CONSUMER REMEDIES FOR DEFECTIVE COMPUTER SOFTWARE

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I. INTRODUCTION

Recent advances in computer technology have transformed radically the face of the consumer products market.[1] Increasingly versatile and inexpensive microcomputer products[2] in turn have spawned the entirely new industry of personal software[3] manufacture and distribution.

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1. Deep price cutting, heavy advertising, and marketing agreements by manufacturers with retail chains have spurred already accelerating sales of personal computers. According to consumer surveys, personal computer technology is becoming less threatening to consumers; public perception of personal computers as luxuries or toys is fading as the price of these products falls and versatility increases. *See* Blundell, *Personal Computers in the Eighties*, BYTE, Jan. 1983, at 166-71.

Industry projections indicate that families with annual incomes of more than $25,000 will account for 90% of the consumer market for domestic personal computers. *Id.* at 171. Hospitals and businesses account for two-thirds of the personal computers currently in use in the United States. *Id.*

The current expansionary phase of the personal computer market will last at least into the next decade. The present 621,000 individually-owned systems will increase tenfold before 1990; the 1.6 million business and medical systems (one for every 34 white-collar workers) are expected to number 15 million by 1990. *Id.* at 170.

2. Early computer models cost hundreds of times the price of a modern version with comparable computing power. The average price of a home computer during 1982-83 was approximately $530. This figure is expected to decrease to less than $370 by 1990. *Id.* at 178-80.

Business and household uses of microcomputer products, with the notable exception of budgeting and financial planning generally diverge. Business uses range from computer-aided design and manufacture (CAD/CAM) to control of logistic details; household uses of microcomputers include climate control, budgeting, and recreation.

3. For a legal definition of the term "software," see *infra* note 9. The personal

Mass-marketed computer software[4] covering a spectrum of consumer applications[5] has emerged as the most important product of this developing industry. This new software differs from more traditional forms in two primary ways: the product is ready-to-use[6] and the software lacks privity[7] between the manufacturer and the consumer.[8]

Computer software consists of a set of machine-readable instructions directing discrete computations by the hardware, or mechanical portion, of a computer.[9] This set of instructions is the computer program,

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software industry still is in its infancy. The first self-contained personal computer appeared in 1976. Since then, more than 10,000 computer programs designed for that system alone have appeared.

4. Mass-marketed software is a radical departure from the prior industry customs of custom-made or user-modified computer software. Custom software typically is the product of an interaction between a programmer and a particular user. The programmer tailors custom software for the user's computational needs. User modified computer software is less specialized than custom-designed software because the user adapts the software for his or her own use. In contrast, mass-marketed software exhibits a high degree of generality and needs little or no adaptation to a user's particular system.

5. Among the forms of software on the market today are those allowing for recreational applications, financial planning (including the "spreadsheet" programs), education, business uses (word processing, inventory management, CAD/CAM), at-home banking and shopping, videotex, information retrieval, and medical diagnosis.

6. *See supra* note 4.

7. Broadly defined, privity is a successive relationship to common property rights. *See* BLACK'S LAW DICTIONARY 1079 (5th ed. 1979). The concept of "privity of contract" is difficult to define. The Uniform Commercial Code makes no attempt to define strictly "privity of contract." The Code leaves responsibility for definition of the term to individual jurisdictions. *See* U.C.C. § 2-318 (1978) and comments. *See also* W. KIMBLE & R. LESHER, PRODUCTS LIABILITY § 31, at 42-43 (1979). *See infra* notes 56-65 and accompanying text (discussing U.C.C. privity requirements).

