

University of Colorado Law School

Colorado Law Scholarly Commons

Publications

Colorado Law Faculty Scholarship

2003

The Internet, Innovation, and Intellectual Property Policy

Philip J. Weiser

University of Colorado Law School

Follow this and additional works at: <https://scholar.law.colorado.edu/faculty-articles>



Part of the [Antitrust and Trade Regulation Commons](#), [Intellectual Property Law Commons](#), [Internet Law Commons](#), and the [Law and Economics Commons](#)

Citation Information

Philip J. Weiser, *The Internet, Innovation, and Intellectual Property Policy*, 103 COLUM. L. REV. 534 (2003), available at <https://scholar.law.colorado.edu/faculty-articles/542>.

Copyright Statement

Copyright protected. Use of materials from this collection beyond the exceptions provided for in the Fair Use and Educational Use clauses of the U.S. Copyright Law may violate federal law. Permission to publish or reproduce is required.

This Article is brought to you for free and open access by the Colorado Law Faculty Scholarship at Colorado Law Scholarly Commons. It has been accepted for inclusion in Publications by an authorized administrator of Colorado Law Scholarly Commons. For more information, please contact rebecca.ciota@colorado.edu.

HEINONLINE

Citation: 103 Colum. L. Rev. 534 2003

Provided by:

William A. Wise Law Library



Content downloaded/printed from [HeinOnline](#)

Thu May 18 14:06:07 2017

- Your use of this HeinOnline PDF indicates your acceptance of HeinOnline's Terms and Conditions of the license agreement available at <http://heinonline.org/HOL/License>
- The search text of this PDF is generated from uncorrected OCR text.
- To obtain permission to use this article beyond the scope of your HeinOnline license, please use:

[Copyright Information](#)

THE INTERNET, INNOVATION, AND INTELLECTUAL PROPERTY POLICY

*Philip J. Weiser**

The Internet continues to transform the information industries and challenge intellectual property law to develop a competition policy strategy to regulate networked products. In particular, inventors of “information platforms” that support the viewing of content—be they instant messaging systems, media players, or Web browsers—face a muddled set of legal doctrines that govern the scope of available intellectual property protection. This uncertainty reflects a fundamental debate about what conditions will best facilitate innovation in the information industries—a debate most often played out at the conceptual extremes between the “commons” and “proprietary control” approaches to the Internet and intellectual property policy.

This Article proposes a “competitive platforms model” as a new conceptual framework to govern intellectual property and Internet policy. This model suggests that where information platforms will continue to face competitive alternatives, intellectual property law and policy should encourage competition among them as a means of driving companies to develop superior products and enabling them to appropriate rewards from their inventions. Alternatively, where a particular information platform emerges as the dominant one—for example, in the case of Microsoft Windows in the market for PC operating systems—intellectual property protection against the reverse engineering of its platform standard or user interface should recede. As a strategy to implement the competitive platforms model, this Article proposes a reformulation of the fair use and misuse principles—as developed in both copyright and patent law—to provide a unified, clear, and coherent framework for protecting platform standards and user interfaces. Moreover, the competitive platforms model calls upon industry standard-setting bodies and the federal government to reassume the critical coordination and funding roles they served in the early days of the Internet in order to support the development of the parts of the Internet’s information infrastructure that are intrinsically open to all and thus are vulnerable to underinvestment.

* Associate Professor, University of Colorado School of Law and Department of Interdisciplinary Telecommunications. Thanks to Kathy Applegate, Linda Bosniak, Curt Bradley, Christina Burnett, Julie Cohen, Stacey Dogan, Chris Eisgruber, Brett Frischmann, Ellen Goodman, Oren Gross, Dirk Hartog, Michael Katz, Mark Lemley, Doug Lichtman, Harry Litman, Tom Lookabaugh, Viva Moffet, Hiroshi Motomura, Tom Nachbar, Jon Nuechterlein, Dale Oesterle, Scott Peppet, Gil Seinfeld, Jim Speta, Heidi Wald, Steve Williams, and Tim Wu for helpful comments and encouragement. I also want to thank Jennifer Laurin for a superb editing job and Jane Thompson for stellar library assistance. I presented earlier versions of this Article at the Princeton University Law and Public Affairs Program, the University of Colorado Summer Workshop Series, and the 29th Annual Telecommunications Policy Research Conference. Finally, I acknowledge the generosity of the Law and Public Affairs Program Fellowship at Princeton University, which supported my work on this project.

TABLE OF CONTENTS

INTRODUCTION	535
I. AN INTRODUCTION TO THE INTERNET AND INTELLECTUAL PROPERTY POLICY	541
A. How the Internet Works and How It Got Started	541
B. Information Platforms and Reverse Engineering	545
C. Intellectual Property Law and the Development of Platform Standards.....	549
II. THE CURRENT STATE OF INTELLECTUAL PROPERTY LAW'S TREATMENT OF REVERSE ENGINEERING	552
A. The Legal Status of Reverse Engineering	552
1. Legal Underpinnings.....	552
2. Reverse Engineering in Practice	560
B. Putting the Reverse Engineering Debate in Context ..	564
III. THE CURRENT BATTLE IN INTELLECTUAL PROPERTY THEORY: THE COMMONS MODEL VERSUS PROPRIETARY CONTROL	568
A. The Commons Model and Its Critics	568
1. The Commons Model	569
2. The Failings of the Commons Theory	573
B. The Proprietary Control Model and the Schumpeterian Justification	576
1. The Proprietary Control Model.....	576
2. The Failings of the Proprietary Control Theory ...	579
IV. TOWARD A COMPETITIVE PLATFORMS MODEL FOR THE INTERNET AND THE INFORMATION INDUSTRIES	583
A. The Competitive Platforms Model and Intellectual Property Law Reform	583
1. Rival Platform Standards	585
2. Competition Within a Standard.....	591
B. The Competitive Platforms Model, the Role of Standard-Setting Bodies, and Government Funding of Research and Development	594
V. TOWARD A COMPETITIVE PLATFORMS CONCEPTION OF THE LEGALITY OF REVERSE ENGINEERING.....	600
A. The Challenge of Converging Platforms and <i>Connectix</i>	601
B. A Model for Horizontal Access Regulation: <i>Lotus v.</i> <i>Borland</i>	604
C. Possible Objections to a Competitive Platforms-Based Approach to Reverse Engineering	608
CONCLUSION	612

INTRODUCTION

The Internet presents a formidable challenge to intellectual property policy. In particular, the continuing evolution of the hardware and software infrastructure that supports Internet content gives rise to radi-

cally different visions for how intellectual property law should regulate the Internet's software infrastructure. One vision, often associated with Lawrence Lessig, suggests that the Internet should be an "information commons" built on open source technologies.¹ Resisting this call for a categorical commitment to openness, others champion a proprietary development model along the lines of Microsoft's role in the computer operating systems market.² This Article rejects both perspectives, proposing a "competitive platforms model" to guide intellectual property policy in the Internet age. This model embraces proprietary development where there is competition between rival platform standards, but calls for open standards where a single platform standard wins out or where rival firms would not seek to invent a proprietary standard at all.

The competitive platforms model both recognizes the significance of the Internet's nonproprietary roots and seeks to facilitate the proprietary investment that will help shape the Internet's future. The Internet developed in a nonproprietary environment in which the U.S. government supported and a disparate array of developers contributed to its growth without focusing on profits. Notably, this environment produced the Internet's basic standard—the Transmission Control Protocol and Internet Protocol (TCP/IP)—that facilitates the routing of Internet communications and enables the Internet to function as a "network of networks."³ To this date, this basic platform standard remains nonproprietary: "No one owns [it], no one licenses its use, and no one restricts access to it."⁴

1. See Lawrence Lessig, *Code and Other Laws of Cyberspace* 6–8 (1999) [hereinafter Lessig, *Code*]; Lawrence Lessig, *The Future of Ideas: The Fate of the Commons in a Connected World* 26 (2001) [hereinafter Lessig, *Future of Ideas*]. As others have explained, Lessig's vision of a commons—as well as his criticisms of proprietary control—is ultimately nuanced, but his prose tends to suggest a black or white choice. See Sonia K. Katyal, *Ending the Revolution*, 80 *Tex. L. Rev.* 1465, 1471 (2002) (reviewing Lessig, *Future of Ideas*, *supra*).

2. See, e.g., R. Polk Wagner, *Information Wants to Be Free: Intellectual Property and the Mythologies of Control*, 103 *Colum. L. Rev.* (forthcoming 2003) (manuscript at 43–44, on file with the *Columbia Law Review*), available at <http://www.law.upenn.edu/polk/wagner.control.pdf> ("To the extent that a policy goal is to increase the amount of informational content accessible via the Internet, extending rights to creators-owners in this new medium will be beneficial.").

3. Philip J. Weiser, *Internet Governance, Standard Setting, and Self-Regulation*, 28 *N. Ky. L. Rev.* 822, 825 (2001) [hereinafter Weiser, *Internet Governance*]. The most salient features of the Internet are its reliance on the basic TCP/IP standard, see *infra* note 21, and its interconnected nature. See *Reno v. ACLU*, 521 U.S. 844, 849 (1997) (defining the Internet as "an international network of interconnected computers"). Congress, for example, has focused on these two attributes in defining the Internet. See 47 U.S.C. § 230(f)(1) (2000) (defining the Internet as "the international computer network of both Federal and non-Federal interoperable packet switched data networks"); *id.* § 231(e)(3) (defining the Internet as "the combination of computer facilities and electromagnetic transmission media, and related equipment and software, comprising the interconnected worldwide network of computer networks that employ the Transmission Control Protocol/Internet Protocol or any successor protocol to transmit information").

4. Jason Oxman, *Fed. Communications Comm'n, The FCC and the Unregulation of the Internet* 5 (Office of Plans and Policy, Working Paper No. 31, 1999), available at

This open platform standard (like the standard gauge developed for the railroad industry) has enabled Internet application developers to create new products and services and users to adopt those products easily,⁵ thereby creating a virtuous circle of an increasing number of applications and users for Internet products and services.⁶ Most importantly, the first popular uses for the Internet—e-mail⁷ and the World Wide Web⁸—were both noncommercial inventions that benefited from government support and helped to establish the Internet as a popular platform for other inventions, such as Napster.

During the Internet's early years, the U.S. government supported and encouraged a culture of nonproprietary development that self-consciously protected the Internet's open and layered architecture.⁹ The essence of this open architecture was a commitment to using a platform standard that both Internet users and providers of Internet content (and services) could access easily without either limits on the use of the network or proprietary gatekeepers who could charge for access to the standard. In the wake of the government's decision to allow commerce on the Internet and to privatize its infrastructure, the Internet's software

[/www.fcc.gov/Bureaus/OPP/working_papers/oppwp31.pdf](http://www.fcc.gov/Bureaus/OPP/working_papers/oppwp31.pdf) (on file with the *Columbia Law Review*).

5. Philip Evans & Thomas S. Wurster, *Blown to Bits* 33 (1999).

6. As Timothy Bresnahan put it, "platform standards are hard to stop, hard to start, and easy to maintain. A platform needs a critical mass of adopters and a critical mass of complementary software (and sometimes other components)." Timothy F. Bresnahan, *New Modes of Competition: Implications for the Future Structure of the Computer Industry*, in *Competition, Innovation and the Microsoft Monopoly: Antitrust in the Digital Marketplace* 155, 161 (Jeffrey A. Eisenach & Thomas M. Lenard eds., 1999) (proceedings of a conference held by the Progress and Freedom Foundation, Wash., D.C., Feb. 5, 1998).

7. For a discussion of the invention of e-mail, see Janet Abbate, *Inventing the Internet* 108–09 (1999).

8. The World Wide Web is a system of powerful computers (servers) connected to the Internet that supports documents formatted in the HyperText Markup Language (HTML). HTML documents support links to other documents, as well as to multimedia programs that use graphics, audio, and video files. In practice, this system enables users to move from one document to another simply by "clicking" on "links" contained in an HTML-formatted document. (Significantly, not all servers connected to the Internet are part of the World Wide Web; some focus solely on e-mail, for example.) The key application that enables users to access the World Wide Web is the "Web browser," such as the now-dominant Microsoft Internet Explorer and the once-dominant Netscape Navigator. See *Webopedia*, *World Wide Web*, at http://www.webopedia.com/TERM/W/World_Wide_Web.html (last visited Oct. 23, 2002) (on file with the *Columbia Law Review*) (defining World Wide Web); Abbate, *supra* note 7, at 214–18. For a description of the Web's creation by its inventor, see Tim Berners-Lee, *Weaving the Web* (1999).

9. For a succinct history of the government's role in developing the Internet, see Edward L. Rubin, *Computer Languages as Networks and Power Structures: Governing the Development of XML*, 53 *SMU L. Rev.* 1447, 1449–52 (2000); see also Abbate, *supra* note 7, at 54–60 (recounting government coordination and use of researchers to help develop Internet).

(and physical) infrastructure has become increasingly owned and controlled by commercial enterprises.¹⁰

The role of intellectual property law in regulating the software infrastructure for the Internet in particular and information platforms more generally will increasingly resemble that of telecommunications law in regulating the physical wires that connect Internet users.¹¹ Thus, to regulate the Internet's basic standards and future development effectively, intellectual property law must develop a competition policy strategy. In this regard, its critical challenge will be to protect investment incentives that facilitate innovation while at the same time ensuring open access to dominant software products that could impede innovation and competition by denying access to their platform. Unfortunately, the current state of intellectual property law is not well suited to handle this task.¹²

The debate over open access to software products taps into a long-unsettled area of intellectual property law.¹³ In particular, the courts

10. For a discussion of the decision to commercialize the Internet, see *infra* notes 27–32 and accompanying text.

11. As to telecommunications law, commentators are actively debating whether regulation should provide for “open access” to privately owned physical broadband infrastructure to ensure that all Internet Service Providers enjoy equal access to Internet users. Compare, e.g., James B. Speta, *Handicapping the Race for the Last Mile?: A Critique of Open Access Rules for Broadband Platforms*, 17 *Yale J. on Reg.* 39, 80–93 (2000) (questioning value of such regulation), and Phil Weiser, *Paradigm Changes in Telecommunications Regulation*, 71 *U. Colo. L. Rev.* 819, 830–31 (2000) (same), with Mark A. Lemley & Lawrence Lessig, *The End of End-to-End: Preserving the Architecture of the Internet in the Broadband Era*, 48 *UCLA L. Rev.* 925, 930–40 (2001) (championing such regulation). As for the future of open access to Internet-related software products regulated by intellectual property law, there are only the very beginnings of an appreciation for how intellectual property law needs to address open access claims for an Internet age. See François Bar & Christian Sandvig, *Rules from Truth: Post-Convergence Policy for Access 15* (Sept. 2000), at http://www.stanford.edu/~fbar/Publications/Rules_from_Truth.pdf (on file with the *Columbia Law Review*) (“[W]ith digital networks, access to network management software features is as important as access to facilities.”); Yochai Benkler & Alan Toner, *Access to the Internet* (2001), at <http://eon.law.harvard.edu/ilaw/Access> (on file with the *Columbia Law Review*) (“Just as at the physical layer, if any single company controls the logical layer—the browser or operating system, the ISP software or the messaging platform—it can exert tremendous control over the way in which that infrastructure is controlled.”).

12. See Mark A. Lemley & David McGowan, *Legal Implications of Network Economic Effects*, 86 *Cal. L. Rev.* 479, 541 (1998) (observing that intellectual property law has not integrated economic thought to the same degree as antitrust law); Randal C. Picker, *Copyright as Entry Policy: The Case of Digital Distribution*, 47 *Antitrust Bull.* 423, 423–26 (2002) (noting that intellectual property law, and particularly copyright, does not follow a clear competition policy).

13. See Raymond T. Nimmer, *Copyright and Competition Norms*, in *Intellectual Property Antitrust 1999*, at 147, 149 (PLI Intellectual Prop., Course Handbook Series No. G-566, 1999) (describing “ebb and flow” of changing emphasis on expansive property rights or those tempered by competition policy); Nelson R. Caples, *The Software Copyright ‘Super Patent,’ Computer Law*, June 1995, at 8, 8 (noting that “courts have found conflicting answers” on whether copyright law protects “aspects of [software] programs other than the source code and object code,” such as the user interfaces produced by that

continue to struggle with the question of how intellectual property law should treat access to platform standards—which facilitate compatibility between complementary products and services that are part of a particular system—and user interfaces—which facilitate the users' interactions with particular systems or products. In its last encounter with this issue in the *Lotus* case several years ago, the Supreme Court divided equally, affirming without an opinion the First Circuit's decision not to protect such an interface.¹⁴ Regulating access through intellectual property rules presents a formidable challenge for judicially developed doctrine because computer programs are eligible for protection under both copyright—as creative works of authorship—and patent—as items of functional utility.¹⁵ To be sure, both copyright and patent law include certain doctrines that limit property rights and aim to strike the right balance between providing incentives to innovate and ensuring access to critical standards. But these doctrines remain muddled, in part because of the unresolved debate between the commons and proprietary control perspectives, and thus are in need of a clear analytical framework to ensure that they serve sound competition policy goals.

With the increasing importance of the Internet, the unresolved state of intellectual property rules governing access to platform standards will become even more significant. In particular, the Internet promises to reshape the information industries¹⁶ in its image by enabling numerous products to use its communications standard to provide new services, such as instant messaging, that rely on its platform standard.¹⁷ Consequently, the conceptual framework used for deciding when firms can

code). In the language often used by courts interpreting the Copyright Act, this issue boils down to the protectibility of literal copying of “non-literal” elements of a software program. See *id.*

14. *Lotus Dev. Corp. v. Borland Int'l, Inc.*, 49 F.3d 807, 819 (1st Cir. 1995), *aff'd* by an equally divided Court, 516 U.S. 233 (1996).

15. In theory, patent law—which only protects novel, nonobvious, and useful inventions—provides “thicker” protection for a shorter period of time than copyright. Compare 35 U.S.C. §§ 101, 103(a) (2000) (requiring for patentability that invention be “new and useful” and nonobvious), and *id.* § 154(a)(2) (specifying twenty-year term of patent), with 17 U.S.C. §§ 102, 107–122 (2000) (providing copyright protection for “original works of authorship fixed in any tangible medium of expression” but with various limitations on exclusive rights), and *id.* §§ 302–305 (specifying duration of copyright, generally life of author plus seventy years). With respect to dynamic software markets, however, the length of protection is often irrelevant, as patent law's twenty-year duration is an eternity in the Internet world. Rather than focus on the length of intellectual property protection, this Article focuses on its scope; in particular, it discusses when software product specifications and user interfaces should be protected so that other firms cannot make their products interoperable with the protected inventions.

16. While the precise definition of “the information industries” remains unsettled, for purposes of this Article the term refers to Internet services, telecommunications services, and software products. Some refer to these industries as the “new economy.” See Richard A. Posner, *Antitrust in the New Economy*, 68 *Antitrust L.J.* 925, 925–26 (2001).

17. Consider, for example, the case of “Web services,” which are greatly influencing the future of software. See *infra* notes 258–261 and accompanying text.

gain access to a platform standard will not only shape the development of the Internet, but also all information industries that rely on platform standards (e.g., cell phones and video game consoles). In evaluating alternative frameworks to guide intellectual property policy, courts and policymakers will need to determine what approach will best facilitate innovation in the development of the Internet in particular and the information industries more generally.

This Article presents an alternative model to the commons and proprietary control perspectives, setting out the competitive platforms model and explaining how it can be applied to the Internet and the information industries. In terms of its application to the Internet, the competitive platforms model would ensure a basic level of openness while allowing for proprietary enhancements, thereby enabling developers to provide rival Internet-based products and services based on technologies that are not open to all.¹⁸ Under this model, the technologies that make these services possible would be protected (and access limited) until and unless a particular one emerged as dominant and likely to monopolize the market. By that time, the innovating firm would already have reaped sufficient rewards to have spurred the innovation; conversely, a failure to open a dominant standard would threaten future innovation by denying access to firms that needed to rely on this standard to bring new products to market.

Based on the competitive platforms model, this Article proposes a reformulation of the intellectual property law doctrines that regulate the copying of user interfaces or platform standards (often accomplished through reverse engineering). Admittedly, reformulating intellectual property policy into a unified and coherent regime based on the competitive platforms model is only one component of a more comprehensive vision for the regulation of the Internet and information industries. In essence, the competitive platforms model calls for a policy of facilitating, wherever possible, the development and continued survival of rival platform standards (or "information platforms"¹⁹) to support different information products and services. Where multiple platforms cannot thrive—and where one appears set to dominate the market—the next best world is one where different firms can all survive based on a common and open standard. As this Article explains, rival standards provide a number of benefits over a single open standard—that is to say, one not owned by a proprietary firm—but a single open standard is better than a single pro-

18. In practice, these enhanced proprietary services could provide advantages over current Internet communications, such as heightened security, guaranteed delivery, and synchronization (for realtime applications). See Richard Karpinski, *Do Web Services Need a Network?*, *InternetWeek.com*, Oct. 25, 2001, at <http://www.internetweek.com/trans today01/ttoday102501.htm> (on file with the *Columbia Law Review*).

19. An information platform, as discussed further at *infra* note 33 and accompanying text, is any product or service that ultimately enables the delivery of information, whether it be in music, video, or text form. A media player, for example, constitutes an information platform because it enables the delivery of music and video via the Internet.

proprietary standard controlled by a dominant firm (as is the case with Microsoft's Windows operating system, for example). In addition to addressing intellectual property law, this Article also explains how standard-setting bodies and government funding of research and development can facilitate the emergence and continued success of an open standard.

This Article proceeds in five parts. To explain the relevant historical, technological, and legal landscape, Part I outlines the Internet's technical architecture and briefly explains how intellectual property law's treatment of reverse engineering will influence the future direction of the Internet. Part II discusses in greater detail the technical and legal landscape of reverse engineering. Part III sets forth the competing visions of a proprietary Internet and an information commons, and Part IV outlines the competitive platforms model, explaining why it would provide a superior strategy for facilitating innovation. In so doing, Part IV discusses the role of standard-setting bodies and government funding in supporting an open platform where proprietary firms will not invest in developing proprietary ones. Finally, Part V explores the application of the competitive platforms model to reverse engineering, discussing both how it would reform the legal treatment of reverse engineering as well as potential criticisms of such reforms.

I. AN INTRODUCTION TO THE INTERNET AND INTELLECTUAL PROPERTY POLICY

The development of the Internet and the continuing need to facilitate and regulate its growth have set the tone for current debates about the information economy and the future of intellectual property policy. To explain the backdrop for these debates, this Part first discusses briefly how the Internet has developed thus far and how it functions, and then connects the development of the Internet to intellectual property policy. It concludes by outlining the legal treatment of reverse engineering, which is one means of regulating when an inventor of an information platform can maintain proprietary control of a platform standard.

A. *How the Internet Works and How It Got Started*

One helpful conceptualization of the Internet's technical architecture is to think of it as four layers that are piled on top of one another.²⁰ At the top is the content layer, which is the level at which most users interact with the Internet (Yahoo's website, for example). Supporting

20. Models such as this have been developed to help describe the different functional "layers" of Internet communication. See, e.g., IT-Director.com, TCP/IP and OSI, searchNetworking.com, Sept. 26, 2002, at http://searchNetworking.techtarget.com/originalContent/0,289142,sid7_gci851291,00.html (on file with the *Columbia Law Review*) (describing the ISO/OSI and TCP/IP reference models). Increasingly, legal commentators rely on a four-layer model to conceptualize the Internet's architecture. See, e.g., Kevin Werbach, A Layered Model for Internet Policy, 1 J. Telecomms. & High Tech. L. 37, 58-64 (2002).

this content layer is the application layer, which includes the browser software to access websites and the media player software for multimedia. At the Internet's core is the logical layer, which consists of the basic standards—namely, the TCP/IP²¹—that define the nature of Internet communications. Finally, at bottom, the Internet relies on the physical layer, which involves the actual wires that are used to access the Internet and the “backbone” infrastructure that carries information from where it is stored to the user.

Using the four-layer model of the Internet set out above, it becomes clear why legal scholars and most commentators have spent a disproportionate amount of attention focusing on the role that intellectual property law plays in regulating access to content over the Internet. For most users, the content layer of the Internet, along with the physical layer, is the most familiar and understandable. But the roles played by the applications and logical layers, while not appreciated by most users, are critically important. Indeed, the available applications and logical standards constitute the Internet's software infrastructure and make possible its various uses. Thus, rather than address the content and physical layer issues that lie at the heart of many current academic and policy debates regarding the Internet,²² this Article focuses on how intellectual property law and government policy can influence the future development of the application and logical layers.

The openness of each layer of the Internet reflects not only the vision of its early pioneers and its government supporters,²³ but also the leadership of standard-setting committees like the Internet Engineering Task Force (IETF).²⁴ To develop the basic Internet technologies, the

21. See *supra* note 3 and accompanying text. For a description of this standard, see T. Socolofsky & C. Kale, A TCP/IP Tutorial 2–8 (Network Working Group, Request for Comments No. 1180, 1991), at <http://www.rfc-editor.org/rfc/rfc1180.txt> (on file with the *Columbia Law Review*). For a discussion of how government funding and academic research helped develop this open standard, see Abbate, *supra* note 7, at 122–33; Robert E. Kahn & Vinton G. Cerf, What Is the Internet? (And What Makes It Work) 8–11 (1999), available at <http://www.policyscience.net/cerf.pdf> (on file with the *Columbia Law Review*); see also James B. Speta, A Common Carrier Approach to Internet Interconnection, 54 Fed. Comm. L.J. 225, 243–47 (2002) (describing development of TCP/IP and its effectiveness for Internet communication).

22. For a sense of the debate over access to the physical layer, see *supra* note 11. For a sense of the debates related to Internet content, see, e.g., Yochai Benkler, Free as the Air to Common Use: First Amendment Constraints on Enclosure of the Public Domain, 74 N.Y.U. L. Rev. 354, 386–94, 412–46 (1999).

23. See *supra* note 9 and accompanying text.

24. For an overview of the IETF, which is acknowledged to be the most important Internet standards body, see Scott Bradner, The Internet Engineering Task Force, in *Open Sources: Voices from the Open Source Revolution* 47, 47–52 (Chris DiBona et al. eds., 1999); Internet Engineering Task Force, Overview of the IETF, at <http://www.ietf.org/overview.html> (last visited Oct. 23, 2002) (on file with the *Columbia Law Review*). For a description of the organizational culture that guided the Internet's early development, see Committee on the Internet in the Evolving Information Industries, *The Internet's Coming of Age* 124, 134–35 (2001) [hereinafter *Internet's Coming of Age*]. For a celebration of

government relied on a collection of engineers, who developed the Internet's key software on a nonproprietary basis.²⁵ To keep such technologies available to all, Richard Stallman founded the Free Software movement, which developed an open source license—the General Public License (GPL)—to guarantee that any improvements to the basic code remain free for others to use under the terms of the license.²⁶

In the early 1990s, the government decided to remove the restrictions on the use of the Internet for commerce, privatize the key Internet infrastructure, and leave it to the private sector to chart the Internet's future growth.²⁷ Taken together, these steps effectively declared that the Internet was now full grown and would no longer be fostered by direct government subsidies.²⁸ These steps also ended the government's com-

the IETF's decisionmaking process, see A. Michael Froomkin, *Habermas@discourse.net: Toward a Critical Theory of Cyberspace*, 116 *Harv. L. Rev.* 749, 796–817 (2003).

25. See Berners-Lee, *supra* note 8, at 73–74 (discussing placement of the Web's software code in the public domain); Charles H. Ferguson, *High St@kes, No Prisoners* 50–52 (1999) (discussing development of the original Web browser); Nathan Newman, *Storming the Gates*, *American Prospect*, Mar. 27–Apr. 10, 2000, at 35, 35 (“Largely funded by the federal government, open-source software was the creative force behind the explosion of the computer industry; it also drove development of the Internet and still comprises much of the Internet's inner workings.”); Apache Software Found., *Apache HTTP Server Project: About the Apache HTTP Server Project*, at http://httpd.apache.org/ABOUT_APACHE.html (last visited Oct. 20, 2002) (on file with the *Columbia Law Review*) (discussing history and organization of the Apache Group, comprised of volunteer software developers committed to “creating a . . . freely-available code implementation of an HTTP (Web) server”).

26. See Ira V. Heffan, Note, *Copyleft: Licensing Collaborative Works in the Digital Age*, 49 *Stan. L. Rev.* 1487, 1508 (1997) (setting out conditions of GPL). As others have noted, there are important differences between the GPL used for innovations such as the Linux operating system and other open source licenses (such as that used for the Apache server) that allow for proprietary extensions that are derivative works of the original product. See Lessig, *Future of Ideas*, *supra* note 1, at 59–60; Michael J. Schallop, *The IPR Paradox: Leveraging Intellectual Property Rights to Encourage Interoperability in the Network Computing Age*, 28 *AIPLA Q.J.* 195, 243–48 (2000). In what open source advocate Eric Raymond deemed a “clever” move, Microsoft recently condemned the entire open source movement by criticizing the “controversial” form of GPL licensing as reflective of the entire movement. See John Markoff, *Microsoft Is Set to Be Top Foe of Free Code*, *N.Y. Times*, May 3, 2001, at C1 (quoting Eric Raymond). For a discussion of the various distinctions, see Free Software Foundation, *Categories of Free and Non-Free Software*, at <http://www.gnu.org/philosophy/categories.html> (last modified Dec. 29, 2002) (on file with the *Columbia Law Review*).

27. See Scientific and Advanced Technology Act of 1992, Pub. L. No. 102-476, sec. 4, § 3, 106 Stat. 2297, 2300 (codified at 42 U.S.C. § 1862(g) (2000)); see also *Appropriate Framework for Broadband Access to the Internet over Wireline Facilities*, 17 *FCC Rcd* 3019, 3025 (2002) (noting that after a period of government support, “the Internet entered a commercial phase characterized by more widespread network interconnection, an explosion of applications and access to a growing universe of websites utilizing common, interoperable protocols”); Abbate, *supra* note 7, at 196–200 (explaining the change in government policy).

28. See *Internet's Coming of Age*, *supra* note 24, at ix (remarking that the Internet has “reached its adolescence”); Kahn & Cerf, *supra* note 21, at 5 (noting that purpose of allowing commerce on the Internet was to use “the enthusiasm of private sector interests to

mitment to supporting an open architecture model for the Internet's development and invited the introduction of proprietary (and closed) standards in the Internet world.²⁹ In particular, by calling on commerce to take the leading role in developing the Internet,³⁰ the government created a gold rush for companies to introduce proprietary technologies to the developing Internet infrastructure.³¹ In developing closed, proprietary standards—as opposed to open ones—companies seek to capture more value from their inventions, maintain more control over their product, and innovate in whatever manner and pace they chose.³² By con-

build upon the government funded developments to expand the Internet and make it available to the general public"). One of the government's important—and unfortunate—steps was to invest less in the creation of open standards through, say, supporting academic research or funding the activities of the IETF. See *Internet's Coming of Age*, supra note 24, at 137 (noting declining government funding for noncommercial Internet research); Noah Green, *Weaning the Net: The Feds Hand Cyberspace to the Private Sector*, *Village Voice*, July 11, 1995, at 41 (noting end of government support for the IETF).

