

Southern Methodist University

SMU Scholar

Faculty Journal Articles and Book Chapters

Faculty Scholarship

2015

Economic Theory, Divided Infringement and Enforcing Interactive Patents

W. Keith Robinson

Southern Methodist University, Dedman School of Law

Recommended Citation

W. Keith Robinson, Economic Theory, Divided Infringement, and Enforcing Interactive Patents, 67 FLA. L. REV. 1961, 2030 (2015)

This document is brought to you for free and open access by the Faculty Scholarship at SMU Scholar. It has been accepted for inclusion in Faculty Journal Articles and Book Chapters by an authorized administrator of SMU Scholar. For more information, please visit <http://digitalrepository.smu.edu>.

ECONOMIC THEORY, DIVIDED INFRINGEMENT, AND ENFORCING INTERACTIVE PATENTS

*W. Keith Robinson**

Abstract

High tech companies—especially in the emerging areas of the Internet of Things, wearable devices, and personalized medicine—have found it difficult to enforce their patents on interactive technologies. Enforcement is especially difficult when multiple parties combine to perform all of the steps of a claimed method, which is referred to as joint or divided infringement. Because of this difficulty, some commentators advocate that “interactive” patents susceptible to divided infringement should not be enforced at all.

In contrast, this Article argues that economic theory supports the enforcement of interactive patents. Previous papers have analyzed divided infringement problems from a doctrinal and policy perspective. This Article is the first to analyze divided infringement from an economic perspective using economic theories of the patent system.

Uniquely, all three prevalent economic theories of the patent system—(1) reward theory, (2) prospect theory, and (3) rent-dissipation theory—support the enforcement of interactive patents. Reward theory is consistent with enforcing the rights of interactive patents so long as the patent system balances the social cost with the social benefit of interactive technologies. Prospect theory recommends enforcing interactive patents where it would promote an inventor’s ability to commercialize her invention free from direct competition. Finally, rent-dissipation theory suggests enforcing interactive patents if enforcement will effectively reduce the dissipation of patent rents.

Viewing interactive patent enforcement through the lens of these economic theories reveals how doctrinal tests for divided infringement may align with the economic goals of the patent system. Although the doctrinal test for divided infringement will likely continue to evolve, start-ups and disruptive, hi-tech companies that own interactive patents should find some comfort in the notion that the economic underpinnings of the patent system support enforcement of their interactive inventions.

* Assistant Professor of Law, SMU Dedman School of Law; J.D., cum laude, 2004, Duke University School of Law; B.S. Electrical Engineering, 1999, Duke University; the author formerly practiced at Foley & Lardner LLP in Washington, D.C. Thanks to Professors Andrew Chin, Fazal Khan, Xuan-Thao Ngyuen, Simone Rose, and Hal Wegner for your advice and comments. Versions of this Article were presented at the Langston Conference at the University of Georgia on December 2, 2013, and the Intellectual Property Scholars Conference at the Benjamin N. Cardozo School of Law on August 8, 2013. This research was made possible by the Charles and Peggy Galvin Endowed Faculty Research Fund.

INTRODUCTION	1963
I. A BRAVE NEW AND CONNECTED WORLD	1977
A. <i>Internet-Age Inventions</i>	1977
B. <i>Personalized Medicine</i>	1979
C. <i>The Internet of Things</i>	1981
II. A THEORETICAL ECONOMIC VIEW OF THE PATENT SYSTEM	1983
A. <i>Economics and Patent Rights</i>	1983
1. The Nature of Patent Rights	1983
2. The Patent System	1985
B. <i>Economic Theory and Patent Enforcement</i>	1986
1. Reward Theory	1986
2. Prospect Theory	1988
3. Rent-Dissipation Theory	1991
C. <i>Summary</i>	1995
III. A HISTORY OF DIVIDED INFRINGEMENT	1995
A. <i>The “Mastermind” Suite</i>	1996
1. A Mastermind Must Assert Control or Direction	1997
2. A Third Party Must Be Contractually Obligated to or in an Agency Relationship with the Mastermind	2004
B. <i>Partial Inducement</i>	2008
C. <i>The All-Steps Test</i>	2010
D. <i>The Joint Enterprise</i>	2011
IV. ECONOMIC THEORY AND ENFORCING INTERACTIVE PATENTS	2014
A. <i>Stimulating Innovation</i>	2015
1. The All-Steps Test Is Inconsistent with Reward Theory	2015
2. Tests That Are Consistent with Reward Theory	2016
B. <i>Discouraging Misappropriation</i>	2020
1. Tests That Are Inconsistent with Prospect Theory	2020
2. Tests That Are Consistent with Prospect Theory	2022

C.	<i>Minimizing Patent Rent Dissipation</i>	2024
1.	Tests That Are Inconsistent with Rent-Dissipation Theory	2024
2.	Tests That Are Consistent with Rent-Dissipation Theory	2026
D.	<i>Summary</i>	2028
CONCLUSION.....		2029

INTRODUCTION

Imagine that you own a small business that processes financial transactions. Your company is responsible for implementing one aspect of this multistep process. That step is to collect payment information from merchants and then forward that information to a debit network.¹ Business is going well when a patentee sues you for patent infringement. The asserted patent purports to cover the entire financial transaction process, in which you only play a small role.² Should you be liable for patent infringement?³ Moreover, should the merchants, the debit network, the banks, and all the other parties involved in the transaction also be liable for patent infringement?⁴

1. See, e.g., *BMC Res., Inc. v. Paymentech, L.P.* (*BMC Resources*), 498 F.3d 1373, 1375–76 (Fed. Cir. 2007) (describing a PIN-less debit bill payment system in which the defendant, Paymentech, was responsible for routing customer payment information to a participating debit network), *overruled by* *Akamai Techs., Inc. v. Limelight Networks, Inc.* (*Akamai/McKesson I*), 692 F.3d 1301, 1306 (Fed. Cir. 2012) (en banc) (per curiam), *rev'd*, 134 S. Ct. 2111 (2014).

2. See, e.g., *BMC Resources*, 498 F.3d at 1376–77 (listing the patent claims for paying bills asserted against Paymentech).

3. See Mark D. Janis & Timothy R. Holbrook, *Patent Law’s Audience*, 97 MINN. L. REV. 72, 117 (2012) (arguing that the modern patent infringement analysis is becoming more unmanageable and complex, and the issue of joint or divided infringement is an example of this trend); see also W. Keith Robinson, *No “Direction” Home: An Alternative Approach to Joint Infringement*, 62 AM. U. L. REV. 59, 109–12, 115 (2012) [hereinafter Robinson, *No “Direction” Home*] (arguing for determining if there should be divided infringement liability based on whether multi-party interaction was an innovative concept of the patent). *But see* Mark A. Lemley et al., *Divided Infringement Claims*, 33 AIPLA Q.J. 255, 272–73 (2005) (explaining that claims can be drafted to capture the activity of a single entity and avoid the divided infringement complications that arise when a claim requires the actions of more than one party).

4. See Dolly Wu, *The Use of Use for Patented Systems in a Single or Joint Infringement World*, 14 COLUM. SCI. & TECH. L. REV. 514, 545–46 (2013) (explaining that, for system claims, most courts find that joint infringement can occur); Simone Rose, *Further Reflections on Extinguishing the Fountainhead of Knowledge: A Call to Transition to the “Innovation Policy” Narrative in Patent Law*, 66 SMU L. REV. 609, 624–29 (2013) (arguing that in the wake of disruptive technologies, the U.S. Court of Appeals for the Federal Circuit should adopt nuanced and flexible standards for evaluating patentability and enforcement questions); Andrew Chin, *Alappat Redux: Support for Functional Language in Software Patent Claims*, 66 SMU L. REV.

Now imagine that you are the founder of a start-up that makes software for tracking customer information and performing billing. For strategic purposes, you form a partnership with a separate company that makes logistics software.⁵ Your partner's software tracks customer orders and deliveries. Together, you both modify your respective software so that it works together.⁶ Your companies market and sell the software together as a unit to customers looking for an end-to-end solution.⁷ Unfortunately, a competitor has a patent on a similar integrated solution and sues you and your partner for patent infringement.⁸ Unlike in the first example, here you have purposefully joined forces with another company to create a product and service. Does this make a difference? Should you or your partner be liable for patent infringement?⁹

In both cases the answer has been unclear until very recently.¹⁰ The federal statutes covering patent infringement offer little help in these situations.¹¹ If a single person performs each and every step of a method claim, then they are liable for direct infringement.¹² In the alternative, a party is liable for induced infringement if it aids or abets another in infringing a patent.¹³ However, the statute is silent as to how liability might attach when multiple parties' combined actions perform all of the steps of a claimed method.¹⁴ This scenario is commonly referred to as

491, 491–94 (2013) (discussing the problem of software claim scope that applies to many claims susceptible to divided infringement).

5. See, e.g., *Golden Hour Data Sys., Inc. v. emsCharts, Inc.*, 614 F.3d 1367, 1371 (Fed. Cir. 2010) (explaining that the defendants, emsCharts and Softech, “formed a strategic partnership, enabled their two programs to work together, and collaborated to sell the two programs as a unit”).

6. See *id.*

7. See *id.*

8. See *id.* at 1369–71 (describing Golden Hour's claimed system for managing information in connection with emergency medical transportation).

9. See Long Truong, *After BMC Resources, Inc. v. Paymentech, L.P.: Conspiratorial Infringement as a Means of Holding Joint Infringers Liable*, 103 NW. U. L. REV. 1897, 1918–19 (2009) (arguing that a legal loophole encourages actors to avoid infringement by entering into conspiracies to avoid liability).

10. See *Janis & Holbrook*, *supra* note 3, at 117; *Wu*, *supra* note 4, at 545–46; see also *Akamai Techs., Inc. v. Limelight Networks, Inc. (Akamai/McKesson III)*, 797 F.3d 1020, 1025 (Fed. Cir. 2015) (en banc) (per curiam) (expanding the test for liability for divided infringement to include where actors form a joint enterprise and finding that the evidence supported the conclusion that the defendant, Limelight, directed or controlled its customer's performance of the asserted method steps).

11. See 35 U.S.C. § 271 (a)–(c) (2012) (stating the statutory rules for direct infringement, induced infringement, and contributory infringement).

12. *Id.* § 271(a).

13. *Id.* § 271(b).

14. See *id.* § 271.

divided or joint infringement.¹⁵ Since 2007, whether there should be liability for divided infringement has been at the center of an ongoing debate between patent attorneys, inventors, and the courts.¹⁶

In response to the lack of guidance in the patent statute, several doctrinal proposals for determining divided infringement liability have emerged within the past eight years.¹⁷ Plaintiffs in analogous cases have argued that liability should depend on the type of connection between the defendant and the other entities involved.¹⁸ In contrast, defendants have argued against divided infringement liability, contending that liability for

15. See *BMC Res., Inc. v. Paymentech, L.P. (BMC Resources)*, 498 F.3d 1373, 1379–80 (Fed. Cir. 2007) (explaining that divided infringement specifically deals with whether a party can be liable for infringement when they participate or encourage infringement but do not directly infringe), *overruled by Akamai Techs., Inc. v. Limelight Networks, Inc. (Akamai/McKesson I)*, 692 F.3d 1301, 1306 (Fed. Cir. 2012) (en banc) (per curiam), *rev'd*, 134 S. Ct. 2111 (2014).

16. Third party liability for patent infringement is broadly governed by statutes setting forth contributory infringement and inducement. However, as evidenced by the Federal Circuit's decisions, the claims at issue in divided infringement cases have revealed a disconnect between direct infringement under 35 U.S.C. § 271(a), and what type of behavior is covered by contributory infringement and induced infringement in § 271(b) and (c). See generally *Akamai/McKesson I*, 692 F.3d at 1305–06. The doctrine of divided infringement touches on several key issues for the patent bar. One of these issues is claim drafting. In several divided infringement cases, the Federal Circuit has said that it will not rewrite poorly drafted claims. See *Akamai/McKesson I*, 692 F.3d at 1349–50 (“As many *amici* have pointed out, the claim drafter is the least cost avoider of the problem of unenforceable patents due to joint infringement, and this court is unwise to overrule decades of precedent in an attempt to enforce poorly-drafted patents.”); *BMC Resources*, 498 F.3d at 1381 (“Nonetheless, this court will not unilaterally restructure the claim or the standards for joint infringement to remedy these ill-conceived claims.”); *Sage Prods., Inc. v. Devon Indus., Inc.*, 126 F.3d 1420, 1425 (Fed. Cir. 1997) (“[A]s between the patentee who had a clear opportunity to negotiate broader claims but did not do so, and the public at large, it is the patentee who must bear the cost of its failure to seek protection for this foreseeable alteration of its claimed structure.”). This highlights a deeper concern of some within the patent bar that claim drafting is a lost art. Notably, Professor Hal Wegner has called for the return of a claim drafting exercise to the patent bar exam. See Harold C. Wegner, *Limelight*, Wordsmithing and Patent Licensure (unpublished manuscript), available at <http://www.ipfrontline.com/downloads/WordsmithingJuly8REV.pdf>. Another reason why divided infringement cases are so interesting has to do with the technology described in the patents at issue. Several of the cases deal with “internet age” inventions. This is technology designed to exploit the Internet’s infrastructure to facilitate communication between several people or devices. See, e.g., *BMC Resources*, 498 F.3d at 1375. An extension of this application is the use of wireless technology. In addition, several companies have articulated concern about what impact the divided infringement doctrine will have on personalized medicine, biotechnology, and other technology areas where process patents are sought to protect innovation. See *infra* Section I.B.

17. See generally Robinson, *supra* note 3, at 77–84 (explaining that the Federal Circuit has mulled over a test for applying the divided infringement doctrine, which has continuously changed since it was first used in 2007).

18. See, e.g., Janis & Holbrook, *supra* note 3, at 90 (explaining that everyone is a potential infringer); *BMC Resources*, 498 F.3d 1373 at 1380 (stating BMC’s argument that the type of connection required to show divided infringement is participation and combined action).

direct infringement requires that a single entity perform all the steps of the claimed method.¹⁹ Several commentators have argued that, in lieu of any new legal standard, the entire problem of divided infringement can be resolved by encouraging patentees to draft clearer claims.²⁰ Others have argued that if alleged infringers conspire to infringe a patent, the law should provide a remedy.²¹

The problem of divided infringement raises an interesting question about patent enforcement.²² That is, once the patent office has granted a patent, how should the patent system manage a patentee's ability to enforce its patent against potential infringers? Economic theory provides an interesting perspective on patent enforcement considerations. For example, commentators have attempted to use economic theory to explain the court's decisions with respect to nonobviousness determinations.²³ This type of exercise can be valuable. Economic theory can help explain and predict court decisions in patent infringement cases. Further, economic theory can suggest whether the current patent enforcement mechanisms align with the economic function of the patent system.

So, should the patent system enforce interactive claims that are susceptible to divided infringement? Through the lens of three economic theories of the patent system—reward theory, prospect theory, and rent-dissipation theory—this Article argues that economic theory supports the enforcement of interactive patents. Further, it argues that economic theory explains the myriad of tests that have been proposed by judges on the U.S. Court of Appeals for the Federal Circuit to determine divided

19. See, e.g., W. Nicholson Price II, *Unblocked Future: Why Gene Patents Won't Hinder Whole Genome Sequencing and Personalized Medicine*, 33 CARDOZO L. REV. 1601, 1629 (2012) (explaining that a genetic sequencing company seeking to avoid infringement of interactive method claims would choose to provide results without any comparison or interpretation and leave it to an independent physician to interpret them).

20. See, e.g., Lemley et al., *supra* note 3, at 272–73 (explaining that claims can be drafted to capture the activity of a single entity and avoid the divided infringement complications that arise when a claim requires the actions of more than one party).

21. See, e.g., Truong, *supra* note 9, at 1918–19 (arguing that the loophole encourages actors to avoid infringement by entering into conspiracies to avoid liability).

22. Is it inefficient for a system to grant rights that cannot be enforced? Much of the literature often focuses on the acquisition of patents. But, it is actually at the enforcement stage where a patent's value can be truly measured. See *McKesson Techs. Inc. v. Epic Sys. Corp.* (*McKesson*), 98 U.S.P.Q. 2d (BNA) 1281, 1291 (Fed. Cir. 2011) (Newman, J., dissenting) (reasoning that a patent that cannot be enforced is not a patent right at all), *rev'd sub nom.* *Akamai Techs. Inc. v. Limelight Networks, Inc.* (*Akamai/McKesson I*), 692 F.3d 1301 (Fed. Cir. 2012) (en banc) (per curiam), *rev'd*, 134 S. Ct. 2111 (2014).

23. See Kevin Rhodes, Comment, *The Federal Circuit's Patent Nonobviousness Standards: Theoretical Perspectives on Recent Doctrinal Changes*, 85 NW. U. L. REV. 1051, 1077–1100 (1991).

infringement liability. Moreover, economic theory suggests that enforcing multi-party, interactive inventions promotes the economic function of the patent system.

Few scholars have considered what enforcement of multiparty, interactive claims means for the patent system from an economic perspective. This Article is the first to attempt to understand the evolution of the doctrine of divided infringement as explained by prevalent economic theories of patent law. Identifying synergies between a court's doctrinal test and an economic theory provides insight as to how courts view patent enforcement decisions. Further, identifying which economic theory seems to be most influential can assist in predicting how a court will decide patent infringement cases. Examining divided infringement through the lens of economic theory provides some answers to this interesting doctrinal puzzle and offers further considerations for policy makers interested in encouraging patent protection while discouraging overly broad patents from being enforced.

Divided infringement is concerned with whether there can be infringement liability when multiple parties collectively perform each step of a method claim.²⁴ Accordingly, divided infringement issues can arise with any technology that facilitates interaction between multiple components or multiple parties. For example, divided infringement raises particular problems for internet-age inventions.²⁵ The very nature of the Internet—what makes it so powerful—is its interactivity. E-business transactions are now the norm.²⁶ The sale of mobile devices has exploded. Further, manufacturers of old and new consumer devices are adding new features based on the ability to access and share information among electronic devices.²⁷

24. *Akamai Techs., Inc. v. Limelight Networks, Inc.*, 786 F.3d 899, 910 (Fed. Cir. 2015) (stating that “only method claims can raise an issue of divided infringement”), *on reh’g en banc*, 797 F.3d 1020 (Fed. Cir. 2015), *reh’g en banc granted, opinion vacated*, 612 F. App’x 617 (Fed. Cir. 2015).

25. See *McKesson*, 98 U.S.P.Q. 2d (BNA) at 1287 (Newman, J., dissenting) (fearing that the majority’s test for divided infringement would discourage “information-age” companies from seeking patent protection), *rev’d sub nom. Akamai/McKesson I*, 692 F.3d 1301, *rev’d*, 134 S. Ct 2111.

26. Harold C. Wegner, *E-Business Patent Infringement: Quest for a Direct Infringement Claim Model*, SOFTIC 2001 Symposium, at 4, available at <http://patentlyo.com/media/docs/2007/09/wegner-en.pdf> (defining an e-business transaction as a transaction involving multiple parties that are interacting electronically with each other).

27. See Hari Gottpati, *With iBeacon, Apple Is Going to Dump on NFC and Embrace the Internet of Things*, GIGAOM (Sept. 10, 2013, 4:30 PM), <http://gigaom.com/2013/09/10/with-ibeacon-apple-is-going-to-dump-on-nfc-and-embrace-the-internet-of-things/> (explaining that the Internet of Things (IoT) technology allows beacons to transmit and receive information, including small files, from mobile devices in real time). Divided infringement will likely have an impact on recent applications of interactive technology such as the IoT. IoT technology will create new

However, when multiple parties are interacting electronically, their activities raise several challenges for a patentee with claims purporting to cover a system or method of implementing interactive technology. For example, the doctrine of divided infringement has made it difficult to determine whether many of the patents directed to internet inventions can be enforced. In addition, several companies have voiced concern about what impact divided infringement will have on personalized medicine, biotechnology, and other technology areas where parties seek process patents to protect innovation. What was once just a legal concern for client/server systems has now spread to everyday consumer devices.²⁸ Accordingly, hi-tech innovators continue to closely watch the development of the law in this area.²⁹

Because of its perceived impact on innovation, economists have studied and debated the merits of the patent system for decades. Many economists view the patent system as the most complex system for enforcing intellectual property rights.³⁰ Economists such as Frank W. Taussig and A. C. Pigou have argued that such a complex system is not necessary to promote innovation.³¹ In contrast, other economists such as Jeremy Bentham, Jean-Baptiste Say, John Stuart Mill, and John Bates Clark asserted that patents and the patent system are necessary to encourage invention.³² Despite these differing views, legal scholars have relied on economic theories of the patent system to gain insight on procedural issues and patent rights enforcement.³³

This Article proposes that three economic theories of the patent system may provide some insight on divided infringement and enforcement of interactive patents. Specifically, this Article uses reward theory, prospect theory, and rent-dissipation theory to examine the issues

applications with the ability to communicate with devices interactively. Undoubtedly, companies—large and small—will file for patents on applications of IoT technology.

