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The Keepers of the Gates:
Intellectual Property, Antitrust, and
the Regulatory Implications of
Systems Technology

by

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Dramatic technological changes often produce equally dramatic changes in legal theory and practice. As new technology presents the law with unanticipated problems and issues, jurists must decide whether these developments can be accommodated within the established legal doctrine,¹ whether the doctrine must be substantially revised to incorporate them,² or whether an entirely new branch of

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¹ For instance, a number of jurists have argued that recent changes in communications technology do not necessitate any novel developments in First Amendment law. See, e.g., Denver Area Educ. Telecomm. Consortium v. FCC, 518 U.S. 727, 812-38 (1996) (Thomas, J., dissenting) (arguing that there is no persuasive basis for "treating cable operators differently from other First Amendment speakers"); Thomas G. Krattenmaker & L.A. Powe, Jr., Converging First Amendment Principles for Converging Communications Media, 104 YALE L.J. 1719 (1995) (arguing that advances in communications technology can be addressed adequately under traditional First Amendment doctrine). See generally Los Angeles v. Preferred Communications, Inc., 476 U.S. 488, 496 (1986) (Blackmun, J., concurring) ("In assessing First Amendment claims concerning cable access, the Court must determine whether the characteristics of cable television make it sufficiently analogous to another medium to warrant application of an already existing standard or whether those characteristics require a new analysis.").

² For example, as economic growth and advances in transportation and communications technology have combined to expand the scope of interactions among geographically distant individuals, courts have continuously revised the doctrine of personal jurisdiction. See, e.g., International Shoe Co. v. Washington, 326 U.S. 310 (1945)
The more revolutionary the technological change, the more likely it is to produce substantial legal developments. Revolution is contagious: technological change alters human interactions, and as these change, so must the systems that govern them.

It should therefore come as no surprise that, as computer technology has advanced rapidly in the past decade, the legal system has begun to question the applicability of its traditional doctrines to the digitized world. Courts have struggled, with varying degrees of success, to apply legal precedents to disputes involving electronic technology, commerce, and communication. These efforts have

(establishing circumstances in which a state can assert personal jurisdiction over an out-of-state defendant); McGee v. International Life Ins. Co., 355 U.S. 220 (1957) (relaxing Due Process limitations on state jurisdiction because the "increasing nationalization of commerce has [produced] a great increase in the amount of business conducted by mail across state lines. At the same time, modern transportation and communication have made it much less burdensome for a party sued to defend himself in a State where he engages in economic activity."); Martin H. Redish, Of New Wine and Old Bottles: Personal Jurisdiction, the Internet, and the Nature of Constitutional Evolution, 38 JURIMETRICS J. 575 (1998) (exploring doctrinal modifications in personal jurisdiction law that have resulted from advances in electronic communication, and advocating further modifications in the same vein); Andrew E. Costa, Comment, Minimum Contacts in Cyberspace: A Taxonomy of the Case Law, 35 HOUS. L. REV. 453 (1998) (cataloging various ways in which courts have responded to the new doctrinal complexities posed by electronic communication).

3. The emergence and evolution of products liability law exemplifies this latter path. Products liability doctrine arose in response to changes in commercial production and distribution brought about by the Industrial Revolution, and it has continued to evolve in response to technological progress ever since. See generally RICHARD A. EPSTEIN, CASES AND MATERIALS ON TORTS 727-30 (6th ed. 1995) (summarizing the doctrinal eras of products liability law); Gary Schwartz, The Beginning and the Possible End of the Rise of Modern American Tort Law, 26 GA. L. REV. 601, 601-20 (1992) (discussing how various modernizations have spurred changes in products liability regimes).

4. Cf. Preferred Communications, Inc., 476 U.S. at 496 (Blackmun, J., concurring) (indicating that the more analogous a new technology is to an older technology, the more likely it is to be analyzed within pre-existing legal doctrines); Robert L. Rabin, Tort Law in Transition: Tracing the Patterns of Sociolegal Change, 23 VAL. U. L. REV. 1, 21, 32 (1988) (explaining how radical developments in tort law were driven, in part, by revolutionary scientific and technological advances after World War II).

5. See, e.g., CompuServe v. Patterson, 89 F.3d 1257 (6th Cir. 1996) (analyzing the relationship between Internet commerce and the conventional "minimum contacts" test for personal jurisdiction); Lotus Dev. Corp. v. Borland Int'l, 49 F.3d 807 (1st Cir. 1995) (analyzing the extent to which copyright protections extend to menu command hierarchies in spreadsheet software); Apple Computer v. Microsoft Corp., 35 F.3d 1435 (9th Cir. 1994) (analyzing the extent to which copyright protections extend to graphical user interfaces in computer systems); Urofsky v. Allen, 995 F. Supp. 634 (E.D. Va. 1998) (using traditional First Amendment doctrine to invalidate a statutory restriction on Internet access); see also Jack E. Brown, "Analytical Dissection" of Copyrighted Computer Software—Complicating the Simple and Confounding the Complex, 25 ARIZ. ST. L.J. 801 (1993) (criticizing judicial efforts to apply copyright law to software technology); Redish, supra note 2 (criticizing the
produced a body of doctrine that is incomplete and at times incoherent. In many cases, those law-and-technology issues that have been addressed have been resolved only partially or inconclusively. Some have been decided inconsistently across jurisdictions. And a number of important legal issues pertaining to the development and use of computer technology have yet to be addressed at all.

This legal uncertainty has left technological innovators in something of a bind. With the applicability of conventional doctrine in doubt, hardware and software developers cannot be sure of the extent to which they may protect, promote, and reap benefits from their innovations. What legal entitlements exist when the products themselves cannot easily be defined? How do the protections of copyright, trademark, and patent law apply in technology industries? What constitutes "fair competition" in a high-tech world where previously anomalous practices have become commonplace? The need to answer these central questions has produced a great deal of litigation; courtroom battles have erupted as actors in emerging technology industries have attempted to capitalize on their own innovations or profit from those of others. This litigation has included several recent high-profile legal disputes, most notably the

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6. In some segments of the software industry, for example, the proper scope of the relevant "product" is in much dispute. See, e.g., Lotus Dev. Corp., 49 F.3d at 807 (analyzing whether the arrangement of executable program instructions is copyrightable subject matter or merely an unprotected "method of operation"); Steve Lohr, Browsers and Borders Are Argued at the Microsoft Trial, N.Y. TIMES, Jan. 20, 1999, at C8 ("The government spent most of today attacking the company's central defense—that its Internet browsing software is a seamless feature of its Windows operating system and not a stand-alone product. The government is trying to prove that the browser and operating system are two products."); cf Rivals Mount New Threat to Windows, FINANCIAL TIMES, Jan. 13, 1999, at 11 ("The joint venture is expected to centre on the fusion of Oracle's database system... with Sun's Solaris product... the most popular corporate operating system. Both companies will have the right to re-sell the resulting software as a single product."). This form of definitional difficulty is compounded by the fact that, in high technology industries, the line between "product" and "information" is often extremely unclear. Cf. Joseph I. Rosenbaum, New Form of Intellectual Property Emerges; Database Protection Is Serious Issue, N.Y.L.J., Nov. 2, 1998, at S2 (exploring whether databases of public information are and should be subject to intellectual-property protection).

7. See, e.g., Lotus Dev. Corp., 49 F.3d at 803; Apple Computer, 35 F.3d at 1443.

8. See, e.g., Henry Norr, Here Come the Clones, MACUSER, Feb. 1995, at 76 ("[Apple, IBM, and Motorola] agreed on a common hardware platform.... [A]nd they proclaimed it an open standard, one other manufacturers will be free to copy in designing their own systems."); Stephen H. Wildstrom, Freeware? What's Not to Like?, BUS. WK., Jan. 11, 1999, at 26 (reporting that software companies such as Sun, Netscape, IBM, and 3Com will be giving away their programs and the source codes of their programs for free).
Microsoft litigation,9 Intergraph’s lawsuit against Intel,10 and the FTC’s investigation of Dell Computer Corporation.11

The parties and courts have framed these disputes under a variety of legal paradigms, including antitrust law,12 contract law,13 and patent law.14 At the heart of each of these disputes, however, lies the same fundamental issue. In all of them, the central question is how to strike the proper balance between (a) promoting open-access technological standards and (b) granting strong, exclusionary property rights to technological innovators. The disputes are also similar in that they all involve the same form of technology: the "architectural" or "meta-" technology that controls the computing environments within which users operate—a form of technology that may be referred to as "systems technology." Thus, although these disputes have arisen in different sectors of the computer industry and have been analyzed under a variety of legal doctrines, they all reduce to essentially the same question: In the systems-technology context, how should the law balance the competing policies of promoting open standards and protecting the property rights of innovators?

This Article provides one answer to that question. I will argue that, once we recognize the common thread that connects systems-technology disputes, we can examine them within a single analytical framework. This framework focuses on the trade-off between open standards and exclusionary property rights, as well as on the relationship between antitrust doctrine and the intellectual-property system. When we apply this framework to systems-technology disputes and consider the features of the markets in which these disputes occur, a common method of resolution suggests itself. Specifically, it appears that the legal regime should protect


12. See Intergraph, 195 F.3d at 1350; Microsoft, 87 F. Supp. 2d at 35; Intergraph, 3 F. Supp. 2d at 1255.

13. See Sun Microsystems, 87 F. Supp. 2d 992; see also Sun Microsystems, 21 F. Supp. 2d at 1119-25.

intellectual-property rights in systems technology with liability rules rather than with the more traditional property rules.\textsuperscript{15} I will show that courts and regulators are slowly beginning to recognize the advantages of this approach and that although this approach is not unproblematic, it can be justified on the basis of both economic policy and legal precedent.

Part I of this Article explores how courts have analyzed competition and intellectual-property rights in high-technology industries. Although courts have traditionally granted strong intellectual-property rights to technological innovators, a few exceptions have begun to appear in systems-technology cases. Part II investigates the context in which these exceptions are arising. It examines the characteristics of systems-technology industries and the particular importance of the choice between open standards and strong property rights in these industries. Part III argues that the industry characteristics discussed in Part II create a heightened need for the law to promote compatibility and open-access standards. Part III then considers whether liability-rule protection is an appropriate method for such promotion. After analyzing the advantages and disadvantages of protecting systems-technology developers with liability rules rather than property rules, I conclude that, as a matter of economic policy, a liability-rule regime is preferable. Part IV examines the doctrinal foundations upon which such a regime might rest. In Part V, the analysis turns to the implications of the preceding discussion for the current legal dispute between Microsoft Corporation and the Justice Department. The Article concludes with some final thoughts and observations.

\section{I. Intellectual-Property Rights in Technology Industries}

\subsection{A. The Creation of Property}

Property rights exist only to the extent that the legal system is

\textsuperscript{15} See Guido Calabresi \\& A. Douglas Melamed, \textit{Property Rules, Liability Rules, and Inalienability: One View of the Cathedral}, 85 HARV. L. REV. 1089 (1972), for the leading exposition of property rules and liability rules. These rules are discussed in greater detail below. \textit{See infra} text accompanying notes 27-29. Although two previous articles have mentioned the distinction between property rules and liability rules while discussing the protection of certain types of technological information, \textit{see} Trotter Hardy, \textit{Property (and Copyright) in Cyberspace}, 1996 U. CHI. LEGAL F. 217 (1996) (arguing that the law should protect informational works in cyberspace with property rules); Julie S. Turner, Comment, \textit{The Nonmanufacturing Patent Owner: Toward a Theory of Efficient Infringement}, 86 CAL. L. REV. 179 (1998) (arguing that nonmanufacturing patent owners should have their entitlements protected by liability rules rather than property rules), neither discussed these rules in the context of systems technology.
willing to recognize and enforce them.\textsuperscript{16} For each form of property, the law must decide whether to (a) create private ownership rights in that property or (b) leave the use and control of that property unregulated. Where real property is concerned,\textsuperscript{17} the law almost always decides in favor of creating private property rights. The theory is that such rights produce the proper incentives for efficient resource use; without them, individuals would both overuse resources and underinvest in their improvement.\textsuperscript{18}

Where intellectual property is concerned, the legal system also generally decides to create property rights, but it does so in a much more limited manner and under a somewhat different theory. Once created, intellectual property exhibits some of the features of a "public good": it is nonrivalrous, meaning that its use by one person does not impinge upon its use by another,\textsuperscript{19} and it may be nonexcludable, meaning that a person cannot feasibly prevent another from taking advantage of it.\textsuperscript{20} Both of these features have important implications for the decision of whether to create intellectual-property rights. The nonrivalrous nature of intellectual property eliminates concerns about its overuse. Indeed, this characteristic suggests that once the property has been created, there are no social benefits to keeping its use restricted, and in fact, there may be benefits from disseminating it as widely as possible.\textsuperscript{21} At the same time, the non-excludable nature of much of this property raises questions about the desirability of implementing an enforceable rights system—the costs of monitoring and limiting the use of freely available information may well render such a system infeasible. If, on the other hand, creators of intellectual property can exclude others

\begin{itemize}
\item \textsuperscript{16} "Legal system" here refers not only to the courts, but to legislators and government regulators as well.
\item \textsuperscript{17} Such property generally includes land and whatever stable assets are attached to it.
\item \textsuperscript{19} This is not to say that certain individuals may not be hurt, economically or otherwise, by another person's use of the intellectual property. The point is merely that their capacity to use the property themselves will not diminish.
\item \textsuperscript{20} Of course, the creation of enforceable property rights is an attempt to increase excludability by providing a legal mechanism against unsanctioned use. Even without such a mechanism, however, the holders of intellectual property may be able to exclude others through extralegal means, such as secrecy. See Robert G. Bone, \textit{A New Look at Trade Secret Law: Doctrine in Search of Justification}, 86 Cal. L. Rev. 241, 255 (1998); Rose, \textit{supra} note 18, at 147; see also infra Section II.D.
\item \textsuperscript{21} For instance, one innovation often inspires another, and therefore disseminating intellectual property throughout the community may increase the community's overall level of technological achievement.
\end{itemize}
from using it without legal mechanisms, then it becomes unclear whether a system of legal rights is necessary.\(^{22}\)

Nonetheless, several arguments counsel in favor of creating private ownership rights for intellectual property. Most notably, investment concerns analogous to those in the real property context are particularly important in the intellectual-property field. Assigning entitlement rights to the creators of this property allows them to recoup their investment costs and profit from their creations, thereby greatly increasing the chances that creation will occur in the first place.\(^{23}\) Similarly, where the intellectual property relates to a standardized technology, creating property rights in it may ensure that at least one party—the holder of these rights—has an incentive to improve the standard with further innovations.\(^{24}\)

The traditional legal solution has been to strike a compromise between property rights and open access: an innovator who creates intellectual property receives an enforceable private ownership right in it—in the form of a patent, copyright, or trademark—but this right expires after a fixed period of time. In theory, the prospect of garnering profits during the ownership period should be sufficient to stimulate innovative endeavors, and after this period, all barriers to the optimal utilization of the resulting innovations disappear.\(^{25}\) Thus, the intellectual-property laws seek to serve the dual purpose of "promoting innovation and enhancing consumer welfare."\(^{26}\)

This does not end the matter, however, for once the legal system has decided to create private ownership rights, there remains the secondary question of how to protect those rights. Here, the basic choice is between property rules and liability rules.\(^{27}\) Under the

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22. Cf. discussion infra Section II.D. Note, however, that even if legal mechanisms for exclusion are not necessary, they may still be desirable if they are socially cheaper than the private mechanisms.

23. But see infra Subsection III.B.1 (arguing that first-mover advantages and other factors may make entitlement rights unnecessary to spur technological innovation).

24. See David Friedman, Standards as Intellectual Property: An Economic Approach, 19 U. DAYTON L. REV. 1109, 1122-23 (1994); see also infra text accompanying notes 93-100 (discussing standardization in more detail).


