying disclosure.<sup>200</sup> Category C is also not helpful. These factors create paths for more evidence to be admitted without addressing whether the additional evidence reflects the inventor's contribution.

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<sup>197</sup> Cf. Brean, *supra* note 150, at 883 (“PAEs claim credit for the financial success of the defendant to grossly inflate their damages demands. They say, in effect, that a substantial amount of the defendant's profits are due to the PAE's patented technology.” (footnote omitted)).

<sup>198</sup> The defendant pays twice because the patentee's disclosure likely did not accelerate the Ideator's process or contribute to the work contributed by any other technology commercialization roles. Cf. BURK & LEMLEY, *supra* note 5, at 66 (noting that “very few scientists get their technical information from patents and scientists at many companies are discouraged from even reading patents”); Love, *supra* note 160, at 936 (explaining why “[n]o [o]ne [r]eads [p]atents—[a]nd for [g]ood [r]eason”); Love, *supra* note 160, at 940 (“In addition to widespread rational ignorance among potential infringers, empirical evidence and the prevalence of near simultaneous invention suggest that truly independent invention, rather than copying, is the norm.”). In fact, *Georgia-Pacific* may require the defendant to pay more the second time around if the product becomes more successful over time. See, e.g., *Lucent Techs.*, 580 F.3d at 1333–34 (considering evidence of infringer usage under factor eleven that occurred after the date of the hypothetical negotiation).

<sup>199</sup> See Brean, *supra* note 150, at 908–09 (explaining how Judge Herlands's *Georgia-Pacific* opinion contemplated reliance on infringer profits only “in certain cases” when assessing the patentee's lost profits, but then Judge Tenney “went further and essentially made profits-related considerations part of every royalty determination”).

<sup>200</sup> Cf. Perel, *supra* note 195, at 219 (suggesting that factors four and five “should be disregarded as they are external to the quality traits of the patented invention”).

Category D is relevant but not particularly useful today. Category D allows courts to acknowledge, for example, that exclusive licenses are more valuable than non-exclusive licenses and long licenses may be more valuable than short licenses. These factors, however, only address relative value between different license permutations. They do not describe the value of the inventor's contribution.

Category E may be the most relevant, but also the most useless. The "nature of the patented invention" might describe the value of the inventor's contribution. Or it might not. Without further definition, Category E is not capable of helping courts measure compensatory damages accurately.

## 2. The Analytical Method

The first fourteen *Georgia-Pacific* factors inform the fifteenth: the amount a willing licensor and licensee would have paid in a hypothetical negotiation.<sup>201</sup> Although courts primarily rely on hypothetical negotiations when setting reasonable royalty rates,<sup>202</sup> the Federal Circuit also recognizes an alternative approach: the analytical method.<sup>203</sup>

The analytical method "focuses on the infringer's projections of profit for the infringing product."<sup>204</sup> Under this approach, the court calculates damages by identifying the infringer's internal profit projections at the time of first infringement and then apportioning the projected profits between the parties.<sup>205</sup> The Federal Circuit first recognized this approach in *TWM Manufacturing* when the court calculated a reasonable royalty by "subtract[ing] the infringer's usual or acceptable net profit from its anticipated net profit realized from sales of infringing devices."<sup>206</sup>

All the Category A criticisms apply to the analytical method. The analytical method deserves special attention, however, due to how the Federal Circuit recognized the method. In *TWM Manufacturing*, the Federal Circuit justified use of the analytical method by citing *Aro Manufacturing* for the proposition that "Section 284 does not mandate how the district court must compute that figure, only

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<sup>201</sup> *Georgia-Pacific*, 318 F. Supp. at 1120.

<sup>202</sup> See *Uniloc USA, Inc. v. Microsoft Corp.* 632 F.3d 1292, 1312 (2011) (noting that "a reasonable royalty is often determined on the basis of a hypothetical negotiation" during litigation); *Lucent Techs.*, 580 F.3d at 1324 (describing the hypothetical negotiation approach as the "more common approach").

<sup>203</sup> See *TWM Mfg. Co. v. Dura Corp.*, 789 F.2d 895, 898–00 (Fed. Cir. 1986).

<sup>204</sup> *Lucent Techs.*, 580 F.3d at 1324 (citing *TWM Mfg. Co.*, 789 F.2d at 899).

<sup>205</sup> *Id.*

<sup>206</sup> *Id.* (quoting *TWM Mfg. Co.*, 789 F.2d at 899).

that the figure compensate for the infringement.”<sup>207</sup> This is not entirely true. Rather, *Aro Manufacturing* stated—on the same page cited by *TWM Manufacturing*—that Section 284 requires courts to determine compensatory damages “without regard to the question whether the defendant has gained or lost by his unlawful acts.”<sup>208</sup> The Federal Circuit violated this mandate in *TWM Manufacturing* by calculating compensatory damages based entirely on the infringer’s anticipated profits.

Together, *Georgia-Pacific* and *TWM Manufacturing* are responsible for opening the schism by shifting reasonable royalty calculations away from the value of the inventor’s contribution. Both decisions also cited *Aro Manufacturing*,<sup>209</sup> suggesting that the courts knew that patent owners are not entitled to recover infringer profits. In fact, Judge William Bernard Herlands recognized that the court in *Georgia-Pacific* was “squarely faced with the issue as to the role, if any, which the infringer’s profits are to play in the ascertainment of ‘Damages adequate to compensate (the patent owner) for the infringement.’”<sup>210</sup> In 1965, Judge Herlands warned against “verbal gymnastics which would allow a patent holder, who had not been deprived of any measurable quantity of sales or profits by the infringement, to recover as damages an amount equal to the infringer’s profits.”<sup>211</sup>

By 1970, however, Judge Herlands’s warning was lost.<sup>212</sup> *Georgia-Pacific*, *TWM Manufacturing*, and their progeny allowed patent owners to recover infringer profits by describing the patentee’s loss as the lost opportunity to negotiate a

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<sup>207</sup> *TWM Mfg. Co.*, 789 F.2d at 899 (citing *Aro Mfg. Co.*, 377 U.S. at 507).

<sup>208</sup> *Aro Mfg. Co.*, 377 U.S. at 507 (quoting *Coupe v. Royer*, 155 U.S. 565, 582 (1895)).

<sup>209</sup> *TWM Mfg. Co.*, 789 F.2d at 899 (citing *Aro Mfg. Co.*, 377 U.S. at 507); *Georgia-Pacific*, 318 F. Supp. at 1143 n.5 (citing *Aro Mfg. Co.*, 377 U.S. at 505–06).

<sup>210</sup> *Georgia-Pacific*, 243 F. Supp. at 515 (discussing *Aro Mfg. Co.*, 377 U.S. at 505 n.20).

<sup>211</sup> *Id.* at 516.

<sup>212</sup> Judge Herlands died on August 28, 1969, less than a year before Judge Tenney announced the *Georgia-Pacific* factors. *Georgia-Pacific*, 318 F. Supp. at 1118. Judge Tenney purportedly “accepted and adopted, with minor amendment, the reasoned opinion of Judge Herlands.” *Id.* at 1119. If Judge Tenney is to be believed, then the original draft opinion from Judge Herlands presumably featured at least some of the *Georgia-Pacific* factors.

license<sup>213</sup> and claiming the parties would have negotiated over infringer profits.<sup>214</sup> These “verbal gymnastics” allowed courts to use profitability evidence that *Aro Manufacturing* instructed courts to disregard.

This “lost opportunity” theory, however, ignores commercial reality and distorts valuation of the underlying asset. A lumber yard, for example, has the right to exclude others from using its lumber prior to sale. However, the lumber yard’s right to negotiate a sale does not mean that the value of the wood changes depending on whether the purchaser uses the wood to construct a profitable house or to build an unprofitable bonfire. Instead, every purchaser pays the same price for lumber regardless of each purchaser’s use case or anticipated profits. The same is true with patents. Redefining the patentee’s loss as the “lost opportunity to obtain a reasonable royalty” does not inform or change the underlying value of the reasonable royalty. Patents, like lumber, have value that can be measured directly without reference to the infringer’s use case or profits.<sup>215</sup>

### 3. Reliance on Comparable Licenses

According to the Federal Circuit, the “best measure of a reasonable royalty” is evidence of an established royalty.<sup>216</sup> The Federal Circuit favors the established-royalty approach because “it removes the need to guess at the terms to which parties would hypothetically agree.”<sup>217</sup> That may or may not be true if the ultimate goal is to

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<sup>213</sup> See, e.g., *Astrazeneca AB v. Apotex Corp.*, 782 F.3d 1324, 1334 (Fed. Cir. 2015) (citing *Lucent Techs.*, 580 F.3d at 1325) (“The reasonable royalty theory of damages, however, seeks to compensate the patentee . . . for its lost opportunity to obtain a reasonable royalty that the infringer would have been willing to pay if it had been barred from infringing.”). But see Oskar Liivak, *When Nominal is Reasonable: Damages for the Unpracticed Patent*, 56 B.C. L. REV. 1031, 1036 (2015) (“[S]o the argument goes, the patentee has lost out on a licensing opportunity, and reasonable royalties aim to compensate the patentee for that loss. . . . [T]his explanation is suspect because this presumption of harm conflicts with the U.S. Supreme Court’s holdings in *Rude v. Westcott* and *Coupe v. Royer*.”).

<sup>214</sup> See *Georgia-Pacific*, 318 F. Supp. at 1143 (reasoning that a hypothetical negotiation under factor fifteen would entail consideration of the other fourteen factors); see also Brean, *supra* note 150, at 883 (“[T]hese arguments are made by exploiting certain factors in the *Georgia-Pacific* framework that focus on the benefits derived by the infringer from use of the patented technology.”).

<sup>215</sup> For more property analogies comparing patents to lumber, see Storm, *supra* note 178, at 297 n.217.

<sup>216</sup> E.g., *Monsanto Co. v. McFarling*, 488 F.3d 973, 978–79 (Fed. Cir. 2007) (internal quotations omitted).

<sup>217</sup> *Id.*

determine the outcome of a hypothetical negotiation.<sup>218</sup> If the goal is to compensate the patentee for the lost value of the inventor's contribution, however, an established royalty may be the worst available measure for at least two reasons.

First, parties today negotiate license agreements in the shadow of *Georgia-Pacific* and *TWM Manufacturing*. These cases and their progeny normalized royalty calculations based on the infringer's profits and proxies thereof.<sup>219</sup> Today, patent owners have an accelerated path to recovering infringer profits. Step one: file suit in a venue that prefers jury trials.<sup>220</sup> Step two: manipulate *Georgia-Pacific* to submit profitability evidence to the jury.<sup>221</sup> Step three: encourage the jury to ignore the value of the inventor's contribution, punish the defendant for its infringement, and award the plaintiff a piece of the infringer's profits.<sup>222</sup> Using these three steps, plaintiffs can do "an end-run around the undisputedly compensatory nature of patent damages."<sup>223</sup>

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<sup>218</sup> The established royalty approach purportedly "indicates the terms upon which the patentee would have licensed the defendant's use of the invention." *Id.* (citations omitted). Hypothetical negotiations, however, are two-party affairs. Establishing the patentee's asking price does not establish that a willing licensee in the defendant's position would pay that amount.