29. The challenges to preserving an open architecture without intermediaries that might act as "gatekeepers" are discussed in Marjory S. Blumenthal & David D. Clark, *Rethinking the Design of the Internet: The End-to-End Arguments vs. the Brave New World*, in *Communications Policy in Transition: The Internet and Beyond* (Benjamin M. Compaine & Shane Greenstein eds., 2001). Among those forces that are leading to the introduction of such entities are the use of the network address translation (NAT) to create additional IP addresses, a number of quality of service (QOS) assurance technologies, and measures that provide security, filter undesirable content, and protect privacy (such as firewalls). See *Internet's Coming of Age*, supra note 24, at 7 (discussing NATs); *id.* at 10, 104 ("The reality of today's Internet is that end-to-end enhancement of QOS is a dim prospect."); *id.* at 143 (describing filtering and firewalls); *Upgrading the Internet*, *Economist*, Mar. 24, 2001, at 33, 34 (quoting Ray Ozzie as stating that NAT and the increasing use of firewalls have fundamentally broken down the Internet's end-to-end architecture).

30. See generally William J. Clinton & Albert Gore, Jr., *A Framework for Global Electronic Commerce* 4 (1997) (stating, as the first principle of Internet policy, "[t]he private sector should lead" and observing that, although the government played a critical role in the Internet's development, "its expansion has been driven primarily by the private sector"). For a discussion of this transition, see Jay P. Kesan & Rajiv C. Shah, *Fool Us Once Shame on You—Fool Us Twice Shame on Us: What We Can Learn from the Privatizations of the Internet Backbone Network and the Domain Name System*, 79 *Wash. U. L.Q.* 89, 107–19 (2001).

31. See Charles R. Morris & Charles H. Ferguson, *How Architecture Wins Technology Wars*, *Harv. Bus. Rev.*, Mar.–Apr. 1993, at 86, 87 ("Simply stated, competitive success flows to the company that manages to establish proprietary architectural control over a broad, fast-moving, competitive space."); Nicholas G. Carr, *Gated Communities, Industry Standard*, *Nov. 27–Dec. 4, 2000*, at 178, 178 ("There is always an incentive for one company to try to . . . change standards and leave other companies inoperable . . . but there's a tremendous incentive for the community as a whole to prevent that.") (quoting Tim Berners-Lee).

32. See Carl F. Cargill, *Open Systems Standardization: A Business Approach* 52–54 (1997) (highlighting the time and compromises necessary to forge a common standard); *Internet's Coming of Age*, supra note 24, at 133 (noting how increased participation in standard-setting bodies lowers the quality of the ultimate standard); William Lehr, *Compatibility Standards and Interoperability: Lessons from the Internet*, in *Standards Policy for Information Infrastructure* 121, 133, 140 (Brian Kahin & Janet Abbate eds., 1995) (explaining that standard-setting committees move slowly because supermajority

trast, committing to open standards often results in a lowest common denominator approach.

B. *Information Platforms and Reverse Engineering*

Information technology inventions at the application and logical layers of the Internet—or in the equivalent positions of other information industries—can be understood as information platforms.³³ Stated simply, applications and logical standards constitute information platforms because they provide a *foundation* for the delivery of content—be it music, text, video games, or video—in digital form. In nearly all cases, this platform relies on complementary products or services that use a platform standard or user interface. Take, for example, Sony PlayStation's video game system. This product, which can be understood as an application, supports content specifically made for it. Similarly, both a Web browser and a media player program function in this manner, as they facilitate the viewing of content in a compatible format. The essence of each of these information platforms is the platform standard for which content can be built, and the user experience created by its user interface.

By understanding how the browser, media player, and the Sony PlayStation all constitute applications, it also becomes clearer how the logical layer standards play a critical role in facilitating invention. Because all Internet users rely on connections that are compatible with the basic technologies comprising the logical layer—and those technologies are free and open to all—inventors like Sony can develop interactive applications without worrying about whether they will have access to the basic Internet standard. At the same time, because there is no one custodian charged with maintaining the logical layer standards, there is a danger that those standards may not develop as effectively as the proprietary applications that rely upon them.

For companies developing proprietary applications that function as information platforms, protecting their platform standard and user inter-

voting, public notice requirements, and hierarchical comment-and-review cycles afford firms multiple opportunities to delay a standard's progress); Office of Policy Planning, Fed. Trade Comm'n, 1 *Anticipating the 21st Century: Competition Policy in the New High-Tech*, Global Marketplace 27–28 (1996) (“[V]oluntary standard setting tends to occur too slowly, too sporadically, and, in settings where proprietary control truly matters, too infrequently to offer anything approximating a complete solution.”); Morris & Ferguson, *supra* note 31, at 89 (“Because they are set by committees, [standard-setting bodies] usually settle on lowest-common-denominator, compromise solutions.”). A related point is that by submitting a standard to a committee for approval, a company may find that its competitors are able to use the standard-setting process to reduce the innovating firm's competitive edge. Martin C. Libicki, *Information Technology Standards: Quest for the Common Byte* 12–13 (1995).

33. For a further explanation of information platforms and their legal significance, see Philip J. Weiser, *Law and Information Platforms*, 1 *J. Telecomms. & High Tech. L.* 1, 3–8 (2002) [hereinafter Weiser, *Information Platforms*]; see also *supra* note 19.

face—often through intellectual property law—is critical to enabling them to succeed. In the case of a game console, for example, the inventor may well safeguard access to its platform standard to prevent a would-be rival from gaining access to its system and appropriating the value of the original invention by developing a clone. Similarly, if a Web browser (or media player) manufacturer develops a user interface that provides a more satisfying user experience than existing alternatives, a rival can copy that interface unless intellectual property law prevents such an attempt.

The Internet's initial development relied on significant government support and the collaboration among academics and programmers who developed most of the core software and protocols for Internet-related standards. This development path can be justified by the fact that the Internet's most basic protocols (like the TCP/IP standard) constitute classic public goods that would not necessarily be provided by the market.³⁴ In particular, these open standards benefit all users enormously, but no single user is able to appropriate enough of their benefits in order to have had the incentive to create them in the first place.³⁵ For such basic standards, intellectual property law confronts a dilemma: Allowing one firm to control such standards on a proprietary basis may prevent the technology from gaining adopters, while not allowing the inventor to reap some rewards from an invention will fail to provide an incentive for firms to innovate in the first place.³⁶ Because of this public goods quality of information, intellectual property law's treatment of information plat-

34. See Brett Frischmann, *Privatization and Commercialization of the Internet Infrastructure: Rethinking Market Intervention into Government and Government Intervention into the Market*, 2 *Colum. Sci. & Tech. L. Rev.* 1, ¶¶ 30–46 (June 8, 2001), at <http://www.stlr.org/cite.cgi?volume=2&article=1> (on file with the *Columbia Law Review*) (pointing out public goods aspects of Internet infrastructure); A. Michael Froomkin, *Wrong Turn in Cyberspace: Using ICANN to Route Around the APA and the Constitution*, 50 *Duke L.J.* 17, 55 (2000) (observing that the National Science Foundation had “already begun funding cooperative private-sector Internet research and development in 1986 and continued to do so on an increasingly large scale until 1995”); see also Jonathan M. Barnett, *Cultivating the Genetic Commons: Imperfect Patent Protection and the Network Model of Innovation*, 37 *San Diego L. Rev.* 987, 1004 (2000) (“In the absence of some form of state intervention, the market is likely to underinvest in fundamental innovation projects that generate a large stream of inappropriable spillovers.”).

35. See Michael L. Katz & Carl Shapiro, *Systems Competition and Network Effects*, *J. Econ. Persp.*, Spring 1994, at 93, 102–03 [hereinafter Katz & Shapiro, *Systems Competition*] (noting that “an open communications network shares many features with a public good; small users may free-ride on large users who may bear the costs necessary to create and market the network”); see also Richard Cornes & Todd Sandler, *The Theory of Externalities, Public Goods, and Club Goods* 240–326 (2d ed. 1996) (describing the public goods concept in general and the intersection of public goods and game theory); William M. Landes & Richard A. Posner, *An Economic Analysis of Copyright Law*, 18 *J. Legal Stud.* 325, 326 (1989) (explaining public goods concept in intellectual property context); Pamela Samuelson et al., *A Manifesto Concerning the Legal Protection of Computer Programs*, 94 *Colum. L. Rev.* 2308, 2337 n.92 (1994) (same).

36. As Wendy Gordon explains, markets will remain underdeveloped where the costs of initial investment are high, copying is easy, and the copyist can undercut the initial inventor's price by free riding on the inventor's efforts. See Wendy J. Gordon, *Asymmetric*

forms (whether or not they are connected to the Internet) plays a critical role in regulating innovation.

In addressing the question of how to encourage investment in public goods, government faces a choice between funding such development directly—as it did with regard to the Internet—or relying on private sector development encouraged by intellectual property protection. Where government decides to provide for intellectual property protection to encourage invention, it must be careful to calibrate the investment incentives awarded to developers so as to limit the ability of inventors to prevent innovation by denying access to would-be improvers and rivals.³⁷

Even though companies have long developed products on a proprietary basis in the software industry, intellectual property law has yet to settle on a coherent model of when to allow open access to an information platform for purposes of developing a similar product. This access can occur either because intellectual property law declines to protect user interfaces or because it allows access to a platform standard through reverse engineering. As defined by a leading case, reverse engineering can be understood as the process of using a finished product and working backward to determine how it was actually made.³⁸ In the case of software programs, reverse engineering is used to translate a program written in object code (that is, the machine-readable language or binary code of ones and zeros that tells the computer what functions to perform) to source code (which programmers can read and understand).³⁹

Market Failure and Prisoner's Dilemma in Intellectual Property, 17 *U. Dayton L. Rev.* 853, 861–67 (1992).

37. For discussions of this basic purpose of intellectual property law, see Phillip Areeda & Louis Kaplow, *Antitrust Analysis: Problems, Text, Cases* 152–53 (5th ed. 1997); Barnett, *supra* note 34, at 991 (summarizing “incentive theory” of intellectual property as postulating that the purpose of intellectual property protection is to stimulate “private investment by warding off low-cost imitators and promising monopolistic profits that will at least cover product development costs”); Landes & Posner, *supra* note 35, at 326 (“For copyright law to promote economic efficiency, its principal legal doctrines must, at least approximately, maximize the benefits from creating additional works minus both the losses from limiting access and the costs of administering copyright protection.”); Robert P. Merges & Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 *Colum. L. Rev.* 839, 843 (1990) (expanding incentive theory to incorporate role for postinvention improvement). Moreover, as commentators have recognized, intellectual property law’s focus on motivating original works must be tempered with an appreciation for other purposes of information management, such as allowing for critical commentary and promoting a robust marketplace of ideas. See, e.g., Robert P. Merges, *Are You Making Fun of Me?: Notes on Market Failure and the Parody Defense in Copyright*, 21 *AIPLA Q.J.* 305, 306 (1993) (critiquing narrow version of incentive theory).

38. *Kewanee Oil Co. v. Bicron Corp.*, 416 U.S. 470, 476 (1974).

39. For a detailed discussion of the issue, see Andrew Johnson-Laird, *Software Reverse Engineering in the Real World*, 19 *U. Dayton L. Rev.* 843 (1994); see also Jessica Litman, *Copyright and Information Policy*, *Law & Contemp. Probs.*, Spring 1992, at 185, 197–98 (explaining process of translating object code into source code); Pamela Samuelson & Suzanne Scotchmer, *The Law and Economics of Reverse Engineering*, 111 *Yale L.J.* 1575, 1608–13 (2002) (same).

In so doing, companies often will need to copy the protected software program; nonetheless, where such "intermediate copying" serves the purpose of facilitating interoperability between a platform and a complementary product, the courts have condoned such copying.⁴⁰ In such cases, noninfringing use does not mean free access, as the process of translating object code to source code⁴¹ can be quite expensive and time consuming.⁴²

The legal status of reverse engineering shapes the nature of competition and innovation in information platforms by providing a quasi-compulsory license to a platform.⁴³ By allowing access to a standard, intellectual property law creates an incentive for the standard bearer to license its product to rivals at an amount equal to the cost of reverse engineering the platform standard and creating an independent invention.⁴⁴ In many cases, the price for negotiated access may be above that amount, as the

40. Most recent cases endorse this right under the Copyright Act. See *Sega Enters. Ltd. v. Accolade, Inc.*, 977 F.2d 1510, 1527-28 (9th Cir. 1992) (concluding, as a matter of law, that reverse engineering constituted fair use of a copyrighted work); *Atari Games Corp. v. Nintendo of Am., Inc.*, 975 F.2d 832, 844 (Fed. Cir. 1992) (same). For a sampling of the legal commentary endorsing such a right, see J. Beckwith Burr, *Competition Policy and Intellectual Property in the Information Age*, 41 *Vill. L. Rev.* 193, 194-99 (1996); Julie E. Cohen, *Reverse Engineering and the Rise of Electronic Vigilantism: Intellectual Property Implications of "Lock-Out" Programs*, 68 *S. Cal. L. Rev.* 1091, 1104-34 (1995). Indeed, a number of recent statutory enactments specifically provide for such a right. See *Digital Millennium Copyright Act of 1998 (DMCA)* § 1201(f), Pub. L. No. 105-304, § 103, 112 Stat. 2860, 2866-67 (1998) (codified as amended at 17 U.S.C. § 1201(f)) (allowing for reverse engineering to achieve interoperability); *Semiconductor Chip Protection Act of 1984 (SCPA)* § 906(a), Pub. L. No. 98-620, §§ 301-302, 98 Stat. 3335, 3350 (1984) (codified as amended at 17 U.S.C. § 906(a)) (permitting reverse engineering for certain purposes); *Brooktree Corp. v. Advanced Micro Devices, Inc.*, 977 F.2d 1555, 1565-67 (Fed. Cir. 1992) (discussing SCPA). The Copyright Act itself, however, provides merely for a fair use defense, leaving courts to employ a set of factors to determine whether such a defense should prevail on a case-by-case basis. 17 U.S.C. § 107.

41. To be precise, there are a number of different translation processes under the broad category of reverse engineering. See Brian Fitzgerald et al., *Innovation, Software, and Reverse Engineering*, 18 *Santa Clara Computer & High Tech. L.J.* 121, 125-29 (2001) (describing disassembly, decompilation, emulation, and binary translation methods of reverse engineering). As all of these processes entail intermediate copying (albeit to different degrees), the courts have tended not to distinguish them for purposes of the relevant legal analysis. See, e.g., *Sony Computer Entm't, Inc. v. Connectix Corp.*, 203 F.3d 596, 603-04 (9th Cir. 2002) (refusing to distinguish between classic "disassembly" method and "black box" reverse engineering, which requires making numerous copies).

42. See Samuelson et al., *supra* note 35, at 2403-04.

43. See Joseph Farrell & Michael L. Katz, *The Effects of Antitrust and Intellectual Property Law on Compatibility and Innovation*, 43 *Antitrust Bull.* 609, 611-13 (1998).

44. In suggesting that "fair use is nothing more than a zero-price compulsory license of copyrighted works," others make this basic point. Timothy J. Brennan, *Copyright, Property, and the Right to Deny*, 68 *Chi.-Kent L. Rev.* 675, 712 (1993). At least in the reverse engineering context, however, most do not account for the technical difficulty of gaining access to the protected work. But see Samuelson & Scotchmer, *supra* note 39, at 1589 (providing a more careful account of the relationship between reverse engineering and licensing).

sponsor of the platform standard can often provide valuable specification information above and beyond access to the technical interface itself.⁴⁵ In theory, once intellectual property law settles on clear legal rules, firms will be better positioned to act in advance of litigation (or reverse engineering) to agree on a reasonable license for access to the platform standard. Unfortunately, as Coase's theorem and subsequent scholarship make clear, transaction costs and imperfect information may well prevent many such resolutions from taking place.⁴⁶ Moreover, as reverse engineering can be quite complicated, the legal permission to do so may be insufficient to enable firms to gain access to a platform standard. In such cases, either antitrust action or telecommunications regulation may be necessary to ensure such access.⁴⁷

C. *Intellectual Property Law and the Development of Platform Standards*

Intellectual property law enjoys an important advantage over antitrust and regulation in deciding when to allow or prevent open access to a platform standard because it operates only as a check on private conduct, not as an affirmative regulatory regime that superintends access obligations. This advantage of intellectual property law stems from the nonrivalrous nature of intellectual property (i.e., it can be used by many at the same time), such that allowing open access to it does not present any of the management problems associated with the "tragedy of the commons" scenario.⁴⁸ The risk in developing an intellectual property re-

45. For a discussion of this point, see Annabelle Gawer & Michael A. Cusumano, *Platform Leadership: How Intel, Microsoft, and Cisco Drive Industry Innovation* 100–03 (2002).

46. See, e.g., R.H. Coase, *The Problem of Social Cost*, 3 *J. L. & Econ.* 1 (1960); see also A. Mitchell Polinsky, *An Introduction to Law and Economics* 11–14 (2d ed. 1989) (providing concise summary of the Coase theorem and the problem of transaction costs); Michael L. Katz, *Intellectual Property Rights and Antitrust Policy: Four Principles for a Complex World*, 1 *J. Telecomms. & High Tech. L.* 325, 328–29 (2002) (explaining the importance of the Coase theorem in grappling with complexities of intellectual property and antitrust law).

47. A more complete exploration of the related antitrust and telecommunications regulation issues is beyond the scope of this Article. For a discussion of the former, see Mark A. Lemley, *Antitrust and the Internet Standardization Problem*, 28 *Conn. L. Rev.* 1041, 1042–43 (1996) [hereinafter Lemley, *Internet Standardization*]. For a look at the latter, see Weiser, *Internet Governance*, *supra* note 3, at 822–23. The effort to harmonize intellectual property and antitrust policy continues to be an important subject for debate. See generally Michael A. Carrier, *Unraveling the Patent-Antitrust Paradox*, 150 *U. Pa. L. Rev.* 761 (2002); Weiser, *Information Platforms*, *supra* note 33.

48. See Niva Elkin-Koren, *Copyrights in Cyberspace—Rights Without Laws?*, 73 *Chi.-Kent L. Rev.* 1155, 1190–92 (1998). This phenomenon of private property neither managed by the government nor subject to control of a private entity represents a distinct class of property supported by a long tradition. See Carol Rose, *The Comedy of the Commons: Custom, Commerce, and Inherently Public Property*, 53 *U. Chi. L. Rev.* 711, 720 (1986) [hereinafter Rose, *Comedy of the Commons*]. Intellectual property law also has important advantages over regulation because the public goods quality of information technology standards enable them to be shared without the challenges presented by the

gime that will withhold protection in certain instances is that this regime may fail to provide an adequate incentive to develop any innovation at all. Thus, the core challenge for developing an appropriate open access regime for information platforms is to craft a framework that both respects the need to provide incentives for investment and permits access when necessary to facilitate competition and innovation.⁴⁹ Given the significance of standards in the information technology sector,⁵⁰ this issue merits much more careful attention than it has received to date, particularly in light of the uncertain status of reverse engineering, which acts as an important regulator of access to information platforms.

In acknowledging a role for antitrust and telecommunications regulation oversight (at least where reverse engineering efforts are ineffective), it is important to emphasize that the existing interplay among intellectual property law, antitrust, and telecommunications regulation does not advance a coherent competition policy. In particular, each regime approaches the issue of open access to platform standards in its own way, even when that approach is in tension with the policy goals advanced by the other regimes.⁵¹ Although this Article does not detail the intersection of intellectual property and antitrust law (nor set forth how antitrust law should work in tandem with telecommunications law⁵²), it does recommend that the three regimes work in combination with one another—and not at cross purposes, as currently is the case.

forced sharing of physical facilities. See *AT&T Corp. v. Iowa Utils. Bd.*, 525 U.S. 366, 428–31 (1999) (Breyer, J., concurring in part and dissenting in part) (discussing challenges of managing shared physical facilities).

49. See Robert Cooter & Thomas Ulen, *Law and Economics* 135 (1988) (“[T]he dilemma is that without a legal monopoly not enough information will be produced but with the legal monopoly too little of the information will be used.”).

50. Consider, for example, a 1995 study that estimated that over fifty percent of all new standards—across all industries—were developed for the information technology sector. See Steven Oksala et al., *The Structure of IT Standardization*, 4 *StandardView* 9, 10 (1996).

51. A classic example is the case of antitrust oversight of conduct related to intellectual property. A number of courts have held that the objectives imposed by antitrust law differ for intellectual property and real property. See Weiser, *Information Platforms*, supra note 33, at 16–18 (discussing intellectual property-antitrust intersection).

52. The integration of these areas of law within a broader framework is part of a larger project. For several components of this effort, see Philip J. Weiser, *Goldwasser*, the Telecom Act, and Reflections on Antitrust Remedies, 55 *Admin. L. Rev.* (forthcoming 2003) (on file with the *Columbia Law Review*); see also Weiser, *Information Platforms*, supra note 33, at 3–8 (discussing relationship between these areas, along with First Amendment law). See generally Philip J. Weiser, *The Imperative of Harmonization Between Antitrust and Regulation*, in *Telecommunications Convergence: Implications for the Industry and for the Practicing Lawyer 2002* (PLI Intellectual Property, Course Handbook Series No. G-698, 2002) (advancing model for a convergence between antitrust and regulation); Joseph Farrell & Philip J. Weiser, *Modularity, Vertical Integration, and Open Access Policies: Towards a Convergence of Antitrust and Regulation in the Internet Age 5*, at <http://repositories.cdlib.org/iber/cpc/CPC02-035> (on file with the *Columbia Law Review*) (same).

The current state of how these legal regimes work in tension with one another can be illustrated effectively by the recent antitrust case against Microsoft. In that case, the court analyzed a challenge to Microsoft's dominance in the operating systems market. Ultimately, through antitrust law, the Department of Justice, a number of litigating states, and Microsoft settled on a set of access remedies.⁵³ Such access opportunities, however, might also have been available through intellectual property law to the extent that it did not limit opportunities for potentially successful reverse engineering. In fact, intellectual property law does not regulate reverse engineering in a consistent manner because patent law tends to be quite restrictive of it and copyright law quite liberal, even where the same computer software product is protectible within both regimes.⁵⁴ Understood properly, intellectual property law can define the nature of a firm's ownership rights in an information platform (including permitting access where appropriate), and antitrust and telecommunications regulation can further limit those rights where the theoretical possibility of access (through reverse engineering) does not occur in practice.⁵⁵ In the Microsoft case, it may well have been the practical obstacles to reverse engineering the operating system that reinforced Microsoft's dominance, but the lack of a more sensible intellectual property regime did not help matters.⁵⁶

Intellectual property law also enjoys an advantage over antitrust and telecommunications regulation in regulating access to would-be dominant information platforms because reverse engineering acts as a self-help opportunity for firms that may otherwise be defeated in the marketplace before a conduct remedy (overseen either by a regulatory agency or

53. See *United States v. Microsoft*, 231 F. Supp. 2d 144, 202-03 (D.D.C. 2002). For a discussion of the settlement agreement's restrictions, see Dan Carney, *Microsoft Could Still Lose a Lot of Yardage*, *Bus. Wk.*, Dec. 24, 2001, at 35, 35.

54. This inconsistency could be a virtue if the award of patents for software inventions reflected truly superior originality as compared to that embodied in software inventions protected by copyright. See Michael J. Schallop, *Protecting User Interfaces: Not as Easy as 1-2-3*, 45 *Emory L.J.* 1533, 1566-67 (1996) (suggesting that patent law and not copyright law provide protection for truly innovative user interfaces); cf. Peter S. Menell, *The Challenges of Reforming Intellectual Property Protection for Computer Software*, 94 *Colum. L. Rev.* 2644, 2647-48 & n.19 (1994) (arguing for protection for software products, including user interfaces, only where they require "significant research efforts"). But the broad issuance of software patents strongly suggest that the current regime does not work this way in practice. See Robert P. Merges, *As Many as Six Impossible Patents Before Breakfast: Property Rights for Business Concepts and Patent System Reform*, 14 *Berkeley Tech. L.J.* 577, 589-91 (1999) (highlighting problem that many software patents are of exceptionally poor quality).

55. For a development of this overall vision, see Weiser, *Information Platforms*, *supra* note 33, at 16-17.

56. For a suggestion along the lines of how intellectual property could address Microsoft's dominance, see Jonathan Zittrain, *The Un-Microsoft Un-Remedy: Law Can Prevent the Problem that It Can't Patch Later*, 31 *Conn. L. Rev.* 1361, 1372-74 (1999) (suggesting that reduction in term of copyright protection could provide an important check on Microsoft's dominance).

a court administering an antitrust remedy) can take effect. Consider, for example, the case of RealNetworks, which produces an application that enables Internet users to view digital content—either music or video—using its RealPlayer. Just recently, RealNetworks announced that it had reverse-engineered Microsoft's rival Windows Media Player in order to ensure that users could use the RealPlayer for any content developed for the Media Player.⁵⁷ This step can be understood either as an offensive effort to appropriate the value of Microsoft's system or as a defensive measure to stay alive.⁵⁸ By condoning defensive measures, intellectual property law can protect firms that need access to a would-be dominant standard without the delay inherent in an antitrust action. Conversely, by refusing to provide access where two or more rival products are both sustainable competitors, intellectual property law can provide important incentives for investment and experimentation between competing information platforms.

II. THE CURRENT STATE OF INTELLECTUAL PROPERTY LAW'S TREATMENT OF REVERSE ENGINEERING

A. *The Legal Status of Reverse Engineering*

This section first sets out the legal background for how intellectual property law regulates reverse engineering and then addresses how reverse engineering works in practice.

1. *Legal Underpinnings.* — Over the course of the Internet's early development, Congress and the courts struggled to develop a stable legal regime to regulate the proprietary development of computer software. The two pillars of this regime were Congress's conclusion that computer programs were eligible for copyright protection⁵⁹ and the Supreme Court's loosening of its prior restrictions on the patenting of software.⁶⁰

57. Jim Hu, *Real Takes the Open-Source Route*, CNET News.com, July 22, 2002, at <http://news.com.com/2100-1023-945406.html> (on file with the *Columbia Law Review*) [hereinafter Hu, *Open-Source Route*]. RealNetworks's use of reverse engineering—and its suggestion that it may be appropriate as a defensive effort against Microsoft's dominance—is a double-edged sword in that its product also faces the possibility of rival offerings created by reverse engineering its own program. See Paul Festa, *Reverse Engineering Could Threaten RealNetworks, Others*, CNET News.com, Feb. 2, 2000, at <http://news.com.com/2100-1023-236427.html> (on file with the *Columbia Law Review*).

58. Both RealNetworks's and analysts' evaluations of the initiative suggest that the step reflects a defensive action against an otherwise likely dominance by Microsoft. See Hu, *Open-Source Route*, supra note 57; Joe Wilcox, *Digital Media: Will Microsoft Win Again?*, CNET News.com, July 25, 2002, at <http://news.com.com/2100-1023-938997.html> (on file with the *Columbia Law Review*).

59. In 1980, Congress adopted the recommendation of the National Committee on New Technologies Uses (CONTU), making clear that copyright law protected software programs. See Pub. L. No. 96-517, § 10(a), 94 Stat. 3015, 3028 (1980) (amending copyright law and defining "computer program" as "a set of statements or instructions to be used directly or indirectly in a computer in order to bring about a certain result").

60. In 1981, the Supreme Court modified its prior skepticism toward software patents, ruling that the implementation of a mathematical formula in a programmed digital

In the wake of these two seminal events, courts and commentators have debated the optimal competition policy strategy for regulating the development of software,⁶¹ without reaching a stable consensus. Most notably, patent law, copyright law, and the Digital Millennium Copyright Act's (DMCA) anticircumvention provisions⁶² all treat reverse engineering differently.⁶³ Because these regimes sometimes regulate the same software, they need to move toward a coherent treatment of reverse engineering, lest they work at cross purposes from one another.

The inconsistent treatment of reverse engineering by different areas of intellectual property law may well reflect the fact that there is no reverse engineering doctrine as such. Under current judicial precedent, for example, patent and copyright law call for different approaches, even though both regimes govern the same technologies in some cases. Nonetheless, both for ease of exposition and because this Article advocates a coherent treatment of reverse engineering across intellectual property law, this Article will refer generally to intellectual property law's treatment of reverse engineering (as opposed to differentiating between patent and copyright law).

computer qualified for patent protection. *Diamond v. Diehr*, 450 U.S. 175, 192–93 (1981) (limiting *Gottschalk v. Benson*, 409 U.S. 63 (1972)). The Federal Circuit later loosened this test even further, concluding in *In re Alappat* that the standard for whether an algorithm merits protection is based on whether it is a “disembodied mathematical concept . . . which in essence represents nothing more than a ‘law of nature,’ ‘natural phenomenon,’ or ‘abstract idea.’” 33 F.3d 1526, 1544 (Fed. Cir. 1994) (departing from early implementation of *Diehr* standard that required that an algorithm also apply to specific physical element or processes); see also *State St. Bank & Trust Co. v. Signature Fin. Group, Inc.*, 149 F.3d 1368, 1375 (Fed. Cir. 1998) (making clear that “business method patents” as embodied in software are patentable). In the wake of a number of influential decisions that weakened the scope of copyright law vis-à-vis reverse engineers, software firms began increasingly to seek patents as a stronger form of protection for their intellectual property. See Philip J. McCabe & William A. Tanenbaum, Copyright Decisions Increase the Value of Patent Protection for Computer Software, *J. Proprietary Rts.*, Feb. 1993, at 2, 4.

61. See Dennis S. Karjala, The Relative Roles of Patent and Copyright in the Protection of Computer Programs, 17 *J. Marshall J. Computer & Info. L.* 41, 42 (1998) (noting rethinking of legal doctrine in light of these decisions). To be sure, trade secret protection and the advent of licensing of intellectual property law also have contributed to the legal landscape. See *infra* notes 69–70. By contrast, despite some suggestions, trademark law—specifically its doctrine governing the protection of “trade dress”—has never been used to regulate access to user interfaces. See Lauren Fisher Kellner, Comment, Trade Dress Protection for Computer User Interface “Look and Feel,” 61 *U. Chi. L. Rev.* 1011, 1035 (1994) (arguing that protecting user interfaces’ “look and feel” under trademark law would prevent customer confusion); Lisa T. Oratz, User Interfaces: Copyright vs. Trade Dress Protection, *Computer Law.*, Jan. 1996, at 1, 7–8 (explaining why suggestion does little to improve legal landscape).