8. Some manufacturers of higher-priced mass-marketed software have licensing agreements with software users. Licenses give manufacturers control over the ultimate uses of software. Unauthorized duplication of a program becomes a breach of the software license, rather than merely copyright infringement. Licenses also facilitate the distribution of software updates, when necessitated by user-reported program errors or manufacturers' enhancements. Licensing, however, clouds the legal status of mass-marketed computer software. Courts have employed a multitude of tests for distinguishing leases and sales. *See* Estate of Starr v. Commissioner, 274 F.2d 294 (9th Cir. 1959) (when lease payments equal purchase price plus financing costs, "lease" is a sale); *In re* Gehrke Enters., Inc., 1 B.R. 647 (Bankr. W.D. Wis. 1979) (court describes several tests to distinguish leases from sales). *See also* United States v. Arnold, Schwinn & Co., 388 U.S. 365 (1967) (analysis of boundaries between a valid franchise agreement and an illegal restraint of trade), *overruled*, Continental T.V., Inc. v. GTE Sylvania, Inc., 433 U.S. 36 (1977). The effects of software licenses upon consumer remedies for defects remain unclear.

9. In United Software Corp. v. Sperry Rand Corp., 5 C.L.S.R. 1492 (E.D. Pa. Nov. 15, 1974), the court provided an operational definition of computer software:

and it is the product of a creative process involving both design[10] and assembly.[11] Software defects can occur in either stage of this process.[12]

"Software" is the generic name for a computer program, or a group of programs. Computer programs are sequences of instructions to direct hardware to carry out specific operations. They establish in advance the operations that hardware is to go through in order to perform the desired functions. The set of instructions together solve a problem, and the creation of the coded instructions is a complex, logical task.

Id. at 1495. Computer software appears in two basic forms: coded magnetic tapes and flexible disks. Several additional formats exist, but the majority of non-recreational software appears on tape or disk.

10. The program concept may arise from market analysis or from a customer's requirements. Program design begins when a systems analyst reifies this concept into a programmable format. This format follows a continuum from the abstract to the semi-tangible: the program flowchart, a skeletal model of the program, guides the drafting of a pseudocode, or the symbolic language later translated into one of the compilable computer languages. In this model of design, the design stage effectively ends with the generation of the pseudocode. The program is not yet readable by a computer. In short, software design creates a blueprint (the flowchart) accompanied by step-by-step instructions (the pseudocode). *See generally* Gemignani, *Legal Protection for Computer Software*, 7 RUTGERS J. COMPUTERS TECH. & L. 269 (1980).

11. Assembly implements the programmer's design. In most cases, assembly begins with the translation of the program pseudocode into computer-readable code. Assembly can involve considerable discretion on the part of the programmer; the characteristics of the chosen language and the complexities of the computer architecture or mechanical workings often necessitate considerable "tailoring" of the program design. A proper design, however, limits the scope of this discretion. *Id.* at 271-72.

After the programmer generates the machine-readable code, the lengthiest part of the assembly process begins. Program errors, known as "bugs" in computer parlance, invariably appear in the code. Once a programmer has eliminated fatal bugs, after extensive testing, the manufacturer duplicates, labels, and distributes the software. Two potential risks still exist at this stage of assembly: there is a small, but finite, risk of error in duplication of the software, and there are dangers of improper labeling of the products. Duplication errors exist because even the most advanced duplication machines have less than perfect data reliability. Typical duplication systems have error rates of less than one "bit" per ten million "bits." In light of the size of many mass-marketed computer programs, this means that a small fraction of programs contain assembly bugs. These bugs, however, may have varying effects upon the functioning of the program: some defective programs will not run, while others have latent defects, both serious and inconsequential. Labeling problems include the manufacturer omitting warnings and packaging software with outdated, misleading, or erroneous warnings of instructions. *See* Gemignani, *Products Liability and Software*, 8 RUTGERS J. COMPUTERS TECH. & L 173, 183 (1981).

12. Because computer software requires systems hardware to operate, mechanical capabilities and defects influence both the occurrence and gravity of software defects. For example, a computer program in extraordinary cases may tax the ability of the host computer to store or transfer data. Another computer of a similar type, although configured differently, may not experience these problems. The same program runs on both computers, although a possible design defect becomes manifest on only one.

The frequency of defects varies with the inherent complexity of the software and the extent of its use.[13]

At present, injuries resulting from defective consumer software are predominantly economic.[14] Opportunities for bodily injury, however, increase as computers assume greater responsibility for monitoring domestic and clinical environments.[15] While this defective software increasingly resembles a product,[16] courts refuse to recognize products

13. *See* Blundell, *supra* note 1, at 182.