28. See Wegner, *supra* note 26, at 14 (setting forth an e-business model as a basic client/server system or service).

29. See generally *Limelight Networks, Inc. v. Akamai Techs., Inc. (Akamai/Mckesson II)*, 134 S. Ct. 2111 (2014) (reversing the Federal Circuit's decision in *Akamai/McKesson I*). The Federal Circuit revisited the standard for direct infringement of interactive method claims and issued a per curiam opinion on August 13, 2015, in *Akamai Technologies, Inc. v. Limelight Networks, Inc. (Akamai/McKesson III)*, 797 F.3d. 1020 (Fed. Cir. 2015) (en banc) (per curiam).

30. Steven N. S. Cheung, *Property Rights and Invention*, in 8 RESEARCH IN LAW & ECONOMICS 5 (1986).

31. See FRITZ MACHLUP, STUDY OF THE SUBCOMMITTEE ON PATENTS, TRADEMARKS, AND COPYRIGHTS OF THE SENATE JUDICIARY COMMITTEE, 85TH CONG., 2D SESS., AN ECONOMIC REVIEW OF THE PATENT SYSTEM, STUDY NO. 15 (Comm. Print 1958) at 34.

32. Cheung, *supra* note 30, at 5.

33. See generally Mark F. Grady & Jay I. Alexander, *Patent Law and Rent Dissipation*, 78 VA. L. REV. 305 (1992).

of divided infringement in a broader context. These theories are briefly summarized here and explored in further detail later in this Article.

Reward theory holds that “patents are rewards to inventors for their completed inventions.”³⁴ It follows that without a patent as a reward, inventors will not be encouraged to invest time and resources in developing new products and methods.³⁵ Thus, reward theory prescribes certain formulas for the patent system.³⁶ For example, reward theory recommends that the social benefit of granting an applicant a patent must outweigh the social cost of being subject to the resulting limited patent monopoly.³⁷ With respect to doctrinal issues, from a reward theory perspective, the key question that must be asked to determine if an innovation is worthy of a patent is: Is this discovery worthy of a monopoly?³⁸ While this provides an interesting view from a patentability perspective, reward theory’s ability to explain the outcome in patent cases has been called into question.³⁹

In response to his dissatisfaction with reward theory, Professor Edmund Kitch developed the prospect theory of patent law.⁴⁰ Prospect theory proposes that “patents create property rights that facilitate the subsequent commercialization of inventions” and maximize their commercial value.⁴¹ In developing his theory, Professor Kitch drew an analogy to prospectors in the mineral claim system in the early American West.⁴² There, in response to receiving a basic mineral claim from a prospector, the government gave the prospector exclusive rights to develop a mineral claim free from competitive interference.⁴³ Thus, the prospect theory of the patent system encourages the granting of patents at earlier stages and minimizes the chance that duplicative research efforts will occur.⁴⁴ With respect to doctrinal questions, from a prospect-theory perspective, the key question that must be asked to determine if an innovation is worthy of a patent is: Is this an area that should be further

34. See Rhodes, *supra* note 23, at 1077.

35. ROBERT P. MERGES ET AL., *INTELLECTUAL PROPERTY IN THE NEW TECHNOLOGICAL AGE* 131 (6th ed. 2012).

36. Rhodes, *supra* note 23, at 1077.

37. *Id.* at 1080.

38. Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J. L. & ECON. 265, 284 (1977).

39. *Id.*; see also Grady & Alexander, *supra* note 33, at 305.

40. Kitch, *supra* note 38, at 266.

41. Rhodes, *supra* note 23, at 1085–86.

42. Kitch, *supra* note 38, at 271.

43. See *id.*

44. See Roger L. Beck, *The Prospect Theory of the Patent System and Unproductive Competition*, in 5 RESEARCH IN LAW AND ECONOMICS 193, 194–95 (1983).

explored?⁴⁵ Although prospect theory provides an interesting view of doctrinal patent questions—similar to reward theory—scholars have criticized prospect theory for lacking the ability to fully explain the patent system.⁴⁶

Rent-dissipation theory builds upon prospect theory in an attempt to create a theoretical framework that explains court decisions in patent cases.⁴⁷ Accordingly, rent-dissipation theory is a direct result of some scholars' belief that reward and prospect theory do not effectively predict the outcome of patent infringement cases.⁴⁸ Specifically, Professor Mark Grady and Jay Alexander argued that the desire to limit rent dissipation is how actual patent cases are decided.⁴⁹ Patent rents are extracted by inventors in the form of a monopoly and can be dissipated in several ways.⁵⁰ For example, an inventor can dissipate patent rent by keeping his invention a secret instead of seeking patent protection. With respect to enforcement, rent-dissipation theory predicts that patents will be successfully enforced against infringing products that fall within the asserted patent's signaled improvements.⁵¹

Taken together, reward theory, prospect theory, and rent-dissipation theory represent a key framework for explaining the economic function of patents. In addition to shaping patent policy, these theories can help predict how courts decide patent cases. Viewing open doctrinal questions such as divided infringement as illuminated by these economic theories may provide additional insight into how the patent system should treat multiparty, interactive claims. The doctrinal challenges presented by divided infringement are briefly summarized below.

Divided infringement is a problem specific to method claims because parties can, and often do, split the performance of method steps between themselves.⁵² The statutes setting forth contributory infringement and inducement broadly govern third party liability for patent infringement.⁵³ However, as evidenced by the Federal Circuit's decisions, the claims at issue in divided infringement cases have revealed a legal gap between direct infringement under 35 U.S.C. § 271(a) and what type of behavior

45. Kitch, *supra* note 38, at 284.

46. See Grady & Alexander, *supra* note 33, at 305.

47. *Id.* at 316.

48. *Id.*

49. *Id.* at 321 ("Rent dissipation theory predicts that the courts will enforce a patent when the size of the patent rent is proportionate to the rent dissipation that the invention's technological signal would otherwise induce.").

50. *Id.* at 308.

51. *Id.* at 309.

52. See *Akamai Techs., Inc. v. Limelight Networks, Inc. (Akamai/McKesson I)*, 692 F.3d 1301, 1305–06 (Fed. Cir. 2012) (en banc) (per curiam), *cert. granted*, 134 S. Ct. 895 (2014).

53. 35 U.S.C. § 271 (2012).

is covered by contributory infringement and induced infringement in § 271(b) and (c).

For example, while the Federal Circuit set out a formulation for addressing divided infringement in *Akamai Technologies, Inc. v. Limelight Networks, Inc. (Akamai/McKesson I)*,⁵⁴ a unanimous Supreme Court in *Akamai/McKesson II* subsequently reversed that decision in 2014, rendering that approach on divided infringement moot.⁵⁵ In its opinion in *Akamai/McKesson I*, the Federal Circuit highlighted the “doctrinal problem” with § 271(a) and (b).⁵⁶ Specifically, the court indicated that § 271(a) and (b) handled instances of infringement by a single actor well but fell short when the asserted infringement allegedly involved two or more actors.⁵⁷ Past Federal Circuit precedent had imposed liability upon a defendant that did not perform all the claimed method steps under § 271(b) only if the defendant directed or controlled the actions of a third party to perform all or some of the remaining steps.⁵⁸

In *Akamai/McKesson I*, a divided Federal Circuit held, 6–5 in a per curiam opinion, that to sustain a finding of induced infringement, “all the steps of a claimed method must be performed.”⁵⁹ However, the court found that there is no requirement that those steps be performed by a single entity.⁶⁰ In other words, under the court’s short-lived rule, a defendant could be liable for induced infringement of a method patent if it induced other parties to perform some of the method steps and the defendant performed the remaining steps or if the defendant induced other parties to collectively perform the method steps.⁶¹ Thus, according to the Federal Circuit,

liability for induced infringement [was] premised on a showing that (1) the alleged inducer knew of the patent, (2) it induced the performance of the steps of the method claimed in the patent or, alternatively, it performed some or all but one of the steps of the method claimed in the patent and induced another party or parties (including end-users) to perform the remaining step(s) of the claimed method, and (3) those steps were performed such that an actual infringement

54. 692 F.3d 1301.

55. See *Limelight Networks, Inc. v. Akamai Techs., Inc. (Akamai/McKesson II)*, 134 S. Ct. 2111, 2117 (2104) (stating that the Federal Circuit’s partial-inducement test “fundamentally misunderstands what it means to infringe a method patent”).

56. See *Akamai/McKesson I*, 692 F.3d at 1305.

57. *Id.* at 1306.

58. *Id.*

59. *Id.*

60. *Id.*

61. *Id.*

occurred.⁶²

The opinion in *Akamai/McKesson I*⁶³ is worth studying because it articulates three new and different views of how divided infringement liability should be determined. In *Akamai/McKesson I*, the Federal Circuit majority overruled its earlier decision in *BMC Resources, Inc. v. Paymentech, L.P. (BMC Resource)*⁶⁴ and established a new partial-inducement test for when more than one party performs steps in a method claim.⁶⁵ The *Akamai/McKesson I* majority held that there could be liability for induced infringement where all the steps are not performed by a single entity.⁶⁶

Two dissenting opinions in *Akamai/McKesson I* provided alternative tests for divided infringement liability. In one dissent, Judge Richard Linn, joined by three other judges, argued that the control or direction test could provide for a finding of liability where there is a joint enterprise.⁶⁷ Notably, the Federal Circuit's recent per curiam opinion closely follows Judge Linn's dissent by incorporating the joint-enterprise test into the divided infringement analysis.⁶⁸ In the second *Akamai/McKesson I* dissent, Judge Pauline Newman, writing for herself, argued that there should be liability for infringement whenever one or more parties perform the steps of a claimed method.⁶⁹ Thus, there has been notable disagreement even within the Federal Circuit on how to determine liability for divided infringement of method claims.

In reversing the Federal Circuit's decision in *Akamai/McKesson I*, the Supreme Court relied upon precedent and its interpretation of the infringement statute. The Court specifically relied on its holding in *Aro Manufacturing Co. v. Convertible Top Replacement Co.*⁷⁰ to make it clear that liability for inducement can only arise if there is direct infringement.⁷¹ By itself, this statement was enough to reject the Federal

62. See *Driessen v. Sony Music Entm't*, 904 F. Supp. 2d 1196, 1203 (D. Utah 2012), opinion vacated in part, modified in part, 2:09-CV-0140-CW, 2013 WL 4501063 (D. Utah Aug. 22, 2013) (citing *Akamai/McKesson I*, 692 F.3d at 1318–19).

63. 692 F.3d 1301.

64. 498 F.3d 1373 (Fed. Cir. 2007), overruled by *Akamai/McKesson I*, 692 F.3d 1301, rev'd, 134 S. Ct. 2111 (2014).

65. *Akamai/McKesson I*, 692 F.3d at 1306.

66. See *id.* at 1308–09.

67. *Id.* at 1338 (Linn, J., dissenting).

68. See *Akamai Techs., Inc. v. Limelight Networks, Inc. (Akamai/McKesson III)*, 797 F.3d 1020, 1023 (Fed. Cir. 2015) (en banc) (per curiam).

69. *Akamai/McKesson I*, 692 F.3d at 1322–23 (Newman, J., dissenting).

70. 365 U.S. 336 (1961).

71. See *Limelight Networks, Inc. v. Akamai Techs., Inc. (Akamai/McKesson II)*, 134 S. Ct. 2111, 2117 (2014) (citing *Aro Mfg. Co.*, 365 U.S. at 341).

Circuit majority's partial-inducement test.⁷² Importantly, the Supreme Court also acknowledged that the Federal Circuit's current legal interpretation of the patent infringement statutes could permit a party to evade liability by splitting up performance of a method with another defendant.⁷³ However, the Court declined to address the key question of whether multiple parties could directly infringe a method claim under § 271(a). Instead, the Court remanded the case back to the Federal Circuit.⁷⁴

On remand, Judge Linn, writing for the majority, reestablished the direction or control standard first articulated in *BMC Resources* as the test for divided infringement liability.⁷⁵ Further, Judge Linn expanded the factual circumstances of direction or control to include a joint enterprise.⁷⁶ Most recently, the Federal Circuit (en banc) endorsed this approach.⁷⁷ Accordingly, the controversy surrounding divided infringement will likely go on for several more years as district courts begin applying the most recent Federal Circuit test.

The Federal Circuit's struggle with divided infringement can be traced back to 2007. The first approach taken by the Federal Circuit was to hold that a "mastermind" infringer could be liable for the infringement of a multiparty claim if they directed or controlled the actions of the other infringing party or parties.⁷⁸ This position was explained further by a subsequent opinion holding that "the control or direction standard is satisfied in situations where the law would traditionally hold the accused direct infringer vicariously liable for the acts committed by another party

72. See *id.* at 2118 (stating that conduct that would be infringing in altered circumstances cannot form the basis for inducement).

73. See *id.* at 2120 (suggesting that the legal loophole could be due to the Federal Circuit's interpretation of § 271(a) as articulated in *Muniauction, Inc. v. Thomson Corp.*, 532 F.3d 1318 (Fed. Cir. 2008)).

74. See *id.* (stating that the Federal Circuit will have the opportunity to revisit the definition of infringement under § 271(a)).

75. *Akamai Techs., Inc. v. Limelight Networks, Inc.*, 786 F.3d 899, 903–05 (Fed. Cir. 2015), *on reh'g en banc*, 797 F.3d 1020 (Fed. Cir. 2015), *reh'g en banc granted, opinion vacated*, 612 F. App'x 617 (Fed. Cir. 2015).

76. *Id.* at 911 (defining a joint enterprise as "(1) an agreement, express or implied, among the members of the group; (2) a common purpose to be carried out by the group; (3) a community of pecuniary interest in that purpose, among the members; and (4) an equal right to a voice in the direction of the enterprise, which gives an equal right of control").

77. See *Akamai Techs., Inc. v. Limelight Networks, Inc. (Akamai/McKesson III)*, 797 F.3d 1020, 1022 (Fed. Cir. 2015) (en banc) (per curiam).

78. See *BMC Res., Inc. v. Paymentech, L.P. (BMC Resources)*, 498 F.3d 1373, 1381 (Fed. Cir. 2007), *overruled by Akamai Techs., Inc. v. Limelight Networks, Inc. (Akamai/McKesson I)*, 692 F.3d 1301 (Fed. Cir. 2012) (en banc) (per curiam), *rev'd*, 134 S. Ct. 2111 (2014).

that are required to complete performance of a claimed method.”⁷⁹ Later, in a third case, *Akamai Technologies, Inc. v. Limelight Networks, Inc.* (*Akamai*),⁸⁰ the Federal Circuit again modified its position on the doctrine of joint infringement, holding that there could only be joint infringement in two cases: (1) “when there is an agency relationship between the parties who perform the method steps,” or (2) “when one party is contractually obligated to the other to perform the steps.”⁸¹

Finally, in *McKesson Technologies Inc. v. Epic Systems Corp.* (*McKesson*),⁸² the last case to be heard before *Akamai/McKesson I*, the Federal Circuit settled on the following formulation: (1) “where the actions of multiple parties combine to perform every step of a claimed method, the claim is directly infringed only if one party exercises ‘control or direction’ over the entire process such that every step is attributable to the controlling party,”⁸³ (2) “the ‘control or direction’ standard is satisfied in situations where the law would traditionally hold the accused direct infringer vicariously liable for the acts committed by another party that are required to complete performance of a claimed method,”⁸⁴ and (3) “there can only be joint infringement when there is an agency relationship between the parties who perform the method steps or when one party is contractually obligated to the other to perform the steps.”⁸⁵

In sum, since 2007, the opinions of the Federal Circuit have revealed four primary categories of tests for determining divided infringement liability. This Article refers to the first category as the “mastermind suite of tests,” which was introduced in *BMC Resources* and *Muniauction*, and slightly modified in *Akamai* and *McKesson*. The remaining three proposed tests were introduced in the majority and two dissenting opinions issued in *Akamai/McKesson I*. These three tests include (1) the majority’s recently rejected partial-inducement rule, (2) Judge Linn’s joint-enterprise test, and (3) Judge Newman’s proposed all-steps rule.

Given these four doctrinal categories, this Article uses the economic theories of the patent system to provide some insight on the issue of divided infringement liability. But several open questions remain with respect to divided infringement. If multiple participants each perform different steps of a method claim, would any of the participants be liable

79. See *Muniauction, Inc. v. Thomson Corp.*, 532 F.3d 1318, 1330 (Fed. Cir. 2008), *overruled by Akamai/McKesson I*, 692 F.3d 1301, *rev’d*, 134 S. Ct. 2111.

80. 629 F.3d 1311 (Fed. Cir. 2010).

81. *Id.* at 1320.

82. 98 U.S.P.Q.2d (BNA) 1281 (Fed. Cir. 2011), *reh’g en banc granted, opinion vacated*, 463 F. App’x 906 (Fed. Cir. 2011).

83. *Id.* at 1283 (quoting *Muniauction*, 532 F.3d at 1329).

84. *Id.* (quoting *Muniauction*, 532 F.3d at 1330).

85. See *id.* at 1283–84 (quoting *Akamai*, 629 F.3d at 1320).

for infringement under direct inducement or contributory infringement?⁸⁶ Further, does the relationship between the multiple participants matter?⁸⁷ Finally, can there be liability for inducement in the absence of direct infringement?⁸⁸

A larger question this Article seeks to answer is whether interactive, multi-participant claims should be enforced at all. In response, this Article argues that the economic theories of the patent system support enforcement of multi-participant claims and are helpful in explaining the Federal Circuit's search for a workable test.

For example, reward theory asks whether the social benefit of enforcing a multiparty patent outweighs the social cost of multiple parties being subject to liability.⁸⁹ The Federal Circuit's answer to this question is yes, but only under certain circumstances. The control or direction test, partial-inducement test, and joint-enterprise test all attempt to define specific circumstances under which infringement liability could attach. In contrast, because it requires only that all the steps of a claim have been performed, Judge Newman's all-steps proposal⁹⁰ is the only test inconsistent with reward theory. Thus, as detailed later in the Article, reward theory is a useful doctrinal filter, but fails to help identify a specific path for divided infringement that would be most consistent with the economic view of the patent system.

In contrast, prospect theory is a bit more helpful. Prospect theory asks whether a patentee should be free to further cultivate the claimed subject

86. See *McKesson Techs. Inc. v. Epic Sys. Corp.*, 463 F. App'x 906, 907 (Fed. Cir. 2011) (citing *Fromson v. Advance Offset Plate, Inc.*, 720 F.2d 1565 (Fed. Cir. 1983)) ("If separate entities each perform separate steps of a method claim, under what circumstances, if any, would either entity or any third party be liable for inducing infringement or for contributory infringement?"); see also *Akamai Techs., Inc. v. MIT*, 419 F. App'x 989, 989 (Fed. Cir. 2011) ("If separate entities each perform separate steps of a method claim, under what circumstances would that claim be directly infringed and to what extent would each of the parties be liable?").

87. See *McKesson Techs.*, 463 F. App'x at 907 ("Does the nature of the relationship between the relevant actors—e.g., service provider/user; doctor/patient—affect the question of direct or indirect infringement liability?").

88. See *Limelight Networks, Inc. v. Akamai Techs., Inc.*, 134 S. Ct. 895, 895 (2014) (granting certiorari to review *Akamai/McKesson I*). Limelight's certiorari petition asked the Supreme Court to review: "Whether the Federal Circuit erred in holding that a defendant may be held liable for inducing patent infringement under 35 U.S.C. § 271(b) even though no one has committed direct infringement under § 271(a)." Dennis Crouch, *US Government Suggests That Supreme Court Reject Federal Circuit's Divided Infringement Jurisprudence*, PATENTLYO (Dec. 12, 2013), <http://patentlyo.com/patent/2013/12/us-government-suggests-that-supreme-court-reject-federal-circuits-divided-infringement-jurisprudence.html>.⁸⁹ See Rhodes, *supra* note 23, at 1080.

89. See Rhodes, *supra* note 23, at 1080.

90. See *Akamai Techs., Inc. v. Limelight Networks, Inc. (Akamai/McKesson I)*, 692 F.3d 1301, 1319 (Fed. Cir. 2012) (en banc) (Newman, J., dissenting) (per curiam), *rev'd*, 134 S. Ct. 2111 (2014); *id.* at 1337 (Linn, J., dissenting).

matter free of interference from competitors. Both Judge Linn's and Judge Newman's tests enable a patentee to protect itself from competitors better than either the mastermind tests or the majority's partial-inducement rule.⁹¹ Accordingly, this Article finds that the two tests proposed by the dissenting judges in *Akamai/McKesson I* are most consistent with the prospect view of the patent system.

Finally, this Article argues that the two positions advocated for by most of the Federal Circuit judges in *Akamai/McKesson I* are both consistent with rent-dissipation theory. Rent-dissipation theory suggests that patents will be successfully enforced against infringing products that fall within the asserted patent's signaled improvements.⁹² The signaled improvement in the claims at issue in *Akamai/McKesson I* and in most internet-age inventions is the ability to facilitate collaboration and interactivity. Thus, rent-dissipation theory predicts that courts should enforce multiparty patents against infringement caused by partial inducement or the joint enterprise of others, since these collaborative activities fall within the patent's signaled improvements.