62. See 17 U.S.C. §§ 1201–1204 (2000).

63. See Lemley & McGowan, *supra* note 12, at 524–25 & n.195 (observing that patent law does not condone reverse engineering); see also Vivian Lou Chen, Sony Sues Bleem for Infringing Six PlayStation Game Patents, *Bloomberg News*, May 18, 2000, LEXIS, Bloomberg, All Bloomberg News File (on file with the *Columbia Law Review*) (reporting on Sony's patent law suit after its copyright action failed on reverse engineering grounds).

Despite the arguments made by a number of prominent commentators for a *sui generis* regime to regulate the software industry,⁶⁴ Congress has declined to take up any such suggestion. This is not surprising, as Congress generally has allowed the judiciary to craft judge-made doctrines to ensure that intellectual property rules fit market realities and enhance social welfare.⁶⁵ As a result, “the heart of copyright doctrine—what may be protected and with what limitations and exceptions—has been developed by the courts through experience with individual cases.”⁶⁶ Occasionally, Congress steps in to harmonize particular areas of intellectual property law, but such efforts tend to occur when an industry consensus emerges as to how to rationalize that area of the law.⁶⁷

Given the reality of the judicially centered development of intellectual property policy,⁶⁸ an important question regarding intellectual property policy for the computer industry is how judges can tailor the current system of copyright and patent protection (as well as trade secret⁶⁹ and contractual protections⁷⁰) to promote sound competition poli-

64. See J.H. Reichman, *Legal Hybrids Between the Patent and Copyright Paradigms*, 94 *Colum. L. Rev.* 2432, 2444–45 (1994) (praising such a model).

65. See Maureen A. O’Rourke, *Evaluating Mistakes in Intellectual Property Law: Configuring the System to Account for Imperfection*, 4 *J. Small & Emerging Bus. L.* 167, 170 (2000).

66. *Lotus Dev. Corp. v. Borland Int’l, Inc.*, 49 F.3d 807, 820 (1st Cir. 1995) (Boudin, J., concurring), *aff’d* by an equally divided Court, 516 U.S. 233 (1996). The Federal Circuit’s decision outlining the relevant protection for software patents reflect a similar perspective. See *AT&T Corp. v. Excel Communications, Inc.*, 172 F.3d 1352, 1356 (Fed. Cir. 1999) (praising ability of patent law “to adapt to new and innovative concepts, while remaining true to basic principles”).

67. See Dennis S. Karjala, *Copyright Protection of Operating Software, Copyright Misuse, and Antitrust*, 9 *Cornell J.L. & Pub. Pol’y* 161, 180–81 (1999); Litman, *supra* note 39, at 196 (“Congress, as it typically does in its crafting of copyright legislation, referred the matter to off-the-record negotiations among interested private parties to develop an alternative that all of them could support.” (footnote omitted)). The enactment of the SCPA represents one such notable effort. See 17 U.S.C. § 906(a); see also Leo J. Raskind & Richard H. Stern, *Introduction to Symposium: The Semiconductor Chip Protection Act of 1984 and Its Lessons*, 70 *Minn. L. Rev.* 263, 263–64 (1985) (describing Act, which stemmed from desire of U.S. manufacturers for a “more orderly mode of competition”).

68. Because the legislative process often is influenced by industry demands, some argue that the judicial development of copyright policy produces better results. See, e.g., Jessica Litman, *Digital Copyright* 51–63, 67–68 n.22, 68 n.28 (2001) (detailing impact on copyright law of endemic shortcomings of legislative process).

69. To be sure, trade secret protections can be important in certain cases, but, by definition, this regime cannot provide any protection against reverse engineering. See *Kewanee Oil Co. v. Bicron Corp.*, 416 U.S. 470, 490 (1974). Thus, it is generally irrelevant to the intellectual property issues discussed herein.

70. The major issue with respect to contract law is the enforceability of licensing terms that arguably conflict with the purposes of intellectual property laws, including the encouragement of reverse engineering when appropriate. Compare *Bowers v. Baystate Technologies, Inc.*, Nos. 01-1108, 01-1109, 2003 WL 262300 *3–*6 (Fed. Cir. Jan. 29, 2003) (enforcing license term that precludes reverse engineering), with *id.* at *13–*16 (Dyk, J., concurring in part and dissenting in part) (criticizing holding). For a very good discussion

cy.⁷¹ By leaving the task of tailoring intellectual property rules to courts, Congress anticipates that federal judges who confront such issues will act quite similarly to common law courts that have had to refine property rules over time to confront new realities.⁷² In the case of intellectual property, both patent and copyright law provide statutory frameworks to guide the analysis,⁷³ but they leave many important issues—like when reverse engineering should be permitted to facilitate access to information platforms—open to interstitial gap filling by the courts.⁷⁴

Intellectual property law includes two limiting doctrines that regulate what aspects of would-be protected software belong in an “information commons” by allowing open access to inventions under certain con-

of the issue, see Maureen A. O'Rourke, *Drawing the Boundary Between Copyright and Contract: Copyright Preemption of Software License Terms*, 45 *Duke L.J.* 479 (1995).

71. See Julie E. Cohen & Mark A. Lemley, *Patent Scope and Innovation in the Software Industry*, 89 *Cal. L. Rev.* 1, 3 (2001) (“With roughly eighty thousand software patents already issued, and the Federal Circuit endorsing patentability without qualification, [questions about other possible regimes for intellectual property protection] are for the history books.”); Karjala, *supra* note 67, at 182 (“[A]bsent a major crisis of a type that is difficult to imagine, Congress is institutionally incapable of correcting a legislative error in recognizing intellectual property protection that is too long, too strong, or too broad.”).

72. See H.R. Rep. No. 94-1476, at 65–66 (1976), reprinted in 1976 *U.S.C.C.A.N.* 5659, 5678–80 (discussing conception of fair use doctrine as delegation to courts to develop the contours of the principle); see also Carol M. Rose, *Energy and Efficiency in the Realignment of Common-Law Water Rights*, 19 *J. Legal Stud.* 261, 267–94 (1990) (discussing evolution of water rights property schemes). Given the dynamic nature of the Internet, some have argued that this model promotes more flexible and effective rules. See Suzanna Sherry, *Haste Makes Waste: Congress and the Common Law in Cyberspace*, 55 *Vand. L. Rev.* 309, 312 (2002) (arguing that the nature of common law adjudication, which allows for constant reevaluation, provides a vehicle superior to legislation in regulating fast-changing technologies).

73. The Copyright Act requires that the work be original—in particular, containing a modicum of creativity—and be fixed in a tangible medium of expression. See 17 *U.S.C.* § 102(a) (2000). With respect to patenting, the Patent Act requires that a claimed invention be useful, novel (in relation to any prior art), nonobvious (with respect to prior art), and a “process, machine, manufacture, or composition of matter.” See 35 *U.S.C.* § 101 (2000). For a discussion of these requirements as applied to computer software, see Lawrence D. Graham & Richard O. Zerbe, Jr., *Economically Efficient Treatment of Computer Software: Reverse Engineering, Protection, and Disclosure*, 22 *Rutgers Computer & Tech. L.J.* 61, 92–115 (1996). Given the different, but overlapping, missions of copyright and patent, there is no bar on obtaining both forms of protection for a particular invention (provided, of course, that it meets the requisite criteria). See *Mazer v. Stein*, 347 *U.S.* 201, 217 (1954); see also *Atari Games Corp. v. Nintendo of Am., Inc.*, Nos. C 88-4805 FMS, C 89-0027 FMS, 1993 WL 214886, at *1–*22 (N.D. Cal. Apr. 15, 1993) (analyzing both patent and copyright infringement claims).

74. This feature of intellectual property protection for the computer age has frustrated both courts and commentators. See *Lotus Dev. Corp. v. Borland Int'l, Inc.*, 49 *F.3d* 807, 820 (1st Cir. 1995) (Boudin, J., concurring) (“Applying copyright law to computer programs is like assembling a jigsaw puzzle whose pieces do not quite fit.”); Paul Goldstein, *Infringement of Copyright in Computer Programs*, 47 *U. Pitt. L. Rev.* 1119, 1126–30 (1986) (noting that copyright and patent protection do not provide an optimal regime for the software industry).

ditions. In particular, the fair use doctrine—as embodied in copyright law—and the misuse doctrine—as embodied in patent law, but more recently in copyright as well⁷⁵—provide for judicial discretion in when to condone access to information platform standards.⁷⁶ In each case, the doctrine emerged from a judicially created principle that Congress later codified.⁷⁷ The fair use doctrine enjoys a long and successful pedigree, beginning with a case decided by Justice Story involving biographies of George Washington,⁷⁸ whereas the misuse doctrine emerged more recently.⁷⁹

The fair use doctrine's policy-based defense against infringement rests on what the Supreme Court has called an "equitable rule of reason" analysis.⁸⁰ Given its flexible nature, the fair use doctrine continues to evolve, moving from an initial focus on noncommercial actors⁸¹ to one that allows commercial actors to use protected works in ways that are "transformative."⁸² Although the fair use defense is rooted in copyright, some commentators have suggested that patent law should also embrace

75. See, e.g., *Lasercomb Am., Inc. v. Reynolds*, 911 F.2d 970, 973 (4th Cir. 1990) (recognizing misuse defense in copyright law).

76. To be more precise, the fair use and misuse doctrines provide the primary defenses for the use of what would otherwise constitute protectible software under copyright law's abstraction-filtration-comparison analysis. This test, which stems from Judge Learned Hand's opinion in *Nichols v. Universal Pictures Corp.*, first determines the appropriate level of abstraction at which a work should be protected, filters out any other unprotectible elements, and then compares the original work to the alleged infringing work. 45 F.2d 119, 121 (2d Cir. 1930); see also *Gates Rubber Co. v. Bando Chem. Indus., Ltd.*, 9 F.3d 823, 834–36 (10th Cir. 1993) (applying test to computer software); *Computer Assocs. Int'l, Inc. v. Altai, Inc.*, 982 F.2d 693, 706–12 (2d Cir. 1992) (same); Mark A. Lemley, *Convergence in the Law of Software Copyright?*, 10 *High Tech. L.J.* 1, 13–14 (1995) (describing test and judicial acceptance of it). Other doctrines—such as the implied license concept—also serve this purpose, albeit primarily for patent, as the fair use doctrine serves this purpose for copyright. See *Harper & Row, Publishers, Inc. v. Nation Enters.*, 471 U.S. 539, 549 (1985) (describing fair use as providing implied license) (quoting H. Ball, *Law of Copyright and Literary Property* 260 (1944)). As to the implied license for patents, this doctrine can best be understood as akin to a prescriptive easement. See Jesse Dukeminier & James E. Krier, *Property* 811 (5th ed. 2002) (describing prescriptive easement concept). Among other things, this doctrine provides that firms that fail to disclose patented technologies during a standard-setting process cannot later assert intellectual property rights to a component of the adopted standard. Cf. *Wang Labs., Inc. v. Mitsubishi Elecs. Am., Inc.*, 103 F.3d 1571, 1580–82 (Fed. Cir. 1997) (setting forth legal standard for and finding presence of implied license where patent holder "tried to coax [defendant] into [its] market" and "provided designs, suggestions, and samples" to defendant).

77. See 17 U.S.C. § 107 (codifying factors to determine fair use); 35 U.S.C. § 271(d) (codifying exclusions from misuse doctrine).

78. See *Folsom v. Marsh*, 9 F. Cas. 342 (C.C.D. Mass. 1841).

79. See *Morton Salt Co. v. G.S. Suppiger Co.*, 314 U.S. 488, 491 (1942).

80. *Sony Corp. of Am. v. Universal City Studios, Inc.*, 464 U.S. 417, 448 (1984).

81. See, e.g., *id.* at 451 (deeming "presumptively . . . unfair" "every commercial use of copyrighted material").

82. *Campbell v. Acuff-Rose Music, Inc.*, 510 U.S. 569, 579–85 (1994); cf. *Lotus Dev. Corp. v. Borland Int'l, Inc.*, 49 F.3d 807, 820 (1st Cir. 1995) (Boudin, J., concurring)

this principle.⁸³ Conversely, the misuse doctrine, which took root in patent law, is increasingly employed in the copyright context as well.⁸⁴ Like the fair use doctrine, it also is somewhat open-ended, with the focus being on whether a patent is used for anticompetitive purposes.⁸⁵

The malleability of the fair use and misuse doctrines stems from both their open-ended nature and the lack of a clearly developed theoretical framework for them—even after decades of judicial and academic debate. To that end, commentators have offered a number of alternative conceptions to guide these doctrines. As to the fair use principle, many courts and commentators have suggested that an economics-based approach should guide the analysis.⁸⁶ This approach, along with the four

(noting that Borland's commercial appeal lay not in its copying of Lotus's menu, but in its added features).

83. See generally Maureen A. O'Rourke, *Toward a Doctrine of Fair Use in Patent Law*, 100 Colum. L. Rev. 1177 (2000).

84. The Supreme Court has explicitly provided for a misuse defense in patent law, see *Morton Salt*, 314 U.S. at 491, but has merely suggested (and not held) that one exists in the copyright context. See *United States v. Loew's, Inc.*, 371 U.S. 38, 45–46 (1962). Lower courts, however, have gone ahead to evaluate copyright misuse claims. See, e.g., *Lasercomb Am., Inc. v. Reynolds*, 911 F.2d 970, 973–77 (4th Cir. 1990).

85. See, e.g., *B. Braun Med., Inc. v. Abbott Labs.*, 124 F.3d 1419, 1426 (Fed. Cir. 1997) (“[B]y imposing the condition, the patentee has ‘impermissibly broadened the “physical or temporal scope” of the patent grant with anticompetitive effect.’” (quoting *Windsurfing Int'l, Inc. v. AMF, Inc.*, 782 F.2d 995, 1001–02 (Fed. Cir. 1986) (quoting *Blonder-Tongue Labs., Inc. v. Univ. of Ill. Found.*, 402 U.S. 313, 343 (1971))); *Mallinckrodt, Inc. v. Medipart, Inc.*, 976 F.2d 700, 704 (Fed. Cir. 1992) (inquiring into whether restriction “arose to restrain practices that did not in themselves violate any law, but that drew anticompetitive strength from the patent right, and thus were deemed to be contrary to public policy”). Thus, the crucial—and potentially limiting—factor is how broadly to construe the relevant protection conferred by patent or copyright. This issue remains unsettled, with some courts allowing for reverse engineering (at least in the copyright misuse context) even where it involved actual copying of the protected work itself. See *Alcatel USA, Inc. v. DGI Techs., Inc.*, 166 F.3d 772, 791 (5th Cir. 1999); *DSC Communications Corp. v. DGI Techs., Inc.*, 81 F.3d 597, 600 (5th Cir. 1996). Admittedly, these precedents from the copyright context are not necessarily applicable to the patent context, as the provision of the Patent Act relating to misuse may call for a different analysis in cases where the nonpatented invention only works with other patented goods. 35 U.S.C. § 271(d) (2000); see *Cohen & Lemley*, *supra* note 71, at 36 n.146.

86. For a classic articulation of this view, see *Harper & Row, Publishers, Inc. v. Nation Enters.*, 471 U.S. 539, 566–67, 566 n.9 (1985); Wendy J. Gordon, *Fair Use as Market Failure: A Structural and Economic Analysis of the Betamax Case and Its Predecessors*, 82 Colum. L. Rev. 1600, 1618 (1982) (arguing that fair use applies when (1) a market failure is present, (2) the allowance of the use is socially desirable, and (3) award of fair use would not cause substantial injury to the incentives of the copyright holder); see also Wendy J. Gordon, *Market Failure and Intellectual Property: A Response to Professor Lunney*, 82 B.U. L. Rev. 1031, 1035 (2002) (explaining that Gordon's approach did not mean to elevate transaction costs as the paramount consideration, but rather embraced as market failures all of the “ways in which real world market systems can fail to align private and social economic welfare”). Even within the traditional commitment to an economics-based approach, there is a variety of formulations of fair use, all of which can claim consistency with current judicial doctrine in some shape or form. Compare *Princeton Univ. Press v. Mich. Documents Servs., Inc.*, 99 F.3d 1381, 1387 n.6, 1388 (6th Cir. 1996) (en banc), cert.

statutorily prescribed considerations,⁸⁷ has provided some structure to the analysis, but as discussed in Part V, has failed to provide a settled or sound analytical structure for when to allow reverse engineering.

The misuse principle, which is of more recent vintage than fair use, continues to evolve. This doctrine initially arose from patent law's public policies (which include, for example, the tradition of only providing protection for a limited term) and its unwillingness to afford a remedy to a party with "unclean hands."⁸⁸ At present, there is a split of authority as to whether the misuse doctrine provides an open-ended defense for firms to allege that a patent holder has violated public policy or whether this doctrine merely tracks existing antitrust law standards.⁸⁹ In recent years, Congress has acted to limit misuse in the patent context,⁹⁰ so there are

denied, 520 U.S. 1156 (1997) (focusing on possibility of licensing in ruling that fair use did not authorize copying of certain course materials), and Tom W. Bell, *Escape from Copyright: Market Success vs. Statutory Failure in the Protection of Expressive Works*, 69 U. Cin. L. Rev. 741, 804 (2001) (suggesting that, in light of the possibilities for contracting and technological self-help mechanisms (such as those afforded by digital rights management), copyright law and fair use are no longer necessary to address market failures), with Robert P. Merges, *The End of Friction? Property and Contract in the "Newtonian" World of On-Line Commerce*, 12 Berkeley Tech. L.J. 115, 133-35 (1997) (noting the tendency of a market failure justification to limit fair use and suggesting that fair use can be justified on redistributive grounds), and Merges, *supra* note 37, at 312 (suggesting a market-centered account that explains why fair use is necessary to enable that parody works are produced). Of course, this debate does not even take account of the argument that copyright should not be justified in economic terms. See Neil Weinstock Netanel, *Copyright and a Democratic Civil Society*, 106 Yale L.J. 283, 332-35 (1996).

87. In particular, the statute calls for a four-part inquiry into:

(1) the purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes; (2) the nature of the copyrighted work; (3) the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and (4) the effect of the use upon the potential market for or value of the copyrighted work.

17 U.S.C. § 107 (2000).

88. See *Morton Salt*, 314 U.S. at 490-91 (holding that courts should not enforce patent rights used to suppress competition).

89. Compare *Saturday Evening Post Co. v. Rumbleseat Press, Inc.*, 816 F.2d 1191, 1200 (7th Cir. 1987) (concluding that copyright misuse is best analyzed under antitrust standards), *USM Corp. v. SPS Techs., Inc.*, 694 F.2d 505, 512 (7th Cir. 1982) (maintaining that patent misuse is best analyzed using antitrust standards), and James A.D. White, *Misuse or Fair Use: That Is the Software Copyright Question*, 12 Berkeley Tech. L.J. 251, 275 n.99 (1997) (collecting commentary), with *Lasercomb*, 911 F.2d at 978 (framing issue as "whether the copyright is being used in a manner violative of the public policy embodied in the grant of a copyright"), Brett Frischmann & Dan Moylan, *The Evolving Common Law Doctrine of Copyright Misuse: A Unified Theory and Its Application to Software*, 15 Berkeley Tech. L.J. 865, 871, 926 (2000) (proposing "narrow public policy-based per se rules [to] supplement a core antitrust-based [misuse] defense" and arguing that antitrust "does not necessarily promote copyright policy"), and White, *supra*, at 275-77 (raising questions about fitness of an antitrust standard for copyright misuse in the software industry).

90. After the patent misuse doctrine expanded through judicial development, Congress passed the Patent Misuse Reform Act in 1988 to prevent patent holders from losing patent protection until the misused conduct ceased and its effects were purged. 35

unanswered questions about the role for and scope of this doctrine.⁹¹ Nonetheless, like patent law's development of a number of limiting doctrines to cabin the scope of patents that can threaten innovation,⁹² it is both advisable and quite possible that courts will use the misuse principle to govern reverse engineering of patented software in a sensible fashion that is harmonious with the fair use doctrine's treatment of the issue.⁹³ Ultimately, to address the confusion resulting from a number of uncertain and overlapping rules emerging from the copyright and patent law contexts,⁹⁴ the Supreme Court or Congress may well need to resolve this issue.⁹⁵ Ideally, this resolution would provide not only a harmonious con-

U.S.C. § 271(d) (enumerating cases in which patent owners "shall not be denied relief or deemed guilty of misuse or illegal extension of the patent right," including derivation of revenue, licensing to others, seeking to enforce, refusing to license for use, and conditioning licensing or sale on acquisition of other licenses or rights); see 134 Cong. Rec. 24, 3247-73 (1988) (statement of Sen. Leahy); see also Marshall Leaffer, *Engineering Competitive Policy and Copyright Misuse*, 19 U. Dayton L. Rev. 1087, 1101 (1994) (noting criticisms that prompted revision). According to some commentators, this law led courts to construe the doctrine—even as left intact—quite narrowly. See Katherine E. White, *A Rule for Determining When Patent Misuse Should Be Applied*, 11 *Fordham Intell. Prop. Media & Ent. L.J.* 671, 709 (2001).

91. See Leaffer, *supra* note 90, at 1101 (suggesting that, in the wake of statutory revision, patent misuse doctrine is "of questionable viability").

92. For an excellent overview of this issue, see Merges & Nelson, *supra* note 37, at 844-68.

93. Professor Merges suggests that an independent role for intellectual property law here can complement the competitive protections developed by antitrust law. See Robert P. Merges, *Reflections on Current Legislation Affecting Patent Misuse*, 70 *J. Pat. & Trademark Off. Soc'y* 793, 800 (1988) (suggesting that doctrine reasonably expands beyond antitrust because some "thin" markets for patented technology would not meet antitrust definition of a market); see also Areeda & Kaplow, *supra* note 37, at 163 (characterizing existing law as "grounded in the competitive considerations of antitrust analysis"). In the event that the misuse principle does not facilitate such a convergence, Cohen and Lemley have argued that, with respect to patent law, the experimental use exception and the implied license doctrine could serve a similar purpose. See Cohen & Lemley, *supra* note 71, at 29-32.

94. See Mark A. Haynes, *Commentary: Black Holes of Innovation in the Software Arts*, 14 *Berkeley Tech. L.J.* 567, 570 (1999) (noting unreliability of fair use protection for reverse engineers); Jonathan Band & Noah Levine, *You Say Misuse, I Say Fair Use . . .*, *Computer Law*, Nov. 1996, at 10, 10 (noting that leading decisions began by identifying the right principle and then found a legal doctrine to justify the result); Robert P. Merges, *Who Owns the Charles River Bridge? Intellectual Property and Competition in the Software Industry* 7 (Univ. of Cal. Berkeley Sch. of Law, Public Law and Legal Theory, Working Paper No. 15, 1999), available at http://papers.ssrn.com/sol3/delivery.cfm/000223651.pdf?abstract_id=208089 (on file with the *Columbia Law Review*) (remarking that it is "far too early to tell whether the nascent pro-interoperability trend will endure, and if so, what its final contours will be").

95. For an effort by Congress to step in and provide clarity, see 17 U.S.C. § 906(a) (2000) (enumerating exceptions to exclusive rights of owner of a mask work). For a case where the Court stepped in to clarify an overlapping interplay between different regimes, see *TraFFix Devices, Inc. v. Mktg. Displays, Inc.*, 532 U.S. 23, 29-30 (2001) (holding trade dress protection could not apply where firm previously held a patent on the would-be protected product—"strong evidence that the features therein claimed are functional"—

ceptualization of the fair use and misuse approaches to reverse engineering, but also an explanation of how those approaches cohered with anti-trust policy.

2. *Reverse Engineering in Practice.* — In terms of the substantive debates on the proper legal treatment of reverse engineering, most commentators fall into either the “commons” or the “proprietary control” camps, either condoning access all of the time or not at all.⁹⁶ Significantly, many thoughtful commentators have failed to distinguish between cases involving horizontal access (between rival platforms) and vertical access (between a platform and a complementary product)—let alone to acknowledge the complex economic considerations related to the competitive costs of allowing reverse engineering at all.⁹⁷ Even in their very careful discussion of the issue, Professors Samuelson and Scotchmer declined to evaluate separately the horizontal and vertical access scena-

and could not “carry the heavy burden of showing that the feature is not functional”); see also *Bonito Boats, Inc. v. Thunder Craft Boats, Inc.*, 489 U.S. 141, 157 (1989) (overriding Florida statute protecting boat hull designs not protected by patent). But see *Vessel Hull Protection Act* §§ 1301–1302, Pub. L. No. 105-304, §§ 501–502, 112 Stat. 2860, 2905–16 (1998) (codified at 17 U.S.C. §§ 1301–1302) (enacting plug mold statute); Douglas G. Lichtman, *The Economics of Innovation: Protecting Unpatentable Goods*, 81 *Minn. L. Rev.* 693, 730 (1997) (criticizing *Bonito* decision on the ground that it failed to acknowledge salutary aspects of the Florida law).

96. For an argument that access should be allowed in all contexts, see, for example, Brief Amicus Curiae of American Committee for Interoperable Systems in Support of Appellees, *ProCD, Inc. v. Zeidenberg*, 86 F.3d 1447 (7th Cir. 1996) (No. 96-1139), available at <http://www.law.berkeley.edu/institutes/bclt/pubs/lemley/procdbrief.html> (on file with the *Columbia Law Review*) (arguing that “the freedom to reverse engineer software in order to achieve interoperability is critical” to preserving competition in software industry); Greg Weiner, *Reverse Engineering as a Method of Achieving Compatibility in the Computer Industry*, 6 *U. Balt. Intell. Prop. L.J.* 1, 6–7 (1997) (arguing that the lack of a reverse engineering right stifles innovation). For a criticism of any such right, see Arthur R. Miller, *Copyright Protection for Computer Programs, Databases, and Computer-Generated Works: Is Anything New Since CONTU?*, 106 *Harv. L. Rev.* 977, 1020 (1993) (calling a right that ignores platform owners’ interests “singularly ill-suited to vindicating the public interest”). A notable exception to this all or nothing approach can be found in O’Rourke, *supra* note 83, at 1211–35 (arguing for more nuanced approach); see also Anthony J. Mahajan, Note, *Intellectual Property, Contracts, and Reverse Engineering After ProCD: A Proposed Compromise for Computer Software*, 67 *Fordham L. Rev.* 3297, 3331–35 (1999) (proposing a two-phase protection of source code, the first of which would permit restrictions on reverse engineering). Professors Samuelson and Scotchmer also appreciate the complex nature of the issue, but they ultimately examine only whether or not to endorse a categorical version of the reverse engineering doctrine—as opposed to some limited such right. See Samuelson & Scotchmer, *supra* note 39, at 1626–30.

97. See, e.g., Cohen & Lemley, *supra* note 71, at 3 (arguing for reverse engineering right to facilitate reuse of software invention without making horizontal-vertical access distinction); Daniel J. Gifford & David McGowan, *A Microsoft Dialog*, 44 *Antitrust Bull.*, Fall 1999, at 619, 677 (promoting interoperability without evaluating horizontal-vertical access distinction). But see Samuelson & Scotchmer, *supra* note 39, at 1608 (“The economic case for allowing reverse engineering to achieve interoperability is not as open and shut as some legal commentators have suggested.”).

rios⁹⁸—or even the possibility of condoning reverse engineering only when a platform owner achieved dominance.⁹⁹

To appreciate the different dynamics involved in facilitating horizontal access as opposed to vertical access, consider the case of instant messaging systems.¹⁰⁰ In the case of vertical access, the arrangement would be between an applications provider—say, a firm that uses instant messaging technology to remind users of important business meetings—and the platform owner—say, AOL, which provides the instant messaging system. In the horizontal case, the relevant access right would be between a rival information platform—say, Microsoft—and AOL. In the vertical situation, the offering of an interoperable application will generally be unobjectionable because, as a complementary good, it will add to the value of the network.¹⁰¹ Not surprisingly, AOL (like other information platform owners) acts quite favorably toward companies who provide complementary applications for their instant messaging system, providing them with royalty-free access to their system, while it resists cooperation with rivals like Microsoft.¹⁰² Consequently, the potential cost of providing access to a developer of a complementary application is considerably less, and the rationale for allowing reverse engineering (as a reasonable default rule) is quite strong.¹⁰³

98. In advocating a *sui generis* regime for protecting computer software, however, Professor Samuelson did, albeit in a footnote, make this distinction. See Samuelson et al., *supra* note 35, at 2404 n.394.

99. See Samuelson & Scotchmer, *supra* note 39, at 1608 (concluding that “interoperability has, on balance, more beneficial than harmful economic consequences”).

100. The possibility of intellectual property litigation between rival information platforms in this market is not merely a hypothetical, as AOL recently secured a patent on its instant messaging system. See Jim Hu, Patent Creates IM Wrinkle, CNET News.com, Dec. 17, 2002, at <http://news.com.com/2100-1023-978234.html> (on file with the *Columbia Law Review*).

101. See Katz & Shapiro, *Systems Competition*, *supra* note 35, at 103–04 (discussing need for platform providers to attract developers of complementary products). Similarly, reverse engineering that produces, say, user manuals and fixes any bugs in the information platform also adds value to the original product and thus is presumptively a noninfringing use. See Fitzgerald et al., *supra* note 41, at 122–23 (discussing such uses of reverse engineering).

102. See *The Future of the Interactive Television Services Marketplace: What Should Consumers Expect?*: Hearing Before the Subcomm. on Telecommunications, Trade, and Consumer Protection, House Comm. on Commerce, 106th Cong. 40–41 (2000) (statement of Steve Case, Chairman and CEO, America Online, Inc.) (explaining that royalty-free licensing for IM application developers is “not just something we did with a few companies. We have done this with many companies and are eager to do with more companies”); see also Douglas Lichtman, *Property Rights in Emerging Platform Technologies*, 29 *J. Legal Stud.* 615, 616 (2000) (reporting that Palm and Handspring have adopted similar strategies of facilitating third party developer access to their interfaces).

103. There is still an argument against allowing reverse engineering to achieve vertical compatibility in emerging platform technologies, as explained in Lichtman, *supra* note 102, at 616–19. The argument against allowing unlimited reverse engineering for vertical access centers on the point that the platform owner can ensure more value through control than openness and—at the very least—should have the legal means to

To date, the video game industry has provided the context for many of the recent cases focused on access to an information platform via reverse engineering. Most of these cases have involved vertical access issues where a manufacturer of a game wants to copy the protected standard as part of a reverse engineering process to ensure that its games will work on the system.¹⁰⁴ In those cases, courts have regularly held as a noninfringing use any copying of the standard that enables companies to create products that make the information platform more valuable and do not compete with existing games.¹⁰⁵ A second set of cases involves horizontal access issues where an entrant wants to ensure that its system is compatible with an established one—such as in cases where a new system is designed so that it can play games made for a competitor's system.¹⁰⁶ In horizontal access cases, the competitive effects of the copying are quite different from the vertical access cases, but courts and commentators have yet to translate the competition policy principles that govern such scenarios into legal doctrine.