14. Economic planning and budgeting software lends itself well to the level of generality required of mass-marketed programs. Given the high number of personal computers in business use, along with the demographic data on individual users, it is not difficult to understand the enormous popularity of economic modeling software. *See The Personal Computer Industry*, CREATIVE COMPUTING, Feb. 1982, at 78.

Litigation involving either applications of mass-marketed software is rare. *See* Zammit, *Computers, Software and the Law*, 68 A.B.A. J. 970 (1982). With few exceptions, that small body of law involves direct or consequential damages for defective computer software. *See, e.g.*, Chatlos Sys., Inc. v. National Cash Register Corp., 670 F.2d 1304 (3d Cir. 1982) (court upholds district court finding of damages based on difference between value of computer system as delivered and value of computer system as contracted for by parties); Independent School Dist. v. Statistical Tabulating Corp., 359 F. Supp. 1095 (N.D. Ill. 1973) (defective software underappraised value of building; economic loss thus resulted upon destruction of structure); Cagle v. Boyle Mortgage Co., 549 S.W.2d 474 (Ark. 1977) (mortgage note cancelled because of software defects leading to usurious interest charges). *But see* IBM v. Catamore Enters., 5 C.L.S.R. 1025 (D.R.I. June 18, 1975) (breach of computer services contract led to request for punitive damages).

15. *See* Petras & Scarpelli, *Computers, Medical Malpractice and the Ghost of the T. J. Hooper*, 5 RUTGERS J. COMPUTERS TECH. & L. 15, 43 (1975). Advances in the reliability of computer systems, along with the increased sophistication of diagnostic software, may obviate much routine diagnosis by physicians. *Id.* at 43. Clinical use of computers extends beyond diagnosis: "Medical computers have gone well beyond the role of passive physicians' assistants, and, in some American hospitals, have been used to control directly the administration to patients of drugs and whole blood or plasma." Norris & Szabo, *Forward*, 7 AMER. J.L. & MED., Summer 1981, at v n.3. Some observers foresee even more extensive implementation of computer technology in third world countries. The "fourth-generation" health care delivery systems in development today may serve a vital role in bringing health care of any kind to deprived areas. *Id.* at iii-iv.

16. The goods-services dichotomy of the Uniform Commercial Code (U.C.C.) generates conceptual difficulties in the case of activities involving interactions between people and semi-autonomous machines such as computers. Courts often view the degree of autonomy of the machine, along with level of transformation of human "input" into machine "output," in resolving goods-services controversies. *See, e.g.*, Computer Servicenters, Inc. v. Beacon Mfg. Co., 328 F. Supp. 653 (D.S.C. 1970) (involving data processing services not goods under the U.C.C.), *aff'd*, 443 F.2d 906 (4th Cir. 1971); SDK Medical Computer Serv. Corp. v. Professional Operating Management Group, 371 Mass. 117, 354 N.E.2d 852 (1976) (reports generated by data processing activities embody manual keypunch services). *But see* Clements Auto Co. v. Service Bureau Corp., 444 F.2d 169 (8th Cir. 1971) (applicability of the U.C.C. assumed in breach of

liability theories of relief.[17] This position forces plaintiffs to seek recovery under existing contractual or Uniform Commercial Code (U.C.C.) remedies.[18] These remedies provide minimal or nonexistent relief in the case of mass-marketed consumer software.[19]

This Note examines the growing difficulties involved in extending traditional remedies[20] for defective software to mass-marketed products. In light of the recent judicial propensities toward assigning strict liability,[21] this Note argues that consumer software resembles more

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contract for inventory control programming); Johnson v. Sears, Roebuck & Co., 355 F. Supp. 1065 (E.D. Wis. 1973) (willingness of court to assign product characteristics to mechanical and administrative hospital services).