27. See Calabresi & Melamed, supra note 15, at 1091. There is also a third option, "inalienability rules," but this type of protection does not hold much attraction in the intellectual property context, as there is typically no reason why producers of such property should be prohibited from sharing it with others.
former set of rules, the holder of the property interest can prevent others from exploiting the property without his or her consent. Under the latter set of rules, the interest holder cannot prevent others from exploiting the property but receives financial compensation (typically in accordance with some preset rule) from those who do so.

There has recently been much academic debate over the relative merit of property rules and liability rules as methods of protecting property interests. Nonetheless, the norm in the legal system has been and continues to be the use of property rules. When the law confers a possessory interest in property—whether tangible or intellectual—the holder of the interest can generally rest assured that no one will be able to use that property without his or her consent. Anyone wishing to gain access must negotiate the terms of such access with the interest holder.

B. Systems Technology and Property Rights: A New Form of Ownership?

Although the legal system continues to grant intellectual-property rights to innovators and to protect those rights with property rules, exceptions have begun to appear in the context of what I shall call “systems technology.” This Section will first define systems technology and then proceed to examine the legal exceptions it has produced.


29. See, e.g., 35 U.S.C. § 271(d)(4) (Deering's 1994) (providing that patent holders have the right not to license their patents); IP GUIDELINES, supra note 26, § 2.2. The main exception to this general rule comes in cases of emergency; the law will often permit a person to make use of another's property if this is necessary to avoid extreme hardship in a crisis, provided that the person later compensates the property owner for the use. See, e.g., Ploof v. Putnam, 71 A. 188 (Vt. 1908) (holding that a person may moor his boat on another person's dock to avoid a life-threatening storm); Vincent v. Lake Erie Transp. Co., 124 N.W. 221 (Minn. 1910) (holding that a person mooring his boat to another's dock during a storm must pay the dock owner for any damages that result). This exception has little relevance in the intellectual-property context, in which such emergencies are unlikely to arise.
What is systems technology?

Systems technology is the technology that defines and governs the computing environments within which people operate. It includes both hardware and software. On the hardware side, systems technology provides the architecture of the computer system: it determines what can connect to the system and what can operate within it. Hardware elements of systems technology therefore include such features as the bus design and the input/output (I/O) interfaces. Similarly, the software elements of systems technology determine the programs that the platform can support and the information it can access. The operating system is the most obvious example, but Internet browsers (which determine the computer's ability to access websites) and word processors (which determine the computer's ability to read text files from other sources) qualify as well. Systems technology, in short, comprises the hardware and software that define the parameters of the computing environment—the metatechnology, if you will, that frames the system.

A few courts have indicated, explicitly or implicitly, that intellectual-property disputes involving systems technology may require a nontraditional form of resolution. Specifically, they have indicated that the nature of this technology may justify protecting property rights with liability rules rather than with property rules. To understand how and why this has occurred, it is necessary to examine the precise circumstances of the disputes that have produced this emerging shift in the law.

30. The “bus” is the device that connects a computer's Central Processing Unit (CPU) to the memory and to the various other hardware components of the system. If the CPU is a computer's brain, the bus is the central nervous system that transmits its commands to the rest of the body. As one technology expert described it: “Physically, a bus is a set of conductive paths that serves to interconnect two or more functional components of a system or several diverse systems. Electrically, a bus is a collection of voltages, levels, and signals that allow the various devices connected to the bus to work properly together.” Desktop Imaging & Bus Design, SCTECH J., Sept. 1995 (quoting Thomas Floyd of Digital Fundamentals).

31. These interfaces, or “ports,” are the devices through which the computer connects to peripheral components such as printers, video monitors, modems, and external drives, as well as to other computers (via a network or otherwise).

32. This conception of systems technology should not be confused with the notions of “systems” and “systems markets” that Katz and Shapiro use in their economic analysis. See Michael L. Katz & Carl Shapiro, Systems Competition and Network Effects, 8 J. ECON. PERSP. 93, 93 (1994) [hereinafter Katz & Shapiro, Systems Competition]. Their conception of “systems” includes any “collection of two or more components together with an interface that allows the components to work together,” and it therefore encompasses such combinations as nuts and bolts, camera bodies and camera lenses, and video components and video programming. Id. at 93. The concept of “systems technology” used in this Article is a distinct subset within the broad category of “systems” that Katz and Shapiro define.
Intergraph v. Intel\(^33\)

*Intergraph* arose out of an intellectual-property dispute between Intel, the world’s leading manufacturer of computer microprocessors, and Intergraph, a graphics workstation manufacturer whose products depend upon Intel technology.\(^34\) The controversy began in 1994, when Intel abruptly decided to move from an “open architecture” design, which allowed industry participants to build onto its microprocessor technology with ease, to a “closed architecture” design, which prevented these participants from incorporating the technology without Intel’s consent.\(^35\) If equipment manufacturers were to continue to build components and systems compatible with Intel technology, they would be dependent upon Intel’s agreeing to share its technical information with them—information that fell within the scope of its intellectual property. Thus, as the district court observed, “[t]his ‘closed architecture,’ for practical purposes, allow[ed] Intel, by exercising its intellectual-property rights in its ‘closed architecture,’ to wield absolute power over who will and who will not be allowed to participate in that part of the high-end computer industry that is based upon the [Intel] microprocessor.”\(^36\)

And wield this power it did. Initially, Intel freely shared information concerning its intellectual property with Intergraph, thereby allowing the company to continue developing workstations that utilized Intel microprocessors. By 1997, however, Intel had become concerned that Intergraph might be able to pursue patent infringement claims against it.\(^37\) To prevent this, the company proposed a contractual agreement that would have given it the right to use all of Intergraph’s patented technology without cost.\(^38\) When Intergraph balked, Intel responded by “summarily and unilaterally” cutting off all of Intergraph’s access to its technology and demanding that the company return all previously shared intellectual-property information.\(^39\) This left Intergraph, which like other manufacturers depended upon access to Intel’s technology, unable to produce profitable workstations. It could not switch to another microprocessor, for as the court explained: “Intergraph ha[d]... invested enormous financial and engineering resources to design and

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34. See id. at 1259-73.
35. See id. at 1261-62.
36. Id. at 1262.
37. See id. at 1266-67.
38. See id.
39. See id. at 1267.
build its products and systems based on Intel's CPUs.... As a result of the migration to Intel's CPUs, Intergraph [was] technologically and economically 'locked-in' to [them] for at least the next two to three years. Moreover, even if Intergraph had not been locked into the Intel technology, the recognized status of this technology as the industry standard would have substantially impaired Intergraph's ability to compete effectively using another microprocessor.

Significantly, Intel's actions not only injured Intergraph but also impaired competition. The primary reason for this was that the relationship between the two companies had recently become more than simply a supplier-customer relationship. Intel was in the process of entering Intergraph's segment of the workstation market, and the two companies had therefore become direct competitors. By terminating Intergraph's access to its microprocessors, Intel was attempting "to control and dominate competition in [the graphics subsystem and workstation] markets." Its efforts to eliminate Intergraph "depriv[ed] customers of alternative and improved technology in these markets, stifl[ed] innovation, reduc[ed] competition in price and quality, and impair[ed] competition generally."

Intergraph responded to Intel's termination of its access privileges with a barrage of legal claims. In its amended complaint, the company asserted twenty-three claims under a variety of legal theories, including fraud, breach of contract, patent infringement, and antitrust. This gave the district court a broad choice of frameworks for analyzing the dispute. Though it ultimately elected to focus on an antitrust framework, the court could just as easily have framed the transdoctrinal matter in other terms. At its core, Intergraph's suit presented simply another variant of the central issue that pervades intellectual-property law in general: the choice between strong property rights and open access to information. Either Intel's

40. Id. at 1264.
41. See id. at 1260 ("Intel's dominance in the market for personal computer CPUs is reflected in its name recognition among the computer buying public, the great majority of whom insist upon having a genuine Intel CPU in their computers.").
42. See id. at 1270 ("Intel has entered the graphics subsystem market and is now a direct competitor of Intergraph in that market."). Although the Federal Circuit disagreed with much of the district court's analysis, see infra notes 58-59 and accompanying text, it did not dispute this factual finding. See Intergraph Corp. v. Intel Corp., 195 F.3d 1346, 1355, 1359-60 (Fed. Cir. 1999).
43. Intergraph, 3 F. Supp. 2d at 1272.
44. Id.
45. See id. at 1258.
46. See id. at 1274-91 (granting preliminary injunction due to the "substantial likelihood" that Intergraph will prevail on its claims of monopolization, refusal to deal, and unlawful restraint of trade).
intellectual-property rights entitle it to share its microprocessing innovations as it sees fit, or the corporation is obliged to share them. Under these circumstances, intellectual-property issues and antitrust concerns collide, but this presents neither cause for concern nor analytical difficulty, as the principles of the two doctrines are more complementary than oppositional. Both exist to maximize social welfare through the promotion of innovation and competition.

Sensitive to this higher purpose, the Intergraph district court struck a compromise between strong property rights and open access. The court acknowledged the "strong" public interest in protecting economic competition that underlies the antitrust laws, and it recognized that Intel's refusal to share its technology had a significant anticompetitive effect. At the same time, it refused to extinguish Intel's intellectual-property rights, implicitly recognizing that such rights may play an important role in fostering innovation. Rather than eliminate these rights or allow Intel to exercise them in restraint of competition, the district court found a middle ground. It reaffirmed Intel's proprietary rights in its microprocessing technology but established that those rights would be protected only by a liability

47. The distinction between strong property rights and open-access requirements in this context is somewhat analogous to the distinction between "public" and "private" paradigms that James Boyle has articulated. See JAMES BOYLE, SHAMANS, SOFTWARE, AND SPELENS: LAW AND THE CONSTRUCTION OF THE INFORMATION SOCIETY 25-34 (1996).

48. See, e.g., Image Technical Servs. v. Eastman Kodak Co., 125 F.3d 1195, 1218 (9th Cir. 1997); Atari Games Corp. v. Nintendo of Am., Inc., 897 F.2d 1572, 1576 (Fed. Cir. 1990) ("[T]he aims and objectives of patent and antitrust laws may seem, at first glance, wholly at odds. However, the two bodies of law are actually complementary, as both are aimed at encouraging innovation, industry and competition.") (citing Loctite Corp. v. Ultrasel Ltd., 791 F.2d 861, 876-77 (Fed. Cir. 1985)); IP GUIDELINES, supra note 26, § 1 ("The intellectual-property laws and the antitrust laws share the common purpose of promoting innovation and enhancing consumer welfare."); cf. Twentieth Century Music Corp. v. Aiken, 422 U.S. 151, 156 (1975) ("The immediate effect of our copyright law is to secure a fair return for an 'author's' creative labor. But the ultimate aim is, by this incentive, to stimulate artistic creativity for the general public good."). For general discussions of the common impetus behind the antitrust and intellectual-property doctrines, see Joel M. Cohen & Arthur J. Burke, An Overview of the Antitrust Analysis of the Suppression of Technology, 66 ANTITRUST L.J. 421, 423-24 (1998); Willard K. Tom & Joshua A. Newberg, Antitrust and Intellectual Property: From Separate Spheres to Unified Field, 66 ANTITRUST L.J. 167 (1997).

49. In this way, the court's solution echoes the general compromise between the two options that intellectual property law as a whole represents. See supra text accompanying notes 25-26.

50. See Intergraph, 3 F. Supp. 2d at 1281-82; see also id. at 1271 (describing Intel's termination of information access as an "unreasonable and anticompetitive" restraint of trade).

51. But cf. infra Subsection III.B.1 (arguing that weakening intellectual-property rights may not diminish technological innovation).
rule, not by the usual property rule.

The court reasoned that because Intel possessed monopoly power in the microprocessor market, it had "affirmative duties as a monopolist not to misuse its monopoly power and to compete in a manner that does not unreasonably or unfairly harm competition." These duties, in its view, included the obligation to provide other companies with "[r]easonable and timely access to critical business information that is necessary to compete," regardless of whether that information was subject to intellectual-property protection. But this did not mean that Intel had to supply its technology for free—Intel retained the right to charge Intergraph for access to its intellectual property, as long as it did so in a nondiscriminatory matter (i.e., as long as it provided access to Intergraph "at the same time," "in the same manner," and on "the same terms" as it did to Intergraph's "similarly situated competitors"). The court's concerns about promoting competition led it to impose a liability rule: Intergraph had the right to gain access to Intel's systems technology, but it had to compensate Intel for that access.

Thus, in the original Intergraph decision, antitrust concerns define the parameters within which intellectual-property law operates. Intellectual-property entitlements grant exclusionary

52. The record showed that Intel had an 88% share of the market for high performance microprocessors and a 100% share of the market for Intel microprocessors, which the court deemed to be separate and relevant. See Intergraph, 3 F. Supp. 2d at 1260, 1275.
53. Id. at 1277.
54. Id. at 1278.
55. Id. at 1277, 1291-92. Significantly, the existence of similarly situated competitors allowed the court to avoid the valuation problems that commonly plague the imposition of liability rules. See infra Subsection III.B.4. See generally Calabresi & Melamed, supra note 15, at 1108-09; Robert Merges, Intellectual Property Rights and Bargaining Breakdown: The Case of Blocking Patents, 62 TENN. L. REV. 75, 77-78 (1994).
56. There is a significant distinction, however, between the original Calabresi-Melamed liability rule and the liability rule imposed here. Under Calabresi and Melamed's original conception, the amount of compensation is "a value determined by some organ of the state rather than by the parties themselves." Calabresi & Melamed, supra note 15, at 1091. In contrast, the Intergraph court did not set the price of compensation, though it did set the terms and conditions.
57. This is not to say that other areas of law do not also provide parameters. The use of intellectual-property rights is further constrained by contract law, see, e.g., McCoy v. Mitsuboshi Cutlery, 67 F.3d 917, 920 (Fed. Cir. 1995) ("[Intellectual property rights, like any other property rights, are subject to the contractual obligations of their owner and the applicable law."); tort law, see, e.g., Hunter Douglas, Inc. v. Harmonic Design, 153 F.3d 1318, 1331-37 (Fed. Cir. 1998) (discussing extent to which state tort law constrains the exercise of patent rights), and criminal law, see, e.g., United States v. United States Gypsum Co., 333 U.S. 364 (1948) (inquiring into whether patent license agreements had been used for criminal purposes). The point is that intellectual-property rights are not exempt from antitrust scrutiny, as has often been argued, see infra note 72, but rather are
rights to innovators, but they do not grant the right to engage in anticompetitive behavior. Therefore, when the denial of access to technology would raise serious antitrust concerns, the proprietary rights in that technology relax slightly, and the law shifts from a property-rule regime to a system of liability-rule protections. Although the Federal Circuit ultimately overruled the district court and vacated its injunction,\(^8\) it did not contradict these central principles. Rather, the Circuit based its holding on its belief that Intergraph had not sufficiently established the anticompetitive effects of Intel's conduct.\(^9\) Had such effects been demonstrated to the

subject to limitations from that body of law as well.

\(^{58}\) See Intergraph, 195 F.3d 1346 (Fed. Cir. 1999).