<sup>219</sup> See *supra* Parts III.A.1–2.

<sup>220</sup> See, e.g., J. Jonas Anderson, *Court Competition for Patent Cases*, 163 U. PA. L. REV. 631, 674 (2015) (noting how 8% of patent cases in the Eastern District of Texas and 11.8% of patent cases in the District of Delaware reach a final decision before a jury, compared to just 2.8% percent of all U.S. patent cases); J. Jonas Anderson & Paul R. Gugliuzza, *Federal Judge Seeks Patent Cases*, 71 DUKE L.J. 419, 460 (2021) (discussing Judge Albright's view that patentees are entitled to a jury trial in the context of validity).

<sup>221</sup> See Brean, *supra* note 150, at 908 (commenting on how reasonable royalty damages are currently "determined under a manipulable analytical framework").

<sup>222</sup> See Brean, *supra* note 150, at 910 (quoting a PAE who argued at trial that the jury should force Newegg to pay \$34 million in "real money" over shopping cart patents because "this is the engine that their business runs on, and they're making a lot of money and doing a lot of business; 28 million transactions, totaled 12 million, I believe, last year and a couple of billion dollars"). See generally Bernard Chao & Roderick O'Dorisio, *Saliency, Anchors & Frames: A Multicomponent Experiment*, MICH. TECH. L. REV. 1, 2 (2019) (researching how jurors seek to punish defendants when assessing damages); Love, *supra* note 160, at 910–11 ("This Article documents the striking fact that courts have time and again awarded reasonable royalty damages for patent infringement that rise well above any objectively 'reasonable' level for the apparent purpose of punishing defendants for their infringing conduct." (footnote omitted)).

<sup>223</sup> Brean, *supra* note 150, at 910.

A patent owner's ability to recover infringer profits through the judicial system influences all private license negotiations.<sup>224</sup> Such influence, however, creates a circularity problem where courts determine reasonable royalties based on established royalties and comparable licenses.<sup>225</sup> Although courts believe such licenses establish "the terms to which parties would hypothetically agree,"<sup>226</sup> past licenses reflect, at best, the parties' best guesstimate as to how a court would calculate the royalty. Each iteration of private negotiation and judicial calculation introduces more opportunities for error, moving proper patent valuation further from the value of the inventor's contribution.

Second, private negotiations may not even reflect the parties' best royalty guesstimate. Instead, negotiations typically reflect leverage and other factors unrelated to royalty calculations.<sup>227</sup> Such factors may introduce errors bidirectionally, creating the possibility of both devaluation and overvaluation of reasonable royalties.<sup>228</sup> These errors are impossible to identify, quantify, and remediate when relying on past license agreements. Even if non-disclosure agreements did not exist and past license agreements were fully transparent,<sup>229</sup> errors caused by negotiation leverage, personal risk tolerance, and other factors never manifest themselves in express license terms.<sup>230</sup> Accordingly, neither courts nor the public should believe that negotiated license agreements reflect the value of the inventor's contribution.

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<sup>224</sup> See Jonathan S. Masur, *The Use and Misuse of Patent Licenses*, 110 NW. L. REV. 115, 121 (2015) (explaining how court-determined damages influence private negotiations); Taylor, *supra* note 151, at 141 ("Parties negotiate royalties in view of potential reasonable royalties; they assess negotiated royalties based on expected reasonable royalties.").

<sup>225</sup> See Taylor, *supra* note 151, at 141 ("But, likewise, courts determine appropriate royalties in the shadow of negotiated royalties; they assess reasonable royalties based on past negotiated royalties.").

<sup>226</sup> *Monsanto*, 488 F.3d at 978–79.

<sup>227</sup> See Storm, *supra* note 178, at 302–03.

<sup>228</sup> See Taylor, *supra* note 151, at 142–43 (discussing potential devaluation due to uncertain enforceability and overvaluation due to selection bias in choosing comparable licenses).

<sup>229</sup> See Mark A. Lemley & Nathan Myhrvold, *How to Make a Patent Market*, 36 HOFSTRA L. REV. 257, 258 (2007) (proposing requirements that all patent assignment and license terms be published to establish a transparent patent market).

<sup>230</sup> For example, if one negotiating team was under strict orders from management to complete the license agreement before the end of the financial year—even if it meant overpaying for the license rights—that negotiating party would almost never inform the counterparty of such an imposed deadline, and existence of the deadline would never be memorialized in the agreement.

#### 4. Apportionment

Trial courts have a mechanism for correcting errors resulting from indirect measurement of the inventor's contribution.<sup>231</sup> In 1884, the Supreme Court recognized the apportionment doctrine in *Garretson v. Clark*.<sup>232</sup> The apportionment doctrine requires patentees to provide evidence tending to separate the patentee's damages between the patented feature and the unpatented features.<sup>233</sup> According to the Supreme Court, "such evidence must be reliable and tangible, and not conjectural or speculative."<sup>234</sup> In other words, apportionment is not merely a box to be checked; rather, measurement accuracy matters.<sup>235</sup>

The "essential requirement" of the apportionment doctrine is that "the ultimate reasonable royalty award must be based on the incremental value that the patented invention adds to the end product."<sup>236</sup> This requirement prevents patentees from overreaching and capturing value outside the claimed invention.<sup>237</sup> Thus, the apportionment doctrine theoretically has potential to ensure that damages awards reflect the value of the inventor's contribution, "and no more."<sup>238</sup>

Unfortunately, today's apportionment doctrine has not met its potential for at least four reasons. First, courts and damages experts tend to treat apportionment as merely an obligation to separate value between the patented invention and

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<sup>231</sup> See Eric E. Bensen & Danielle M. White, *Using Apportionment to Rein in the Georgia-Pacific Factors*, 9 COLUM. SCI. & TECH. L. REV. 1, 5 (2008) (proposing that courts treat apportionment as a threshold question to "rein in" the *Georgia-Pacific* factors).

<sup>232</sup> *Garretson v. Clark*, 111 U.S. 120, 121 (1884).

<sup>233</sup> *Id.*

<sup>234</sup> *Id.*

<sup>235</sup> *Contra Dowagiac Mfg. Co.*, 235 U.S. at 647 (affirming nominal damages where the plaintiff failed to provide apportionment evidence but commenting that "mathematical [sic] exactness" is not necessarily required when apportioning the defendant's profits).

<sup>236</sup> *Ericsson*, 773 F.3d at 1226 (interpreting *Garretson*, 111 U.S. at 121).

<sup>237</sup> *VirnetX, Inc. v. Cisco Sys., Inc.*, 767 F.3d 1308, 1326 (Fed. Cir. 2014) ("These strict requirements limiting the entire market value exception ensure that a reasonable royalty 'does not overreach and encompass components not covered by the patent.'" (quoting *Laserdynamics, Inc. v. Quanta Comput., Inc.*, 694 F.3d 51, 70 (Fed. Cir. 2012))).

<sup>238</sup> See *Ericsson*, 773 F.3d at 1226 ("[W]here multi-component products are involved, the governing rule is that the ultimate combination of royalty base and royalty rate must reflect the value attributable to the infringing features of the product, and no more." (citing *VirnetX*, 767 F.3d at 1326)).



“other-patented” features.<sup>239</sup> In technology commercialization terms, this is analogous to apportioning value between the inventor and other Ideators. This form of apportionment, although important, still allows patentees to capture the value contributed by the other technology commercialization roles.<sup>240</sup>

Second, some courts have treated the apportionment doctrine as an evidentiary rule rather than a substantive restriction on patent damages awards. For example, the Ninth Circuit rejected use of the smallest-saleable patent-practicing unit (SSPPU) in reasonable-royalty calculations because, according to the court, the SSPPU concept is merely an evidentiary tool to avoid jury confusion, and therefore is unnecessary in bench trials.<sup>241</sup> However, the SSPPU is the best available tool for ensuring compliance with the apportionment doctrine in standard-essential patent cases,<sup>242</sup> and the Ninth Circuit did not cite or rely on any alternative concept for enforcing the apportionment doctrine.<sup>243</sup> By failing to require apportionment evidence, the Ninth Circuit’s ruling encourages bench trials to disregard the apportionment doctrine.

Third, juries are poorly positioned to apportion value correctly. Patent trials typically award the plaintiff and the defendant an equal, but limited amount of time.<sup>244</sup> Plaintiffs can use their time emphasizing “the critical importance of the patented invention” and the defendant’s financial success.<sup>245</sup> For defendants, “it would be virtually impossible to explain the importance of all the other, non-infringing components and features contained in complex products like

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<sup>239</sup> Anne Layne-Farrar, *The Patent Damages Gap: An Economist’s Review of U.S. Statutory Patent Damages Apportionment Rules*, 26 TEX. INTEL. PROP. L.J. 31, 31 (2018).

<sup>240</sup> The apportionment doctrine, when applied correctly, would limit reasonable royalties to “the value that the patented invention actually contributes as a proportion of the defendant’s product, taking into account the other patents, know-how, raw materials, and labor that also contribute to the value of that product.” See Lemley, *supra* note 167, at 670.

<sup>241</sup> Fed. Trade Comm’n v. Qualcomm Inc., 969 F.3d 974, 999–00 (9th Cir. 2020) (citing *Ericsson*, 773 F.3d at 1226; *VirnetX*, 767 F.3d at 1327–28; *LaserDynamics*, 694 F.3d at 68).

<sup>242</sup> Storm, *supra* note 178, at 291.

<sup>243</sup> See *Qualcomm*, 969 F.3d at 999–00 (rejecting the district court’s use of the SSPPU without citing *Garretson* or referencing any other patent doctrines that restrict the patentee’s damages recovery).

<sup>244</sup> See, e.g., D. DEL., SCHEDULING ORDER FORM FOR PATENT CASES 10 n.5 (2019), <https://www.ded.uscourts.gov/sites/ded/files/chambers/Form%20Sch.%20Order.pdf> [<https://perma.cc/P8M4-42KB>] (Dec. 6, 2019, 12:57 PM) (“Five days (i.e., about ten to thirteen hours per side) is the presumptive length of a patent jury trial.”).

