MODIFYING COPYRIGHTED SOFTWARE: ADJUSTING COPYRIGHT DOCTRINE TO ACCOMMODATE A TECHNOLOGY

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ABSTRACT

This article addresses the question of whether computer software users do have or ought to have the right to modify legally-obtained software, either themselves or through the services of another party. It analyzes and critiques some possible defenses to a software vendor's charge of copyright infringement arising out of such modification. None of these defenses prove to be satisfactory, but the fault does not lie with them. Rather, the fault lies with the overall analysis framework provided by the current copyright statute, an overly technical and insensitive approach that obscures the real issues and policies that should be brought to bear. A new framework of analysis is suggested, one that accounts for the opinions and needs of both software developers and the user community. The conclusion drawn from this new analysis is that users must have the right to modify their software and to employ third parties to perform such modification, thus creating an open market for software modification services in line with the American free enterprise tradition and the purposes of American intellectual property law.

The adaptability of computer software is one of this technology's most important characteristics.¹ Flaws² in the software can be corrected, new func-

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¹See infra notes 138-40, 164-65 and accompanying text for a more detailed discussion of the adaptability of software.

Various terms are used to refer to the activity of altering software. The author prefers the terms "modify" and "modifications" to "adapt" and "adaptation." Although the latter terms are used in the special copyright statute provision applicable to software modifications, see 17 U.S.C. § 117 (1982), "adaptation," with its overtones of novels being "adapted" to dramatic plays and dramas...
tional features can be added, even major reconfigurations of the software, such as modifying it for use on a different computer, can be achieved at virtually no material cost. If hardware could as easily be reconfigured, a 1980 model car could be updated to a 1987 model without sending it to a "body shop" for new parts. Because of its adaptability, software is a very different kind of product than the static final texts of printed works that have traditionally been protected by copyright law. Software is, in a very real sense, being "adapted" to screenplays, has, in copyright parlance, a more loaded significance than the more neutral term "modification."

"Modification" more clearly encompasses the full range of conduct of interest here: from fixing coding errors rendering software inoperable, or adding new functions, to reengineering code to run on a new computer. (Not everyone would agree fixing a software bug is an "adaptation," but clearly it is a "modification.")

"Modification" is also more congruent with the author's principal concern to discuss problems arising from the alteration of the text of a computer program acquired by an individual end-user, rather than the creation of a subsequent separate work, which the term "adaptation" would also embrace. See infra notes 24-28 and accompanying text for a discussion of the differences between altering an original text and creating a new work.

In the software engineering and computer science communities, "maintenance" is the term most often used for the range of activities to which the author refers when she speaks of software modification. See, e.g., NATIONAL BUREAU OF STANDARDS, GUIDANCE ON SOFTWARE MAINTENANCE (1983) [hereinafter NBS GUIDE]. Software "support" is another term that is coming to be used for software modification activities. See, e.g., Martin & Deasy, Licensing of Intellectual Property Rights Needed for Software Support: A Life Cycle Approach, 28 JURIMETRICS J. 223 (1988).

The term most often used by computer programmers for errors or flaws in the code is "bug." The origin of the term "bug" is literal: when investigating the cause of a breakdown of an early computer, the machine's engineers found that a moth, attracted to the computer's vacuum tubes, had caused the malfunction. See R. PATTIS, KAREL THE ROBOT 14-15 (1981).

The examples of software modifications given in the text correspond to the standard categories of software modification activities as software engineers speak of them: "corrective maintenance (performed in response to the assessment of failures); adaptive maintenance (performed in anticipation of change within the data or processing environments); and perfective maintenance (performed to eliminate inefficiencies, enhance performance, or improve maintainability)." B. Lientz, E. Swanson, and G. Tompkins, Characteristics of Application Software Maintenance, 21 COMMUNICATIONS OF THE ACM 466, 466 (1978). For an excellent introduction to software maintenance and enhancement issues to which lawyers negotiating software licenses should be sensitive, see Martin & Deasy, supra note 1. See also Samuelson, The Need for Reform of the Software Licensing Policy of the Department of Defense, 27 JURIMETRICS J. 9, 34-35 (1986) (discussing software modifications and other derivative work problems associated with software in government software procurements).

See infra notes 158-71 and accompanying text for a discussion of the contrast between hardware and software maintenance, and between the low material resources cost and high intellectual labor cost of software modification.

See, e.g., U.S. CONGRESS, OFFICE OF TECHNOLOGY ASSESSMENT, INTELLECTUAL PROPERTY RIGHTS IN AN AGE OF ELECTRONICS AND INFORMATION 169, 180-83, 194-95, 206-208, 271-276 (1986) [hereinafter OTA REPORT] (discussing future implications for copyright of advances in electronic storage, dissemination, and manipulation of written material, and contrasting it with the traditional system of copyright focusing on the fixed character of printed works); E. Eisenstein, THE PRINTING PRESS AS AN AGENT OF CHANGE (1979) (discussing "typographical fixity" as a characteristic of printed works as compared with manuscripts that were revised as they were transcribed). See also Starr, The Electronic Reader, 112 DAEDELUS 143 (Winter 1983) and Newell, Response: The Models Are Broken! The Models Are Broken!, 47 U. PITT. L. REV. 1023 (1986) (challenging assumptions of the patent system as applied to software and algorithms).
an evolutionary product.  

This article addresses the question of whether users of computer software do, or should, have a legal right to modify it or to authorize third parties to modify it for them. That is, in the absence of a specially negotiated contractual provision allocating modification rights, what does—and ought—intellectual property law (particularly copyright law) say about users’ rights to modify copyrighted software? 9 To put it in "computerese," what should be the "de-


7For the most part, software modification rights tend to be allocated through the licensing agreements by which software firms make their products available to the public. It is a common practice for software firms to make their products available on a license-only basis. With mass-marketed software this is usually done by a "shrink-wrap license," which states that it becomes an effective contract upon the user’s opening the package. These licenses typically claim to retain for software developers not simply ownership of the intellectual property rights in the software, but also ownership of the personal property rights in it as well. These licenses purport to limit the user’s rights in the software to those named in the "license."

Among the common limitations imposed under these licenses are those pertaining to software modification rights (usually providing that users have none). The enforceability of these licenses and their individual provisions has been much debated. See, e.g., Stern, Shrink-Wrap Licenses of Mass Marketed Software: Enforceable Contracts or Whistling in the Dark?, 11 RUTG. COMP. & TECH. L.J. 51 (1983) (arguing many shrink-wrap license provisions are invalid or unenforceable); Einhorn, The Enforceability of 'Tear-Me-Open' Software License Agreements, 67 J.P.O.S. 509 (1985) (questioning the enforceability of such licenses); Hazen, Contract Principles As a Guide for Protecting Intellectual Property Rights in Computer Software, 20 U.C. DAVIS L. REV. 105 (1986) (arguing invalidity).


While most software is sold with a licensing agreement, intellectual property law is still important in cases where no such agreement exists, and also if such "licenses" should be declared unenforceable.

8Software was added to the subject matter of copyright in 1980. Enacted along with the subject matter provision was a provision giving owners of copies of copyrighted computer programs a limited right to make adaptations to their copies. See Pub. L. No. 96-517, 94 Stat. 3007 (1980) (codified at 17 U.S.C. §§ 101, 117 (1982)). See infra notes 36-60 and accompanying text for a discussion of the adaptation provision. Congress passed these enactments on the recommendations of the National Commission of New Technological Uses of Copyrighted Works (CONTU) which Congress had established in 1974 to advise it about a variety of new technology subjects. CONTU made its Final Report to Congress in 1978. With one change discussed infra notes 86-87 and accompanying text, Congress enacted CONTU’s recommendations verbatim. See NATIONAL COMM’N ON NEW TECHNOLOGICAL USES OF COPYRIGHTED WORKS, FINAL REPORT (1979) [hereinafter CONTU FINAL REPORT].

9Several other authors have given some attention to the issue of whether users do or should have a legal right under copyright law to modify software. See, e.g., Stern, Section 117 of the Copyright Act: Charter of the Software User’s Rights or an Illusory Promise?, 7 W.N. ENG. L. REV. 459 (1985); Raskind, The Uncertain Case for Special Legislation Protecting Computer Software, 47 U. PITT. L. REV. 1131 (1986); Nimmer & Krauthaus, Copyright and Software Technology Infringement: Defining Third Party Development Rights, 6 IND. L.J. 13 (1986); Karjala, Lessons From the Computer Software Protection Debate in Japan, 1984 ARIZ. STAT. L.J. 53;
fault setting" of intellectual property law on user modification rights?

Section I of this article presents an analysis of four defenses a software user might assert if the owner of a software copyright charged infringement based on the user’s modification of the software: (1) an essential adaptation defense under a special computer program provision of the copyright statute, (2) a fair use defense, (3) a first sale defense, and (4) a private or personal use defense. The author concludes that software users cannot be sure any of these defenses will shield them from liability for even the most minor modifications to software they purchase. Nor can users be sure they can hire someone other than the copyright owner to do the modifications for them.

After analyzing these defenses and demonstrating the uncertainties attending reliance on each of them, Section I develops a criticism of the framework the copyright statute seems to provide for analyzing the modification rights problem. This framework is not well-suited to permitting serious consideration of the conflicting interests and policy concerns that software modification rights raise. The article develops an alternative analytic framework which the author believes has been endorsed in a recent Supreme Court copyright decision on another new technology issue, a framework that permits consideration of the broader interests and policies implicated by software modifications. If copyright law is not to fail at its difficult task of accommodating software, it must recognize that software is a technology (in itself, a novelty for copyright), and a highly adaptable technology at that. The framework that intellectual

Davidson, Common Law, Uncommon Software, 47 U. PITT. L. REV. 1037 (1986). All these authors seem to endorse the idea that software users should have a right to make “personal use” modifications. Two of them, Stern and Raskind, argue that the copyright statute ought to be amended to broaden the scope of user modification rights. See Stern, supra, at 484-85, and Raskind, supra, at 1172-73. Karjala argues that American copyright law has not adequately confronted the issues that software modifications raise. Karjala, supra, at 68.

With the exception of Stern’s, these articles tend to discuss the user modification issue rather briefly while focusing on other software copyright issues. Stern’s article delves into the legislative history of the special statute provision giving some software users some modification rights, and the caselaw interpreting it. But even Stern’s article does not devote exclusive attention to the modification issue, instead focusing heavily on software copying, the other major issue addressed by § 117.

The author of this article agrees in the main with Stern’s analysis of § 117 as to user adaptation rights. One reason the analysis of § 117 is here relatively brief is that Stern has done such an extensive analysis of the provision. The author hopes this article will supplement and strengthen arguments other authors have made concerning user modification rights.

10 “Default setting” is a useful term from computer programming argot that refers to the insertion into a program of the most likely choice that software users would exercise among a set of options.


14 This defense is nonstatutory. See infra notes 88-105 and accompanying text.

15 Software is proving to be a difficult intellectual property law subject matter because it differs so significantly from the traditional subject matters of copyright and patent law. See e.g., OTA REPORT, supra note 5, at 78-87; Samuelson, CONTU Revisited: The Case Against Copyright Pro-

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property law provides for analyzing software modification issues should take this into account.

Section II uses this broader analytic framework to address the question of whether software users ought to have modification rights. The section sets forth reasons why software users believe they have and need to have rights to modify their software and to authorize others to modify it, as well as reasons why software copyright owners may perceive a need to retain exclusive control over software modification services. The economics of the software industry are somewhat different from the economics attending older technologies, creating special concerns about controlling the market for software adaptations.

At the heart of the modification rights problem lies the question of whether a competitive market for software modifications should exist. Should users be able to "compete" with developers by performing their own modifications? Should users have the choice of third-party modification services or be left with obtaining modifications only from the original developer? Given the amount of money at stake, the software modification problem needs to be solved by squarely confronting the competition issue. This article concludes that owners of software copyrights will, as a practical matter, tend to have several important advantages over competitors in providing software modification services, but that the underlying purposes of intellectual property law and the American tradition of competitiveness argue strongly for the existence of a competitive software modifications market. At the very least, competition for software modification services ought not be eliminated by unthinking application of copyright law's derivative work right.

To create a competitive market for software modifications, software users must have rights to modify their software and to authorize others to modify it. In addition, there must be a concomitant right on the part of third parties to offer their modification services to the general public in competition with software.

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See also Kidwell, Software and Semiconductors: Why Are We Confused?, 70 MINN. L. REV. 533 (1985) and Raskind, supra note 9. Both Professors Kidwell and Raskind urge that careful attention be paid to the particular nature of software in formulating rules concerning intellectual property protection, and caution against wooden application of old concepts having limited usefulness for software. Raskind makes a number of suggestions for adapting both copyright doctrine generally and the copyright statute specifically to accommodate software. Id. at 1183. See also infra notes 127-28 and accompanying text concerning the accommodation difficulties arising from the utilitarian nature of software.

Estimates vary as to how expensive software maintenance and enhancement activities are, but they range from 40 to 75 percent of life cycle costs. See, e.g., Lientz, Swanson and Tompkins, supra note 3, at 466. Even the most conservative of these estimates reflects that the maintenance phase of the software life cycle is a highly expensive aspect of software.

While the precise dollar volume of the maintenance market may be difficult to pin down, the federal government alone spends $3.5 billion a year maintaining its estimated 20 billion lines of code. See Harrison, In Depth: Maintenance Giant Sleeps Undisturbed in Federal Data Centers, XXI COMPUTERWORLD 81 (March 8, 1987). Industry giant IBM earned $4.2 billion on software maintenance in 1985 and expects to rely on this facet of the market for an increasing percentage of its revenues. Kerr, Making Waves: Large IBM Users are Irked by Big Blue's New Software Pricing Policies, 33 DATAMATION 44 (December 1, 1986).
copyright owners. Though the modification rights problem is a genuinely difficult one, the social costs of giving copyright owners complete control over modifications may be too high for the public interest.

I. MODIFICATION RIGHTS UNDER THE COPYRIGHT LAW

To "own" a copyright is to have certain "exclusive rights" that are set forth in the copyright statute. An exclusive right gives its owner control over the conduct of other people within the scope of the right. Among the enumerated exclusive rights of the copyright owner is the right to prepare, or authorize

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17 It may seem redundant to assert that if users have rights to authorize third parties to modify software, then third parties must have rights to perform such services for users and to offer their services in the marketplace. As explained infra notes 57-58 and accompanying text, the caselaw interpreting the special software modification provision of the copyright statute has called into question the legality of any third-party commercial services commenced before user authorizations have been obtained.

18 See 17 U.S.C. §§ 201 (ownership of copyright) and 106 (1982) (exclusive rights possessed by the copyright owner). Because the scope of the exclusive rights provision is central to this article, it is worth setting forth the full text of § 106:

Subject to sections 107 through 118, the owner of copyright under this title has the exclusive rights to do and to authorize any of the following:

1. to reproduce the copyrighted work in copies or phonorecords;
2. to prepare derivative works based upon the copyrighted work;
3. to distribute copies or phonorecords of the copyrighted work to the public by sale or other transfer of ownership, or by rental, lease, or lending;
4. in the case of literary, musical, dramatic, and choreographic works, pantomimes, and motion picture and other audiovisual works, to perform the copyrighted work publicly; and
5. in the case of literary, musical, dramatic, and choreographic works, pantomimes, and pictorial, graphic, or sculptural works, including the individual images of a motion picture or other audiovisual work, to display the copyrighted work publicly.