\(^{59}\) See id. at 1367. This belief was in turn based on the Circuit's questionable theory that if a monopolist in one market uses its monopoly power to injure a business with which it is competing in a second market, the injured competitor cannot succeed in an antitrust claim without showing that the monopolist possessed market power in the second market as well. See, e.g., id. at 1360. To justify its application of this theory to Intergraph's leveraging claim (i.e., Intergraph's allegation that Intel had used its monopoly power in the microprocessor market to gain a competitive advantage in the graphics subsystem and workstation markets, in violation of section 2 of the Sherman Act), the Federal Circuit cited two Eleventh Circuit precedents. See id. at 1360. The first, Aquatherm Indus., Inc. v. Florida Power & Light Co., 145 F.3d 1258 (11th Cir. 1998), held that a monopolist cannot be held liable for leveraging if it does not compete in the allegedly leveraged market. See 145 F.3d at 1262. It therefore has little relevance to the leveraging allegations against Intel, which was competing with Intergraph in the markets at issue. See supra text accompanying notes 42-44. The second case cited by the Federal Circuit in support of its theory was Amey, Inc. v. Gulf Abstract & Title, Inc., 758 F.2d 1486 (11th Cir. 1985). The Circuit claimed that Amey "stated that the use of a position in one market to gain an advantage in another market is not an illegal market restraint unless 'a significant fraction of buyers or sellers are [sic] frozen out of a market.'" Intergraph, 195 F.3d at 1360 (supposedly quoting Amey, 758 F.2d at 1503-04). In fact, however, neither the quoted material nor any paraphrase of it appears in Amey. The quote instead comes from the Supreme Court's decision in Jefferson Parish Hosp. Dist. No. 2 v. Hyde, 466 U.S. 2, 45 (1984), a case that concerned charges of anticompetitive vertical arrangements under section 1 of the Sherman Act, not monopolistic leveraging under section 2. These problems aside, the Federal Circuit's view of leveraging requirements under section 2 is not devoid of precedential or academic support. See, e.g., Spectrum Sports v. McQuillian, 506 U.S. 447, 459 (1993); Alaska Airlines, Inc. v. United Airlines, Inc., 948 F.2d 536, 547-49 (9th Cir. 1991); James May, Redirecting the Future: Law and the Future and the Seeds of Change in Modern Antitrust Law, 17 Miss. C. L. REV. (1996) (discussing the Chicago School's view of monopoly leveraging). The validity and wisdom of its view, however, is currently a matter of great dispute in both the federal judiciary and the legal academy. See generally HERBERT HOVENKAMP, FEDERAL ANTITRUST POLICY § 7.9 (2d ed. 1999); Louis Kaplow, Extension of Monopoly Power Through Leverage, 85 COLUM. L. REV. 515 (1985); Mark R. Patterson, Coercion, Deception, and Other Demand-Increasing Practices in Antitrust Law, 66 ANTITRUST L.J. 1, 80-88 (1997). Even if the view is correct, the Federal Circuit may have erred when, in its evaluation of possible anticompetitive effects, it failed to consider that upholding Intel's conduct towards Intergraph may pave the way for monopolist to take similar measures against its other competitors in the graphics markets, virtually all of whom are dependent on Intel microprocessors. See
Circuit Court's satisfaction, the decision of the district court would have stood.

(3) *In re Dell Computer Corporation*[^60]

A similar legal dynamic arose in the Federal Trade Commission’s (FTC’s) investigation of Dell Computer Corporation (Dell), where once again, the dispute centered around systems technology. The FTC alleged that Dell had engaged in “deceptive acts” and “unfair methods of competition” while participating in an organization that set industry standards for computer architecture.[^61] The organization, the Video Electronics Standards Association (VESA), had designated technology known as the “VL-bus” as the industry standard for bus design, and this technology had then been widely adopted.[^62] After the adoption of the VL-bus design standard, Dell asserted that it controlled a patent that gave it “exclusive rights to the mechanical slot configuration used on the motherboard to receive the VL-bus card.”[^63] Dell then attempted to enforce this patent, informing computer manufacturers that their implementation of the VL-bus technology violated Dell’s intellectual-property rights and demanding that these rights be recognized.[^64] According to Dell, these rights allowed it to exclude anyone it wished from the use of its technology. If manufacturers wanted to use the VL-bus standard, they had to negotiate their access to that standard with Dell, who retained the right to refuse such access or to demand compensation for it.

Under the framework of the original *Intergraph* decision, the resulting dispute between Dell and the computer manufacturers would not be difficult to resolve. As with Intel, Dell’s intellectual-property rights gave it control of a technology that other industry participants needed to compete and survive. There was a substantial threat that, by preventing certain manufacturers from accessing this technology, Dell could both stifle competition and exclude its rivals. The question was: Should Dell’s property rights be upheld in their strong, exclusionary form, or were the interests in open access and competition sufficient to trump those rights? Based on these facts alone, the *Intergraph* solution would be to strike a compromise: Dell would retain its proprietary rights in the technology but be able to enforce them only through liability rules. Although Dell would then

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[^60]: *Intergraph*, 3 F. Supp. 2d at 1270-71.
[^64]: *See id.*
be unable to exclude others from using the VL-bus, it could force them to compensate it for this use.

There was, however, a significant twist in the Dell case that distinguished it from Intergraph. Not only did Dell retain intellectual-property rights that arguably allowed it to control access to the VL-bus technology, but as a member of VESA, it had been an active participant in the decision to adopt that technology as the industry standard.65 Dell representatives had been on the VESA committee that approved the VL-bus standard.66 Moreover, these representatives had, consistent with regular VESA practice, repeatedly certified in writing that the proposed standard did not “infringe on any trademarks, copyrights, or patents” that Dell possessed.67 The purpose of requiring such certifications was to ensure that no VESA member would be able to impede access to the technological standard adopted—precisely what Dell then attempted to do.

The FTC determined that because Dell had misrepresented its intellectual-property rights during the standard-setting process, the company had forfeited the benefits to which these rights would normally entitle it.68 However, its decision to deny Dell the ability to wield these rights in an exclusionary manner was based upon considerations that would have applied even if no misrepresentation had occurred. The FTC alleged that Dell’s actions constituted an unreasonable restraint of competition because:

(a) Industry acceptance of the VL-bus design standard was hindered because some computer manufacturers delayed their use of the design standard until the patent issue was clarified.

(b) Systems utilizing the VL-bus design standard were avoided due to concerns that patent issues would affect the VL-bus’ success as an industry design standard.

(c) The uncertainty concerning the acceptance of the VL-bus design standard raised the costs of implementing the VL-bus design as well as the costs of developing competing bus designs.

(d) Willingness to participate in industry standard-setting efforts

65. See id.
66. See id. ("[B]y June 1992, VESA’s Local Bus Committee, with Dell representatives sitting as members, approved the VL-bus design standard.").
67. Id.
68. See id.; Dell Consent Agreement, 60 Fed. Reg. at 57872 (citing Potter Instrument Co. v. Storage Tech. Corp., 641 F.2d 190 (4th Cir. 1981)); cf. Studiengesellschaft Kohle v. Eastman Kodak Co., 616 F.2d 1315, 1325 (5th Cir. 1980) (holding that the laches defense may be invoked in patent infringement suits “where the plaintiff has unreasonably and inexcusably delayed in prosecuting its rights and where that delay has resulted in material prejudice to the defendant").
have [sic] been chilled.  

Suppose that Dell had not directly participated in the standard-setting process and that VESA had nonetheless selected the VL-bus design as the industry standard. Suppose further that, following the adoption of this standard, Dell had come forward and begun asserting its patent rights against manufacturers who were implementing the VL-bus in their products. Although no fraud or misrepresentation would have occurred, the competitive concerns enumerated in the FTC complaint would remain valid.  

Under the FTC's reasoning, Dell's exertion of its patent privileges is anticompetitive regardless of the company's prior involvement in the standard-setting proceedings. The theory implicit in the FTC's resolution of this dispute is therefore identical to the theory at work in Intergraph v. Intel: When access to systems technology is vital to industry competition, such access cannot be restricted through the exclusionary use of intellectual-property rights. Had Dell not engaged in deliberate fraud, it would have retained the ability to enforce its patent rights, but these rights would have been protected merely by a liability rule, not by the property rule that typically applies. By engaging in fraud, however, Dell lost the right to enjoy even this degree of protection, and its patents were effectively terminated.

(4) Pinpointing the doctrinal shift of Intergraph and Dell Computer

Intergraph and Dell Computer represent a subtle but important shift in the law—a movement away from the automatic imposition of property-rule protections in intellectual-property regimes. Before examining the impetus behind this shift and its merits, it is important to make the character of the shift as clear as possible.

In both Intergraph and Dell Computer, the legal system responded to the choice between strong property rights and open access with a liability-rule solution. These cases imply that antitrust concerns act as binding constraints upon the scope of intellectual-property entitlements in technology industries; when exclusionary

70. See also Federal Trade Comm'n, Dell Computer Settles FTC Charges; Won't Enforce Patent Rights for Widely Used Computer Feature, Nov. 2, 1995, available in 1995 WL 641656 (news release stressing the general importance of open-access standards in high-technology industries).

71. The existence of the standard itself, however, is important to the FTC's reasoning. See infra notes 84-85 and accompanying text.

72. They may also constrain entitlement use more generally, though that is a subject beyond the scope of the present inquiry. Note also that this conception of the relationship between antitrust and intellectual-property doctrine is at odds with the traditional conception, which views intellectual-property rights as state-sanctioned monopolies that
entitlements can impede competition and innovation, the law moves to a system of liability rules that ensure access to the technology at issue.

There is, however, a central difference between the operation of the liability rule in the systems-technology context and the operation of such rules in most other contexts, including compulsory-licensing regimes and eminent-domain proceedings. The difference stems from the distinction between ownership and access. As a number of scholars have observed, the state’s eminent domain power is essentially a system of liability-rule protections. This power permits the state, in certain circumstances, to force property owners to relinquish their land for a price. When the state exercises this power, title in the land transfers from one party to another, the private owner loses all rights to the land, and the state gains complete control of it. Compulsory licensing also functions as a liability-rule system, as it permits parties to force patent holders to share their technology in return for compensation. In that context, the party “protected” by the liability rule does not lose her ability to exploit the property, but the party receiving the property still receives it in full, in the sense that his ability to control and exploit it is generally coextensive with that of the original owner. There is one exception, however, as the property recipient typically does not enjoy licensing privileges, which remain within the original owner’s exclusive control. With the form of liability rule implemented in Intergraph, there can be an even greater disparity between the rights of the original owner and those of the compensating party. What matters in systems-technology disputes is that the compensating party receive access to the property at issue, not ownership of the property itself. For instance, in Intergraph, it was important for Intergraph to be unimpeded in its ability to make products compatible with Intel’s technology, not necessarily for it to have full information about that

trump the competitive concerns embodied in the antitrust laws, see e.g., ERNEST GELLHORN & WILLIAM E. KOVACIC, ANTITRUST LAW & ECONOMICS 409 (4th ed. 1994); Cohen & Burke, supra note 48, at 423 (“For many years, courts have suggested that there is a “conflict” or “tension” between the intellectual-property laws and antitrust laws. One set of laws was viewed as creating monopolies … and the other sought to restrain and limit monopolies.”) (citing, inter alia, Simpson v. United Oil Co., 377 U.S. 13, 24 (1964); Chrysler Motors v. Auto Body Panels, 908 F.2d 951, 954 (Fed. Cir. 1990)), even more than the conception that is now emerging, see supra note 48 and accompanying text.


74. See sources cited supra note 73.

 technology.76

The differences among these various liability-rule schemes can be conceptualized within a simple general framework. Three different types of ownership rights can be at stake in technological-property disputes: (1) the right to access to the technology, (2) the right to full information about the technology, and (3) the right to control the disposition and dissemination of the technology. The precise content of these rights, particularly the first two, may vary from case to case. Because access is a continuous variable, and because meaningful access takes different forms in different industries, it is difficult to define a legal standard for it in the abstract. In Intergraph, the district court determined that a nine-part injunction was necessary to guarantee meaningful access to Intel's microprocessor technology.77 The injunction required, inter alia, that Intel provide Intergraph with product design information, samples of microprocessor prototypes, advanced product allocations, and inclusion in its marketing events.78 In Dell Computer, however, the FTC determined that meaningful access to the VL-bus technology could be ensured merely by barring Dell from pursuing patent infringement claims against rival manufacturers.79 Because the design specifications of the VL-bus standard were already known throughout the industry, no further measures were necessary.

These cases illustrate that the appropriate standard for determining whether access to a technology exists is not rigid and absolute. Rather, a functional approach is necessary: a company possesses access to a technology if it can manufacture commercially viable products that incorporate or are compatible with that technology.80 Similarly, a functional standard is necessary for

76. Cf. Friedman, supra note 24, at 1119-20 (contrasting the employment of a dominant technology with the employment of another technology that is compatible with the dominant technology). It is true that the distinction between ownership and access becomes somewhat fuzzy in Intergraph, as Intergraph arguably requires full licensee privileges to manufacture compatible products, but this will not necessarily be the case in all such circumstances.


78. See id.


80. Note that this standard has both informational and temporal components. As the Intergraph court emphasized, it was not enough that Intergraph simply receive the technological information necessary for the manufacture of compatible products. It was also necessary that Intergraph receive this information at the same time as its competitors. Given the pace of the industry, a delay of as little as a month "would prevent Intergraph from maintaining a competitive presence in the . . . market" and therefore render its access meaningless. Intergraph, 3 F. Supp. 2d at 1269. Note also that there is some ambiguity inherent in a functional standard of this sort—reasonable parties may disagree over whether a particular measure is necessary for technological access.
determining whether a company possesses "full information" about a particular technology. Although the courts have yet to adopt such a standard, one could easily be derived from the body of law that governs patent disclosures. Unlike the right to access a technology and the right to full information about a technology, the right to control the disposition and dissemination of a technology is straightforward. Either a company possesses the authority to share and license a particular innovation, or it does not.

If a liability regime conferred all three of these rights on the compensating party, the result would be a system much like the eminent domain system that applies to real property, in which there is a total transfer of ownership and control from the original rightsholder to the compensator. Compulsory-licensing regimes

81. The primary context in which courts would need such a standard is that of compulsory-licensing disputes. Statutory compulsory-licensing provisions, however, are extremely rare in American law and almost never give rise to legal conflicts. See Kenneth J. Nunnenkamp, Compulsory Licensing of Critical Patents Under CERCLA?, 9 J. NAT. RESOURCES & ENVTL. L. 397, 400-07 (1994). Judicially compelled licensing is relatively more common, but it usually comes about through a court's refusal to issue an injunction against an alleged infringer. See id. at 412-13. In these cases, the licensees already possess sufficient technological information, so the courts do not need to develop disclosure standards. Should compulsory licensing become a more prominent feature of American law, however, the courts will need to develop more definite standards for the amount of information that licensors must divulge.

82. Upon applying for a patent, an innovator must disclose enough technical information so that the public can fully exploit the innovation once the patent expires. See generally DONALD S. CHISUM, PATENTS §§ 7.01-.05 (1994) (discussing the purposes and intricacies of patent disclosure requirements). To this end, federal law requires each patent applicant to file a written "specification." 35 U.S.C. § 112 (1999). The law states that:

The specification shall contain a (1) written description of the invention and (2) of the manner of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and (3) shall set forth the best mode contemplated by the inventor of carrying out his invention.

Id. These requirements could form the basis for a standard for determining whether a compelled licensor had provided its licensees with sufficient information.

83. In such a system, the recipient would gain the ability to disseminate the technology, and the innovator might or might not retain these rights as well. Admittedly, it is hard to imagine a circumstance in which we would want an innovator to share technology with parties who were willing to pay, grant those parties the right to share the technology with others, and lose the ability to share it with others herself. Nonetheless, there could be situations in which this might occur. For instance, assuming that the government could exercise its eminent domain power over intellectual property, it might wish to use that power to remove a particular technology from the private sector. This possibility is not as outrageous as it might sound. Cf. Lionel Marks Lavenue, Patent Infringement Against the United States and Government Contractors Under 28 U.S.C. § 1498, in the United States Court of Federal Claims, 2 J. INTELL. PROP. L. 389, 393-96 (1995) (arguing that the eminent domain power does extend to intellectual-property
stop short of this and confer only the first two types of rights on compensating parties: the right to access and the right to full information. In systems-technology contexts, by contrast, the recent cases point to a liability rule that confers only the access right. Thus, the shift that occurs in Intergraph and Dell Computer is a shift to the least intrusive type of liability rule possible, one that allows innovators to retain significant exclusive rights in their technology.