This analysis has some interesting implications. First, although rejected as policy making and as a judicial creation, the majority's partial-inducement test seems to be justified by economic theory. Moreover, the joint-enterprise test, first introduced by Judge Linn in his dissent in *Akamai/McKesson I*, is the test most consistent with the three economic theories of the patent system discussed here. Specifically, all three prevalent economic theories of the patent system predict that a court would employ Judge Linn's joint-enterprise test. Accordingly, a theoretical economic analysis not only justifies the enforcement of interactive, multi-participant claims, but also seems to suggest that Judge Linn's joint-enterprise test is consistently aligned with the economic goals of the patent system.

A detailed discussion of the issues outlined above will proceed as follows: Part I of this Article discusses the practical impact divided infringement has on innovation. In that context, Part II summarizes the economic view of the patent system from a theoretical perspective and discusses three prevalent economic theories of the patent system. Part III explains the doctrine of divided infringement. In addition, Part III attempts to distinguish between the major doctrinal views concerning divided infringement. Part IV analyzes the Federal Circuit's efforts to formulate a test for divided infringement through the lens of the economic theories discussed in Part II. Specifically, Part IV attempts to align the doctrinal perspectives identified in Part III with one or more of the given

91. See *id.* at 1306 (majority opinion).

92. See Grady & Alexander, *supra* note 33, at 309.

economic theories of the patent system. The Conclusion proposes that economic theory justifies enforcement of interactive patents.

In concluding that economic theory justifies enforcement of interactive patents, this Article finds theoretical support for the existence of interactive and multi-participant claims. Further, the economic theories discussed in this Article suggest that protecting multiparty, interactive inventions promotes the economic function of the patent system by encouraging the commercialization of interactive innovations and preventing unproductive rent-dissipating behavior by patentees or competitors.

I. A BRAVE NEW AND CONNECTED WORLD

Although patentability issues seem to garner more attention from the media, divided infringement is also an important issue. Divided infringement affects established technologies as well as the cutting-edge applications of the future. Parties concerned with doing business via the Internet, financial services businesses, and companies specializing in personalized medicine all have drafted amicus briefs in several divided infringement cases. While their positions on the merits varied, it was clear that each party was concerned about the effect of divided infringement issues on their respective industries. In order to provide some practical context for the following theoretical discussion, this Part briefly describes some of the major classes of technologies impacted by divided infringement.

A. *Internet-Age Inventions*

Divided infringement has a significant impact on internet-age inventions. In *Akamai/McKesson I*, Judge Newman expressed a preference for formulating a divided infringement test that would allow owners of internet-age inventions to enforce their patents.⁹³ In contrast, some industry amici feared that too broad a liability standard would unnecessarily put all participants in an internet transaction at risk.⁹⁴

Internet-age inventions can be characterized as inventions that make use of the Internet and its associated technologies; they often necessitate and facilitate the participation of multiple parties. Specific applications

93. See *Akamai/McKesson I*, 692 F.3d at 1326 (Newman, J., dissenting) (“The court should simply acknowledge that a broad, all-purpose single-entity requirement is flawed, and restore infringement to its status as occurring when all of the claimed steps are performed, whether by a single entity or more than one entity, whether by direction or control, or jointly, or in collaboration or interaction.”).

94. Brief of Amicus Curiae the Financial Services Roundtable in Support of Limelight Networks, Inc. and Affirmance at 16, *Akamai/McKesson I*, 692 F.3d 1301 (Nos.2009-1372, 2009-1380, 2009-1416, 2009-1417), 2011 WL 7730148 [hereinafter *Financial Services*].

of internet-age technology include wireless technology,⁹⁵ internet retail,⁹⁶ and financial services.⁹⁷ The financial-services industry provides banking services to consumers⁹⁸ who may buy or sell goods using an internet retailer.⁹⁹ These industries have exploded in the last decade.¹⁰⁰ Internet retail use continues to grow in the United States with approximately 192 million users visiting, on average, over thirteen retail sites per month.¹⁰¹ Financial services work globally to facilitate an estimated 10,000 transactions per second quickly and in a secure manner.¹⁰²

Growth in demand for financial services and internet retail has been driven in part by innovation and explosive growth in the wireless industry.¹⁰³ The United States has more mobile internet users than any other country in the world.¹⁰⁴ “Apps,” or applications that run on smart mobile devices, have also contributed to the growth of the wireless industry.¹⁰⁵ The revenue generated from mobile app sales was projected to increase 190% and surpass 15.1 billion dollars in 2011.¹⁰⁶

Accordingly, the global economy has become dependent upon this interconnected system of wireless devices, internet storefronts, and financial services.¹⁰⁷ Different companies and different systems must interact to provide consumers with the services they have come to expect.¹⁰⁸ For example, a credit card transaction can involve six or more participants.¹⁰⁹ Therefore, different companies in different technology areas may partner to provide connected web services.¹¹⁰ Partnering is

95. Brief of CTIA—the Wireless Association® and Metropcs Wireless, Inc. at 2, *Akamai/McKesson I*, 692 F.3d 1301 (Nos. 06-CV-11109, 06-CV-11585), 2011 WL 4071472 [hereinafter *Wireless Association*].

96. Amici Curiae Internet Retailers’ Brief in Support of Defendant/Cross-Appellant’s En Banc Response Brief at 2, *Akamai/McKesson I*, 692 F.3d 1301 (Nos. 2009-1372, 2009-1380, 2009-1416, 2009-1417), 2011 WL 3796786 [hereinafter *Internet Retailers*].

97. See *Financial Services*, *supra* note 94, at 3.

98. *Id.*

99. See *Internet Retailers*, *supra* note 96, at 2.

100. *Id.* at 12.

101. *Id.*

102. See *Financial Services*, *supra* note 94, at 4.

103. See *Wireless Association*, *supra* note 95, at 3 (“Advances in wireless technology have enabled explosive innovation in the last decade. Ten years ago, consumers used cell phones almost exclusively to make voice calls. Five years later, they were texting, sharing pictures, and surfing the Internet.”).

104. *Id.* at 8 (stating that 234 million or more Americans use mobile devices).

105. *Id.* at 4.

106. *Id.*

107. *Financial Services*, *supra* note 94, at 4.

108. *Wireless Association*, *supra* note 95, at 2.

109. *Financial Services*, *supra* note 94, at 2.

110. See *Wireless Association*, *supra* note 95, at 7 (“A good example is Sprint’s partnership with Google and others to launch the Google Wallet app earlier this spring. This app provides a

more efficient for these companies and allows them to specialize, which can result in higher-quality service.¹¹¹

Due in part to the innovation taking place in this area, internet-age companies are targets of an increasing number of patent-infringement lawsuits.¹¹² For example, wireless carriers may be sued based on methods that make use of their network.¹¹³ Internet retailers are also sued for patent infringement “based in part on the activities of their customers in visiting their websites.”¹¹⁴ Accordingly, due to the interactive and multi-participant nature of internet-age technology, the issue of divided infringement is of deep concern to internet-age industry stakeholders.

In sum, although the Internet is no longer “new,” internet-age technology and applications of that technology continue to grow. Stakeholders in this industry must provide technology and applications that facilitate communication between multiple participants. Thus, divided infringement is a concern for this technology area. This is exacerbated by the fact that stakeholders in this area are the frequent targets of lawsuits. The next Section summarizes personalized medicine, another technology area that has seen significant growth and an uptick in legal activity in recent years.

B. *Personalized Medicine*

Similar to internet-age inventions, the doctrine of divided infringement can also have a significant impact on personalized medicine inventions. Personalized medicine is a relatively new field and includes a large number of small companies.¹¹⁵ The stakeholders in personalized medicine technology include pharmaceutical, biotech, and genetic companies, institutions, and organizations.¹¹⁶ These groups are also

‘wave and pay’ service through which consumers can pay at stores by simply waving their phones over a scanner. The phones use a near field communications (NFC) chip to communicate with the scanner. The service involved not only Google, but also Samsung (which incorporated the NFC chip in the phone), credit powerhouses Citi and MasterCard, merchant processing provider First Data, and Sprint to provide the necessary network connection.”).

111. *Id.* at 7.

112. *Financial Services*, *supra* note 94, at 12.

113. *Wireless Association*, *supra* note 95, at 10.

114. *Internet Retailers*, *supra* note 96, at 1.

115. See Corrected Brief of Amicus Curiae Myriad Genetics, Inc., in Support of Neither Party at vii, *Akamai Techs., Inc. v. Limelight Networks, Inc.* (*Akamai/McKesson I*), 692 F.3d 1301 (Fed. Cir. 2012) (en banc) (per curiam) (Nos. 2009-1372, 2009-1380, 2009-1416, 2009-1417), 2011 WL 3281836 [hereinafter *Myriad Amicus Brief*] (describing Myriad’s role in the personalized medicine industry).

116. See Amicus Curiae Brief of Biotechnology Industry Organization in Support of Neither Party at 1, *Akamai/McKesson I*, 692 F.3d 1301 (Nos. 2009-1372, 2009-1380, 2009-1416, 2009-1417), 2011 WL 3281836 [hereinafter *Biotechnology Industry Amicus Brief*] (describing the role of biotechnology companies).

involved in the development of everything from agriculture applications to therapeutic healthcare products.¹¹⁷

The therapeutic healthcare products rely heavily on diagnostic tests.¹¹⁸ These tests are used to obtain information about a patient's molecular and genetic markers¹¹⁹ associated with the risk of disease, the presence or absence of a disease, what a patient's response will be to certain drug therapies, and other conditions.¹²⁰ Using this information, healthcare providers can provide patient-specific preventive care and treatment regimens that reduce healthcare costs.¹²¹

In order to provide these personalized services, the healthcare industry has pushed to become more efficient, and in doing so it has developed interactive systems and methods for performing certain processes.¹²² For example, it may be more efficient for one actor to perform diagnostic testing and another actor to correlate a marker detected during the diagnostic test with a disease or drug treatment.¹²³ Similarly, new and innovative methods for medical treatment or drug delivery may require the participation of multiple healthcare providers and patients.¹²⁴

"Interactive" personalized medicine has several real-world applications. For example, the *Prolaris*® test diagnoses a prostate tumor and correlates that diagnostic information with a patient to help healthcare providers decide how to treat prostate cancer.¹²⁵ Stakeholders in personalized medicine expect that similar applications—which allow users to store and manage healthcare data online and allow hospitals, insurance carriers, and healthcare providers to interact—will continue to grow.¹²⁶ Moreover, future treatment and diagnostic methods will continue to involve multiple actors.¹²⁷

The doctrine of divided infringement is of particular interest to personalized medicine because "[t]he steps of biotechnology method patents are often capable of being practiced by separate entities."¹²⁸

117. *Id.* at 1.

118. *Myriad Amicus Brief*, *supra* note 115, at 4.

119. *Id.*

120. *Id.*

121. *Id.*

122. Brief of Amicus Curiae Pharmaceutical Research and Manufacturers of America on Rehearing En Banc in Support of Neither Party at 5, *Akamai/McKesson I*, 692 F.3d 1301 (Nos. 2009-1372, 2009-1380, 2009-1416, 2009-1417), 2011 WL 3281836 [hereinafter *PhRMA Amicus Brief*].

123. *Myriad Amicus Brief*, *supra* note 115, at viii.

124. *Biotechnology Industry Amicus Brief*, *supra* note 116, at 8–9.

125. *Myriad Amicus Brief*, *supra* note 115, at 6.

126. *PhRMA Amicus Brief*, *supra* note 122, at 10.

127. *Id.* at 11–12.

128. *Biotechnology Industry Amicus Brief*, *supra* note 116, at 8.

Further, it is extremely time consuming and costly to develop personalized medicine applications.¹²⁹ Generally, the industry can only protect this large investment of time and money by claims covering the diagnostic and correlation processes of a personalized medicine product.¹³⁰ Personalized medicine stakeholders continue to develop novel and interactive methods for diagnosing and treating medical conditions.¹³¹ Accordingly, a divided infringement doctrine that is adverse to the personalized medicine industry could render thousands of patents useless and reduce the incentive to invest in expensive and time-consuming research.¹³²

In sum, personalized medicine is a relatively new technology application that is interactive in nature. Stakeholders in this area are concerned about divided infringement because it has the potential to affect not only patented inventions but also whether new and inventive applications can be enforced.

C. *The Internet of Things*

In addition to personalized medicine, the Internet of Things (IoT) is an emerging field with numerous interactive applications. The IoT is a platform of objects connected via a complex network.¹³³ The IoT has slowly grown as more smart devices become connected to the Internet.¹³⁴

Several IoT technology stakeholders exist. They include, but are not limited to, integrated circuit manufacturers, manufacturers of sensing equipment, network providers, system integrators, and service providers in addition to customers and users of IoT services.¹³⁵ What makes this platform appealing to technology stakeholders is its potential to facilitate human interaction with smart devices.¹³⁶ For legal observers, it is the multi-participant, interactive nature of this new platform that makes it important for those concerned with divided infringement issues.

Bruce Sterling, a science-fiction writer, popularized the idea of an IoT. His vision predicted that physical objects connected to the Internet would be traceable in space and time.¹³⁷ In 2010, connected devices

129. *Myriad Amicus Brief*, *supra* note 115, at 8

130. *Id.* at 1–2.

131. *PhRMA Brief*, *supra* note 122, at 2.

132. *Id.* at 3.

133. Gerd Kortuem et al., *Smart Objects as Building Blocks for the Internet of Things*, IEEE INTERNET COMPUTING, Jan.–Feb. 2010, at 44, 44.

134. See Oladayo Bello & Sherali Zeadally, *Intelligent Device-to-Device Communication in the Internet of Things*, IEEE SYS. J. (forthcoming 2015) (manuscript at 1).

135. Peng-fei Fan & Guang-zhao Zhou, *Analysis of the Business Model Innovation of the Technology of Internet of Things in Postal Logistics*, 2011 IEEE 532, 532.

136. Kortuem et al., *supra* note 133, at 50.

137. *Id.* at 48.

outnumbered human beings. There were almost two connected devices for every one person.¹³⁸ In 2015, it is estimated that there are 25 billion connected devices and only 7.2 billion people on the planet.¹³⁹ Technologies such as WiFi allow all these devices to connect and share information.¹⁴⁰ Accordingly, Sterling's vision is close to becoming a reality.

Generally, the IoT is defined as an "infrastructure of networked physical objects."¹⁴¹ This is a paradigm shift from the internet-age technology described above.¹⁴² Particularly, instead of simply facilitating human interaction, the IoT allows devices to interact with the physical environment, gather information from that environment, and share that information with other devices, people, or environments.¹⁴³ Technologies and equipment—beyond the Internet itself—that provide the platform for the IoT include smart objects, information processing equipment, and device sensing equipment.¹⁴⁴

The Internet has allowed people and things to become interconnected. The true power of the IoT is allowing smart objects to interact and collaborate with each other.¹⁴⁵ In other words, "devices are the users of the IoT network."¹⁴⁶

Because of its possible application in many daily activities, the IoT is a tremendous growth area for innovation. New and innovative routing protocols are needed to allow smart objects to communicate in real time.¹⁴⁷ Improvements need to be made in device-to-device communication.¹⁴⁸ Further, there is an opportunity to create business models and business methods that will make use of the IoT platform in new and innovative ways.¹⁴⁹ In sum, with the proliferation of connected devices, the IoT will affect every person in every walk of life.¹⁵⁰

138. See Bello & Zeadally, *supra* note 134, at 1 ("By 2010, the number of devices connected to the Internet rose to 12.5 billion, while the world's population increased to 6.8 billion . . .").

139. *Id.*

140. *Id.*

141. Kortuem et al., *supra* note 133, at 44.

142. See Bello & Zeadally, *supra* note 134, at 2 ("Akin to how humans are the users of the Internet, devices (things) are the users of the IoT.").

143. *Id.* at 1.

144. See Fan & Zhou, *supra* note 135, at 532 ("The Internet of Things which bases on the Internet, uses a variety of information sensing identification device and information processing equipment, such as RFID, GPS, GIS, JIT, EDI, and other devices to combine with the Internet to form an extensive network in order to achieve information and intelligence for Entity.").

145. Kortuem et al., *supra* note 133, at 49.

146. Bello & Zeadally, *supra* note 134, at 2.

147. *Id.*

148. See *id.* at 2–3.

149. See, e.g., Fan & Zhou, *supra* note 135, at 535–36 (explaining that business models are needed to maximize the potential of the IoT in China).

150. *Id.* at 532.

Stakeholders in IoT technology will most likely seek patents for their inventions. Thus, the doctrine of divided infringement should be a primary concern to patentees because of the interactive and collaborative nature of the IoT. The current state of the doctrine makes it unclear whether IoT multi-participant patent claims could be enforced. Some economic theories of the patent system may provide insight. Accordingly, the next Part begins with an explanation of how economists view the patent system and patent enforcement.

II. A THEORETICAL ECONOMIC VIEW OF THE PATENT SYSTEM

This Part examines the economic theories and justifications offered by economists to support a system of patent rights. These normative theories offer a foundation to then evaluate the different legal standards created by the Federal Circuit and U.S. Supreme Court to decide when to enforce patent rights in claims of divided infringement.

A. *Economics and Patent Rights*

This Section first describes the basic foundations of patent rights and the patent system. It then shifts to focus on theoretical justifications for such a system.

1. The Nature of Patent Rights

Intellectual property is inherently different in nature than real property. Economist Arnold Plant argued that instead of arising from scarcity, intellectual property rights created scarcity.¹⁵¹ That is, an intellectual property right creates scarcity in the idea, trademark, or artistic work it purports to protect.¹⁵² Economist Steven Cheung partially agreed with this sentiment but limited the scarcity idea to inventions that would be created absent a property right.¹⁵³ While there is still some debate about its nature, there seems to be more consensus as to the impetus for intellectual property.

The impetus for intellectual property law is to support individual creators.¹⁵⁴ The intellectual property system is designed based on the idea that the best way to allocate intangible property is to assign control of the assets to individuals.¹⁵⁵ With respect to patents, two primary justifications exist: (1) granting patents is justified because ownership in one's creation is a natural right, and (2) granting a patent right to an individual also

151. See Cheung, *supra* note 30, at 9.

152. *Id.*

153. *Id.* at 10.

154. See ROBERT P. MERGES, JUSTIFYING INTELLECTUAL PROPERTY 71 (2011).

155. See *id.* at 70–71.

benefits society as a whole.¹⁵⁶ In turn, society recognizes the individual's property right by allowing the owner to enforce its rights against others.¹⁵⁷

Several ideas exist concerning the question of what a patent right confers to its owner. According to one framework, a patent confers to an individual the right to "secure the enforcement power of the state in excluding unauthorized persons, for a specified number of years, from making commercial use of a clearly identified invention."¹⁵⁸ Economist John Commons argued that a patent right secured for its owner behavior in others subject to restraint of competition and control of supply.¹⁵⁹ Cheung asserted that a patent confers what he referred to as "production rights" and "development rights."¹⁶⁰ Production rights are the rights to use an idea to make a product.¹⁶¹ Development rights are the rights to use an idea to generate other ideas.¹⁶²

Another rationale for the existence of a patent right is that it provides an incentive to innovate.¹⁶³ Inventors receive a monopoly in exchange for their secret inventions.¹⁶⁴ It is in the public's best interest to recognize patent rights because otherwise inventors may keep their inventions a secret.¹⁶⁵ If important inventions are kept secret, it is difficult for the public as a whole to benefit.¹⁶⁶ Further, inventors benefit from their disclosure by receiving exclusive rights that protect their inventions and those who invested in their research from normal competition.¹⁶⁷ Thus, an overarching goal of the patent system must be to encourage and protect innovation.

156. See MACHLUP, *supra* note 31, at 21.

157. *Id.*

158. *Id.* at 1.

159. *Id.* at 26 (quoting JOHN R. COMMONS, *LEGAL FOUNDATIONS OF CAPITALISM* 279 (1924)).

160. See Cheung, *supra* note 30, at 13.

161. *Id.*

162. *Id.*

163. *Id.* at 27.

164. MACHLUP, *supra* note 31, at 21.

165. *Id.*

166. See *id.* There is some criticism of this "exchange-for-secrets" view. First, most inventors are not successful at keeping their inventions a secret. Second, in the United States, applicants generally keep inventions a secret in the developmental stages until their invention can be reduced to practice. Further, critics argue that inventors will innovate whether they receive incentives or not. In addition, inventors that are first to market obtain a first-mover advantage that generates profits. Some critics would argue that the profits generated from being first are a better reward than an exclusive right. *Id.* at 24-25.

167. *Id.* at 21.