Unlike patent law, copyright law does not include and has never included an exclusive right to use the protected work. Compare 17 U.S.C. § 106 (1982) with 35 U.S.C. § 154 (1982). A consumer who buys and uses a pirated copy of a patented invention violates the patentee's exclusive use right, and is liable as an infringer. A consumer who buys and uses a pirated copy of a copyrighted work does not violate any of the copyright owners exclusive rights and, therefore, incurs no infringement liability (unless he or she redistributes it).

19 Strictly speaking, an exclusive right is a negative right—the right to stop an unauthorized person from doing such things as making a copy of the protected work. If author A wished to incorporate into his or her work a substantial part of the copyrighted work of B and sought recognition as the owner of a copyright in the larger whole, the negative character of exclusive rights would become apparent. B would have a right to exercise his or her exclusive rights over A as to the incorporated portion, even though A still might have a valid copyright in other parts of the larger work. See 17 U.S.C. § 103 (1982) concerning the limitations of copyright where preexisting material is incorporated into a work of authorship. See, e.g., Regents of the University of Colorado v. K.D.I. Precision Products, Inc., 488 F.2d 261 (10th Cir. 1973) (discussing the difference between "unlimited" rights and "exclusive" rights).

The exclusive right to make copies is simply that: the right to make and authorize the making of copies and the right to stop those who make copies without permission. Sometimes, however, owners of intellectual property interests have attempted to extend their property rights beyond those Congress has granted. See infra notes 77-81 and accompanying text.
preparation of, derivative works. Whatever authority software copyright owners might have to control user modifications would seem to arise from this derivative work right.

The copyright statute defines the term "derivative work" very broadly, as:

a work based upon one or more preexisting works, such as a translation, musical arrangement, dramatization, fictionalization, motion picture version, sound recording, art reproduction, abridgment, condensation, or any other form in which a work may be recast, transformed, or adapted . . . [and including a] work consisting of editorial revisions, annotations, elaborations, or other modifications which, as a whole, represent an original work of authorship.

The legislative history of the Copyright Act of 1976 ("the 1976 Act"), while extensive as to many subjects, is regrettably scanty as to congressional intent about the derivative work right.

The most evident concern of the drafters of the derivative works definition is revealed by an examination of the list of examples contained in the definition. Novelists are to be protected against predations by unscrupulous movie studios which, in the absence of a derivative work right, might make unauthorized and uncompensated motion picture versions of the novel. Graphic artists are to be protected from those who might otherwise print posters of their works without paying royalties to the artist. These and other examples in the statute suggest that the main concern underlying the derivative work right is the protection of

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21There are, in all likelihood, some de minimis modifications that would not rise to a high enough level even to trigger the defenses discussed in this article. See, e.g., Mura v. Columbia Broadcast System, Inc., 245 F. Supp. 587 (S.D.N.Y. 1965) (use of hand puppets on Captain Kangaroo show was de minimis and incidental, and noninfringing of the copyright).
23The 1909 Copyright Act, 17 U.S.C. § 1 et seq (superseded) [hereinafter 1909 Act], which governed works created before January 1, 1978, contained a much more extensive set of exclusive rights for copyright owners, among which were rights to control many specific types of derivatives from specific types of copyright works. Section 1(b) of the 1909 Act, for example, provided exclusive rights:
[to] translate the copyrighted work into other languages or dialects, or make any other version thereof, if it be a literary work; to dramatize it if it be a nondramatic work; to convert it into a novel or other nondramatic work if it be a drama; to arrange or adapt it if it be a musical work; to complete, execute, and finish it if it be a model or design.

17 U.S.C. § 1(b) (superseded). One major aim of the drafters of the new statute seems to have been to simplify and condense the set of exclusive rights that under the 1909 Act had been extensive, over-particularized, and wordy. Rather than separately listing translations, musical arrangements, and dramatizations, the 1976 Act created an abstract category of "derivative works" (which term was then defined in § 101 in terms of examples from the 1909 Act) and gave copyright owners an exclusive right to them. Compare 17 U.S.C. § 101 (definition of "derivative work") with 17 U.S.C. § 1 (superseded). There is no indication in the legislative history of the 1976 Act that Congress intended to dramatically expand the scope of exclusive rights. See Samuelson, Allocating Rights in Computer-Generated Works, 47 U. Pitt. L. Rev. 1185, 1212-1221 (1986).
the economic interests\textsuperscript{24} of the copyright owner from the unauthorized creation of subsequent works making substantial use of the original protected material.\textsuperscript{25}

The derivative work right less clearly covers the situation that user modification of software typically raises, namely, making adjustments to a lawfully obtained copy of the work to make it more useful. Altering the text of one’s own copy of a work is significantly different from the creation of a separate, subsequent work.\textsuperscript{26} However, the derivative work definition’s inclusion of any recasting, transformation, or modification of a copyrighted work\textsuperscript{27} casts doubt on the otherwise plausible notion that the derivative work right is confined to the creation of subsequent works.\textsuperscript{28} This broad definition suggests that any modification of copyrighted software could run afoul of the derivative work right.\textsuperscript{29}

Tempering the broad reach of the copyright statute’s exclusive rights pro-

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\item \textsuperscript{24}American copyright law, unlike the law of many European countries, does not recognize the “moral rights” of authors to protect the integrity of their work from efforts to modify it or make subsequent works based on it. \textit{See generally,} R. \textsc{Brown} and R. \textsc{Denicola}, \textsc{Cases on Copyright} 571-593 (4th Ed. 1985). This rule may change if the United States joins the Berne Convention.
\item \textsuperscript{25}\textit{See supra} note 22 and accompanying text. All of the examples listed in the 1976 Act’s definition of “derivative works” are instances of subsequent works based on a copyrighted work.
\item \textsuperscript{26}\textit{See infra} notes 86-87 and accompanying text for a discussion of the implications of the “first sale” rule for this problem.
\item \textsuperscript{27}\textit{See supra} note 22 and accompanying text.
\item \textsuperscript{28}In a few cases copyright infringement has been found when the defendant deleted some of the protected material. For example, in \textit{Gilliam v. American Broadcasting Co.}, 538 F.2d 14 (2d Cir. 1976), ABC exceeded the scope of its license rights in certain “Monty Python’s Flying Circus” television programs when it deleted 27 percent of the program contents, including certain material it found “offensive.” The court likened ABC’s unauthorized editing to situations in which licensees had gone beyond the duration of a license, thereby infringing the copyright if they continued to exhibit the work. The court in \textit{Gilliam} may have strained somewhat to reach this result; breaching a copyright license generally gives rise to a contract action, not a copyright infringement action. \textit{See M. \textsc{Nimmer}, Nimmer on Copyrights} § 8.21[1C] (1986). \textit{See also WGN Continental Broadcasting Co. v. United Video, Inc.}, 693 F.2d 622, \textit{clarified and reh’g denied}, 693 F.2d 628 (7th Cir. 1982) (satellite carrier’s deletion of teletext from copyrighted broadcast signal transmitted to stations held to be infringement) and \textit{Barnett, From New Technology to Moral Rights: Passive Carriers, Teletext, & Deletion as Copyright Infringement—The WGN Case}, 31 J. \textsc{Copr. Off. Soc’y} 427, 475 (1984) (critical of WGN).
\item \textsuperscript{29}This article will not discuss, except in this footnote, a closely related problem to user modification rights, namely, whether a user or a third party has a right to develop and/or market software that modifies the function or display of the first firm’s copyrighted software. One could argue such interactive software infringes the first firm’s copyright as a form of “recasting” or “transforming” of some portion of the copyrighted work, thereby coming within the literal terms of the “derivative work” definition. \textit{See 17 U.S.C.} § 101 (1982). \textit{See also infra} notes 22-23 and accompanying text for a discussion of the derivative work right.
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vision are a set of twelve specific statutory limitations. At least three of these limitations, as well as one potential nonstatutory privilege, might provide some basis for asserting that a software copyright owner has no right to control user modifications. Section 117 of the 1976 Act grants owners of copies of copyrighted software a limited right to make some adaptations to the programs. Section 107 allows fair uses to be made of copyrighted works. Section 109 limits the copyright owner's control over a copy of the work after the first sale of it to the general public. And, finally, there is growing support for recognition of a nonstatutory 'personal use' or 'private use' defense: the public and some commentators tend to regard private or personal use copying and adaptation as beyond the copyright owner's reach. Each of these limitations is discussed below.

The Midway opinion does not disclose whether there was similarity between the plaintiff's and defendant's programs, but this may be because Midway was relying on audiovisual copyrights. But see Vault Corp. v. Quaid Software Ltd., 655 F. Supp. 750 (E.D. La. 1987) (software program that "unlocked" plaintiff's copyrighted data security software was not an infringing derivative work because there was no similarity in expression between the two programs).

An interpretation of the derivative work right that would hold as an infringer a software firm that made software that modified the functioning of other software does not, however, seem to be supported by the legislative history of the derivative work provision, which indicates that a work must incorporate expression from the original work. See H.R. Rep. No. 1476, 94th Cong., 2d Sess. 62 (1976). See also Litchfield v. Spielberg, 736 F.2d 1352, 1357 (9th Cir. 1984); Berkic v. Crichton, 761 F.2d 1289, 1291, n.1 (9th Cir. 1985) (rejecting derivative work claims where no protectable expression was incorporated into subsequent works); Samuelson, supra note 23, at 1209-21 (1986) (discussing the derivative work right). Congress did not follow a suggestion made in the 1976 Act legislative history that the set of exclusive rights include the right to prepare supplementary works. See Hearings Before Subcommittee No. 3 of the House Committee on the Judiciary, 89th Cong., 1st Sess., § 8, pt. 1 at 134. From this legislative history, it is apparent that works interacting with other works should not be found to infringe.

Because software is inherently interactive with other software, it would make no sense for courts to find infringement based on functional interactiveness. The problem of software modifying other software is closely related to the user modification problem because it matters very little, from a computer scientist's perspective, whether one modifies a program by changing its code or by writing a separate program. Whether modified from the inside or the outside, the act of adaptation is the same, and there is no principled basis for copyright law to distinguish between them.

34See infra note 89 and accompanying text.
35See, e.g., OTA REPORT, supra note 5, at 209, and infra notes 88-105 and accompanying text.
A. Section 117: “Essential Step”

At first blush, § 117 seems to provide a very significant limitation on the copyright owner’s ability to control user modifications. It says the owner of a copy of copyrighted computer program “may make or authorize the making of . . . [an] adaptation of that computer program provided . . . that such . . . adaptation is created as an essential step in utilization of the computer program in conjunction with a machine. . . .” This provision seems to recognize that software is a kind of work more likely to need consumer modification than other copyrighted works. Because of this, § 117 appears to create a special privilege for software consumers, seemingly granting wider modification rights than are ordinarily available to owners of copies of copyrighted works.

Section 117 might initially seem so protective of the consumer’s interest as to render the user modification problem a nonissue. But looking more closely at the text of the provision, how the software industry has reacted to it, and recent caselaw interpreting it, one sees the seemingly helpful intent of the provision picked clean of substance, raising doubts whether consumers ever have the right to make even essential modifications.

The first problem with § 117 is that it grants the modification privilege only to “owners of copies” of the program, not to all users. The National Commission on New Technological Uses of Copyrighted Works (CONTU), which recommended the computer program amendments to the copyright statute, originally drafted the text of § 117 to extend adaptation rights to all “rightful possessors” of copyrighted programs. Without explanation, Congress changed the class of § 117 beneficiaries from “rightful possessors” to “owners of copies,” opening the door to the widespread practice of marketing soft-

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37See CONTU FINAL REPORT, supra note 8, at 13.
38See infra note 70 and accompanying text for a discussion of the possible relationship between the fair use doctrine and § 117. See also Stern, supra note 9, at 462 (asserting that § 117 was intended as a compromise to accommodate user modifications).
39Because of the overly narrow judicial interpretations of § 117, Professor Raskind and Mr. Stern have argued for amendments to broaden user modification rights. See Raskind, supra note 9, at 1172-73 and Stern, supra note 9, at 484-485.
40See supra note 7 for a discussion of “shrink-wrap” licenses by which software publishers try to retain ownership of copies. See also infra note 76-83 for a discussion of resale rights that consumers of copyrighted products usually have.
41See CONTU FINAL REPORT, supra note 8, at 13. The text of § 117 as originally proposed by CONTU would have permitted “rightful possessors” to make “essential step” adaptations and backup copies.
42Compare CONTU FINAL REPORT, supra note 8, at 13 and 38, with Pub. L. No. 96-517, 94 Stat. 3007 (1980). But for the change of the beneficiary class, the text of § 117 as proposed by CONTU was adopted. See id.

Since Congress did not explain, one can only speculate about the reasons for the change. The most plausible explanation is that Congress wanted § 117 to conform to the “first sale” rule in § 109. Both §§ 117 and § 109 concern consumer rights to redistribute their copies of the work. CONTU’s version of § 117 would have permitted rightful possessors to redistribute their copies.
ware on a "license-only" basis. This practice seems to have been adopted solely to strip consumers of rights they would otherwise have under copyright law. If the software industry's interpretation is followed, no consumer has the right to make even essential modifications under §117, since this privilege is available only to "owners of copies," not licensees.

There is precedent in copyright caselaw for disregarding the manufacturer's characterization of a transaction, looking through the form of a transaction to its substance to find a sale when the manufacturer asserts there is only a license. It may be some comfort to software modifiers that several commentators have argued that the "shrink wrap" licenses the software industry so often uses are invalid (or have invalid provisions), but there is as yet no definitive ruling striking down such software "licenses."

A second problem with §117 is that the privilege is limited to making modifications that are an "essential step in the utilization of the computer program in conjunction with a machine." It is not self-evident what "essential step"
modifications might or might not include. The phrase seems susceptible of a broad or narrow interpretation under § 117.

The narrowest reading of § 117 would limit its application to fixing errors in the code that would render the program inoperable.20 Under the strictest interpretation, one might not be privileged to correct an error that makes the machine function inefficiently (or even inaccurately) because such a modification would not be “essential” to execution of the program. The narrow interpretation also leaves no room for a user to enhance the program to make it function better for the purpose for which it was acquired, as enhancements are not “essential” to using the program in the machine. Unfortunately (from the user standpoint), recent caselaw seems to favor the narrow interpretation of the “essential step” language of § 117.51

A broader view of § 117 would permit modifications to software that are “essential” from the standpoint of the user’s purposes for the software, not just from the standpoint of execution. A user who buys a copy of a computer program to perform a particular function and must modify it in order to perform the function (or to perform it better) would be covered by § 117 under this reading. It appears CONTU intended this broad view.52

Unfortunately, CONTU was careless in drafting § 117. The “essential

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20A statement in the CONTU Final Report supports the narrow interpretation of § 117 adaptation rights:

Because of a lack of complete standardization among programming languages and hardware in the computer industry, one who rightfully acquires a copy of a program frequently cannot use it without adapting it to that limited extent which will allow its use in the possessor’s computer. The copyright law, which grants to copyright proprietors the exclusive right to prepare translations, transformation, and adaptations of their work, should no more prevent such use than it should prevent rightful possessors from loading programs into their computers.