Under what circumstances do competitive concerns become sufficient to justify this shift to liability rules? At least a partial answer can be found in the commonalties of Intergraph and Dell Computer. Both cases involved standardized systems technology, and the existence of standardization was crucial to the outcome of each dispute. In Intergraph, access to the microprocessor technology was vital because that technology had been adopted as the industry standard, so Intergraph could not survive without incorporating it into its systems.8

Similarly, Dell's exclusionary actions were problematic not because they impeded access to systems technology, but because they impeded access to systems technology that had been endorsed as a standard.8

entitlements). Consider, for instance, the argument that it is contrary to the public interest for private parties to develop encryption techniques capable of thwarting law enforcement officials. One way to eliminate the risks of private experimentation with encryption technology while continuing beneficial research might be to have the government assert control over such research through an eminent-domain-like acquisition.

84. Indeed, the district court's repeated characterization of Intel as a monopolist implicitly depended upon the status of its technology as a standard. Cf. Intergraph Corp. v. Intel Corp., 3 F. Supp. 2d 1255, 1277 (N.D. Ala. 1998) ("Accordingly, the court concludes that Intel has violated its affirmative duties as a monopolist not to misuse its monopoly power ... "). By definition, one cannot exert monopoly power if the market contains reasonable substitutes for one's product. See, e.g., United States Dep't of Justice & Federal Trade Comm'n, 1992 Horizontal Merger Guidelines, reprinted in 4 Trade Reg. Rep. (CCH) ¶ 13,104 (Apr. 7, 1992) (defining the relevant product market for determinations of monopoly power). Thus, if it had been feasible for Intergraph to compete using an alternative to Intel's microprocessing technology (i.e., if Intel's technology had not been adopted as an industry-wide standard), it would not have been possible for the court to characterize Intel as a monopolist. Therefore, because the court relied heavily upon this characterization in making its ruling, the ruling was implicitly dependent upon the standardized nature of the Intel technology.

85. The FTC made clear that Dell would have been entitled to exercise its intellectual-property rights in an exclusionary manner had VESA selected a different technology to be the standard. See Federal Trade Comm'n, News Release, June 17, 1996, available in 1996 WL 328839.

There was also another important similarity between the two cases. In both of them, circumstances were such that the court (or, in the case of Dell Computer, the FTC) could impose a liability rule without becoming entangled in the valuation problems that typically accompany such rules. See discussion supra note 55 and accompanying text; discussion supra Subsection I.B.3. The importance of this will be discussed in more detail below. See discussion infra Subsection III.B.4.
The effect of the doctrinal shift towards liability rules is therefore to promote the development of open-access standards in systems technology. The doctrine seeks to ensure that all market participants can make their products and innovations compatible with this technology. As a consequence, the doctrine may also promote standardization itself, as it averts the possibility that parties will be excluded from a technology and respond by developing competing standards, or it may reduce standardization, as it allows firms to gain information about their rivals' technology that they can use to develop competing standards.

86. Note again that it does not seek to ensure that all market participants have access to internal information about such technology or that their control of the industry standard becomes equal to that of the technology's developer.

87. Cf. Diane W. Savage, Intellectual Property Due Diligence in Acquisitions of Technology Companies, 985 PLI/CORP 329, 350 (1997) (arguing that patent-sharing arrangements can be anticompetitive when "they involve a large percentage of firms that could be expected to develop competing technologies"). To the extent that the doctrine promotes standardization in this manner, however, the impact may not be great because, in many cases, the development of a competing standard will be too costly to be feasible for an excluded firm. See infra note 99.

88. It is important not to confuse standardization with compatibility. Standardization exists when a large consumer base uses a single technology. Compatibility concerns the relationship between technologies, and it exists when different technologies can utilize identical units of a complementary technology. Cf. Michael L. Katz & Carl Shapiro, Technology Adoption in the Presence of Network Externalities, 94 J. POL. ECON. 822, 823 (1986) [hereinafter Katz & Shapiro, Technology Adoption] (providing a similar definition). The matrix below illustrates the distinction between the two concepts with an example drawn from the Intergraph case. It depicts possible combinations of standardization and compatibility for microprocessor technology (an analogous matrix could be used to depict operating system technology, VL-bus technology, etc.). Intel, Motorola, and IBM are assumed to be the three microprocessor manufacturers, with their respective market shares indicated by their size. Real 3D, Compaq, and Intergraph are assumed to be hardware designers whose systems require microprocessors. A line between a hardware designer and a microprocessor manufacturer indicates that the former can utilize the technology of the latter. For the sake of simplicity, the grid only depicts compatibility relationships that include the Intel microprocessor technology—compatibility with Motorola products and IBM products is not shown.
Having defined the nature and implications of the doctrinal shift at work in *Intergraph* and *Dell Computer*, it is appropriate to inquire into both the impetus behind this shift and its desirability. Why does the tension between strong intellectual-property rights and open-access standards keep arising in the context of systems-technology disputes? Is it significantly different in this context than in other intellectual-property contexts? And should the legal system respond by striking a compromise that rewards innovators while encouraging industry-wide compatibility? These are the issues taken up in the following parts.

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Box 1 depicts the case in which Intel's technology is standardized (i.e., it has an overwhelming market share) and fully compatible with existing hardware systems. Every hardware manufacturer is able to design products that incorporate the standardized Intel microprocessor. In Box 2, Intel's microprocessor remains fully compatible with the various hardware platforms, but microprocessing technology is not standardized—Intel, Motorola, and IBM each control a third of the market (and by assumption, each uses a different technological design). In Box 3, standardization exists, but compatibility is limited. Compaq and Real 3D can access and incorporate Intel technology, but Intergraph cannot and risks being frozen out of the market. This is the situation that produced the actual *Intergraph* litigation. Box 4 depicts a situation in which neither standardization nor compatibility (at least, not full compatibility) exist. Intergraph cannot design products that work in conjunction with Intel technology, but it will remain viable if it can utilize the technology of Intel's rivals. Although the example assumes that each microprocessor manufacturer uses a different technology, this need not be the case. Different manufacturers may produce products that employ identical technology, and if they do, technological standardization can occur without any one firm dominating the market.

Also, although standardization and compatibility can exist independent of one another, the two are not always unrelated. For instance, industries can achieve interproduct compatibility by standardizing their interface specifications.
II. Why Access Disputes Permeate Systems Technology: An Examination of Market Characteristics

It is no accident that the conflict between strong property rights and open standards continues to arise in systems-technology industries, and the reasons for its persistence merit attention. Because this conflict underlies all of intellectual-property law to some extent, its pervasiveness in systems-technology disputes should not be entirely surprising. In the systems-technology context, however, the issue manifests itself in a somewhat novel form—and is particularly likely to be the subject of legal controversy—due to four characteristics of the markets for this technology: network externalities, interconnectivity, rapid innovation, and excludability.

A. Network Externalities

First, and perhaps most importantly, systems-technology markets exhibit what economists refer to as "network effects" or "network externalities." Network externalities arise when the utility that a user derives from a product increases with the number of other individuals who also use the product. These externalities have several sources. Direct network externalities exist when the number of users affects the quality of the product itself. Communications products such as telephones and fax machines exhibit this type of effect, as these products become more useful as more individuals obtain them. Indirect network externalities exist when the number of users affects the availability of complementary products and services, which in turn affects the value of the core product. For example, if more individuals purchase laser disc players, film distributors will find it more profitable to release their movies in laser disc format, which will result in more movies being available in that format, which will increase the value of the players to their users. Similarly, if more individuals come to own laser disc players, the availability of repair and maintenance services can be expected to increase as well, which again will add to value of the players themselves.

89. See Michael L. Katz & Carl Shapiro, Network Externalities, Competition, and Compatibility, 75 AM. ECON. REV. 424, 424 (1985) [hereinafter Katz & Shapiro, Network Externalities].


91. See, e.g., Jeffrey Church & Neil Gandal, Network Effects, Software Provision, and Standardization, 40 J. INDUS. ECON. 85, 85 (1992) ("The benefit from consuming durables often depends on the consumption of supporting or complementary goods."); Katz & Shapiro, Network Externalities, supra note 89, at 424; Shurmer & Lea, supra note 90, at 379.
Systems-technology markets contain both direct and indirect network externalities. To the extent that computer users wish to use their platforms to communicate electronically with others, the utility of a system increases with the number of users who utilize compatible technologies. Furthermore, the greater the number of users that exist for a systems-technology product, the more likely it is that hardware and software producers will develop goods compatible with that product, and the more likely it is that support services for that product will be widespread.\footnote{2}

Network externalities push systems-technology markets toward standardization. Consumers prefer technologies that allow them to participate in large user networks and that benefit from thick markets of complementary goods and services.\footnote{3} Because of these preferences, producers have strong incentives to create products that provide these benefits.\footnote{4} Thus, dominant technologies tend to become entrenched, and when no technological standard dominates, "developers and consumers are both likely to gravitate towards the system they think will come to dominate, helping to ensure that that system does in fact become dominant."\footnote{5} This dynamic, which economists term "tipping,"\footnote{6} results in a "natural tendency towards de facto standardization" in markets with strong network effects.\footnote{7}

Whether the social benefits of such standardization outweigh its costs is subject to dispute.\footnote{8} But once a technological standard exists, hardware and software manufacturers will not be able to compete unless their products are compatible with it.\footnote{9} Exclusion from

\footnote{2. These dynamics work in the other direction as well: The greater the number of complementary products and support services that exist for a systems technology product, the more attractive it will be to consumers, and the more widespread it is therefore likely to become. \textit{Cf.} Church & Gandal, \textit{supra} note 91, at 85 ("The decision of software developers regarding which technology to provide software for affects the market share of hardware technologies, or alternatively, the size of each network.").}

\footnote{3. See, e.g., Joseph Farrell & Garth Saloner, \textit{Standardization, Compatibility, and Innovation}, 16 RAND. J. ECON. 70, 70-71 (1985); Katz & Shapiro, \textit{Network Externalities, supra} note 89.}

\footnote{4. See \textit{Katz & Shapiro, Externalities, supra} note 89.}

\footnote{5. Mark A. Lemley, \textit{Antitrust and the Internet Standardization Problem}, 28 CONN. L. REV. 1041, 1049 (1996). Lemley makes this comment in the context of Internet technology, but it applies equally to systems technology in general.}


\footnote{7. Katz & Shapiro, \textit{Systems Competition, supra} note 32, at 95.}

\footnote{8. \textit{See infra} Subsection III.A.1.}

\footnote{9. A firm unable to produce compatible technology would only be able to compete successfully by developing and promulgating a new standard compatible with its own products. While this might produce beneficial competition in the "market" for standards,}
standardized systems technology is therefore tantamount to exclusion from the market itself. With access to this technology vital to industry participants, exclusion is almost certain to produce litigation. This provides a partial explanation of why conflicts between intellectual-property rights and access demands are so prominent in systems-technology markets.

B. Interconnectivity

A second notable feature of systems technology is its high level of interconnectivity. Individual systems-technology products, be they hardware or software, have little value in and of themselves. Rather, they combine with other complementary and supplementary components to form a complete computing system, which generally consists of a CPU, memory, a system bus, input/output ports, various peripherals, an operating system, and a variety of application programs. All of these components must be compatible with one another for the system to function, and all of them are typically manufactured by different producers.

Thus, once a technological standard comes to govern a particular component, producers of the other components must have access to that standard for their products to remain successful. The existence of the creation and promotion of a new standard can be a rather Herculean task and is not a feasible option for most industry participants. Persuading users to switch from one standard to another is particularly difficult in technology markets because these markets typically exhibit path dependence, meaning that once consumers invest in a particular product (or standard), they are unlikely to make choices in the future that require them to abandon that product. See Lemley, supra note 95, at 1050; Richard T. Rapp, How Economists See Competition Problems in High-Technology Industries, C137 ALI-ABA 139, 148-50 (1995); Mark J. Roe, Chaos and Evolution in Law and Economics, 109 HARV. L. REV. 641 (1996). Path dependence occurs in systems technology markets for at least two reasons: (1) individuals who work to become familiar with a particular system, and who invest in equipment and training specific to it, will be reluctant to switch to another system, and (2) individuals often create large amounts of data that can only be accessed on their particular system, which again makes them reluctant to switch to another system (unless their databases and files will be readable in the new system). See Lemley, supra note 95, at 1050; Rapp, supra, at 149.


101. As one commentator has noted, "[f]or creators of computer programs, achieving interoperability with particular computers and operating systems is necessary for commercial survival." Julie E. Cohen, Reverse Engineering and the Rise of Electronic Vigilantism: Intellectual Property Implications of "Lock-Out" Programs, 68 S. CAL. L. REV. 1091, 1093 (1995). This statement is as true for hardware developers as it is for
of network externalities makes standardization a likely outcome in systems-technology markets, and the high level of interconnectivity in such markets means that once a technology becomes standardized, producers of a wide variety of complementary and supplementary products will depend on access to it. An attempt by the developer of the standardized technology to limit this access can therefore threaten the commercial existence of numerous parties throughout the industry. This dynamic compounds the exclusionary potential of intellectual-property rights and contributes to the prevalence of property-rights/open-access disputes involving systems technology.

C. Rapid Innovation

In general, innovation and product evolution occur extremely rapidly in high-technology markets, and systems-technology markets are no exception. Technology companies must constantly upgrade their products or introduce new products if they wish to remain competitive. Perhaps the most notable evidence of this phenomenon accompanied the release of Microsoft’s Windows 95 operating system software. As this operating system became the industry standard, hardware technology that could not meet its processing-speed, memory, and hard-disk requirements quickly became obsolete, as did software that was not able to run in the Windows 95 environment.

The rapid pace of innovation in computer industries has two important effects that increase the likelihood of legal disputes over access to systems technology. First, parties who hold intellectual-property rights in systems technology need not completely exclude other parties from this technology to cause them substantial harm. Merely delaying access—by prolonging licensing negotiations, for instance—can severely damage or eliminate companies who produce complementary products. Second, companies that produce

software developers.

102. See, e.g., Robert Prentice, Vaporware: Imaginary High-Tech Products and Real Antitrust Liability in a Post-Chicago World, 57 OHIO. ST. L.J. 1163, 1171 (1996). See generally Rapp, supra note 99, at 145-48. Note that although the rate of technological development is rapid, the rate at which standards are adopted may not be. The latter rate will depend on such factors as the strength and number of competing standards and the ability of industry participants to coordinate with one another.

103. See, e.g., Prentice, supra note 102, at 1171.


complementary products do not have the option of waiting for intellectual-property rights to expire. While these rights are only of limited duration, they endure for a number of years, at the end of which the systems technology is almost certain to be obsolete. Access will then be meaningless, and any excluded firms that depended upon such access will have long since vanished from the market.

D. Excludability

Developers of systems technology can easily exclude other parties from accessing their products, even without the assistance of the legal system. The two primary methods for this are secrecy and exclusionary engineering.

Exclusion through secrecy is possible because the development of products compatible with a given systems technology may require detailed internal information about that technology. Developers may not be able to discern this information simply by studying the technology, the research required for such discernment may be too costly, or this research may be so time-consuming that, given the rapid pace of the industry, the information will be obsolete by the time it is obtained. Under any of these conditions, other developers will be unable to produce compatible products unless the developer of the systems technology relinquishes its internal information.

This dynamic is possible due to the complex nature of the technology; in most industries, secrecy is not a viable method of exclusion because once a product is on the market, anyone can examine it and design compatible products.

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106. In the case of most patents, the duration is twenty years. See 35 U.S.C. § 154 (Deering's Supp. 1999).

107. But cf. Richard C. Levin et al., Appropriating the Returns from Industrial Research and Development, 3 BROOKINGS PAPERS ON ECON. ACTIVITY' 783, 810 tbl.9 (1987) (finding that major patented innovations were imitated by rival firms within three or fewer years in a majority of the industries surveyed).

108. Cf. Affidavit of Wade Patterson ¶ 7, quoted in Intergraph, 3 F. Supp. 2d at 1265 n.28 (“Information [concerning Intel's microprocessor technology] which was no longer contained in product data books, but necessary for product development, was migrated into packets of confidential information . . .”).