<sup>245</sup> Christopher B. Seaman, *Reconsidering the Georgia-Pacific Standard for Reasonable Royalty Patent Damages*, 5 BYU L. REV. 1661, 1697–98 (2010).

computer operating systems or smartphones—such a presentation likely would take weeks or months of highly technical testimony.”<sup>246</sup> Defendants must also spend some of their time rebutting various plaintiff attacks, leaving them with little time to discuss “all the other things that contribute to the success of the defendant’s product, including other inventions included in that product and the contributions the defendant makes to the success of the product.”<sup>247</sup> Thus, instead of apportioning value between the inventor’s contribution and the defendant’s contributions, juries “come away with an inflated sense of the relative value of that invention.”<sup>248</sup>

Finally, patent owners can avoid apportionment altogether by relying on past license agreements or negotiations. For example, *CSIRO v. Cisco Systems* did not require apportionment because the district court calculated the royalty based on the parties’ prior negotiations.<sup>249</sup> The court assumed, without citing any supporting evidence, that “the parties negotiated over the value of the asserted patent, ‘and no more.’”<sup>250</sup> The court’s assumption is false. License negotiations are influenced by a variety of factors having nothing to do with the value of the asserted patent.<sup>251</sup> This assumption is also dangerous because it allows patent owners to avoid apportioning value in future cases if they successfully forced past licensees to sign agreements that did not appropriately apportion value.<sup>252</sup> Yet subsequent Federal Circuit cases have embraced this assumption and declined to enforce the apportionment doctrine under the mistaken belief that prior negotiations somehow “built-in apportionment.”<sup>253</sup>

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<sup>246</sup> *Id.*

<sup>247</sup> BURK & LEMLEY, *supra* note 5, at 30 (“But as a practical matter, juries never get to hear that evidence . . .”).

<sup>248</sup> *Id.*

<sup>249</sup> Commonwealth Sci. & Indus. Rsch. Org. v. Cisco Sys., Inc., 809 F.3d 1295, 1302–03 (Fed. Cir. 2015) [hereinafter *CSIRO*] (rejecting use of the SSPPU because “the district court did not apportion from a royalty base at all”).

<sup>250</sup> *Id.* (quoting *Ericsson*, 773 F.3d at 1226).

<sup>251</sup> See *supra* notes 230–30 and accompanying text; see also Storm, *supra* note 178, at 302–03 (discussing how leverage distorts private negotiations away from actual patent value).

<sup>252</sup> This exception to apportionment also encourages SEP owners to game license settlements to set up future profits. Storm, *supra* note 178, at 279 n.117 (citing Erik Hovenkamp, *Tying, Exclusivity, and Standard-Essential Patents*, 19 COLUM. SCI. & TECH. L. REV. 79, 110–11 (2017)).

<sup>253</sup> See *Vectura Ltd. v. GlaxoSmithKline LLC*, 981 F.3d 1030, 1040 (Fed. Cir. 2020) (quoting *CSIRO*, 809 F.3d at 1303); *Bio-Rad Labs., Inc. v. 10X Genomics Inc.*, 967 F.3d 1353, 1376 (Fed. Cir. 2020) (same); *Elbit Systems Land & C4I Ltd. v. Hughes Network Sys., LLC*, 927 F.3d 1292 (Fed. Cir. 2019) (same).

### *B. The Schism's Impact on the Patent System*

The compensatory damages scheme originally enacted by Congress was consistent with how the commercial world values the inventor's contribution.<sup>254</sup> Courts created the schism, however, when they deviated from compensatory damages to calculations that allow patentees to capture an infringer's profits.<sup>255</sup> In addition to opening the schism, this judicial deviation away from compensatory damages has also contributed to other significant policy issues threatening the patent system.

Consider, for example, royalty stacking. "Royalty stacking refers to situations in which a single product potentially infringes on many patents, and thus may bear multiple royalty burdens."<sup>256</sup> Royalty stacking becomes problematic where each patent owner is allowed to overcharge the infringer for a license because "these overcharges, when aggregated, can lead to a very significant cost burden on producers."<sup>257</sup> Overcharging occurs because, among other reasons,<sup>258</sup> courts allow patent owners to capture more than the value of the inventor's contribution.<sup>259</sup> Despite efforts to address other contributing factors like the availability of injunctions,<sup>260</sup> overcharging persists because courts still allow patent owners to seek inflated damages awards.<sup>261</sup> Although setting reasonable royalties based on the value of the inventor's contribution will not eliminate royalty stacking problems,

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<sup>254</sup> Compare sources cited *supra* notes 142–163 and accompanying text (summarizing how the Patent Act of 1946 compelled courts to set reasonable royalties based on the inventor's lost value), with *supra* notes 139–141 and accompanying text (discussing how the outside world pays Ideators for the work they perform).

<sup>255</sup> See *supra* Part III.A.

<sup>256</sup> Mark A. Lemley & Carl Shapiro, *Patent Holdup and Royalty Stacking*, 85 TEX. L. REV. 1991, 1993 (2007).

<sup>257</sup> *Id.* at 2013.

<sup>258</sup> Injunctions, threats of treble damages, and other patent holdup issues also contribute to the problem. *Id.* at 1992–93.

<sup>259</sup> See Part III.A, *supra*; see also BURK & LEMLEY, *supra* note 5, at 30 (explaining how jury trials fail to "take into account all the other things that contribute to the success of the defendant's product, including other inventions included in that product and the contributions the defendant makes to the success of that product").

<sup>260</sup> See *eBay Inc. v. MercExchange, L.L.C.*, 547 U.S. 388, 393–94 (2006) (replacing the Federal Circuit's "general rule" favoring injunctions with a case-specific, four-factor test); see also *infra* notes 269–273 (discussing *eBay*).

<sup>261</sup> Cf. Brean, *supra* note 150, at 877 ("PAEs can still strongly leverage the burden and expense of litigation, as well as the specter of a high damages award, and perhaps do so more post-*eBay* with aggressive litigation techniques and damages theories.").

correcting compensatory damages can help producers manage aggregate patent exposure.<sup>262</sup>

Relatedly, the patent system also suffers from an “overabundance of low-quality and low-value patents.”<sup>263</sup> “Low-quality patents are those that cover technological developments requiring little to no R&D investment, often yielding negligible social or technological value.”<sup>264</sup> Although patent examination and other quality issues are important, quality is ultimately a compensation problem. If courts calculated royalties based on the value of the inventor’s contribution, then these low-quality patents would, by definition, merit negligible royalties because they contribute little value. Not only would correcting compensation address the “concomitant problems with rights coordination and patent trolling”<sup>265</sup> by reducing the financial upside of low-quality patents, but aligning compensation to contributed value would incentivize inventors to focus patent filing on higher-quality inventions.

Overcompensation also contributes to the modern debate over patent eligibility. Mathematically, there are two ways to fix royalty stacking: reduce the number of patents or reduce compensation owed for each patent. Given the overabundance of low-quality patents, advocates naturally push for reforms that would eliminate certain types of patents.<sup>266</sup> In response, a series of Supreme Court cases deemed certain inventions ineligible for patent protection under Section 101.<sup>267</sup> Setting aside the merits of these decisions, the Supreme Court failed to solve

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<sup>262</sup> Setting compensation at the value of the inventor’s contribution can protect operating companies from paying patent owners for the value contributed by the other technology commercialization roles. These companies, however, will still have to pay for the value of Ideation twice: once when they pay their Ideator as part of the product development process, and again when a different Ideator steps forward with a patent. See sources cited *supra* note 198 and accompanying text.

<sup>263</sup> See, e.g., Marcowitz-Bitton & Morris, *supra* note 121, at 1840 (“The overabundance of low-quality and low-value patents and their concomitant problems with rights coordination and patent trolling have led to what many term a ‘patent crisis’ or ‘patent failure,’ with significant costs for patentees, innovation, and society at large.”).

<sup>264</sup> *Id.* at 1839 (footnote omitted).

<sup>265</sup> *Id.* at 1840.

<sup>266</sup> See, e.g., David S. Olson, *Taking the Utilitarian Basis for Patent Law Seriously: The Case for Restricting Patentable Subject Matter*, 82 TEMP. L. REV. 181, 189–90 (2009) (suggesting that “knocking out whole areas of subject matter from patentability would reduce the load on the patent office” and thereby improve patent quality).

<sup>267</sup> See, e.g., *Alice Corp. Pty. Ltd. v. CLS Bank Int’l*, 573 U.S. 208, 221 (2014) (excluding an escrow service improvement implemented by a generic computer); *Ass’n for Molecular Pathology v.*

royalty stacking because it focused on patent volume instead of patent compensation.

Inflated compensation concerns even led to the Supreme Court's decision in *eBay v. MercExchange*.<sup>268</sup> Prior to the Court's decision, the Federal Circuit recognized the "general rule that courts will issue permanent injunctions against patent infringement absent exceptional circumstances."<sup>269</sup> This generalization made sense historically because most patent plaintiffs were operating companies.<sup>270</sup> The typical fact pattern changed, however, when PAEs emerged in droves seeking financial compensation (rather than injunctions).<sup>271</sup> Rather than uphold the general rule against a mismatched fact pattern, *eBay* merely recognized that shifting

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Myriad Genetics, Inc., 569 U.S. 576, 580 (2013) (excluding claims directed to using isolated DNA to detect a patient's genetic propensity of contracting breast cancer); Mayo Collaborative Servs. v. Prometheus Lab'ys, Inc., 566 U.S. 66, 91–92 (2012) (excluding process claims that determine medication dosages using blood test results and patient health); *Bilski v. Kappos*, 561 U.S. 593, 609, 611–12 (2010) (excluding a method of hedging seasonal risks when buying energy); see also Mark A. Lemley & Samantha Zyontz, *Does Alice Target Patent Trolls?*, 18 J. EMPIRICAL LEGAL STUD. 47, 48 (2021) ("Most surprisingly, we find that the entities most likely to lose their patents [under *Alice*] are not patent trolls but individual inventors and inventor-started companies.").

<sup>268</sup> See *eBay*, 547 U.S. at 396 (Kennedy, J., concurring) (expressing concerns about when "the threat of an injunction is employed simply for undue leverage in negotiations").

<sup>269</sup> *MercExchange, LLC v. eBay, Inc.*, 401 F.3d 1323, 1339 (Fed. Cir. 2005) (citing *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1246–47 (Fed. Cir. 1989)), *vacated and remanded*, 547 U.S. 388 (2006); see also *eBay*, 547 U.S. at 395 (Roberts, C.J., concurring) (recognizing that courts have historically granted injunctive relief "in the vast majority of patent cases").

<sup>270</sup> See *eBay*, 547 U.S. at 396 (Kennedy, J., concurring) ("[T]he nature of the patent being enforced and the economic function of the patent holder present considerations quite unlike earlier cases. An industry has developed in which firms use patents not as a basis for producing and selling goods but, instead, primarily for obtaining licensing fees.").