CONTU FINAL REPORT, supra note 8, at 13 (emphasis added).

51See, e.g., Midway Mfg. Co. v. Strohoh, 564 F. Supp. 741, 745 n.2 (N.D. Ill. 1983) (Strohon was the manufacturer of a “speed-up kit” videogame which was an adaptation of Midway’s copyrighted videogame program, who was held liable for infringement; § 117 did not permit the adaptation because a speed-up kit was not essential to make the game compatible with the hardware). See also Apple Computer, Inc. v. Formula Int’l, Inc., 594 F. Supp. 617 (C.D. Cal. 1984) (rights under § 117(1) apply only where the activity is “indispensable” to use the program) and Stern, supra note 9, at 467-68.

52Several statements in the CONTU FINAL REPORT support a broader interpretation of § 117:

[A] right to make those changes necessary to enable the use for which it was both sold and purchased should be provided. The conversion of a program from one higher-level language to another to facilitate use would fall within this right, as would the right to add features to the program that were not present at the time of rightful acquisition. These rights would necessarily be more private in nature than the right to load a program by copying it and could only be exercised so long as they did not harm the interests of the copyright proprietor . . . . Again, it is likely that many transactions involving copies of programs are entered into with full awareness that users will modify their copies to suit their own needs, and this should be reflected in the law. The comparison of this practice to extensive marginal note-taking in a book is appropriate: note-taking is arguably the creation of a derivative work, but unless the note-taker tries to copy and vend that work, the copyright owner is unlikely to be very concerned.

CONTU FINAL REPORT, supra note 8, at 13 (emphasis added).
The "essential step" language of § 117 actually addresses two different problems, the first being the need to make copies of software within the computer in order to use the program, and the second being adaptations to make the software more useful. The "essential step" language was both meaningful and appropriate for the first problem, but not for the second. Unfortunately, the bare text of § 117 on the scope of the adaptation right does seem more consistent with the narrower interpretation than the broader one.

Though the narrow interpretation is contrary both to the legislative history of the provision and to common sense, and while a software user might successfully argue that a particular modification is essential to fulfill the user's

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To demonstrate CONTU's carelessness, it is helpful to see the full text of § 117:

> Notwithstanding the provisions of section 106, it is not an infringement for the owner of a computer program to make or authorize the making of another copy or adaptation of that computer program provided:
>
> (1) that such a new copy or adaptation is created as an essential step in the utilization of the computer program in conjunction with a machine and that it is used in no other manner, or
>
> (2) that such new copy or adaptation is for archival purposes only and that all archival copies are destroyed in the event that continued possession of the program should cease to be rightful. Any exact copies prepared in accordance with the provisions of this section may be leased, sold, or otherwise transferred, along with the copy from which such copies were prepared only as part of the lease, sale, or other transfer of all rights in the program. Adaptations may be transferred only with the authorization of the copyright owner.

In order to execute a program (or even store it), a computer must repeatedly make internal copies of the program (unlike other copyrighted works which can be used without copying). Making copies is thus an *essential step* in utilizing the program in conjunction with the machine, and the language of § 117 (1) works reasonably well with this unique aspect of software.

The language of § 117(2) is also oriented to copying problems. Because of the unusually fragile nature of software as normally stored (e.g., a series of polarized areas on a magnetic substrate), it is considerably more susceptible to destruction than other copyrighted works. It is considered prudent to make one or more "backup" copies of software to avoid accidental loss of it. Copies made only for "archival" or backup purposes do not wrongfully interfere with the copyright owner's interests. Hence, the language of § 117(2) is also appropriate to the copying problem.

However, the "essential step" language of § 117 is quite inappropriate for adaptations. Even when one is correcting a bug that renders the computer program inoperable—the situation that the narrowest interpretation of § 117 seems to reach—one does not fix the bug as an essential step in utilizing the program in the machine. As to § 117(2), it seems doubtful anyone would ever make an adaptation solely for archival purposes, which the text of § 117(2) contemplates. Yet, having combined copying and adaptation in the opening text of § 117 and in subsection (1), the CONTU drafters seemed trapped into carrying it into subsection (2) as well, even though utterly inappropriate.

One might think that error corrections essential to execution of the program would be such de minimus interferences with the copyright owner's interests as to raise no § 117 issue. See supra note 21. Another possible defense to a software modification infringement action based on interference with the derivative work right might be that the user modifications were only "trivial variations" on the copyrighted software, variations too trivial to support a separate copyright, and thus too trivial to constitute a derivative work within the meaning of the statute. See, e.g., L. Batlin & Son, Inc. v. Snyder, 536 F.2d 486 (2d Cir. 1976), cert. denied, 429 U.S. 857 (1976) (more than trivial variation on public domain work necessary to support a derivative work copyright).
purposes for the software, a user sued for infringement based on a modification can anticipate an attack on the "essentiality" of the adaptation from an execution standpoint.

A third problem with § 117 is that the caselaw has construed the right to authorize others to make adaptations so narrowly as virtually to read the right entirely out of the statute. Section 117 explicitly allows the owner of a copy of a copyrighted program to authorize a third person to modify it. The caselaw construing § 117 has undercut this provision by treating as infringers third parties who have gone into the business of implementing rights that owners of copies have under § 117. These cases posit that even if A, the owner of a copy, has the right under § 117 to authorize B to modify software in which C holds the copyright, that doesn't mean B can go into the business of modifying software before he has A's authorization (even if B later gets A's authorization), and thereafter defend against C's lawsuit by saying he or she was merely implementing A's rights under § 117. This interpretation of the authorization provision seems absurdly narrow, but some judges seem to have accepted it.

Because users of software are often not knowledgeable enough about software to do the modification work themselves, they must be able to authorize third parties to do modifications, or else their "right" even to make essential modifications under § 117 is useless. Limiting authorizations to only those

Professor Patterson would distinguish between "use of the copyright" and "use of a copy," the former occurring when competitive use is made of protected expression, the latter being what consumers do with the work. "Use of the copyright," he argues, is what the copyright statute is intended to regulate and is an appropriate basis for imposing copyright liability. Use of a copy, however, should not create liability. See Patterson, Free Speech, Copyright, and Fair Use, 40 Vand. L. Rev. 1 (1987).

See supra note 53 for the full text of § 117. The text of § 117 suggests that users can authorize third parties to make whatever modifications to the software that would be lawful for the users themselves to make. Section 117 also allows owners to authorize third parties to make "essential step" and backup copies of software.

At least three software copyright cases have involved third parties who claimed a privilege for their conduct by virtue of their intent to implement user rights under § 117. See Micro-SPARC Inc. v. Amtype Corp., 592 F. Supp. 33 (D. Mass. 1984); Apple Computer, Inc. v. Formula Int'l, Inc., 594 F. Supp. 617 (C. D. Cal. 1984); and Hubco Data Products Corp. v. Management Assistance, Inc., 219 U.S.P.Q. (BNA) 450 (D. Idaho 1983). Micro-SPARC and Formula involved third parties making copies on behalf of users. Hubco involved third parties making adaptations. In all three cases these defenses were unsuccessful. The courts seem to have been affected by the fact that it was not the user/consumers who took the first step by coming to the third party with a request the third party responded to, but rather in the two copying cases, the third parties first made the copies and then attempted to find user/consumers to buy them, and in the adaptation case, the third party advertised its ability to make an adaptation to copies of the plaintiff's program that would significantly upgrade the program's capabilities. When user/consumers responded to the advertisement, the third party came to their place of business to perform the modification. The discussion of § 117 in Hubco is too cursory to be helpful. Interestingly, infringement liability in Hubco was not based on the modification to user/consumers' copies, but on a printout of the program the defendant had made in the course of adapting it to upgrade its capabilities. See infra note 96 concerning the legality of reverse engineering of software. But see Vault Corp. v. Quaid Software, Inc., 655 F. Supp. 750 (E. D. La. 1987) (third party not liable for contributory copyright infringement where defendant's program allowed users to make backup copies to implement their rights under § 117).

See Stern, supra note 9, at 478-483.

See Raskind, supra note 9, at 1173 and Stern, supra note 9, at 480.
third parties not in the business of modifying software would also make § 117 virtually useless.\(^6\)

In conclusion, while § 117 appears to offer some meaningful shelter for users wanting to modify copyrighted software, the text of § 117 has provided the software industry an opportunity to carp over language and focus on a very confined and confining range of issues. One ends up arguing what is "essential," not what is reasonable for software users to do under the circumstances.

B. Section 107: The Fair Use Defense

Section 107 of the copyright law provides that fair use can be made of copyrighted works.\(^6\) This means that even though someone has quite literally trespassed on one of the copyright owner's exclusive rights under § 106, if the defendant's use was "fair," there is no infringement.\(^6\) This provision does not, of course, define what is and is not "fair," although it points to a set of factors to be used in assessing whether a particular use is fair.\(^6\) The factors are:

1. the purpose and character of the defendant's use of the copyrighted work;\(^6\)
2. the nature of the copyrighted work;
3. the amount and substantiality of the portion used in relation to the copyright work as a whole; and
4. the effect of the use upon the potential market for or value of the copyrighted work.

Though no fair use defense has yet been raised in any software copyright case, see Raskind, supra note 9, at 1177, user adaptations may be an appropriate place for fair use to be applied. But see infra notes 70-75 and accompanying text for an argument that fair use does not apply if adaptations go beyond the scope of § 117.

\(^{6}\) See infra notes 195-201 and accompanying text for a discussion of problems associated with the scope of third-party modification rights.


\(^{62}\) The fair use doctrine is often spoken of as an "equitable rule of reason." See, e.g., Sony Corp. v. Universal City Studios, 464 U.S. 424, 448 (1984). Prior to the 1976 Act, "fair use" was a judicially recognized defense to copyright infringement but not part of the statute. The House Report indicates that Congress did not intend to "freeze" the fair use doctrine by putting it into the statute, but to let it evolve over time in response to technological change. See H.REP., supra note 29, at 65-66 (discussion of congressional intent to codify the doctrine).

\(^{63}\) The full text of § 107 provides:

> Notwithstanding the provisions of section 106, the fair use of copyrighted work, including such use by reproduction in copies or phonorecords or by any other means specified by that section, for purposes such as criticism, comment, news reporting, teaching (including multiple copies for classroom use), scholarship, or research, is not an infringement of copyright. In determining whether the use made of a work in any particular case is a fair use the factors to be considered shall include—

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

Although no fair use defense has yet been raised in any software copyright case, see Raskind, supra note 9, at 1177, user adaptations may be an appropriate place for fair use to be applied. But see infra notes 70-75 and accompanying text for an argument that fair use does not apply if adaptations go beyond the scope of § 117.

\(^{64}\) As the preamble and subsection (1) indicate, the purpose and character of the defendant's use of the plaintiff's work is of considerable importance. The recent Sony Betamax case states that noncommercial takings of copyrighted works are presumptively fair, while commercial takings are presumptively unfair. See Sony Corp. v. Universal City Studios, 464 U.S. 424, 449 (1984). If this
(2) the nature of the work;\(^6\) (3) the substantiality of the taking from the work;\(^6\)
and (4) the effect of the defendant’s use upon the market (or potential market) for the work.\(^7\)

As with § 117, the fair use provision appears to hold out some promise of protecting software consumers from the otherwise long reach of the exclusive rights provision. One advantage of § 107 over § 117 is that rights under § 107 are not restricted to “owners of copies.”\(^6\) Also, § 107 clearly is intended to reach some things that would otherwise be infringing derivative works.\(^6\) There are, however, serious questions about the usefulness of § 107.

For one thing, an argument can be made that § 107’s fair use privilege does not apply to computer program modifications.\(^7\) The argument runs like this: § 117 is a special provision of the copyright law written specifically to deal with software modification rights; it alone prescribes what software modifications are fair or unfair and who can make them; if a particular modification goes beyond the scope of § 117, or if the user is otherwise disqualified from assert-

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\(^{6}\) This is in general the most elusive of the fair use factors. In many cases it is simply not significant. See, e.g., Triangle Publications, Inc. v. Knight-Ridder Newspapers, Inc., 626 F.2d 1171, 1176 (5th Cir. 1980) (that TV GUIDE was a commercial publication neither supported nor hurt Knight-Ridder’s fair use claim). Still, in some circumstances the nature of the work is important. If a teacher makes and distributes multiple copies of a portion of a copyrighted work for classroom use, it matters whether the copied work is from a newspaper, or from a textbook designed for class use, more leeway being given to copy the former because of lesser threat of market displacement and because “fresh news” may stale before permission can be obtained. See S. Rep. No. 473, 94th Cong., 1st Sess. 64 (1975). Caselaw suggests more leeway may be given to one who takes from a copyrighted work that requires mere diligence rather than creativity to produce. See, e.g., New York Times Co. v. Roxbury Data Interface, Inc., 434 F. Supp. 217, 221 (D.N.J. 1977). More freedom will also be given to reproduce works that are out-of-print or otherwise difficult to obtain. S. Rep. No. 473, supra, at 64-65. The adaptability of software should create more leeway for fair modifications to this type of copyrighted work, at least as to the “nature of the work” factor.

\(^{7}\) The substantiality of the defendant’s taking is frequently of great importance in the fair use analysis. Courts often take a quantitative approach to assessing fair use, calculating the number of words or percentage of the whole appropriated. The computations in Metropol v. Nizer, 560 F.2d 1061 (2d Cir. 1977), cert. denied, 434 U.S. 1013 (1978), are fairly typical. There, portions of twenty-eight letters from a copyrighted collection were incorporated verbatim into the defendant’s book. A total of 1,957 words, or approximately one percent of the defendant’s work, were taken. However, taking a relatively small quantity will still be considered a “substantial” taking if what was taken is a valuable portion of the work. See, e.g., Wainwright Sec., Inc. v. Wall St. Transcript Corp., 558 F.2d 91 (2d Cir. 1977), cert. denied, 434 U.S. 1014 (1978) (publication of predictions of a financial research report deemed substantial in quality).

\(^{8}\) The harm or potential harm for the plaintiff’s market is often considered the most significant factor in fair use analysis. See, e.g., Triangle Publications, Inc. v. Knight-Ridder Newspapers, Inc., 626 F.2d 1171, 1177 (5th Cir. 1980); 3 M. Nimmer, supra note 28, § 13.05[A][4].

\(^{9}\) Compare the text of § 107, supra note 63, with the text of § 117, supra note 53.

\(^{10}\) See, e.g., Rosemont Enterprises, Inc. v. Random House, Inc., 366 F.2d 303 (2d Cir. 1966) (popular history of Howard Hughes took material from copyrighted articles about Hughes, yet use was fair).

\(^{11}\) See supra notes 37-38 and accompanying text for the argument that § 117 gives special leeway for software modifications.
ing § 117 rights, the conduct cannot then be protected as fair under § 107. This argument is surely no more absurd than several other technical arguments used with some success under § 117. Secondly, even if § 117 does not entirely supplant § 107 as to user modification rights, it may still be used as a guide to what modifications are fair and reasonable.