2. The Patent System

The patent system is arguably the most complex system for protecting intellectual property.¹⁶⁸ The English Parliament passed the Statute of Monopolies, which granted a trade monopoly to a first and true inventor, early in the seventeenth century.¹⁶⁹ The British economist John Jewkes argued that the patent system survives into modernity because “there seems to be nothing better.”¹⁷⁰ Similarly, economist Joan Robinson argued that there was no such thing as a beneficial patent system.¹⁷¹ Despite some dislike for its complexity, there are widely accepted justifications for the patent system’s existence.¹⁷²

A primary justification for the patent system is that it stimulates invention. The views of scholars such as Bentham, Say, Mill, and Clark support the idea that granting patent rights is necessary to encourage invention.¹⁷³ In addition, Plant argued that the patent system incentivizes research in areas that may not be profitable short-term.¹⁷⁴ Economist A.T. Hadley takes a different view, arguing that the patent system incentivizes and protects those industries that would invest in and use new inventions.¹⁷⁵ Bentham, Say, and Mill also viewed the cost of the patent system as nominal.¹⁷⁶ Accordingly, in their view, society received the benefit of innovation at no cost.¹⁷⁷

In contrast, many scholars, particularly economists, have put forth cogent arguments against the patent system.¹⁷⁸ Plant argued that, with respect to innovation, the market produces the most efficient result with or without the patent system.¹⁷⁹ The patent system simply creates an artificial monopoly, which causes firms to divert resources to the production of inventions that may be arbitrarily patentable.¹⁸⁰ This provides incentive for some firms to engage in inventive activity just for

168. Cheung, *supra* note 30, at 5.

169. See MACHLUP, *supra* note 31, at 2–3.

170. *Id.* at 44 (quoting JOHN JEWKES, *THE SOURCES OF INVENTION* 254 (1958)).

171. *Id.* at 40 (quoting JOAN ROBINSON, *THE ACCUMULATION OF CAPITAL* 87 (1956)).

172. See generally *id.* at 21–25 (describing the four major arguments in support of patents: (1) natural-law, (2) reward-by-monopoly, (3) monopoly-profit-incentive, and (4) exchange-for-secrets).

173. Cheung, *supra* note 30, at 5.

174. *Id.* at 9.

175. MACHLUP, *supra* note 31, at 37.

176. Cheung, *supra* note 30, at 6.

177. *Id.*

178. *Id.* at 5–6 (describing Plant’s opinion that the patent system is detrimental); see also MACHLUP, *supra* note 31, at 28 (listing economists that argue that patent monopolies are not good for free-market competition).

179. Cheung, *supra* note 30, at 8.

180. *Id.*

the sake of obtaining a monopoly.¹⁸¹ Further, Plant believed that the patent system caused competitors to circumvent a protected idea rather than improve upon it.¹⁸²

Several economists have also voiced concerns about the cost of the patent system and the type of behavior it promotes. Taussig and Pigou argued that patents increase activity in areas useful to society, but do not, of themselves, stimulate inventive activity.¹⁸³ Further, in contrast to the view of Bentham, Say, and Mill, Cheung argued that the cost of the patent system is great.¹⁸⁴ For example, Cheung stated that the costs of activities associated with protecting patents—defining the idea or invention, for instance—inhibited innovation.¹⁸⁵ In sum, Cheung argued that, without a clear idea of the rules for patentability and understanding of the enforcement mechanisms, it is pointless to argue about the value of the patent system.¹⁸⁶

B. *Economic Theory and Patent Enforcement*

Thus far Part II has discussed the view of the patent system from the perspective of economists. This Section discusses three specific economic theories of the patent system.

1. Reward Theory

Reward theory holds that patents are rewards to inventors for their completed inventions.¹⁸⁷ Generally, inventions are costly to make, and the idea behind the invention is difficult to control after the invention is disclosed.¹⁸⁸ A patent allows an inventor to recoup the cost of developing the invention¹⁸⁹ and to appropriate the full economic benefit of her invention.¹⁹⁰ An inventor's commercial benefit stems from a patent's ability to exclude free riders.¹⁹¹ Thus, the patent (a form of limited

181. See MACHLUP, *supra* note 31, at 34.

182. *Id.* at 35.

183. See Cheung, *supra* note 30, at 7. Taussig's basic argument is that since it is in man's nature to create, no incentive is needed to spur invention; Pigou generally agrees with this sentiment but adds that patents may divert activity to the right industries. See MACHLUP, *supra* note 31, at 34.

184. Cheung, *supra* note 30, at 14.

185. *Id.*; see also *id.* at 6 (arguing that Bentham's, Say's, and Will's views fail to take into account the potential cost imposed by criteria for patentability).

186. *Id.* at 9.

187. See generally Rhodes, *supra* note 23 (discussing the nonobviousness standard and the reward theory of the patent system).

188. See MERGES ET AL., *supra* note 35, at 131.

189. Rhodes, *supra* note 23, at 1078.

190. See MERGES ET AL., *supra* note 35, at 131.

191. See Rhodes, *supra* note 23, at 1078.

monopoly) is adequate compensation for the time and money an inventor invests in developing her invention.¹⁹²

One justification for reward theory is that giving an inventor a patent will stimulate more inventive activity.¹⁹³ Without a patent, an inventor does not have enough incentive to invest in creating, developing, and marketing new products.¹⁹⁴ Further, at least Bentham believed that offering a patent for disclosure of an invention was a good trade because the monopoly costs society nothing.¹⁹⁵ But there are several criticisms of reward theory. One critique is that reward theory is an acceptable justification for the patent system but does not explain patent decisions.¹⁹⁶ For example, reward theory by itself cannot explain why some high-cost inventions do not receive patent protection while other less important and less-expensive-to-create inventions do receive patent protection.¹⁹⁷

Another critique of reward theory is that the benefit from being a "first-mover" in a market is a better reward than a limited monopoly.¹⁹⁸ Of course, this fails to take into account incremental inventions or improvements upon existing technology. Plant argued that exchanging property rights for inventions would lead to over-investment in inventions, which would be detrimental to society.¹⁹⁹ Another criticism of reward theory relates to the cost to society of granting a patent,²⁰⁰ as in the higher prices that an inventor might charge for a good or service covered by the patent.²⁰¹

Despite these criticisms, reward theory prescribes a very specific framework for the patent system. Specifically, the theory says that the social benefit of granting a patent must outweigh the social cost of being subject to the resulting limited patent monopoly.²⁰² One social benefit of a patent is that it encourages the public disclosure of new ideas, which leads to new inventions.²⁰³ The most costly patents under this theory are

192. See Grady & Alexander, *supra* note 33, at 310.

193. *Id.* at 312; see also *id.* at 311 (advancing economist John B. Clark's argument that ideas are free to acquire and that unless the government grants some sort of property right to inventors, there will be too little invention).

194. See MERGES ET AL., *supra* note 35, at 131.

195. Grady & Alexander, *supra* note 33, at 310–12.

196. *Id.* at 312–13.

197. *Id.* at 313.

198. See MACHLUP, *supra* note 31, at 23.

199. See Grady & Alexander, *supra* note 33, at 312.

200. Rhodes, *supra* note 23, at 1078.

201. See *id.*

202. *Id.* at 1080.

203. *Id.* at 1078.

inventions that cover a commercially successful product but represent only a minor advance in technology.²⁰⁴

Reward theory is consistent with some existing principles of the patent system and would prescribe very different procedures for other aspects. For example, at least one author has suggested that under reward theory the patent term should be perpetual.²⁰⁵ More consistent with the current system, reward theory suggests that an invention disclosure must be sufficient to enable others to use the invention.²⁰⁶ In one area of interest to the Supreme Court, reward theory suggests that, due to patents' high social cost, there should be a high standard for patentability.²⁰⁷

Through a reward-theory lens, courts view the patent system as a trade-off between incentives and "output constraining effects."²⁰⁸ With respect to doctrinal questions facing a court, this means that the key question that must be asked to determine if an innovation is worthy of a patent is whether the discovery is worthy of a monopoly.²⁰⁹ Accordingly, reward theory predicts that courts will grant and enforce patents that were induced by the patent system.²¹⁰ However, whether reward theory predicts patent decisions or, more importantly, is an accurate predictive tool for how courts should rule is an open question.

2. Prospect Theory

In response to his dissatisfaction with reward theory's ability to explain some patent jurisprudence, Professor Kitch created the prospect theory of patent law.²¹¹ Prospect theory holds that patents create property rights that facilitate the subsequent commercialization of inventions and maximize their commercial value.²¹²

In developing his theory, Professor Kitch drew an analogy to prospectors in the mineral claim system in the early American West.²¹³ In this system, upon receiving a basic mineral claim from a prospector, the government gave the prospector exclusive rights to develop the mineral claim free from competitive interference.²¹⁴ Professor Kitch argued that the patent system operated in a similar fashion by granting

204. *Id.* at 1079.

205. Kitch, *supra* note 38, at 284.

206. *Id.* at 287.

207. See Rhodes, *supra* note 23, at 1080.

208. See Kitch, *supra* note 38, at 282.

209. *Id.* at 284.

210. See Grady & Alexander, *supra* note 33, at 312-13.

211. See Rhodes, *supra* note 23, at 1084-85.

212. See *id.* at 1085-86.

213. See Grady & Alexander, *supra* note 33, at 314.

214. See Kitch, *supra* note 38, at 271.

inventors a patent that allowed them to commercialize their invention free from competitive interference.²¹⁵

The patent system performs a prospecting function in three ways. First, to encourage early filing, priority is given to the first inventor to file a patent application.²¹⁶ Second, there is no requirement that the invention described in the patent application be commercially viable; thus, patents are issued long before commercial exploitation.²¹⁷ Third, although specific embodiments can be included in the patent application, the invention is defined broadly by the patent claims in terms of a technological approach rather than a specific technology.²¹⁸

Further, “a patent ‘prospect’ increases the efficiency with which investment in innovation can be managed.”²¹⁹ Under a prospect-theory view, a patent gives an inventor the exclusive right to develop and commercialize his inventions.²²⁰ One advantage of this approach is that rival inventors will not waste resources competing in areas already covered by the patent.²²¹ The inventor may then invest in commercial development of the invention without the threat of competitors or free riders.²²² Competitors in the marketplace are put on notice and can evaluate whether to license the patentee’s technology instead of wasting resources researching the same technology.²²³ In addition, having a patent lowers transaction costs involved in developing the new technology for an inventor, which results in efficient commercial development.²²⁴ Finally, some commentators argue that prospect theory reduces the need for secrecy.²²⁵

In contrast to reward theory—rewarding a patentee for what she has done—prospect theory suggests that the patent system reward inventors for what they have the potential to create commercially. Professor Kitch

215. *See id.*

216. *Id.* at 267.

217. *Id.*

218. *See* D. G. McFetridge & M. Rafiquzzaman, *The Scope and Duration of the Patent Right and the Nature of Research Rivalry*, in 8 RESEARCH IN LAW AND ECONOMICS: THE ECONOMICS OF PATENTS AND COPYRIGHTS 91, 100 (John Palmer & Richard O. Zerbo Jr. eds., 1986).

219. Kitch, *supra* note 38, at 276.

220. *See* McFetridge & Rafiquzzaman, *supra* note 218, at 100.

221. *See id.* Unproductive competition is a serious problem that includes premature invention, duplication, patenting of unnecessary substitutes, and excessive spending on research. Beck, *supra* note 44, at 194.

222. *See* Rhodes, *supra* note 23, at 1085–86.

223. *Id.* at 1087.

224. *See id.* at 1086–87. The patent is a set of legal rights known to the public. The patent system lowers the patentee’s transaction cost for contracting with other firms with complimentary technology, information, or resources that will assist in commercial exploitation of the patent. This increases the efficiency of invention development. *See* Kitch, *supra* note 38, at 277–78.

225. *See* Grady & Alexander, *supra* note 33, at 314.

argued that in areas of fast-paced technological advancement, the advantages of prospect theory become clear.²²⁶ Prospect theory relies on the notion that patents are granted early in the development of the innovation process to facilitate commercialization of the invention.²²⁷ Because the patent system requires a disclosure before a patent can be granted, prospect theory suggests that the patentee must provide some context for the claims.²²⁸ The first-to-file regime of the patent office forces inventors to file an application on a version of the invention that will work, rather than on the finalized commercial product.²²⁹

Under prospect theory—encouraging early filing—the bar for patentability must be set lower than under reward theory. Further, patent rights with strong commercial potential must be protected. Thus, the key question under prospect theory to determine if an innovation is worthy of a patent is whether the technological area covered by the patent should be further explored,²³⁰ or whether it contains information that needs further investigation.²³¹

Under this rubric, Professor Kitch has criticized the nonobviousness test for patentability as not as helpful to courts as some of the secondary factors that may be used to make a nonobvious determination.²³² For example, one of the secondary factors for nonobviousness is commercial success. Prospect theory explains the commercial success requirement because under this theory, courts protect and enforce patents that cover an inventor's investment to maximize the commercial potential of his invention.²³³

Despite its insights, there are several criticisms of prospect theory. For example, Roger Beck criticized Professor Kitch's characterization of the mineral rights system itself.²³⁴ Beck argued that Professor Kitch modeled his theory on a dysfunctional system.²³⁵ Beck also cited other patent procedures as unsupported by prospect theory, including the means for

226. See Kitch, *supra* note 38, at 284–85.

227. See Rhodes, *supra* note 23, at 1085; see also Beck, *supra* note 44, at 195; Lawrence M. DeBrock, *Market Structure, Innovation, and Optimal Patent Life*, 28 J.L. & ECON. 223, 242 (1985).

228. See Kitch, *supra* note 38, at 287.

229. *Id.* at 269.

230. *Id.* at 284.

231. *Id.*

232. *Id.* at 281.

233. *Id.* at 283.

234. See Beck, *supra* note 44, at 206. Mineral rights' effectiveness as property rights has been seriously questioned. Most prospectors first claimed they found minerals, then secured the right to develop the claim, and only then looked for the minerals. In addition, some minerals required such a large pre-discovery investment that the mineral prospect system broke down. *Id.*

235. *Id.*

applications to be amended, the time bar rule, and workability.²³⁶ A more practical criticism of prospect theory is that a patentee should not have the right to exclude others from using later discoveries.²³⁷ That is, a right to exclude should be granted to the patentee for what he has invented—limited to what is described in the claims—not what he might develop or commercialize.²³⁸

The critique of prospect theory most relevant to this Article is that the theory struggles to fully explain the behavior of the patent system after a patent has been granted. For example, Beck argued that granting an inventor a patent does not guarantee control and coordination over the commercialization of the innovation.²³⁹ Specifically, there is no legal support for the suggestion that a patentee can protect more than he has invented.²⁴⁰ Further, commentators argue that the central coordination theme of prospect theory does not explain how courts decide patent cases.²⁴¹ Although prospect theory, like reward theory, provides an interesting view of doctrinal patent questions, scholars have criticized prospect theory for lacking the ability to fully explain the patent system.²⁴² The last theory this Article summarizes—rent-dissipation theory—purports to provide a better explanation for the U.S. patent system as it exists today.

3. Rent-Dissipation Theory

Rent-dissipation theory is a third economic theory that attempts to explain the patent system. Proponents of rent-dissipation theory suggest that it explains how courts decide patent cases better than either reward or prospect theory. Rent-dissipation theory predicts that courts will protect or enforce patent rights in a way that will discourage the dissipation of patent rents.²⁴³ Specifically, a patent right will receive protection when the “size of the patent rent is proportionate to the rent dissipation that the invention’s technological signal would otherwise induce.”²⁴⁴ Accordingly, rent-dissipation theory predicts that, given a patent’s disclosed technical information and its perceived value, the

236. *See id.* at 198–99.

237. *Id.* at 198.

238. *See* McFetridge & Rafiquzzaman, *supra* note 218, at 100–01; *see also* Beck, *supra* note 44, at 195–96 (arguing that the patent statute specifies that the invention is defined by the patent claims and that the patentee is awarded an exclusive right to their actual discovery, not future discoveries).

239. *See* Beck, *supra* note 44, at 201–04.

240. *Id.* at 207.

241. *See* Grady & Alexander, *supra* note 33, at 317.

242. *See id.*

243. *See id.* at 309.

244. *Id.* at 321.

patent system will protect the invention as necessary to prevent the dissipation of the monopoly patent rent.²⁴⁵

Rent-dissipation theory suggests that the patent system should seek to minimize the dissipation of patent rents,²⁴⁶ defined as the difference between the development cost of the innovation and what society would pay for the innovation.²⁴⁷ Patent rents are extracted by inventors in the form of a monopoly and can be dissipated in several ways.²⁴⁸ Specifically, the patent system can cause rent dissipation by (1) encouraging redundant research efforts by competitors at the pre-invention or development stage,²⁴⁹ (2) encouraging redundant commercialization efforts at the post-patent or improvement stage,²⁵⁰ or (3) encouraging inventors to keep their inventions a secret.²⁵¹ The patent system minimizes these various forms of rent dissipation through patent protection and enforcement mechanisms.

Rent-dissipation theory suggests that the patent system should protect and enforce patents in a way that balances rent-dissipation effects at the development and improvement stages by varying the scope of protection afforded to patents on a case-by-case basis.²⁵² Two factors that determine the scope of protection courts should afford a patent, according to rent-dissipation theory, are the values of both the invention and its technologically signaled improvements.²⁵³ Protecting inventions that contain technological signals for a large number of improvements prevents rent dissipation at the improvement phase.²⁵⁴ If the patent signals that follow-on improvement can be made, then the scope of the patent should be broadened to prevent rent dissipation in improvement efforts.²⁵⁵ In the alternative, if the patent signals that improvement is unlikely, courts should give the invention narrower protections.²⁵⁶

245. *See id.* at 320–21.

246. *See id.* at 308–09.

247. *Id.*

248. *Id.*

249. *See id.* (arguing that when multiple inventors expend resources on redundant patenting efforts, the benefit to society is dissipated).

250. *See id.* at 316.

251. *See id.* at 316–18 (explaining that rent dissipation can occur at the invention or conception stage or at the improvement stage and that trade secrecy is another form of rent dissipation that provides justification for the patent system); *see also id.* at 308–09, 318 (explaining that patent rents are also dissipated if inventors invest resources in keeping their inventions a secret out of fear that the patent system will inadequately protect and compensate them for their innovations).

252. *Id.* at 309, 317–18.

253. *See id.* at 319–21.

254. *See id.* at 320.

255. *Id.* at 318.

256. *See id.*

Valuable inventions confer a larger monopoly rent on inventors; thus, the more valuable the invention, the less protection it should receive in order to prevent rent dissipation at the development stage.²⁵⁷ Therefore, rent-dissipation theory suggests that courts consider the value of an invention and its technological signals when deciding patentability and enforcement issues.

Professors Grady and Alexander have argued that the desire to limit rent dissipation determines how actual patent cases are decided. The authors explained, “[r]ent dissipation theory predicts that the courts will enforce a patent when the size of the patent rent is proportionate to the rent dissipation that the invention’s technological signal would otherwise induce.”²⁵⁸ Accordingly, Professors Grady and Alexander describe a “hierarchy” of protection for patents.²⁵⁹ A patent with a small value but large improvement signal is likely to receive greater protection from the courts.²⁶⁰ Alternatively, an invention that is less likely to be improved upon and that has a large value is less likely to receive protection.²⁶¹

Rent-dissipation theory has interesting implications for the scope of protection afforded to a patentee. A patentee with broad protection can control the rent generated from improvements on the original innovation.²⁶² Professors Grady and Alexander argue that courts protect broad patents when the patent signals that follow-on improvements can be made.²⁶³ By protecting such “pioneering inventions,” rent dissipation is discouraged at the improvement or modification stage.²⁶⁴ However, a broad scope of protection may result in waste at the pre-invention stage since it would increase the number of failed inventions that are developed.²⁶⁵ If the cost of these failed inventions outweighs the social benefit to society of giving broad protection to successful inventions, then too broad a scope of protection can also cause rent dissipation.²⁶⁶ Rent-dissipation theory suggests that courts use the inventions’ perceived value and technological signals to balance scope-of-protection concerns.

In an infringement suit, when a court enforces a patent, it is discouraging competitors from the rent-dissipating activity of improving upon the existing commercial embodiment. Rent-dissipation theory

257. *Id.* at 321.

258. *Id.*

259. *Id.* at 320.

260. *Id.*

261. *Id.* at 321.

262. *See id.* at 307 (providing the example of Alexander Graham Bell and his invention of the telephone).

263. *See id.* at 318.

264. *See id.*

265. *See id.* at 307–08.

266. *Id.*

predicts that patents will be successfully enforced against infringing products or methods that fall within the asserted patent's signaled improvements.²⁶⁷ Professors Grady and Alexander argued that the technological information disclosed in a patent signals improvement and that size of the rent an inventor can extract corresponds to the quality of the signaled information.²⁶⁸ Rent-dissipation theory predicts that if an alleged infringing innovation is not within a range of signaled improvements, patent protection will not be available because the patent is not a product of the rent-dissipating activity to improve the invention.²⁶⁹ Alternatively, a narrower scope of protection allows competitors to extract rent for improvements to the invention, placing the initial inventor at a disadvantage.²⁷⁰ The doctrine of equivalents is an example of a judicially created doctrine that adheres to rent-dissipation theory's signaling idea. Professors Grady and Alexander cite *Graver Tank & Manufacturing Tank & Manufacturing v. Linde Air Products*²⁷¹ as recognition of the fact that a patentee's invention may signal infringing equivalents.²⁷² Thus, "[i]n the typical infringement case, a court need only apply hindsight to determine whether a second invention was within the signal of a patented device."²⁷³

In sum, rent-dissipation theory operates quite differently than reward or prospect theory. In contrast to reward theory's focus on patent acquisition, rent-dissipation theory attempts to explain the patent system in both a pre-invention and commercialization context. The fact that rent-dissipation theory takes into account a patent's signaled improvements and perceived value sets rent dissipation apart from reward and prospect theory. However, the signaling idea put forward by rent-dissipation theory seems to ignore the fact that it is the claims that define the metes and bounds of the invention, not what is described elsewhere in the patent. Further, it is questionable whether patent value, as determined under the theory, is an accurate way of determining an invention's value. Nevertheless, rent-dissipation theory attempts to account for these factors in response to the criticism that reward and prospect theory do not effectively predict the outcome of patent-infringement cases.²⁷⁴ Further, since rent-dissipation theory considers a patent's technical disclosure, the theory may provide more insight about patent enforcement and infringement issues.