<sup>271</sup> Unlike operating companies, PAEs can only make money if other companies infringe their patents. Thus, although PAEs ask for injunctive relief, they do not want injunctions to be enforced; rather, they only ask for injunctions because they want to extract larger settlements from defendants. See Oskar Liivak & Eduardo M. Peñalver, *The Right Not to Use in Property and Patent Law*, 98 CORNELL L. REV. 1437, 1485 (2013) ("While most patent trolls are not interested in enforcing a permanent injunction against their targets, the plausible threat of the permanent injunction helps them to extract maximum value out of users who have sunk enormous costs into the infringing activity." (emphasis added)). Courts have the power, however, to grant financial compensation through damages awards. From this perspective, *eBay* is consistent with the notion that a court in equity should not grant relief the plaintiff does not want (an injunction) when the court has the power to grant relief the plaintiff actually wants (financial compensation).

litigation patterns had rendered the generalization moot.<sup>272</sup> Although critics still disagree with *eBay*,<sup>273</sup> the only fair way to restore the general rule is to restore the fact pattern that justified the general rule. By prohibiting patent owners from capturing infringer profits, courts can make the patent system more attractive to operating companies that want injunctive relief and less attractive to those who only want inflated damages awards.<sup>274</sup>

Compensation miscalculation even affects industry-specific issues like licensing of standard-essential patents (SEPs). Standard setters and implementors have battled for decades over what it means to license SEPs on terms that are fair, reasonable, and non-discriminatory (FRAND).<sup>275</sup> The FRAND commitment, however, distracts from the root cause of the SEPs debate: over-valuation of SEPs.<sup>276</sup> SEP owners use patent assertions to capture value well outside the inventor's contribution, including the "value of connectivity" and the value created by each implementor's use case.<sup>277</sup> Rather than try to enforce FRAND as a matter of French contract law,<sup>278</sup> courts should ignore FRAND and instead set reasonable royalties based on the value of the inventive contributions.<sup>279</sup>

Failure to anchor compensation to the inventor's contribution even distorts macro-level policy debates. For example, commentators frequently ask whether

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<sup>272</sup> See *eBay*, 547 U.S. at 391–94 (instructing courts to return to the four-factor test applicable to all fact patterns).

<sup>273</sup> See, e.g., Britain Eakin, *Retiring Fed. Circ. Judge Says She Wants 'To Have a Voice'*, LAW360 (Oct. 28, 2021, 6:15 PM), <https://www.law360.com/articles/1434209> [<https://perma.cc/T85Z-4GB3>] (reporting that Judge Kathleen O'Malley retired from the Federal Circuit bench so that she can advocate for overturning *eBay*).

<sup>274</sup> Cf. Brean, *supra* note 150, at 880 (attributing the emergence of PAEs to "the failure of the courts and the bar to correctly read and enforce the damages law"); Landers, *supra* note 154, at 343–47 (explaining how "[a]wards over the [m]arket [v]alue of the [p]atented [i]nvention [p]rovide [p]atentees with an [i]ncentive to [e]ngage in [p]atent [t]rolling").

<sup>275</sup> See 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, 44 (2015) (noting how the patent industry's current interest in FRAND commitments began with a well-known series of cases against Rambus, Inc.).

<sup>276</sup> Storm, *supra* note 178, at 280.

<sup>277</sup> *Id.* at 267–70.

<sup>278</sup> See, e.g., *HTC Corp. v. Ericsson Inc.*, No. 19-CV-40566, slip op. at 9–11 (5th Cir. Aug. 31, 2021) (asserting that the FRAND commitment does not require SEP owners to comply with apportionment or other patent law principles because the FRAND commitment is a matter of French contract law, not U.S. patent law).

<sup>279</sup> Storm, *supra* note 178, at 310–11.

patents encourage or discourage “innovation.”<sup>280</sup> Innovation, however, takes on many different forms. Each technology commercialization role described in Part II is an innovator.<sup>281</sup> Today, the patent system encourages one form of innovation—inventorship—at the expense of every other form of innovation.<sup>282</sup> Instead of abstractly debating whether patents encourage innovation, anchoring policy discussions to the inventor’s contribution allows commentators to address the more precise question of whether incentivizing inventors and taxing the other technology commercialization roles creates a net innovation gain for society.<sup>283</sup>

### *C. Courts Should Exclude Indirect Evidence of Patent Damages Where Direct Measurements Exist*

Where direct measurements of the inventor’s contribution exist, courts should reject cases like *Georgia-Pacific* that encourage plaintiffs to inflate reasonable

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<sup>280</sup> See, e.g., Maureen K. Ohlhausen, *Patent Rights in a Climate of Intellectual Property Rights Skepticism*, 30 HARV. J.L. & TECH. 103, 104 (2016) (summarizing some of “the empirical and theoretical literature on the relationship between patents and innovation”).

<sup>281</sup> Cf. Landers, *supra* note 3, at 638 (discussing how, outside the realm of patent law, “economists define invention as a subset of innovation” and “consider innovation to include new ways of conducting business, marketing approaches, organizational structures, facilitating previously unexplored modes of communication, and solving social problems”).

<sup>282</sup> See *supra* notes 197–198 and accompanying text (using a PAE fact pattern to demonstrate how the patent system requires all the technology commercialization roles to pay patentees for work that they themselves performed); see also Ohlhausen, *supra* note 280, at 111 (quoting critics who argue that the patent system “provides excessive rewards to patent holders . . . by discouraging innovation” and that a patent represents “the right to block someone else from innovating” (footnote omitted)).

<sup>283</sup> Theoretically, patent law should incentivize all technology commercialization roles by helping inventors fill the other roles and bring products to market. See, e.g., Lee, *supra* note 155, at 232–33 (arguing that “damages serve to enhance incentives to invent and commercialize new technologies”). This does not appear to be happening. Instead, the rise in patent assertions by non-practicing entities suggests that the patent system is encouraging inventors (or their assignees) to tax the other technology commercialization roles rather than join them. See BURK & LEMLEY, *supra* note 5, at 26 (“[T]he number of lawsuits is accelerating *faster* than the already dramatic increase in the number of issued patents.”); PWC, 2018 PATENT LITIGATION STUDY 2, 9 (2018) (reporting subsequent numbers indicating that patent grants have kept pace with lawsuits over the past twenty years; reporting that PAEs recover higher damages awards than practicing entities); see also Lemley & Shapiro, *supra* note 256, at 1993 (arguing that excessive royalties “act as a tax on new products incorporating the patented technology, thereby impeding rather than promoting innovation”).

royalty values using indirect damages evidence.<sup>284</sup> First, courts should exclude indirect evidence at trial.<sup>285</sup> Indirect evidence lacks probative value because such evidence, by definition, does not actually measure the value of the plaintiff's compensatory damages.<sup>286</sup> Indirect evidence also unfairly prejudices defendants who have achieved profitability or other measures of success for reasons unrelated to the issue of patent infringement.<sup>287</sup> Indirect evidence also confuses juries into assessing punitive damages rather than compensatory damages,<sup>288</sup> which judges cannot always resolve on appeal.<sup>289</sup> Given the limited time available to conduct patent trials, courts should avoid wasting precious jury time on indirect evidence where direct evidence of patent damages exists.

Second, courts must prohibit damages experts from relying on indirect evidence of patent damages in their opinions. Judges must “ensure that any and all scientific testimony or evidence admitted is not only relevant, but reliable.”<sup>290</sup> Using indirect evidence to measure patent damages, however, is not a reliable method of determining how much compensation is owed to the patent owner.<sup>291</sup> Rather,

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<sup>284</sup> See Brean, *supra* note 150, at 912 (“Absent a more extensive overhaul to simplify the meaning of ‘reasonable royalty,’ at a minimum the restitutional factors in *Georgia-Pacific* should no longer be used because they are irreconcilable with Aro and § 284.” (footnote omitted)).

<sup>285</sup> See FED. R. EVID. 403 (permitting exclusion of relevant evidence if its probative value is substantially outweighed by potential prejudice, confusion, or wasting time).

<sup>286</sup> See sources cited, *supra* notes 169–174 and accompanying text (distinguishing indirect evidence from direct evidence).

<sup>287</sup> See sources cited, *supra* notes 244–2488 and accompanying text (explaining how defendants lack the necessary jury time to explain all the various contributions actually responsible for the defendants' success).

<sup>288</sup> See sources cited, *supra* note 222 and accompanying text (discussing how profitability evidence can encourage juries to award non-compensatory damages).

<sup>289</sup> See Arthur J. Gajarsa et al., *Breaking the Georgia-Pacific Habit: A Practical Proposal to Bring Simplicity and Structure to Reasonable Royalty Damages Determinations*, 26 TEX. INTELL. PROP. L.J. 51, 62–63 (2018) (“Fourth, since the jury is not instructed to document its findings on each factor or how it weighed the factors, use of the *Georgia-Pacific* framework results in unpredictable, black box determinations that are difficult to review. The difficulty of reviewing reasonable royalty determinations is reflected by the fact that the overwhelming majority of courts affirm juries' reasonable royalty determinations.” (footnotes omitted)).

<sup>290</sup> *Daubert v. Merrell Dow Pharms., Inc.*, 509 U.S. 579, 589 (1993).

<sup>291</sup> *Cf.* Durie & Lemley, *supra* note 176, at 632 (“The breadth of the available [*Georgia-Pacific*] factors also means that it is difficult to exclude evidence or expert testimony espousing virtually any theory of reasonable royalty damages, no matter how outlandish.”); Landers, *supra* note 154, at



indirect evidence invites error, which plaintiffs can exploit to inflate damages beyond the actual value of the inventor's contribution. In fact, merely presenting an inflated expert report can warp jury deliberations, either by "anchoring" the jury's damages decision to an inflated number or by enticing the jury to "split the difference" between the parties.<sup>292</sup>

Finally, if a court feels compelled to consider indirect evidence, the court must still require that damages theories citing indirect evidence be just as accurate and reliable as direct measurement methods. This requirement ensures that indirect measurement approaches still satisfy the apportionment doctrine.<sup>293</sup> Historically, enforcement of the apportionment doctrine has been limited because courts have lacked the ability to measure whether the enforcement doctrine has been fully satisfied.<sup>294</sup> To enforce apportionment correctly, courts need a mechanism for determining whether a plaintiff has apportioned out all non-inventive value from its infringement theory. Direct damages evidence provides this mechanism. If the plaintiff proposes a damages theory based on indirect evidence that would result in higher royalties than can be justified based on direct evidence, then courts should conclude that the plaintiff's damages theory does not fully satisfy the apportionment doctrine. In this scenario, courts should exclude the plaintiff's damages theory and any reliance on indirect evidence to prevent apportionment violations.

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331–32 ("Absent defined standards, district courts have little reason to prevent economically unsupported theories from reaching the jury."); Seaman, *supra* note 245, at 1661 (discussing how "the imprecise nature of *Georgia-Pacific* makes it difficult to exclude expert testimony on a reasonable royalty, even if it seems grossly disproportionate to the relative value of the patented invention").