But more importantly, fair use may have limited usefulness because of the heavy emphasis fair use caselaw has placed on the harm-to-the-market factor, particularly to the extent it emphasizes harmful effects on potential market interests of the copyright owner. If a copyright owner offers his or her own software modification services to consumers, or demands compensation for allowing a competitive market to arise for such services, it may be hard to say user modification does not harm the copyright owner’s market or potential market for modification services. It may be particularly difficult to establish a fair use defense where the user has chosen a third party over the software copyright owner to do the modification. While no caselaw currently interprets § 107 in the software modification context, the emphasis on “harm to potential markets” makes the fair use provision a rather infirm ground for asserting modification rights.

C. Section 109: The First Sale Rule

Section 109 of the copyright law limits the copyright owner’s right to exercise control over copies of his or her work following their sale to the public. Like the fair use doctrine, this “first sale” doctrine was originally a judicially created limitation on the scope of copyright owners’ exclusive rights. The doctrine arose in a series of cases in which copyright owners and patentees tried to restrict what purchasers could do with copies of the works, such as reselling them in particular territory, reselling them except at a price fixed by the copy-

71See supra notes 57-58 and accompanying text.
72See supra note 67.
73The OTA REPORT, supra note 5, raises many questions about harms to potential markets arising from such activities as home taping. Id. at 197–203.
74See infra notes 158-75 and accompanying text for a discussion of reasons software developers might object to other firms modifying their software.
75Particularly if courts adopt the “implied consent” theory Justice O'Connor used to analyze fair use issues in Harper & Row Publishers, Inc. v. Nation Enterprises, 471 U.S. 539 (1985) (whether a “reasonable” software developer would consent to users modifying their software or authorizing someone else to modify it). No rational profit maximizer would ever agree to competition when he/she could have a monopoly position, and thus no adaptations could ever be made.
77See 2 M. NIMMER, supra note 28, at § 8.12 and 3 M. NIMMER supra note 28, at § 13.05.
78See, e.g., Keeler v. Standard Folding Bed Co., 157 U.S. 659 (1895) (no patent infringement in reselling beds purchased from the patentee’s licensee; once royalty was paid to the patentee on the first sale, absolute property rights rest in owners of the beds, entitling them to resell).
right owner or patentee, and using them except in conjunction with another product approved by the patentees. The courts in these cases struck down efforts to control what purchasers did with the work after it left the hands of the owner of the intellectual property right. The courts regarded copyright and patent protection as creating an entitlement to compensation on the first sale of the item, but held that after that sale, the personal property rights of the purchasers became paramount.

Like the fair use doctrine, the first sale rule was codified in the 1976 Act. Like its common law cousin, § 109 provides some protection for consumers against overreaching copyright owners, particularly as to resales and displays

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79See, e.g., Bobbs-Merrill Co. v. Straus, 210 U.S. 339 (1908) (copyright owner's exclusive right to vend copies of the copyrighted work does not create a right to restrict the buyer by "license" from reselling the work except at a specified price; copyright owner has no power to impose a restriction on subsequent alienation after parting with title to the copy).

80See, e.g., Straus v. Victor Talking Machine Co., 243 U.S. 490 (1917) (patentee's "license" restricting "licensee's" right to use the patented phonograph except with patentee's recordings, sound boxes, and needles held void). See also Motion Picture Patents Co. v. Universal Film Mfg. Co., 243 U.S. 502 (1917) (unlawful for the patentee to attach "license" notices to motion picture projection machine, a piece of which was patented, that purported to restrict the use of the invention to those who had leased motion pictures from the patentee's licensees).

81As the Court stated in the Motion Pictures Patents case: "[t]he [exclusive] right to vend [the patented article] is exhausted by a single, unconditional sale, the article sold being thereby carried outside the monopoly of the patent law and rendered free of every restriction which the vendor may attempt to put upon it." 243 U.S. at 516. Responding to the widespread use of so-called "license" notices purporting to restrict the use of the patented item except in connection with unpatented items the patentee had licensed, the Court went on to say:

"Courts would be perversely blind if they failed to look through such an attempt as this 'License Notice' thus plainly is to sell property for a full price, and yet to place restraints on its further alienation, such as have been hateful to the law from Lord Coke's day to ours, because obnoxious to the public interest... It would be a perversion of terms to call the transaction intended to be embodied in this system of marketing plaintiff's machines a 'license to use the invention.' [citation omitted]"

Id. at 500-501. See also supra notes 46-48 and accompanying text.

82The full text of § 109 states:

(a) Notwithstanding the provisions of section 106(3), the owner of a particular copy or phonorecord lawfully made under this title, or any person authorized by such owner, is entitled, without the authority of the copyright owner, to sell or otherwise dispose of the possession of that copy or phonorecord.

(b)(1) Notwithstanding the provisions of subsection (a), unless authorized by the owners of copyright in the sound recording and in the musical works embodied therein, the owner of a particular phonorecord may not, for purposes of direct or indirect commercial advantage, dispose of, or authorize the disposal of, the possession of that phonorecord by rental, lease, or lending, or by any other act or practice in the nature of rental, lease, or lending. Nothing in the preceding sentence shall apply to the rental, lease, or lending of a phonorecord for nonprofit purposes by a nonprofit library or nonprofit educational institution.

2) Nothing in this subsection shall affect any provision of the antitrust laws. For purposes of the preceding sentence, "antitrust laws" has the meaning given that term in the first section of the Clayton Act and includes section 5 of the Federal Trade Commission Act to the extent that section relates to unfair methods of competition.
of copies of copyrighted works.\textsuperscript{83} However, the section is drafted more narrowly than its common law roots would have predicted.\textsuperscript{84}

There are at least two problems with § 109 as a source of protection for software modifiers. First, like § 117, § 109 provides protection only to "owners of copies." As explained above, software firms purport to make their work available only on a license basis, with the intent of defeating user rights under § 109, although such "licensing" may one day be struck down.\textsuperscript{85} Second, § 109 as codified limits only the exclusive rights of display and distribution, not the right to prepare derivative works.\textsuperscript{86} Since modifying software affects (if anything) the derivative work right, § 109 may have no application to it.\textsuperscript{87}

\begin{itemize}
\item[(3)] Any person who distributes a phonorecord in violation of clause (1) is an infringer of copyright under section 501 of this title and is subject to the remedies set forth in sections 502, 503, 504, 505, and 509. Such violation shall not be a criminal offense under section 506 or cause such person to be subject to the criminal penalties set forth in section 2319 of title 18.
\item[(c)] Notwithstanding the provisions of section 106(5), the owner of a particular copy lawfully made under this title, or any person authorized by such owner, is entitled, without the authority of the copyright owner, to display that copy publicly, either directly or by the projection of no more than one image at a time, to viewers present at the place where the copy is located.
\item[(d)] The privileges prescribed by subsections (a) and (b) do not, unless authorized by the copyright owner, extend to any person who has acquired possession of the copy or phonorecord from the copyright owner, by rental, lease, loan, or otherwise, without acquiring ownership of it.
\end{itemize}

The "first sale" rule was codified in the 1909 Act in somewhat different form. See 17 U.S.C. § 27 (superseded). It still has not been codified in the patent statute.\textsuperscript{88}

\textsuperscript{83}One who purchases a copy of a book may, under § 109(a), resell it, or loan it, or otherwise dispose of it. Under § 109(c), the owner of a copy of a sculpture can display it publicly without worrying about getting the copyright owner's consent. The first sale rule was amended in 1984 to limit the right to rent, lease, or lend copies of sound recordings for profit. See Pub. L. No. 98-450, 98 Stat. 1727 (1984).

\textsuperscript{84}It is noteworthy that most of the "first sale" cases involved patentees or copyright owners who purported to make their intellectual property available only on a "licensing" basis. See supra notes 78-81. The "first sale" cases seemed to regard intellectual property rights as exhausted (at least as to that copy of the work) once the consumer has acquired personal property rights in the item. See supra note 81. For an application of the common law first-sale analysis to the software modification problem, see infra notes 177-79 and accompanying text.

\textsuperscript{85}See supra notes 7, 40-48 and accompanying text.

\textsuperscript{86}The preamble to § 109(a) begins: "Notwithstanding the provisions of section 106(3)." The preamble to § 109(c) begins: "Notwithstanding the provisions of section 106(5)." Section 106(3) is the exclusive right of distribution, and § 106(5) is the exclusive right of public display. See 17 U.S.C. § 106 (1982). The exclusive right to prepare derivative works is found in 17 U.S.C. § 106(2) (1982). See Midway Mfg. Co. v. Stroh, 564 F. Supp. 741 (N.D. Ill. 1983) (rejecting the first sale defense). See also Apple Computer, Inc. v. Formula Int'l, Inc., 594 F. Supp. 617 (C.D. Cal. 1984) (that Formula had paid to acquire copies of Apple's operating software for resale to its customers did not justify Formula's copying of the Apple program from a floppy disk to a hard disk for the convenience of its customers, even though no more copies were made and resold than Formula had paid for).

\textsuperscript{87}It is curious that § 109(a) permits owners of copies of copyrighted works to sell them, loan them, lease them, and even destroy them utterly. Destruction is covered by the language "or otherwise dispose of them" in § 109(a). See 2 NIMMER ON COPYRIGHTS § 8.12(B) (1986). Destruction of a copy arguably would not infringe the distribution right of the copyright owner under § 106(3).
D. The Non-Statutory Personal or Private Use Defense

Though courts and some commentators 8 have been loathe to give their imprimatur to the concept of a privilege to make copies of copyrighted works for private or personal use, 9 the public strongly supports this concept. 90 Congress at times seems to have agreed, 91 as have some commentators. 92 The recent report of the Office of Technology Assessment, Intellectual Property Rights In An Age of Electronics and Information, concludes it is unclear whether private-use copying is reachable under the current copyright statute and its caselaw interpretation. 93

There is reason to believe the public (and maybe the courts) would give

Perhaps in this respect § 109 is broader in scope than the preambles to subsections (a) and (c) suggest.

Though § 109(a) does not provide any authority for making alterations short of complete destruction, one could argue that a purchaser has the right to alter the copy as a lesser-included right of the right to destroy it. One could also argue that the "first sale" rule, as a common law doctrine, is not limited in application to only those situations reached by the statutory codification of the rule in § 109.

8See, e.g., Nimmer, Copyright Liability for Audio Home Recording: Dispelling the Betamax Myth, 68 VA. L. REV. 1505 (1982) (arguing that home taping infringes copyrights). It is useful to compare the District Court decision in the Sony Betamax case (finding an implied exemption for home use copying) to the Court of Appeals decision (finding against the implied exemption theory) and the dissent in the Supreme Court (also critical of the implied home use exemption). See Sony Corp. v. Universal City Studios, 480 F. Supp. 429 (C.D. Cal. 1979), rev'd, 659 F. 2d 963 (9th Cir. 1982), rev'd, 464 U.S. 417, 457-500 (1984) (dissent by Justice Blackmun). The majority did not reach the implied home use exemption issue, having found for Sony on other grounds. 464 U.S. at 456.

9See, e.g., Nimmer, Copyright Liability for Audio Home Recording: Dispelling the Betamax Myth, 68 VA. L. REV. 1505 (1982) (arguing that home taping infringes copyrights). It is useful to compare the District Court decision in the Sony Betamax case (finding an implied exemption for home use copying) to the Court of Appeals decision (finding against the implied exemption theory) and the dissent in the Supreme Court (also critical of the implied home use exemption). See Sony Corp. v. Universal City Studios, 480 F. Supp. 429 (C.D. Cal. 1979), rev'd, 659 F. 2d 963 (9th Cir. 1982), rev'd, 464 U.S. 417, 457-500 (1984) (dissent by Justice Blackmun). The majority did not reach the implied home use exemption issue, having found for Sony on other grounds. 464 U.S. at 456.

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91The OTA REPORT defines "private use" as: "the unauthorized, uncompensated, noncommercial, and noncompetitive use of a copyrighted work by an individual who is a purchaser or user of that work." OTA REPORT, supra note 5, at 194. The OTA REPORT includes within this term a set of related terms such as "personal use," "private copying," "noncommercial use," and "home use." Id., n.40. The OTA REPORT points out that:

Private use may be occasional or insubstantial—as when a cartoon is photocopied (possibly infringing reproduction rights) and posted on an office door (possible infringing display rights)—or it can be systematic and substantial—as when music "libraries" are built on blank tape (possibly infringing reproduction rights) and shared amongst friends (possibly infringing distribution rights).

Id. See also id. at 190-213 (discussion of "private use" issues).


93The implied home use exemption theory developed for home videotaping in the Betamax case relied heavily on the legislative history of the 1971 amendment to the copyright statute that added sound recordings to the subject matter of copyright. During the congressional hearings, some endorsed the view that home taping of sound recordings would not infringe copyright; home videotaping was incidentally mentioned in the same vein. The evidence relating to this issue, and the argument that this exemption was carried over into the 1976 Act were set forth in the District Court decision in Sony. See Universal City Studios, Inc. v. Sony Corp., 480 F. Supp. 429, 442-446 (C.D. Cal. 1979) (discussing this legislative history and the implied exemption theory). See also dissent of Justice Blackmun in Sony Corp. v. Universal City Studios, Inc., 464 U.S. 417, 470-475 (1984) (presenting a rebuttal argument to the theory).


95The OTA REPORT observes:

Technology is transferring activities such as printing, publishing, reproducing, and modifying works from the commercial entrepreneur to the end user. As a result,
greater support to private or personal use software modification than to private-use home video or audio taping. After all, one reason copyright owners object to home taping or other private-use copying is that the typical taper pays nothing to the copyright owner, yet receives the benefit of the product the industry sells. If software consumers have paid for the software, then the copyright owner has received a reward for providing the product to the consumer, and the public can be expected to support the idea that the consumer should be able to thereafter improve it without fear of liability. Indeed, it seems modifying software is a common and accepted practice in computer science and other software user communities.

The private or personal use defense, like the defenses previously considered, has a number of problems for software modifiers. The main problem is that it is not statutory. As strongly as the public may feel on the subject, the statute does not recognize a private or personal use privilege except perhaps as a subset of § 107’s fair use defense. Some would argue that Congress intended

policy questions are emerging about whether and how the copyright proprietor is to be remunerated for end use, or private use, activities. The private use of copyrighted works raises questions of how far the rights currently granted to the copyright proprietor should extend when new technologies change the context in which these rights operate. Because copyright law does not clearly extend to private use, Congress needs to consider whether it should, and if so, under what conditions. Whether copyright should extend to private use depends, in turn, on a number of criteria, including whether it causes harm to copyright proprietors, whether it would be economically efficient to extend rights, whether political support for an extension of rights exists, and whether access to information can be ensured.

Id. at 193 (emphasis in original).

This was one of Universal City Studios’ arguments in the Sony case. Other private use copying cases have raised the same issue. See, e.g., Williams & Wilkins Co. v. United States, 487 F.2d 1345 (Ct. Cl. 1973), aff’d by an equally divided court, 420 U.S. 376 (1975) (uncompensated photocopying of copyrighted journal articles for medical researchers was fair use).

The concept that copyright owners might have continuing control over a consumer’s use of his or her copy is anathema to those who are not copyright specialists. See infra notes 177-79 and accompanying text.