For a sense of how the different theoretical frameworks of the commons and proprietary control models can influence intellectual property law, consider the recent case of *Sony Computer Entertainment, Inc. v. Connectix Corp.*¹⁰⁷ In that case, Connectix used reverse engineering, including some intermediate copying of Sony's PlayStation video game console's BIOS (basic input-output system), to develop a new software program called the Virtual Game Station (VGS).¹⁰⁸ The VGS, which cost Connectix approximately \$150 thousand to develop,¹⁰⁹ enables consumers to play games made for Sony's game console on a personal computer. By contrast, Sony spent well in excess of \$600 million developing the PlayStation and building up brand loyalty for it, which it highlighted in challeng-

make this choice. This Article does not consider whether reverse engineering rights should be limited in such cases, but rather confines its analysis to why reverse engineering rights should be more limited in the horizontal scenario. In terms of a relevant consideration for the vertical access issue, Michael L. Katz's reminder about the Coase theorem—that where the default rule is set is often where it stays—underscores why the current rule in favor of vertical access is a plausibly correct one. See Katz, *supra* note 46, at 328 (“In a sense, transactions costs create stickiness—where a market begins affects where it ends up.”); see also *Ty, Inc. v. Publ'ns Int'l Ltd.*, 292 F.3d 512, 517 (7th Cir. 2002) (Posner, J.) (explaining default rule allowing access for complementary products as one that “economizes on transaction costs”).

104. See, e.g., *Sega Enters. Ltd. v. Accolade, Inc.*, 977 F.2d 1510, 1514–15 (9th Cir. 1992) (upholding as fair use reverse engineering of game console to ensure compatibility of videogames).

105. See, e.g., *id.* at 1523 (addressing vertical access through reverse engineering that “led to an increase in the number of independently designed video game programs offered with the Genesis console”).

106. See, e.g., *Sony Computer Entm't, Inc. v. Connectix Corp.*, 203 F.3d 596, 599 (9th Cir. 2000) (addressing horizontal access through reverse engineering that led to creation of an emulator that played Sony PlayStation games on a computer).

107. *Id.* at 602–08.

108. See *id.* at 598–99.

109. *Id.* at 601.

ing the legality of Connectix's rival invention.¹¹⁰ The Ninth Circuit, however, endorsed openness as a categorical value and held that, because Connectix's invention was "modestly transformative" of Sony's platform, its use of reverse engineering should be deemed a noninfringing use.¹¹¹ Thus, in this case, the commons model won out over the proprietary control model, a debate that Part III examines at length.

To make the law governing computer software even more complex, Congress and state legislatures have provided additional protection to inventors that may allow them to use contracts and "digital rights management" (DRM) systems¹¹² to limit the use of reverse engineering, thereby changing the balance struck by judicially crafted copyright and patent doctrines.¹¹³ In particular, the proposed Uniform Computer Information Transactions Act (UCITA)¹¹⁴ and the anticircumvention provisions of the DMCA¹¹⁵ both may enable inventors to limit reverse engineering opportunities. In cases that implicate limits on reverse engineering through contract and DRM, the courts may well protect at least certain reverse engineering opportunities by holding that intellectual property law preempts license restrictions on reverse engineering and construing the DMCA's protection of reverse engineering broadly (or holding any limits on reverse engineering unconstitutional).¹¹⁶

The use and legal protection of DRM systems in general and the DMCA's anticircumvention provisions in particular may complicate considerably the legal status of reverse engineering. On its face, the DMCA

110. *Sony Computer Entm't, Inc. v. Connectix Corp.*, 48 F. Supp. 2d 1212, 1214 (N.D. Cal. 1999) (noting Sony's investment).

111. *Connectix*, 203 F.3d at 606-07.

112. DRM systems, whether through use of encryption, watermarking, or other technological means, serve as a virtual lock to restrict access to and uses of digital content. For a discussion of digital rights management technologies and their effectiveness, see David Balaban, Note, *The Battle of the Music Industry: The Distribution of Audio and Video Works via the Internet, Music and More*, 12 *Fordham Intell. Prop. Media & Ent. L.J.* 235, 259-62 (2001).

113. Some commentators have criticized such efforts as overbroad and threatening to the balance provided by intellectual property law's protection of fair use. See, e.g., Julie E. Cohen, *Lochner in Cyberspace: The New Economic Orthodoxy of "Rights Management"*, 97 *Mich. L. Rev.* 462, 480-515 (1998).

114. Uniform Computer Information Transactions Act § 815 (2001), available at <http://www.law.upenn.edu/bll/ulc/ucita200.pdf> (on file with the *Columbia Law Review*).

115. 17 U.S.C. §§ 1201-1204 (2000).

116. See Samuelson & Scotchmer, *supra* note 39, at 1626-30 (discussing UCITA); *id.* at 1630-49 (discussing DMCA's relationship to reverse engineering and possibility of judicial invalidation). The legal debate over shrinkwrap licenses preceded the UCITA, as earlier court cases differed on the legality of such licenses. Compare *ProCD, Inc. v. Zeidenberg*, 86 F.3d 1447, 1449 (7th Cir. 1996) (enforcing a shrinkwrap license), with *Vault Corp. v. Quaid Software Ltd.*, 847 F.2d 255, 268-69 (5th Cir. 1988) (holding restriction on reverse engineering preempted under the Copyright Act), and Mark A. Lemley, *Intellectual Property and Shrinkwrap Licenses*, 68 *S. Cal. L. Rev.* 1239, 1248-53 (1995) (arguing such licenses are unenforceable). See also *supra* note 70 (discussing issue).

purports not to limit the access that companies can obtain through reverse engineering to facilitate interoperability,¹¹⁷ and leaves it to the courts to define the appropriate scope of permissible reverse engineering efforts.¹¹⁸ The complications arise, nonetheless, because companies may be able to use encryption technology in an “arms race” to make it more difficult for rivals to gain access to their protected standard or pursue litigation under the DMCA to combat legitimate reverse engineering.¹¹⁹ At this point, however, it is unclear whether DRM systems based on encryption, watermarking, or other technologies will be effective in preventing (or even substantially raising the costs of) reverse engineering, as well as what impact the DMCA will have on efforts to reverse engineer standards that should not be protected under intellectual property law.¹²⁰

B. *Putting the Reverse Engineering Debate in Context*

Before using the competitive platforms model to develop an appropriate conception of how intellectual property law should treat reverse engineering, it is important to explain that this model leaves untouched three important facets of current law (as developed under the fair use principle). First, vertical access—which involves products that are complementary to an information platform—should not be restricted. Second, cases involving the ability to transfer user-created applications (such as word processing files, for example) from one system to another also should not be restricted. Finally, because the relevant intellectual property issue in reverse engineering cases will often be the legality of the copying of the protected standard in the first place (as opposed to the

117. 17 U.S.C. § 1201(f).

118. See *id.* § 1201(f)(1) (protecting reverse engineering only “to the extent any such acts of identification and analysis do not constitute infringement under this title”).

119. As the *Reimerdes* case demonstrates, the line between legitimate and illegitimate reverse engineering may not always be easy to draw. See *Universal City Studios v. Reimerdes*, 111 F. Supp. 2d 294, 319–20 (S.D.N.Y. 2000) (rejecting defense that “DeCJs” code did not violate the DMCA because it was designed to achieve interoperability with computers running the Linux operating system), *aff’d sub nom Universal City Studios, Inc. v. Corley*, 273 F.3d 429 (2d Cir. 2001).

120. Some predict that “new technologies may soon make copying virtually impossible without the permission of the copyright owner,” Marshall Leaffer, *The Uncertain Future of Fair Use in a Global Information Marketplace*, 62 *Ohio St. L.J.* 849, 859 (2001), but others are far less certain of the ultimate outcome. See, e.g., Bruce Abramson, *Promoting Innovation in the Software Industry: A First Principles Approach to Intellectual Property Reform*, 8 *B.U. J. Sci. & Tech. L.* 75, 130 (2002) (concluding that it is “unclear” whether advances in encryption will outstrip advances in reverse engineering technology). Depending on how the use of encryption technology evolves, Congress may ultimately need to revisit the DMCA to prevent wasteful “arms races”—where each side invests in encryption and decryption technology—and encourage legal means—as opposed to self-help efforts—to resolve these access questions as well as to provide clearer protection for legitimate reverse engineers. Alternatively, to the extent that the use of DRM technologies prevents reverse engineers from gaining relatively manageable access to would-be protected standards, this will increase the pressure on antitrust and regulation to address such access questions.

rival product itself), courts will face challenging remedial questions regarding the propriety of injunctive relief. This section will address each point in turn.

First, with respect to the difference between horizontal and vertical access, intellectual property law currently appreciates the difference between complementary and substitutable goods, and thus generally allows access for the creation of complementary goods.¹²¹ On this rationale, for example, the fair use principle authorizes reporters to quote from primary sources without first having to seek permission. By contrast, intellectual property law generally does not allow a competitor to appropriate a creator's achievement without paying any fee as a license to use the proprietary standard.¹²²

Second, the importance of protecting information platform innovations should not extend to enabling a firm to benefit from investments made by users of the product (as opposed to by the producer). This distinction between user investments and producer investments is the difference between the value of a set of word processing documents created by the user and an innovative user interface, invented by the producer, that makes the product easier to use. Microsoft, for example, initially developed a spreadsheet program (Excel) that could read macros created by users for Lotus 1-2-3, and a word processing program (Word) that could read documents originally produced on WordPerfect. Significantly, Microsoft's product—unlike some others—did not copy Lotus's user interface, but was compatible with Lotus's product in that it would give users the ability to use the Lotus commands, would read its files, and could use its macros.¹²³ To avoid protecting investments such as a user's creation of her own files and macros, intellectual property law should distinguish between two forms of open access: access to a user interface or the product's essential standard—cloning—that may be objectionable from a competition policy standpoint, and access to the program specifications that will allow users to rely on converters or adapters that enable their creations to be transferred to other systems—compatibility—that will generally be unobjectionable.¹²⁴

121. For a cogent explanation of this principle, see *Ty, Inc. v. Publ'ns Int'l Ltd.*, 292 F.3d 512, 517–18 (7th Cir. 2002).

122. To be more precise, the reverse engineering right may place an upper bound on the amount of the potential license: A would-be licensee will not pay more than it would cost to reverse engineer the product to gain the sought-after access. See Cohen & Lemley, *supra* note 71, at 18; Samuelson & Scotchmer, *supra* note 39, at 1589. In reality, there may well be other benefits that the inventor can provide in addition to access to the standard (forms of technical assistance, for example), so the cost of reverse engineering may often be a floor, not a ceiling, for a licensing fee. See Gawer & Cusumano, *supra* note 45, at 100–03.

123. See Stan J. Liebowitz & Stephen E. Margolis, *Winners, Losers, and Microsoft: Competition and Antitrust in High Technology* 140 (1999).

124. See *Eng'g Dynamics, Inc. v. Structural Software, Inc.*, 26 F.3d 1335, 1343–44 (5th Cir. 1994) (making the clone-compatibility distinction). Because there is no clear and consistent technology in this area, there is plenty of opportunity for confusion. See

Where the value of the overall standard is not intrinsic to that invention, but instead relates only to the user's investment in it—say, the creation of word processing documents—allowing access to product specifications that will support a different product (as opposed to a clone built on the same user interface and functionalities) may be, as Joseph Farrell put it, “the only commercially reasonable way to compete.”¹²⁵ Thus, intellectual property law should condone reverse engineering used to gain access to the product specifications (for compatibility purposes), but be more careful in evaluating when a rival is permitted to appropriate a proprietary standard or user interface (cloning). In so doing, intellectual property law can both protect investment incentives and allow for a smoothly functioning market where user investments will not necessarily determine the success of a system just because it came first.

In many cases, the difference between access to the basic platform standard itself and facilitating compatibility with it will be the difference between a user interface and a product interface. User interfaces or platform standards define how the software and the user interact;¹²⁶ product interfaces enable programmers to design software so that it can work with other software.¹²⁷ Whether a rival reverse engineers a platform standard or simply copies the basic user interface, this appropriation goes to the essence of the invention at issue. Thus, where alternative user interfaces or platform standards can be viable competitors and where their development requires real innovation, courts should protect rival user interfaces or standards.¹²⁸ In many cases, a private firm may itself allow fairly liberal

Kenneth W. Dam, *Some Economic Considerations in the Intellectual Property Protection of Software*, 24 *J. Legal Stud.* 321, 330 (1995).

125. Joseph Farrell, *Arguments for Weaker Intellectual Property Protection in Network Industries*, in *Standards Policy for Information Infrastructure* 368, 373 (Brian Kahin & Janet Abbate eds., 1995); see also Joseph Farrell & Garth Saloner, *Converters, Compatibility, and the Control of Interfaces*, 15 *J. Indus. Econ.* 9, 13–14 (1992) (noting that dominant firms might well refuse to provide key interface information necessary to build a converter to interconnect with the industry standard).

126. Stated in more depth, user interfaces consist of the overall screen display, the individual elements of the screen display (including the menu structure and the graphical images used in the program), and the accompanying sounds that create much of the program's experience for users. See *Apple Computer, Inc. v. Microsoft Corp.*, 35 F.3d 1435, 1438 & nn.3–4 (9th Cir. 1994).

127. Such interfaces, for example, enable macros developed for Lotus 1-2-3 to work with Microsoft's Excel spreadsheet program.

128. Some argue that user interfaces are merely “obvious” or “arbitrary” and thus not worthy of protection. Compare Peter S. Menell, *An Analysis of the Scope of Copyright Protection for Application Programs*, 41 *Stan. L. Rev.* 1045, 1099–1100 (1989) (arguing that selection of a user interface is essentially arbitrary), with David Friedman, *Standards as Intellectual Property: An Economic Approach*, 19 *U. Dayton L. Rev.* 1109, 1122 (1994) (arguing that when standards involve significant development costs, the “availability and quality of the standard” and the “incentive to produce it” may depend greatly on the reward offered by intellectual property protection). Given the value of innovative interfaces, the better argument would seem to be that such inventions generally should be rewarded through intellectual property protection—at least until and unless a single

terms of access to its information platform,¹²⁹ but intellectual property law should allow firms themselves to decide whether or not to adopt open architecture strategies, provided that the firms do not control a dominant standard.¹³⁰

The core concern of the competitive platforms model is to resolve the unsettled issue of how intellectual property law should regulate rival systems.¹³¹ To allow reverse engineering in all cases would threaten to allow firms to “clone” inventions at a fragment of the cost to the original producer (even though they would have to write an independent program), thereby undermining important investment incentives.¹³² At the same time, refusing ever to permit reverse engineering to facilitate horizontal access between competitive products would allow the original inventor to appropriate a windfall on an initial invention that became dominant while impeding the introduction of similar, and even superior, goods into the market.

Finally, it is important to recognize that cases involving reverse engineering raise a potentially tricky remedial question. In many reverse engineering cases, the rival product itself—say, the Connectix VGS—does not infringe on the original product’s intellectual property by using the latter’s protected technology. Rather, the *process* of reverse engineering (including the use of intermediate copying) that led to the manufacture of the similar product constitutes the relevant infringement. From the

standard emerges as dominant. See Farrell & Katz, *supra* note 43, at 648–49; see also *Eng’g Dynamics*, 26 F.3d at 1344 (“[I]f a best-selling program’s interface were not copyrightable, competitors would be free to emulate the popular interface exactly This cannot be the law.”); *infra* Part V.B (discussing *Lotus* case).

129. See Joseph Farrell & Nancy Gallini, *Second-Sourcing as a Commitment: Monopoly Incentives to Attract Competition*, 103 Q. J. Econ. 673, 675 & n.4 (1988); Andrea Shepard, *Licensing to Enhance Demand for New Technologies*, 18 RAND J. Econ. 360, 360–61 (1987) (discussing incentives for firms to license proprietary technology); Farrell & Weiser, *supra* note 52, at 5–10.

130. See Farrell & Weiser, *supra* note 52, at 17–39 (explaining why platform providers generally can be trusted to make such decisions).

131. See *Eng’g Dynamics*, 26 F.3d at 1341 (stating that judicial doctrine is, “generously described, in a state of creative ferment”); Samuelson & Scotchmer, *supra* note 39, at 1578 (noting set of challenges that leave doctrine in flux). The lack of a settled, coherent strategy for U.S. law is in contrast with an explicit regime adopted by the European Union. See Jaap H. Spoor, *Copyright Protection and Reverse Engineering of Software: Implementation and Effects of the EC Directive*, 19 U. Dayton L. Rev. 1063, 1063–64 (1994) (noting that “[u]nlike the U.S. Copyright Act, the EC Software Directive . . . explicitly addresses the issue of software reverse engineering, thereby obligating EC member countries to do the same in respect to their national copyright laws”). Recognizing the complex competitive dynamics posed by reverse engineering, Professor Samuelson and her Manifesto coauthors proposed an alternative *sui generis* regime that would strike an appropriate balance between permitting and excluding access via reverse engineering. Samuelson et al., *supra* note 35, at 2392.

132. See *supra* notes 106–110 and accompanying text (discussing disparity between Sony’s initial investment in its game system and the cost to its rival to copy Sony’s platform); see also Samuelson & Scotchmer, *supra* note 39, at 1585–90 (discussing cloning issue).

standpoint of the competitive platforms model, the remedial flexibility that a court might have—in, say, imposing a compulsory license or damages as opposed to enjoining production or use—suggests that, in close cases, the court might use this flexibility to minimize the error costs of either preventing reverse engineering where it is justified or allowing access where it is unnecessary.¹³³

III. THE CURRENT BATTLE IN INTELLECTUAL PROPERTY THEORY: THE COMMONS MODEL VERSUS PROPRIETARY CONTROL

Intellectual property protection constitutes a first line of competition policy that provides open access to information platforms. By making access more difficult, intellectual property law can, like antitrust, discourage cooperation where competition would lead to more innovation and consumer choice. Alternatively, by allowing access (as in the *Connectix* case¹³⁴), intellectual property law affords companies a self-help remedy that facilitates open access without the regulatory intervention characterized by antitrust or telecommunications regulation.¹³⁵ How intellectual property law should function in this regard continues to spark heated debates between advocates of the commons and proprietary control models, each of which pushes for very different approaches. In particular, commons advocates point to the spectacular growth of the Internet based on open source technologies, claiming that this growth could never have occurred against a backdrop of proprietary standards. By contrast, the proprietary control model underscores that a dominant firm may be able to develop a uniform and continually evolving platform standard that can push the industry forward. This Part evaluates these claims, highlighting the shortcomings of each.

A. *The Commons Model and Its Critics*

With the privatization of the Internet's basic infrastructure and the government's decision not to direct the Internet's development, the Internet's future direction remains in flux. A number of legal commentators—most notably Lawrence Lessig—are associated with the vision that the Internet should function as a “commons,” relying on open source technology for the maintenance and development of the Internet's architecture.¹³⁶ At bottom, Lessig's support for this model rests on both his suspicion of proprietary standards developed by commercial firms and

133. See *infra* notes 318–320 and accompanying text.

134. *Sony Computer Entm't, Inc. v. Connectix Corp.*, 203 F.3d 596 (9th Cir. 2000); see *supra* notes 108–111 and accompanying text (discussing *Connectix*).

135. Because intellectual property law cannot facilitate access in all cases in which it would be beneficial, it cannot substitute for antitrust policy. See *supra* note 47 and accompanying text.

136. See Lessig, *Code*, *supra* note 1, at 104–08; Lessig, *Future of Ideas*, *supra* note 1, at 55–72.

his belief that open source software leaves the end user in control.¹³⁷ In Lessig's words, an Internet built on open source technologies will remain a "commons" that is open to innovation from all comers and will adhere to an open architecture model.¹³⁸ This section first sets out this model and then critically evaluates its premises.

1. *The Commons Model.* — In the current struggle over how the Internet will develop, the commons camp is often associated with the "cyber hacker rallying cry" that "information wants to be free."¹³⁹ In the Internet world, the information infrastructure has been mostly free, as many of the main software programs that support Internet content are nonproprietary and distributed on an open source basis. Under the open source model, no individual firm benefits directly from the creation of the product, as all open source licenses allow for free access to the source code for the software program. This model harkens back to the early era of software development, where developers viewed software not as a commercial product but as one that should be shared with society. Under this model, the sharing and cloning of software—like the free reuse of academic ideas—are viewed as natural and healthy.¹⁴⁰ Most famously, the GNU-Linux operating system (which uses the GPL license developed by Richard Stallman¹⁴¹) has capitalized on the popularity of open source development among independent programmers and continues to grow in popularity for use on Internet servers.¹⁴²

Under open source development, programmers collaborate on the creation of software programs and allow all users free access to the pro-

137. See David G. Post, *What Larry Doesn't Get: Code, Law, and Liberty in Cyberspace*, 52 *Stan. L. Rev.* 1439, 1450–51 (2000) (discussing Lessig's concern that commercialism of the Internet and use of proprietary code will lead to less freedom in cyberspace).

138. See Lessig, *Future of Ideas*, *supra* note 1, at 61 (stating that open source code ensures a neutral platform that cannot be turned against innovators); Lawrence Lessig, *Architecting Innovation*, 49 *Drake L. Rev.* 397, 403 (2001) (arguing that "the platform of an open source system remains neutral" and "invites innovation").

139. For a discussion of this "hacker movement" see Marci A. Hamilton, *The TRIPS Agreement: Imperialistic, Outdated, and Overprotective*, 29 *Vand. J. Transnat'l L.* 613, 625 n.30 (1996); Michael Stutz, *Freed Software Winning Support, Making Waves*, *Wired News*, Jan. 30, 1998, at <http://www.wired.com/news/technology/0,1282,9966,00.html> (on file with the *Columbia Law Review*) (stating that "hacker ethic" envisions that "information should be shared, so that everyone can benefit from it").

140. See Dam, *supra* note 124, at 328, 330 (noting acceptance of software cloning in hacker culture and that hackers view software "much like academics view library books—something to be acquired, studied in detail, and then borrowed from").

141. See *supra* note 26 and accompanying text.

142. This operating system, which is often popularly described as Linux, actually results from the merger of the GNU operating system project with the Linux kernel—a program that allocates resources to the other programs running on the computer. Accordingly, this Article shall refer to the operating system as "GNU-Linux." See Richard Stallman, *Linux and the GNU Project*, at <http://www.fsf.org/gnu/linux-and-gnu.html> (last updated Dec. 14, 2002) (on file with the *Columbia Law Review*).

grams' source codes.¹⁴³ Within the realm of open source development, the GPL license reflects a particular vision of "free software," as it insists not only on openness, but prevents developers from using free software in conjunction with proprietary products.¹⁴⁴ By contrast, software merely placed in the public domain enables any firm to repackage it—even with modest improvements—and sell it as proprietary software.

The commons model's fervent commitment to openness reflects the perspective that, at least in the information industries, proprietary control is not necessary or desirable to encourage innovation. This perspective finds support in a substantial body of literature that makes clear that a large number of all innovations would take place in the absence of any intellectual property protection.¹⁴⁵ Indeed, then-Professor Breyer highlighted this point over thirty years ago, well before the wave of added intellectual property protection in recent legislation and judicial decisions.¹⁴⁶ For advocates of the commons model, the legacy of the Internet's development provides even further reason for questioning the centrality of broad intellectual property protection as a means of spurring valuable innovation. In fact, this history underscores that intellectual property protection raises the costs of invention to would-be innovators.¹⁴⁷

143. The basic definition for open source is set out in Bruce Perens, *The Open Source Definition*, in *Open Sources: Voices from the Open Source Revolution* 171, 176–80 (Chris DiBona et al. eds., 1999).

144. For a fuller explanation of free software, see *supra* note 26. For a discussion of the economics of open source development, see Yochai Benkler, *Coase's Penguin, or, Linux and The Nature of the Firm*, 112 *Yale L.J.* 369 (2002).

145. See Jay B. Barney, *Competence Explanations of Economic Profits in Strategic Management*, in *Dynamic Competition and Public Policy: Technology, Innovation, and Antitrust Issues* 45, 57 (Jerry Ellig ed., 2001) (citing studies that suggest that patenting accounts for only fourteen percent of all inventions and that it is the least significant factor in spurring innovation); Edwin Mansfield et al., *Imitation Costs and Patents: An Empirical Study*, 91 *Econ. J.* 907, 913 (1981) ("Within 4 years of their introduction, 60% of the patented successful innovations in our sample were imitated."); *id.* at 915 ("Excluding drug innovations, the lack of patent protection would have affected less than one-fourth of the patented innovations in our sample."); Roberto Mazzoleni & Richard R. Nelson, *The Benefits and Costs of Strong Patent Protection: A Contribution to the Current Debate*, 27 *Res. Pol'y* 273, 274 (1998) (citing relevant studies and explaining that "in most industries patents were not an important part of the incentives firms have for investing in R&D"). To be sure, this point is a general rule and there are exceptions within particular industries. See, e.g., Richard C. Levin et al., *Appropriating the Returns from Industrial Research and Development*, in *3 Brookings Papers on Economic Activity* 783, 796 (Martin Neil Baily & Clifford Winston eds., 1987) (arguing that only in drug industry do patents provide particularly effective protection against appropriation); Mazzoleni & Nelson, *supra*, at 276 (noting that the "collection of small and medium sized firms in the American biotechnology industry represents such an exception").

146. Stephen Breyer, *The Uneasy Case for Copyright: A Study of Copyright in Books, Photocopies, and Computer Programs*, 84 *Harv. L. Rev.* 281, 334–46 (1970).

147. See Landes & Posner, *supra* note 35, at 332 (arguing that in some cases copyright protection raises cost and thus decreases amount of creative expression); Levin et al., *supra*

In the Internet world, the commons model looks to the increasing use of open source licenses as well as standard-setting committees to regulate the development of new technologies. In particular, some argue that these institutions allow for a “bottom-up” system of norms and traditions that should replace current legal tools, such as intellectual property laws.¹⁴⁸ Just recently, the World Wide Web Consortium (W3C), a group that endorses standards for the Web, took a commons model approach, concluding that patented technologies would not be permitted in that group’s official standards.¹⁴⁹ To the extent that the W3C is able to develop new standards without recognizing proprietary ownership—and licensing fees—for Internet technologies, it will offer a model of how the commons approach can govern an Internet where proprietary ownership is neither necessary nor desirable.¹⁵⁰

The commons model rests in part on the “path dependence” theory that network markets will almost invariably rely on a single standard. On this view, an information technology standard may become dominant not because of its relative merits and greater degree of technological sophistication, but because it came first.¹⁵¹ Among economists, there is an ongoing debate over which (if any) markets reflect this phenomenon, with the case study of the standard for keyboards—the choice of the “QWERTY” over the “Dvorak” model—being a topic of notable disagreement.¹⁵²

note 145, at 816 (“Stronger appropriability will not yield more innovation in all contexts and, where it does, innovation may come at excessive cost.”).

148. See Elkin-Koren, *supra* note 48, at 1158–79 (detailing a potential shift to “private ordering” regimes in cyberspace).

149. The debate over this issue is well documented at the World Wide Web Consortium’s Patent Policy Working Group homepage. In its document setting forth a new proposal that would allow patented technologies to be included in its approved standards, the W3C’s Patent Policy Working Group suggested that rejecting any role for patents—and proprietary control—may be a lost cause; it stressed both that the “open standards environment” was crucial to the Web’s success and that “patents will be a factor in the ongoing development of the World Wide Web infrastructure.” Patent Policy Working Group, World Wide Web Consortium, W3C Patent Policy Framework: W3C Working Draft, Aug. 16, 2001, at <http://www.w3.org/TR/2001/WD-patent-policy-20010816/> (on file with the *Columbia Law Review*) [hereinafter Patent Policy Working Group, Working Draft].

150. See Carol M. Rose, *The Several Futures of Property: Of Cyberspace and Folk Tales, Emission Trades and Ecosystems*, 83 *Minn. L. Rev.* 129, 146–53 (1998) (summarizing debate related to how the Internet will shape intellectual property law).

151. See W. Brian Arthur, *Positive Feedbacks in the Economy*, *Sci. Am.*, Feb. 1990, at 92, 92.

152. Compare Carl Shapiro & Hal R. Varian, *Information Rules: A Strategic Guide to the Network Economy* 185–86 (1999) [hereinafter Shapiro & Varian, *Information Rules*] (arguing that the persistence of the QWERTY keyboard reflects path dependence), with Liebowitz & Margolis, *supra* note 123, at 19–39 (challenging this interpretation), and S.J. Liebowitz & Stephen E. Margolis, *The Fable of the Keys*, 33 *J.L. & Econ.* 1, 21–23 (1990) (same). Other candidates for this theory include Microsoft’s operating system. See Stanley M. Besen & Joseph Farrell, *Choosing How to Compete: Strategies and Tactics in Standardization*, *J. Econ. Persp.*, Spring 1994, at 117, 118 (suggesting that inferior products, such as MS-DOS, can triumph in a standards battle, in part because of

Those invoking this example to demonstrate the path dependence phenomenon suggest that the Dvorak standard provided users with the ability to type more quickly, but lost out to the established QWERTY standard because QWERTY came first. On this view, QWERTY, which initially served the purpose of slowing down typists so that they would not jam the keys, benefited greatly from the fact that users continued to be locked into an inferior standard.¹⁵³ Following the logic of this argument, path dependence theory claims that markets characterized by strong “network effects”—that is, where “the utility a user derives from consumption of the good increases with the number of other agents consuming the good”¹⁵⁴—are also ones where one standard or product will achieve dominance because its established value network will, once dominant, never be replaced.

In network markets where a single standard emerges as dominant, economists suggest that the market has “tipped” to a particular product.¹⁵⁵ This tipping phenomenon does not suggest that the product is inherently superior, but merely that a sufficient mass of users have adopted it and are locked into it because the switching costs of moving to an incompatible product are sufficiently great to deter a move.¹⁵⁶ In particular, where a company can build a proprietary value network and prevent others from gaining the critical mass to provide an alternative product—say, by refusing to make its dominant product compatible with rivals—it can establish a durable monopoly.

For intellectual property policy, the commons model suggests that the Internet and information industries function best when they are open and not susceptible to control by a proprietary firm. As commons model advocates explain it, the Internet’s openness enables firms to introduce innovations without worrying about gaining access to the basic platform. Consequently, this model envisions that, by introducing proprietary standards to the Internet and allowing firms to exercise control over its development, the Internet will not only fail to realize its potential, but may fail as an emerging communications medium. On this view, reverse engi-

expectations as to the ultimate size of their network); see also Joseph Farrell & Garth Saloner, *Installed Base and Compatibility: Innovation, Product Preannouncements, and Predation*, 76 *Am. Econ. Rev.* 940, 940 (1986) (describing how network effects create resistance towards switching to new products).

153. See Joseph Farrell, *Standardization and Intellectual Property*, 30 *Jurimetrics J.* 35, 37–38 (1989).

154. Michael L. Katz & Carl Shapiro, *Network Externalities, Competition, and Compatibility*, 75 *Am. Econ. Rev.* 424, 424 (1985). The network effect of increased value from additional users can be understood as having a direct component—that more individuals who are connected to, say, an instant messaging system, can be reached via that medium—as well as an indirect one—that, for example, more software applications will be developed for a system as more individuals join it.