<sup>292</sup> See Drew Amerson, *Gatekeeping Trends in Reasonable Royalty Cases*, 25 TEX. INTEL. PROP. L.J. 1, 24–25 (2017) (noting how the jury in *Summit 6 v. Samsung* awarded \$15 million in damages, splitting the difference between Summit 6's \$29 million number and Samsung's \$1.5 million number, and how the jury in *CSIRO* awarded \$16.24 million in damages, splitting the difference between the plaintiff's \$30.18 million request and the defendant's \$1.05 million counter); John Campbell et al., *Countering the Plaintiff's Anchor: Jury Simulations to Evaluate Damages Arguments*, 101 IOWA L. REV. 543, 545 (2016) ("Numerous studies establish that the jury's damages decision is strongly affected by the number suggested by the plaintiff's attorney, independent of the strength of the actual evidence (a psychological effect known as 'anchoring').").

<sup>293</sup> See sources cited *supra* notes 231–238 and accompanying text (introducing the apportionment doctrine).

<sup>294</sup> Courts can use the SSPPU in SEPs cases, but even this approach only helps courts apportion value down from the end product to a smaller piece of technology, which then needs to be apportioned further. *VirnetX, Inc. v. Cisco Sys., Inc.*, 767 F.3d 1308, 1328–29 (Fed. Cir. 2014). Even if the SSPPU includes no other inventions, courts should still apportion the SSPPU further to separate the inventor's contribution from the contributions of other technology commercialization roles. See *supra* notes 239–40 and accompanying text.

#### IV. DIRECT VALUATION OF THE INVENTOR'S CONTRIBUTION

This Part IV explains how courts can measure the value of the inventor's contribution directly without relying on infringer profits, comparable licenses, or other indirect measurements. First, courts should identify an appropriate valuation method that directly measures the inventor's contribution, as described in Part IV.A. Next, Part IV.B explores appropriate payment mechanisms for compensating inventors. The remainder of Part IV discusses factors courts should or should not consider when adjusting valuations and setting license rates.

##### A. *Direct Valuation Methods*

A direct measurement quantifies a variable associated with an object by using direct evidence of the object.<sup>295</sup> In the patent sense, direct measurement of compensatory patent damages means measuring what the patent owner has lost without referencing or measuring any value gained by the infringer.<sup>296</sup> This Part IV.A presents three example methods for directly measuring the patentee's losses: the inventor cost method, the reasonable cost method, and the "ex ante" method.

##### 1. The Inventor Cost Method

Disclosure "is the price paid for the exclusivity secured."<sup>297</sup> The inventor cost method attempts to calculate this price paid by measuring the original patentee's cost basis in the inventor's contribution. By measuring how much value the original patentee gave for its exclusionary rights, courts can help make patentees whole if patentees grant licenses in lieu of enforcing their exclusionary rights.<sup>298</sup>

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<sup>295</sup> Iyer, *supra* note 169, at 731.

<sup>296</sup> *Cf.* *Leesona Corp. v. United States*, 599 F.2d 958, 969 (Ct. Cl. 1979) ("The proper measure [of damages] is what the [patent] owner has lost, not what the taker has gained.").

<sup>297</sup> *Eldred v. Ashcroft*, 537 U.S. 186, 216 (2003) (citing *J.E.M. Ag Supply, Inc. v. Pioneer Hi-Bred Int'l, Inc.*, 534 U.S. 124, 142 (2001)).

<sup>298</sup> Admittedly, these royalty calculations may not be fair to defendants who still must pay for the same idea twice: once for the Ideator's contribution, and again for a license from the patentee. *See* sources cited *supra* notes 198, 262. For this reason, policymakers should consider adopting an independent-development exception to patent infringement. *See* Mark A. Lemley, *Should Patent Infringement Require Proof of Copying?*, 105 MICH. L. REV. 1525, 1526 (2007) ("An independent invention defense would eliminate the troll problem."); Love, *supra* note 160, at 935 ("[P]atentees should not be permitted to recover damages from those who independently invent the same technology."); Samson Vermont, *Independent Invention as a Defense to Patent Infringement*, 105 MICH. L. REV. 475, (2006) ("[I]f two or more independent inventors converge on an invention, the

The inventor cost method should capture the original patentee's actual costs for ideation activities.<sup>299</sup> These costs can be measured both financially and temporally. Relevant costs may include, for example, hours spent on conceiving and framing the claimed invention, relevant research expenditures, and overhead expenses allocatable to the ideation process. Cost measurements should exclude, however, all expenses incurred by non-Ideator roles, as well as any expenses related to licensing or enforcing the patent.<sup>300</sup> Although patent prosecution expenses arguably qualify for inclusion since they reflect part of the "price paid" for securing patent protection,<sup>301</sup> courts may exclude these costs since inventors typically complete the ideation process prior to seeking a patent.<sup>302</sup>

Cost measurements can be particularly useful in PAE cases. Since PAEs make no effort to commercialize their inventions, they suffer no damages when their patents are infringed—other than the nebulous lost opportunity to seek a license.<sup>303</sup>

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patent protection available for that invention should be ratcheted down moderately. A good way to ratchet down protection moderately is to automatically bestow a defense to patent infringement on the independent inventor(s) not entitled to the patent.”).

<sup>299</sup> Cf. Ted Sichelman, *Innovation Factors for Reasonable Royalties*, 25 TEX. INTELL. PROP. L.J. 277, 309 (2018) (“[C]osts should only reflect the direct amounts spent to perform R & D on the patented invention.”). Note, however, that the term “R & D” may overstate the inventor’s contribution by including development work performed by other technology commercialization roles.

<sup>300</sup> *Contra id.* at 309 (including costs for commercialization activities, “such as marketing, market testing, clinical and safety testing, pricing analysis, and other costs directly related to transforming the invention into a commercial product”); *id.* at 309 n.228 (“[C]ommercialization costs would include any costs incurred in attempting to license the patent.”). These commercialization costs should be excluded because they do not measure the value of the inventor’s contribution. Cf. Lemley & Shapiro, *supra* note 256, at 1994 (“[O]ur goal is to make sure that the reward patent owners can reap bears some reasonable relationship to the value of the ideas they contribute, so that patent holdup does not distort or even dampen innovation incentives.”).

<sup>301</sup> See Sichelman, *supra* note 299, at 309 n.228 (“R & D costs would also include any costs for securing patent protection . . .”).

<sup>302</sup> Most inventors complete the Ideator’s inspiration and framing steps prior to preparing a patent application. For example, inventors at operating companies often prepare documents explaining their inventions to coworkers prior to starting the patent application process. See, e.g., Chris Storm, *How a Different Approach to Patenting Can Help to Close the Gap*, IAM MAGAZINE, Summer 2020, at 10, 11 (introducing a passive harvesting approach for identifying inventions described in internal company communications). Even if the inventor proceeds straight to the patent application process, the company’s “invention disclosure form” may be the first enabling disclosure to frame the invention. See, e.g., David R. McGee, *Invention Disclosures and the Role of Inventors*, in HANDBOOK OF BEST PRACTICES 787 (2007) (providing a sample invention disclosure form that prompts inventors to “[p]rovide a complete, enabling description of the invention”).

<sup>303</sup> See sources cited, *supra* note 213–215 and accompanying text.

Thus, these PAEs should only be entitled to nominal damages.<sup>304</sup> Yet the inventors who originally sought patent protection did contribute value by disclosing their invention to the USPTO. Rather than deny any compensation to the inventors (or their successors-in-interest), the inventor cost method allows courts to compensate PAEs for the value of the original disclosures.<sup>305</sup>

Compensating inventors based on the cost of their contributed disclosures provides at least three policy advantages. First, cost-based reasonable royalties can sufficiently incentivize innovation.<sup>306</sup> The patent system offers three potential awards to incentivize patentable inventorship: injunctive relief, recovery of lost profits, and a reasonable royalty.<sup>307</sup> The first two remedies may be worth more than the value of the inventor's contribution, and for good reason<sup>308</sup>: patentees earn the first two remedies by performing all the technology commercialization roles, rather than just completing the minimal Ideator steps required to obtain a patent.<sup>309</sup> In this way, the first two remedies attract the “good” patentees—those who desire to commercialize their inventions by performing the other necessary technology

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<sup>304</sup> Brean, *supra* note 150, at 870–71.

<sup>305</sup> See John M. Golden & Karen Sandrik, *A Restitution Perspective on Reasonable Royalties*, 36 REV. LITIG. 335, 371 (2017) (“By promising reimbursement where a patent holder might otherwise walk away empty-handed, a cost measure also appears facially consistent with the language of the Patent Act, which specifies that damages are to provide adequate compensation . . .”). *But see* Liivak & Peñalver, *supra* note 271, at 1490 (“In cases where an owner is not practicing the patent or actively disseminating the invention, reasonable royalties might even be limited to an award of nominal damages.”).

<sup>306</sup> See Golden & Sandrik, *supra* note 305, at 371 (explaining how cost measures serve “the general purpose of patent law to promote innovation for the purposes of benefiting society as a whole”).

<sup>307</sup> 35 U.S.C. § 283 (allowing for injunctions “in accordance with principles of equity”); 35 U.S.C. § 284 (allowing the patentee to recover “damages adequate to compensate for the infringement, but in no event less than a reasonable royalty”). Patentees eligible for compensatory damages may also recover additional “damages up to three times the amount found or assessed.” 35 U.S.C. § 284.

<sup>308</sup> Valuation and appropriateness of injunctive relief and lost profit damages are outside the scope of this Article. The point here is that, unlike reasonable royalty awards, there's a logical reason for decoupling injunctive relief and lost profit damages from the value of the inventor's contribution.

<sup>309</sup> See *Rite-Hite Corp. v. Kelley Co.*, 56 F.3d 1538, 1546 (1995) (recognizing that operating companies can recover lost profits if such losses were “reasonably foreseeable by an infringing competitor in the relevant market, broadly defined”); Christopher B. Seaman, *Permanent Injunctions in Patent Litigation After eBay: An Empirical Study*, 101 IOWA L. REV. 1949, 1988 (2016) (reporting that non-PAEs have an 80% chance of receiving a requested permanent injunction).

commercialization roles.<sup>310</sup> As such, these remedies encourage all forms of innovation.<sup>311</sup>

By contrast, patentees can recover reasonable royalties without performing any technology commercialization activities outside of ideation. Unlike injunctive relief and lost profits, reasonable royalties can either encourage or discourage commercialization depending on how they are calculated. For example, reasonable royalties can encourage commercialization by providing a safety net. If the patentee desires to commercialize but fails, the patentee can at least recover some of its investment through licensing. Inflated reasonable royalties, on the other hand, discourage commercialization by incentivizing the inventor to lie in wait while others attempt to bring new products to market. In this way, inflated royalty awards attract the “bad” patentees—those who merely want to profit off the innovation of others while minimizing their own contributions. To avoid overcompensation and attracting bad patent filers, cost-based reasonable royalties should compensate inventors for the value of their contributions, and no more.<sup>312</sup>

Second, cost measures enable a unitary patent system to accommodate “the extraordinarily diverse needs of innovators in today’s industries.”<sup>313</sup> For example, the pharmaceutical and information technology industries often disagree over patent valuation and related issues.<sup>314</sup> Using cost measures to value the inventor’s contribution, however, can allow a unitary patent system to accommodate both industries. Ideation costs in the pharmaceutical industry are typically much higher than in the software industry.<sup>315</sup> Not only do higher research costs help explain the

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<sup>310</sup> Cf. John M. Golden, *Principles for Patent Remedies*, 88 TEX. L. REV. 505, 509 (2010) (“assum[ing] a utilitarian goal that is standard in modern accounts: the patent system should act to promote the development, disclosure, and use of new technologies, ideally in a way that maximizes social welfare”).