See OTA REPORT, supra note 5, at 115. The commonness of this practice may give rise to another potential nonstatutory defense. Some recent software copyright decisions have recognized a kind of "common practice" defense for reverse-engineering of software. Because reverse engineering is a common practice in the software industry, some judges have not found the copying of a program for reverse engineering purposes to be an infringement per se. Only if the subsequently developed program incorporates a substantial block of another firm’s protected expression will infringement arise. See E. G. Johnson Co. v. Uniden Corp. of America, 623 F. Supp. 1985 (D. Minn. 1985) (infringement based on substantially similar expression in second program) and Q-Co. Industries, Inc. v. Hoffman, 625 F. Supp. 608 (S.D.N.Y. 1985) (no infringement without substantial similarity of program expressions). But see Hubco Data Products Corp. v. Management Assistance, Inc., 219 U.S.P.Q. (BNA) 450 (D. Idaho 1983) (infringement based on making a "core dump" copy of the copyrighted program for reverse-engineering purposes). Adapting software is probably an even more common practice in the industry. See OTA REPORT, supra note 5, at 115. Much of the reverse engineering is performed in order to adapt software.


See OTA REPORT, supra note 5, at 195-197 (discussing the interplay between fair use and private use).
to set forth every limitation on exclusive rights in the 1976 Act, and since no personal use or private use privilege was included, none exists. 99

Others do not take such a rigid approach to the statute. 100 The recent OTA Report indicates that Congress has not spoken clearly on the issue. 101 It questions whether private or personal-use copying really harms copyright owners' markets, 102 and raises concerns about harmful effects on the public resulting from outlawing personal or private use. 103 Several other commentators have endorsed the idea that consumers should be able to use copyrighted materials as they wish so long as they do not go into commercial competition with the copyright owner with identical or near-identical works. 104 However, a modifying user may find this commentary rather cold comfort. The individual user/consumer cannot be certain he or she can raise a successful private or personal use defense for modifications to copyrighted software. 105

E. The Unsatisfactory Analysis Dictated by the Copyright Framework

While more filigree could be added to the analysis of each of the defenses discussed above, enough has been said to illuminate their uncertainty of application to this problem. Neither the user/consumer of software who modifies it nor a third party whom the user authorizes to modify it can be certain that they

100There are a number of copyright defenses that are not found in the statute (e.g., laches and estoppel). See 3 M. NIMMER supra note 28, at §§ 12.06 and 13.07. See also Sony Corp. v. Universal Studios, 464 U.S. 417 (1984) (reading a contributory infringement standard into the copyright law though the statute was silent on this issue). See also infra notes 119-126 and accompanying text for a discussion of the Sony decision.
101OTA REPORT, supra note 5, at 192-3.
102Id. at 197-201. The OTA REPORT points out that in order to show meaningful potential harm to the copyright owner's market, there must be evidence not only that potential users could have bought a copy from the copyright owner (or his/her distributors) but would have done so; other factors also contribute to make potential harm highly indeterminate. Id. at 200-201.
103Id. at 204-208.
104See, e.g., Harvard Note, supra note 92 (arguing that only "iterative" commercial copying should be infringing conduct under copyright law in an advanced technological era) and Patterson, supra note 55 (arguing that copyright law is intended to regulate commercial reproductions of copyrighted works, not to create property rights that permit control over noncommercial conduct.) See also Gordon, Fair Use As Market Failure: A Structural and Economic Analysis of the Betamax Case and Its Predecessors, 82 COLUM. L. REV. 1600 (1982) (fair use should be found when the market cannot be relied upon to allow access to copyrighted works). See also supra note 9 for articles arguing for allowing users to make "private use" modifications to software. CONTU also seems to have contemplated private use modifications to software as noninfringing. See supra note 52 for CONTU FINAL REPORT statements that indicate this.
105Though a "private" or "personal" use privilege might help some software modifiers, it is not clear it would help those who made equally reasonable modifications outside the home for other than one individual's "personal" purposes. In a business setting, for example, software modifications may be critically important to the purposes for which the software was acquired. Even less clear is whether a private or personal use defense could be made if the modification was made by a third party for profit.
would be free from copyright liability. This is a failure of the copyright statute.\footnote{As Professor Kaplan said about the lack of a congressional resolution on the fair use status of photocopying: "It seems hardly a statesman-like result to leave a sizeable fraction of the population... thus uncertainly subject to civil and even criminal liability for acts as habitual to them as a shave in the morning, especially as publishers are still far from devising any simple methods by which this public could calculate and make the payments that might clearly legitimize those habits." \textit{B. Kaplan, An Unhurried View of Copyright} 102 (1967).
}

Quite apart from these uncertainties, the analysis of the copyright defenses presented above—a very standard copyright analysis, one following the framework the copyright statute itself sets up for analyzing such problems as user modification rights—may leave an uneasy and dissatisfied feeling, for it never addresses in any depth what is really at stake in the software modification controversy: why users think they need to modify software, why software developers want to prohibit them from doing it, and what impact would result from resolving the issue one way or the other.

The copyright statute itself leads to the narrow, carping, tedious, and technical analysis that the sections above have set forth. The structure of the statute implies that an analytic framework such as the one employed above must be used to assess infringement defenses. This framework seems to require, first, determining whether the conduct in question (software modification) might affect an exclusive right of the copyright proprietor\footnote{17 \textit{U.S.C.} § 106 (1982) (exclusive rights provision). \textit{See supra} note 18.} (the derivative work right). If so, one must then hunt through twelve finely crafted, highly technical limitation provisions\footnote{17 \textit{U.S.C.} §§ 107-118 (1982).} to see if any apply to the situation (as to software modifications, there are three). Finally, one must determine if each of the special elements necessary to establish a successful defense under a particular limitation are met.\footnote{See \textit{supra} notes 36-87 and accompanying text for illustrations of the technical requirements these limitation provisions contain.}

Several aspects of this analysis are noteworthy. First, a defendant is almost certain to lose if his or her case presents a situation Congress did not contemplate (or was unable to resolve).\footnote{The defendant’s only chance would be to argue that this analytic framework should not be used in this instance.} Second, even in situations Congress has addressed, the analysis heavily favors the copyright owner. Once a hint of impact on an exclusive right is shown, the copyright owner need only show that the defendant missed one statutory wicket, and the limitation provision defense is dead. Third, this approach is very insistent that the statutory wickets are all that matter. Thus, one ends up analyzing whether a particular defendant is an “owner of a copy” or a “licensee”; questioning whether a particular modification was “an essential step” in using the software in a machine; parsing the “first sale” provision to see which exclusive rights it affects. We should be
asking whether it was reasonable for the defendant to make the modification, and whether a user/consumer might need to tinker with the code to use it for the purpose for which it was acquired. In the statutory-oriented analytic framework, however, there is simply no place to put these other facts and issues; being outside the statutory framework, they are presumed to be extraneous.

Nor does this analytic framework permit consideration of the larger policy implications of infringement decisions. The derivative work right was adopted to protect novelists against unscrupulous screenwriters. Perhaps one should treat differently a technology such as software because of the chilling effect on innovation that a "no modification" rule might have. The standard analysis turns a deaf ear to this argument. It simply points to § 117 and implies that Congress fully dealt with the issue; if the modifying user can't make it through the wickets of that provision, the matter is closed. The analysis is oblivious to the possibility that the copyright owner might be overreaching, or attempting to unlawfully extend its monopoly, or misusing the copyright. The standard analysis comes from a highly property-oriented model of what copyright is about. This model certainly has its adherents, prominently among them the owners of valuable copyrights. But is this the "right" model, or at least the model that Congress intended for the courts to adopt?

An alternate model of copyright takes a regulatory approach. It views copyright as reflecting a bargain that Congress has struck between the interests of authors and those of the public: by granting certain limited exclusive rights to authors, Congress seeks to attain the public policy end of promoting learning and dissemination of knowledge. The regulatory approach jealously watches to see that copyright monopoly extends no further than necessary to reach this goal. It considers the uses consumers need or want to make of a copyrighted work, balancing their interests against those of copyright owners. This more flexible, open model of copyright is guided by the statute, but not chained to it. It is not hostile to the possibility of new situations that lead to new defenses. It is

Concerning the appropriateness of a "property" characterization for copyright, Professor Kaplan has observed:

To say that copyright is 'property,' although a fundamentally unhistorical statement, would not be baldly misdescriptive if one were prepared to acknowledge that there is property and property with few if any legal consequences extending uniformly to all species and that in practice the lively questions are likely to be whether certain consequences ought to attach to a given piece of so-called property in given circumstances . . . . But characterization in grand terms then seems of little value: we may as well go directly to the policies activating or justifying the particular determinations.

Kaplan, supra note 106, at 74. Professor Patterson warns of a risk that "judges will be beguiled by the talismanic nature of the word property" and not balance consumers' interests along with those of authors and entrepreneurs. Patterson, supra note 55, at 58, 61.

The author is indebted to Professor Patterson for his concept of the "property" and "regulatory" models of copyright. See Patterson, supra note 55 at 5. See supra note 100 for other nonstatutory copyright defenses.

See, e.g., OTA REPORT, supra note 5, at 188-193.
sensitive to unfair competitive uses of protected expression, but also attentive
to dangers of overreaching by copyright owners, who have sometimes in the
past brandished their property rights to the detriment of the public.

Historically, the regulatory model of copyright has predominated. The
OTA Report indicates that Congress did not make explicit in the 1976 Act
which of the models it was adopting, though there is language in the House
Committee report supporting the regulatory model.

In the Sony Betamax case the Supreme Court chose a regulatory over a
property-oriented approach to analyzing the home videotaping controversy.
There is striking contrast between the analytic structure used by the majority
and that of dissenting Justice Blackmun, who favored the property-oriented
approach. The majority opinion considers a wide range of factors, among them:
the public's interest in using videotape recorders; evidence that many copy-
right owners either did not object to home taping or perceived it as a good thing;
and that the plaintiffs' works constituted only a small percentage of total televi-
sion programming. The property-oriented model used by the dissent admits
of no room for consideration of these factors.

The majority realized that if movie studios got the relief they sought
against Sony, others besides the parties—namely, the public and copyright
owners who did not object to home taping—would be hurt. And the studios
conceded there had as yet been no harm to their markets and they were unable
to offer persuasive evidence of future harm to their markets. The Court char-
acterized their claims against Sony as an effort

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114 See Patterson, supra note 55, at 37-41.
115 See supra notes 78-81 and accompanying text.
116 See OTA REPORT, supra note 5, at 188-190.
117 See id. at 192-193.
118 See id. at 192, quoting H. REP. NO. 1476, supra note 29, at 61 (emphasizing commercial
copying and distribution).
120 Justice Blackmun's dissent even states: "The Court has adopted an approach very different
from the one I have outlined." Id. at 493. Justice Blackmun accused the majority of dramatically
altering the fair use doctrine, id., and evading the hard issues presented by the case, id., at 457.
121 See id. at 442-447.
122 The Blackmun dissent sticks closely to the text and legislative history of the statute, and to
factors that standard copyright analysis employs. Id. at 460-486.
123 If there are millions of owners of VTR's who make copies of televised sports
events, religious broadcasts, and educational programs . . ., and if the proprietors
of those programs welcome the practice, the business of supplying the equipment
that makes such copying feasible should not be stifled simply because the equipment
is used by some individuals to make unauthorized reproductions of respondents' works.
The respondents do not represent a class composed of all copyright holders.
Yet a finding of contributory infringement would mentally frustrate the interests of
broadcasters in reaching the portion of their audience that is available only through
time-shifting.

Id. at 446.
124 Id. at 450-454.
to enlarge the scope of [their] statutory monopolies to encompass control over an article of commerce that is not the subject of copyright protection. Such an expansion of the copyright privilege is beyond the limits of the grants authorized by Congress.\textsuperscript{125}

Quoting prior decisions, the Court reiterated:

The limited scope of the copyright holder's statutory monopoly . . . reflects a balance of competing claims upon the public interest: creative work is to be encouraged and rewarded, but private motivation must ultimately serve the cause of promoting broad public availability of literature, music, and the other arts . . . . When technological change has rendered its literal terms ambiguous, the Copyright Act must be construed in light of this basic purpose.\textsuperscript{126}

The Court followed a perfect regulatory analysis. It balanced the competing interests of the parties, as well as the interests of others affected by the case, assessed the impact of its decision on all of them and on the utilization of the technology Sony manufactures, considered the limited scope of protection that Congress intended to extend to copyright owners, and weighed these factors in light of the underlying public purposes of the copyright law, ruling finally that Sony was not liable for contributory infringement of the studios' copyrights.

The Supreme Court's regulatory analysis in \textit{Sony} can also be applied to the software user modification problem discussed in earlier subsections. The fact that the Court rejected in \textit{Sony} the highly technical, property-oriented analysis of the Blackmun dissent suggests that the Court would take a regulatory approach to software modifications as well. It is to this regulatory analysis that this article now turns.

\section*{II. A NEW LOOK AT USER MODIFICATION RIGHTS}

Because it is a technology, software is radically different from other subject matters of copyright.\textsuperscript{127} Utilitarian works, including technologies, have traditionally been excluded from the copyright system precisely because of their

\textsuperscript{125}Id. at 421. The Court made the astute point that were it to grant the relief the studios sought, it would in effect be holding that the studios had the exclusive right to distribute videotape machines in the United States simply because the machines could be used to infringe copyrights. \textit{Id.} at 441, n.21. The Court described this notion as "extraordinary." \textit{Id.}

\textsuperscript{126}\textit{Id.} at 431-32, quoting Justice Stewart's majority opinion in Twentieth Century Music Corp. v. Aiken, 422 U.S. 151, 156 (1975)

\textsuperscript{127}See, e.g., OTA REPORT, supra note 5, at 78-84 (discussing the "hybrid" character of computer software, which has both symbolic, descriptive qualities like the traditional "writings" that have been protected by copyright and also functional, process implementation qualities traditionally unprotectable under copyright; also pointing out the difficulty of protecting software's descriptive aspects without also protecting its functional aspects). Davidson points out that software is the first copyright subject matter that is also patentable. Davidson, supra note 9, at 1055. As yet no coherent theory addresses either the existing or optimal relationship between patent and copyright protection for software.
utilitarian character.\textsuperscript{128} Technologies have traditionally been protectable—if at all—under the patent or trade secret systems.\textsuperscript{129} Copyright law has no experience protecting technologies, so no precedent exists for recognizing a right to modify a piece of copyrighted technology. It is understandable (if inappropriate) that the first reaction of many copyright lawyers dealing with the software modification issue is to apply the derivative work principle.\textsuperscript{130}

It may have been unwise to place a technology such as software under copyright in the first place,\textsuperscript{131} but it is for now a copyright subject matter, and it may well remain one. That does not mean copyright doctrine must be applied to

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\textsuperscript{128}The 1976 Act makes explicit what copyright caselaw had long recognized as a fundamental principle: that works with "an intrinsic utilitarian function that is not merely to portray the appearance of the article or to convey information" are not copyrightable. See 17 U.S.C. § 101 (1982) (definition of "useful article"). See also H. Rep. No. 1476, supra note 29, at 55 (discussing the lack of protection for utilitarian works). The statute regards as "nonutilitarian" (and protectable) those works whose sole function is to convey information or portray appearances, and treats works with functions beyond these two as "utilitarian" (and unprotectable). Works having both aspects are protected only as to their nonutilitarian elements, and even then only if those elements are capable of existing independently of the utilitarian ones. See, e.g., Mazer v. Stein, 347 U.S. 201 (1954). See also Samuelson, supra note 15, at 727-39. "Utility" was, for a long time, the dividing line between the subject matters of copyright and patent law; a work had to have utility to be patentable and could not have utility to be copyrightable. Id. at 735. For software, the separation is no longer clear.