155. See Gregory J. Werden, *Network Effects and Conditions of Entry: Lessons from the Microsoft Case*, 69 *Antitrust L.J.* 87, 90–91 (2001) (explaining tipping effect).

156. See Shapiro & Varian, *Information Rules*, *supra* note 152, at 103–34.

neering should always be allowed, even in cases like *Connectix* where multiple platform standards exist.

2. *The Failings of the Commons Theory.* — As an initial matter, it is important to understand that the commons conception of the Internet rests in large part on a community that can enforce norms committed to open architecture and nonproprietary development. In today's Internet, however, the conditions that once nurtured that environment—considerable government support, a small community of stakeholders, and the absence of proprietary development—are increasingly no longer in place. Thus, to the extent that the development of information platforms reflects the lessons of managing other common resources, the increasing number of interested parties and diversity of interests suggests that solutions like open source development and the creation of common, nonproprietary standards will become the exception, not the norm.¹⁵⁷

Second, in terms of standard-setting committees, there are good reasons to believe that the stance taken by the W3C in rejecting the use of patented technologies may be the exception in the Internet's future development. Most other standard-setting bodies, like the IETF, have tolerated patented technologies, provided that they are licensed at reasonable and nondiscriminatory terms.¹⁵⁸ This acceptance reflects the fact that stakeholders in the Internet's development and participants in standard-

157. The literature documenting how common property can be managed is now quite rich. Two classic studies that highlight the challenges of increasing numbers and diversity are Robert C. Ellickson, *Order Without Law: How Neighbors Settle Disputes* (1991), and Elinor Ostrom, *Governing the Commons: The Evolution of Institutions for Collective Action* (1990).

158. See Martin Libicki et al., *Scaffolding the New Web: Standards and Standards Policy for the Digital Economy* 31 (2000), available at <http://www.rand.org/publications/MR/MR1215> (on file with the *Columbia Law Review*); see also Patent Policy Working Group, World Wide Web Consortium, *Response to Public Comments on the W3C Patent Policy Framework Working Draft*, at <http://www.w3.org/2001/10/patent-response> (last visited Oct. 24, 2002) (on file with the *Columbia Law Review*) [hereinafter Patent Policy Working Group, Response] (noting that the IETF's policy reflects the norm among standard-setting bodies). The policy of the American Nationalization Standardization Institute (ANSI), which coordinates standardization in a variety of industries, requires companies with patented technologies to disclose any proprietary technology included within a proposed standard and to agree to provide free or reasonable and nondiscriminatory licenses to any patented technologies. See ANSI's *Procedures for the Development and Coordination of American National Standards*, reprinted in Raymond T. Nimmer, *Standards, Antitrust, and Intellectual Property*, in *Intellectual Property Antitrust* 1995, at 797, 851–52 (PLI Patents, Copyrights, Trademarks, and Literary Prop., Course Handbook Series No. G-414, 1995); see also Inst. of Electrical and Electronics Eng'rs, IEEE-SA Standards Board Operations Manual, cl. 6.3.2 (2000), at <http://standards.ieee.org/guides/opman/sect6.html> (on file with the *Columbia Law Review*). For a very thorough study of the issue of standard-setting organizations' intellectual property rules, see Mark A. Lemley, *Intellectual Property Rights and Standard-Setting Organizations*, 90 Cal. L. Rev. 1889 (2002) [hereinafter Lemley, *Intellectual Property Rights*]; see also Mark R. Patterson, *Inventions, Industry Standards, and Intellectual Property*, 17 Berkeley Tech. L.J. 1043, 1056–78 (2002) (discussing challenge of how to value invention included within a standard).

setting bodies have become more diverse and focused on profits.¹⁵⁹ Nonetheless, standard-setting committees like the IETF and the W3C still can provide a forum for negotiating between different proprietary interests and developing common standards that will benefit the entire community, but this role differs from a communal commitment to certain values.¹⁶⁰ Finally, even to the extent that groups like the W3C reject the use of patents in their endorsed standards, it remains to be seen when and how this will be enforced.¹⁶¹

Third, the claim that network markets will invariably tip to a single standard and thus platform standards should not be protected under intellectual property law overlooks important reasons why network competition can occur.¹⁶² Significantly, the tipping prediction does not take ac-

159. Cargill, *supra* note 32, at 259 (describing how commercialization affects workings of the IETF); Libicki et al., *supra* note 158, at 21 (“Five to ten years ago, IETF standards meetings were dominated by academics and other computer scientists; these days, businesspeople are likely to make up the overwhelming majority of participants—even when the subject is libraries.”); Paul A. David & Mark Shurmer, Formal Standards-Setting for Global Telecommunications and Information Services, 20 *Telecomm. Pol’y* 789, 795 (1996) (“[T]he outcome of deliberations among electrical and electronic engineers (in committees of the IEEE) more often reflect considerations other than an objective assessment of the technology.”). The W3C’s lack of any stated policy on intellectual property rights became a problem for the organization and spurred the development of one. See Patent Policy Working Group, Response, *supra* note 158 (noting emergence of the issue and suggesting that an approach to standards that denies the proliferation of software patents would be irresponsible); Michael Champion, Patents and Web Standards Town Hall Meeting, O’Reilly XML.com, Dec. 19, 2001, at <http://www.xml.com/pub/a/2001/12/19/patents.html> (on file with the *Columbia Law Review*) (discussing emergence of issue and likely adoption of policy that would prefer, but not commit exclusively to, royalty free standards by May 2002); see also Maurits Dolmans, Standards for Standards, 26 *Fordham Int’l L.J.* 163, 183 (2002) (suggesting that a requirement by the W3C of “royalty-free licensing of [intellectual property rights used in official standards] could discourage innovation, and by limiting the pool of available technologies, might result in the selection of second-class technology as Internet standards”).

160. See David & Shurmer, *supra* note 159, at 789 (noting that standard-setting bodies “can be viewed as a response to the difficulties of achieving coordination in a purely market-driven process”); Schallop, *supra* note 26, at 205 (commenting that “the importance of standards organizations, to some extent, temper [sic] the market power and de facto standard dominant players” in particular contexts); Wylie Wong, The Future: Sun Pins Hopes on Web Services, CNET News.com, Mar. 28, 2002, at <http://news.com.com/2009-1001-869770.html> (on file with the *Columbia Law Review*) (“Every company involved in a standards organization has its own proprietary interests at heart.”); see also Berners-Lee, *supra* note 8, at 91–95 (discussing the rationale for the establishment of the W3C).

161. See Lisa M. Bowman, .Net Patent Could Stifle Standards Effort, CNET News.com, Feb. 10, 2003, at <http://news.com.com/2100-1001-984052.html> (on file with the *Columbia Law Review*) (reviewing a number of strategies contemplated by free software supporters, ranging from development of a W3C policy on inclusion of patented technology to calls for boycotts “of companies that aggressively enforce patents”).

162. See, e.g., W. Brian Arthur, Increasing Returns and the New World of Business, *Harv. Bus. Rev.*, July–Aug. 1996, at 100, 102–07 (reviewing competition in knowledge-based industries). The economists’ amicus brief to the Supreme Court in the *Lotus* case suggested that “because network markets inexorably put new entrants at a disadvantage,

count of the likely scenario where a network effect (the value of additional customers) declines at some point in time because the network size has reached critical mass or where a rival network is able to overcome the first mover's initial advantage.¹⁶³ In markets where the critical mass is small enough to accommodate multiple providers of a particular product or service, multiple firms will compete at the platform level, as they currently do in the market for video game consoles and cell phones.¹⁶⁴ Moreover, it is quite clear that consumers' demand for variety can compensate for a lack of a strong network effect.¹⁶⁵

Finally, it merits noting that some advocates of a commons model, like Professor Lessig, view open source not as an optimal goal for economic regulation, but as a means of protecting broader public values.¹⁶⁶ This endorsement is consistent with a recognition that experiences like the fragmentation of the Unix operating system suggest that strong government support may be necessary to support research and development of open and common standards. This response, after all, is the typical one for a public goods problem and was the posture that the U.S. govern-

access to interfaces is necessary to ensure fair competition. See Brief Amicus Curiae of Economics Professors and Scholars in Support of Respondent at 7–8, *Lotus Dev. Corp. v. Borland Int'l, Inc.*, 49 F.3d 807 (1st Cir. 1995) (No. 94-2003), available at <http://elsa.berkeley.edu/users/woroch/amicus.txt> (on file with the *Columbia Law Review*) (noting that “if interfaces are public, competitors can make their products compatible, and users will be able to choose a program on the basis of its quality and price”).

163. For a discussion of the critical mass concept and the nature of consumer adoption of new innovations, see Everett M. Rogers, *Diffusion of Innovations* 313–34 (4th ed. 1995); see also *id.* at 221 (explaining how incentives can be effective at increasing adoption rates). For a discussion of the nature of networks and why many of them do not tip to a single standard, see Albert-László Barabási, *Linked: The New Science of Networks* 94–98 (2002).

164. See *infra* Part IV.A.I. The analogy of a proliferation of languages suggests a role for niche and rival platforms. See Edward L. Rubin, *Computer Languages as Networks and Power Structures: Governing the Development of XML*, 53 *SMU L. Rev.* 1447, 1448 (2000) (comparing XML, a network standard, to languages) (citing David Crystal, *The Cambridge Encyclopedia of Language* app. III, at 436–44 (1987)).

165. Katz & Shapiro, *Systems Competition*, *supra* note 35, at 106 (“Consumer heterogeneity and product differentiation tend to limit tipping and sustain multiple networks.”); Willow A. Sheremata, *Barriers to Innovation: A Monopoly, Network Externalities, and the Speed of Innovation*, 42 *Antitrust Bull.* 937, 966 (1997) (noting that high value for variety can overcome the advantage of a strong network effect). In addition, other factors can minimize the advantage of a network leader. Among other things, adding customers onto a network can create congestion problems of different sorts—including customer service support, for example—and marketing costs for customer acquisition can be a substantial, recurring cost. See William J. Kolasky, *Network Effects: A Contrarian View*, 7 *Geo. Mason L. Rev.* 577, 586–89 (1999) (explaining how networks can face congestion costs).

166. See Lawrence Lessig, *The Limits in Open Code: Regulatory Standards and the Future of the Net*, 14 *Berkeley Tech. L.J.* 759, 764–66 (1999) (arguing that open code embodies important values for cyberspace); Lawrence Lessig, *Open Code and Open Societies: Values of Internet Governance*, 74 *Chi.-Kent L. Rev.* 1405, 1406–09 (1999) (same).

ment took during the earlier years of the Internet's development.¹⁶⁷ Professor Lessig's writings, however, acknowledge that such levels of government support are unlikely, leading him to concede the likelihood that the Internet will increasingly be subject to the control of proprietary firms.¹⁶⁸

B. *The Proprietary Control Model and the Schumpeterian Justification*

The success of the Internet and open source development represents a fundamental challenge to the traditional model of proprietary software development, which still remains dominant and is exemplified (for good and bad) most clearly by Microsoft.¹⁶⁹ Microsoft and other proprietary software vendors, unlike open source developers, do not rely on a dispersed community of developers contributing to a common project, but rather on a team of developers centralized at corporate headquarters. As such, proprietary firms expect to recoup substantial returns from their work and do not release the source code of their products for free (or at all, in most cases). Not surprisingly, such firms challenge the open source movement as foolhardy and counterproductive.¹⁷⁰

1. *The Proprietary Control Model.* — Believers in the proprietary control model view the challenges for supremacy among firms as part of an ongoing battle that the late economist Joseph Schumpeter called "creative destruction."¹⁷¹ On this view, any market power will be temporary, as

167. See *supra* notes 9 and 34 and accompanying text.

168. See Lessig, *Code*, *supra* note 1, at 225 (concluding, after highlighting the importance of open code, that "[t]he politics is [sic] just not there").

169. See Stephen Shankland, *Study: Linux Sales Down, but Not Out*, CNET News.com, Aug. 6, 2002, at <http://news.com.com/2102-1001-948678.html> (on file with the *Columbia Law Review*) (describing Microsoft's dominance in the operating system market).

170. For Microsoft's most public criticism of the movement, see Craig Mundie, *The Commercial Software Model*, Remarks at the New York University Stern School of Business (May 3, 2001), at <http://www.microsoft.com/presspass/exec/craig/05-03sharesource.asp> (on file with the *Columbia Law Review*); see also Craig Mundie, *Commercial Software, Sustainable Innovation*, CNET News.com, May 17, 2001, at <http://news.com.com/2010-1078-281466.html?legacy=net> (on file with the *Columbia Law Review*) ("In a nutshell, [GPL] debases the currency of the ideas and labor that transform great ideas into great products."). Craig Mundie is a Senior Vice President at Microsoft.

171. Joseph A. Schumpeter, *Capitalism, Socialism, and Democracy* 81–90 (2d ed. 1947); see Posner, *supra* note 16, at 930 ("The gale of creative destruction that Schumpeter described, in which a sequence of temporary monopolies operates to maximize innovation that confers social benefits far in excess of the social costs of the short-lived monopoly prices that the process also gives rise to, may be the reality of the new economy."). Schumpeter's early work, while also focused on innovation, suggested that small entrepreneurs are critical to facilitating the advance of technology. See Joseph Schumpeter, *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle* 132–33 (1934); see also F.M. Scherer, *Schumpeter and Plausible Capitalism*, 30 *J. Econ. Literature* 1416, 1417 (1992) [hereinafter Scherer, *Plausible Capitalism*] (noting that for Schumpeter, "innovation . . . was driven by the entrepreneurial activity to which the capitalist system's rewards and opportunities were uniquely conducive").

a new technology will ultimately knock off every incumbent.¹⁷² As two commentators recently put it, Schumpeter's hypothesis is that "firms compete through innovation for temporary market dominance, from which they may be displaced by the next wave of product advancements."¹⁷³ Although this position rests on three analytically distinct propositions, the strong version of the Schumpeterian contention is that monopolies are both acceptable and necessary to facilitate technological innovation.¹⁷⁴

The Schumpeterian justification for strong intellectual property protection underlies the basic theory behind Edmund Kitch's "prospect theory" vision of the patent system.¹⁷⁵ This theory suggests that broad protection of patent rights can ensure that a single firm can both appropriate gains from and coordinate the development of a new technology.¹⁷⁶ Consequently, it challenges limiting doctrines—like those that facilitate access through reverse engineering—as cutting against the control of an inventor in managing development through licensing. Thus, Kitch's theory and the proprietary control model together represent an important strand in intellectual property theory,¹⁷⁷ supporting claims such as Professor Miller's argument that copyright law should categori-

172. See Thomas A. Piraino, Jr., *An Antitrust Remedy for Monopoly Leveraging by Electronic Networks*, 93 Nw. U. L. Rev. 1, 2 (1998) (terming this free market perspective the "'Marketeters'" view); Richard Schmalensee, *Antitrust Issues in Schumpeterian Industries*, 90 Am. Econ. Rev. 192, 194 (2000) (arguing that in a struggle for survival the intent to exclude is the intent to survive).

173. Howard A. Shelanski & J. Gregory Sidak, *Antitrust Divestiture in Network Industries*, 68 U. Chi. L. Rev. 1, 10–11 (2001); see also Scherer, *Plausible Capitalism*, *supra* note 171, at 1418 (arguing that innovation "undermine[s] the market positions of firms committed to old ways of doing business").

174. See Richard R. Nelson & Sidney G. Winter, *The Schumpeterian Tradeoff Revisited*, 72 Am. Econ. Rev. 114, 114 (1982) (defining Schumpeterian hypothesis as positing that "[a] market structure involving large firms with a considerable degree of market power is the price that society must pay for rapid technological advance"); F.M. Scherer, *Antitrust, Efficiency, and Progress*, 62 N.Y.U. L. Rev. 998, 1010 (1987) [hereinafter Scherer, *Antitrust*] (noting that Schumpeter's hypothesis encompasses the points that (1) only large businesses can achieve sufficient scale to invest in research and development and bear the necessary risks, (2) the profits yielded by monopoly are an ideal fund to support research and development, and (3) a monopoly position is necessary to ensure that a business can appropriate the benefits of research and development expenditures).

175. See Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & Econ. 265, 266 (1977).

176. For a thorough critique of this theory, see Merges & Nelson, *supra* note 37, at 871–78.

177. Although Schumpeter's work has informed a number of intellectual property arguments (like Kitch's), it has failed to gain much currency in antitrust thinking. See Robert P. Merges & Richard R. Nelson, *Market Structure and Technical Advance: The Role of Patent Scope Decisions*, in *Antitrust, Innovation, and Competitiveness* 184, 186 (Thomas M. Jorde & David J. Teece eds., 1992).

cally reject any privilege for the reverse engineering of software programs.¹⁷⁸

The proprietary control model embraces a rich tradition in intellectual property theory that without an appropriate incentive, inventors will not create new innovations. In the Internet context, both the Clinton Administration's embrace of strong intellectual property protection in the e-commerce area and the endorsement of the so-called "business method patents" reflect this perspective.¹⁷⁹ In particular, this vision places a premium on ensuring that firms reap proprietary rewards for innovating in the Internet environment. On this view, proprietary control of intellectual property does not simply provide the important incentive to invent new technologies, but also ensures that such technologies are maintained carefully and put to their best use.¹⁸⁰

Relying on proprietary development provides a clear answer to a potential weakness of the open source model: It boasts a clear ability to develop and deploy talented leadership and coordination to ensure that a standard does not fragment within a wide user base. To be sure, the Linux operating system continues to build support, but the history of the Unix operating system suggests that open source standards like Linux face long odds in displacing the dominant proprietary model of software development.¹⁸¹ Second, a real weakness of open source projects is that they do not generate any direct financial benefits for their inventors, so they can fall prey to the public goods problem of being subject to underinvestment. Sun's experience with its open Java standard (which relies on a "community source license" that is somewhat similar to the open

178. See Miller, *supra* note 96, at 1023–26.

179. See *Amazon.com, Inc. v. BarnesandNoble.com, Inc.*, 73 F. Supp. 2d 1228, 1228 (W.D. Wash. 1999) (providing a preliminary injunction for Amazon's 1-click patent for engaging in electronic commerce), vacated, 239 F.3d 1343 (Fed. Cir. 2001); Clinton & Gore, Jr., *supra* note 30, at 9–13; Q. Todd Dickenson, *E-Commerce, Business Method Patents, and the USPTO: An Old Debate for a New Economy*, 19 *Cardozo Arts & Ent. L.J.* 389, 398–99 (2001) (defending business method patents); see also Frank H. Easterbrook, *Cyberspace Versus Property Law?*, 4 *Tex. Rev. L. & Pol.* 103, 106 (1999) ("Curtail the top returns, and the whole structure of rewards changes for the worse."). For two critical appraisals of the effort to extend patent protection to the business method context, see James Gleick, *Patently Absurd*, *N.Y. Times (Magazine)*, Mar. 12, 2000, at 44; Tim O'Reilly, *An Open Letter to Jeff Bezos*, Feb. 28, 2000, at http://www.oreilly.com/cgi-bin/amazon_patent.comments.pl (on file with the *Columbia Law Review*).

180. See Douglas G. Baird, *Does Bogart Still Get Scale?*, 4 *Green Bag* 2d 357, 363 (2001) (arguing that without intellectual property protection, cheap reproductions would dilute and tarnish creative works); Bell, *supra* note 86, at 758–60.

181. For a thoughtful discussion of the open source model, see David McGowan, *Legal Implications of Open-Source Software*, 2001 *U. Ill. L. Rev.* 241; see also Weiser, *Information Platforms*, *supra* note 33, at 25–29 (outlining reasons for skepticism). As for Linux, its role as a bulwark against Microsoft's dominance may well attract sufficient support from computer industry leaders to enable it to survive and even thrive. See Nicholas Petreley, *Linux Road Map Needed*, *Computerworld*, Sept. 24, 2001, at 47, 47 (explaining the need for a group to develop and maintain Linux standard and noting that Hewlett Packard is taking a leading role in supporting this effort).

source model) is telling on this score: “For all its hype and popularity, Java has made more money in direct software sales for competitors than for the company that invented it.”¹⁸² To be sure, the invention of Java did bring considerable recognition and indirect benefits to Sun, but it is far from clear that Sun has appropriated enough benefits from Java to justify its investment in the technology.¹⁸³

In the computer world, the proprietary model relies on the ability of software firms to maintain close control over the application programming interfaces (APIs) for the programs they develop. These interfaces can be analogized to the “gear teeth, levers, pulleys, and belts that physical machines use to interoperate.”¹⁸⁴ In the context of proprietary software, control over these interfaces enables the platform owner to maintain control over its platform both defensively—to prevent rivals from cloning its products—as well as offensively—to prevent competitors from creating compatible products. In the government’s antitrust case against Microsoft, for example, the government submitted evidence of a manager’s statement that “‘to control the APIs is to control the industry’”¹⁸⁵ and established that Microsoft’s monopoly rested, in part, on its firm control of its APIs.¹⁸⁶

2. *The Failings of the Proprietary Control Theory.* — Even though there are important reasons to allow for the development of proprietary technologies as a means of facilitating new innovations, there also are reasons to doubt Schumpeter’s claim that complete control over an industry’s standards by large firms like Microsoft will be good for consumers and will be checked by future innovation.¹⁸⁷ As an initial matter, current economic thinking suggests that while larger firms may enjoy some advantages in fostering innovation, the Schumpeterian hypothesis is not supported by the evidence,¹⁸⁸ in part because smaller firms tend to be more

182. Stephen Shankland, *The Goal: Sun Looks for Payoff to Java Addiction*, CNET News.com, Mar. 25, 2002, at <http://news.com.com/2009-1001-866365.html> (on file with the *Columbia Law Review*).

183. See Bill Whyman, *Sun’s Bigger Troubles*, Software Transformation Series (Precursor Group, Wash., D.C.), Apr. 10, 2002 (on file with the *Columbia Law Review*) (“The *relative* openness of Java, which successfully created its growth, is at odds with a more closed effort to capture its value.”).

184. Samuelson et al., *supra* note 35, at 2321.

185. Thomas A. Piraino, Jr., *Identifying Monopolists’ Illegal Conduct Under the Sherman Act*, 75 N.Y.U. L. Rev. 809, 888–89 (2000) (quoting Microsoft manager’s internal e-mail).

186. See *United States v. Microsoft Corp.*, 65 F. Supp. 2d 1, 15 (D.D.C. 1999) (suggesting that process of reverse engineering Windows is so time consuming that it could not be done successfully); see also Jonathan Band, Paragraph 52: A Window into Judge Jackson’s Findings of Fact, *Computer Law*, Mar. 2000, at 3, 4 (same).

187. In terms of challenging the perspective at a theoretical level, Kenneth Arrow famously countered that competition provides the best spur to innovation. Kenneth J. Arrow, *Economic Welfare and the Allocation of Resources for Invention*, in *Essays in the Theory of Risk-Bearing* 144, 156–60 (1971).

188. See Wesley M. Cohen & Richard C. Levin, *Empirical Studies of Innovation and Market Structure*, in 2 *Handbook of Industrial Organization* 1059, 1078 (Richard

efficient, productive, and aggressive about pursuing innovation.¹⁸⁹ Accordingly, Scherer and Ross conclude that “[t]echnological progress thrives best in an environment that nurtures a diversity of sizes and, perhaps, especially, that keeps barriers to entry by technologically innovative newcomers low.”¹⁹⁰

Second, to the extent that some size may be helpful in more established industries, there is reason to think that this is less true for the information industries where there is a greater need for intellectual capital than physical capital, and the fixed costs necessary for research and development are considerably less. Cisco, for example, despite its overwhelming size, relies on outsourcing for much of its research and development through purchasing start-up companies.¹⁹¹ Similarly, start-up companies

Schmalensee & Robert D. Willig eds., 1989) (“[T]he effects of firm size and concentration on innovation, if they exist at all, do not appear to be important.”); Edwin Mansfield, *Industrial Research and Technological Innovation: An Econometric Analysis* 43 (1968) (“[E]xcept for the chemical industry, there is no evidence that the largest firms [in petroleum, drugs, steel, and glass] spent more on research and development . . . than did somewhat smaller firms.”); Michael E. Porter, *The Competitive Advantage of Nations* 527–30, 577–89 (1990) (showing that monopolists in mature markets have an incentive to suppress new technology so as to protect their sales revenue from existing products in markets they dominate); Scherer, *Antitrust*, supra note 174, at 1012 (concluding that “relatively small firms and ‘outsiders’ appear to originate a disproportionate fraction of the most radical innovations”); Scherer, *Plausible Capitalism*, supra note 171, at 1425 (asserting that “theoretical and empirical work” for the fifty years following Schumpeter’s conjecture provides “at best meager support”). To be fair, it merits notice that Schumpeter’s focus on innovation—or dynamic efficiency, as economists often call it—facilitated the study of the area, even if his suggestion that monopolies could innovate in a superior fashion proved to be suspect. In this respect, the counterhypothesis offered by Arrow is, in some sense, in the Schumpeterian tradition of focusing on innovation. See generally Arrow, supra note 182, at 156–60.

189. See F.M. Scherer, *Innovation and Growth: Schumpeterian Perspectives* 246–47 (1984) [hereinafter Scherer, *Innovation and Growth*] (concluding from empirical studies that entrenched monopolists tend to be averse to innovation for fear that new products will cannibalize revenues from their existing products); Wesley M. Cohen & Steven Klepper, *A Reprise of Size and R & D*, 106 *Econ. J.* 925, 925 (1996) (concluding that, in academic circles, an “enduring consensus emerged long ago that large firms have no advantages in R & D competition and may even suffer disadvantages”); *id.* at 929 (“[S]maller firms accounted for a disproportionately large number of patents and innovations relative to their size.”); Douglas H. Ginsburg, *Antitrust, Uncertainty, and Technological Innovation*, 24 *Antitrust Bull.* 635, 649 (1979) (“Studies have indicated . . . that small firms are more efficient than larger ones in conducting research.”).

190. F.M. Scherer & David Ross, *Industrial Market Structure and Economic Performance* 660 (3d ed. 1990). Admittedly, this is a broad generalization, where results will vary from industry to industry. See, e.g., Levin et al., supra note 145, at 812–15 (highlighting “sources of interindustry difference in R&D spending and the rate of technological advance”).

191. See Gawer & Cusumano, supra note 45, at 167–73; Ben Elgin, *A Do-It Yourself Plan at Cisco*, *Bus. Wk.*, Sept. 10, 2001, at 52, 52 (noting that since 1993 Cisco acquired more than seventy companies, including many start-ups as its primary R&D strategy); see also Joshua S. Gans & Scott Stern, *Incumbency and R&D Incentives: Licensing the Gale of Creative Destruction*, 9 *J. Econ. & Mgmt. Strategy* 485, 504–05 (2000) (examining how this practice contrasts sharply with the Schumpeterian perspective).

financed by venture capitalists have undertaken risky research and development efforts that have produced a significant number of patents.¹⁹²

Finally, two critical concerns underscore why pure Schumpeterian thinking should not drive intellectual property policy. First, although monopolies such as IBM and Microsoft may be dethroned at some point, the exercise of monopoly power in the meantime—which may well be several decades—still can injure consumers.¹⁹³ In the case of Microsoft, its ability to maintain and control closed, *de facto* industry standards—as opposed to open, *de jure* ones endorsed by standard-setting committees—has enabled it to exercise great influence over other companies. In particular, Microsoft has used this control to undermine support for Sun Microsystems's open Java standard.¹⁹⁴

A second, and more fundamental, criticism of the proprietary control model is that numerous studies have shown that incumbent monopolies will often fail to develop and deploy radically new technologies,¹⁹⁵

192. See Samuel Kortum & Josh Lerner, *Assessing the Contribution of Venture Capital to Innovation*, 31 *RAND J. Econ.* 674, 676–81 (2000) (providing statistical evidence of the importance of venture funding on patent activity). As to smaller firms, however, it may well be the case that patents and intellectual property provide an important incentive and means of justifying their value. See Mazzoleni & Nelson, *supra* note 145, at 274 (noting absence of focus on smaller firms in research on importance of patents); see also Ferguson, *supra* note 25, at 251 (suggesting that intellectual property protection created value in start-up firm); Levin et al., *supra* note 145, at 797 (observing that for start-ups, patents may be particularly important, because other means of appropriating innovations are not feasible and because patents may be a marketable asset). Although it could be the case that venture capital firms appreciate the presence of patents as a psychological benefit even if they have minimal actual market impact, Kortum & Lerner's study suggests that venture capital backed patents do not appear to be lower quality patents. Kortum & Lerner, *supra*, at 689–91.

193. See Michael E. Porter, *Competition and Antitrust: Towards a Productivity-based Approach to Evaluating Mergers and Joint Ventures*, 33 *UWLA L. Rev.* 17, 33 (2001) ("In truth, drastic innovations in industries occur only once every few decades, so that dominant positions create substantial costs to productivity growth and to society."); F.M. Scherer, *Some Principles for Post-Chicago Antitrust Analysis*, 52 *Case W. Res. L. Rev.* 5, 10 (2001) (noting that it took seventy-five years for rivals to erode U.S. Steel's monopoly and fifty-five years to erode General Motors's, and that Microsoft has enjoyed a near monopoly position in the personal computing operating system market for almost two decades); Sheremata, *supra* note 165, at 963 ("To say . . . that automobiles eventually replaced horses is to ignore the impact to welfare of innovation delayed.").

194. See *United States v. Microsoft Corp.*, 65 F. Supp. 2d 1, 20–21 (D.D.C. 1999) (discussing Microsoft's fear of Java's ability to diminish the applications barrier to entry).

195. See, e.g., Jonathan B. Baker, *Fringe Firms and Incentives to Innovate*, 63 *Antitrust L.J.* 621, 634 (1995) (observing that leading firms face pressure either to deter rival innovation—through predatory conduct or preemptive innovation—or to accommodate it); Mary Tripsas, *Unraveling the Process of Creative Destruction*, 18 *Strategic Mgmt. J.* 119, 119 (1997) (citing examples to demonstrate that the "continual failure of established firms in the face of radical innovation has been documented in a number of empirical studies"). Three relatively recent examples illustrate this phenomenon. First, despite the proven use of fiber optic technology in telecommunications, AT&T failed to deploy it until Sprint and other upstarts did and began advertising a superior quality network. See Howard A. Shelanski, *Competition and*

sometimes even using their current monopolies to distort and thwart the process of competing to introduce more innovative products.¹⁹⁶ Indeed, this very concern motivated AT&T's decision not to embrace the Internet at its creation as well as to slow roll the deployment of wireless telephone service.¹⁹⁷ Thus, an important role for regulation is to "keep entry open so that challengers with new ideas can force the pace of innovation."¹⁹⁸

In short, the commons model's basic insight—that the Internet provided an avenue for entry because of its open and common platform—can still guide the Internet's future even with an allowance for the development of proprietary standards. By contrast, an acceptance of dominant platform standards may create more value for the individual companies, but can leave the Internet community itself worse off, where would-be improvers lack access to the particular proprietary platform (or only gain access under onerous terms).¹⁹⁹ To solve this problem and to facili-

Deployment of New Technology in U.S. Telecommunications, 2000 U. Chi. Legal F. 85, 107–08. Second, even though DSL technology had been developed in the 1980s, the Bell Companies did not begin deploying it until the cable companies began deploying cable modems. See *id.* at 111. Finally, new entrants into access exchange markets used cutting edge telecommunications technology to provide higher quality and more reliable service than that afforded by the old copper networks of the incumbent providers. See Thomas M. Jorde et al., *Innovation, Investment, and Unbundling*, 17 *Yale J. on Reg.* 1, 9 (2000).