109. For instance, consider the technology involved in railroad transportation. The "systems technology" in rail systems are the rails themselves, which determine what vehicles can travel the railroad and what other transportation systems (i.e., other rail networks) the railroad can connect to. As in the digital systems technology context, there are significant network externalities in the choice of which type of rail to use (if all railroads use the same or compatible rails, they will be accessible to all trains and able to connect to one another). It is therefore unsurprising that a uniform standard for rails emerged early in the history of railroad development. See Dennis W. Carlton & J. Mark Klamer, The Need for Coordination Among Firms, with Special Reference to Network
Developers can also achieve exclusion through certain engineering tactics. A company producing a systems technology can design it to be compatible only with certain products, either by designing it to accept only products with particular characteristics or by designing it not to accept products with particular characteristics.\footnote{110} Again, exclusion of this sort is possible only because of the complex nature of the underlying technology.

Through both secrecy and exclusionary engineering, systems-technology developers can often prevent other market participants from accessing their products. When this occurs, those seeking access must persuade the developers to share their intellectual property with them, and the developers may refuse, thereby instigating a legal dispute over whether intellectual-property rights permit such refusal.

E. Summary

The combination of network externalities, interconnectivity, rapid innovation, and excludability in systems-technology markets creates a situation in which intellectual-property rights and access demands are likely to come into conflict. Network externalities cause systems technology to become standardized, which makes access to the technology vital to industry participants. The high level of interconnectivity increases the number of participants that require such access, and the rapid pace of the market necessitates that they obtain access as quickly as possible. The nature of systems technology, however, enables its designers easily to exclude others from the technology, so that those seeking access can obtain it only if the designers themselves share their intellectual property with them.

Of course, intellectual-property rights and access demands still would not come into conflict if designers were in fact willing to share their intellectual property. But because exclusion typically allows

\footnote{Industries, 50 U. CHI. L. REV 446, 456-57 (1983). It would not be possible, however, for the producer of railroad tracks to exclude certain vehicles from using them (or to exclude other rail networks from connecting to them) simply through secrecy, as anyone could simply examine the physical details of the tracks and then manufacture a vehicle capable of traveling on them. Exclusion through secrecy is only possible when the underlying technology is sufficiently complex.}

\footnote{110. See, e.g., Sega Enter. Ltd. v. Accolade, Inc., 977 F.2d 1510 (9th Cir. 1992) (adjudicating a dispute involving a Sega computer system designed not to accept cartridges that lack a secret “compatibility code” found only in Sega-manufactured cartridges); Atari Games Corp. v. Nintendo of Am. Inc., 975 F.2d 832 (Fed. Cir. 1992) (analyzing a similar situation); Sun Microsystems v. Microsoft Corp., No. C 97-20884 RMW (PVT), 1998 U.S. Dist. LEXIS 17985 (N.D. Cal. filed Oct. 14, 1997) (alleging that Microsoft engineered its Java system so that it would not accept programs written in Sun’s programming language); cf. United States v. Microsoft Corp., 84 F. Supp. 2d 9, 49-54 (D.D.C. 1999) (finding that Microsoft attempted to bias its operating systems against supporting Internet browsers made by competing companies). See generally Cohen, supra note 101.}
designers to increase their profits—indeed, a central premise of the intellectual-property system is that exclusive rights enhance returns on investment—that they have little incentive to provide free access to their creations.

III. Are Liability-Rule Protections for Systems Technology Socially Beneficial?

The preceding discussion has focused on the private value of access and the private cost (to the entitlement holder) of achieving it. The discussion will now turn to the social benefits and costs of technological access. The same market characteristics that foster access disputes in systems-technology industries suggest that it would be socially beneficial to resolve these disputes with a liability-rule approach—the very approach that Intergraph and Dell Computer exemplify. At the same time, however, there are several potential costs to this approach. The discussion that follows will weigh the potential social benefits and potential social costs of a liability-rule regime.

A. Factors That Counsel in Favor of Liability Rules

As discussed in Part I, weakening intellectual-property entitlements by adopting liability-rule protections would increase compatibility and decrease exclusion in systems-technology markets. The question, then, is whether these effects are socially desirable given the particular characteristics of those markets. Each characteristic discussed in Part II suggests that these effects would indeed be beneficial.

(1) Network externalities

Network externalities produce a substantial bias towards standardization in systems-technology industries, though it is uncertain whether the resulting level of standardization will be socially optimal. Standardization can provide benefits to consumers by lowering the transaction costs associated with collecting product information and by assuring them some minimum level of quality in their purchases. It also increases the benefit of network

111. See supra text accompanying note 23.

externalities by funneling users onto the same network, thereby increasing both network size and the demand for complementary products.\textsuperscript{113} In fact, some degree of standardization is necessary if user networks are to exist at all. Furthermore, once a standard is established, it may enhance entry and competition in both the primary and complementary markets, as market stability will increase and the danger of rapid obsolescence will diminish.\textsuperscript{114}

On the other hand, standardization can facilitate a range of anticompetitive practices: firms that control standards can use them to exclude their rivals and thereby monopolize markets,\textsuperscript{115} and standards can be vehicles through which firms collude with each other, both tacitly and explicitly.\textsuperscript{116} In addition, technological standardization can stifle innovation in several ways. First, even if a particular standard is optimal when adopted,\textsuperscript{117} the market can become "locked in" to the standard so that it remains in use long after superior technologies have become available.\textsuperscript{118} Second, the adoption of a standard can prevent superior technologies from becoming available by narrowing the innovative endeavors of

\textsuperscript{113} See Gates, supra note 112, at 598-99; Leeds, supra note 112, at 645-48.

\textsuperscript{114} Cf. Gates, supra note 112, at 599 ("In an industry plagued by memories of the bloody VHS/Beta video tape war, the [videodisk design] standard may be procompetitive because if (1) encourages manufacturers to enter the disk player market by allaying fears of obsolescence, (2) alleviates the risk of producing videotapes because the single standard ensures consumer acceptance . . . .").

\textsuperscript{115} See Gates, supra note 112, at 598-600; discussion supra Section II.D.

\textsuperscript{116} See Gates, supra note 112, at 600 (noting that standards can reduce product complexity and thereby assist cartels in policing their members); Leeds, supra note 112, at 649; Albert N. Link, Market Structure and Voluntary Product Standards, 15 APPLIED ECON. 393,395 (1983).

\textsuperscript{117} In certain circumstances, markets may adopt a technology as a standard even though it is not the best option available. See, e.g., Joseph Farrell & Garth Saloner, Installed Base and Compatibility: Innovation, Product Preannouncements, and Predation, AM. ECON. REV. 940, 942 (arguing that "excess momentum in markets can cause consumers to adopt new standards that are inferior to the old ones"); Michael L. Katz & Carl Shapiro, Product Introduction with Network Externalities, 40 J. INDUS. ECON. 55 (1992) (arguing that when network externalities exist, firms have incentives to introduce their products to the market sooner than is socially desirable); Katz & Shapiro, Technology Adoption, supra note 88, at 831 ("When standardization does occur, the socially optimal technology may not be selected; there are biases in the market's choice of a standard."); Garth Saloner, Economic Issues in Computer Interface Standardization, 1 ECON. INNOVATION & NEW TECHNOLOGY 135, 153 (1990) (noting that many commentators believe the Beta videotape standard was superior to the VHS standard that prevailed against it).

\textsuperscript{118} See discussion supra note 99 (discussing path dependence in technology industries); Gates, supra note 112, at 601-12 (discussing manner in which standards produce economic and psychological barriers to the acceptance of new technology); Katz & Shapiro, Technology Adoption, supra note 88, at 830-33.
competing firms\textsuperscript{119} and by reducing the standard-developer's incentives to improve its technology.\textsuperscript{120}

Given these various costs and benefits, the optimal level of standardization in any particular industry is unclear, and markets may not produce this optimal level on their own.\textsuperscript{121} It is also unclear whether shifting from an intellectual-property regime that employs property rules to one that employs liability rules will increase or decrease the overall level of standardization.\textsuperscript{122} Despite these uncertainties, two facts appear to be relatively free of dispute. First, there is a consensus in the economic literature that, regardless of the optimality of the level of technological standardization that occurs, the level of technological compatibility will be sub-optimal; in industries with network externalities, firms have insufficient incentives to make their products compatible with those of other firms.\textsuperscript{123} Second, whenever a firm or collection of firms controls access to a standardized technology, that control can be used in an anticompetitive manner; to gain monopoly power or other economic benefits, the controlling firm or firms may well have strong incentives to exclude other firms.\textsuperscript{124} Both of these facts indicate that it is appropriate for the legal system to promote compatibility and to ensure access to standardized technology beyond what the market is likely to provide on its own.\textsuperscript{125}

\begin{enumerate}
\item[119.] See, e.g., Leeds, supra note 112, at 649 ("[C]onsumers are deprived of non-compatible technological innovations that would have been developed absent the standard.").
\item[120.] This is the so-called "X-inefficiency" that commonly arises whenever monopolies exist. See, e.g., F.M. Scherer, Antitrust, Efficiency, and Progress, in REVITALIZING ANTITRUST IN ITS SECOND CENTURY 130, 135-36 (Harry First et al. eds., 1991); cf. Joel Dreyfuss, Living with Windows 98, FORTUNE, Sept. 28, 1998, at 284 (arguing that the Windows 98 operating system is not a significant improvement over Windows 95).
\item[121.] Compare Katz & Shapiro, Technology Adoption, supra note 88 (arguing that in certain situations, the market will produce excessive standardization), with Church & Gandal, supra note 91 (arguing that if consumers place a high value on technological variety, the market will produce a sub-optimal amount of standardization).
\item[122.] See supra note 87-88 and accompanying text.
\item[123.] See, e.g., Joseph Farrell & Garth Saloner, Converters, Compatibility, and the Control of Interfaces, 40 J. INDUS. ECON. 9 (1992) (finding that when an important technology is supplied only by a single firm, that firm will have an incentive to make conversion overly costly); Katz & Shapiro, Network Externalities, supra note 89 (presenting a model in which "firms' joint incentives for product compatibility are lower than the social incentives"); Katz & Shapiro, Technology Adoption, supra note 88 (finding that "compatibility tends to be undersupplied by the market"). This market failure occurs because the designing firms are unable to capture the full benefits of compatibility.
\item[125.] Significantly, in the telephone communication industry, which also exhibits strong network effects and is in many ways the closest technological precursor to the systems
(2) Interconnectivity

The high level of interconnectivity in systems-technology markets also increases the need for open access to such technology. A decision to restrict access to a systems-technology product can retard innovation and competition in multiple sectors of the industry. For instance, technical information concerning the microprocessor and bus design of a computer is necessary not only to workstation manufacturers, but to the manufacturers of virtually every internal computer hardware component, from memory chips to power supplies, and to software developers who tailor their products to the platforms that will run them. Given all of the complementary products that require access to systems technology, the efficiency consequences of exclusion are likely to be tremendous. Their magnitude will depend upon the economic importance of the excluded firms—the larger a producer is and the fewer substitutes there are for its products, the more socially costly its exclusion will be.

Furthermore, interconnectivity increases the likelihood of exclusion as well as the social costs of exclusion in systems-technology industries. If dependence upon a particular technology is widespread, its developer is more likely to restrict access to it in an effort to extract economic rents. The dynamic is analogous to one discussed by Thomas Merrill in the context of real property and eminent domain. Interconnectivity arises when a developer (e.g., the technology industries discussed here, the government chose to require telephone companies to grant one another access on reasonable terms. See Telecommunications Act of 1996, Pub. L. No. 104-104, 110 Stat. 56 (codified in scattered sections of 47 U.S.C. §§ 151-613 (1999)). This modified the companies' property rights in much the same manner as the liability-rule regime proposed herein. Cf. Epstein, supra note 28, at 2119-20 (analyzing the Telecommunications Act of 1996 as a type of constrained liability rule); Lemley, supra note 95, at 1060-62 (noting that federal telecommunications law modifies intellectual-property rights to promote interoperability).

126. See Intergraph, 3 F. Supp. 2d at 1255.

127. Cf. INTEL CORPORATION, 1995 ANNUAL REPORT ("Intel's strategy has been, and continues to be, to introduce ever higher performance microprocessors and work with the software industry to develop compelling applications that can take advantage of this higher performance . . . .").

128. The combination of interconnectivity and standardization results in these products "depending" upon access to a greater extent than would otherwise be the case. In many industries, developers excluded from a particular technology can find ways to design around the protected component and thereby compete without access to it. This will not usually be a feasible option, however, when the protected technology is both complementary to the developer's product and the industry standard. Intergraph cannot design around the Intel bus any more than computer manufacturers can design around Dell's standardized system architecture design.

129. These rents could come in the form of financial payments extracted in return for access or in the form of monopoly profits.

130. See Merrill, supra note 73, at 72-93.
government) needs to acquire a number of contiguous land parcels for a project.\textsuperscript{131} Because the consent of each landowner is necessary for the project to go forward, a single landowner can attempt to extract economic rents from the other parties—both the developer and the other landowners—in return for his or her consent.\textsuperscript{132} Merrill observes, "As the number of parcels and/or the site-dependence [i.e., the need to access those particular parcels] increases, the opportunities for rent seeking multiply."\textsuperscript{133} The same holds true in the systems-technology context: more products that are dependent and higher levels of dependence increase the incentives and opportunities to foreclose access.

Thus, because interconnectivity raises the costs of permitting exclusion and increases the likelihood that exclusion will occur, its existence reinforces the argument for protecting systems-technology entitlements with access-enabling liability rules.

(3) \textit{Rapid innovation}

Rapid technological innovation increases the costs of a property-rule regime by greatly reducing the value of the information released when an intellectual-property right expires. Where design information remains valuable for a period longer than the term of intellectual-property entitlements, there are fewer costs to permitting unilateral exclusion because excluded parties will at least be able to benefit when the information becomes public. In systems-technology industries, however, the term of intellectual-property entitlements typically exceeds the useful life of technical information,\textsuperscript{134} and this increases the costs of protecting such entitlements with exclusionary property rules. Rapid innovation therefore strengthens the argument for permitting access to technology prior to the expiration of the innovator’s proprietary entitlements.

(4) \textit{Excludability}

The inability of developers to design complementary technology without the entitlement holder’s consent eliminates the standard method of innovating and competing in the face of intellectual-property protections. This inability stems not just from the

\textsuperscript{131} See id. While Merrill does not explicitly invoke the concept of interconnectivity, its importance is implicit in his analysis.

\textsuperscript{132} This is the standard hold-out problem, familiar to economists and other scholars of strategic behavior. See, e.g., POSNER, supra note 18, at 62; Calabresi & Melamed, supra note 15, at 1093-95.

\textsuperscript{133} Merrill, supra note 73, at 82.

\textsuperscript{134} See supra Section II.C.
possibilities of secrecy and exclusionary engineering\textsuperscript{135} but also from the fact that interconnectivity and standardization typically prevent developers from designing around a patent.\textsuperscript{136} If developers wish to create ancillary technology or to learn from the innovations contained in the core technology, they must negotiate directly with the designer of that technology.\textsuperscript{137} This makes anticompetitive exclusion possible, and the potential for such exclusion provides the primary impetus for moving to a policy of liability protections for systems technology.\textsuperscript{138}

(5) Summary

Network externalities produce standardization in systems-technology industries, and the developers of the standardized technology may lack sufficient incentives to give technological information and access to other developers, even when this would improve social welfare.\textsuperscript{139} Their refusal to allow access to their intellectual property—or their attempts to exact large rents in return for such access—can severely diminish competition and innovation, particularly given the high level of interconnectivity in systems-technology industries and the long term of intellectual-property rights relative to the useful life of the information they protect. The adoption of a liability-rule system that reduces such exclusion could therefore significantly improve social welfare and economic performance.