<sup>311</sup> See sources cited *supra* notes 280–283 and accompanying text (discussing how the term “innovation” applies to all technology commercialization activities, not just inventorship).

<sup>312</sup> Cf. Sichelman, *supra* note 299, at 317 (responding to concerns about undercompensating “flash of genius” inventors by noting “that an innovator should only be rewarded the amount that precisely incentivizes the innovation, and no more or no less”); Taylor, *supra* note 151, at 117 (“[L]egal scholars have made the case that reasonable royalties should provide just enough incentive for prospective patent owners to invent, but no more.” (footnote omitted)).

<sup>313</sup> See BURK & LEMLEY, *supra* note 5, at 5 (arguing that courts should “tailor unitary patent rules on a case-by-case basis to the needs of different industries”).

<sup>314</sup> See *id.* at 4.

<sup>315</sup> Sichelman, *supra* note 299, at 302.

pharmaceutical industry's preference for "strong" patent value,<sup>316</sup> but these larger research investments justify awarding larger royalty awards on pharmaceutical patents than on software patents.<sup>317</sup> By using cost measures to calculate the value of the inventor's contribution, the patent system can avoid industry-specific rules for resolving patent disputes.

Finally, cost-based damages can reduce transaction costs and instances of "efficient infringement."<sup>318</sup> Unlike infringer-based damages, cost-based damages are consistent across all infringers.<sup>319</sup> For infringers, cost-based damages will be more predictable,<sup>320</sup> either because the patentee has already provided the relevant evidence elsewhere<sup>321</sup> or because the patentee can estimate the patentee's costs through other means.<sup>322</sup> The predictive power of cost-based damages can reduce the infringer's incentive to fight infringement allegations because paying the actual value of the inventor's contribution—rather than the value of the infringer's implementation—may be more attractive than incurring legal expenses.

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<sup>316</sup> See BURK & LEMLEY, *supra* note 5, at 4 ("In the pharmaceutical industry, there seems to be a strong consensus (at least among innovative rather than generic pharmaceutical companies) that patents are critical to innovation.").

<sup>317</sup> Cf. Sichelman, *supra* note 299, at 317 ("[T]he serendipitous, independent inventor who generates a new invention merely through a 'flash of genius' without any large expenditure arguably should be awarded less than a large inventive team that toils for years with huge cash outlays.").

<sup>318</sup> "[E]fficient infringement can occur when the transaction costs of negotiation dwarf the value of the innovation at issue, which can result when there is large uncertainty in the underlying patent rights or simply when the economic value of the innovation is fairly minimal." Ted Sichelman, *Purging Patent Law of "Private Law" Remedies*, 92 TEX. L. REV. 517, 525 (2014) (footnote omitted).

<sup>319</sup> Substantively, consistent license valuation makes sense since the invention or idea itself is constant across all implementations and all licensees. Storm, *supra* note 178, at 285 n.150.

<sup>320</sup> See Miriam Marcowitz-Bitton et al., *Recoupment Patent*, 98 N.C. L. REV. 481, 515 (2020) (explaining how "[m]easuring patent investment using the cost method is preferable to other methods described above that attempt to capture the benefit produced from the invention, rather than its cost," because the other methods invite "speculation regarding future earnings or comparative advantage of the invention resulting from its use").

<sup>321</sup> For example, companies can review a patentee's assertion campaign activity to assess its own license exposure. See, e.g., *Campaigns*, RPX CORP., <https://insight.rpxcorp.com/features/campaigns> [<https://perma.cc/F38F-TLED>] (last visited Feb. 22, 2022) (explaining how RPX organizes litigation data around assertion campaigns).

<sup>322</sup> See *infra* Part IV.A.2 (explaining how to measure the value of the inventor's contribution using objectively-reasonable cost estimates).

Patentees, meanwhile, could calculate the value of a reasonable royalty using cost information within their custody.<sup>323</sup> Additionally, patentees could use the same cost-based damages evidence in all their licensing efforts, thereby reducing licensing campaign costs.<sup>324</sup> In fact, the USPTO could even facilitate licensing by asking patentees to register evidence of ideation costs.<sup>325</sup> Cost-based damages also have the potential to remove circularity from judicial damages awards, leading to predictable and accurate royalty calculations for all parties.<sup>326</sup>

Various scholars have studied cost-plus methods for determining reasonable royalties.<sup>327</sup> Unlike the inventor cost method, the “plus” captures costs unrelated to ideation activities or the inventor’s contribution, such as commercialization and opportunity costs.<sup>328</sup> Although these proposals appear to incentivize commercialization, they still suffer from at least three flaws.

First, courts have no statutory authority to set reasonable royalties based on non-inventive costs or value. Section 284 requires that reasonable royalties be “for the use made of the *invention* by the infringer.”<sup>329</sup> Thus, courts cannot require infringers to pay reasonable royalties for value other than the invention’s value. This statutory exclusion makes sense, as U.S. patent law excludes non-inventors from

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<sup>323</sup> Even if the patentee no longer has complete cost records, the patentee could introduce inventor testimony and other evidence describing the patentee’s relevant investments in ideation.

<sup>324</sup> See Storm, *supra* note 1788, at 274–75 (discussing how campaign costs lead SEP owners to target big infringers while allowing smaller companies to infringe for free).

<sup>325</sup> Cf. Marcowitz-Bitton et al., *supra* note 320, at 504 (proposing a system whereby patent applicants submit investment reports documenting research costs).

<sup>326</sup> See Sichelman, *supra* note 299, at 313 (“Specifically, because R & D expenditures involve out-of-pocket expenditures on inputs such as labor, materials, and the like, the cost of which is determined primarily by market prices independent of judicial decisionmaking, the value of these expenditures as reflected on a company’s books would tend to be relatively accurate and reliable.”).

<sup>327</sup> See, e.g., Michael Abramowicz, *Cost-Plus Damages*, 26 TEX. INTELL. PROP. L.J. 133, 156, 160 (2018) (“A working cost-plus damages system would make it feasible to grant broad patent scope without granting powerful monopoly rights.”); Hannah Brennan et al., *A Prescription for Excessive Drug Pricing: Leveraging Government Patent Use for Health*, 18 YALE J.L. & TECH. 275, 283 (2016) (“If appropriate evidence is supplied by the patentee, courts would then adjust this compensation award upwards to account for the patentee’s risk-adjusted R&D costs and to ensure a reasonable profit.”); Sichelman, *supra* note 299, at 308 (proposing a cost-plus formulation that captures “R & D, commercialization, and related opportunity costs”).

<sup>328</sup> See, e.g., Sichelman, *supra* note 299, at 308 (proposing a cost-plus formulation based on commercialization and opportunity costs).

<sup>329</sup> 35 U.S.C. § 284 (emphasis added); see also Storm, *supra* note 1788, at 298 (explaining why the word “use” in section 284 does not entitle patentees to capture non-inventive value).

participating in the patent system.<sup>330</sup> Instead, if a patentee wants to recover any non-inventive costs, the patentee must prove that the infringer caused the patentee's non-inventive losses.<sup>331</sup>

Second, cost-plus proposals ignore injunctions and lost-profits damages, which can incentivize innovation and deter infringement much more effectively than reasonable royalties.<sup>332</sup> Reasonable royalties do not need to single-handedly incentivize inventorship and commercialization or deter infringement. Rather, injunctions and lost-profits damages can incentivize operating companies to invent for the purpose of commercialization.<sup>333</sup>

Finally, innovative operating companies often wear two hats: patentee and infringer.<sup>334</sup> Today, many companies cannot bring advanced technology to market without also infringing the patents of others.<sup>335</sup> In a cost-plus damages world, these companies would be responsible for paying cost-plus royalties to others, thereby offsetting any financial benefit these companies might receive for collecting cost-plus royalties. Thus, although cost-plus damages may, in isolation, incentivize Ideators to invent and seek patent protection, applying cost-plus damages to every patent would tax innovative companies that commercialize their own inventions.

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<sup>330</sup> See *supra* Part II.A.3 (explaining how the Ideator is the only technology commercialization role permitted to participate in the patent system).

<sup>331</sup> See *Rite-Hite Corp. v. Kelley Co.*, 56 F.3d 1538, 1546 (1995) (requiring that plaintiffs establish proximate cause when seeking lost-profit damages); Amy L. Landers, *Proximate Cause and Patent Law*, 25 B.U. J. SCI. & TECH. L. 329, 344 (2019) (“[T]here is no reason to limit [causation requirements] to lost profits, given that reasonable royalty awards are also compensatory in their purpose.”).

<sup>332</sup> See generally Lee, *supra* note 155, at 242–43 (“Currently, the patent system exhibits a strong normative concern for deterring infringement, as demonstrated in both the availability of injunctive relief and the award of make-whole damages.” (footnote omitted)).

<sup>333</sup> See sources cited *supra* notes 307–11 and accompanying text (discussing how inflated reasonable royalties can discourage commercialization and counteract the “good” incentives offered by injunctions and lost-profit damages).

<sup>334</sup> For example, some of America's most inventive companies also receive the most patent assertions. Compare RPX CORPORATION, PATENT LITIGATION AND MARKETPLACE REPORT 30 (2020) (ranking Samsung, Apple, Microsoft, Alphabet, and Amazon as 1–5 among top 2019 defendants by assertion campaigns), with INTELLECTUAL PROPERTY OWNERS ASSOCIATION, TOP 300 ORGANIZATIONS GRANTED U.S. PATENTS IN 2019, at 2 (2020) (listing Samsung (2nd), Microsoft (5th), Alphabet (12th), Apple (14th), and Amazon (15th) in the 2019 patent grant rankings).

<sup>335</sup> See BURK & LEMLEY, *supra* note 5, at 27 (explaining how information technology products can implement “fifty, one hundred, even one thousand, or—as Intel lawyers themselves say with respect to their own core microprocessor—five thousand different patent rights”).