196. See David J. Teece, *Profiting from Technological Innovation: Implications for Integration, Collaboration, Licensing and Public Policy*, 15 *Res. Pol'y* 285, 291–92 (1986) (noting how incumbent monopolies often withhold cooperation with respect to their complementary assets to stall competitive innovation). Such measures, as established caselaw underscores, warrant antitrust oversight. See *Standard Fashion Co. v. Magrane-Houston Co.*, 258 U.S. 346, 355–57 (1922); Posner, *supra* note 16, at 933–35.

197. See John Naughton, *A Brief History of the Future* 107 (2000) (quoting AT&T executive as stating about the Internet that "it can't possibly work, and if it did, damned if we are going to allow the creation of a competitor to ourselves"); Rudolfo Luján Baca, *Effect of the FCC Regulatory Process on the Investment Community*, 2001 *L. Rev. Mich. St. U.-Det. C.L.* 339, 340 (noting AT&T's prediction of wireless as a niche service and suggesting that AT&T, if left to manage it, would have kept it that way); see also Blair Levin, *The Innovation Dilemma*, CNET News.com, Mar. 18, 2002, at <http://news.com.com/2010-1078-861972.html> (on file with the *Columbia Law Review*) (noting how competition spurred innovation in both the wireless and data networks contexts).

198. Scherer, *Antitrust*, *supra* note 174, at 1014; see also Richard N. Langlois, *Technological Standards, Innovation, and Essential Facilities: Towards a Schumpeterian Post-Chicago Approach*, in *Dynamic Competition and Public Policy: Technology, Innovation, and Antitrust Issues* 193, 207 (Jerry Ellig ed., 2001) ("[I]nnovation normally proceeds fastest when a large number of distinct participants are trying multiple approaches simultaneously."); Shane Greenstein, *The Three Coms of the Microsoft Antitrust Suit: Competition Policy, Commercial Experimentation, and Computing Platforms*, 32 *UWLA L. Rev.* 95, 100 (2001) (noting how experimentation and innovation requires multiple points of entry); Sheremata, *supra* note 165, at 944 ("When owners of a current technology raise artificial barriers to entry of new technology, opportunities for innovation decline to the detriment of consumers.").

199. See Weiser, *Internet Governance*, *supra* note 3, at 829–30 (arguing that "the larger the Internet community becomes, the more difficult it is to maintain a completely 'commons' model"). Put differently, the concern is that the Internet commons will be fully proprietyzed and subject to enclosure by commercially owned technologies. See

tate continued innovation in the Internet environment will require a combination of private and public responses: the leadership of standard-setting committees, enlightened self interest on behalf of companies in the marketplace, some well-targeted government subsidies for basic research, and appropriate antitrust and telecommunications regulation, as well as—the primary focus of this Article—a well-formulated and coherent intellectual property policy.²⁰⁰

IV. TOWARD A COMPETITIVE PLATFORMS MODEL FOR THE INTERNET AND THE INFORMATION INDUSTRIES

The polarizing debates between the commons and proprietary control models threaten to eclipse a third way for the Internet and information industries to develop: the competitive platforms model. Those enamored of Schumpeterian thinking often suggest that any attempt to promote access to a proprietary platform is misguided on the ground that any incumbent platform standard ultimately will be displaced entirely. Those commons advocates who maintain that network markets invariably will tip to a single standard tend to argue that all information platform standards must be kept open, lest their owners limit innovation. By incorporating important insights from both perspectives, the competitive platforms model provides a new framework for intellectual property law that reconciles the need to confer the investment incentives necessary to spur innovation with the risk of protecting proprietary dominance.²⁰¹ This model can also help policymakers appreciate how standard-setting and government funding efforts should work together to develop and maintain uniform standards where proprietary firms would be unable or unwilling to do so.

A. *The Competitive Platforms Model and Intellectual Property Law Reform*

The competitive platforms model provides a vision for when and how intellectual property should be treated as a limited—as opposed to a

Lawrence Lessig, *Internet Under Siege*, Foreign Policy, Nov.–Dec. 2001, at 56, 56 (“It is the enclosure of [the Internet’s] commons that will bring about the Internet’s demise.”); see also Benkler, *supra* note 22, at 415 (identifying growing “enclosure movement” that will limit use of information available via the Internet).

200. The difficulty of expanding on a more precise explanation of how each of these tools should be used in combination with one another to stimulate innovation results in a lack of attention by scholars to this question. See Brett Frischmann, *Innovations and Institutions: Rethinking the Economics of U.S. Science and Technology Policy*, 24 Vt. L. Rev. 347, 350 (2000) (“Despite wide recognition that socially efficient production of innovation (of all types) requires a comprehensive, complicated ‘mix’ of federal institutions, comparative institutional analysis is lacking, particularly in terms of mixed systems that rely on multiple institutions.”).

201. A basic reason for a more cautious and less intrusive strategy is that, with regard to network markets, “we are far from having a general theory of when government intervention is preferable to the unregulated market outcome.” Katz & Shapiro, *Systems Competition*, *supra* note 35, at 113.

pure—commons.²⁰² As to property law, Carol Rose has explained how the common law recognized that limited common property—such as easements—in roads and waterways served to enable access to, and thus more efficient exploitation of, the surrounding private property.²⁰³ With respect to intellectual property law, the appropriate conception of an information commons is less clearly developed; after all, we are still in the formative stage of developing the basic infrastructure (of hardware and software) for the Internet and the information economy.²⁰⁴ Thus, a critical challenge for policymakers and commentators is to understand what role intellectual property law can play in fostering an information commons as the Internet develops.

Following the competitive platforms model described below, intellectual property rules (and regulation in general) should ensure that parties maintain proprietary control over information platforms to provide the necessary incentives for investment and innovation. Without such investment incentives and opportunities for rewards, the Internet will not continue to develop in a robust fashion. To be sure, preserving the common platform provided by the basic standards of the Internet's logical layer is essential, and intellectual property law should be sensitive to the need to facilitate open access to a standard when it emerges as dominant.²⁰⁵ If the entire software infrastructure related to the Internet (or other information platforms) is treated as a commons, however, then there will be only limited opportunities to make money investing in its development. To move back to Professor Rose's metaphor: Easements serve the important public purpose of making everyone's property more valuable, but if property law sought to dedicate all of a property holder's rights to a commons, the property holder would lose the incentive to develop her property.²⁰⁶

202. As Julie Cohen put it, "What is missing from the conventional economic wisdom about property rights in general and intellectual property rights in particular is a vocabulary for apprehending the link between incomplete control and productivity, between 'leaky' entitlements and public welfare, between chaos and creative ferment." Julie E. Cohen, *Copyright and the Perfect Curve*, 53 *Vand. L. Rev.* 1799, 1818 (2000).

203. Rose, *Comedy of the Commons*, *supra* note 48, at 744–45; see also *White v. Samsung Elecs. Am., Inc.*, 989 F.2d 1512, 1513 (9th Cir. 1993) (Kozinski, J., dissenting) (explaining how providing some public access to creative works is crucial to innovation).

204. For an explanation of how an information commons could be fostered by intellectual property rules, see Yochai Benkler, *Siren Songs and Amish Children: Autonomy, Information, and Law*, 76 *N.Y.U. L. Rev.* 23, 84–88 (2001).

205. In so doing, the law may not only regulate the market by facilitating open standards in certain situations, but also reinforce an important norm that prevailed during the Internet's formative years. Cf. Arti Kaur Rai, *Regulating Scientific Research: Intellectual Property Rights and the Norms of Science*, 94 *Nw. U. L. Rev.* 77, 88, 99 (1999) (noting this point and highlighting role of government in encouraging norm of patenting gene fragments).

206. See Rose, *Comedy of the Commons*, *supra* note 48, at 744–45 (explaining role of easements).

A central tenet of the competitive platforms model is that, even if the industry structure will ultimately rely on a single standard, competition policy should still err on the proprietary side of the line, allowing rival standards to battle it out in the marketplace. To be sure, promoting standards competitions risks forestalling, duplicating, and stranding investment,²⁰⁷ but even where a single standard ultimately emerges, the temporary competition is likely to produce a better outcome.²⁰⁸ Moreover, in addition to maintaining the possibility of competition on quality, rival standards also hedge against the risk that the single standard proves flawed in some fundamental matter.²⁰⁹ Finally, even though some platform standards will appear to be susceptible to the tipping phenomenon, policymakers and courts will not necessarily be able to predict which markets will tip and which standard will emerge as dominant. Consequently, they should encourage rival platform standards, and only where a single one emerges as dominant, facilitate and—if necessary—mandate access to that standard.

1. *Rival Platform Standards.* — In the Internet context in particular and the information industries more generally, standards competitions can often be procompetitive by increasing innovation in a manner that would not occur under cooperative efforts that settle on a lowest common denominator standard. The problem with joint standard-setting efforts, such as those led by standard-setting bodies like the IETF, is that they move slowly and need to satisfy a broad range of constituents.²¹⁰ Indeed, even where the relevant market involves substantial capital expenditures, such as the deployment of cell phone networks, rival standards can facilitate innovation and experimentation. Thus, in evaluating the nature of a network market, rival standards may not only be sustainable, but also procompetitive. To be sure, this rivalry may well look more like an oligopoly—with three or four rival platforms—than textbook

207. See Merges & Nelson, *supra* note 37, at 870 (“In particular, under a wide range of assumptions, rivalrous inventive efforts generate a great deal of inefficiency.”).

208. See Robert J. Aiken & John S. Cavallini, *When Are Standards Too Much of a Good Thing? Will They Provide Interoperability for the National Information Infrastructure?*, in *Standards Policy for Information Infrastructure* 253, 261 (Brian Kahin & Janet Abbate eds., 1995) (“[T]he overzealous creation and use of [official] standards, either through formal standards processes or by government purchasing practices, poses the risk of impeding the introduction of necessary new technologies and services . . .”).

209. One incident that would seem to support this concern is the use of a single standard for encrypting digital versatile disks (DVDs) as a copy protection measure. Part of why the DVD industry is so committed to using legal means to limit the use of the software code that decrypts and unlocks the copy protection standard is that the industry is completely dependent upon a single technology. See *Universal City Studios v. Reimerdes*, 82 F. Supp. 2d 211, 218–19 (S.D.N.Y. 2000) (enjoining distribution of a software program that unlocks DVD copy protection standard).

210. See *supra* note 159 (noting how diverse commercial interests limit the effectiveness of standard-setting bodies); see also Merges & Nelson, *supra* note 37, at 872 (suggesting that the theoretical benefits of cooperative development are often not borne out in practice).

competition,²¹¹ but there still are important payoffs to innovation from competition among information platforms.

The case of wireless telephone standards provides an example of why regulation should not be too quick to mandate—or even facilitate—horizontal access and standardization across rival information platforms. In Europe, regulators concluded that the market for wireless telephones was “tippy” and thus decided to mandate a single standard. In particular, the European Economic Community’s government standard-setting body, European Telecommunications Standards Institute (ETSI), adopted the Global System for Mobile Communications (GSM) as the only standard for which equipment suppliers could provide wireless telephone equipment. By contrast, U.S. regulators (in particular, those at the Federal Communications Commission) decided to let the market determine whether multiple standards could be supported and which one, if any, was clearly superior. As it turned out, this experiment yielded three separate standards—that is, two alternatives to GSM (Qualcomm’s Code Division Multiplexing (CDMA) and Time Division Multiplexing (TDMA))—all of which were deployed in the United States with minimal disruption to consumers.²¹² Most notably, the last standard to be deployed, CDMA, uses spectrum more effectively than its predecessors by allowing numerous subscribers to use the same channel and providing an easier migration path to next generation uses.²¹³ Consequently, the case of wireless standards highlights the innovative payoff from the FCC’s decision not to mandate a single standard.²¹⁴

As the wireless standards example illustrates, rivalry between alternative standards can not only increase innovation, but also lead information

211. See Scherer, *Innovation and Growth*, *supra* note 189, at 246.

212. See Kathleen M.H. Wallman, *The Role of Government in Telecommunications Standard-Setting*, 8 *CommLaw Conspectus* 235, 246–47 (2000). Admittedly, consumers with CDMA and TDMA did not have the convenience of being able to take their wireless phones to Europe, but those who valued this opportunity could simply stick with a GSM phone.

213. On the enhanced innovative opportunities offered by CDMA, see Libicki, *supra* note 32, at 12–13 (suggesting standards competition may well be responsible for greater security and ten-fold increase in capacity); Libicki et al., *supra* note 158, at 8, 10 (noting CDMA’s enhanced features and how its deployment spurred innovation by its competitors); Steven Titch, *Blind Faith, Telephony*, Sept. 8, 1997, at 24, 26, 30 (noting that different providers report anywhere from six- to eighteen-fold capacity increase). On the benefits in terms of a transition to the third generation standard, see Peggy Albright, *Charting the Course to 3G, Wireless Wk.*, Jan. 8, 2001, at 25, 25; Lynette Luna, *Battle of the Standards, Telephony*, Feb. 19, 2001, at 62, 62.

214. The wireless standard case study also highlights the dynamics introduced by a world market. In that case, European users may actually benefit from the standard-setting competition in the United States without enduring the costs of that competition because they can enjoy interoperability while also being able to incorporate the advances of CDMA technology into a next generation standard. The questions raised by viewing the issue on the international level implicate trade policy concerns as well as highlight how regulatory rules—including intellectual property policy—may have to be international in order to be effective. A fuller discussion of these issues, however, is beyond the scope of this Article.

platform sponsors to work harder to build an installed base of customers for their innovation. To do so, providers must work hard to build a value network by assuring consumers that their products offer important benefits and enlisting companies to provide complementary goods.²¹⁵ When Nintendo first introduced its game console in the U.S. market, for example, it worked hard to ensure that it would be sold by vendors and used by consumers.²¹⁶ Similarly, in today's video game marketplace, Microsoft, Nintendo, and Sony are engaged in a heated competition in the video game console market, spending nearly \$1 billion in marketing over an eighteen-month period.²¹⁷ In short, a company that invents a new standard will often need to be willing to invest in the value of its network (including the perception of it),²¹⁸ in some cases by adopting seemingly unconventional strategies by giving portions of the product away for free to lure users onto its platform.²¹⁹ Similarly, where a firm sponsoring a platform standard faces competition, it is likely to provide open access to its platform in order to attract complementary products even without regulatory requirements that it do so.²²⁰ Even if the competition among rival standards ultimately converges to a single standard (as may occur at some point with the rival cell phone standards), "going through an early phase of extremely intense competition where each firm tries to build up its network to get ahead of its rival" is likely to result in greater total network penetration.²²¹

Even where an incumbent company establishes an early lead and installed base of users, new entrants still will often find a niche and be able to enter the market. To be sure, switching costs will often limit the new entrant's ability to attract customers, but unless the economies of scale give the incumbent an extraordinary cost advantage, the incumbent's nat-

215. See Katz & Shapiro, *Systems Competition*, supra note 35, at 103 (noting that network sponsor may need to make commitments regarding the availability of complementary products to encourage adoption of its product).

216. See Rogers, supra note 163, at 246–50.

217. Chris Gaither, *Video Game Field Becomes Crowded and Highly Profitable*, N.Y. Times, Dec. 17, 2001, at C17.

218. As David Friedman put it, "Even where inventing a standard is not costly, making it a standard may be." David Friedman, *Standards as Intellectual Property: An Economic Approach*, 19 U. Dayton L. Rev. 1109, 1122 (1994).

219. Shapiro & Varian, *Information Rules*, supra note 152, at 273–74; Arthur, supra note 162, at 105–06 (describing Novell's efforts to line up developers for its Netware product).

220. See Farrell & Weiser, supra note 52, at 13–17 (describing incentives for such a strategy); see also Gawer & Cusumano, supra note 45, at 51–52 (describing how Intel used this approach).

221. Michael L. Katz & Carl Shapiro, *Product Compatibility Choice in a Market with Technological Progress, in Strategic Behaviour and Industrial Competition*, 146, 164 (D.J. Morris et al. eds., 1986) [hereinafter Katz & Shapiro, *Product Compatibility*]. The record-breaking sales of the three major consoles—as well as the games manufactured for them—suggest that the healthy rivalry in this market has a positive impact on total output. See Jim Hu, *Video Game Sales Set Record in 2001*, CNET News.com, Feb. 7, 2002, at <http://news.com.com/2100-1040-831599.html> (on file with the *Columbia Law Review*).

ural tendency to exploit its installed base will create openings for new entrants.²²² As Farrell and Shapiro explain, in many cases an incumbent's marketing strategy will leave market segments underserved and thereby actually invite entry.²²³

A second important reason why entrants often will have an opportunity to introduce a rival standard is that incumbents confront what Clayton Christensen calls the "innovator's dilemma": They hesitate to introduce new technologies that would "cannibalize" their existing product offerings.²²⁴ This fear of cannibalization helps to explain why AT&T declined to use fiber optic technology for its long distance calls until Sprint "made a pin drop," and why the Big Three auto companies failed to produce smaller cars until forced to do so to compete with the Japanese.²²⁵ Put differently, companies get locked in to a particular value network, so that they are not able to innovate radically after establishing a platform standard.²²⁶ Similarly, incumbent firms have a well-documented psychological propensity to rely on established ways of looking at their market that leads them to misunderstand the opportunity for change through radical innovations that would displace their old technologies.²²⁷ Regardless of the reason—a propensity to exploit their own installed base, their fear of cannibalizing their existing products, or a commitment to established perceptions—the failure of incumbents to introduce radical innovations will often create an opening for a new entrant to introduce a rival information platform.

222. See Joseph Farrell & Carl Shapiro, *Dynamic Competition with Switching Costs*, 19 *RAND J. Econ.* 123, 127 (1988).

223. *Id.* at 128.

224. Clayton M. Christensen, *The Innovator's Dilemma* 21 (1997). Christensen's book follows a number of other commentators who articulated similar positions. See, e.g., Scherer & Ross, *supra* note 190, at 653 ("[N]ew entrants without a commitment to accepted technologies have been responsible for a substantial share of the really revolutionary new industrial products and processes."); Rebecca Henderson, *Underinvestment and Incompetence as Responses to Radical Innovation: Evidence from the Photolithographic Alignment Equipment Industry*, 24 *RAND J. Econ.* 248, 251, 267-68 (1993) (explaining how incumbents focus on incremental innovation whereas new entrants are far more likely to undertake radical innovation); Rebecca M. Henderson & Kim B. Clark, *Architectural Innovation: The Reconfiguration of Existing Product Technologies and the Failure of Established Firms*, 35 *Admin. Sci. Q.* 9, 9, 11 (1990) (same).

225. See *supra* notes 195-198 and accompanying text.

226. As one commentator remarked with respect to IBM's ability to alter the basic computer architecture that it introduced in its original PC, "the same forces that gave IBM the power to create a standard in 1981 will impede" it from changing it. In particular, given its promises of support and upward compatibility for its initial standard, IBM faced a number of obstacles in considering the introduction of any breakthrough products. Michael Hergert, *Technical Standards and Competition in the Microcomputer Industry*, in *Product Standardization and Competitive Strategy* 67, 87 (H. Landis Gabel ed., 1987).

227. Henderson & Clark, *supra* note 224, at 17.

To establish a new standard or a rival to an existing one, a company will often need to develop a “killer application,”²²⁸ or at least differentiate its product from the incumbent.²²⁹ In the video game console market, for example, Sega jumpstarted its new game console by developing and introducing a *Sonic the Hedgehog* game made for its system, which helped it to overcome Nintendo’s exclusive licensing practices that required developers to market their games solely for the Nintendo system.²³⁰ Moreover, Sega also benefited from the cannibalization effect, as Nintendo delayed its introduction of a more advanced product. In particular, even though Nintendo had developed a sixteen-bit machine, it did not introduce such machines (for fear that it would undercut the sale of its games to its installed base) until Sega began to capture market share with its sixteen-bit machine and games like *Sonic*.²³¹ More recently, Microsoft introduced the Xbox to challenge Sony’s leading console and is seeking to build up a menu of attractive games to lure customers.²³² As a result of standards competitions such as these, rival information platform sponsors face added incentives to introduce enhanced features, attract new developers for complementary applications, and build up the installed base of users.²³³

As suggested above in the cellular telephone example, standards competitions often will enable consumers to benefit from a more dynamic product market that includes more choices, enhanced products, and lower prices. To be sure, a head start or an installed base from a related technology is important to influencing the ultimate outcome of such a battle, but, regardless of the outcome, it seems clear that competition to control the standard will push companies to develop superior technology in the hope of establishing their preferred standard.²³⁴ Take, for example, the case of the VHS-Beta battle for supremacy in the market for videocassette recorders, where users enjoyed a rapid series of technological advances because both platform standards sought to improve

228. One classic example, which helped drive demand for new color televisions, was RCA’s use of *Walt Disney’s Wonderful World of Color* to attract viewers. See Carl Shapiro & Hal R. Varian, *The Art of Standards Wars*, Cal. Mgmt. Rev., Winter 1999, at 8, 13 [hereinafter Shapiro & Varian, *Standards Wars*].

229. See Werden, *supra* note 155, at 91–93 (explaining that potential market entrant must offer some “offsetting advantage”—such as lower price—to compete with incumbent).

230. For a discussion of this episode, see Adam M. Brandenburger & Barry J. Nalebuff, *Co-opetition* 237–41 (1996).

231. *Id.* at 239–42; Steven L. Kent, *The Ultimate History of Video Games* 407–08 (2001) (detailing some of Sega’s game development).

232. See Stephen H. Wildstrom, *Xbox: It’s All About the Games*, *Bus. Wk.*, Dec. 24, 2001, at 22, 22.

233. See Katz & Shapiro, *Product Compatibility*, *supra* note 221, at 148.

234. Shapiro & Varian, *Standards Wars*, *supra* note 228, at 11 (arguing that superior technology can overcome a “first mover advantage,” provided that “the performance advantage is significant and users are not overly entrenched”).

upon their products in order to gain widespread acceptance.²³⁵ Of more recent vintage, the video games market represents an instance where three alternative platforms (Nintendo's Gamecube, Sony's PlayStation, and Microsoft's Xbox) continue to improve upon one another's product, even adding Internet access and other enhanced functionalities to their consoles.²³⁶ In fact, the video game console market's now-ancient history of the early Atari-Nintendo battles demonstrated how a rival network product can capture market share by introducing "superior technology and hot new games."²³⁷

A proactive commitment to a single platform standard facilitated through intellectual property policy by allowing immediate access risks entrenching a single standard and precluding valuable competition.²³⁸ In particular, by awarding all firms access to the initial standard at the outset of a potential standards competition, rivals may well choose to take advantage of the already developed standard as opposed to creating their own.²³⁹ Put differently, new entrants would often have an easier time competing *within* an open standard, but, if not able to pursue that course, they are more likely to develop an alternative and innovative standard than a dominant firm with an established one and an installed base of users.²⁴⁰ Because individual firms are unlikely to develop alternative technologies at the same time, rival firm development ensures a certain amount of experimentation in the marketplace.²⁴¹ In sum, by encouraging competition between rival platforms, intellectual property law can ad-

235. For an extended version of this history, see James Lardner, *Fast Forward: Hollywood, the Japanese, and the Onslaught of the VCR* (1987); see also Anita M. McGahan et al., *Creating Value and Setting Standards: The Lessons of Consumer Electronics for Personal Digital Assistants, in Age of Digital Convergence* 227, 250 (David B. Yoffie ed., 1997) ("Competition also led to the introduction of special features on VHS."); Michael I. Krauss, *Regulation vs. Markets in the Development of Standards*, 3 *S. Cal. Interdisc. L.J.* 781, 805 (1994) (arguing that VHS standard improved due to challenge from Betamax).

236. See Michel Marriott, *Let the Game Wars Begin*, *N.Y. Times*, Apr. 26, 2001, at G1; Eric J. Savitz, *Big Game Hunting, Industry Standard*, *May 7, 2001*, at 30, 33; David Becker, *Microsoft Trims Xbox Price*, *CNET News.com*, May 15, 2000, at <http://news.com.com/2100-1040-913832.html> (on file with the *Columbia Law Review*); Ian Fried, *Microsoft Invests Big to Put Xbox Online*, *CNET News.com*, May 20, 2002, at <http://news.com.com/2100-1040-917884.html> (on file with the *Columbia Law Review*).

237. Shapiro & Varian, *Standards Wars*, *supra* note 228, at 18.

238. See Richard J. Gilbert, *Symposium on Compatibility: Incentives and Market Structure*, 40 *J. Indus. Econ.* 1, 2 (1992) ("Standards limit flexibility to offer products with specialized characteristics (standards limit product variety) and may constrain technological progress by leading firms to suboptimal designs.").

239. To be sure, regardless of the legal rules, rivals can still attempt to take the path of cooperation over competition, but intellectual property policy can influence their decisions by making one course more difficult. For a discussion of competitive strategy questions facing companies with regard to this issue, see Besen & Farrell, *supra* note 152, at 117.

240. See Scherer, *Innovation and Growth*, *supra* note 189, at 108-09.

241. See Joseph Farrell, *Thoughts on Antitrust and Innovation*, *Address Before the National Economists' Club* 5 (Jan. 25, 2001), at <http://www.usdoj.gov/atr/public/>

vance three critical goals: forcing companies to compete to build a valuable customer base, requiring all companies to continue to enhance their products and bring new ones to market more quickly for fear of being displaced by a new killer application,²⁴² and driving companies to innovate and develop superior technologies.²⁴³ By contrast, providing open access to a single standard that would otherwise face viable platform competition undermines the achievement of each of these benefits.

2. *Competition Within a Standard.* — In the event that an information platform owner dominates a market because alternative platforms cannot reach or maintain the necessary critical mass, it will reap a great windfall. For Schumpeterians, this result is acceptable on the ground that the great bounty provided by controlling a proprietary standard may be a necessary incentive to develop killer applications that can support a new platform. On balance, however, it seems more likely that such unmitigated incentives would overreward platform inventors by allowing them to thwart innovation (or reap exorbitant monopoly rents). Thus, when a platform standard reaches or is headed for a dominant position in a market, intellectual property protection against reverse engineering should recede.

Even where others can develop a product based on the same platform standard, control of a dominant industry standard is “a license to print money.”²⁴⁴ Arguments that the forced sharing of a dominant industry standard would unduly undermine investment incentives deserve, as Tim Bresnahan puts it, “a reality check.”²⁴⁵ After all, “[a] talented kid can be quite motivated by rents in the low tens of millions, trifling as

speeches/7402.pdf (on file with the *Columbia Law Review*) (“[S]ometimes diverse approaches will be pursued only if there are multiple organizations involved.”).

242. See Scherer, *Innovation and Growth*, supra note 189, at 125 (noting that competition accelerates deployment date).

243. See Langlois, supra note 198, at 217 (observing that rival platforms afford “more possible entry points for innovation” and the possibility of “experimenting with organizational and design alternatives”).

244. Ferguson, supra note 25, at 280. As Ferguson elaborated:

If you control the standard, then you have advance knowledge of how it will evolve and probably the deepest knowledge of how it works. You can therefore develop the earliest and best products that depend upon it, while others are reduced to trying to clone you, follow behind you, or serve minor niche markets.

Id. at 280–81.

245. Bresnahan, supra note 6, at 192. A number of other commentators have remarked that protecting dominant standards provides a windfall, not a necessary economic incentive. See Langlois, supra note 198, at 222 (asserting that protecting a standard through broad intellectual property protection creates a situation where “the remuneration that monopoly rights confer far outstrip the risk-discounted ex ante costs of innovation”); Lemley, *Internet Standardization*, supra note 47, at 1060 n.64 (“[T]he winners of standards competitions receive a windfall that is far greater than what intellectual property normally gives as an incentive to invention.”). In a sense, this judgment reflects a relative assessment of the explanatory power of the Schumpeterian hypothesis vis-à-vis the explanation provided by network economics. See Shelanski & Sidak, supra note 173, at 6–7.

those may seem.”²⁴⁶ Thus, particularly where, as in the case of Microsoft, a dominant firm abuses its control of an established standard to exclude competition,²⁴⁷ the law should not hesitate to impose some form of forced sharing requirement as to the intellectual (or real) property in question.²⁴⁸

Stated in competition policy terms, the critical point is that facilitating access to rival platforms, even if anticipated before a firm invests in innovation, will only dull—and not eradicate—the incentives to establish an innovative platform standard.²⁴⁹ Put differently, economic theory suggests that the rewards of establishing a *de facto* standard are well above those necessary to motivate parties to champion and develop the standard in the first place.²⁵⁰ That is, even without continued intellectual property protection over the standard, the original inventor still will reap considerable benefits from her invention in the form of the first mover, installed base, and reputational advantages—all in addition to any monopoly rents accrued until the standard was opened.²⁵¹ Thus, courts should not wait too long before allowing access to a dominant proprietary standard, lest the firm be able to extract excessive monopoly rents and thwart future innovation.²⁵²

246. Bresnahan, *supra* note 6, at 192.

247. See *United States v. Microsoft Corp.*, 253 F.3d 34, 64, 71, 74, 78 (2001).

248. See F.M. Scherer, *Industrial Market Structure and Economic Performance* 456–57 (2d ed. 1980) (“All in all, the substantial amount of evidence now available suggests that compulsory patent licensing, judiciously confined to cases in which patent-based monopoly power has been abused . . . would have little or no adverse impact on the rate of technological progress”); Scherer, *Innovation and Growth*, *supra* note 189, at 216 (finding “no significant indication” that compulsory licensing in antitrust decrees led parties to invest less in research and development); see also Levin et al., *supra* note 145, at 804 (“The overall lack of impact from compulsory licensing requirements [in affected industries] was consistent with Scherer’s finding that they did not discourage R&D spending.”).

249. See Posner, *supra* note 16, at 929 (positing that increased amount of available rewards “should accelerate the rate of innovation, in just the same way that, other things being equal, the more valuable a horde of buried treasure is, the more rapidly it will be recovered”). The rhetoric of property law actually parallels this perspective, as it posits that easements on an otherwise protected property right constitute a limitation that inheres in the scope of the property right. See Rose, *Comedy of the Commons*, *supra* note 48, at 716–17.