267. See *id.* at 309.

268. See *id.* at 319.

269. *Id.* at 309.

270. See *id.* at 307.

271. 339 U.S. 605 (1950).

272. See Grady & Alexander, *supra* note 33, at 348 (citing *Graver Tank & Mfg.*, 339 U.S. 605).

273. *Id.* at 320.

274. See *id.* at 316.

C. Summary

The economic theories of the patent system are a useful tool to explain patent law's impact on inventors, innovation, and the commercialization of new technology. These theories suggest what types of inventions should be patented and how the courts should enforce patent rights. When patent law is consistent with economic theory, presumably the patent law is performing its economic function. Accordingly, analyzing the question of how the law should formulate a test for infringement of interactive method claims on the basis of economic theory may provide further support and insight into which proposals best support the economic function of the patent system.

III. A HISTORY OF DIVIDED INFRINGEMENT

This Part discusses the various doctrinal approaches the Federal Circuit has considered with respect to divided infringement. Following this Part, this Article attempts to analyze the doctrinal approaches within a theoretical economic framework. But first, this Article provides a detailed analysis of the particular doctrinal approaches.

Since 2007, various Federal Circuit judges have proposed four general categories of tests to determine if there should be liability for divided infringement. This Article refers to the first category of tests as the mastermind suite. These tests were introduced in *BMC Resources, Inc. v. Paymentech, L.P. (BMC Resources)*²⁷⁵ and *Muniauction, Inc. v. Thomson Corp. (Muniauction)*,²⁷⁶ and were modified in *Akamai Technologies, Inc. v. Limelight Networks, Inc. (Akamai)*²⁷⁷ and *McKesson Technologies Inc. v. Epic Systems Corp. (McKesson)*.²⁷⁸ The remaining three tests were introduced in each of the three opinions issued in the en banc *Akamai Technologies, Inc. v. Limelight Networks, Inc. (Akamai/McKesson I)*²⁷⁹ decision. These tests include the majority's partial-inducement rule, Judge Newman's proposed all-steps rule, and Judge Linn's joint-enterprise expansion of the control or direction test. As of August 15, 2015, Judge Linn's view was adopted in part by the Federal Circuit en banc in *Akamai/McKesson III*.²⁸⁰

275. 498 F.3d 1373 (Fed. Cir. 2007), *overruled by* *Akamai Techs., Inc. v. Limelight Networks, Inc. (Akamai/McKesson I)*, 692 F.3d 1301 (Fed. Cir. 2012) (en banc) (per curiam), *rev'd*, 134 S. Ct. 2111 (2014).

276. 532 F.3d 1318 (Fed. Cir. 2008).

277. 629 F.3d 1311 (Fed. Cir. 2010).

278. 98 U.S.P.Q. 2d (BNA) 1281 (Fed. Cir. 2011), *rev'd sub nom. Akamai/McKesson I*, 692 F.3d 1301, *rev'd*, 134 S. Ct. 2111 (2014).

279. 692 F.3d 1301.

280. See *Akamai Techs., Inc. v. Limelight Networks, Inc. (Akamai/McKesson III)*, 797 F.3d 1020, 1022 (Fed. Cir. 2015) (en banc) (per curiam).

These approaches attempt to identify behavior that should invoke liability among multiple parties participating in steps that lead to infringement of a method claim.²⁸¹ As of this writing, the Supreme Court has indicated that whether multiple parties can be liable for divided infringement is currently governed by the Federal Circuit's *Muniauction* decision.²⁸² Stated succinctly, direct infringement of a method patent occurs when all the claimed steps can be attributed to a single person.²⁸³ In order to place this rule in the proper context, the following Sections briefly review the Federal Circuit's divided-infringement jurisprudence.²⁸⁴

A. The "Mastermind" Suite

Four Federal Circuit cases comprise what this Article refers to as the mastermind suite of tests. The rule extracted from these cases attempts to set forth three principles for how a method claim may be infringed when the actions of more than one party combine to perform every step of the method claim. First, "the claim is directly infringed only if one party exercises 'control or direction' over the entire process such that every step is attributable to the controlling party."²⁸⁵ Second, "the control or direction standard is satisfied in situations where the law would traditionally hold the accused direct infringer vicariously liable for the acts committed by another party that are required to complete performance of a claimed method."²⁸⁶ Third, "there can only be joint infringement when there is an agency relationship between the parties who perform the method steps or when one party is contractually obligated to the other to perform the steps."²⁸⁷ The following Subsection discusses the first principle: the control or direction test.

281. See *Muniauction*, 532 F.3d at 1329–30.

282. See *Limelight Networks, Inc. v. Akamai Techs., Inc. (Akamai McKesson II)*, 134 S. Ct. 2111, 2119 (2014) (stating that the court "assume[s]" *Muniauction* is correct).

283. See *id.* at 2118.

284. Portions of this Section are adapted from this author's previous articles: W. Keith Robinson, *Ramifications of Joint Infringement Theory on Emerging Technology Patents*, 18 TEX. INTELL. PROP. L.J. 335 (2010); Robinson, *No "Direction" Home*, *supra* note 3; W. Keith Robinson, *A Case Study of Federal Circuit Policy Making*, 66 SMU L. REV. 579 (2013).

285. See *Muniauction*, 532 F.3d at 1329.

286. *Id.* at 1330 (citing *BMC Res., Inc. v. Paymentech, L.P. (BMC Resources)*, 498 F.3d 1373, 1379 (Fed. Cir. 2007)).

287. *Akamai Techs., Inc. v. Limelight Networks, Inc. (Akamai)*, 629 F.3d 1311, 1320 (Fed. Cir. 2010), *rev'd*, 692 F.3d 1301 (Fed. Cir. 2012) (en banc) (per curiam), *rev'd*, 134 S. Ct. 2111 (2014).

1. A Mastermind Must Assert Control or Direction

The Federal Circuit established a test for determining whether a single method claim could be infringed by the actions of multiple parties in two cases. In *BMC Resources*, the Federal Circuit held that, where multiple parties perform the steps of a method claim, the entire method must be performed at the control or direction of the alleged direct infringer.²⁸⁸ Accordingly, the Federal Circuit reasoned that if performance of every step of a claimed method could be attributable to a mastermind, the claim was infringed.²⁸⁹ Approximately one year later, in *Muniauction*, the Federal Circuit explained that the control or direction standard set forth in *BMC Resources* was met when “the law would traditionally hold the accused direct infringer vicariously liable for the acts committed by another party that are required to complete performance of a claimed method.”²⁹⁰

The mastermind test was a response to defendants that avoided infringement liability by simply arguing that they did not perform all the steps of an asserted claim, and plaintiffs’ insistence that any relationship between multiple participants was enough to invoke liability. For example, in *BMC Resources*, the defendant, Paymentech, asserted that it did not infringe the claims because “it did not perform all of the steps of the patented method by itself or in coordination with its customers and financial institutions.”²⁹¹ In response, BMC argued that the Federal Circuit’s decision in *On Demand Machine Corp. v. Ingram Industries, Inc.*²⁹² altered the law controlling joint infringement by multiple parties.²⁹³ Specifically, BMC argued that the *On Demand* court “adopted a ‘participation and combined action’ standard as the type of ‘connection’ a plaintiff must show to prove joint infringement.”²⁹⁴ Under the *On Demand* standard, BMC argued that Paymentech infringed the asserted claims.²⁹⁵

Paymentech was a financial transaction processing company that processed payment information collected by its merchant customers.²⁹⁶ Paymentech provided this information to a debit network and to financial institutions.²⁹⁷ The financial institutions would then send information

288. See *BMC Resources*, 498 F.3d at 1380–81.

289. See *id.* at 1381.

290. See *Muniauction*, 532 F.3d at 1330.

291. *BMC Resources*, 498 F.3d at 1377.

292. 442 F.3d 1331 (Fed. Cir. 2006).

293. *BMC Resources*, 498 F.3d at 1378.

294. *Id.* at 1380.

295. *Id.* at 1378.

296. See *id.* at 1375–76.

297. *Id.* at 1376.

regarding the status of the transaction back to Paymentech.²⁹⁸ When BMC demanded that Paymentech license its patents, Paymentech filed a declaratory judgment action against BMC asserting that it did not infringe BMC's patents—U.S. Patent Nos. 5,718,298 (the '298 patent) and 5,870,456 (the '456 patent).²⁹⁹ The patents asserted by BMC purported to cover a method for processing debit transactions in the absence of a personal identification number (PIN) and required the participation of several entities,³⁰⁰ including a customer using a telephone, an interactive voice response unit for interacting with the customer, a debit card network, and a financial institution.³⁰¹

BMC asserted that "Paymentech directly infringed claim 7 of the '456 patent and claim 2 of the '298 patent."³⁰² Claim 7 of the '456 patent depends on claim 6.³⁰³ Claims 6 and 7 are reproduced below:

6. A method of paying bills using a telecommunications network line connectable to at least one remote payment card network via a payee's agent's system wherein a caller begins session using a telecommunications network line to initiate a spontaneous payment transaction to payee, the method comprising the steps of:

prompting the caller to enter a payment number from one or more choices of credit or debit forms of payment;

prompting the caller to enter a payment amount for the payment transaction;

accessing a remote payment network associated with the entered payment number, the accessed remote payment network determining, during the session, whether sufficient available credit or funds exist in an account associated with the payment number to complete the payment transaction, and upon a determination that sufficient available credit or funds exist in the associated account, charging the entered payment amount against the account associated with the entered payment number, adding the entered payment amount to an account associated with the entered account number, and storing the account number, payment number and payment amount in a transaction file of the system.

7. The method of claim 6 wherein said payment is a PIN-less

298. *Id.*

299. *See id.* at 1375–76.

300. *Id.* at 1375.

301. *Id.*

302. *Id.* at 1376.

303. *Id.*

credit or debit card number.³⁰⁴

Claim 2 of the '298 patent depends on claim 1.³⁰⁵ Both claims 1 and 2 are reproduced below:

1. A method of paying bills using a telephone connectable to at least one remote payment card network via a payee's agent's system, wherein a caller places a call using said telephone to initiate a spontaneous payment transaction that does not require pre-registration, to a payee, the method comprising the steps of: prompting the caller to enter an account number using the telephone, the account number identifying an account of a payor with the payee in connection with the payment transaction;

responsive to entry of an account number, determining whether the entered account number is valid;

prompting the caller to enter a payment number using the telephone, the payment number being selected at the discretion of the caller from any one of a number of credit or debit forms of payment;

responsive to entry of the payment, determining whether the entered payment number is valid;

prompting the caller to enter a payment amount for the payment transaction using the telephone;

responsive to a determination that a payment amount has been entered and further responsive to a determination that the entered account number and payment number are valid, and during the call;

accessing a remote payment network associated with the entered payment number, the accessed remote payment network determining, during the call, the account associated with the entered payment number to complete the payment transaction;

accessing a remote payment network associated with the entered payment number, the accessed remote payment network determining, during the call, whether sufficient available credit or funds exist in an account associated with the entered payment number to complete the payment

304. U.S. Patent No. 5,870,456 col.12, l.52–col.14, l.2 (filed Oct. 7, 1997).

305. *BMC Resources*, 498 F.3d at 1377.

transaction;

responsive to a determination that sufficient available credit or funds exist in the associated account, charging the entered payment amount against the account associated with the entered payment number, adding the entered payment amount to an account associated with the entered account number, informing the caller that the payment transaction has been authorized, and storing the account number, payment number and payment amount in a transaction log file of the system during the call; and

responsive to determination that sufficient available credit or funds do not exist in the associated account, informing the caller during the call that the current payment transaction has been declined and terminating the current payment transaction.

2. The method of claim 1 wherein said payment number is a debit card number.³⁰⁶

Considering the merits of the case, first the *BMC Resources* court explained that the jury instruction in *On Demand* had no bearing on the case before the court.³⁰⁷ Second, the court described the requirements for direct infringement liability. Specifically, the Federal Circuit explained that “[d]irect infringement requires a [single] party to perform or use each and every step or element of a claimed method or product.”³⁰⁸ Further, the court said that there could only be liability under indirect infringement if there was first a commitment of the entire act of direct infringement by one of the accused participants.³⁰⁹

In the absence of a direct infringer, the *BMC Resources* court explained that a first party that controls the conduct of a second party is vicariously liable for the acts of the second party.³¹⁰ In support of this principle, the court referred to other courts that faced divided infringement and “refused to find liability where one party did not control or direct each step of the patented process.”³¹¹ Thus, an alleged infringer could not avoid liability for direct infringement by having another party perform one of the claimed steps on its behalf.³¹² The Federal Circuit

306. U.S. Patent No. 5,715,298 col.12, ll.6–53 (filed Jan. 22, 1997).

307. *BMC Resources*, 498 F.3d at 1380.

308. *Id.* at 1378–79.

309. *Id.* at 1379.

310. *Id.*

311. *Id.* at 1380.

312. *Id.* at 1381.

reasoned that “[i]n those cases, the party in control would be liable for direct infringement. It would be unfair indeed for the mastermind in such situations to escape liability.”³¹³

Unfortunately, the control or direction test created a loophole. The *BMC Resources* court noted that parties could avoid infringement under the control or direction standard by entering into arms-length agreements.³¹⁴ However, the court warned that “expanding the rules governing direct infringement to reach independent conduct of multiple actors would subvert the statutory scheme for indirect infringement.”³¹⁵ Thus, while the Federal Circuit acknowledged that “the standard requiring control or direction for a finding of joint infringement may in some circumstances allow parties to enter into arms-length agreements to avoid infringement,” the court opined that these concerns could be addressed by proper claim drafting.³¹⁶

Applying its control or direction test to the facts, the *BMC Resources* court observed that BMC’s claims implicated the participation of four separate entities.³¹⁷ The court, however, found that there was no evidence that Paymentech controlled or directed its customers or the financial institutions it exchanged data with.³¹⁸ Consequently, since Paymentech did not perform all the claimed steps or control or direct others to perform all the claimed steps, the Federal Circuit concluded that Paymentech did not infringe the claims.³¹⁹

Approximately one year later in *Muniauction*, the Federal Circuit was presented with another case in which a patentee asserted that the defendant was infringing the asserted patent under a theory of divided infringement.³²⁰ The patent at issue in *Muniauction*, U.S. Patent No. 6,161,099 (the ‘099 patent), was directed to conducting an auction of financial instruments over a network using a web browser.³²¹ Thompson owned the accused internet bidding process.³²² *Muniauction* asserted that Thompson infringed claims 1, 2, 9, 14, 18, 20, 24, 31, 32, 36, 40, 42, 46, and 56.³²³ Claim 1 is representative and is reproduced below:

1. In an electronic auction system including an issuer’s

313. *Id.*

314. *Id.*

315. *Id.*

316. *Id.* But see *Limelight Networks, Inc. v. Akamai Techs., Inc. (Akamai/McKesson II)*, 134 S. Ct. 2111, 2120 (2014) (suggesting that the Federal Circuit created the loophole by misinterpreting the requirements for direct infringement under § 271(a)).

317. See *BMC Resources*, 498 F.3d at 1381.

318. *Id.* at 1382.

319. *Id.*

320. See *Muniauction, Inc. v. Thomson Corp.*, 532 F.3d 1318, 1328 (Fed. Cir. 2008).

321. See *id.* at 1321–22.

322. See *id.* at 1323.

323. See *id.*

computer having a display and at least one bidder's computer having an input device and a display, said bidder's computer being located remotely from said issuer's computer, said computers being coupled to at least one electronic network for communicating data messages between said computers, an electronic auctioning process for auctioning fixed income financial instruments comprising:

inputting data associated with at least one bid for at least one fixed income financial instrument into said bidder's computer via said input device;

automatically computing at least one interest cost value based at least in part on said inputted data, said automatically computed interest cost value specifying a rate representing borrowing cost associated with said at least one fixed income financial instrument;

submitting said bid by transmitting at least some of said inputted data from said bidder's computer over said at least one electronic network; and

communicating at least one message associated with said submitted bid to said issuer's computer over said at least one electronic network and displaying, on said issuer's computer display, information associated with said bid including said computed interest cost value,

wherein at least one of the inputting step, the automatically computing step, the submitting step, the communicating step and the displaying step is performed using a web browser.³²⁴

Both parties acknowledged that Thompson did not perform all the steps of the claims.³²⁵ However, because the actions of the bidder could be attributed to Thompson as the auctioneer, the issue was whether Thompson infringed the claims.³²⁶

Summarizing its decision in *BMC Resources*, the Federal Circuit described a multiparty spectrum for direct infringement.³²⁷ At one end of the spectrum, the Federal Circuit explained, "where the actions of multiple parties combine to perform every step of a claimed method, the claim is directly infringed only if one party exercises 'control or

324. U.S. Patent No. 6,161,099 col.14, l.41–col.15, l.2 (filed May 29, 1998).

325. *See Muniauction*, 532 F.3d at 1328.

326. *See id.* at 1329.

327. *See id.*

direction' over the entire process such that every step is attributable to the controlling party, i.e., the 'mastermind.'"³²⁸ At the other end of the spectrum, the court stated, "mere 'arms-length cooperation' [would] not give rise to direct infringement by any party."³²⁹ Given this spectrum, the *Muniauction* court concluded that one situation in which the control or direction standard would be satisfied is "where the law would traditionally hold the accused direct infringer vicariously liable for the acts committed by another party that are required to complete performance of a claimed method."³³⁰

Next, the Federal Circuit analyzed the facts to determine whether Thompson would be vicariously liable for the acts of the claimed bidders. The court noted that Thomson did not perform every step of the method claims nor did it have another party perform the steps on its behalf.³³¹ Further, the court found the fact "[t]hat Thomson control[ed] access to its system and instruct[ed] bidders on its use [was] not sufficient to incur liability for direct infringement."³³² Accordingly, the Federal Circuit found that Thompson did not infringe the asserted claims.³³³

In sum, *BMC Resources* held that, where multiple parties perform the steps of a method claim, the entire method must be performed at the control or direction of the alleged direct infringer for liability to exist.³³⁴ The *Muniauction* decision elaborated, holding that "the control or direction standard is satisfied in situations where the law would traditionally hold the accused direct infringer vicariously liable for the acts committed by another party that are required to complete performance of a claimed method."³³⁵ As previously mentioned, the Supreme Court's recent opinion in *Limelight Networks, Inc. v. Akamai Technologies, Inc. (Akamai/McKesson II)*³³⁶ assumed that the holdings in *Muniauction* were correct while at the same time questioning whether "the Federal Circuit erred by too narrowly circumscribing the scope of § 271(a)."³³⁷ In its August 2015 decision, *Akamai/McKesson III*,³³⁸ the en

328. *Id.*

329. *Id.*

330. *Id.* at 1330.

331. *Id.*

332. *Id.*

333. *Id.*

334. *BMC Res., Inc. v. Paymentech, L.P. (BMC Resources)*, 498 F.3d 1373, 1380–81 (Fed. Cir. 2007), *overruled by* *Akamai Techs., Inc. v. Limelight Networks, Inc. (Akamai/McKesson I)*, 692 F.3d 1301 (Fed. Cir. 2012) (en banc) (per curiam), *rev'd*, 134 S. Ct. 2111 (2014).

335. *Muniauction*, 532 F.3d at 1330.

336. 134 S. Ct. 2111.

337. *Id.* at 2117, 2119.

338. *See Akamai Techs., Inc. v. Limelight Networks, Inc. (Akamai/McKesson III)*, 797 F.3d 1020 (Fed. Cir. 2015) (en banc) (per curiam).

banc Federal Circuit endorsed the control or direction test while also expanding it to impose liability for infringement due to a joint enterprise.³³⁹ Other Federal Circuit cases, discussed below, have attempted to impose further restriction on the mastermind idea by specifying what relationships might satisfy the control or direction test.

2. A Third Party Must Be Contractually Obligated to or in an Agency Relationship with the Mastermind

In two cases after *Muniauction*, the Federal Circuit expanded on the idea that there must be a mastermind for multiparty infringement liability; it did so by attempting to identify the relationship that must exist between the mastermind and a third party. In *Akamai*, the Federal Circuit reasoned that the “control or direct” test must be read in the context of traditional agency law³⁴⁰ and that “direction,” no matter how explicit, is not an indicator of an agency relationship.³⁴¹ Further, in both *Akamai* and *McKesson*, the Federal Circuit held that the actions of another party could not be attributed to the accused infringer in the absence of an agency relationship or contractual obligation.³⁴² While both cases were eventually reheard en banc in *Akamai/McKesson I* and the doctrine further modified in a subsequent case,³⁴³ a brief review of the tests proposed in these earlier cases is useful.