## 2. The Reasonable Cost Method

Although the inventor cost method directly measures the patentee's compensable loss, the method may not be appropriate in all patent disputes. Congress authorized courts to award "reasonable" royalties,<sup>336</sup> but the inventor cost method does not necessarily ensure that the patentee's actual ideation expenses are reasonable. Thus, it may be possible for a patentee either to overstate its costs to inflate royalty awards or to incur actual, unreasonable expenses during ideation activities.<sup>337</sup> On the other hand, the patentee's actual costs may understate the value of the inventor's contribution if a reasonable company would have spent more in ideation expenses.<sup>338</sup>

Accordingly, the reasonable cost method introduces an "objectively reasonable" element to the inventor-cost methodology.<sup>339</sup> Rather than measuring the original patentee's cost basis in the inventor's contribution, the reasonable cost method asks what a reasonable company would have spent on ideation activities to conceive a replacement idea. Here, the infringer's ideation costs could be relevant if the infringer lacked knowledge of the patentee's invention. The infringer's ideation costs are not dispositive, however, since a reasonable company might have spent a different amount. For example, a reasonable company may have market-level labor and overhead expenses that are different than the infringer's actual cost structure.

The reasonable cost method should not be confused with valuation techniques based on identifying the next-best non-infringing alternative. The non-infringing alternative theory correctly recognizes that, "faced with an exorbitant licensing demand for the patented technology, a rational licensee would explore reasonable alternatives, such as developing or licensing a substitute technology."<sup>340</sup> Analyzing substitute *technologies*, however, can inflate patent damages by capturing value

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<sup>336</sup> 35 U.S.C. § 284.

<sup>337</sup> See Golden & Sandrik, *supra* note 305, at 372 ("Cost measurement can raise difficult accounting questions and could encourage manipulation of accounts simply for the purpose of making patent protection more effective.").

<sup>338</sup> Such may be the case, for example, if the patentee's "flash of genius" invention solved a long-felt need that other industry players would have dedicated more resources to solving. See *infra* note 368 and accompanying text.

<sup>339</sup> See Golden & Sandrik, *supra* note 305, at 372 ("Requiring that relevant costs be objectively reasonable and not only actually incurred should help prevent the worst potential distortions of private behavior in this regard.").

<sup>340</sup> Seaman, *supra* note 245, at 1661 (footnote omitted).

outside the realm of ideation.<sup>341</sup> Furthermore, analysis of non-infringing alternatives is also an indirect measurement approach, and therefore could invite measurement errors.<sup>342</sup>

The reasonable cost method also recognizes that the replacement idea may or may not be infringing. In technology commercialization terms, the reasonable cost method asks how much a reasonable Ideator would invest to solve the problem posed by the Product Manager. In some scenarios, the Ideator may rediscover the same patented invention. In other scenarios, the Ideator may select a different solution. Instead of focusing on whether the replacement idea is infringing, the reasonable cost method asks how much a company would invest to solve the problem without regard to whether the solution is infringing. Product management experts are well-suited to answer this question because Product Managers are responsible for projecting and managing budget, time, and scope restraints.<sup>343</sup>

### 3. The “Ex Ante” Method

These first two valuation methods directly measure patent value by measuring ideation costs. Cost measurements, however, are not the only available methods for directly measuring the inventor's contribution. Rather, courts should be permitted to use any valuation method that relies on direct evidence of the patent's value and ignores indirect evidence that reflects value outside the scope of the inventor's contribution.

For example, Maayan Perel has proposed an “ex ante” theory of patent valuation that attempts to measure patent quality at the time of issuance.<sup>344</sup> Under this theory, “the value of patents should correlate with their technological contribution so that the patent system could efficiently reward innovation.”<sup>345</sup> Perel proposes several “quality indicators” that correlate with patent quality: subject matter eligibility, utility, novelty, non-obviousness, clarity, and definiteness.<sup>346</sup> Perel chose these

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<sup>341</sup> See sources cited, *supra* notes 164–167 and accompanying text (explaining why patent owners are not entitled to capture the full value of “technology”).

<sup>342</sup> See *supra* Part III.A (describing measurement measures associated with indirect reasonable royalty calculations).

<sup>343</sup> See sources cited *supra* note 46 and accompanying text.

<sup>344</sup> Perel, *supra* note 195, at 157 (2014) (“This Article thus proposes to ‘price tag’ patents ex ante, upon issuance, in accordance with their inventive value and ability to benefit the public.” (footnote omitted)).

<sup>345</sup> *Id.*

<sup>346</sup> *Id.* at 202.

quality indicators because they are measurable at the time of issuance.<sup>347</sup> Perel then explains how to use these quality indicators to establish an acceptable range of license rates.<sup>348</sup>

The ex ante theory provides just one example of how to measure the inventor's contribution directly without necessarily relying on cost measurements. Other examples surely exist. Furthermore, once courts embrace reasonable royalty calculations based on direct evidence of the inventor's contribution, scholars and enterprising damages experts should discover even more ways to measure the inventor's contribution directly. Thus, rather than treat direct valuation methods as a closed set, the patent industry should embrace the challenge to discover even more ways to set reasonable royalties based on direct measurements of the inventor's contribution.

### *B. Identifying the Appropriate Payment Model*

Once the direct valuation method is established, the next step is choosing the appropriate payment model. Judicial damages awards are often expressed in terms of a royalty base and a royalty rate.<sup>349</sup> Companies and universities may also license patents using royalty rate calculations, although this phenomenon likely reflects the circular nature of judicial damages awards and private license negotiations.<sup>350</sup>

Some courts, however, have awarded lump sum royalties in lieu of setting a per-unit royalty rate.<sup>351</sup> Although used less frequently today, lump sum royalties may be the most appropriate payment model in most patent cases. Inventors contribute value by providing access to a qualifying disclosure describing a qualifying idea.<sup>352</sup> This is a one-time event. Disclosure of a qualifying idea can enable the recipient to

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<sup>347</sup> *Id.* at 202–03.

<sup>348</sup> *Id.* at 213–14. Note, however, that Perel's approach to converting quality indicators to license rates includes some flaws. Most notably, Perel failed to disavow royalty payments based on the infringer's profits. See, e.g., *id.* at 216 (expressing support for the "profit splitting" rule of thumb).

<sup>349</sup> See, e.g., *Ericsson, Inc. v. D-Link Sys., Inc.*, 773 F.3d 1201, 1226 (Fed. Cir. 2014) ("[T]he governing rule is that the ultimate combination of royalty base and royalty rate must reflect the value attributable to the infringing features of the product, and no more." (citing *VirnetX, Inc. v. Cisco Sys.*, 767 F.3d 1308, 1326 (Fed. Cir. 2014))).

<sup>350</sup> See sources cited, *supra* notes 224–226 and accompanying text (describing the circularity problem inherent in patent damages calculations).

<sup>351</sup> See, e.g., *Amgen Inc. v. Hospira, Inc.*, 944 F.3d 1327, 1332 (2019) (affirming the jury's \$70 million lump sum reasonable royalty award).

<sup>352</sup> See *supra* Part II.C.

make one infringing unit or make millions of infringing units; in either scenario, the value of the disclosure remains unchanged.

Furthermore, a company's ability to make millions of units implementing the same invention rarely reflects the underlying value of the implemented invention. Bringing a successful technology product to market at scale is a team effort, not the inevitable result of having access to a patented invention.<sup>353</sup> The Marketer, for example, is responsible for understanding customer needs and identifying the opportunity for success at scale.<sup>354</sup> The Builder, meanwhile, brings the technology from prototype to scale production.<sup>355</sup> The Advertiser curates a large market of buyers to consume this scale production,<sup>356</sup> and the Seller completes the process by selling and delivering products to each customer.<sup>357</sup> In most product stories, these technology commercialization roles contribute more to a company's success at scale than the Ideator's one-time contribution.

Each role's relative contribution to success at scale is reflected in how companies pay various technology commercialization roles. In most industries, companies compensate Ideators through salary and bonuses.<sup>358</sup> Yet some companies pay Sellers through commissions, and other mechanisms allow take-home pay to vary as a function of volume.<sup>359</sup> This discrepancy in payment mechanism suggests that those businesses believe Sellers contribute more to success at scale than Ideators.

Of course, there may be situations where an infringer truly cannot afford to pay for a lump sum license, even if the fee amount is fair and reflects the inventor's one-time contribution. In these situations, however, the parties can always work out different payment terms that satisfy the needs of both parties.<sup>360</sup>

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<sup>353</sup> See *supra* Part II.A.

<sup>354</sup> See *supra* Part II.A.1.

<sup>355</sup> See *supra* Part II.A.6.

<sup>356</sup> See *supra* Part II.A.7.

<sup>357</sup> See *supra* Part II.A.8.

<sup>358</sup> See sources cited, *supra* notes 139–141 and accompanying text.

<sup>359</sup> *Commission (Remuneration)*, WIKIPEDIA, [https://en.wikipedia.org/wiki/Commission\\_\(remuneration\)](https://en.wikipedia.org/wiki/Commission_(remuneration)) [<https://perma.cc/C9CR-G56D>] (last visited Feb. 2, 2022) (“Commissions are a common way to motivate and reward salespeople.”).

<sup>360</sup> Cf. Eli Greenbaum, *A Million Unlicensed Pieces*, 2020 U. ILL. L. REV. ONLINE 275, 280 (2020) (arguing that the “non-discrimination” element of FRAND should not be interpreted to require all implementors to pay the same identical patent royalty because implementors have different cost structures and cash-on-hand).

### C. *Relevant Factors for Royalty Adjustments*

After establishing the valuation model and the payment mechanism, courts can adjust the damages award to ensure that the defendant's royalty obligation is reasonable. Here, *Georgia-Pacific* factors three and seven should be the only two factors relevant to a proper reasonable royalty analysis. Factor three describes the "nature and scope of the license, as exclusive or non-exclusive; or as restricted or non-restricted in terms of territory or with respect to whom the manufactured product may be sold."<sup>361</sup> Applying this factor, a non-exclusive licensee should not be solely responsible for ensuring that the patentee is compensated for the value of the inventor's contribution.<sup>362</sup> Rather, the burden of compensating the patentee for the inventor's contribution should be spread across all licensees to the extent practicable. Allowing the patentee to recover the full value of the inventor's contribution from multiple licensees would violate *Aro Manufacturing's* prohibition against multiple recoveries.<sup>363</sup>

*Georgia-Pacific* factor seven, meanwhile, considers the "duration of the patent and the term of the license."<sup>364</sup> Factor seven presents a conundrum, however, since disclosure of a qualifying disclosure describing a qualifying invention is a one-time event,<sup>365</sup> suggesting that patent duration should not necessarily impact license value. Fact patterns may exist, however, that would justify modifying the reasonable royalty fee to reflect patent term. For example, some ideas lose their value over time, especially as more non-infringing alternatives become available.<sup>366</sup> Courts could use factor seven to adjust royalty fees for unique inventions that became more ordinary as time progressed.