250. Cf. Scherer, *Antitrust*, *supra* note 174, at 1016–17 (concluding that compulsory licensing decree imposed on Xerox did not stall its research and development, but instead facilitated innovation by enabling others to improve the technology developed by Xerox); *id.* at 1018 (“[A] massive antitrust attack on business firms’ use of patents to monopolize markets or enhance profit returns appears to have had negligible adverse consequences for the vigor of innovative activity in the United States.”).

251. See Porter, *supra* note 188, at 788 n.61 (explaining how first mover advantages can bring considerable rents to a firm, even where competitors soon enter a market).

252. See Langlois, *supra* note 198, at 221 (“The owner of a dominant standard may thus want to manipulate the standard in ways that close off the possibilities for a competitor to achieve compatibility. This has a tendency to retard the generational advance of the system.”); Barnett, *supra* note 34, at 992 (“Absent significant entry threats,

Intellectual property law should insist on several preconditions before concluding that a company's proprietary control of an information platform threatens full and fair competition and requires corrective action (in the form of permitting reverse engineering of a proprietary standard). First, to the extent that it seems clear that a company lacks market power, it should be permitted to enforce its intellectual property rights to prevent horizontal access.²⁵³ A lack of market power can be shown by recent entry and swings in market share, both of which can demonstrate that the tipping phenomenon has yet to—or will not—kick in. Second, the law needs to recognize the value of allowing competition to proceed in developing platform markets. In particular, because rival platform standards compete to attract users and press to develop a superior product, even where one standard ultimately emerges as dominant, some initial experimentation may well result in a better standard.

Finally, if it seems clear that a single standard will emerge as dominant, the law should facilitate competition *within*—as opposed to *for*—the platform standard by allowing horizontal access. In so doing, it not only is calibrating investment incentives (to avoid awarding an unnecessary windfall for innovation), but also is ensuring continued innovation in a market where a single firm controls the basic platform standard. This approach, to be sure, raises the question of how to judge whether a firm's

incumbent firms may face serious disincentives to exploit intensively [their] intellectual property holdings and sustain significant levels of fundamental innovation.”); *id.* at 1026 (“If a large firm has a dominant market share and faces few potential entrants, it may be reluctant to undertake or accelerate development projects that may generate radical innovations that could cannibalize the existing profit stream of current projects.”). AT&T's actions in the equipment and long distance markets remain the quintessential case in point. See *United States v. AT&T Co.*, 552 F. Supp. 131, 222–23 (D.D.C. 1982), *aff'd sub nom. Maryland v. United States*, 460 U.S. 1001 (1983). See generally Steve Coll, *The Deal of the Century: The Breakup of AT&T* (1986) (describing history and aftermath of antitrust litigation against AT&T). Related to AT&T's dominance of these markets was its thinking about the deployment of fiber optic technology. As one industry executive related it:

AT&T, which owned most of the telephone lines in America at the time [of the invention of fiber optic technology], said it would be 30 years before its telephone system would be ready for optical fiber. And when it was, AT&T planned to make its own fiber. . . .

[After AT&T entered into a consent decree,] MCI took the risk [of ordering fiber optic technology] and placed a 100,000 kilometer order for a new generation of fiber

Telecommunications: The Role of the Department of Justice: Hearing Before the House Committee on the Judiciary, 104th Cong. 125–26 (1995) (prepared statement of Timothy J. Regan, Division Vice President and Director of Public Policy, Corning, Inc.).

253. See Dep't of Justice and Fed. Trade Comm'n Antitrust Guidelines for Collaborations Among Competitors 26 (2000), reprinted in 4 Trade Reg. Rep. (CCH) ¶ 13161 (2000) (providing safe harbor for ventures with less than twenty percent market share); see also *Northwest Wholesale Stationers, Inc. v. Pac. Stationery & Printing Co.*, 472 U.S. 284, 296–97 (1985) (holding that access to joint venture only raises antitrust concern where venture has market power or access to the facility is essential to competition).

control of a user interface or a platform standard will enable it to establish dominance, but, as discussed further in Part V, such predictive judgments are reasonably well developed in antitrust law. In the case of defending against using another firm's platform standard, the relevant test would be along the lines of the antitrust standard used in evaluating a proposed merger—in particular, whether a firm's dominance would be entrenched without allowing access to the standard at issue. To take the case of RealNetworks's use of reverse engineering to gain access to Microsoft's Windows Media Player standard, the relevant question is whether, but for the reverse engineering used to gain access to Microsoft's standard, there is a substantial likelihood that Microsoft will emerge as a monopoly in the market for media players.²⁵⁴

B. The Competitive Platforms Model, the Role of Standard-Setting Bodies, and Government Funding of Research and Development

The competitive platforms model provides an alternative guide for Internet policy and intellectual property law to that offered by either the proprietary control or commons theories. In particular, it aims to integrate an economic theory about how platform markets develop with the tools offered by intellectual property policy. With respect to the Internet's application layer—be it a Web browser, media player, or other invention that supports the viewing of or access to content—intellectual property law may well prove an effective regulator of access to platform standards and ensure that a firm does not wield monopoly control over a proprietary standard. With respect to the Internet's most basic standards contained in its logical layer, however, their public goods quality and open nature mean that they may not be susceptible to proprietary development.²⁵⁵ To assist in the maintenance and development of such standards, both standard-setting bodies and government support are likely to prove to be the more significant and effective regulators (as opposed to intellectual property law) in ensuring that the Internet's logical standards (and ones similar to it) can evolve over time.

Most legal commentators have failed to appreciate the essential role played by standard-setting bodies in developing the rules of the road for the Internet and the information economy. Standard-setting bodies

254. It is important to note in this regard that a company need not control one hundred percent of a market to be considered a monopolist; rather, being a monopolist merely connotes that a company possesses a considerable degree of control over prices and output (or the ability to exclude competitors). See *United States v. E.I. du Pont de Nemours & Co.*, 351 U.S. 377, 391 (1956) (defining "monopoly power" as "power to control prices or exclude competition"). For a discussion of monopoly power and when a firm is a monopolist, see Richard A. Posner, *Antitrust Law* 195–96 (2d ed. 2001) (noting, among other things, that courts often use market shares of fifty to seventy percent as threshold indicators of when a firm is a monopolist); see also Am. Bar Ass'n, Section of Antitrust Law, *1 Antitrust Law Developments* 235–36 (4th ed. 1997) (noting the fifty and seventy percent benchmarks and citing supporting federal case law).

255. See *supra* note 34 and accompanying text.

range from those operating under the auspices of government agencies to independent organizations like the W3C or IETF, to industry consortia focused on a single standard.²⁵⁶ By providing a forum for communication, standard-setting bodies serve an important management and coordinating role, but their lack of formal legal authority underscores why they are best seen as a tool for implementing government policy and not a substitute for government policymaking.²⁵⁷ Over the course of the Internet's development, a number of standard-setting bodies—in particular, the IETF and the W3C—have played essential roles in developing and pushing the deployment of Internet-related standards.

As an example of the potential importance of standard-setting committees for the Internet's future development, consider the case of Web services. The category of developments labeled collectively as "Web services" describes a set of Internet-related initiatives designed to transform the development, use, and distribution of software programs by enabling them to access different components from remote locations.²⁵⁸ These initiatives were championed in and developed by the W3C standard-setting body. Based on these initiatives, companies like Dollar Rent A Car were able to rely on a Web service connection to Southwest Airlines that allows passengers to reserve a Dollar rental car through Southwest's online reservation system.²⁵⁹ Not only was this service easier to develop as a Web service—it took only two months using the Web services technology as opposed to the eight months it would have taken to develop a proprie-

256. The ongoing effort to manage the standard for digital television reflects one example of government standard setting outside of the Internet context. See Wallman, *supra* note 212, at 243–46. The patent pool used for the development of the MPEG-2 standard used for DVDs is an example of an industry consortium. See Willard K. Tom & Joshua A. Newberg, *Antitrust and Intellectual Property: From Separate Spheres to Unified Field*, 66 *Antitrust L.J.* 167, 219–21 (1997).

257. Kevin Werbach's observation, made in regard to the IETF, is worth noting: The legal authority of any of these bodies is unclear. Most of the underlying architecture of the Internet was developed under the auspices, directly or indirectly, of the United States government. The government has not, however, defined whether it retains authority over Internet management functions, or whether these responsibilities have been delegated to the private sector. The degree to which any existing body can lay claim to representing "the Internet community" is also unclear.

Kevin Werbach, Fed. Communications Comm'n, *Digital Tornado: The Internet and Telecommunications Policy 20* (Off. Plans & Pol'y, Working Paper No. 29, 1997), available at http://www.fcc.gov/Bureaus/OPP/working_papers/oppwp29.pdf (on file with the *Columbia Law Review*). For a critique of the use of nongovernmental bodies such as ICANN to make government policy, see Froomkin, *supra* note 34, at 165–71. For a discussion of how standard-setting bodies can be used to implement government policy, see Weiser, *Internet Governance*, *supra* note 3, at 825–32.

258. See Erick Schonfeld, *What The *&%@!! Are Web Services? (And Why You Should Care.)*, *Business 2.0*, Feb. 18, 2002, available at <http://www.business2.com/articles/web/print/0,1650,38028,FF.html> (on file with the *Columbia Law Review*).

259. See Wylie Wong, *Pitch: Why Web Services Make Business Sense*, *CNET News.com*, Nov. 8, 2001, at <http://news.com.com/2009-1017-275442.html> (on file with the *Columbia Law Review*).

tary system from scratch—but it also can easily be duplicated for other airline partners using the open and common protocols.²⁶⁰ Like the Internet itself, this model of software development places a premium on interoperability between certain basic standards that would be adopted by a community of developers, and thus requires a continuing commitment to a common standard.²⁶¹

As currently envisioned, Web services will rely on a set of standards associated with the W3C's Extensible Markup Language (XML),²⁶² which is designed to facilitate electronic commerce by enabling the use of electronic "tags" that will make "it significantly easier for organizations and individuals to identify, integrate, and process complex information that may initially be widely dispersed among systems and organizations."²⁶³ In its new .NET initiative, Microsoft has embraced the open XML standard and, in its own words, is committed to allowing "applications to share information via the Internet, regardless of the operating system or back-end software that the application is using."²⁶⁴ To be sure, it remains to be seen whether Microsoft will adhere to a nonproprietary strategy with respect to the XML standard (and its past actions offer good reasons for skepticism on this score²⁶⁵), but its rhetoric and actions thus far are quite

260. *Id.*

261. As Mark Lemley put it, "the optimal number of 'Internets' in a free market economy is one." Lemley, *Internet Standardization*, *supra* note 47, at 1045.

262. For an explanation of XML and its development process, see Norman Walsh, *A Technical Introduction to XML*, xml.com, Oct. 3, 1998, at <http://www.xml.com/pub/a/98/10/guide0.html> (on file with the *Columbia Law Review*); World Wide Web Consortium, *Extensible Markup Language (XML) Activity Statement*, at <http://www.w3.org/XML/Activity> (last modified Jan. 15, 2003) (on file with the *Columbia Law Review*). A second key standard associated with Web services is the Simple Object Access Protocol (SOAP), which, using XML, is designed to allow businesses to connect their computing systems over the Internet. See Paul Festa, *Critics Clamor for Web Services Standards*, CNET News.com, Feb. 12, 2002, at <http://news.com.com/2100-1023-834990.html> (on file with the *Columbia Law Review*). Two additional related standards are Universal Description, Discovery, and Integration (UDDI) and Web Services Description Language (WSDL). The interaction of the four standards can be understood by analogy to a telephone call: "XML represents the conversation, SOAP describes the rules for how to call someone, and UDDI is the phone book. WSDL describes what the phone call is about and how you can participate." Margaret Kane, *Players: Start-ups May Get Window to Fill Gaps*, CNET News.com, Nov. 8, 2001, at <http://news.com.com/2009-1017-275443.html> (on file with the *Columbia Law Review*) [hereinafter Kane, *Players*].

263. Gen. Accounting Office, *Electronic Government: Challenges to Effective Adoption of the Extensible Markup Language 3* (Apr. 2002), available at <http://www.gao.gov/new.items/d02327.pdf> (on file with the *Columbia Law Review*). For a general discussion of XML, see Douglas E. Phillips, *XML Schemas and Computer Language Copyright: Filling in the Blanks in Blank Esperanto*, 9 *J. Intell. Prop. L.* 63, 64–72 (2001).

264. Microsoft Corp., *Microsoft.NET: What Are XML Web Services?* (Jan. 14, 2002), at <http://www.microsoft.com/net/basics/xmlservices.asp> (on file with the *Columbia Law Review*).

265. Part of the incentive to propertize a common standard is that the common standard invites entry and innovation from outside players. See Kane, *Players*, *supra* note 262 (noting how Web services facilitate new entry).

promising.²⁶⁶ Only time will tell whether this effort will succeed, as maintaining a common standard in the face of pressures to move more quickly or in different directions—even if not motivated by a desire to “embrace, extend, and extinguish” a standard used by rivals²⁶⁷—is notoriously difficult.²⁶⁸ One reason for optimism, though, is that there is a strong incentive for parties to commit to open platforms where such commitment can

266. Lawrence Lessig, for example, testified to this very point. See *The Microsoft Settlement: A Look to the Future: Hearings Before the Senate Comm. on the Judiciary, 107th Cong. 2* (2001) (statement of Lawrence Lessig, Professor, Stanford Law School), available at http://judiciary.senate.gov/print_testimony.cfm?id=135&wit_id=104 (on file with the *Columbia Law Review*) (stating that Microsoft .NET could become an important force in preserving innovation). It is noteworthy that, even if Microsoft supports XML as an open and common standard, it could still reap great profits through other .NET initiatives, such as its “.NET My Services” effort to set itself up as a crucial—and proprietary—intermediary for e-commerce transactions. See generally Alec Klein, *Planting the Seeds*, Wash. Post, July 1, 2001, at H1 (describing .NET initiative); Jim Hu, *Competition: Ultimate Challenge to AOL*, CNET News.com, Oct. 19, 2001, at <http://news.com.com/2009-1001-273801.html?legacy=cnet> (on file with the *Columbia Law Review*) [hereinafter Hu, *Competition*] (describing .NET My Services effort as “designed to organize all manners of personal information, from calendars to credit card numbers, while easing such online transactions as banking and shopping”). There are at least two forces, however, that mitigate against this concern. First, the marketplace appears to be reluctant to embrace Microsoft’s strategy, leading Microsoft to backpedal on this initiative. See John Markoff, *Microsoft Has Quietly Shelved Its Internet “Persona” Service*, N.Y. Times, Apr. 11, 2002, at C1 (noting customer resistance to service). Second, and not surprisingly, there are alternatives to Microsoft’s effort, though important questions remain as to whether they will pose a real threat to Microsoft. See Hu, *Competition*, supra (noting that AOL has developed a similar service called “Screen Name Service”); Stephen Shankland, *Open Source Steps in to Duplicate .NET*, CNET News.com, July 9, 2001, at <http://news.com.com/2100-1001-269665.html> (on file with the *Columbia Law Review*) (noting the development of an open source alternative).

267. Dan Goodin, *Microsoft, Intel Wage War of Words*, CNET News.com, Nov. 12, 1998, at <http://news.com.com/2102-1023-217848.html> (on file with the *Columbia Law Review*) (quoting Intel executive testifying at Microsoft trial as to Microsoft’s alleged self-proclaimed strategy). Sun Microsystems has already challenged Microsoft’s .NET efforts as anticompetitive, filing a private antitrust suit requesting that the .NET initiative be “decoupled” from Microsoft’s Windows operating system. See Stephen Shankland, *Sun Brings Antitrust Suit Against Microsoft*, CNET News.com, Mar. 8, 2002, at <http://news.com.com/2100-1001-855696.html> (on file with the *Columbia Law Review*). In testifying on behalf of the nine states that opposed the terms of the government’s settlement with Microsoft, a Sun executive explained how Web services could be a “substantial, viable threat to Windows” because they could work with Windows on the desktop, the historic source of Microsoft’s monopoly. See Joe Wilcox, *Sun: Microsoft Worried over Web Services*, CNET News.com, Apr. 9, 2002, at <http://news.com.com/2100-1001-879012.html> (on file with the *Columbia Law Review*). As Carl Shapiro and Hal Varian have explained, “[o]pen standards can . . . be ‘hijacked’ by companies seeking to extend them in proprietary directions, and thus in time gain control over the installed base.” Shapiro & Varian, *Information Rules*, supra note 152, at 257.

268. The challenge for the W3C is to work with individual company or consortium initiatives without allowing those efforts to derail or fragment the common standard. See Festa, supra note 262 (noting criticisms of the W3C’s progress and detailing the establishment of a “Web Services Interoperability Organization” to prod the W3C).

facilitate the development of a strong complementary market and ensure that the market develops.²⁶⁹

For initiatives—like the development of the XML standard—that represent an upgrade to the Internet’s architecture and will facilitate a greater reliance on the Internet, there is a vital role for direct government support of the basic research and development that will upgrade the logical infrastructure of the Internet. This support can come in several forms, most notably by sponsoring the basic research of academics (or other disinterested parties).²⁷⁰ Indeed, the government’s use of this strategy in the 1960s and 1970s supported the work of a number of research institutions that played a critical role in developing key Internet technologies.²⁷¹

The evidence is mixed as to whether the government appreciates the importance of its ability to push the development of new basic standards and the development of an advanced information infrastructure, particularly as to the Internet’s logical standards. Because it both funds research and is an important consumer of information technology,²⁷² the government can play an active and effective role in supporting the development

269. See Larry Dignan, Web Services: Ready, Set, Wait, CNET News.com, June 18, 2002, at <http://news.com.com/2100-1001-936941.html> (on file with the *Columbia Law Review*) (noting the slow rates of adoption in the absence of well developed common standards); see also Farrell & Weiser, *supra* note 52, at 12–22 (explaining incentives for parties to develop open architectures); Jim Hu, Cries to Open up IM Have Quietened, CNET News.com, May 13, 2002, at <http://news.com.com/2100-1023-911820.html> (on file with the *Columbia Law Review*) (“[D]eveloping common standards [for instant messaging] is a necessary step to creating the first real revenue-making opportunities for [instant messaging].”).

270. See NII 2000 Steering Comin., Nat’l Research Council, *The Unpredictable Certainty: Information Infrastructure Through 2000*, at 23 (1996), available at <http://www.books.nap.edu/books/030905432X/html/index.html> (on file with the *Columbia Law Review*) (explaining call for increased funding of research and development as “one of the most effective mechanisms” for the federal government to “enable more capabilities, greater ease of use, and lower cost for different components of the information infrastructure”); President’s Info. Tech. Advisory Comm., *Information Technology Research: Investing in Our Future 1* (Feb. 1999), available at http://www.ccic.gov/ac/report/pitac_report.pdf (on file with the *Columbia Law Review*) [hereinafter *Investing in Our Future*] (“Research programs intended to maintain the flow of new ideas in information technology and to train the next generation of researchers are funding only a small fraction of the research that is needed, turning away large numbers of excellent proposals.”); cf. Suzanne Scotchmer, *Standing on the Shoulders of Giants: Cumulative Research and the Patent Law*, *J. Econ. Persp.*, Winter 1991, at 29, 40 (observing that the minimal prospects of fine tuning the patent system to achieve an optimal competition policy “may be an argument for more public sponsorship of basic research”). For a list of recommendations related to government support for the information infrastructure, see *Investing in Our Future*, *supra*, at 40–46.

271. See Abbate, *supra* note 7, at 36–37.

272. Margaret Kane, *Government Seeks Accord on XML*, CNET News.com, June 12, 2002, at <http://news.com.com/2100-1001-935223.html> (on file with the *Columbia Law Review*) (“[T]he federal government is easily the largest consumer of computer hardware, software and services on the planet.”).

of new basic standards.²⁷³ In the case of the development of the TCP/IP standard, for example, the Defense Department played a critical role by not only pushing its contractors to adopt this standard, but also subsidizing users to invest the time and money to make the necessary upgrades.²⁷⁴ In moving to support a compatible implementation of XML, the government has taken an important step in supporting basic standards, but it should adopt a more systematic approach to facilitating their adoption.²⁷⁵ Without the government's financial support for collective action efforts involving lots of Internet players—such as upgrading the Internet's addressing system or ensuring that the Internet works in a secure fashion—it will be difficult for the private sector alone (even with enlightened thinking and the coordination of standard-setting bodies) to spearhead such efforts.²⁷⁶ Moreover, with the government's declining in-

273. See Gen. Accounting Office, *supra* note 263, at 50–51 (noting successful government coordination and engagement with standard-setting bodies); Steve Lohr, *Go To 45* (2001) (noting that the government used its spending on information technology to support the COBOL language in the 1960s). With respect to Web services and the emerging set of standards associated with XML, there is an important opportunity for the federal government to itself agree on certain specifications and to champion their cause within standard-setting bodies and the marketplace. See Gen. Accounting Office, *supra* note 263, at 5, 7, 47, 51, 60 (calling for the government to adopt a unified strategy and to be more active at the relevant standard-setting committees); Margaret Kane, *Government Urges Slow Road to XML*, CNET News.com, Apr. 8, 2002, at <http://news.com.com/2100-1001-877795.html> (on file with the *Columbia Law Review*) [hereinafter Kane, *Slow Road*] (reporting on GAO conclusions).

274. See Abbate, *supra* note 7, at 140–42 (discussing government pressure on contractors); *id.* at 188 (discussing funding for upgrades). The government also can facilitate technological transitions in its role as a regulator. For a discussion of such an effort with regard to the transition from analog to digital television, see Albert N. Lung, *Note, Must-Carry Rules in the Transition to Digital Television: A Delicate Constitutional Balance*, 22 *Cardozo L. Rev.* 151, 158–95 (2000).

275. Paul Festa, *Web Group Pushes XML Testing*, CNET News.com, June 12, 2002, at <http://news.com.com/2100-1001-935405.html> (on file with the *Columbia Law Review*) (noting that government's National Institute of Standards and Technology provided first foundation for testing suite for XML); Kane, *Slow Road*, *supra* note 173 (outlining government approach to the issue and noting proposal to promote interagency collaboration on standards).

276. For a discussion of the need for and the challenge of adding more Internet addresses, see Sam Ames, *Europe Sees Net Running out of Room*, CNET News.com, Feb. 21, 2002, at <http://news.com.com/2100-1033-842718.html> (on file with the *Columbia Law Review*); see also William Jackson, *Clarke Stumps for Net Security Center*, GCN, Oct. 21, 2002, at http://www.gcn.com/21_31/news/20301-1.html (on file with the *Columbia Law Review*) (calling for U.S. government involvement in transition). For a discussion of the security issues raised by the Internet's core protocols, see Brian Krebs, *White House Sounds Call for New Internet Standards*, *washingtonpost.com*, July 30, 2002, at <http://www.washingtonpost.com/ac2/wp-dyn/A22535-2002Jul30> (on file with the *Columbia Law Review*). One area where government has provided some support is in the development of the so-called "Internet2" initiative, which aims to support, among other things, research focused on quality of service improvements. See Aliza Earnshaw, *What Will the Next Generation of the Internet Bring?*, *Denver Bus. J.*, Jan. 18–24, 2002, at B7.

vestment in basic research,²⁷⁷ the private sector is not likely to pick up the slack on funding important projects that could lead to long-run social benefits.²⁷⁸ Fortunately, some governmental officials appreciate the rationale for government involvement in and support for the collective interests of the Internet community, and have proposed, for example, a resumption of support for the IETF.²⁷⁹

V. TOWARD A COMPETITIVE PLATFORMS CONCEPTION OF THE LEGALITY OF REVERSE ENGINEERING

This Part proposes a new framework for evaluating the legality of reverse engineering efforts based on the competitive platforms model. Under intellectual property law, the permissibility of copying user interfaces and using reverse engineering to gain access to a platform standard holds great promise as a lever to implement the balance struck by the competitive platforms model. Unlike antitrust or telecommunications regulation, a well-crafted intellectual property regime offers a self-help option by allowing the copying of user interfaces and the use of reverse engineering to gain access to a platform standard to facilitate competition where a firm is otherwise likely to dominate that market. Similarly, intellectual property law should resist allowing the copying of a user interface or allowing access to a platform standard where competition is otherwise sustainable in that market. Significantly, intellectual property law, unlike government funding and standard-setting bodies, is not a helpful tool to address the need to support common standards, such as those that comprise the Internet's logical layer. But for inventions at the Internet's applications layer, intellectual property law will play an important role in regulating the nature of competition and facilitating innovation.

As discussed below, the current state of intellectual property law fails to implement any coherent competition policy, let alone the approach suggested by the competitive platforms model. To highlight the recommended change in direction, sections A and B examine two influential

277. See Mark Chediak, *Funding Research and Development*, Red Herring, Nov. 2001, at 28, 28 (noting that government's support of research and development spending went from 65% in 1960 to 26% in 2000 and industry's rose from 33% to 68%); *Investing in Our Future*, supra note 270, at 3 ("Measured in constant (non-inflated) dollars, support in most critical areas has been flat or declining for nearly a decade, while the importance of information technology to our economy has increased dramatically.").

278. See Frischmann, supra note 200, at 371-72 (explaining this phenomenon). For calls for the government to support such efforts in the Internet context, see *Investing in Our Future*, supra note 270, at 7 ("We cannot rely on industry to fund the needed research because they necessarily focus, in view of economic realities, on the short term. Industry cannot and will not invest in solving problems of importance to society as a whole unless such investments make sense from a business perspective."); *Internet's Coming of Age*, supra note 24, at 21 (calling on the government to provide such funding).

279. See William Jackson, *U.S. Should Fund R&D for Secure Internet Protocols*, Clarke Says, GCN, Oct. 31, 2002, at http://www.gcn.com/vol1_no1/daily-updates/20382-1.html (on file with the *Columbia Law Review*).

cases that dealt with the issue of access to platform standards and user interfaces, *Sony Computer Entertainment, Inc. v. Connectix Corp.*²⁸⁰ and *Lotus Development Corp. v. Borland International, Inc.*²⁸¹ Although *Connectix* failed to appreciate the role of intellectual property in implementing competition policy, the *Lotus* case (or, more precisely, Judge Boudin's concurring opinion) did so effectively.²⁸² Finally, section C evaluates potential objections to the suggested role for intellectual property law outlined in this Part.

A. *The Challenge of Converging Platforms and Connectix*

As discussed briefly in Part I, *Connectix* represented the first major case to raise a horizontal access claim. In that case, *Connectix* used reverse engineering, including some intermediate copying of Sony's PlayStation video game console's BIOS (basic input-output system), to develop a new software program called the "Virtual Game Station" or "VGS." This new platform enabled consumers to use *Connectix*'s product to play on their computers games made for Sony's PlayStation.²⁸³

The Ninth Circuit analyzed Sony's challenge to *Connectix*'s use of its copyrighted product under the fair use standard set forth in its earlier decision, *Sega Enterprises Ltd. v. Accolade, Inc.*²⁸⁴ In *Sega*, the court held that intermediate copying of a program to gain access to its functional elements—as part of a reverse engineering process—constitutes a fair use under copyright when such use is "necessary" to gain access to the functional elements of the copyright itself.²⁸⁵ Although *Sega* did not expressly distinguish between horizontal and vertical access, it did recognize a critical distinction between the two in asking whether the alleged infringer's product would satisfy demand for the protected work.²⁸⁶ Moreover, the Supreme Court's subsequent decision in *Campbell v. Acuff-Rose Music, Inc.*

280. 203 F.3d 596 (9th Cir. 2000).

281. 49 F.3d 807 (1st Cir. 1995), *aff'd* by an equally divided Court, 516 U.S. 233 (1996).

282. Although these cases arise in the context of copyright infringement, the approach urged for regulating the permissibility of reverse engineering should also be implemented in the patent context in light of the increased patenting of computer software. In theory, it should be unnecessary to copy the protected work in order to reverse engineer patented software, as the Patent Act requires disclosure as a prerequisite to gaining protection. See 35 U.S.C. § 112 (2000). With respect to software patents, however, neither caselaw nor the Patent and Trademark Office regulations requires the disclosure of the actual source code. See *N. Telecom, Inc. v. Datapoint Corp.*, 908 F.2d 931, 941–43 (Fed. Cir. 1990) (holding that a code listing is not necessary if a programmer of reasonable skill could write a satisfactory program with an ordinary effort); *Submission of Computer Program Listings*, 37 C.F.R. § 1.96 (2002).

283. The relevant facts of the case are set out in the Circuit Court's opinion. See *Connectix*, 203 F.3d at 598–99.

284. 977 F.2d 1510 (9th Cir. 1992).

285. *Id.* at 1527–28.

286. *Id.* at 1523. Technically, this consideration falls within the fourth, and most important, fair use factor—the effect on the potential market. See 17 U.S.C. § 107(4)

suggested that the fair use analysis should take a more nuanced analysis by evaluating whether the use of copyrighted material serves a “transformative” (and therefore permissible) or a “substitutive” (and therefore impermissible) purpose.²⁸⁷ The *Connectix* court, in an attempt to harmonize *Sega* and *Campbell*, concluded that the Virtual Game Station was “modestly transformative” because it constituted a “wholly new product, notwithstanding the similarity of uses and functions between the Sony PlayStation and the Virtual Game Station.”²⁸⁸ In so doing, it failed to distinguish between cases like *Sega*, where the provider of the application designed a complementary product, and those like *Connectix*, where the purpose of interoperability was to compete with the underlying information platform.²⁸⁹

Under the competitive platforms model for regulating access to information platforms, the Ninth Circuit should have accepted Sony’s claim of infringement. In particular, the court should have looked more closely at whether the markets for video games and computing were in fact converging, such that VGS’s product would compete with Sony’s.²⁹⁰ Because there are important signs that this was the case (as recognized in the district court’s opinion, for example²⁹¹), the next question would be

(2000); *Stewart v. Abend*, 495 U.S. 207, 238 (1990); *Harper & Row, Publishers, Inc. v. Nation Enters.*, 471 U.S. 539, 566 (1985). In his *Sega* opinion, Judge Reinhardt explained:

There is no basis for assuming that Accolade’s “Ishido” has significantly affected the market for Sega’s “Altered Beast,” since a consumer might easily purchase both; nor does it seem unlikely that a consumer particularly interested in sports might purchase both Accolade’s “Mike Ditka Power Football” and Sega’s “Joe Montana Football,” particularly if the games are, as Accolade contends, not substantially similar.

Sega Enters., 977 F.2d at 1523. Similarly, in *Lewis Galoob Toys*, the Ninth Circuit concluded that the complementary nature of the work counseled against holding it to be an infringing work. See *Lewis Galoob Toys, Inc. v. Nintendo of Am., Inc.* 964 F.2d 965, 969 (9th Cir. 1992) (“The Game Genie is useless by itself, it can only enhance, and cannot duplicate or recast, a Nintendo game’s output.”).

287. 510 U.S. 569, 579–80, 598–99 (1994).

288. *Connectix*, 203 F.3d at 606; see also *id.* at 606–07 (“We are therefore at a loss to see how *Connectix*’s drafting of entirely new object code for its [Virtual Game Station] program could not be transformative, despite the similarities in function and screen output.”).