(6) Final note on anticompetitive behavior in systems-technology industries

The anticompetitive use of intellectual-property rights is more than just a theoretical possibility. \textit{Intergraph, Dell Computer,} and \textit{U.S. v. Microsoft}\textsuperscript{140} all provide examples of systems-technology innovators wielding their property rights in an exclusionary and arguably anticompetitive manner. In all these cases, the allegedly anticompetitive behavior takes the same basic form. Manufacturers of complementary products seek access to protected technology, and

\begin{itemize}
\item \textsuperscript{135} See discussion supra Section II.D.
\item \textsuperscript{136} See discussion supra note 128.
\item \textsuperscript{137} Of course, they need not do this if the designer elects, as Intel did for a number of years, not to pursue secrecy or exclusionary engineering. See \textit{Intergraph Corp. v. Intel Corp.}, 3 F. Supp. 2d 1255, 1261 (N.D. Ala. 1998). In that case, however, they depend upon the designer's continuing decision not to engage in either of those practices.
\item \textsuperscript{138} The above discussion assumes, to a certain extent, that the rightsholder has some interest in complementary markets. Without an interest in these markets, the rightsholder might want to foster competition in them through the release of its intellectual property—provided that it could share that property with complementary designers while continuing to exclude potential competitors.
\item \textsuperscript{139} See supra Subsection III.A.1.
\item \textsuperscript{140} Discussed infra Part V.
\end{itemize}
the innovator attempts to use intellectual-property rights as a basis for denying such access and thereby gaining an economic advantage. Intellectual-property rights can be used anticompetitively in other ways as well. A firm can obtain a "preemptive patent" on technology that it has no intention of implementing but that it wishes to prevent rival firms from implementing.\(^\text{141}\) Alternatively, a firm can refuse to license a particular technology except in conjunction with other technologies, thereby effectively tying the technologies together and forcing other firms to purchase more technologies than they desire.\(^\text{142}\) In oligopolistic markets, intellectual-property pooling and cross-licensing techniques "may serve both to organize the market and limit interfirm competition, and to exclude possible entrants."\(^\text{143}\)

To be successful, most of these anticompetitive practices require that the pertinent intellectual-property right be subject to property-rule protections. With liability rules, a holder of intellectual-property rights can, within limits, raise the costs of access to a technology, but the rightsholder cannot deny such access to those willing to pay a reasonable price.\(^\text{144}\) A firm could still use preemptive patents to impose costs on its rivals,\(^\text{145}\) and pooling arrangements could still


142. See, e.g., Motion Picture Patents Co. v. Universal Film Mfg. Co., 243 U.S. 502 (1917); Grid Sys. Corp. and Tandy Corp. v. Texas Instruments, Inc., 1991-1 Trade Cas. (CCH) ¶ 69,446 (N.D. Cal. 1991); Rapp, supra note 99, at 148. Some commentators maintain that firms will not tie complementary products because doing so will not allow them to increase their overall profits. See, e.g., ROBERT H. BORK, THE ANTITRUST PARADOX 140 (1978); RICHARD A. POSNER, ANTITRUST LAW: AN ECONOMIC PERSPECTIVE 171-73 (1976). Even if such tying cannot increase profits, however, firms may still engage in it if they miscalculate its potential profitability or if they are not interested merely in profit maximization. Cf. Kaplow, supra note 59, at 547-52 (arguing that firms may systematically misperceive the profitability of tying and that they may tie products to maximize sales or growth).

143. CARL KAYSEN & DONALD F. TURNER, ANTITRUST POLICY 167 (1965). Possible examples of this phenomenon in the systems-technology context include alliances among microprocessor developers. Several of these developers have elected to share their intellectual property and cooperate in the creation of microprocessing architectures. See, e.g., Linley Gwennap, Room for Three Architectures in the 2000s, MICROPROCESSOR REPORT, July 11, 1994, at 14 (describing the formation of a partnership between Intel and Hewlett-Packard to compete with the technological alliance of Motorola, IBM, and Apple).

144. Thus, liability-rule regimes may actually promote a higher degree of information access than regimes without any legal protection for intellectual property. If no intellectual-property rights existed, developers could still refuse to share their technology, but once property rights become protected through liability rules, the developers cannot refuse such access to anyone able to pay for it.

145. While the implementation of a liability-rule regime would not eliminate this practice, it would constrain it. Liability rules would only allow firms to impose finite
serve to organize markets and facilitate collusion. But firms could no longer use their intellectual-property rights for exclusionary purposes, nor could they force tying arrangements upon their licensees. Thus, under a liability-rule regime, there is much less danger that intellectual-property rights will become mechanisms for reducing competition and innovation.

With these benefits in mind, it is time to consider some of the potential costs of a liability-rule regime for systems technology.

B. Potential Disadvantages of Liability Rules

The potential drawbacks of liability rules as methods of protecting systems-technology entitlements fall into four broad categories, each of which is examined below.

(1) Effects on incentives to innovate

If intellectual-property rights provide incentives for innovation, weakening those rights could reduce innovative endeavors. And property rights certainly become weaker when the law shifts from a property-rule system to a liability-rule system, as this shift removes the exclusionary power from the bundle of privileges. For this reason, theorists have traditionally argued against moving to nonexclusionary entitlement systems, maintaining that such a move would produce a socially undesirable reduction in innovation.

As a theoretical matter, however, it is unclear whether weakening intellectual-property entitlements will reduce the overall production of innovations. First, although weakening these entitlements may reduce the individual incentive to innovate, it also results in a greater diffusion of those innovations that do occur. This diffusion permits firms to learn from the technological advances of others, and the knowledge they gain may enhance the productivity of their own innovative efforts. Whether this spillover effect is strong enough to overcome reduced innovation incentives will depend upon

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increases in their rivals' costs, as opposed to the infinite increases that are possible through exclusion in property-rule systems.

146. See supra notes 23-28 and accompanying text.


148. See Levin et al., supra note 107, at 805-07.
the character of technological change in any given industry.\textsuperscript{149} If spillover effects are sufficiently large, weakening intellectual-property rights will reduce individual incentives to innovate but increase the overall level of innovation. Conversely, strengthening these rights may increase individual incentives to innovate but reduce the overall level of innovation. Second, weakening intellectual-property entitlements will not significantly decrease individual incentives to innovate unless innovators rely upon these entitlements to appropriate returns on their investments. If innovators can secure adequate returns through mechanisms other than property rights—such as secrecy or first-mover advantages, discussed below—changes in the strength of these rights will not alter their investment behavior.

Empirical studies suggest that strong intellectual-property rights may indeed not significantly increase the overall level of innovation. For instance, an international study of pharmaceutical development found only minimal correlation between the level of patent protection and the level of innovation,\textsuperscript{150} and a number of studies that purport to establish contrary results rely on faulty methodologies.\textsuperscript{151} Even if intellectual-property rights do generally increase innovation, there is reason to believe they do not have this effect in systems-technology industries. Network externalities create large “first-mover advantages” in these industries, and intellectual-property entitlements may therefore be unnecessary for the appropriation of investment returns. The first technology to enter the market will be the first to acquire a network of users, who may not switch to a superior technology that enters subsequently because doing so would


\textsuperscript{150} See Pablo Chalid, The Consequences of Pharmaceutical Product Patenting, 15 WORLD COMPETITION: LAW & ECON. REV. 65, 65 (finding no strong relationship between patent systems and invention in developed countries); cf. Linda Rabin Judge, Issues Surrounding the Patenting of Medical Procedures, 13 SANTA CLARA COMPUTER & HIGH TECH. L.J. 181, 212 (1997) (“The potential severity of the chilling effect which widespread patenting will have on innovation is already apparent in patent-driven industries such as biotechnology, where companies routinely have excessive controls on dissemination of ‘proprietary’ information.”). For a discussion of this evidence, see James Boyle, A Theory of Law and Information: Copyright, Spleens, Blackmail, and Insider Trading, 80 CAL. L. REV. 1413, 1453-55 (1992).

\textsuperscript{151} See Boyle, supra note 150, at 1454. Boyle notes that one such study relied on data that the pharmaceutical industry itself supplied in response to a questionnaire on the desirability of patent protection. See id. (discussing Edwin Mansfield, Patents and Innovation: An Empirical Study, 32 MGMT. SCI. 173 (1986)).
require them to lose the benefits of the established network. Systems-technology users often make significant nontransferable investments in complementary assets that reinforce the first-mover advantage. Once users have invested in complementary assets, such as software programs and training, they often cannot switch to another technology without replicating those investments, which they may be reluctant to do. In addition, a firm may obtain substantial advantages simply from being the first company that customers associate with a particular technology, from being the first to start down any learning curve associated with the technology's production, or from the fact that, once a technology is established as sound and relatively error-free, conservative customers will be unlikely to assume the risks of adopting a newer technology. All of these factors indicate that systems-technology developers may well be able to earn adequate profits without intellectual-property rights, let alone exclusionary intellectual-property rights.

152. See William E. Cohen, Competition and Foreclosure in the Context of Installed Base and Compatibility Effects, 64 ANTITRUST L.J. 535, 541-46 (1996); Levin et al., supra note 107, at 799-802. See generally Marvin B. Lieberman & David B. Montgomery, First-Mover Advantages, 9 STRATEGIC MGMT. J. 41 (1988). A user switching from an established technology to a new technology not only loses the direct network benefits of the old technology, but also its indirect network benefits related to complementary services and products. Cf. discussion supra Section II.A.

153. See discussion supra note 99; Cohen, supra note 152, at 541. This gives innovating firms incentives to market their technologies in ways that encourage users to make large, non-transferable complementary investments; the greater these investments, the greater the chance that an innovator's technology will become locked in as a standard. Firms may try to achieve this effect by "bundling" their systems technology with non-transferable complementary products or by encouraging users to purchase long-term service or technical support contracts along with the technology.


155. See Levin et al., supra note 107, at 799-802.

156. In general, early entrants enjoy first-mover advantages in industries where product uncertainty is high and mistakes are costly. See SHARON M. OSTER, MODERN COMPETITIVE ANALYSIS 74-76 (2d ed. 1994); cf. Rapp, supra note 99, at 149 (noting that physicians, once satisfied with a drug, will be reluctant to abandon it). Both of these features characterize systems-technology markets, in which product performance often cannot be ascertained until after users have gained experience with the technology and in which product failure can result in wasted investments and the loss of important information.

157. Note, however, that the rapid pace of innovation in systems-technology industries may reduce first-mover advantages. Users may not buy the first technology to enter the market if they know that other technologies are likely to follow shortly thereafter — each user has an incentive to wait for competing technologies to emerge and then choose from among them — and this may lessen the advantages that accrue to the first entrant. This incentive to wait is reinforced by the high level of uncertainty associated with new technological products. Cf. supra note 156 and accompanying text. Consumers in rapidly
This raises another important point, which is that although the shift from property rules to liability rules weakens intellectual-property rights, it does not weaken them greatly. Innovators retain the ability to extract compensation from others who utilize their technology, and if this compensation is set properly, the adoption of liability rules should not significantly reduce the innovation incentives. Indeed, the firms whose innovation incentives will be reduced most will be those who seek to develop alternatives to their own pre-existing products, establish intellectual-property rights in the alternative technology, and then suppress that technology from the market. Innovations produced in this manner, however, are not socially beneficial, and the reduction of the incentive to engage in such behavior is in fact procompetitive.

Whereas the incentive effects of changes in systems-technology entitlements are likely to be weak, the spillover effects of such changes are likely to be substantial. Computer technology tends to progress through incremental innovation as advances occur predominantly through minor improvements on pre-existing products. As a consequence, innovators in hardware and software industries often require access to the technologies of other firms. Increasing such access through non-exclusionary intellectual-property entitlements will be likely to enhance innovative productivity throughout these industries.

Given the above considerations, the argument that liability rules would reduce the overall level of system-technology innovation seems fairly weak. It does not appear that the adoption of these rules would diminish the incentives to develop new technology greatly, if at all, and any diminution that did result might be offset by an increase in innovation made possible by the diffusion of technological information.

(2) Effects on nonlegal exclusionary practices

As explained in Section II.D, firms often use exclusionary intellectual-property rights in conjunction with methods of exclusion that are not based in the legal system, most notably secrecy and

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158. See supra note 141 and accompanying text.
160. See Jorde & Teece, supra note 159, at 49.
exclusionary engineering. At least one commentator has suggested that if innovators lost the ability to regulate technological access through legal means, they would invest more resources in achieving such regulation through these alternative means. If these efforts succeeded, the outcome would be the same as before—companies seeking access to systems technology would be dependent upon the consent of the innovator—and the cost to society would be greater, as the incremental resources invested in maintaining excludability would effectively be wasted.

The superficial appeal of this argument is deceptive. Firms wishing to prevent the unlicensed use of their technology must have the ability to monitor use of the technology and to impose penalties on infringers. A shift from property rules to liability rules would weaken their ability to do the latter. Under a property-rule regime, firms can punish the unlicensed use of their technology with injunctions and damages, but under a liability-rule regime, injunctive relief is no longer available. One might therefore think that to achieve the same level of deterrence in a system of liability rules, firms would invest more resources in their monitoring capacities. This would entail devoting more resources to secrecy and exclusionary engineering, the techniques by which firms prevent the nonconsensual use of their technology. The flaw in this reasoning is that regardless of the penalties for infringement, a firm must invest in sufficient exclusionary techniques so that others must negotiate for access to its technology. Otherwise, the firm will be unable to monitor the use of its intellectual property, which it must do to prevent unlicensed exploitation under both property-rule and liability-rule regimes. Under a property-rule regime, the firm will want to ensure that it controls the diffusion of its technology and secures compensation from those who use it. Under a liability-rule regime, control of diffusion is no longer possible, but the firm must still monitor usage to secure compensation. Although the goals of monitoring change under the two systems, the level of monitoring necessary to attain them does not. For this reason, a shift from property rules to liability rules is not likely to increase significantly the investments that systems-technology developers make in restricting access to their intellectual property.

161. See Rose, supra note 18, at 146-50; cf. Cohen, supra note 101, at 1094-95 (describing how manufacturers of video game systems have used exclusionary engineering to prevent other companies from copying their technology and producing compatible programs).


163. This assumes that damage awards could not or would not be sufficient to compensate for the loss of injunctive relief.
Yet another objection to liability-rule regimes stems from an argument that Robert Merges recently advanced. Merges has provided a general argument against the adoption of liability rules in the intellectual-property context, based upon the effects of property rights on private collective action. According to Merges, intellectual-property entitlements should be designed to maximize efficient market transactions, and the best way to facilitate these is through strong, exclusionary property rights. While such rights ordinarily impede transactions in markets that exhibit transactions costs, Merges argues that this very fact will cause rightsholders to form Collective Rights Organizations (CROs), private associations designed to set rules of exchange and serve as vehicles for the efficient distribution of intellectual property. As Merges puts it, "[i]t is the high transaction costs associated with the initial [property] entitlements that lead the parties to establish the [CRO]—an organization that then dramatically lowers the costs of exchanging the rights." In this manner, market participants would facilitate the diffusion of technological information without state interference and without any weakening of the underlying entitlements. Merges argues that CROs will produce more efficient transactions than liability regimes because they allow the terms of exchange to be set by the market participants themselves rather than by public regulators. The latter, he says, are more likely to be sub-optimal and insufficiently responsive to changing conditions. Thus, in Merges' opinion, liability rules excessively involve the state in matters better left to the market, and efficiency is best served through the legal protection of strong, exclusionary intellectual-property rights.

Merges' theory assumes that the holders of property rights want to exchange their intellectual property with others; high contracting costs will not drive rightsholders to form CROs unless they want contracting to occur. The assumption that rightsholders desire contracting may be correct in certain contexts, but it is often incorrect in systems-technology industries. As Intergraph discovered, traditional transaction costs are not the only potential barrier to

164. See Merges, supra note 75, at 1300.
165. See id.
166. See id. at 1301-27.
167. See id. at 1295-97.
168. Id. at 1302-03.
169. See id. at 1307-15.
170. See id.
171. Most of the examples Merges uses involve artistic intellectual property such as musical rights and movie scripts, see id., products that exhibit none of the characteristics discussed in Part II and whose creators may indeed wish to maximize their licensed use.
efficient transactions in these industries. Innovators with anticompetitive motives will exclude others from their intellectual property even if such exclusion is not socially desirable.\textsuperscript{172} To use Merges' terminology, even with gains from trade in the intellectual-property rights, the exercise of market power can impose transaction costs that CROs may not be able to overcome. Merges essentially ignores the role of anticompetitive behavior as an impediment to intellectual-property exchange.\textsuperscript{173}

\textbf{(4) Valuation difficulties}

A standard objection to liability rules is that they raise valuation difficulties.\textsuperscript{174} Because these rules produce nonconsensual transactions, they require an external mechanism for assigning values to property rights. Typically, the external mechanism will be the judicial system, which will assign values based upon prevailing market rates.\textsuperscript{175} Where those rates are nonexistent or unreliable, however, another valuation method is necessary.