In *Akamai*, Akamai Technologies, Inc. and the Massachusetts Institute of Technology (collectively, “Akamai”) sued Limelight Networks, Inc. (Limelight) for allegedly infringing three patents directed to Akamai’s content delivery network (CDN) service.³⁴⁴ The district court granted “judgment as a matter of law, overturning a jury verdict of infringement by Limelight of claims 19-21 and 34 of U.S. Patent No. 6,108,703 (the ‘703 patent’) and Akamai appealed to the Federal Circuit.”³⁴⁵

In addition to owning patents that purported to cover CDN systems and methods, Akamai also provided CDN services.³⁴⁶ A CDN is created with several connected computers.³⁴⁷ It optimizes the delivery of

339. *Id.* at 1022–23.

340. *Akamai Techs., Inc. v. Limelight Networks, Inc. (Akamai)*, 629 F.3d 1311, 1320 (Fed. Cir. 2010), *rev’d*, 692 F.3d 1301 (Fed. Cir. 2012) (en banc) (per curiam), *rev’d*, 134 S. Ct. 2111 (2014).

341. *Id.* at 1321.

342. *Id.* at 1320; *see also* *McKesson Techs. Inc. v. Epic Sys. Corp. (McKesson)*, 98 U.S.P.Q. 2d (BNA) 1281, 1285 (Fed. Cir. 2011), *rev’d sub nom. Akamai/McKesson I*, 692 F.3d 1301, *rev’d*, 134 S. Ct. 2111.

343. *Akamai/McKesson I*, 692 F.3d 1301.

344. *See Akamai*, 629 F.3d at 1316.

345. *Id.* at 1314.

346. *Id.* at 1315–16.

347. *See id.* at 1315.

information over the Internet by storing embedded objects of a website across different devices in different locations.³⁴⁸ A content provider uses a CDN service to store and serve embedded objects of its website.³⁴⁹ The embedded objects are “tagged” with a URL so that they can be served to customers properly.³⁵⁰

The two independent method claims asserted by Akamai at trial required a “tagging” step.³⁵¹ Claim 19 is representative and is reproduced below with emphasis on the “tagging” step:

19. A content delivery service, comprising:

replicating a set of page objects across a wide area network of content servers managed by a domain other than a content provider domain;

for a given page normally served from the content provider domain, tagging the embedded objects of the page so that requests for the page objects resolve to the domain instead of the content provider domain;

responsive to a request for the given page received at the content provider domain, serving the given page from the content provider domain; and

serving at least one embedded object of the given page from a given content server in the domain instead of from the content provider domain.³⁵²

At trial and on appeal, Akamai relied on a theory of divided infringement and asserted that Limelight directed or controlled its customers to perform the tagging step in both method claims.³⁵³ In response, Limelight argued that it did not perform at least the tagging step and therefore did not infringe the asserted claims.³⁵⁴ Instead, Limelight required its customers to do the tagging.³⁵⁵

In analyzing the facts, the Federal Circuit focused on when the acts of one entity could be attributed to another.³⁵⁶ The court reasoned that “the performance of a method step may be attributed to an accused infringer

348. *Id.* at 1315–16.

349. *Id.* at 1316.

350. *See id.*

351. *Id.*

352. U.S. Patent No. 6,108,703 col.19 ll.6–20 (filed May 19, 1999) (emphasis added).

353. *Akamai*, 629 F.3d at 1318.

354. *Id.* at 1322.

355. *See Limelight Networks, Inc. v. Akamai Techs., Inc. (Akamai/McKesson II)*, 134 S. Ct. 2111, 2115 (2014).

356. *See Akamai*, 629 F.3d at 1319.

when the relationship between the accused infringer and another party performing a method step is that of principal and agent”³⁵⁷ or “when a party is contractually obligated to the accused infringer to perform a method step.”³⁵⁸ Considering the facts, the court found that Limelight’s customers were neither agents of, nor contractually obligated to, Limelight.³⁵⁹ Accordingly, the Federal Circuit concluded that Limelight did not infringe Akamai’s asserted claims.³⁶⁰

The technology at issue in *McKesson* also related to the Internet.³⁶¹ The defendant, Epic Systems Corporation (Epic), developed MyChart software, which allowed patients and healthcare providers to exchange healthcare information via a webpage.³⁶² The plaintiff, McKesson, owned U.S. Patent No. 6,757,898 (the ‘898 patent) related to a method for sharing healthcare information via the Internet.³⁶³ McKesson alleged that Epic induced healthcare providers to infringe its patent.³⁶⁴ Claim 1 of the ‘898 patent is representative of the claims asserted against Epic and is reproduced below:

1. A method of automatically and electronically communicating between at least one health-care provider and a plurality of users serviced by the health-care provider, said method comprising the steps of:

initiating a communication by one of the plurality of users to the provider for information, wherein the provider has established a preexisting medical record for each user;

enabling communication by transporting the communication . . . ;

electronically comparing content of the communication . . . ;

returning the response to the communication automatically . . . ;

357. *Id.*

358. *Id.*

359. *Id.* at 1320–21 (holding that Limelight’s control over customers was similar to the relationship in *Muniauction*, and thus there was no agency).

360. *Id.* at 1314, 1322.

361. See *McKesson Info. Solutions LLC v. Epic Sys. Corp.*, 2009 U.S. Dist. LEXIS 88158, at *3–4 (N.D. Ga. Sept. 6, 2009).

362. See *McKesson Techs. Inc. v. Epic Sys. Corp. (McKesson)*, 98 U.S.P.Q. 2d (BNA) 1281, 1282 (Fed. Cir. 2011), *rev’d sub nom. Akamai Techs., Inc. v. Limelight Networks, Inc. (Akamai/McKesson I)*, 692 F.3d 1301 (Fed. Cir. 2012) (en banc) (per curiam), *rev’d*, 134 S. Ct. 2111 (2014).

363. *Id.*

364. *Id.*

said provider/patient interface providing a fully automated mechanism for generating a personalized page or area within the provider's Web site for each user serviced by the provider; and

said patient-provider interface service center for dynamically assembling and delivering customer content to said user.³⁶⁵

In response, Epic argued that its customers (the healthcare providers) did not perform the "initiating a communication" step and that Epic did not exercise "direction or control" over the party that performed the "initiating" step.³⁶⁶ The district court agreed with Epic and granted its renewed motion for summary judgment.³⁶⁷ On appeal, the Federal Circuit set out to determine whether the relationship between the providers and users of MyChart was sufficient to attribute the initiating step to the MyChart providers.³⁶⁸

Applying the agency or contractual obligation prong of the mastermind test set forth in *Akamai*, the Federal Circuit stated that the relationship between the MyChart healthcare providers and the MyChart customers was not an agency relationship, nor were the customers contractually obligated to the MyChart healthcare providers.³⁶⁹ Accordingly, the Federal Circuit found that McKesson's claims were not infringed.³⁷⁰

In *Akamai/McKesson I*, the Federal Circuit reheard en banc both the *McKesson* and *Akamai* cases,³⁷¹ and rejected the mastermind test.³⁷² In the various opinions that ensued, the en banc panel introduced three new tests for divided infringement. These tests include the majority's partial-inducement rule,³⁷³ Judge Linn's proposed joint-enterprise expansion,³⁷⁴ and Judge Newman's proposed all-steps rule.³⁷⁵ Since the Supreme Court recently rejected the partial-inducement rule,³⁷⁶ and the Federal Circuit

365. U.S. Patent No. 6,757,898 col.44 l.60–col.45 l.24 (filed Jan. 18, 2000) (emphasis added).

366. *McKesson*, 98 U.S.P.Q.2d (BNA) at 1283.

367. *Id.*

368. *Id.*

369. *Id.* at 1284.

370. *Id.*

371. *Akamai Techs., Inc. v. Limelight Networks, Inc. (Akamai/McKesson I)*, 692 F.3d 1301 (Fed. Cir. 2012) (en banc) (per curiam), *rev'd*, 134 S. Ct. 2111 (2014).

372. *Id.* at 1306.

373. *Id.* at 1306, 1309.

374. *Id.* at 1350 (Linn, J., dissenting).

375. *Id.* at 1337–38 (Newman, J., dissenting).

376. *Akamai Techs., Inc. v. Limelight Networks, Inc. (Akamai/McKesson II)*, 134 S. Ct. 2111, 2117–18 (2014).

recently revived the control or direction test in conjunction with the joint-enterprise test,³⁷⁷ this area of law is in so much flux that it is instructive to explore each of these rules in detail. To begin, the next Section examines the partial-inducement rule and why the Supreme Court rejected it.

B. *Partial Inducement*

In the Federal Circuit's rehearing of *Akamai/McKesson I*, the majority departed from the mastermind tests discussed above and created a new test for divided infringement based on inducement. In issuing its opinion, the majority acknowledged that doctrinal problems arise "when the acts necessary to give rise to liability for direct infringement are shared between two or more actors."³⁷⁸ In order to address these problems, the majority relied on the concept of induced infringement under 35 U.S.C. § 271(b).³⁷⁹

In previous cases, the Federal Circuit had held that a defendant was liable for infringement under § 271(b) only if the defendant directed or controlled another party to perform all the claimed steps.³⁸⁰ However, the majority in *Akamai/McKesson I* overruled this portion of *BMC Resources*.³⁸¹ The *Akamai/McKesson I* majority specifically held that there could be liability for induced infringement where all the steps are not performed by a single entity.³⁸² For example, a party could be liable under § 271(b) if it induced others to collectively perform the claimed method steps or performed some steps and induced others to perform the remaining steps.³⁸³

The majority's rationale for its partial-inducement rule came from several sources. Relying on the House Report on the 1952 Patent Act, the majority reasoned that inducement applies to divided infringement cases because "one who aids or abets infringement is likewise an infringer."³⁸⁴ Further, the decision asserted that analogies to imposing liability for induced infringement could be found in both criminal and tort law.³⁸⁵ In addition, the majority reasoned that § 271 defined different conduct as infringement that did not require a finding of infringement under

377. See *Akamai Techs., Inc. v. Limelight Networks, Inc. (Akamai/McKesson III)*, 797 F.3d 1020, 1022–23 (Fed. Cir. 2015) (en banc) (per curiam).

378. *Akamai/McKesson I*, 692 F.3d at 1305–06 (acknowledging that with respect to method patents, parties can, and often do, share the performance of method steps between them).

379. *Id.*

380. See *id.* at 1306.

381. *Id.*

382. *Id.*

383. *Id.* at 1309.

384. *Id.*

385. See *id.* at 1311–12.

§ 271(a).³⁸⁶ Accordingly, the opinion explained that an act of infringement under § 271(b) need not qualify as an act of infringement under § 271(a).³⁸⁷ Finally, in support of its inducement-only rule, the majority reasoned that an inducer has the same impact on the patentee whether inducing one party or multiple parties to infringe.³⁸⁸

The Supreme Court rejected this approach. In reversing the Federal Circuit, Justice Samuel Alito wrote that the partial-inducement test “would require the courts to develop two parallel bodies of infringement law.”³⁸⁹ Instead, relying on *Aro Manufacturing Co. v. Convertible Top Replacement Co.*,³⁹⁰ the Court clarified that liability for inducement can only arise if there is direct infringement.³⁹¹ By itself, this statement was enough to reject the *Akamai/McKesson I* majority’s partial-inducement test.³⁹² Importantly, the Supreme Court also acknowledged that the Federal Circuit’s legal interpretation of the patent infringement statutes at that time could permit a party to evade liability by splitting up performance of a method with another defendant.³⁹³ However, the Court declined to address the key question of whether multiple parties could directly infringe a method claim under § 271(a).³⁹⁴ Instead, the Court remanded the case back to the Federal Circuit.³⁹⁵

The dissents in *Akamai/McKesson I* are important because they, in part, reflect the Federal Circuit’s most recent views on divided infringement. Both dissents harshly criticized the majority for making new policy.³⁹⁶ In response to the majority’s partial-inducement rule, Judge Linn argued in his dissent that inducement of a partial act that is not itself infringement is not inducement of any prohibited conduct under the act.³⁹⁷ Further, Judge Newman criticized the majority for creating

386. *Id.* at 1309.

387. *See id.*

388. *Id.*

389. *Limelight Networks, Inc. v. Akamai Techs., Inc. (Akamai/McKesson II)*, 134 S. Ct. 2111, 2118 (2014).

390. 365 U.S. 336 (1961).

391. *Akamai/McKesson II*, 134 S. Ct. at 2117 (citing *Aro Mfg.*, 365 U.S. at 341).

392. *Id.* at 2117–18 (explaining that conduct that would be infringing in altered circumstances cannot form the basis for inducement).

393. *Id.* at 2120 (suggesting that the legal loophole resulted from the Federal Circuit’s interpretation of § 271(a) as articulated in *Muniauction*).

394. *See id.*

395. *Id.* (stating that the decision gave the Federal Circuit the opportunity to revisit the definition of infringement under § 271(a)).

396. *See Akamai Techs., Inc. v. Limelight Networks, Inc. (Akamai/McKesson I)*, 692 F.3d 1301, 1321, 1329 (Fed. Cir. 2012) (en banc) (Newman, J., dissenting) (per curiam), *rev’d*, 134 S. Ct. 2111 (2014); *id.* at 1337 (Linn, J., dissenting).

397. *Id.* at 1345 (Linn, J., dissenting).

additional opportunities for gamesmanship and abuse,³⁹⁸ Judge Newman interpreted the majority's opinion as assigning liability solely to the party inducing infringement while exonerating the party that was induced.³⁹⁹

C. The All-Steps Test

In Judge Newman's *Akamai/McKesson I* dissent, she argued that infringement of an interactive method claim occurs when all of the claimed steps are performed regardless of how many parties are involved or the nature of their relationship.⁴⁰⁰ After having determined that there was infringement, Judge Newman proposed that liability for infringement by multiple parties should be assessed using tort principles of apportionment.⁴⁰¹ The apportionment calculus would consider factors such as an entity's relative contribution to the injury, the economic benefit received by the infringer, and the knowledge or culpability of the contributory infringer.⁴⁰² According to Judge Newman's rule, one or more parties infringe a method claim if all its steps are performed.⁴⁰³

In the divided-infringement cases she has heard, Judge Newman has expressed strong opinions about affording internet-age patents the opportunity to be enforced. In *McKesson*, Judge Newman argued that the court's agency or contractual obligation rule eliminated the incentive for inventors to pursue patents on interactive inventions.⁴⁰⁴ The rationale for Judge Newman's rule was based, in part, on her belief that more than one participant can directly infringe a method claim.⁴⁰⁵ Further, Judge Newman's test was based on the principle that an entity that wrongfully appropriates an invention violates the inventor's patent rights.⁴⁰⁶ In support of her position, Judge Newman referenced the Federal Circuit's approval of a jury instruction in *On Demand*.⁴⁰⁷ The jury instruction in *On Demand* provided that it was not necessary for acts of infringement to be performed by one person and that more than one person may be

398. *Id.* at 1320 (Newman, J., dissenting).

399. *Id.*

400. *Id.* at 1326.

401. *Id.* at 1331.

402. *Id.*

403. *Id.* at 1337–38.

404. *McKesson Techs. Inc. v. Epic Sys. Corp. (McKesson)*, 98 U.S.P.Q. 2d (BNA) 1281, 1286–88 (Fed. Cir. 2011) (Newman, J., dissenting) (questioning the court's interpretation of precedent that resulted in the "single-entity rule" of infringement being held as an absolute rule of law and stating that the decision left interactive methods more susceptible to infringement), *rev'd sub nom. Akamai/McKesson I*, 692 F.3d 1301, *rev'd*, 134 S. Ct. 2111 (2014).

405. *See Akamai/McKesson I*, 692 F.3d at 1322 (Newman, J., dissenting).

406. *Id.* at 1324.

407. *Id.* at 1325 (citing *On Demand Mach. Corp. v. Ingram Indus., Inc.*, 442 F.3d 1331, 1344–45 (2006)).

jointly liable for patent infringement.⁴⁰⁸ Further, Judge Newman argued that the *Akamai/McKesson I* majority's new rule created new problems for enforcement and compensation as well as "new opportunities for gamesmanship and abuse and inequity."⁴⁰⁹ Judge Newman asserted that the majority focused only on the alleged inducer who would then be solely liable even if divided infringement were proven.⁴¹⁰

The overall principle guiding Judge Newman's argument is that a patent right must afford its owner the right to exclude others from making, using, or selling the invention.⁴¹¹ Accordingly, the law eliminates the incentive for patenting if it does not impose liability when a patent is infringed by collaboration, joint action, or other cooperative activity.⁴¹² Thus, Judge Newman argued that infringement of an interactive method claim occurs "when all the claimed steps are conducted, whether by a single entity or in interactions or collaboration."⁴¹³ One could conclude then, that Judge Newman would find all the claims at issue in *Akamai* and *McKesson I* infringed. Then, under her apportionment solution, the only outstanding issue would be for a court to assess liability to all the parties involved in the infringement based on factors such as the relative contribution to the injury, the economic benefit received by the infringer, and the knowledge or culpability of the contributory infringer.⁴¹⁴ In assigning liability in this way, Judge Newman argued, the damages attributed to so-called innocent actors would be insignificant.⁴¹⁵

D. *The Joint Enterprise*

In contrast to Judge Newman, Judge Linn argued that the "control or direction" test was the proper test for divided infringement liability.⁴¹⁶ Judge Linn relied on the Supreme Court's statement in *Aro Manufacturing* that direct infringement must occur for there to be

408. *Id.*

409. *Id.* at 1320.

410. *See id.*

411. *See McKesson Techs. Inc. v. Epic Sys. Corp. (McKesson)*, 98 U.S.P.Q. 2d (BNA) 1281, 1291 (Fed. Cir. 2011) (Newman, J., dissenting) ("A patent that cannot be enforced on any theory of infringement, is not a statutory patent right."), *rev'd sub nom. Akamai/McKesson I*, 692 F.3d 1301, *rev'd*, 134 S. Ct. 2111 (2014).

412. *Id.* at 1286 (stating that the majority decision left interactive methods more susceptible to infringement).

413. *Akamai/McKesson I*, 692 F.3d at 1336 (Newman, J., dissenting).

414. *See id.* at 1331.

415. *See id.* at 1332.

416. *See id.* at 1324 (majority opinion) (stating that *BMC Resources* provided the "control or direction" standard); *id.* at 1337–38 (Linn, J., dissenting) (arguing that the standard established in *BMC Resources* should be followed).

contributory infringement.⁴¹⁷ In addition to upholding the “control or direction” test, Judge Linn suggested expanding the idea of vicarious liability to include participation “in a joint enterprise to practice each and every limitation of the claim.”⁴¹⁸ Judge Linn explained that a joint enterprise exists:

when there is (1) an agreement, express or implied, among the members of the group; (2) a common purpose to be carried out by the group; (3) a community of pecuniary interest in that purpose, among the members; and (4) an equal right to a voice in the direction of the enterprise, which gives an equal right of control.⁴¹⁹

In rejecting the majority’s partial-inducement test, Judge Linn accused the majority of playing policy maker.⁴²⁰ The judge argued that Congress, given the recent enactment of the America Invents Act,⁴²¹ had an opportunity to change the law, but since it did not, it must have been satisfied with the decisions in *BMC Resources* and *Muniauction*.⁴²² Judge Linn asserted, first, that there cannot be contributory or induced infringement without direct infringement.⁴²³ Second, he defined direct infringement as only occurring when all the steps of a claimed method are practiced by a single entity, vicariously or via a joint enterprise.⁴²⁴ Joint enterprises are individual participants who act together to infringe a patent.⁴²⁵ The acts of one member are imputed to the others, thus creating a separate infringing consciousness referred to as a joint enterprise.⁴²⁶ According to Judge Linn’s dissent, an entity that participates in a joint enterprise to infringe a claim is liable as a direct infringer under § 271(a).⁴²⁷

Judge Linn’s expansion of the “control or direction” test to include a joint enterprise leads to a curious result. Based on this approach, Judge Linn’s dissent claims that the decision in *Golden Hour Data Systems, Inc.*

417. See *id.* at 1340 (Linn, J., dissenting) (citing *Aro Mfg. Co. v. Convertible Top Replacement Co.*, 365 U.S. 336, 341 (1961)).

418. *Id.* at 1350.

419. *Id.* at 1349 (quoting RESTATEMENT (SECOND) OF TORTS § 491 cmt. c (1965)).

420. *Id.* at 1341–42.

421. Pub. L. No. 112-29, 125 Stat. 284 (codified in scattered sections of 35 U.S.C.).

422. *Akamai/McKesson I*, 692 F.3d at 1343.

423. *Id.* at 1337 (reviewing statutory provisions § 271(a)–(c) and concluding that if the entire invention is not practiced as required under 35 U.S.C. § 271(a), then there can be no infringement under subsections (b) or (c)).

424. *Id.* at 1337–38.