Courts may also consider factors beyond *Georgia-Pacific's* enumerated list. For example, courts may adjust reasonable royalty fees based on secondary

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<sup>361</sup> *Georgia-Pacific Corp. v. U.S. Plywood Corp.*, 318 F. Supp. 1116, 1120 (S.D.N.Y. 1970).

<sup>362</sup> This principle is especially true where the patentee's disclosure did not inform or assist the licensee's actual product development process because the licensee already paid a different Ideator for the same contributed value. See sources cited *supra* notes 198, 262.

<sup>363</sup> See Brean, *supra* note 150, at 906–07 ("In any event, all royalties collected must not exceed what is reasonable in light of the total number of users of the technology at issue, on a usage or market share *pro rata* basis, taking into account existing licenses.").

<sup>364</sup> *Georgia-Pacific*, 318 F. Supp. at 1120.

<sup>365</sup> *Supra* note 352 and accompanying text.

<sup>366</sup> *Cf. Seaman*, *supra* note 245, at 1672 (noting how courts before *Georgia-Pacific* considered patent valuation in light of potential non-infringing solutions).

considerations of non-obviousness.<sup>367</sup> The patent system was not designed to protect inventions that contribute little to the advancement of technology,<sup>368</sup> and courts can use secondary considerations to confirm that cost-based license fees reflect the inventor's true contribution. For example, *Graham v. John Deere* factors such as “long-felt but unsolved needs” and the “failure of others”<sup>369</sup> might suggest that a reasonable company would incur more ideation cost than the patentee's actual ideation costs. On the other hand, courts may discount damage awards if the patented invention was “obvious to try,” suggested or motivated by the prior art, or the mere result of simple combinations, substitutions, or known techniques.<sup>370</sup> Even if the patented invention clears the obviousness hurdle imposed by Section 103, these secondary considerations still suggest that the inventor's contribution may have limited value.

#### *D. Irrelevant Factors for Royalty Adjustments*

Some factors, however, do not merit consideration when adjusting compensatory damages. Most notably, courts should avoid relying on indirect evidence when adjusting reasonable royalties. For example, courts must assess reasonable royalty fees “without regard to the question whether the defendant has gained or lost by his unlawful acts.”<sup>371</sup> Courts should also ignore proxies of this category of information, such as the value of an infringer's use case.<sup>372</sup> Courts should also avoid considerations that inherently overstate the value of the inventor's contribution, such as references to patented “technology” or other value that exists

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<sup>367</sup> See Golden & Sandrik, *supra* note 305, at 373 (suggesting that “judges and juries might draw useful instruction from the sort of external evidence of nonobviousness already used in assessing patent validity, including factors such as scientific acclaim or relevant failure of others”).

<sup>368</sup> See *Graham v. John Deere Co.*, 383 U.S. 1, 9 (1966) (surmising that “[Thomas] Jefferson did not believe in granting patents for small details, obvious improvements, or frivolous devices”).

<sup>369</sup> See *id.* at 17–18 (“Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented.”). Although the court recognized “commercial success” as a secondary indicia of non-obviousness, courts should avoid considering this factor in setting patent damages because doing so may conflict with *Aro Manufacturing*.

<sup>370</sup> See MPEP § 2143 (listing “[e]xamples of rationales that may support a conclusion of obviousness”).

<sup>371</sup> *Aro Mfg. Co. v. Convertible Top Replacement Co.*, 377 U.S. 476, 507 (1964) (quoting *Coupe v. Royer*, 155 U.S. 565, 582 (1895)).

<sup>372</sup> *Supra* note 277–79 and accompanying text.

due to the contributions of non-Ideator technology commercialization roles.<sup>373</sup> Courts should also avoid relying on comparable licenses and established royalties without evidence that such licenses and royalties reflect the actual value of the inventor's contribution.<sup>374</sup>

Arguably, courts should even avoid the hypothetical negotiation construct.<sup>375</sup> The hypothetical negotiation construct fails because it is circular and allows consideration of indirect evidence that courts should disregard.<sup>376</sup> Courts could salvage the hypothetical negotiation, however, by referencing the inventor's contribution. Instead of negotiating over the value of a license, parties to a hypothetical negotiation should instead negotiate over the value of the inventor's contribution: providing access to a qualifying disclosure describing a qualifying idea. This alternative construct removes patent assertion leverage as a negotiation factor and focuses the discussion back on the value of the underlying invention. Under this construct, hypothetical negotiations may even start resembling real-life business negotiations outside the patent world,<sup>377</sup> while remaining consistent with patent law principles.<sup>378</sup>

## V. CONCLUSION

Parts II–IV discussed three reasons for courts to adopt direct measurements of the inventor's contribution and eschew indirect measurements based on the value of the infringer's implementation or proxies thereof. First, judicial reliance on infringer profits contradicts both congressional mandate and *Aro Manufacturing*.<sup>379</sup> Second, indirect measurements introduce opportunities for errors that plaintiffs can exploit to capture non-inventive value created by other technology

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<sup>373</sup> See source cited *supra* notes 164–167 and accompanying text (explaining why patent owners are not entitled to capture the full value of “technology”).

<sup>374</sup> See *supra* Part III.A.3.

<sup>375</sup> See Taylor, *supra* note 151, at 126–28 (arguing that courts should eliminate use of the hypothetical negotiation construct because it reflects the value of “patent rights” rather than the value of “patented technology”).

<sup>376</sup> See sources cited *supra* notes 224–226 and accompanying text.

<sup>377</sup> See *supra* note 358 and accompanying text (discussing how companies typically do not share sales or profits with Ideators outside the patent context).

<sup>378</sup> See Storm, *supra* note 178, at 286 (“Even if the Supreme Court did not require patent owners to apportion value between the patented and unpatented features, commercially reasonable parties to a hypothetical negotiation over the true value of a patent license would have done so anyway.”).

<sup>379</sup> See *supra* Part III.A.

commercialization roles, thereby contributing to the schism between the patent world and the commercial world.<sup>380</sup> Finally, indirect patent damages calculations exacerbate other significant patent policy issues, which courts can address by adopting direct measurement methods.<sup>381</sup> Part V concludes by adding a fourth reason for courts to directly measure the value of the inventor's contribution.

Returning to this Article's opening premise, *all inventors* should be compensated for the value of their contributions. Unfortunately, the patent system does not work this way today. The current system permits some inventors to recover significantly more than the value they contribute while denying other inventors any compensation for their contributions.<sup>382</sup> These phenomena are related. For example, the patent system has responded to PAE activity and inflated damages awards by leaning on Sections 101 through 103 to remove patent protection for certain inventors.<sup>383</sup> As patent damage awards grow for some fortunate inventors, the patent system reacts by reducing or eliminating awards for other inventors.

This cycle of action and reaction has led to a system that treats patents like lottery tickets.<sup>384</sup> Every step in the patent assertion process is another entry on the

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<sup>380</sup> See *supra* Part III.A.

<sup>381</sup> See *supra* Part III.B.

<sup>382</sup> Compare *supra* Part III.A (describing how patentees leverage measurement errors in reasonable royalty calculations to capture more than the inventor's contribution), with *supra* notes 266–267 and accompanying text (discussing patent-eligible subject matter under Section 101).

<sup>383</sup> See, e.g., Leahy-Smith America Invents Act, Pub L. No. 112-29, § 7, 125 Stat. 284, 313 (2011) (establishing the Patent Trial and Appeal Board); *supra* notes 266–267 and accompanying text (explaining how inflated damages awards contribute to modern restrictions on subject-matter eligibility).

<sup>384</sup> See, e.g., Dennis D. Crouch, *The Patent Lottery: Exploiting Behavior Economics for the Common Good*, 16 GEO. MASON L. REV. 141, 142 (2008) (“The majority of issued patents are relatively worthless . . . . A sizable number are worth enough to repay the associated costs of research, but only a few are highly valuable . . . . This low odds structure is comparable to a lottery where players have a low probability of winning a large jackpot.”); Landers, *supra* note 154, at 307 (“[D]amages awarded for patent infringement far exceed the amount that the patent is worth. These circumstances create incentives for patentees to ‘game’ the patent system by seeking large damages and settlement *jackpots* from those accused of infringement.” (emphasis added)); Jeremy Phillips, *The Patent Lottery*, 2 J. INTELL. PROP. L. & PRAC. 567, 567 (2007) (“The value of the patent is in some respects comparable with that of the lottery ticket.”); Greg Hitt, *Industries Brace for Tough Battle over Patent Law: Drug Makers Oppose Overhaul Plan Backed by Tech, Finance Firms*, WALL ST. J., June 6, 2007, at A1 (quoting the general counsel of Cisco Systems as saying that the “current patent system has encouraged ‘lottery ticket’ litigation and deterred innovation”); Joe Mullin, *The Oracle v. Google Aftermath*, ARS TECHNICA (June 3, 2012, 9:30 PM), [229](https://arstechnica.com/tech-</a></p>
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lottery ticket to scratch. One bad scratch, and the lottery ticket becomes worthless. But if every scratch is successful, jackpot! The inventor receives “mega millions,” even though the underlying invention may be worth far less.

Reversing this cycle starts with restoring patent awards back to the compensatory damages regime originally enacted by Congress. Courts can do this by directly measuring the value of the inventor’s contribution and eschewing indirect measurements that encourage overcompensation. Once damages awards reflect the value of the inventor’s contribution, courts and policymakers can revisit those issues that prevent other inventors from receiving any compensation for the value of their contributions. For example, instead of categorically excluding inventors from compensation based on subject-matter eligibility tests or obviousness concerns, courts can start allowing these inventors to collect compensation while recognizing that such compensation will be minimal if they contributed little inventive value.<sup>385</sup> In time, patents may stop resembling lottery tickets and start reflecting the actual value of the inventor’s contribution

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policy/2012/06/oracle-v-google-aftermath-apis-remain-free-cost-of-business-soars/ [https://perma.cc/NXZ9-6JXL] (quoting the general counsel of Google as saying that “[p]eople are treating patents like lottery tickets”); Elon Musk, *All Our Patent Are Belong to You*, TESLA (June 12, 2014), <https://www.tesla.com/blog/all-our-patent-are-belong-you> [https://perma.cc/UWM3-ADA5] (“After Zip2, when I realized that receiving a patent really just meant that you bought a lottery ticket to a lawsuit, I avoided them whenever possible.”).

<sup>385</sup> See *supra* notes 266–267 and accompanying text (discussing how inflated damages created the need for stronger subject-matter eligibility tests); *supra* notes 367–370 and accompanying text (explaining how courts can adjust damages awards based on secondary indicia of non-obviousness).