\textsuperscript{129}The patent system provides protection for new, useful, and nonobvious machines, manufactures, compositions of matter, and processes (including improvements in these categories). See 35 U.S.C. § 101 (1982). Technologies generally qualify as machines, manufactures, or processes. Trade secrets can protect those valuable technologies giving firms a competitive edge in the marketplace so long as the technologies are kept secret. See Restatement of Torts § 757 (1939). Patentable technologies (or parts thereof) have traditionally been held to be outside the bounds of copyright. See, e.g., Taylor Instrument Co. v. Fawley-Brost Co., 139 F.2d 98 (7th Cir. 1943), cert. denied, 321 U.S. 785 (1944) (claim of copyright in circular chart used with a temperature recording machine held invalid because the chart had been part of a patented device; no overlap between patent and copyright domains) and Brown Instrument Co. v. Warner, 161 F.2d 910 (D.C. Cir. 1947), cert. denied, 322 U.S. 801 (1947) (charts intended for use in a machine are not copyrightable subject matter).

\textsuperscript{130}One may wince at a novelist’s strained metaphor or poor grammar, but errors in a novel cannot have the kind of effect on the reader that software errors can have on users (e.g., burnt toast in one’s computerized toaster, or an airplane crash from faulty avionics software).

The author was told of an instance where military personnel modified some avionics software after the software’s developer insisted on what the military thought was an outrageous sum to fix a problem in the software that made the advanced weapons system vulnerable to attack. A sergeant reverse-engineered the software and fixed the “bug,” making the weapon effective for its intended purpose. Though the developer was deprived of the revenues it sought for modifying the software, it is difficult to conceive of the sergeant as a ‘pirate’ upon whom the full sanctions of the copyright law ought to be brought to bear. See infra note 182 and accompanying text on the Defense Department’s policy on software modification rights.

\textsuperscript{131}See Samuelson, supra note 15. The author continues to believe that it was inappropriate to put a utilitarian subject matter like software into the copyright system, but thinks that serious efforts need to be made to accommodate software in the copyright system given that it has been put there. It is possible, however, that a successful accommodation cannot be made. See, e.g., OTA Report, supra note 5, at 81 (“copyright law cannot successfully be applied to computer programs”). See also Karjala, supra note 9 at 55-6:

The MITI Report argues that the realities of software production differ so significantly from those involved in producing other works generally agreed to be copyrightable (reliance on existing programs in producing new ones, for example) that

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software in an unthinking, inflexible way, as if software were the same manner of "literary work" as For Whom the Bell Tolls.\textsuperscript{132} Neither CONTU nor Congress has paid sufficiently careful attention to the special concerns raised by the software modification issue.\textsuperscript{132} To fit software sensibly into the copyright system, one must take into account what software is, what people do with it, and the significant differences between it and other copyright subject matters that may require flexibility in applying traditional doctrines.

As applied to the modification problem, this means realizing that software is a technology and that there are more reasons to allow users to modify technologies than to allow screenwriters to make unauthorized screen adaptations of novels. After exploring reasons why software users might think they need, and are entitled to have, a right to modify software or to hire whomever they choose to modify it, this section will discuss reasons why software developers might think they need, and are entitled to have, control over modifications to their products. The very adaptability of software raises special concerns about controlling the market for modifications. The section concludes that even though the modification problem is a difficult one to resolve, the traditional rules of intellectual property and of the competitive system favor allowing user/consumers to modify software or to authorize third parties to modify it.

A. Considerations Favoring Modification Rights for Users

Software is a technology. People pay money to acquire software to use it for functional tasks such as running gasoline pumps, nuclear power plants, to grant copyright protection would either inhibit software production or require a wasteful allocation of resources in duplicating, without copying, the function of existing programs. In the case of some types of software, copyright protection might also lead to a socially undesirable monopoly not based on the original creator's superior genius, but simply because he gets to the market first and sets a standard that can be equaled only by copying.

These issues are not frivolous nor have they adequately been debated in the United States or in other countries that generally apply copyright law to computer software.

\textsuperscript{132} The Third Circuit has obstinately clung to its characterization of software as a "literary work" entitled to no special consideration on account of its functionality, either as that might affect its copyrightability or the scope of protection accorded to it as compared with more traditional literary works. See Apple Computer, Inc. v. Franklin Computer Corp., 714 F.2d 1240 (3d Cir. 1983) and Whelan Associates, Inc. v. Jaslow Dental Laboratories, Inc. 797 F.2d 1222 (3d Cir. 1986), cert. denied, 107 S. Ct. 877 (1987). It is a time-honored practice for courts to consider the nature of the copyrighted work—whether imaginative, historical, or whatever— in determining the scope of copyright and its permissible uses by persons other than the copyright owner. See, e.g., Continental Casualty Co. v. Beardsley, 253 F.2d 702 (2d Cir 1958), cert. denied, 358 U.S. 816 (1958) and Landsberg v. Scrabble Cross Word Puzzle Game Players, Inc. 736 F.2d 485 (9th Cir. 1984).

\textsuperscript{133} See supra notes 36-55 and accompanying text for a discussion of the paucity of legislative history on § 117. The CONTU FINAL REPORT is virtually the only reflection of congressional intent. CONTU devoted only one short paragraph of its 38-page chapter on computer-related issues to the software modification problem. See CONTU FINAL REPORT, supra note 1, at 13. The text of its statements on the modification issue may be found supra notes 50 and 52.
missile systems, and word processors. Different pieces of software transform one machine—the computer—into many different machines. That is why computer scientists speak of computers as "universal machines," and software, firmware, and hardware when operating together as a "virtual machine."

If software consumers can figure out ways to make this technology more useful to themselves, by modifying certain passages in the code, for instance, or by adding additional lines of code to enhance its functionality, it would seem to make more sense to allow them to do this (or hire someone else to) than to prohibit them from it or force them to pay a premium to the original developer for the "privilege" of doing their own enhancements. Software is a uniquely adaptable technology, much more readily adaptable at lower material costs than standard technologies, and valuable to users because of this quality. Adapting software is an accepted practice in many software user communities. Tools, programming languages, and engineering practices are now being developed to make software even more adaptable in the future.

Allowing users to make modifications to technology to improve its functionality is an important way that technology evolves. This is the primary reason why modest improvements in technology—things obvious to one skilled

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135 See, e.g., A. Hodges, ALAN TURING: THE ENIGMA 293-95, 318-21 (1983). Hodges quotes mathematician and early computer scientist Alan Turing: "We do not need to have an infinity of different machines doing different jobs. A single one will suffice. The engineering problem of producing various machines for various jobs is replaced by the office work of 'programming' the universal machine to do these jobs." Id. at 293.
136 See, e.g., T. Pratt, PROGRAMMING LANGUAGES: DESIGN AND IMPLEMENTATION 14 (2nd ed. 1983): "The computer that executes translated programs may occasionally be hardware component but ordinarily it is a virtual computer composed partially of hardware and partially of software."
137 See infra notes 186-91 and accompanying text for an elaboration for the interests consumers may have in the existence of competition for modification services.
138 See, e.g., Kajala, supra note 9. Kajala points out that many new programs are developed through improvements or additions to existing programs, and enjoining such improvements might impede the development of software technology. Id. at 67.
139 See, e.g., OTA REPORT, supra note 5, at 115.
140 Id. at 114-115. Efforts are being made in the software engineering community to improve software maintainability by improving the initial design process, making it more formal, structured, precisely specified, and automated. See, e.g., Wedo, Structured Program Analysis Applied to Software Maintenance, IEEE PROCEEDINGS OF THE CONFERENCE ON SOFTWARE MAINTENANCE-1985 28 (1985); Bjorn, On the Use of Formal Methods in Software Development, IEEE PROCEEDINGS OF NINTH INTERNATIONAL CONFERENCE ON SOFTWARE ENGINEERING 17 (1987); and Basili and Rombach, Tailoring the Software Process to Project Goals and Environments, id. at 345. See also Martin and Deasy, supra note 1, for a discussion of how standardization, higher level programming languages, and reuse of software may affect software modification activities.
141 The primary purpose of both the patent and copyright laws is not to maximize an innovator's profits but to promote innovation. See, e.g., Motion Picture Patents Co. v. Universal Film Mfg. Co., 243 U.S. 502 (1917):
in the art an improvement addresses—are not protectable under patent law.\textsuperscript{142} Even when someone has made an inventive improvement to technology that qualifies for patent protection, the patentee is not given the right to control user adaptations.\textsuperscript{143} The courts have said that use, modification, and repair rights are within the bundle of rights a purchaser acquires along with a patented machine.\textsuperscript{144} As the Supreme Court stated well over a century ago in \textit{Adams v. Burke}: ‘‘When the patentee sells a machine whose sole value is in its use, and he receives consideration for its use, he parts with the right to restrict that use.’’\textsuperscript{145} A patentee who tried to force purchasers of its machines to buy servicing only from the patentee would risk liability for violations of the antitrust laws.\textsuperscript{146}

Copyright law stands alone among intellectual property laws in conferring derivative work rights on the innovator.\textsuperscript{147} The intellectual property laws that explicitly protect technologies, namely, the patent law\textsuperscript{148} and the semiconduc-

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\textsuperscript{142}The primary purpose of our patent laws is not the creation of private fortunes for the owners of patents but is ‘‘to promote the progress of science and useful arts’’ (Constitution, Art. I., § 8).

\textsuperscript{143}See also infra note 152 and accompanying text.

\textsuperscript{144}The standard for what is a patentable invention is set out in § 103 of the patent statute: A patent may not be obtained . . . if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matters pertains.

35 U.S.C. § 103 (Supp. 1985). See also Graham v. John Deere Co., 383 U.S. 1, 5-6 (1966) (Congress is forbidden under the Constitution from granting patents to improvements in the industrial arts that do not qualify as ‘‘inventions’’).

\textsuperscript{145}See, e.g., Wilbur-Ellis Co. v. Kuther, 377 U.S. 422 (1964). (The purchaser of patented canning machines who adapted them for use with a different-sized can was held not to infringe the patent. Although patentees can control ‘‘reconstructions’’ of the invention, which infringe because they interfere with the patentee’s exclusive right to make the invention, an adaptation making the machine more useful to the purchaser was not a reconstruction.) See also Dana Corp. v. American Precision Co., 618 F. Supp. 288 (N.D. Ill. 1985); General Electric Co. v. United States, 572 F.2d 745 (Ct. Cl. 1978).

\textsuperscript{146}Patentees have exclusive rights only to make, use, or sell their inventions. 35 U.S.C. § 154 (1982). See supra notes 76-87 and accompanying text for a discussion of the ‘‘first sale’’ limitation on the power to control conduct of purchasers of copies of protected works.

\textsuperscript{147}84 U.S. (17 Wall.) 453, 456 (1873), cited with approval in Wilbur-Ellis Co. v. Kuther, 377 U.S. 422, 425 (1964).

\textsuperscript{148}See, e.g., Advance Business Systems and Supply Co. v. SCM Corp., 415 F.2d 55 (4th Cir. 1969), cert. denied, 397 U.S. 920 (1970) (manufacturer’s marketing of machines under the same price structure for both outright sale and lease arrangements including supplies and machine maintenance found in violation of Sherman Antitrust Act, § 1 (15 U.S.C.A. § 1) and Clayton Act, § 3 (15 U.S.C.A. § 14)). See also United States v. Jerrold Electronics Corp., 187 F. Supp. 545 (E.D. Pa. 1960), aff’d per curiam, 365 U.S. 567 (1961) (although a firm may legitimately tie the sale of a very new technology to service and maintenance contracts during its formative phase where necessary to protect its operability, once the industry is well established this justification no longer applies and such an arrangement violates both the Sherman Act and the Clayton Act).

\textsuperscript{149}In addition to the patent and semiconductor chip laws, discussed infra notes 148-150 and accompanying text, other federal intellectual property laws include the design patent law, 35 U.S.C. §§ 171-173, the plant patent law, 35 U.S.C. §§ 161-164, and the Plant Variety Protection Act, 7 U.S.C. §§ 2321-2382.

tor chip law, do not grant an exclusive right to make derivative works. Patent caselaw makes clear that derivative work rights are not within the scope of the exclusive rights granted patentees. Indeed, patent law explicitly provides that improvements to existing machines, manufactures, compositions of matter, and processes can be separately patented by their inventor, even though he or she may not be the same person as the inventor of the underlying work. It is by allowing inventors of improvements to separately patent their creations and by preventing patentees from interfering with the adaptations users may make to improve the functionality of technology that patent law fosters technology's continuous growth.

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149See 17 U.S.C. § 905 (Supp. II 1984) (exclusive rights provision). Indeed, the legislative history of the reverse engineering privilege under this law insulates from liability those who legitimately reverse engineer another firm's protected chip and thereafter make a competitive product that builds upon and improves on the first firm's design unless the two firms' products are substantially identical. See Raskind, Reverse Engineering, Unfair Competition, and Fair Use, 70 MINN. L. REV. 385, 396-98 (1985).

150An early patent case where a patentee sought a "derivative work" right was O'Reilly v. Morse, 56 U.S. (15 How.) 62 (1854). Morse, inventor of the telegraph, claimed patent rights in all devices (not just the one he developed) employing electromagnetism to communicate intelligible marks over long distances. (This would have included the later-invented teletype machine, and possibly all modern telecommunications.) The Supreme Court ruled this claim illegal and void. Id. at 120. The Court cited the need to leave room to encourage other inventors to develop new devices. Id. at 113. The rule in patent cases since then has been that the patentee has rights only to the thing he invented and its equivalents. See 1 CHISUM ON PATENTS § 1.03[2][b] (1986).

15135 U.S.C. § 101 (1982). If the underlying machine is patented by A, and B invents an improvement on it, B can separately patent the improvement and exclude A from using it without B's permission. If B can sell his improvement without incorporating it into A's apparatus, B can do so without running afoul of A's patent. If the improvement must be incorporated into A's apparatus to be effective but B can lawfully acquire copies of A's apparatus and perform the incorporation in B's shop, B can still sell the improved version without liability to A. B is liable only if he/she must recreate the underlying invention as a step in the process of constructing the improved version. See 3 CHISUM ON PATENTS § 9.03[2][b][ii] (1986) and 4 CHISUM ON PATENTS § 16.02 (1986).

There is some precedent for applying a similar rule in copyright. See C.M. Paula Co. v. Logan, 355 F. Supp. 189 (N.D. Tex. 1973) (no infringement where the purchaser of copyrighted greeting cards pasted the cards onto a piece of china and resold them as wall plaques). See also Lantern Press, Inc. v. American Publishers Co., 419 F. Supp. 1267 (E.D.N.Y. 1976) (no infringement where defendant purchased paperback copies of copyrighted books and bound them into hardcover sets which it then sold); Fawcett Publications, Inc. v. Elliott Publishing Co., Inc., 46 F. Supp. 717 (S.D.N.Y. 1942) (no infringement where defendant compiled copies of copyrighted comic books which were then sold to the public); Kipling v. G.P. Putnam & Sons, 120 F. 631 (2d Cir. 1903) (no infringement where defendant purchased new, unbound copies of copyrighted material and bound these, together with uncopyrighted material by the same author, into sets given a distinctive set-name and resold to the public).