425. See *id.* at 1349.

426. See *id.*

427. See *id.* at 1350.

v. *emsCharts, Inc.*,⁴²⁸ where two parties each performed separate steps of a claimed method for their mutual benefit, should be overturned.⁴²⁹ In *Golden Hour*, the patent at issue—U.S. Patent 6,117,073 (the ‘073 patent)—was directed to an integrated system for use in emergency medical transportation.⁴³⁰ The patent disclosed methods and systems for integrating services such as dispatch, clinical service, and billing data with the tracking of medical transports such as helicopters.⁴³¹

The accused infringers were *emsCharts* and *Softtech*. Defendant *emsCharts* produced a web-based program (also “*emsCharts*”) that stored patient information and provided billing services.⁴³² *Softtech* made flight dispatch software (*Flight Vector*) that helped coordinate patient pickup and delivery, and provided flight-tracking capabilities.⁴³³ *Softtech* and *emsCharts* partnered together to enable their respective programs to complement each other, marketing and selling their programs as a unit.⁴³⁴ In her dissent, Judge Newman characterized the relationship between *emsCharts* and *Softtech* as a strategic partnership to sell an infringing product.⁴³⁵ Further, the press release announcing their collaboration stated that “[t]his partnership allows *emsCharts* to combine their existing product line with *Softtech*’s CAD [Computer Aided Dispatch] technology, enabling them to deliver a complete pre-hospital data solution for Emergency Medical Services.”⁴³⁶

Based upon this collaboration, *Golden Hour* accused *emsCharts* and *Softtech* of jointly infringing claims 1, 6–8 and 15–22 of the ‘073 patent.⁴³⁷ Claim 15 is a representative method claim and is reproduced below:

15. A computerized method of generating a patient encounter record, comprising the steps of:

collecting flight information relating to an emergency transport crew dispatch;

428. 614 F.3d 1367 (Fed. Cir. 2010).

429. *Akamai/McKesson I*, 692 F.3d at 1350; see also *Golden Hour*, 614 F.3d at 1382–83 (Newman, J., dissenting) (noting that at trial, the jury found that *emsCharts* and *Softtech* enabled their respective programs to work together such that their combined system, which they sold as a package, met all the limitations of several of the asserted claims).

430. See *Golden Hour*, 614 F.3d at 1369 (majority opinion).

431. *Id.*

432. *Id.* at 1371.

433. *Id.*

434. *Id.*

435. *Id.* at 1383 (Newman, J., dissenting).

436. *Id.*

437. *Id.* at 1371 (majority opinion).

collecting patient information from a clinical encounter associated with a patient incident requiring emergency medical care by the emergency transport crew; and

integrating the patient information with the flight information to produce an encounter record indicative of the patient's clinical encounter.⁴³⁸

The jury found that emsCharts and Softtech had jointly infringed the asserted claims, and it awarded Golden Hour \$3,500,000 in damages.⁴³⁹ During a bench trial, the District Court overturned the jury verdict, asserting that neither emsCharts nor Softtech satisfied the direction or control test.⁴⁴⁰ On appeal, without much analysis, the Federal Circuit agreed with the District Court that there was no evidence that either emsCharts or Softtech directed or controlled the other to infringe Golden Hour's claims.⁴⁴¹

If the District Court had applied Judge Linn's joint-enterprise test, it would likely have led to a different result. Softtech and emsCharts agreed to work together. Their collaboration was for the purpose of providing customers with "a complete pre-hospital data solution for Emergency Medical Services."⁴⁴² Presumably, both companies would reap financial benefits from selling their integrated software. Finally, if there was no evidence that one party controlled or directed the other, one could conclude that emsCharts and Softtech had an "equal right of control" over their joint venture. Accordingly, under Judge Linn's joint-enterprise test, the court would likely have found that emsCharts and Softtech infringed Golden Hour's patents. Thus, the effect of Judge Linn's joint-enterprise expansion is that it carves out a narrow opportunity for interactive claims to be enforced against certain active parties, while still protecting innocent actors from infringement liability.

IV. ECONOMIC THEORY AND ENFORCING INTERACTIVE PATENTS

The divided infringement tests discussed above all attempt to balance the law's interest in encouraging innovation with its obligation to enforce patents against those who misappropriate others' inventions. Economists have proposed several theories that attempt to explain how to strike this balance. Economic theory can be a useful lens through which to view patent enforcement mechanisms. This Part offers an examination of the relationship between three prevalent economic theories of patent law—

438. U.S. Patent No. 6,117,073 col.21, l.54–col.22, l.6 (filed Mar. 2, 1998).

439. See *Golden Hour*, 614 F.3d at 1372 (majority opinion).

440. See *id.* at 1372–73.

441. See *id.* at 1380–81.

442. See *id.* at 1383 (Newman, J., dissenting).

reward theory, prospect theory, and rent-dissipation theory—and divided infringement. It also considers whether divided infringement jurisprudence has progressed the way scholars might have predicted in light of the three economic theories and concludes that it has.

A. *Stimulating Innovation*

Reward theory predicts that the patent system will implement a high standard for patentability and enforcement of patent rights.⁴⁴³ Thus, the relevant question under reward theory is whether the invention being asserted is worth the social costs of a monopoly.⁴⁴⁴ With respect to divided infringement, reward theory asks whether the social benefit of enforcing a multi-participant, interactive patent outweighs the social cost of subjecting multiple parties to liability.⁴⁴⁵ The Federal Circuit's answer to this question is yes, but only under certain circumstances.

Accordingly, in most of the divided infringement tests discussed *supra*, in addition to all of the claimed steps being performed, there is some other requirement that must be satisfied for liability to attach. Specifically, these tests are consistent with reward theory in only enforcing interactive claims where there is evidence of (1) a mastermind, (2) a joint enterprise, or (3) induced infringement.

1. The All-Steps Test Is Inconsistent with Reward Theory

Judge Newman's all-steps test seems to be inconsistent with reward theory. The test Judge Newman proposes for divided infringement states that infringement of an interactive method claim occurs when all of the claimed steps are performed, regardless of how many parties are involved or the nature of their relationship.⁴⁴⁶ In theory, Judge Newman's test for divided infringement would probably make it easier for patentees to enforce interactive claims.

However, this lower bar of patent enforceability is inconsistent with reward theory, which predicts that the patent system will implement a high bar for patentability and enforcement of patent rights.⁴⁴⁷ Thus, only inventions worth the social costs of a monopoly will be patented and enforced.⁴⁴⁸

443. Rhodes, *supra* note 23, at 1080.

444. See Kitch, *supra* note 38, at 284.

445. See Rhodes, *supra* note 23, at 1080.

446. *Akamai Techs., Inc. v. Limelight Networks, Inc. (Akamai/McKesson I)*, 692 F.3d 1301, 1326 (Fed. Cir. 2012) (en banc) (Newman, J., dissenting) (per curiam), *rev'd*, 134 S. Ct. 2111 (2014).

447. See Rhodes, *supra* note 23, at 1080.

448. See *id.*

Judge Newman has consistently argued that interactive claims covering internet-age inventions are worthy of a monopoly.⁴⁴⁹ And her divided infringement test imposes a lower standard for infringement than that articulated in § 271(a).⁴⁵⁰ Further, Judge Newman's all-steps test advocates ignoring the single-entity doctrine and suggests that if one or multiple actors perform the steps of a claim, it is infringed.⁴⁵¹ Most importantly, in the reward theory context, Judge Newman's test assumes that the social benefit of all interactive method claims outweighs the social cost. Accordingly, Judge Newman's test is inconsistent with reward theory because it does not help courts answer the key question of whether the interactive patent at issue is worthy of a monopoly.

2. Tests That Are Consistent with Reward Theory

Reward theory predicts that any of the mastermind tests are acceptable for determining liability for divided infringement. This theory suggests that the patent system should impose a high bar to patentability and enforcement of patent rights.⁴⁵² Thus, under the reward theory, courts have very little wiggle room in interpreting the patent infringement statute.

The mastermind tests are the Federal Circuit's attempt to define an exception to the single-entity rule for direct infringement under 35 U.S.C. § 271(a).⁴⁵³ The single-entity rule asserts that for a party to be liable for direct infringement of a method claim under § 271(a), that party must perform each and every step of the claimed method.⁴⁵⁴ Accordingly, under a rigid interpretation of § 271(a) and the single-entity rule, a party that performed only some steps of a claimed method would not be liable for infringement. Thus, the mastermind tests create a very narrow exception to the single-entity rule by expanding liability to a third party only when an agency relationship exists or there is a contractual

449. See *McKesson Techs. Inc. v. Epic Sys. Corp. (McKesson)*, 98 U.S.P.Q. 2d (BNA) 1281, 1285–89 (Fed. Cir. 2011) (Newman, J., dissenting) (questioning the court's interpretation of precedent that resulted in the "single-entity rule" of infringement being held as an absolute rule of law and stating that the majority decision leaves interactive methods more susceptible to infringement), *rev'd sub nom. Akamai/McKesson I*, 692 F.3d 1301, *rev'd*, 134 S. Ct. 2111.

450. See *Akamai/McKesson I*, 692 F.3d at 1307 (majority opinion) (stating that "[t]his court has held that for a party to be liable for direct patent infringement under 35 U.S.C. § 271(a), that party must commit all the acts necessary to infringe the patent"). In contrast, Judge Newman's test only considers when all of the steps are performed. *Id.* at 1326 (Newman, J., dissenting).

451. See *id.*

452. See Rhodes, *supra* note 23, at 1080.

453. See *supra* Section III.A.

454. See *BMC Res., Inc. v. Paymentech, L.P. (BMC Resources)*, 498 F.3d 1373, 1379 (Fed. Cir. 2007), *overruled by Akamai/McKesson I*, 692 F.3d 1301, *rev'd*, 134 S. Ct. 2111.

obligation.⁴⁵⁵ By tailoring this exception narrowly, proponents of the mastermind tests are asserting that parties in these relationships are the equivalent of a single entity.

Reward theory also provides insight as to how the patent system should balance the social cost and benefit of interactive claims. By making liability dependent upon the existence of rigid, legally defined relationships, the proponents of the mastermind tests are expressing their view that the social cost of enforcing interactive patents on society is high. However, reward theory would completely bar enforcement of interactive claims if they lacked value and social utility.⁴⁵⁶ To the contrary, evidence that two parties may have (1) contracted or (2) entered into an agency relationship to perform steps of a patented method suggests that the invention is valuable to society.⁴⁵⁷ A single party would not perform steps of a claimed method if they were not valuable in some way. Similarly, a party would not likely perform steps in conjunction with an agent or contractual partner unless the performance of those steps also provided value.

Judge Linn's expansion of divided infringement liability to include "joint enterprise" activities is also consistent with reward theory. Reward theory holds that an inventor should be able to recoup the cost of developing the invention⁴⁵⁸ and appropriate the full economic benefit of her invention.⁴⁵⁹ Judge Linn's joint-enterprise test includes a pecuniary interest requirement.⁴⁶⁰ That is, for multiple parties to be liable for divided infringement, they must have a pecuniary interest in the performance of the infringing steps.⁴⁶¹ Presumably, the pecuniary interest being appropriated by these multiple parties is covered by the patentee's claims. Thus, the joint-enterprise test seeks to prevent a group of participants from appropriating a pecuniary benefit from practicing another's invention.

455. See *McKesson Techs. Inc. v. Epic Sys. Corp.* (*McKesson*), 98 U.S.P.Q. 2d (BNA) 1281, 1284–85 (Fed. Cir. 2011), *rev'd sub nom. Akamai/McKesson I*, 692 F.3d 1301, *rev'd*, 134 S. Ct. 2111.

456. See Rhodes, *supra* note 23, at 1080 (explaining that the social benefit of granting an applicant a patent must outweigh the social cost of being subject to the resulting limited patent monopoly).

457. Cf. *McKesson*, 98 U.S.P.Q. 2d at 1285 (noting that there must be an agency relationship or contractual obligation for liability to exist).

458. Rhodes, *supra* note 23, at 1078.

459. MERGES ET AL., *supra* note 35, at 131.

460. See *Akamai/McKesson I*, 692 F.3d at 1349 (Linn, J., dissenting) (citing RESTATEMENT (SECOND) OF TORTS § 491 cmt. c (1965)).

461. See *id.* at 1349–50.

Further, reward theory also suggests that a patent must be able to exclude free riders.⁴⁶² The joint-enterprise test requires that there be some agreement and common purpose among alleged infringing parties.⁴⁶³ These requirements target parties that have agreed to benefit from the performance of a claimed method without licensing the invention. Therefore, Judge Linn's joint-enterprise test is also an attempt to exclude free riders from benefiting from a patent without licensing the claimed technology.

The joint-enterprise test also affirms that interactive claims are worthy of a monopoly.⁴⁶⁴ Judge Linn's statement that the court's decision in *Golden Hour* would be overturned under the joint-enterprise test⁴⁶⁵ and the Federal Circuit's most recent en banc decision in *Akamai/McKesson III*⁴⁶⁶ are significant evidence that interactive claims are worthy of a patent right and should be enforced. Reward theory would predict that a court could use Judge Linn's joint-enterprise test to determine divided infringement liability.

Finally, the majority's now rejected partial-inducement rule in *Akamai/McKesson I* is also consistent with reward theory.⁴⁶⁷ Reward theory predicts that courts will set a high bar for patentability and enforcement of inventions.⁴⁶⁸ Although it is less rigid than the "control or direction" test in *BMC Resources*,⁴⁶⁹ the partial-inducement rule is still a relatively high bar for enforcement of a patent. Under the partial-inducement rule, a party that induces others to collectively perform claimed method steps, or that performs some of the steps and induces others to perform the remaining steps, is liable for infringement under § 271(b).⁴⁷⁰

The inducement rule is not as rigid as the other divided infringement tests discussed in this Article because instead of carving out a narrow exception to the single-entity rule, it avoids the single entity analysis

462. Rhodes, *supra* note 23, at 1078.

463. See *Akamai/McKesson I*, 692 F.3d at 1349.

464. *McKesson Techs. Inc. v. Epic Sys. Corp. (McKesson)*, 98 U.S.P.Q. 2d (BNA) 1281, 1286 (Fed. Cir. 2011), *rev'd sub nom. Akamai/McKesson I*, 692 F.3d 1301 ("Interactive methods that meet all of the conditions and requirements of the Patent Act are fully entitled to participate in the patent system."), *rev'd*, 134 S. Ct. 2010 (2014).

465. See *Akamai/McKesson I*, 692 F.3d at 1349.

466. *Akamai Techs., Inc. v. Limelight Networks, Inc. (Akamai/McKesson III)*, 797 F.3d 1020 (Fed. Cir. 2015) (en banc) (per curiam).

467. See *supra* Section III.B.

468. See Rhodes, *supra* note 23, at 1080.

469. See *supra* Subsection III.A.1.

470. See *Akamai/McKesson I*, 692 F.3d at 1315, 1317–18 (majority opinion) (acknowledging that, with respect to method patents, parties can and often do share the performance of method steps between them).

altogether. Instead, the majority in *Akamai/McKesson I* relied on the requirements of § 271(b),⁴⁷¹ which are generally well-defined and have been clarified recently by the Supreme Court.⁴⁷² Inducement requires that a party have knowledge of the patent and encourage or aid others in performance of the claimed steps.⁴⁷³ Thus, the inducement-only rule still provides several hurdles for a patentee to contend with in order to successfully enforce his patent.

Concerning the inducement-only rule, reward theory predicts that the social benefit of interactive patents outweighs the social cost if the patent can only be enforced against actors that have performed some of the claimed steps and have induced others to perform the remaining steps. The Federal Circuit's effort to provide an avenue for enforcement of interactive patents under § 271(b) illustrates that the court was persuaded that interactive patents have social value. However, the majority incorrectly limited the costs on society of interactive patents by imposing rigorous evidentiary requirements on patentees. Specifically, under § 271(b), in addition to showing that a party encouraged or aided in infringement, a patentee must also show that the accused party had knowledge of the patent.⁴⁷⁴ The knowledge requirement acts as a proxy for evidence of the social benefit of the interactive patent. Thus, under the partial-inducement rule, the social benefit of enforcing interactive patents is greater than the social cost if there is a clear indication that a party involved in the infringement finds the asserted patent of some social utility.

Ultimately, reward theory provides an unclear picture of how the patent system should resolve the divided infringement problem. Take the facts of *Golden Hour*, for example. There, the two defendants—each selling separate software—enabled their products to work together to provide an integrated system for patient billing and emergency transportation logistics.⁴⁷⁵ The patentee asserted that the combined system jointly infringed its patent on a similar system.⁴⁷⁶

Reward theory predicts that the patent in *Golden Hour* should be enforced if the social benefit of the patent outweighs the social costs.⁴⁷⁷ That is, within the context of the tests discussed above, it should be

471. *Id.* at 1307–09.

472. *See* *Limelight Networks, Inc. v. Akamai Techs., Inc. (Akamai/McKesson II)*, 134 S. Ct. 2111, 2117–19 (2014).

473. *Akamai/McKesson I*, 692 F.3d at 1308.

474. *Id.* at 1312–13.

475. *See* *Golden Hour Data Sys., Inc. v. emsCharts, Inc.*, 614 F.3d 1367, 1371 (Fed. Cir. 2010) (explaining that the defendants, emsCharts and Softtech, “formed a strategic partnership, enabled their two programs to work together, and collaborated to sell the two programs as a unit”).

476. *See id.*

477. *See* Rhodes, *supra* note 23, at 1080.

enforced where there is evidence of (1) direction or control, (2) a joint enterprise, or (3) induced infringement. Considering the mastermind tests, the Federal Circuit affirmed the district court's finding that there was no evidence of direction or control.⁴⁷⁸ In contrast, Judge Linn argued that under his joint-enterprise formulation, the court would impose liability for infringement on the two defendants.⁴⁷⁹ Finally, it is unclear what the outcome would be under the partial-inducement test without further evidence regarding the parties' interaction and knowledge of Golden Hour's patent. Accordingly, the doctrinal tests that seem to align with reward theory lead to inconsistent results.

In sum, it is difficult to use the tests that align with reward theory to predict how the courts should decide close cases like *Golden Hour*. Further, reward theory does not help one choose between the tests. At best, reward theory contemplates that some interactive claims are worthy of patent protection. The next Section discusses prospect theory, which provides a clearer picture of divided infringement.

B. Discouraging Misappropriation

Prospect theory says that an inventor is granted a patent in order to cultivate the claimed subject matter free from the interference of competitors.⁴⁸⁰ This Article finds that the two tests first proposed by the dissenting judges in *Akamai/McKesson I* are most consistent with the prospect view of the patent system. Particularly, Judge Linn's and Judge Newman's tests enable a patentee to protect itself from competitors better than either the mastermind tests or the majority's partial-inducement rule.

1. Tests That Are Inconsistent with Prospect Theory

Prospect theory suggests that the law should minimize wasteful competition among potential patentees.⁴⁸¹ By providing a mechanism for enforcement of interactive patents, the mastermind tests are facially consistent with the spirit of minimizing duplicative patenting and commercialization efforts. However, enforcing interactive patents only when there is evidence of a mastermind is not consistent with prospect theory's goal of minimizing wasteful competition.

Specifically, satisfaction of the mastermind tests occurs in such a limited set of conditions that wasteful efforts of competitors may not

478. See *Golden Hour*, 614 F.3d at 1380–81.

479. See *Akamai/McKesson I*, 692 F.3d at 1349 (Linn, J., dissenting) (citing RESTATEMENT (SECOND) OF TORTS § 491 & cmt. c (1965)).

480. See Kitch, *supra* note 38, at 276–77.

481. See *McFetridge & Rafiquzzaman*, *supra* note 218, at 100; see also Beck, *supra* note 44, at 207–09 (explaining that unproductive competition is a serious problem that includes premature invention, duplication, patenting of unnecessary substitutes, and excessive spending on research).

necessarily be minimized. For example, the Federal Circuit has stated that parties that entered into arms-length transactions to perform the steps of a method claim are often exempt from infringement liability.⁴⁸² Further, until its 2015 en banc decision in *Akamai/McKesson III*,⁴⁸³ the Federal Circuit had never affirmed a finding of divided infringement liability under the “control or direction” test.⁴⁸⁴ This result effectively renders most interactive patents unenforceable under a mastermind approach. Unenforceable patents do not discourage competitors from either seeking patents on similar technology or producing competing products. Consequently, prospect theory would not suggest that a court impose a patent enforcement regime that leaves patentees unable to protect their inventions and subject to aggressive commercialization challenges from competitors.⁴⁸⁵

For similar reasons, the partial-inducement rule is also inconsistent with prospect theory. At first glance, it would seem that enforcing interactive patents in cases where partial induced infringement occurs would minimize wasteful competition among competitors. However, as emphasized by Judge Newman in her dissent, relying on inducement introduces new opportunities for potential infringers to game the system.⁴⁸⁶ Further, the bar for showing induced infringement is so high that it may effectively weaken enforcement opportunities for interactive patents.

Induced infringement is becoming harder to prove. The Federal Circuit has acknowledged that the Supreme Court’s holding in *Global-Tech Appliances, Inc. v. SEB S.A.*⁴⁸⁷ raised the standard for proving inducement to require actual knowledge or willful blindness.⁴⁸⁸ Further, defendants in inducement cases have an additional defense available to them. Specifically, a good faith belief that a patent is not infringed is a defense to inducement.⁴⁸⁹ This means that very few patents can be enforced under the inducement-only standard. Thus, the inducement-only test will not minimize wasteful competition and is therefore inconsistent with prospect theory.