Merges argues that valuation is acutely difficult in the intellectual-property context and that this provides a basis for rejecting liability rules. Without elaborating upon the point, he asserts that "[in] the intellectual property field... court valuation is unrealistic."\textsuperscript{176} Presumably this is because markets for individual intellectual-property rights usually are not thick (if those rights have been traded at all), and courts lack the expertise to appraise them. Merges considers legislatures a more realistic mechanism for assigning values to intellectual-property rights, but he argues that their valuations are likely to be inaccurate and excessively

\textsuperscript{172} See supra Part III.A.6 (discussing anticompetitive use of intellectual-property rights in systems-technology industries); supra note 123 and accompanying text (noting that compatibility will be underproduced in industries with network externalities).

\textsuperscript{173} The only hints that such behavior might be a concern are buried in the middle of the article, where Merges notes that patent pools may facilitate cartels but nonetheless concludes that the government should encourage their formation. See Merges, supra note 75, at 1340, 1355-58.

\textsuperscript{174} Calabresi and Melamed recognized these difficulties in their initial elaboration of the property-rule/liability-rule framework, see Calabresi & Melamed, supra note 15, at 1106-10, and they have since been elaborated upon by other scholars, see, e.g., Epstein, supra note 28, at 2092-94.

\textsuperscript{175} See, e.g., 4 NICHOLS ON EMINENT DOMAIN § 12.01[3] (rev. 3d ed. 1997) (stating that eminent-domain valuation is a power reserved to the judiciary); Calabresi & Melamed, supra note 15, at 1108 (noting that tort systems, in which judges determine damage awards, are liability regimes). Indeed, most scholarly discussions of liability rules simply assume that the judiciary will perform valuation. See, e.g., Calabresi & Melamed, supra note 15; Kaplow & Shavell, Property Rules Versus Liability Rules, supra note 28; Madeline Morris, The Structure of Entitlements, 78 CORNELL L. REV. 822, 854 n.82 (1993).

\textsuperscript{176} Merges, supra note 75, at 1308.
inflexible. He therefore rejects external valuation methods altogether and concludes that the appraisal of intellectual-property rights should be left to private parties—that is, property-rule protections should not be abandoned in favor of liability rules.

What Merges overlooks is that liability rules need not specify the valuations of intellectual-property rights, only the processes for making such valuations. Obtaining valuations on an ad hoc basis through the courts may be unrealistic, and legislative assignment of specific valuations may be likewise undesirable. But rather than assign particular values to intellectual-property rights, courts or legislatures could mandate a process by which rightsholders and those seeking their technology would have to agree upon access prices. Arbitration techniques exist that can determine transaction prices likely to be superior to government-mandated values. Perhaps the best technique for this purpose would be final-offer arbitration, in which each party submits a single value to an arbitrator, who must select between them. This form of arbitration has two primary advantages in this context: it is a mechanical process that forces both parties' participation, and it can proceed along a fixed, streamlined timetable without becoming bogged down by stalled negotiations. Although the final-offer technique does not eliminate the risk of inefficient valuation, it is far superior to a system in which courts or legislatures directly mandate values themselves.

Merges also overlooks the fact that, in many access disputes, independent valuation may not be necessary. In Intergraph, for instance, Intel had denied technological access to Intergraph but had granted it to a number of similarly situated manufacturers. As a consequence, the court could rely upon market transactions when appraising the value of access. Indeed, unless the innovator attempts to suppress access entirely, it is likely that voluntary market transactions will be able to inform the valuation process.

177. See supra note 170 and accompanying text.
178. See generally Amy Farmer & Paul Pecorino, Bargaining with Informative Offers: An Analysis of Final-Offer Arbitration, 27 J. LEGAL STUD. 415 (1998). The parties may or may not be given a brief period to settle after learning of each others' submissions.
180. See id. at 1291-93.
181. Individual rightsholders may have idiosyncratic valuations that are not reflected in the market prices of their rights. See generally Charles J. Goetz & Robert E. Scott, Liquidated Damages, Penalties and the Just Compensation Principle: Some Notes on an Enforcement Model and a Theory of Efficient Breach, 77 Colum. L. Rev. 554, 562-65 (1977). For discussions of the difficulties in attempting to provide compensation for idiosyncratic property valuations, see Epstein, supra note 73, at 182-86, 216-18; Jack L. Knetsch & Thomas E. Borcherding, Expropriation of Private Property and the Basis for Compensation, 29 U. Toronto L.J. 237, 237-42 (1979); Merrill, supra note 73, at 82-85. Even if courts could accurately measure the idiosyncratic valuations that rightsholders
Furthermore, in cases such as Dell Computer, in which the innovator engaged in independent improper behavior,\textsuperscript{182} it may be appropriate to set the valuation at zero. In either of these situations, it will be possible to avoid valuation problems entirely.

So again, although valuation issues raise difficulties for liability-rule regimes, they do not provide a compelling basis for opposing the adoption of such a regime for systems technology.

\section*{C. Inconclusive Factors}

At least two potential effects of liability rules cannot currently be evaluated with any degree of certainty. One is their impact upon technological standardization. It is not clear whether liability rules would further entrench existing standards or encourage the development of competing technologies.\textsuperscript{183} It is also not clear whether the market currently produces optimal, insufficient, or excessive standardization.\textsuperscript{184} Until these issues become resolved, normative evaluations of the impact that liability rules would have on standardization will be speculative at best.\textsuperscript{185}

The impact that liability rules would have on litigation in systems-technology industries is likewise indeterminate. Adopting these rules would eliminate lawsuits in which developers seek to overcome exclusionary property rights and gain access to a technology, but several other forms of litigation would probably become more prominent. For instance, once the factors necessary for the shift to liability rules had been established, litigation would no place on their intellectual property, however, it might still be preferable to set compensation at the market rate. For instance, by withholding access to intellectual property, a rightsholder may be able to maintain market power and pursue anticompetitive practices. See discussion \textit{supra} Subsection III.A.6. This would contribute to the value the rightsholder places on access to the property, but it would be improper to provide compensation for the loss of the ability to engage in illegal behavior. In such a situation, a liability rule based upon a market valuation might be more efficient than one based upon the rightsholder's subjective valuation. Of course, courts should rely upon market valuations only when markets are sufficiently thick. Otherwise, these valuations might not reflect efficient transaction prices, but rather the idiosyncratic preferences of a few parties. See generally Saul Levmore, \textit{Explaining Restitution}, 71 VA. L. REV. 65 (1985).

\textsuperscript{183} See \textit{supra} notes 87-88 and accompanying text.
\textsuperscript{184} See \textit{supra} Subsection III.A.1. Indeed, there may be no generalized answer to this matter, as it may vary across technologies.
\textsuperscript{185} Access to systems technology becomes important and subject to dispute only once that technology has already become somewhat standardized. When a systems technology has not become standardized, its owner has a strong incentive to make access to it as open as possible and thereby increase the likelihood of industry adoption. For this reason, resolving access disputes with liability rules probably will not affect the creation of standards. But it may have an impact on the longevity of pre-existing standards.
doubt arise over whether those factors existed in individual cases. Lawsuits might also arise over whether innovators obliged to allow access to their technologies were in fact doing so adequately. There is no reliable way of establishing, ex ante, which of these effects would dominate, and it is therefore difficult to formulate an argument for or against a liability-rule system based upon its potential effects on litigation.

D. Conclusions on the Desirability of the Liability-Rule Solution

As a matter of economic policy, the nascent legal trend towards open-access liability rules for systems technology appears justified. These rules produce a more efficient level of compatibility than would otherwise exist, and they prevent firms from using exclusionary intellectual-property entitlements to achieve anticompetitive ends. Moreover, no compelling basis exists for objecting to the implementation of these rules—the strongest possible objections either contain significant flaws or depend upon issues that have yet to be resolved.

It is worth noting that the implementation of liability rules would not impose significant financial burdens on the general public. Although switching to a liability-rule system might diminish the value of existing property rights in systems technology, this diminution would not be a government “taking” that would require compensation. Under the current doctrine, the adjustment of property rights should not trigger a compensation obligation, regardless of whether one approaches the issue by way of analogy to the real property context or from a deregulation perspective. As a consequence, there is no need to fear that a transition to a liability-rule regime will require large public expenditures.

IV. Doctrinal Foundations for a Liability-Rule Regime

The shift towards liability rules identified in Part I appears
justified as a matter of economic policy, but can it be squared with prevailing legal doctrine? The question may seem irrelevant, as both antitrust and intellectual-property laws constantly evolve in response to changing economic conditions.\textsuperscript{189} If a doctrine becomes contrary to the goals of these laws, a change is appropriate regardless of the doctrine's precedential pedigree. Furthermore, the cases discussed in Part I themselves provide precedential support for the use of liability rules in future systems-technology disputes, and no more may be necessary to satisfy the adjudicators of such disputes. Nonetheless, critics may argue that these decisions represent a radical departure from the traditional policy of promoting strong proprietary entitlements in intellectual property, and they might assert that such an unprecedented move must be made at the behest of the legislature and not the courts.\textsuperscript{190} To guard against such potential criticisms, it is important to observe that the doctrinal shift under consideration is not a radical legal change, but rather a logical extension of several strains of well-established court jurisprudence. Support for the use of liability rules to promote access to systems technology can be found in each of the legal doctrines discussed below.

A. Monopolization Doctrine

As the Intergraph district court properly noted, section 2 of the Sherman Act imposes affirmative duties upon monopolists "to refrain from acting in a manner that unreasonably harms competition."\textsuperscript{191} Because of these duties, behavior that impedes competition may be unlawful for a monopolist even if the same behavior would be legal


for a party without monopoly power.\textsuperscript{192} Furthermore, a few courts have explicitly held that intellectual-property rights do not confer antitrust immunity and that a monopolist’s exclusionary use of such rights may constitute a violation of section 2 of the Sherman Act.\textsuperscript{193}

The \textit{Intergraph} district court drew upon this doctrinal foundation in holding that Intel’s refusal to license its technology constituted a misuse of monopoly power under section 2. The court reasoned that this section prohibits a monopolist from using its power in an anticompetitive manner, and that Intel had therefore violated the Sherman Act because its invocation of its property rights had unreasonably impaired competition.\textsuperscript{194} Requisite to this holding was the court’s finding that Intel was indeed a monopolist.\textsuperscript{195} The court found that Intel controlled over ninety percent of the market for high-performance microprocessors,\textsuperscript{196} that there were no adequate substitutes for its technology,\textsuperscript{197} and that the company was therefore presumptively a monopolist for section 2 purposes.\textsuperscript{198}

The same reasoning will apply whenever a party holds an intellectual-property entitlement in systems technology that has become standardized. Once a standard technology exists, it will by definition control a vast portion of its market, and exclusion of competitors from that market, whether through the exercise of intellectual-property rights or otherwise, will violate the Sherman Act. None of the reasoning necessary to this argument constitutes a revolutionary departure from traditional understandings of that Act, and the result of this reasoning firmly supports the use of liability rules to protect systems-technology property rights.\textsuperscript{199}

\begin{itemize}
\item[192.] \textit{See}, \textit{e.g.}, \textit{Image Technical Servs. v. Eastman Kodak Co.}, 125 F.3d 1195, 1207 (9th Cir. 1997) (citing \textit{Greyhound Computer Corp. v. IBM}, 559 F.2d 488, 498 (9th Cir. 1977)); \textit{Bonjorno v. Kaiser Aluminum & Chem. Corp.}, 752 F.2d 802, 811 (3d Cir. 1984).
\item[193.] \textit{See} \textit{Image Technical Servs.}, 125 F.3d at 1216-19; \textit{Data Gen. Corp. v. Grumman Sys. Support Corp.}, 36 F.3d 1147, 1187 (1st Cir. 1994).
\item[194.] \textit{See Intergraph}, 3 F. Supp. 2d at 1277.
\item[195.] \textit{See id.} at 1275.
\item[196.] \textit{See id.} The court also found that Intel possessed monopoly power in the “separate relevant market” for Intel high-performance microprocessors, but this conclusion was not necessary to its decision. \textit{Id.} The Federal Circuit did not revisit either of these findings because, in its opinion, “Intel’s market power in the microprocessor market [was] irrelevant to the issues of this case.” \textit{Intergraph Corp. v. Intel Corp.}, 195 F.3d 1346, 1354 (Fed. Cir. 1999).
\item[197.] \textit{See Intergraph}, 3 F. Supp. 2d at 1276.
\item[198.] \textit{See id.} at 1275-76.
\item[199.] At least, it supports the use of such rules once the technology has become standardized. But as discussed in Sections II.A and III.A.1, systems technology tends to become standardized fairly quickly, and it is only after such standardization that access disputes are likely to arise.
\end{itemize}
B. Common-Carrier Doctrine

The common-carrier doctrine provides a second foundation for a liability-rule regime. A common carrier is an entity with control of a particular service to which there is a public interest in providing nondiscriminatory access.200 Once an entity has been designated a common carrier, it must provide its service on reasonable terms and in an open, unbiased manner. Thus, common carriers are effectively governed by liability rules; they cannot exclude others from obtaining their services and from using property dedicated to these services, but they do have a right to reasonable compensation.201 The concept of common carriers originated in England, where it originally applied to innkeepers and other businessmen determined by the courts to have "held [themselves] out as ready to serve the public by exercising [their] trade[s]."202 Over time, however, jurists have expanded the concept to encompass such modern service providers as railroads,203 telephone carriers,204 and the administrators of electricity distribution networks.205 Often, the classification of an entity as a common carrier has been predicated upon the entity's enjoyment of a grant of de jure monopoly status or other privilege from the government,206 but such a privilege is neither necessary207 nor sufficient208 for such a classification.


201. See Epstein, supra note 28, at 2118.


203. See, e.g., Beekman v. Saratoga & Schenectady R.R. Co., 3 Paige Ch. 44 (N.Y. Ch. 1831).


206. See, e.g., 47 U.S.C. §§ 201-31 (Deering's 1994 & Supp. III 1997) (regulating telephone and telegraph companies as common carriers); Shepard v. Milwaukee Gas Light Co., 6 Wis. 539, 546-47 (1858) (holding that a gas company has a duty to serve the public because of its "exclusive privilege" to furnish gas to the surrounding area).

207. See Singer, supra note 200, at 1412-50 (discussing applicability of common-carrier doctrine to hotels, which receive no monopoly privileges from the government).

208. See 47 U.S.C. § 541(c) (Deering's 1994) (declaring that cable operators are not common carriers); Robert Kline, Freedom of Speech on the Electronic Village Green: Applying the Lessons of Cable Television to the Internet, 6 CORNELL J.L. & PUB. POL'Y 23, 30 n.45 (1996) (noting "the practice of local governments to grant monopoly status to cable operators").
A strong argument can be made that once a systems technology becomes standardized, so that its innovator enjoys a *de facto* monopoly over public access to a particular computing environment, that innovator should be considered a common carrier. Like the owners of railroad lines and electricity networks, those who hold intellectual-property rights in systems technology control access to a resource that others need to facilitate their own trade, and there is a public interest in allowing this access to be as open and nondiscriminatory as possible. This reasoning leads directly to the outcome advocated in Part III of this Article: owners of systems-technology entitlements should receive fair compensation for the use of their technology and not be able to exclude others from it.

C. Other Possible Doctrinal Foundations

There exist two further possible doctrinal foundations for liability rules in systems-technology industries: the essential-facility doctrine and the merger doctrine of copyright law. The former doctrine is of questionable validity, and the proper scope of the latter is uncertain. Nonetheless, both doctrines enjoy an established legal pedigree, and if nothing else, they provide additional precedential support for the use of liability rules to promote technological access.