289. See Ivan Rothman, *From Sega to Sony and Beyond: An Alternative Legal Basis For Software Reverse Engineering*, *Intell. Prop. L. Newsl.* (Am. Bar Ass’n Section on Intellectual Prop. Law, Chicago, Ill.), Spring 2000, at 1, 5 (noting that “unlike *Accolade*, *Connectix* did not develop software games compatible with Sony’s platform, but an alternative platform compatible with” games made for Sony’s platform).

290. By contrast, the court in *Midway Mfg. Co. v. Artic Int’l, Inc.* made this very judgment, concluding that the copying necessary to produce a “speed-up” chip that would replace a portion of a copyrighted program did not constitute an acceptable use. See 704 F.2d 1009, 1013 (7th Cir. 1983).

291. *Sony Computer Entm’t, Inc. v. Connectix Corp.*, 48 F. Supp. 2d 1212, 1221 (N.D. Cal. 1999) (“Sony is being harmed by the sales of *Connectix*’s emulator. . . . To the extent an individual purchases a VGS to play PlayStation games, those consumers [sic] will be less likely to buy PlayStation consoles.”); see *Sony Computer Entm’t, Inc. v. Bleem*, 214 F.3d

whether Sony enjoyed sufficient market dominance to justify access to its platform to create a rival one along the lines of the VGS. Given Microsoft's recent entry into this market, and the continued strength of Nintendo, it seems that no such access is necessary,²⁹² and thus Connectix's copying should not have been judged a fair use. Finally, if Connectix had engaged in the reverse engineering of a dominant standard, it should also have been required to show that it did not merely clone Sony's product, but added some value to it. The Ninth Circuit may have had this criteria in mind when it determined that Connectix's product was "modestly transformative," but this conclusory language should not substitute for the relevant market analysis.

The *Connectix* precedent threatens to allow horizontal access in contexts where so doing will undermine important investment incentives. In particular, VGS's use of Sony's innovation without permission—by creating a product that relied on the established brand strength and set of complements—enabled it to appropriate the benefits of Sony's investments in a competitive market that will limit Sony's return on them.²⁹³ If this precedent is followed and upheld, intellectual property law will not protect companies whose nondominant innovations are copied and re-sold in a related form that avoids significant research and development, marketing, and other key investments. To be sure, it is important that courts do not simply take a company's opposition to reverse engineering as sufficient to condemn an alleged use as infringing,²⁹⁴ but the *Connectix* court did not even begin to formulate an analysis that evaluated the relevant incentives created by its decision.²⁹⁵

1022, 1027 (9th Cir. 2000) (finding it "manifestly clear" that an emulator competed directly with the Sony PlayStation console).

292. See Marriott, *supra* note 236, at G1 (reporting on the active rivalry among Microsoft, Nintendo, and Sony); Savitz, *supra* note 236, at 30 (same).

293. The costs of developing a platform standard often are substantial. In Sony's case, it spent over \$600 million developing the PlayStation. See *Connectix*, 48 F. Supp. 2d at 1214.

294. Perhaps the best example of this point is the Supreme Court's decision in the *Betamax* case, where it rejected the studio's argument that the recording of programming would necessarily undermine its existing revenue streams. See *Sony Corp. of Am. v. Universal City Studios*, 464 U.S. 417 (1984); see also Stephen M. McJohn, *Fair Use of Copyrighted Software*, 28 Rutgers L.J. 593, 610 (1997) ("If a use does not adversely affect the market for the copyrighted work, then it will not affect the financial incentives to produce such work.").

295. It is plausible, though not particularly likely, that the court could have concluded, after analyzing the relevant incentives created from the deployment of the Virtual Game Station, that because Nintendo would sell more of its own proprietary games for the VGS than it would have otherwise, it might make more money, even accounting for the displacement of its console sales. Cf. *Bleem*, 214 F.3d at 1027 (noting that emulator sales spur more sales for the games). In the face of such a conclusion, the use of the VGS would constitute a "partial substitute" (as opposed to a pure complement) and would actually act more as a complement than a substitute in terms of its actual market impact. See *Micro Star v. FormGen, Inc.*, 154 F.3d 1107, 1112–14 (9th Cir. 1998) (finding that product that served as partial substitute did not constitute permissible work); *Midway*, 704

B. A Model for Horizontal Access Regulation: Lotus v. Borland

In perhaps the most famous case addressing the horizontal access issue, the First Circuit held that Borland could incorporate Lotus 1-2-3's command hierarchy to build a rival spreadsheet program (its Quattro program).²⁹⁶ In that case, Lotus argued that to allow competition within the standard it developed by not protecting the user interface threatened to make its invention—and the community of users trained on the interface—a “common resource” in which no particular company would want to invest.²⁹⁷ Borland countered that it could not compete without access to Lotus's user interface, as many users already had adopted it. Unfortunately, no clear opinion emerged in this case, in which the district judge and the two court of appeals judges to hear the case all took different approaches (and the Supreme Court divided equally).²⁹⁸

In *Lotus*, Borland argued that Lotus's established standard needed to be shared through some form of an open access arrangement.²⁹⁹ In ruling for Borland and providing it with open access to Lotus's user interface, the majority focused on whether the would-be protected resource constituted “a method of operation”—like the buttons on a VCR—that warranted no protection under copyright law.³⁰⁰ By contrast, Judge Boudin's concurrence called for a more flexible inquiry and a competition policy focus. In particular, he recognized that the establishment of a standard—in this case, a user interface and a particular command hierar-

F.2d at 1009 (finding that product that modulated speed of game was wholly derivative of original work and therefore was infringing); see also *Lewis Galoob Toys, Inc. v. Nintendo of Am., Inc.*, 964 F.2d 965, 969 (9th Cir. 1992) (“The Game Genie does not physically incorporate a portion of a copyrighted work, nor does it supplant demand for a component of that work.”).

296. *Lotus Dev. Corp. v. Borland Int'l, Inc.*, 49 F.3d 807, 819 (1st Cir. 1995), aff'd by an equally divided Court, 516 U.S. 233 (1996). The *Lotus* case has provided commentators a veritable cornucopia of opportunities for comment. For example, one possible complicating factor in that case was that Borland's rival product constituted an “improving use” that might justify some intellectual property protection for it (as opposed to a pure clone, see, e.g., *Lotus Dev. Corp. v. Paperback Software Int'l*, 740 F. Supp. 37, 75 (D. Mass. 1990)). See Mark A. Lemley, *The Economics of Improvement in Intellectual Property Law*, 75 *Tex. L. Rev.* 989, 1079–81 (1997) (arguing for a doctrine that allows access to “radical improvers”); see also Pierre N. Leval, *Towards a Fair Use Standard*, 103 *Harv. L. Rev.* 1105, 1111–12 (1990) (championing concept of “transformative use”).

297. See *Lotus*, 49 F.3d at 819–22 (Boudin, J., concurring) (explicating stakes for developers and public in resolving access issues); see also Joseph Farrell, *Creating Local Competition*, 49 *Fed. Comm. L.J.* 201, 210 (1996) (“Just as we would not want to reduce the life of a patent from seventeen years to seventeen minutes, since that would reduce innovative effort, so also it would be unwise policy to make all developers of network externalities share them in all circumstances.”). See generally Dam, *supra* note 124 (explaining why standards merit protection).

298. *Lotus*, 799 F. Supp. 203, rev'd, 49 F.3d 807 (1st Cir. 1995), aff'd by an equally divided Court, 516 U.S. 233 (1996).

299. *Lotus*, 49 F.3d at 815.

300. *Id.* at 816–17 (discussing principle set forth in *Baker v. Selden*, 101 U.S. 99 (1879)).

chy for spreadsheets—merited protection in order to encourage innovation. At the same time, Judge Boudin made clear that complete protection could—rather than provide a reward necessary to encourage innovation—limit consumer welfare.³⁰¹ Thus, where a first mover like Lotus already had received a “substantial reward for being first,”³⁰² which appears to have been the case in *Lotus*, intellectual property protection should recede and allow others to appropriate some of the value of the industry standard so as to allow for competition.³⁰³

As suggested by Judge Boudin’s concurrence in *Lotus*, a fair use analysis easily can accommodate the type of competition policy questions raised by the competitive platforms model.³⁰⁴ Under such an approach, courts would have more flexibility to engage in a fact-specific analysis that evaluates the relevant market circumstances discussed in Part III as opposed to making a categorical judgment about the protectibility of product and user interfaces.³⁰⁵ Unlike the reverse engineering of a platform standard, which involves the literal copying of software, the issue in *Lotus* was Borland’s nonliteral copying of the user interface—as opposed to the literal copying of software as part of reverse engineering. Nonetheless, both scenarios involve functionally similar issues related to the viability of competing platform standards and should be evaluated under the same analytical framework.

The appropriate development of the fair use principle would look to the competitive platforms model to guide courts in cases like *Lotus*. (By

301. As Judge Boudin explained:

But if a better spreadsheet comes along, it is hard to see why customers who have learned the Lotus menu and devised macros for it should remain captives of Lotus because of an investment in learning made by the users and not by Lotus. Lotus has already reaped a substantial reward for being first; assuming that the Borland program is now better, good reasons exist for freeing it to attract old Lotus customers: to enable the old customers to take advantage of a new advance, and to reward Borland in turn for making a better product.

Id. at 821 (Boudin, J., concurring).

302. Id.; see Lemley, *Internet Standardization*, supra note 47, at 1060 n.64; c.f. *Apple Computer, Inc. v. Microsoft Corp.*, 799 F. Supp. 1006, 1025 (N.D. Cal. 1993) (“By virtue of having been the first commercially successful programmer to put these generalized features together, Apple had several years of market dominance in graphical user interfaces until Microsoft introduced Windows 3.0 . . .”).

303. For a discussion of some of the first mover advantages in the software market, see Shapiro & Varian, *Information Rules*, supra note 152, at 29–32 (explaining business strategies open to first movers); Mark A. Lemley & David W. O’Brien, *Encouraging Software Reuse*, 49 *Stan. L. Rev.* 255, 274–75 (1997) (explaining how benefits of being first mover motivate innovation).

304. The majority opinion relied on the traditional principle that fair use presumptively only can be invoked by noncommercial actors, but Judge Boudin highlighted how this is “something less than a definitive answer; [as] ‘presumptively’ does not mean ‘always’ and, in any event, the doctrine of fair use was created by the courts and can be adapted to new purposes.” *Lotus*, 49 F.3d at 821 (Boudin, J., concurring).

305. For another articulation of this approach, see O’Rourke, supra note 83, at 1233–34 (discussing benefits of fair use analysis).

contrast, proponents of the commons model would argue that user interfaces are outside the scope of copyright law, and proprietary control advocates would argue that user interfaces should always be protected.) The flexible approach animated by the competitive platforms model recognizes that the ideal form of competition would come if other providers could successfully offer an alternate—and superior—form of a user interface. By contrast, if there was only one appropriate form of a user interface (or it appeared that one would ultimately emerge as dominant), that single usable interface should not be protected.³⁰⁶ In most cases, however, there will be a range of possible user interfaces,³⁰⁷ even if they rely on certain similar characteristics.³⁰⁸ Unfortunately, the *Lotus* majority opinion did not even begin to grapple with a number of important factors that should have been part of its analysis: the nature of access arrangement (horizontal or vertical), whether the case involved access to a user interface (as opposed to a product interfaces), whether the market could have supported other successful interfaces, and whether the would-be improving use was transformative (as opposed to mere cloning).

As suggested by Judge Boudin's concurrence, the legality of reverse engineering or copying a user interface should follow a three-part inquiry. First, it should consider whether the inventor, through first mover advantages and the like, has reaped a sufficient reward such that protection of the interface would be unnecessary to facilitate innovation (even if the limits of the protection were known *ex ante*). In nearly all cases

306. See Farrell & Katz, *supra* note 43, at 649; cf. *Mitel, Inc. v. Iqtel, Inc.*, 124 F.3d 1366, 1376 (10th Cir. 1997) (finding command codes that facilitated long distance telephone not copyrightable because, although they contained the requisite level of originality, they were "dictated by external functionality and compatibility requirements of the computer and telecommunications industries").

307. Unfortunately, some courts have glided over this possibility, asserting that user interfaces are like buttons on a VCR and that, as they are functional, there is no room for creativity. See *Lotus*, 49 F.3d at 817; *Apple Computer*, 799 F. Supp. at 1023, *aff'd*, 35 F.3d 1435 (1994), cert denied, 513 U.S. 1184 (1995). In the *Apple* case, however, the court did undertake a careful examination of user interfaces in the software industry to evaluate which features would constitute unprotectible "scenes a faire"—noncreative elements that are common to similar products—under copyright law. *Id.* at 1024. To the extent that an element of a user interface reflects the only practical way to achieve a particular functionality, either the scenes a faire or merger doctrines of copyright law would leave the standard unprotectible. See *supra* note 306.

308. In *Atari, Inc. v. N. Am. Philips Consumers Elec. Corp.*, for example, the Seventh Circuit confronted this issue in the context of maze-like video games, explaining that there were a number of ways in which the basic game could be presented. 672 F.2d 607, 617-18 (7th Cir. 1982). On matters of user interface design, where there are no reasonable alternative options—say, as to whether to use the command "print" or its "Ctrl P" shortcut—the doctrine of merger "denies copyright protection to expression necessarily incidental to the idea being expressed." *Computer Assocs. Int'l, Inc. v. Altai, Inc.*, 982 F.2d 693, 707 (2d Cir. 1992). Similarly, the scenes a faire doctrine excludes from protection those expressions that are "as a practical manner indispensable, or at least standard, in the treatment of a given topic." *Atari*, 672 F.2d at 616 (quoting *Alexander v. Haley*, 460 F. Supp. 40, 45 (S.D.N.Y. 1978)).

where an information platform captures a dominant share of a market, this consideration will weigh in favor of allowing open access.³⁰⁹ Second, it should evaluate whether competitors could challenge the proprietary standard's position in the market without such a sharing of the user interface.³¹⁰ Finally, it should determine whether the company seeking to take advantage of the sharing requirement used it to facilitate the introduction of a differentiated rival product rather than merely imitate the initial invention.³¹¹

In a case reflecting the flip side of the *Lotus* decision, *Atari Games Corp. v. Nintendo of America*³¹² involved a scenario where a court correctly declined to grant access to a rival's system. In particular, the Federal Circuit concluded that, even though fair use access would be appropriate, Nintendo's patented "lock-out" chip provided it with protection against Atari's reverse engineering efforts.³¹³ By not affording Atari an intellectual property right to play Nintendo games on its console, the court encouraged rivals to build up their own systems, which Sega, Sony, and Microsoft later did successfully.³¹⁴ Moreover, this decision—unlike *Connectix*—drew the appropriate line between determining when to grant ac-

309. An amicus brief in *Lotus* presented a rationale for why that was the case. See Brief Amicus Curiae of American Committee for Interoperable Systems and Computer & Committee Industrial Association in Support of Respondent at 27, *Lotus Dev. Corp. v. Borland Int'l, Inc.*, 516 U.S. 1167 (1996) (No. 94-2003) ("[E]conomists have established that in markets with strong network externalities, such as the market for software, the first comer reaps enormous competitive advantages from the establishment of a *de facto* standard interface specification."). Similarly, Judge Boudin explained that the apparently arbitrary nature of Lotus's invention counseled against extending it copyright protection. See *Lotus*, 49 F.3d at 819–21 (Boudin, J., concurring) (emphasizing that Lotus's menu is premised on a set of commands that "are largely for standard procedures that Lotus did not invent and are common words that Lotus cannot monopolize").

310. This analysis should take account of the fact that competitors can gain access to product interfaces for purposes of enabling users to transfer user-created macros to a rival product. See *supra* notes 126–130 and accompanying text.

311. Judge Boudin's concurring opinion stressed this point, explaining that his rationale "would not automatically protect Borland if it had simply copied the Lotus menu (using different codes), contributed nothing of its own, and resold Lotus under the Borland label." *Lotus*, 49 F.3d at 821 (Boudin, J., concurring). Similarly, the particularized protection for reverse engineering allowed in the SCPA also requires that any reverse engineering of protected works be used to provide an improved—and not merely an imitated—competitive product. See 17 U.S.C. § 906(a) (2000); see also Raskind & Stern, *supra* note 67, at 266 (noting that the Act's reverse engineering provision "strikes a balance between the exclusive reproduction right of an owner and the public interest in innovation, by imposing the condition on the copyist that an improved, or at least original, chip product must result"). Significantly, this requirement should not be the sole criteria for allowing reverse engineering because, as demonstrated by *Connectix*, it is often quite simple to make modest improvements and use those as a sufficient basis to free ride on a much more substantial investment. See *Sony Computer Entm't, Inc. v. Connectix Corp.*, 203 F.3d 596, 601 (9th Cir. 2000), cert. denied, 531 U.S. 871 (2000).

312. 975 F.2d 832 (Fed. Cir. 1992).

313. *Id.* at 840; see also Shapiro & Varian, *Standards Wars*, *supra* note 150, at 285 (noting that Atari could not overcome Nintendo's lock-out chip).

314. See *supra* notes 217, 230–233 and accompanying text.

cess to truly complementary products,³¹⁵ as opposed to a horizontal access claim like that at issue in *Lotus*.

The Internet world, like that of video games, is premised on the development of information platforms that will, in many cases, compete with one another. In the applications layer, as well as in some possible logical layer developments, there is going to be an increasing number of rival inventions that will battle it out for supremacy. The recent browser war between Microsoft and Netscape and the current tussles between rival media players provide some hints of what sorts of competitive struggles lie ahead. To ensure that marketplace battles like these benefit consumers, it is important that intellectual property law develop a clear and effective vision for when and how proprietary rights in software will be protected. The competitive platforms model, as outlined in Part IV and applied above, would do just that.

C. Possible Objections to a Competitive Platforms-Based Approach to Reverse Engineering

Given the continuing debate over the proper legal treatment of reverse engineering, it should not be surprising that there are numerous countervailing arguments against revising it to follow the competitive platforms model. In particular, there are three related criticisms that can be made against this approach: the difficulty of distinguishing between vertical and horizontal access, the administrative costs in implementing this model, and the challenge of discerning at what point in a standard's development a rival firm should be permitted access. This section addresses each concern in turn.

Despite the fair use doctrine's inquiry into whether a product is substitutive or transformative, courts have resisted focusing on whether access to a proprietary standard is sought by a horizontal competitor or a vertical complementor. Although one response is to criticize courts for failing to analyze the actual market effects,³¹⁶ another might be to evaluate whether this distinction is too elusive to guide intellectual property policy. In support of this point, one might highlight how platform owners often choose a "razor and blades" strategy whereby they do not choose to appropriate fully the value of the platform via direct sales, but instead

315. Such products would include those involving claims of vertical compatibility where a party sought to develop games for an information platform. See, e.g., *Sega Enters. Ltd. v. Accolade, Inc.*, 977 F.2d 1510, 1514 (9th Cir. 1992) (granting manufacturer of games access to game console); *Lewis Galoob Toys, Inc. v. Nintendo of Am., Inc.*, 780 F. Supp. 1283, 1286 (N.D. Cal. 1991), *aff'd*, 964 F.2d 965 (9th Cir. 1992) (granting manufacturer of plug-in cartridge access to game console). Indeed, in *Lewis Galoob Toys*, the Ninth Circuit focused directly on the competitor-complementor distinction. See 964 F.2d at 969 ("The Game Genie is useless by itself. . . . [It does not] supplant demand for Nintendo game cartridges [or the Nintendo console]. Such innovations rarely will constitute infringing derivative works under the Copyright Act.").

316. See, e.g., Rothman, *supra* note 289, at 7-8 (deeming the inquiry of the *Connectix* court on this point to be "superficial").

make money off the complementary product.³¹⁷ Thus, for cases where an information platform owner decided to appropriate the value of the platform in the complementary market, such control could be said to be as important as control over the platform market itself.

There are several responses to the concern that there may not be a meaningful distinction between horizontal and vertical access to a standard. First, as to this basic criticism, it is important to highlight that the right to the self-help remedy of reverse engineering is a less desirable mode of access than a license, so there still are considerable incentives for parties to strike a deal. The costliness of reverse engineering, the considerable value of the technical support that the inventor can provide, and the potential trademark issues that may impede the marketing of a product that is not officially approved are among the factors that might drive parties to the negotiating table.³¹⁸ Moreover, it is important that intellectual property law set as the default principle that complementors should be afforded such access because in most cases it will be to the advantage of the platform owners—and the public more generally—to enable such access and opportunity for improvement.³¹⁹

A related criticism regarding the vertical-horizontal distinction is that some products could elude easy classification. In particular, a “middleware” product that emerges as a complementary one, but ultimately substitutes for the platform itself, might not easily fall into either category. (The classic example of middleware is the Web browser, which could be used in combination with Microsoft’s operating system, but also threatened—over the long term—to supplant it.) In such cases, the outcome will depend on whether the product can be used with the platform—as, say, a browser is used with an operating system—or actually would be used instead of the product, but might not provide as optimal performance—as, say, the virtual game station product.

A second potential criticism of the competitive platforms model is that a standards-based approach would add additional administrative costs and uncertainty into the current legal environment. These costs would include not only the court costs of judging whether a particular

317. Indeed, this business model is now standard in the video game industry. See Samuelson & Scotchmer, *supra* note 39, at 1618–19 (“In the game system market, platform developers typically lose money on sales of consoles, making up losses on sales of games and peripherals.”); Gaither, *supra* note 217, at C17 (“While profits are thin as manufactures subsidize the sale of hardware, they grow rapidly once consumers start buying games to play on them.”).

318. For a discussion of the costs, see Johnson-Laird, *supra* note 39, at 900–01. On the trademark point, competitors are allowed to represent that a product is compatible with an information platform, but they do not gain the benefits of being approved or certified by the platform owner. See Mark A. Lemley & David McGowan, *Could Java Change Everything? The Competitive Propriety of a Proprietary Standard*, 43 *Antitrust Bull.* 715, 761–64 (1998).

319. See Katz, *supra* note 46, at 334–35 (outlining default rule rationale for vertical access).

platform standard has established sufficient dominance to lose intellectual property protection against reverse engineering, but also the costs in the marketplace of license agreements that would be forestalled by the legal uncertainty of a standards-based approach. As an initial matter, this argument mistakenly assumes that the status quo provides for a clear rule on the legality of reverse engineering and the protectibility of platform standards and user interfaces.³²⁰ Consequently, if the competitive platforms model strikes the right balance, it may well lead to greater certainty than a bad rule that generates undesirable outcomes and begs for exceptions.³²¹ In terms of the costs on the legal system of implementing a standards-based approach, the second response is to point to how antitrust law—both as administered by the courts and by legal counseling—successfully uses a similar rule-of-reason-type approach,³²² as does copyright law in implementing the idea-expression dichotomy that separates protected from unprotected works.³²³ Not only does a standards-based approach allow for important precision in this area, but its undefined nature also can encourage parties to settle access disputes out of court on mutually agreeable terms.³²⁴ Moreover, as the analogy to antitrust law suggests, lawyers and business persons will increasingly grow proficient in anticipating the likely outcome and will act accordingly.

The final question presents the greatest challenge to the workability and soundness of the approach outlined herein: How will courts know when a standard is sufficiently well established to allow access through reverse engineering? As an initial matter, it is critical to remember the two alternatives: allowing access in all cases, or never allowing access. Given the flaws of each alternative, the risks of a limited right of access would have to be quite great to warrant rejection in favor of either alternative approach. To be sure, there is not an obvious marketplace test of

320. See Rothman, *supra* note 289, at 1 (describing reverse engineering issue as an “intractable problem” for intellectual property law); *supra* Part II.A.1 (discussing lack of clarity in legal treatment of reverse engineering).

321. The rules-versus-standards debate is well developed, with most commentators acknowledging the usefulness of both and concluding that the desirability of either approach depends on the situation. See *Mindgames, Inc. v. Western Publ'g Co., Inc.*, 218 F.3d 652, 656–67 (7th Cir. 2000).

322. See, e.g., Michael S. Jacobs, *The New Sophistication in Antitrust*, 79 *Minn. L. Rev.* 1, 48 (1994) (explaining success of “rule-of-reason” in antitrust).

323. As Judge Learned Hand famously put it, “Obviously, no principle can be stated as to when an imitator has gone beyond copying the ‘idea,’ and has borrowed its ‘expression.’ Decisions must therefore inevitably be ad hoc.” *Peter Pan Fabrics, Inc. v. Martin Weiner Corp.*, 274 F.2d 487, 489 (2d Cir. 1960); see also *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co., Ltd.*, 122 S. Ct. 1831, 1838 (2002) (stating that uncertainty created by doctrine of equivalents in patent law is “the price of ensuring the appropriate incentives for innovation”).

324. For an explanation of how blurry intellectual property rights can facilitate efficient bargaining, see Jason Scott Johnston, *Bargaining Under Rules Versus Standards*, 11 *J. L. Econ. & Org.* 256, 273 (1995). For a general discussion of when standards are economically efficient, see Louis Kaplow, *Rules Versus Standards: An Economic Analysis*, 42 *Duke L.J.* 557, 568–77, 579–84, 621–23 (1992).

whether courts can make the necessary judgments to implement a limited access right, but the antitrust precedent is encouraging.

The analogy to antitrust is instructive here because it underscores how an antitrust-like treatment of reverse engineering can ask courts to undertake a similar market definition analysis in a related context. First, it is significant that courts evaluating antitrust cases regularly—and, for the most part, successfully—undertake this analysis. Second, by employing such an analysis to guide the scope of intellectual property rights, courts can enable self-help and private conduct to address market dominance issues before they emerge as a monopolization issue. In the case of RealNetworks's use of reverse engineering to compete against Microsoft, for example, RealNetworks is taking a proactive step that is unavailable to an antitrust court, which generally must wait to mandate an access arrangement until after a company establishes a monopolization case against a competitor. As many commentators have highlighted with respect to the browser war between Microsoft and Netscape, the possibility of judicially overseen relief came too late to help Netscape.³²⁵ But for cases where reverse engineering of a platform standard or copying of a user interface can forestall or avoid monopolization, permitting this conduct can potentially avoid the need for antitrust action.

The goal of the limited access right envisioned by the competitive platforms model and a reformed legal treatment of reverse engineering is to facilitate a procompetitive environment. Under this regime, parties would be free to gain access through reverse engineering at any point, but if they guessed wrong about whether an information platform constituted a dominant standard, they would potentially be liable for infringement. At present, the potential for guessing incorrectly is much greater than it would be under the competitive platforms model, as there is no clear guide for the scope and application of the fair use and misuse principles in such cases. To be sure, a clear rule always allowing access or never allowing it would eliminate such guesswork, but it would potentially undermine investment incentives or the ability to limit the market dominance of a particular product.

For close cases, the remedial consequences for any infringement would depend upon the circumstances surrounding the infringement. In some cases, where the appropriateness of access is a close call, courts might choose to provide for a liability-type remedy where the defendant would be allowed continued access based upon some licensing fee.³²⁶ In

325. See Timothy F. Bresnahan, *A Remedy that Falls Short of Restoring Competition, Antitrust*, Fall 2001, at 67, 71 n.10 (noting that the threat presented to Microsoft by the Web browser no longer exists); Charles A. James, *The Real Microsoft Case and Settlement, Antitrust*, Fall 2001, at 58, 61 (“[B]y most accounts, Microsoft has essentially won the browser war; relief to revive Netscape Navigator as a middleware threat may have been too little, too late.”).

326. See *Campbell v. Acuff-Rose Music, Inc.*, 510 U.S. 569, 578 n.10 (1994) (suggesting that injunctive relief may not be appropriate in close cases where a defendant

other cases, where there is a number of alternative viable standards—as is the case in cell phone standards³²⁷ and video game consoles—there may well be marketplace analogs of licensing systems that could be imposed by the courts, along with any other remedies that would be appropriate to impose on a party who infringed a standard holder's intellectual property. With respect to Internet applications, there is likely to be a number of rival applications to perform a particular function because the open logical standard invites entry. As the case of media players illustrates, there often will be a number of entrants that will seek to develop a successful information platform.³²⁸

CONCLUSION

Intellectual property law's unresolved search for a sensible regime to regulate computer software and the Internet reflects a fundamental debate over what framework will best facilitate innovation in the information industries. Given the difficulty of resolving the commons versus proprietary control debate, the increasing complexity of and uncertainty in this area is quite understandable. But intellectual property law's continuing failure to produce any clear framework for determining when information platform inventors can maintain proprietary control of their inventions undermines its ability to advance a coherent competition policy strategy.

Courts and policymakers, rather than adopting either the commons or proprietary control perspective, should embrace the approach suggested by the competitive platforms model. This model envisions that intellectual property policy can regulate open access to information platforms in advance of and in a manner consistent with antitrust law. In particular, intellectual property law, in regulating the permissibility of reverse engineering, possesses the tools to facilitate access to platform standards and user interfaces only where so doing will thwart the likely dominance of a single firm—before antitrust or regulatory oversight would need to step in to facilitate entry.

exceeds the bounds of its fair use rights). The classic framework for evaluating the appropriate choice of remedies is, of course, the one set forth in Guido Calabresi & A. Douglas Melamed, *Property Rules, Liability Rules, and Inalienability: One View of the Cathedral*, 85 *Harv. L. Rev.* 1089, 1106–10 (1972). In general, Congress leaves it to the courts to develop the appropriate remedy for intellectual property violation, but, on occasion, it has imposed a particular regime. See, e.g., 7 U.S.C. § 136a(c)(1)(F) (2000) (setting forth binding arbitration procedures for competing pesticide registration claims).

327. To be sure, the FCC (and not a court) decided whether to mandate compatibility to a common protocol in the cell phone context. See *supra* note 212 and accompanying text. But such questions could easily be presented to courts and presumably will be with increasing frequency. Cf. *Secure Servs. Tech., Inc. v. Time and Space Processing, Inc.*, 722 F. Supp. 1354, 1359–63 (E.D. Va. 1989) (examining intellectual property issues raised by reverse engineering of a protocol for enhanced facsimile machines to establish horizontal compatibility).

328. See *supra* notes 56–58 and accompanying text.

The competitive platforms model also recognizes how intellectual property policy in general and Internet policy in particular calls for the federal government and standard-setting bodies to play an important role in supporting and coordinating the development of the common information technology standards that would not be developed by any proprietary firm. With respect to the Internet, the open standards that comprise its logical layer, for example, require government funding and the coordination of standard setting bodies to evolve in an effective fashion. Put simply, even with intellectual property protection, these standards are appropriately treated as a commons because they are not likely to be developed or maintained by a proprietary firm. But if the Internet's entire software infrastructure, including rival applications, is treated as a commons, individual firms will not invest in developing and extending its potential. Thus, an optimal Internet policy requires that both courts—in developing judicial doctrine—and policymakers—in supporting the common and open Internet infrastructure—reject the attractive simplicity of the commons and proprietary control perspectives and embrace the balance and nuance of the competitive platforms model.