152The copyright and patent laws are not designed to maximize revenues for the copyright or patent owner. Their main purpose is to promote the progress of science and the useful arts, as the Constitution itself directs. U.S. CONST. art. I, § 8, cl. 8. See OTA REPORT, supra note 5, at 37-39 (discussing traditional goals of the U.S. intellectual property system). See also Sony Corp. v. Universal City Studios, 464 U.S. 417, 429 (1984): The monopoly privileges that Congress may authorize (under the Constitution) are neither unlimited nor primarily designed to provide a special private benefit. Rather, the limited grant is a means by which an important public purpose may be achieved. It is intended to motivate the creative activity of authors and inventors by the provision of a special reward, and to allow the public access to the products of their genius after the limited period.
In deciding what rule to adopt for user modifications of software, it seems appropriate to look to the principal body of law that regulates intellectual property rights in other technologies, namely patent law. There seems to be general acceptance that patent law is well suited to promoting advances in technology.\textsuperscript{153} Perhaps its more tolerant stance toward user modifications and enhancements is a more appropriate stance for copyright to take toward software modifications than a stance whose foundations rest on protecting novelists from unscrupulous movie producers.\textsuperscript{154}

Looking to patent law for instruction when copyright law provides no clear or useful answer is not without precedent. The Supreme Court in the \textit{Sony Betamax} case\textsuperscript{155} looked to patent principles to resolve a difficult new technology issue and to balance conflicting interests—those of certain copyright owners, those of a manufacturer who supplied a desirable technology to the public, and those of the public—where the copyright statute itself provided no useful guidance.\textsuperscript{156} That case also affirms that one important consideration in deciding a conflict over intellectual property rights is the interest of the public in having access to new technologies and being able to use them for their intended purposes.\textsuperscript{157}

\textsuperscript{154}See Karjala, \textit{supra} note 9, at 68-69 (discussing differences between adapting books and adapting software).
\textsuperscript{155}Sony Corp v. Universal City Studios, 464 U.S. 417 (1984), discussed \textit{supra} notes 119-26 and accompanying text.
\textsuperscript{156}The Supreme Court observed that the copyright statute contains no contributory infringement provision. 464 U.S. at 434. \textit{See also} 17 U.S.C. § 501 (1982). The Court was left with either finding that no contributory infringement doctrine existed in copyright law (an unlikely outcome), or else looking to patent or trademark law for a contributory infringement standard.


Under patent law, on the other hand, contributory infringement liability is only imposed on those who knowingly sell items that have no substantial use except to infringe a patent. \textit{See} 35 U.S.C. § 271(c) (1982). \textit{Sony} argued that its Betamax machines could be used for other things beside infringing plaintiffs’ copyrights, that the machines were (to use the patent term) “staple items of commerce” that Sony should be free to sell even if it had constructive knowledge that some purchasers might use them to infringe copyrights. After discussing the “staple item of commerce” doctrine of patent law, the Court stated:

\begin{quote}
[T]he sale of copying equipment, like the sale of other articles of commerce, does not constitute contributory infringement if the product is widely used for legitimate, unobjectionable purposes. Indeed, it need merely be \textit{capable} of substantial noninfringing uses.
\end{quote}

464 U.S. at 442 (emphasis added). After finding there were noninfringing uses for Betamx machines, the Court held for \textit{Sony}.

\textsuperscript{157}See \textit{supra} notes 123-125 and accompanying text. \textit{See also} \textit{Sony}, 464 U.S. at 441, n.21, 455, n.40, 456, 470.
B. Considerations Opposing Modification Rights for Users

The discussion thus far has focused on reasons why users might think they ought to have modification rights in software. To a certain extent, it has relied on an analogy to the patent law’s system for dealing with user adaptation rights in other technologies. Now we must consider ways in which software differs significantly from traditional technologies, ways that may strengthen the case for giving software developers an exclusive right to control user (or third party) modifications.

Software differs from hardware in that software does not wear out and need to be replaced as most technologies do. Software can of course be destroyed, and it can become obsolete when new products displace it. But it does not erode gradually or become fatigued as metal machinery and other industrial products typically do. That does not mean that software does not need to be maintained; a substantial portion of a software system’s life cycle costs are devoted to maintenance. However, it needs to be maintained in different ways than traditional hardware systems. From an economic standpoint, the non-erodability of software may mean a software developer will look to modifications and enhancements to recoup research and development costs and to

See, e.g., Martin and Deasy, supra note 1, at 227 (hardware maintenance involves servicing the equipment, replacing deteriorated components, and stockpiling spare parts, whereas software maintenance corrects defects and improves functionality).


Most engineers must deal with physical limitations of the materials they use—weight and strength for example. Achieving an acceptable design within these limitations is often the central problem faced by the engineer. Although there are a few limitations of computers such as the amount of memory and processor speed, these limitations do not matter for a large collection of programs. Indeed, the limitations encountered in programming are most often related to our own, very human capabilities.

See supra notes 1-4 and accompanying text for a discussion of “maintenance” as applied to software.

See supra note 166. See also NBS Guide, supra note 1, at 4, discussing reasons for the extensiveness of software maintenance problems:

First of all, there is a great deal of code which was not developed with maintenance in mind. Indeed, the emphasis has often been to get the program up and running without being ‘hindered’ by guidelines, methodologies, or other controls. The second reason is, that over the life cycle of a software system, the code and logic which may have been well-designed and implemented often deteriorate due to an endless succession of ‘quick fixes’ and patches which are neither well-designed nor well-documented. Thus, in today’s vast inventory of application systems, there are many programs which at the time of their development were considered “state-of-the-art,” but today are, in fact, virtually unmaintainable.

More resources are now estimated to be needed to maintain existing systems than to develop new ones. Id. at 2. And while the character of software maintenance may change somewhat with improved software engineering practices, it is expected to continue as a major expense of software systems. Id. at 2-3.

See supra note 158. Lientz, Swanson, and Tompkins report that 17% of their survey respondents’ maintenance and enhancement activities were devoted to corrective maintenance (e.g., routine debugging and emergency fixes), 18% to adaptive maintenance (e.g., accommodation of
generate follow-on revenues, because the spare parts, replacement, repair, and new model markets that hardware manufacturers have traditionally looked to will not be available as income generators.163

Software is also much more adaptable than hardware.164 Hardware is static and fixed. When hardware is adapted, material resources must be devoted to the effort, along with physical labor. Software is dynamic and, from a physical resource standpoint, readily changeable; all it takes is a few logic states changed or added to the group that constitutes the program.165

Software can not only be modified to fix programming errors; it can also be upgraded. From the software developer's standpoint, this is a frightening prospect. Every time the firm sells rights in a piece of software to a customer, the firm is, in a sense, selling not only the product but a production facility that potentially could be used to upgrade the product as well.166 In order to control the evolution of its software products and to finance its own research and development efforts, the development firm will be very concerned about controlling the enhancement market. Because of this, software developers may perceive a need for exclusivity to make the ongoing development of software profitable.

While software is readily adaptable from a material resource standpoint, it is not so easy to adapt from other standpoints. It may in fact be quite difficult or impossible to adapt effectively. A number of factors contribute to the difficulty of modifying software effectively, among them the intangibility of software, the exceptionally complex nature of software designs, and the fact that, until recently, little effort was made to structure software for ease of maintenance and enhancement.167

changes to data inputs, files, hardware or software systems), and 60% to perfective maintenance (e.g., user enhancements, improved documentation and recoding for computational efficiency), with 4% miscellaneous. Lientz, Swanson, and Tompkins, supra note 3, at 468. Sixty-eight percent of the software development firms they surveyed treated existing system maintenance and enhancement (48% of annual personnel hours) as a separate activity from new system development (46%). Over 20% of the respondents allocated 85% or more of their software system efforts to maintenance and enhancement. Id. at 468.

See Stern, supra note 7, at 66:
[Some] software proprietors object to modifications on the ground that 'souping up' a computer program may allow the customer to obtain a product of higher value for the price of the original and lower-valued product—in effect, obtaining the added value free. This would prevent the copyright owner from extracting full value.

See Samuelson, supra note 3, at 14-15 (discussing the adaptability of software as compared with hardware) and 34-35 (discussing intellectual property implications of this).

In machine-readable form, computer programs consist of a sequence of high and low voltage states that represent instructions to the hardware directing the flow of electricity. What makes software modification expensive is the intellectual labor it requires. As software production becomes more automated, the expense of modifying software will increasingly be for acquiring the sophisticated tools needed for maintenance.

It is as if when buying a 1980 Honda one bought a Honda plant along with it, a plant capable not only of turning out endless 1980 models, but also upgraded 1987 models.

Moreover, adapting software can be very difficult without access to the sometimes extensive documentation\(^6\) that pertains to it.\(^{166}\) However, even with 100,000 pages of documentation, modifying software to achieve a desired functional change can be very difficult. Understanding and effectively using 100,000 pages of documentation may require a very high level of sophistication. Sometimes programmers who document a program inadvertently omit significant design detail decisions that are extremely difficult to reconstruct without a technical assistance contract with the original developer.\(^{170}\) And one small change in one part of the software improving one of its functions may do substantial unanticipated harm to other functions of the software, because software modules are often interdependent.\(^{171}\) Because of its accumulated expertise, the software’s developer should be able to make more reliable modifications than a third-party competitor could.\(^{172}\)

If the software is warranted—which, of course, most software is not—changes in the code, either by a user or third-party maintainer, may affect the developer’s warranty liability, as well as the reputation of the product in which the original developer has a substantial stake. The developer investing in an ongoing program of development for the software (or family of software products) can find its upgrade services in jeopardy if every user adds his or

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One of the hallmarks of structured programs is that they can generally be understood as easily by their maintainers as by their authors. Thus a DP [data processing] shop in which all of the programs were structured would enjoy interchangeability of programmers. . . . [W]idespread use of this technology should have as its greatest effect the upgrade of the profession of software maintenance, a profession in which it is projected two out of every three programmers will engage by the end of the century.

\(^{166}\)See Martin and Deasy, supra note 1, at 230–31 for a discussion of the kinds of documentation and other materials typically needed to effectively modify software.

\(^{169}\)If one wants to modify software but does not have access to the code documentation and/or the technical expertise of the programmers who wrote the code or had experience modifying it, one may need to “reverse engineer” the code in order to learn enough about its design to modify it effectively. The legality of reverse-engineering of copyrighted software is discussed supra notes 96 and 130.

\(^{170}\)Sometimes the omission is not so inadvertent. See, e.g., NBS GUIDE, supra note 161, at 15 (concerning the poor quality of much software documentation). Sometimes a user wanting to modify software will need not only the source code, documentation, and a technical assistance contract, but also access to the development tools used to create the software, and/or the latest version support management tools, including configuration management materials. See, e.g., Martin and Deasy, supra note 1, at 231–32. “Configuration management” refers to a system for keeping track of the various versions of a computer program and the associated documentation for each version. See, e.g., Taylor, A Database Approach to Configuration Management for Large Projects, IEEE PROCEEDINGS, CONFERENCE ON SOFTWARE MAINTENANCE-1985 15 (1985).

\(^{171}\)See supra note 161, and Martin and Deasy, supra note 1, at 227.

\(^{172}\)However, the original developer may only be able to do the best job if it retains the personnel who originally wrote the software. See Martin and Deasy, supra note 1 at 236.
her own twists to the software. The developer's own upgrades may not work properly if someone else has tinkered with the code. Also, once customers begin going off on nonstandard development tracks, the developer's base for ongoing development may become too small and dispersed to support the expense.

Software developers may also be reluctant to make very valuable trade secret materials, such as the documentation and/or software tools needed for software modifications, available to customers or, worse, to competitive maintainers. Even with a nondisclosure agreement, the developer will always be worried that the user will—consciously or unconsciously—make use of the materials beyond the scope permitted by the agreement. This, and all the considerations above make the desire of software developers to control user modification more understandable.

C. A Proposed Resolution

After attempting to make the best arguments for and against recognizing a user right to modify software developed and copyrighted by another, a proposal for resolving the problem is in order. Before the author presents one, she asks her readers to remember: (1) software user modification rights is a genuinely hard problem; (2) the present copyright statutory-based analytic framework for addressing the issue does not accommodate consideration of the real and difficult conflicting interests, but rather directs attention to niggling statutory technicalities; (3) in addressing the software modification problem, the real issues must be brought out, and the resolution must be grounded in a careful assessment of its impact on those who have a stake in the outcome (including the user community); (4) neither the CONTU Commission nor Congress has given careful attention to this issue; and (5) the policy protecting novelists from unscrupulous movie moguls is quite different from the policy involved with the software modification problem.

And now the proposal: software users ought to have the right to make whatever modifications make the software more useful for the function for  

173See Stern, supra note 7, at 66:
Some software proprietors have said that modifications create a nonstandard product in the marketplace, making it difficult for the copyright owner to service customer complaints. It would seem, though, that a clause refusing to honor warranties if the software is modified is a more reasonable response.

174See Samuelson, supra note 3, at 41-45.

175Third-party maintainers who also do their own development work may be reluctant to maintain another firm's trade secret software because of fear of litigation in the event the maintainer was in the process of independently developing similar software.
which it was acquired or for functions that users have come to desire.\textsuperscript{176} Users also ought to be able to authorize third parties to do the modification work for them; third parties ought to be able to sell their modification services to users, and even to do the modification work in advance of receiving orders for it. Perhaps, though, third-party modification rights ought not to be so extensive as to permit unrestricted marketing of enhanced versions of programs. And user rights to modify do not entail rights to demand free access to the developer's documentation or software development tools that might be useful in the modification process. Developers should have the right to decide when and under what conditions to license these materials.

1. Users' Right to Modify

The case for recognizing users' rights to modify software rests on several factors. For one thing, users who want to modify software have generally paid for the software, or have acquired the right to use the software from someone else who paid for it. People who have paid for software typically think of themselves as having property rights in it. They think of themselves as owners of copies, even if software manufacturers try, through shrink-wrap licenses, to make them think otherwise. Because they perceive themselves to own copies of software (just as they own copies of books), they do not believe what they do with the software after they buy it is any of the software developer's business.\textsuperscript{177}

It is a matter of common sense to user/purchasers of software that they should be able to use the software for the purpose for which they acquired it. If they need to modify the software to improve its usefulness, users think they have and should have such rights.\textsuperscript{178} The true performance capabilities of software will often not be known until after it has been purchased and used for a considerable time. The software's performance may, for example, fall short of the "puffery" by which it was sold. Some glitch may be discovered in a spe-

\textsuperscript{176}One could develop a very complicated scheme for deciding which categories of users should be able to do which types of modifications and which should be able to authorize third parties to do them. For instance, one might categorize users into various groups such as: individual consumers of mass-marketed software for in-home, noncommercial use (e.g., videogames), individual consumers of mass-marketed software for in-home, commercial purposes (e.g., writing a book), business consumers of mass-marketed software, business consumers of non-mass-marketed software, etc. One could then develop an elaborate calculus for when different users could modify software—so that, for example, the noncommercial home user could both fix bugs and enhance the software, whereas business customers and commercial home users could only fix bugs. If one treated modification in a manner similar to fair use analysis (see supra notes 61-67 and accompanying text), such an elaborate calculus might be developed. The software modification problem deserves a more simple solution, one rule that applies across the board: users should have the right to modify, and the right should be nonwaivable as with fair use, at least for widely-distributed works.