482. See *BMC Res., Inc. v. Paymentech, L.P. (BMC Resources)*, 498 F.3d 1373, 1380–81 (Fed. Cir. 2007), *overruled by Akamai/McKesson I*, 692 F.3d 1301, *rev’d*, 134 S. Ct. 2111 (2014).

483. *Akamai Techs., Inc. v. Limelight Networks, Inc. (Akamai/McKesson III)*, 797 F.3d 1020, 1022–23 (Fed. Cir. 2015) (en banc) (per curiam).

484. See Amicus Curiae Brief of Cascades Ventures, Inc. & VNS Corp. in Support of Plaintiffs-Appellants & in Support of Reversal, *Akamai/McKesson I*, 692 F.3d 1301 (Nos. 2009-1372, 2009-1380, 2009-1416, 2009-1417), 2011 WL 2323820 at *6.

485. See *McFetridge & Rafiquzzaman*, *supra* note 218, at 100.

486. See *Akamai/McKesson I*, 692 F.3d at 1320 (Newman, J., dissenting).

487. 131 S. Ct. 2060 (2011).

488. See *id.* at 2068–69.

489. See *Commil USA, LLC v. Cisco Sys., Inc.*, 135 S. Ct. 1920 (2015).

In sum, prospect theory suggests that the patent system should minimize wasteful competition by making it easier to obtain and enforce a patent than the reward theory provides. As demonstrated above, the partial-inducement rule and the mastermind tests set a high standard of enforcement that make it difficult to enforce interactive patents. Accordingly, both the partial-inducement and mastermind tests are inconsistent with the prospect theory of patent protection.

2. Tests That Are Consistent with Prospect Theory

Judge Newman's proposed all-steps test is consistent with prospect theory. Prospect theory suggests that the law should implement a lower bar to patentability and enforcement than what is required under reward theory.⁴⁹⁰ In *Akamai/McKesson I*, Judge Newman proposed simply that if all the steps of a multiparty claim are performed, then the claim is infringed.⁴⁹¹ Judge Newman's test provides a lower standard of enforcement than the partial-inducement or mastermind rules because it does not require evidence of any relationship between alleged joint infringers.

Further, prospect theory explains that the patent system should grant and protect patent rights in a way that will minimize competition to commercialize patented inventions.⁴⁹² By making it significantly easier to enforce interactive claims, Judge Newman's test discourages a broader range of competitors from participating or investing in commercial activities that may infringe interactive patents. In turn, this minimizes wasteful and duplicative efforts among competitors. Thus, under a prospect theory view, it is likely that courts would use Judge Newman's proposed test to determine divided-infringement liability.

Similarly, Judge Linn's joint-enterprise test is consistent with prospect theory. Prospect theory suggests that the patent system should grant and enforce patents in a way that allows inventors to commercialize their invention free from competitive interference.⁴⁹³ Parties of two or more that had an express or implied agreement to perform the steps of a claimed method would satisfy one or more elements of the joint-enterprise test.⁴⁹⁴ Accordingly, under the joint-enterprise test, patentees could enforce multiparty claims against competitors who joined forces to appropriate the benefits of their invention.

490. To compare the low bar of enforceability in the all-steps test, see *supra* Subsection IV.A.1.

491. See *Akamai/McKesson I*, 692 F.3d at 1326 (Newman, J., dissenting).

492. See *McFetridge & Rafiquzzaman*, *supra* note 218, at 100.

493. See *id.*

494. See *Akamai/McKesson I*, 692 F.3d at 1349 (Linn, J., dissenting) (citing RESTATEMENT (SECOND) OF TORTS § 491 cmt. c (1965)).

Prospect theory also suggests that the patent system should enforce patents based on the technological approach rather than the specific technology.⁴⁹⁵ In the divided infringement context, this could relate to the idea that, for infringement liability, the court should be most concerned with whether the steps of a claimed method were performed rather than with which party performed them. Judge Linn's rule is consistent with this idea in imposing liability if a joint enterprise practices each limitation of a claim. His rule is focused on the existence of an agreement to appropriate the claimed invention, rather than the specifics of how the patent was appropriated.⁴⁹⁶ Thus, parties who sought to avoid infringement by splitting up the performance of a claimed method would still be liable under Judge Linn's joint-enterprise test.⁴⁹⁷

Further, prospect theory says that the patent system should discourage wasteful competition in a patented area.⁴⁹⁸ Enforcing interactive patents against parties that act cooperatively to infringe the multiparty claims minimizes wasteful competition. Especially under a joint-enterprise regime, competitors are put on notice that if they act alone (as a single entity) or in conjunction with another entity, they will be held liable for infringement.⁴⁹⁹ The threat of liability discourages competitors from engaging in research or commercial activity in the relevant technology area. Accordingly, the patentee of the interactive method is in a better position to pursue commercialization efforts under a joint-enterprise theory of enforcement than under the mastermind tests. In sum, prospect theory predicts that a court could also use the joint-enterprise test to determine divided infringement liability.

Prospect theory's prediction is only unsatisfying in that it appears to recommend extremely different tests in this context. For example, prospect theory predicts that the patent at issue in *Golden Hour* should be enforced if the subject matter—an integrated patient billing and emergency dispatch system⁵⁰⁰—is an area that is worth exploring. In other words, is this an area that the patent system should allow a patentee to commercialize free from competitor interference? Under Judge Newman's all-steps test, the patent would be successfully enforced because all the claimed steps were performed.⁵⁰¹ Under Judge Linn's

495. See *McFetridge & Rafiquzzaman*, *supra* note 218, at 100.

496. See *Akamai/McKesson I*, 692 F.3d at 1349 (citing RESTATEMENT (SECOND) OF TORTS § 491 cmt. c (1965)).

497. See *id.* at 1350 (discussing liability even in instances of split-performance).

498. See *Beck*, *supra* note 44, at 207.

499. See *Akamai/McKesson I*, 692 F.3d at 1350.

500. See *Golden Hour Data Sys., Inc. v. emsCharts, Inc.*, 614 F.3d 1367, 1369 (Fed. Cir. 2010).

501. See *Akamai/McKesson I*, 692 F.3d at 1326 (Newman, J., dissenting).

joint-enterprise test, the patent would also be enforced because there is evidence that emsCharts and Softtech worked closely together to create a system that infringed the patent.⁵⁰²

In sum, both Judge Linn's and Judge Newman's proposed tests for determining divided infringement liability are consistent with prospect theory. Unfortunately, prospect theory does not help decide between the two tests. Accordingly, prospect theory is not much more helpful than reward theory in prescribing a specific doctrinal test. At best, it leads to the conclusion that the subject matter of interactive claims is worth exploring commercially and therefore worthy of some protection. The next Section discusses rent-dissipation theory and the insights it provides concerning divided infringement.

C. *Minimizing Patent Rent Dissipation*

Rent-dissipation theory suggests that patents should be enforced against infringing products that fall within the asserted patent's signaled improvements.⁵⁰³ The signaled improvement in the claims at issue in *Akamai/McKesson I*—and most internet-age inventions—is the ability to facilitate collaboration and interactivity between multiple parties. Thus, under rent-dissipation theory, the law should enforce interactive patents against infringement caused by collaboration or interactivity.

1. Tests That Are Inconsistent with Rent-Dissipation Theory

The mastermind tests are inconsistent with rent-dissipation theory. Rent-dissipation theory suggests that the patent system should discourage the dissipation of patent rent at both the pre-invention and post-grant phase.⁵⁰⁴ Specifically, it suggests that the patent system should discourage duplicative efforts by competitors to patent and commercialize inventions.⁵⁰⁵

The mastermind tests not only fail to prevent the dissipation of rent at the post-grant or commercialization stage, they encourage it. The mastermind tests require evidence of such a specific relationship between separate parties that even when an alleged infringing activity falls within a patent's signaled improvements, it is difficult for a patentee to enforce his asserted patent. In fact, requiring evidence of an agency relationship or contractual obligation provides a clear roadmap for competitors seeking to avoid liability for infringement. The control or direction test

502. See *Golden Hour*, 614 F.3d at 1371.

503. See Grady & Alexander, *supra* note 33, at 309.

504. See *id.* at 316, 321 (explaining that rent dissipation can occur at the invention or conception stage or at the improvement stage). Trade secrecy is another form of rent dissipation that provides justification for the patent system. *Id.* at 318.

505. See *id.* at 316.

has a similar effect. To avoid infringement, all competitors need to do is avoid legally entering into a contract with another or refrain from acting as if one party is directing or controlling the other.

The mastermind tests also dissipate patent rents in another way. Inventors who cannot rely on the patent system to protect their inventions are more likely to keep their inventions a secret.⁵⁰⁶ Several amici in *Akamai/McKesson I* expressed concern that they could not continue to disclose their multiparty inventions because the control or direction test was proving too difficult to satisfy.⁵⁰⁷ This behavior is another way patent rent is dissipated and is strongly discouraged under rent-dissipation theory.⁵⁰⁸ Accordingly, rent dissipation suggests that courts should not use any test that relies on identifying a mastermind to enforce interactive claims.

Similarly, Judge Newman's all-steps test is inconsistent with rent-dissipation theory. The goal of Judge Newman's proposal is to clearly encourage patenting of internet-age inventions by making them easy to enforce.⁵⁰⁹ To that end, Judge Newman suggests that if one or more parties perform all the steps, the claim is infringed.⁵¹⁰ Concerning liability, Judge Newman proposes that all parties involved in performing the steps of the asserted claim should be liable in varying degrees.⁵¹¹ Since more patentees would be confident they could enforce their patent under Judge Newman's all-steps test, they would also be more likely to create innovations related to internet-age technology.

However, under a rent-dissipation analysis, Judge Newman's approach may go too far. Specifically, because it almost guarantees that any and all interactive inventions can be enforced, competitors will be reluctant to enter into the subject market.⁵¹² With powerful and broad enforcement rights, most competition of any kind at the post-grant or commercialization stage is eliminated. In turn, Judge Newman's proposal would likely cause a race among inventors to patent interactive inventions. Rent-dissipation theory suggests that a race to obtain powerful monopoly rights dissipates patent rents at the pre-invention

506. See *id.* at 318.

507. See *Akamai Techs., Inc. v. Limelight Networks, Inc. (Akamai/McKesson I)*, 692 F.3d 1301, 1327, 1330, 1333 (Fed. Cir. 2012) (en banc) (Newman, J., dissenting) (per curiam) (discussing earlier cases that exemplify the difficulty in proving direction or control), *rev'd*, 134 S. Ct. 2111 (2014).

508. See Grady & Alexander, *supra* note 33, at 318.

509. See *supra* Subsection IV.A.1.

510. See *Akamai/McKesson I*, 692 F.3d at 1326.

511. See *id.* at 1331.

512. Judge Newman's approach also seems to defeat the notice function of the patent system, which suggests that potential infringers be put on notice that they might infringe a patent. See *id.* at 1350 (Linn, J., dissenting).

stage and should be discouraged.⁵¹³ Accordingly, rent-dissipation theory would not suggest implementing Judge Newman's proposal since it would lead to rent-dissipating activity at the pre-invention stage.

2. Tests That Are Consistent with Rent-Dissipation Theory

In contrast, the partial-inducement standard is consistent with rent-dissipation theory.⁵¹⁴ Rent-dissipation theory predicts that a patent will be successfully enforced when the alleged infringing product falls within the patent's signaled improvements.⁵¹⁵ An example of this principle is the court-created doctrine of equivalents. The doctrine of equivalents is a tool patentees may use to expand the coverage of their patent beyond the literal scope of their claims to cover equivalent means signaled by the claims.⁵¹⁶

In the divided infringement context, at least one of an interactive patent's signaled improvements is the notion of collaboration. The ability to allow two or more parties to perform a claimed method in an interactive way that provides some value to all involved parties is an improvement over past methods that relied upon a single actor. The advent of connected homes, connected cars, IoT technology, and personalized medicine applications all support the notion that interactivity and collaboration between different parties may be innovative and have commercial value.⁵¹⁷

The partial-inducement standard acknowledges the possibility that different parties may combine their actions to complete the steps of a claimed method.⁵¹⁸ Although the Supreme Court ultimately rejected it,⁵¹⁹ the partial-inducement rule demonstrated that the Federal Circuit's thinking was shifting significantly away from strict adherence to the single-entity rule. The partial-inducement rule represents the Federal Circuit's realization that interactive patents should be enforced against potential competitors seeking to appropriate the benefits of performing a

513. See Grady & Alexander, *supra* note 33, at 308, 317 (explaining that multiple inventors expending resources on redundant patenting efforts dissipates the benefit to society).

514. See *supra* Section III.B.

515. Grady & Alexander, *supra* note 33, at 309, 321 ("Rent dissipation theory predicts that the courts will enforce a patent when the size of the patent rent is proportionate to the rent dissipation that the invention's technological signal would otherwise induce.").

516. See *Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 520 U.S. 17, 21, 40 (1997) (clarifying the scope of the doctrine of equivalents).

517. See discussion *supra* Part I.

518. *Akamai Techs., Inc. v. Limelight Networks, Inc.* (*Akamai/McKesson I*), 692 F.3d 1301, 1306 (Fed. Cir. 2012) (en banc) (per curiam), *cert. granted*, 134 S. Ct. 895 (2014), *rev'd*, 134 S. Ct. 2111 (2014).

519. See *Akamai Techs., Inc. v. Limelight Networks, Inc.* (*Akamai/McKesson II*), 134 S. Ct. 2111, 2117–18 (2014).

claimed method. This prevents the dissipation of patent rent at the improvement stage.

The joint-enterprise test is also consistent with rent-dissipation theory.⁵²⁰ Rent-dissipation theory discourages redundant commercialization efforts at the post-grant or improvement stage of the patent life cycle.⁵²¹ Protecting inventions that contain signals for a large number of technological improvements prevents rent dissipation at the improvement phase.⁵²² One of the signaled improvements of multiparty claims may be interactivity—the exchange of information between people or things. For example, a multiparty claim may signal other possible components or users that could be integrated into a claimed system or method. Further integration could provide the system with more information or computing power, making the claimed method faster and more accurate. The joint-enterprise rule clearly recognizes the advantages of different parties combining their actions to perform a claimed method.⁵²³ Rent-dissipation theory predicts that patents will be successfully enforced when the alleged infringing product falls within the patent's signaled improvements.⁵²⁴ Accordingly, rent-dissipation theory suggests that Judge Linn's joint-enterprise standard also prevents the dissipation of patent rent at the improvement stage.

Rent-dissipation theory also encourages inventors to disclose their inventions.⁵²⁵ Judge Linn's statement that the court's decision in *Golden Hour* would be overturned under the joint-enterprise test⁵²⁶ is a signal that interactive claims cover inventions that should be disclosed and enforced. Thus, rent-dissipation theory would also predict that a court could use Judge Linn's joint-enterprise test to determine divided infringement liability.

The view of divided infringement through the lens of rent-dissipation theory is an interesting picture. The tests that align with rent-dissipation theory confirm that the signaled improvement of divided infringement claims is their ability to facilitate collaboration. Accordingly, in *Golden Hour*, rent-dissipation theory predicts that the patent at issue would be enforced if the infringing activity is a signaled improvement of the patent. Specifically, rent-dissipation theory predicts that the patent would be

520. See *supra* Section III.D.

521. See Grady & Alexander, *supra* note 33, at 316.

522. *Id.* at 320.

523. See *Akamai/McKesson I*, 692 F.3d at 1349 (Linn, J., dissenting) (citing RESTATEMENT (SECOND) OF TORTS § 491 cmt. c (1965)) (explaining that pecuniary interest may be a factor in determining whether there was a joint enterprise).

524. See Grady & Alexander, *supra* note 33, at 309.

525. See *id.* at 318.

526. *Akamai/McKesson I*, 692 F.3d at 1349.

enforced if there is evidence of a joint enterprise or one party inducing others to infringe. Thus, it is unclear what the outcome would be under the partial-inducement test without further evidence regarding the parties' interaction and knowledge of *Golden Hour's* patent. However, method claim 15 in *Golden Hour* would be enforced under a joint-enterprise test because there is evidence that *emsCharts* and *Softtech* worked closely together to create a system that infringed the patent.⁵²⁷

In short, both the joint-enterprise test and the now-defunct partial-inducement rule for determining divided infringement liability are consistent with rent-dissipation theory. While rent-dissipation theory does not help one choose between the two tests, the Supreme Court's recent decision in *Akamai/McKesson II*⁵²⁸ and the Federal Circuit's 2015 en banc decision in *Akamai/McKesson III*⁵²⁹ indicate that only Judge Linn's joint-enterprise test is a viable option at the present time. Further, the guiding principle that can be gleaned from this analysis is that (1) one of the signaled improvements of interactive or multiparty claims is that of facilitating collaboration among multiple parties, and (2) under rent-dissipation theory, the patent system should enforce interactive patents against infringement related to this signaled improvement.

D. Summary

The analysis of divided infringement under various economic theories of the patent system provides several interesting insights. Under reward theory, some interactive claims are worthy of patent protection. Further, prospect theory suggests that the subject matter of interactive claims is worth exploring commercially and therefore worthy of protection. Finally, it is possible that one of the signaled improvements of interactive or multiparty claims is facilitating collaboration—that the invention allows multiple parties to interact; thus under a rent-dissipation theory, the patent system should enforce interactive patents against products that fall within this signaled improvement. As a result, all three prevalent economic theories of the patent system justify the enforcement of claims susceptible to divided infringement in some way.

However, no single theory provides a consistent doctrinal answer for how courts should determine liability for divided infringement. It is interesting to note that the doctrinal solution that seems to be consistent with all the economic theories discussed is Judge Linn's joint-enterprise test. Judge Linn's proposal to expand the idea of control or direction to

527. See *Golden Hour Data Sys., Inc. v. emsCharts, Inc.*, 614 F.3d 1367, 1370–71 (Fed. Cir. 2010).

528. *Akamai Techs., Inc. v. Limelight Networks, Inc. (Akamai/McKesson II)*, 134 S. Ct. 2111 (2014).

529. *Akamai Techs., Inc. v. Limelight Networks, Inc. (Akamai/McKesson III)*, 797 F.3d 1020 (Fed. Cir. 2015) (en banc) (per curiam).

include a joint enterprise would promote the economic function of the patent system by (1) rewarding inventors, (2) encouraging the commercialization of interactive innovations, and (3) preventing unproductive rent-dissipating behavior by patentees or competitors. Now that the Federal Circuit has expanded the control or direction test to include Judge Linn's concept of a joint enterprise, whether this standard is a workable one for district courts could be the subject of future research. One could certainly interpret the Supreme Court's decision in *Akamai* as endorsing some form of multiparty infringement liability for collective action taken against a patentee.

CONCLUSION

The prevalent economic theories of the patent system provide an interesting insight into how courts enforce patent rights. With respect to interactive method claims, economic theory suggests that the law should enforce claims susceptible to divided infringement. However, three different economic theories of the patent system—reward, prospect, and rent-dissipation theory—provide differing views as to how the patent system should determine liability for divided infringement.

Reward theory states that “patents are rewards to inventors for their completed inventions.”⁵³⁰ Under reward theory, interactive patents should only be enforced when their social benefit outweighs their social cost. Accordingly, any doctrinal test that predicates liability on more than just the fact that the claimed steps are performed aligns with reward theory. Under prospect theory, the patent system promotes the inventor's ability to commercialize her invention free from direct competition.⁵³¹ Therefore, proponents of prospect theory would prefer an enforcement regime for interactive patents that is focused on discouraging competitors from misappropriating interactive inventions, leaving inventors free to commercialize their innovations. Finally, the goal of rent-dissipation theory is to reduce the dissipation of patent rents in the form of (1) redundant research efforts,⁵³² (2) redundant commercialization efforts,⁵³³ or (3) secret inventions.⁵³⁴ Rent-dissipation theory recommends an enforcement regime for interactive patents that will effectively reduce the dissipation of patent rents for truly innovative multiparty inventions.

Each economic theory discussed predicts that the patent system should enforce interactive, multi-participant claims. However, the three theories do not provide a consistent suggestion for which doctrinal test

530. Rhodes, *supra* note 23, at 1077.

531. See Kitch, *supra* note 38, at 276–77.

532. Grady & Alexander, *supra* note 33, at 308 (stating that when multiple inventors expend resources on redundant patenting efforts, the benefit to society is dissipated).

533. See *id.* at 316.

534. See *id.* at 308–09, 318.

the patent system should employ to determine divided infringement liability. Each theory predicts that the patent system should employ a different set of doctrinal tests.

At best, all three theories do seem to align in one way with Judge Linn's joint-enterprise test. This Article finds that Judge Linn's proposal to expand the idea of control or direction to include a joint enterprise promotes the economic function of the patent system by (1) rewarding inventors, (2) encouraging the commercialization of interactive innovations, and (3) preventing unproductive rent-dissipating behavior by patentees or competitors. Accordingly, although the doctrinal test for divided infringement will likely continue to evolve, start-ups and disruptive hi-tech companies who own interactive patents should find some comfort in the idea that enforcement of their interactive inventions finds support in the economic underpinnings of the patent system.