Under the essential-facility doctrine, parties can gain access to property essential for their competitive survival if they can establish (1) control of the essential facility by a monopolist, (2) their inability to duplicate the facility in a reasonable manner, (3) the monopolist’s denial of the use of the facility, and (4) the feasibility of providing the facility. Arguably, access to standardized systems technology qualifies as an essential facility, as a firm requires this access to develop its own marketable products, it cannot reasonably replicate the technology on its own, and the controller of the technology can

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209. Admittedly, there is a difference between systems technology and the other resources traditionally subject to common-carrier requirements, as those seeking access to systems technology can be competitors, and not just customers, of its owner. The case law indicates, however, that the presence of competitors among those seeking access should not affect the calculus. *See, e.g., Otter Tail Power Co.*, 410 U.S. at 366 (presence of rival power generators among those seeking access to Otter Tail’s distributional network did not relieve it of its duty to provide open access).

210. *See supra* Part III.

211. *See MCI Communications Corp. v. AT&T Co.*, 708 F.2d 1081 (7th Cir. 1983). Recent cases have indicated that there may now be a fifth requirement as well: that the monopolist be unable to establish a reasonable business justification for restricting access to the facility. *See Aspen Skiing Co. v. Aspen Highlands Skiing Corp.*, 472 U.S. 585 (1985) (appearing to place the burden of establishing such a justification on the alleged monopolist). *See generally PHILLIP AREEDA & HERBERT HOVENKAMP, ANTITRUST LAW ¶¶ 736.1-36.2 (1996).*
easily provide the firm with the information necessary for access.\textsuperscript{212} The essential-facility doctrine, however, is not without its problems and critics. Several prominent antitrust scholars have questioned its coherence and utility as a method of promoting competition.\textsuperscript{213} Even if the doctrine is sound in general, it may be inapplicable to the systems-technology context. The majority of cases that have established and developed the doctrine involved situations where duplication of the pertinent facility would have been inefficient.\textsuperscript{214} Whether it is efficient to develop a systems technology to compete with a prevailing standard can depend upon whether one considers a static or a dynamic model. In a static model, the existence of network externalities may make it efficient for everyone to use the same standardized technology,\textsuperscript{215} and access to this technology may therefore qualify as an essential facility. In a dynamic model, however, the development and adoption of competing standards can facilitate efficient transitions to superior technologies, which strengthens the argument for encouraging the development of these new standards. As it is unknown whether liability rules will promote or impede the development of competing standards,\textsuperscript{216} and as the optimal pace of technological transition is similarly unknown, it is impossible to determine as a general rule whether enforcing access to systems-technology standards would be consistent with the essential-facility rationale.

The applicability of the merger doctrine to systems-technology disputes is similarly questionable. Under merger doctrine, an innovator cannot assert a proprietary copyright over a creation if that

\textsuperscript{212} Cf. Intergraph Corp. v. Intel Corp., 3 F. Supp. 2d 1255, 1278 (N.D. Ala. 1998) ("Reasonable and timely access to critical business information that is necessary to compete is an essential facility.") (citing BellSouth Adver. & Publ'g Corp. v. Donnelley Info. Publ'g., Inc., 719 F. Supp. 1551, 1566 (S.D. Fla. 1988), aff'd 933 F.2d 952 (11th Cir. 1991)). But cf. Intergraph Corp. v. Intel Corp., 195 F.3d 1346, 1356-59 (holding that the essential facility doctrine does not apply to the Intergraph-Intel dispute).

\textsuperscript{213} See, e.g., HOVENKAMP, supra note 59, § 7.7; Phillip Areeda, Essential Facilities: An Epithet in Need of Limiting Principles, 58 ANTITRUST L.J. 841 (1990).

\textsuperscript{214} For instance, two of the most important essential facility cases are United States v. Terminal Railroad Association, 224 U.S. 383 (1912), and Otter Tail Power Co. v. United States, 410 U.S. 366 (1973). The former concerned access to railroad switching yard facilities in St. Louis, while the latter concerned access to a large electricity distribution network. In each case, the presumed inefficiency of constructing a duplicate facility strengthened the argument for requiring open access to the existing facility. Indeed, at least one commentator has argued that the essential facility doctrine should be limited to cases where the facility at issue is a natural monopoly. See McGowan, supra note 190, at 804-05.

\textsuperscript{215} This will depend upon whether the strength of the externalities outweighs the virtues of alternative technologies.

\textsuperscript{216} See supra note 87-88 and accompanying text.
creation is the only reasonable means of achieving a valuable end. Economist Joseph Farrell has proposed that, in markets that exhibit network externalities and standardization, this doctrine may provide a basis for weakening intellectual-property rights. He suggests that this doctrine might apply to technology that, though originally protectable, “becomes a de facto standard and thus becomes the only commercially reasonable way to compete.”

As with the essential-facility doctrine, there are several problems with invoking the merger doctrine as support for a liability-rule regime for systems technology. First, the scope of this doctrine is currently in dispute. The Third Circuit has held that the doctrine applies only if the copyrighted creation is the only way to achieve the desired end. Arguably, this narrow interpretation would permit the protection of standardized technology, as those seeking access to the technology could, in theory, create a competing standard or design their own compatibility interfaces. On the other hand, the Second Circuit has indicated that merger occurs when the copyrighted creation is merely the most efficient method of achieving the desired end. Under this interpretation, access to standardized technology would appear not to be protectable, as the use of such access is the most efficient method of competition for the developers of complementary products. Other circuit courts have adopted different formulations of the merger doctrine that lie somewhere between the narrow construction of the Third Circuit and the broad construction of the Second Circuit.

217. See WILLIAM S. STRONG, THE COPYRIGHT BOOK 12 (3d ed. 1990) (citing Morrissey v. Procter & Gamble Co., 379 F.2d 675, 678 (1st Cir. 1967)); cf NATIONAL COMMISSION ON NEW TECHNOLOGICAL USES OF COPYRIGHTED WORKS, FINAL REPORT 20 (1979) (“[W]hen specific instructions, even though previously copyrighted, are the only and essential means of accomplishing a given task, their later use by another will not amount to infringement.”), cited with approval in Computer Assoc. Int'l, Inc. v. Altai, Inc., 982 F.2d 693, 708 (2d Cir. 1992). Copyright law typically protects the innovations of software developers, whereas patent law protects the innovations of hardware developers.

218. See Farrell, supra note 154, at 373.

219. Id.


221. Of course, it is not hard to imagine situations in which neither of these options would be realistic. Consider Intergraph's predicament or that of a PC software company excluded from the Windows operating system.


223. See Gates Rubber Co. v. Bando Chem. Indus., 9 F.3d 823, 838 (10th Cir. 1993) (stating that the merger doctrine prevents the granting of exclusive rights to “the only, or one of only a few, means of expressing [an] idea”) (citing Concrete Mach. Co. v. Classic Lawn Ornaments, Inc., 843 F.2d 600, 606-07 (1st Cir. 1988)); Brown Bag Software v. Symantec Corp., 960 F.2d 1465, 1476 (9th Cir. 1992) (articulating a slightly different merger test).
its utility as a foundation for open-access liability rules is open to question. Furthermore, the merger doctrine suggests that the proper approach would be to eliminate intellectual-property entitlements in standardized systems technology entirely, not merely to weaken their enforcement mechanisms.

But regardless of the merit and applicability of the essential-facility and merger doctrines, both rest on a central premise that has become ensconced in the law: exclusion from a resource necessary for competitive survival can be anticompetitive and therefore illegal. This premise is consistent with and supportive of the use of liability rules in cases in which fully exclusionary intellectual-property rights would stymie competition and innovation. Despite their problems, the two doctrines therefore provide further precedential support for the use of liability rules to protect systems-technology entitlements. These doctrines, together with the monopolization doctrine and the common-carrier doctrine, establish that the shift identified in Part I is not a radical departure from established legal theory. Rather, it furthers a general policy against anticompetitive exclusion that has long existed in the laws that regulate economic behavior. Indeed, this policy appears so well grounded in the law that a failure to adhere to it in the systems-technology context would in fact be something of a departure.

V. Case Study: United States v. Microsoft

The current legal dispute between the United States and Microsoft is, like Intergraph and Dell Computer, a dispute about the scope of intellectual-property rights in systems technology and the constraints that antitrust concerns place upon their use.224 The dispute is rich with novel elements and sources of legal controversy, and analyzing these has become something of a cottage industry for jurists and economists alike.225 The purpose of this Part is neither to provide a comprehensive analysis of the dispute nor to retrace ground that has already been covered in the burgeoning academic literature on the subject. Rather, the discussion below will focus on a single aspect of the Microsoft case—the dispute over the company's


management of the Windows desktop—and examine it in light of the theories set forth in Parts I-IV.

One of the charges against Microsoft is that it "has misused, and continues to misuse, its Windows operating system monopoly by requiring PC OEMs [Original Equipment Manufacturers] to agree... to adopt the uniform 'boot-up' sequence and 'desktop' screen specified by Microsoft."226 The essence of the claim is that Microsoft has used its control of the initial desktop settings to promote its own Internet browser software, Internet Explorer, and to exclude those of other developers. Microsoft requires computer manufacturers to retain Internet Explorer on the Microsoft desktop and prohibits them from adding other browsing software to the desktop.227 According to the Justice Department:

As a result of Microsoft's restrictive boot-up and desktop screen agreements, OEMs are deprived of the freedom to make competitive choices about which browser or other software product should be offered to their customers, the ability to determine for themselves the design and configuration of the initial screens displayed on the computers they sell, and the ability to differentiate their products to serve their perceptions of consumers' needs.

As a result, these restrictions further exclude competing Internet browsers from the most important channels of distribution, substantially reduce OEMs' incentives and abilities to innovate and differentiate their products in ways that could facilitate competition between Microsoft products and competing software products, and enhance Microsoft's ability to use the near-ubiquity of its Windows operating system monopoly to gain dominance in both the Internet browser market and other software markets.228

According to Microsoft, however, its proprietary intellectual-property rights in its operating system allow it to place whatever restrictions it pleases on the appearance of its desktop.229

The computer desktop serves as the user interface for the operating system, and it therefore qualifies as a component of systems

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technology. As stated in the Microsoft complaint, "the Windows desktop screen is the screen through which most PC users access application programs and the other functionality on their PCs." The desktop frames the computing environment within which users operate other programs and from which they connect to external products and other users. The government alleges that Microsoft's exclusion of rival browsing software from its desktop stifles competition and innovation, whereas Microsoft alleges that such exclusion is a permissible exercise of its intellectual-property rights—a paradigmatic access dispute over systems technology.

One proposed solution is to compel Microsoft to allow the browser software of its competitors, particularly Netscape, equal access to its desktop. This proposal has some merit, but it lacks a limiting criterion. How viable must a browser be to deserve access to the desktop? Must Microsoft grant such access to every functional browser on the market? Furthermore, it is not unreasonable for Microsoft to argue that it should not be forced to use its own technology as a vehicle for its competitors' programs without any control or compensation.

A better solution would be the liability-rule approach explored in this Article. Under this approach, developers of rival web browsers could buy their way onto the Microsoft desktop. Microsoft

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231. See id. at 47. This exclusion can also be conceptualized as exclusion from equal access to the operating system itself.
232. See Memorandum in Support of Motion for Preliminary Injunction at 2, United States v. Microsoft Corp., No. CIV.A.98-1232 (D.D.C. filed May 18, 1998) (seeking injunction to force Microsoft to include Netscape browsing software on the initial Windows desktop); Steve Lohr & Joel Brinkley, Antitrust Talks Founder on Microsoft's "Desktop", N.Y. TIMES, May 18, 1998, at A4. The district court largely adopted this proposal as part of its remedial decree. See United States v. Microsoft Corp., 97 F. Supp. 2d 59, 66-67 (D.D.C. 2000) ("Microsoft shall not restrict ... an OEM from modifying the boot sequence, startup folder, internet connection wizard, desktop, preferences, favorites, start page, first screen, or other aspect of a Windows Operating System Product to (1) include a registration sequence to obtain subscription or other information from the user; (2) display icons of or otherwise feature other products or services, regardless of the size or shape of such icons or features, or to remove the icons, folders, start menu entries, or of Microsoft products or services; (3) display any user interfaces, provided that an icon is also displayed that allows the user to access the Windows user interface; or (4) launch automatically any non-Microsoft Middleware, Operating System or application, offer its own Internet access provider or other start-up sequence, or offer an option to make non-Microsoft Middleware the Default Middleware and to remove the means of End-User Access for Microsoft's Middleware Product.").
could not deny them access, but they would be required to pay for this access at a reasonable rate. Determining the proper rate would be more difficult here than in *Intergraph* because Microsoft has not previously sold this type of access and has no interest in selling it. It may be, depending on the ultimate outcome of other portions of the case, that compensation could be set at zero, as was done in *Dell Computer*, due to Microsoft's history of anticompetitive behavior in the browser and operating-system markets. If not, this would be an appropriate situation in which to mandate an expedient arbitration procedure to resolve the pricing issue. Either way, Microsoft would be able to profit from the use of its standardized systems technology, the innovation and competition of other software firms would not be constrained, and the net result would presumably be a marked increase in social welfare.

The principle at work here is not limited to browser software. Because the Windows operating system is the industry standard, Microsoft should not be able to deny adequate access to any manufacturer of a complementary product willing to pay reasonable compensation, regardless of whether the product is a web browser, a word processor, or any other form of technology. For instance, if Microsoft designed its desktop to give Microsoft Word a substantial advantage over Corel WordPerfect or to give Microsoft Excel a substantial advantage over Lotus 1-2-3, analogous competitive concerns would arise. This is not to say that Microsoft must take affirmative steps to make its operating system compatible with the technology of others, nor is it to say that other technology must have precisely the same level of access as Microsoft technology. The appropriate standard, as discussed in Part I, is that Microsoft should not be able to use its systems-technology rights to deny other innovators the ability to develop commercially viable compatible products.

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235. The Justice Department's case against Microsoft, for example, is predicated on the theory that denying Netscape access to the Microsoft desktop "materially disadvantaged" that company's ability to compete on the Windows platform. *See Amended Complaint at 50, United States v. Microsoft*, 1999 U.S. Dist. LEXIS 20897 (D.D.C. Dec. 20, 1999). Microsoft may presumably favor its own technology on its desktop and in its operating system to some extent. It simply cannot do so in ways that substantially impair the commercial viability of its rivals.

**Conclusion**

There is an emerging doctrinal shift in the laws that govern economic competition, a movement towards the use of liability rules to protect intellectual-property rights in systems technology. In one respect, this legal development is revolutionary, as it represents a movement away from the strong, exclusionary entitlements that the law has traditionally granted to intellectual-property developers. In other respects, however, this development is not revolutionary at all. Rather, it is a foreseeable response to the new forms of intellectual property that have recently arisen—a response that is entirely consistent with, and perhaps even required by, an anti-exclusionary principle that has permeated property and antitrust laws since their inception. Carrying this principle into the systems-technology context advances the goals of robust innovation and efficient economic behavior that underlie these laws, and indeed, the net effect of liability rules in this context will probably be to increase social welfare.

The trend that has begun with the cases of *Intergraph* and *Dell Computer* should continue. Courts and other regulators that preside over technological access disputes should be alert to the existence of systems technology and to the way its characteristics affect legal and economic analysis. They should resist the arguments of innovators who claim the absolute right to control the disposition and use of their technology. Such arguments appeal to a conception of intellectual property that has become ingrained in the legal culture and the popular mind, but the same competitive concerns that fuel antitrust doctrine form the parameters of the regulatory system of which intellectual-property law is a part. To permit intellectual-property rights to trump these concerns would be to place the cart before the horse—and to do so at the expense of the public good.

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237. When uncertain as to whether a particular technology qualifies as systems technology, these regulators should consider whether it possesses the characteristics emphasized in the foregoing discussion: network externalities, interconnectivity, rapid innovation, and excludability.