\textsuperscript{177}See supra notes 78-81 and accompanying text concerning caselaw development of the "first sale" rule. No one who buys a copy of a copyrighted book thinks it gives them the right to become a publisher in competition with the copyright owner. Applying the same logic to software, the consuming public would not think that purchasing a copy of a program would give them a right to commercially reproduce and distribute the software.

\textsuperscript{178}This is what the "first sale" rule is (or should be) about. See supra notes 76-87 and accompanying text.
cialized function of the software. Some extensions to its original intended use may evolve as the user gains experience with it. Software's inherently adaptable nature only reinforces the sense users have that their adaptations are appropriate and lawful. The ideal software protection system should, if consistent with traditional principles of patent and copyright law, regard these kinds of incremental improvements in the technology as desirable technological evolution, not piracy.

Private software consumers should have those same modification rights under intellectual property law that are recognized when the government is a consumer of software under the Federal Acquisition Regulations (FAR) issued in May 1987. The acquisition regulations of the Department of Defense (DoD) and the National Aeronautics and Space Administration (NASA) have for many years included a modification right as a standard minimum right these agencies always acquire in software. Neither the FAR nor the special

179Moreover, users often modify software in the privacy of their own home or office. This too reinforces the sense that their conduct is beyond the proper reach of the copyright owner. Their modifications are typically minor in nature and inconsequential except perhaps to the user, who may have an atypical need the altered code addresses. User modifications are typically noncommercial and noncompetitive with the copyright owner, and do not affect the major markets on which software developers rely. Significant enforcement problems would attend any rule that deprived users of modification rights, or limited rights to those that were "essential." See supra notes 9 and 104.

180The FAR are a series of regulations governing acquisitions of products and services from the private sector by the federal government, found at 48 C.F.R. § 1.000 et seq. (1986). The FAR are divided into parts corresponding to particular subject matters. Part 27 sets forth acquisition policy as to patents, data, and copyrights, and Part 27.4 contains copyright and data rights provisions. Part 52 contains standard contract clauses implementing the FAR policy provisions. Part 27.4 did not contain any significant guidance for federal agency policy on acquiring copyrighted materials or rights in other data. Because of this, several federal agencies that acquire considerable amounts of software and other data, chiefly the Department of Defense (DoD) and the National Aeronautics and Space Administration (NASA), supplemented the FAR by adopting their own elaborate copyright and data rights regulations. See, e.g., 48 C.F.R. § 227.401 et seq (Defense Department Supplement). On May 13, 1987, new FAR copyright and data rights regulations were published. See 52 Fed. Reg. 18,140 (1987). They are applicable to all federal agencies (except DoD) and are effective June 1, 1987. Id. While DoD will continue to have a separate copyright and data rights policy, the Federal Register announcement indicates that DoD and FAR policy are to be unified by September 30, 1988. DoD has also recently issued revisions to its copyright and data rights regulations. See 52 Fed. Reg. 12,390 (1987). DoD is currently working on revisions to its software data rights regulations.

181Modification right provisions appear at 48 C.F.R. §§ 27.404(e) and 52.227-14, 52 Fed. Reg. 18,143 and 18,152 (1987).

18248 C.F.R. §§ 227.401 (definition of "restricted rights") and 252.227-7013 (1986). The regulations also give DoD the right to combine software with other software.


184It has been DoD policy to require special permission from the Defense Acquisition Regulation Council to deviate from the standard minimum rights policy. See 48 C.F.R. § 227.404-2(b)(2). The author recognizes that DoD and NASA make some atypical software acquisitions (e.g. missile and space shuttle guidance systems) in the course of which the government may pay substantial sums for the development and delivery of considerable documentation and tools for software system maintenance. Yet, the rules which apply across the board to government acquired software give the government the right to modify software; documentation and software tools must be separately licensed.
agency acquisition regulations limit the right to modify software to modifications that are "essential," or even "reasonable" or "fair." Federal agencies buying software have the right to modify it—period. These regulations reflect a realistic assessment of the rights software users perceive themselves to need and to be entitled to. The intellectual property law affecting software should be no less attentive to consumer needs.

2. Third-Party Authorizations

The strongest argument for allowing users to contract for third-party modification is that many users lack the expertise to perform modification themselves. If a user's modification right is to have any meaning for the class of nonexpert users, then it must be exercised by a knowledgeable third party if not by the original developer.

From the user/consumers' perspective, the personal property rights they think they have in software creates an expectation: "If I am allowed to modify software, why can't I hire whomever I want to modify it?" If a book binding falls apart, the user/consumer has the right to have the book rebound without giving a thought to the copyright owner. If a car breaks down, the user/consumer can take it to any auto mechanic he or she pleases, and is not restricted to taking it to an authorized dealer. As noted above, a manufacturer who tried to impose a condition that repairs could only be done by its designated agents would run the risk of an antitrust violation for an unlawful tying arrangement. If the manufacturer was a patentee, it would also run the risk that its conduct would be found to be a misuse of the patent, resulting in the patent becoming unenforceable for the period of time necessary to dissipate the effect of the misuse.

From experience consumers have in using and modifying other items, they tend to think competition for maintenance services is a good thing, giving them choice about price and quality of services that a noncompetitive environment would not provide. If software modifications could be done only by the original developer or its designated agents, the consumer might experience considerable, and perhaps even dangerous, delays in service because the original developer could not get to everyone at once. If the software's developer decided to stop supporting it, consumers would think it unfair to be forced to pay the...

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185 It is reasonably clear that this is what CONTU intended for § 117. See supra notes 52-53 and accompanying text.
186 See supra note 59 and accompanying text.
187 See supra note 146 and accompanying text.
188 See, e.g., 4 ChiSUm On PAteNTS § 19.04 (1986).
189 Professor Raskind asserts that users should have the benefit of competition for modification services, although he does not explain why or to what extent competition ought to be available. See Raskind, supra note 9, at 1174.
190 If, for example, the software controlled a nuclear power plant or an airplane's inertial navigation unit, a software bug could have catastrophic consequences if left unattended for any length of time.
developer for the privilege of hiring someone else to support it. It is difficult for user/consumers not to analogize software maintenance to other product maintenance services that they are entitled to get on a competitive basis.

On the other hand, the right of users to modify software should not be construed to include a right to free access to the developer's trade secret documentation or software development tools, even though these may be helpful or in some cases necessary to optimal maintenance or enhancement. Personal property rights of software consumers should not extend beyond exercising dominion over the copy which they have acquired.

In any competition for software modification services, there will be many reasons for software users to look to the original development firm for maintenance and enhancement services. If the firm does a good, fast, reliable job for a reasonable sum, users are likely to choose the more expert firm for modification. To give the original development firm some incentive to engage in meaningful price and quality competition for software modification services, it may be advisable to allow competition for these services rather than allow the derivative work right of copyright to choke off the possibility of competition.

At this point, it is worth remembering that even the awkwardly drafted § 117 gives rights to authorize third parties to do whatever adaptations the user/consumer is authorized to do. The recently adopted FAR also give government software users the right to have modification done by support contractors. Congress has in several pieces of legislation insisted on competition in contracting for maintenance and enhancement of hardware and software systems acquired from private contractors by federal government agencies. There is no reason to suppose Congress would not be equally insistent on competition in maintenance services for private software if the wider public policy issue presented itself.

3. Third-Party Rights to Conduct a Software Modification Business

If one accepts the premise that users should have the right to modify software, and that to effectuate that right users ought to be able to authorize a third

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191Not every developer wants the business of maintaining and enhancing software. Within the software engineering community, maintenance and enhancement of software is frequently viewed as a less important and less desirable activity than design and development. See Lientz, Swanson, & Tompkins, supra note 3, at 466. There is, however, growing awareness in the software engineering community of the importance of maintenance and enhancement. Id. at 469-70.

192See supra note 53 for the text of § 117.


party to do the modification work, it is then a logical step to conclude that third-party maintainers ought to be able to establish software modification businesses in advance of actual authorizations, advertise their services, and perform modification services for profit in competition with the original developer and other third-party maintainers.

From the user/consumer perspective, the logic of this argument is so tight and convincing that any clamor raised by software development firms would seem nothing but capitalistic greed. Analogies based on copyright's derivative work policies will, from the user/consumer standpoint, seem strained beyond words. Perhaps partly out of frustration at finding a flaw in the tight logic of the user/consumer perspective have some software developers seemed to dig in their heels and demand that users do not or should not have any modification rights. This would explain the pervasiveness of "no modification" clauses in licensing agreements. Once users obtain any modification rights, it may seem a quick slide down a slippery slope into a viciously competitive pit for providing maintenance and enhancement services.

To quell the strongest concerns of the software development community, it may be necessary to compromise the scope of permissible business activities of third-party modifiers. Perhaps they ought to be forbidden to mass-market enhanced versions of a copyrighted program in competition with the software developer, and restricted to activities such as fixing bugs and doing individual customizations and specific enhancements at customer requests.

From the user/consumer standpoint, such a compromise in response to software developers' demands would represent a major concession. They see nothing wrong with a competitor buying another firm's product, enhancing it, and selling the enhanced version to the public. In such a scenario, the software developer benefits from the sales to its competitor (which may significantly increase the market for the work) and has been compensated in the price paid for the original version for what it contributed to the technology. The enhancer has seen an opportunity to improve the software, invested in that improvement, and created a market for an enhanced version. It therefore seems logical that the enhancer should be entitled to some reward for its contribution

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95 The U.S. Department of Defense has experienced considerable difficulties with software developers over the issue of competitive maintenance and enhancement. DoD is under congressional mandate to encourage this market (see supra note 194). Software developers, however, are reluctant to allow competitors access to their code and/or its documentation, and consequently often deliver incomplete or poor-quality documentation and/or resist efforts to persuade them to agree to competitive maintenance. See, e.g., P. Samuelson, Toward a Reform of the Defense Department Software Licensing Policy, Technical Report CMU/SEI-86-TR-1 47 (1986).

96 Another alternative would be to create a compulsory license scheme to permit enhancers to pay the original developer a fee for the privilege of distributing the enhancement.

97 See supra note 151 for examples where "enhanced" copyrighted or patented works have been held noninfringing.
to technological growth. Yet the threat presented by unrestricted marketing of enhanced software by firms other than the original developer may be so substantial as to direct investment away from software. This certainly would not be in the public interest.

The existing copyright provision dealing with software user modification contains a restriction on the right to redistribute adapted versions. An adapted version cannot be redistributed without the copyright owner's permission. This provision would certainly cover third-party mass-marketing of enhanced versions. Section 117, however, is broader than this. It also covers noncompetitive transfers, such as the sale of an upgraded program to a neighbor, even though this and similar transfer situations represent no competitive threat to the software developer. A more narrowly drawn restriction on redistributions of enhanced versions, one limited to commercialized redistributions, might prove beneficial. But even this concession to the developers' interest should be adopted only if there is persuasive evidence that unrestricted competition in enhanced versions would have negative consequences for the public.

4. Conclusion

Competition is what the user modification question finally comes down to: is there a societal interest in the existence of a competitive market for software maintenance and enhancement services? If so, then users should be able to modify software themselves and to authorize others to do so. If not, then software developers should be able to control the modification market, perhaps

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198 If one permitted unrestricted marketing of modified versions of software, one would have to decide how to allocate intellectual property rights in the enhanced versions. In the patent system each inventor owns an intellectual property right in his or her contribution to the improved work. See supra note 151.

In the copyright system, one who prepares a derivative of a work either in the public domain or separately copyrighted has a right to copyright the derivative work if it has sufficient original expression. The copyright in the derivative work extends only to the second author's contribution. When the underlying work is copyrighted, and the derivative work's author is not the original author, the derivative work's copyright is restricted to the extent the second work incorporates the first work's expression. Section 103(a) states that "protection for a work employing preexisting material in which copyright subsists does not extend to any part of the work in which such material has been used unlawfully." 17 U.S.C. § 103 (1982). See 1 M. Nimmer, supra note 28, at § 3.04.

Applying this rule to software modifications, it would seem that to the extent the software was modified by creation of a separate new module, a separate copyright for the module would present no § 103(a) problem. See also supra note 29. However, a derivative work author's claims to copyright ownership of modifications made internal to another firm's modules would seem likely to run afoul of § 103.

It may be that a rigid rule against copyright for software modifications improving functionality is no more in the public interest than a similar rule in the patent system would be. If there is to be room for technology to evolve and incentives to make improvements, a patent-like rule may be more appropriate for software than the present copyright rule.

199 Intellectual property law provides sufficient prospects of reward for innovative activity to attract investment toward it. See, e.g., Goldstein, Infringement of Copyright in Computer Programs, 47 U. Pitt. L. Rev. 1119, 1120 (1986).

200 See supra note 53 for the text of § 117.

201 See Stern, supra note 9, at 485.
even to the point of preventing the user from performing his own modification work.

This article has argued that it is more consistent with traditional rules of intellectual property and our competitive system to say that software consumers have rights to modify software and to hire third parties to perform modifications for them. The article has argued that the Supreme Court's *Sony* decision makes it appropriate for courts considering the modification rights problem to break away from a rigid statutory analysis and to consider the broader issues and policies raised by software modifications.

In the event that Congress decides to reconsider the software user modification problem, it should realize that regardless of what the statute says, users will continue to modify copyrighted software when it suits their purposes. Users will probably also hire others to modify software for them, and will probably continue to pass on the modified versions. The eminent computer scientist Allen Newell recently observed that practices of this sort are common and widely believed to contribute to the growth of technology in computer science communities:

> [In] some computer communities... people take each other's programs freely, then enhance them, and then pass them on to others, who do more of the same. Of course, they also use them as well. But consuming the behavior of a program does not consume the program. Furthermore, it is the possession of the previously invented program that permits the new invention to occur. For the new inventor adds, modifies, enhances and re-shapes the existing system, mostly in small ways, though occasionally substantially. The capabilities of the system evolve and grow. The motivations for such enhancements are partly that one benefits from the inventions themselves, for one gets to use the enhanced system. But the motivations are also partly those that keep the artist and the mathematician creating—it becomes a medium of expression and a coin of the realm. If patentability implies that mostly what is used is left untouched and unenhanced, then the total improvements in the community's software may well decrease, even though some people are induced to work harder at innovating to capture the rewards from patents. They must do their inventing from a poorer base.  

Intellectual property law has historically balanced the competing interests of the public and innovative entrepreneurs. The long accepted principle of intellectual property law is that protection should be granted to innovators only so far as it serves the interests of the public. As applied to software modification policy, there would seem a strong public interest in permitting users to modify software to make it more useful, as well as a strong interest in the existence of market competition for software modification services. The intellectual property law should recognize and accommodate these important public interests.

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202 Newell, *supra* note 5, at 1033-34.
203 The history of the intellectual property law is also a history of public antipathy to abuses of copyright and patent monopolies. See, e.g., Patterson, *supra* note 55, at 24-36.