17. *See, e.g.*, Chatlos Sys., Inc. v. National Cash Register Corp., 479 F. Supp. 738 (D.N.J. 1979) (court refuses to create new tort of "computer malpractice" that imposes higher standard of care on computer programmers), *rev'd on other grounds*, 635 F.2d 1081 (3d Cir. 1980), *aff'd on rehearing*, 670 F.2d 1304 (3d Cir. 1982). *See infra* notes 70-91 and accompanying text (discussing negligence grounds for holding software manufacturers liable).

18. *See* Norris & Szabo, *supra* note 15, at vii. Because the law characterizing the production, distribution, and use of software is unclear or wholly absent, the plausible legal arguments for recovery of software-mediated injuries are manifold. Among these are breach of express warranty, breach of implied warranties of fitness and merchantability, breach of contract, negligence under both the "reasonable consumer" and professional standards, and strict liability in tort. *Id.*

19. Recovery under a contractual theory is barred by the absence of privity between the consumer and the manufacturer. Express warranties often exclude recovery of damages above the price of the software itself, and often include a limitation of remedies. *See* Gemignani, *supra* note 11, at 175-77. Implied warranties may provide a viable theory of recovery for injuries, although recovery may be limited.

Microcomputer warranty and liability disclaimers often resemble this disclaimer drafted by the manufacturer of a popular computer system:

> DISCLAIMER OF ALL WARRANTIES AND LIABILITY
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> ————Inc. and ——— make no warranties, either express or implied, with respect to this manual or with respect to the software described in this manual, its quality, performance, merchantability, or fitness for any particular purpose. ——— computer software is sold or licensed "as is". The entire risk as to its quality and performance is with the buyer. Should the program prove defective following their purchase, the buyer (and not ——— Computer, Inc., or ———, their distributors, or their retailers) assumes the entire cost of all necessary servicing, repair, or correction and any incidental or consequential damages. In no event will ——— Inc., or ——— be liable for direct, indirect, incidental, or consequential damages resulting from any defect in the software, even if they have been advised of the possibility of such damages. Some states do not allow the exclusion or limitation of implied warranties or liability for incidental or consequential damages, so the above limitation or exclusion may not apply to you.

Reference Manual for the Apple II Microcomputer, Apple Computer, Inc. (1981).

20. *See supra* note 18.

21. *See generally* W. KIMBLE & R. LESHER, *supra* note 7, §§ 20-21.

traditional products, and that strict products liability best protects injured consumers in the absence of privity with the software manufacturer. Finally, this Note addresses specific difficulties involved in imposing strict liability upon the microcomputer software industry in its present state.

II. GROWING DEFICIENCIES IN AVAILABLE REMEDIES

A. *Recovery Under the Uniform Commercial Code*

Even in the absence of a negotiated agreement between manufacturer and consumer, U.C.C. Article 2 provides recovery for defective merchandise under a breach of warranty theory.[22] Such a theory may address the express warranty included with the software,[23] or the implied warranties of merchantability[24] and fitness for particular

22. *See, e.g.*, Chatlos Sys., Inc. v. National Cash Register Corp., 479 F. Supp. 738 (D.N.J. 1979) (court finds breach of both express warranty and implied warranty for a particular purpose resulting from faulty software programming and installation), *rev'd on other grounds*, 635 F.2d 1081 (3d Cir. 1980), *aff'd on rehearing*, 670 F.2d 1304 (3d Cir. 1982); Salvador v. Atlantis Steel Boiler Co., 457 Pa. 24, 33, 319 A.2d 903, 908 (1974) ("manufacturer by marketing and advertising his product impliedly represents that it is safe for its intended use"). *See generally* McGonigal, *Application of Uniform Commercial Code to Software Contracts*, 2 COMPUTER L. SERV. § 3-3, art. 4 (1979); Nycum, *Liability for Malfunction of a Computer Program*, 7 RUTGERS J. COMPUTERS TECH. & L. 1, 2-8 (1979).

23. Section 2-313 of the U.C.C. reads, in pertinent part:

(1) Express warranties by the seller are created [by]:
   (a) Any affirmation of fact or promise made by the seller to the buyer which relates to the goods and becomes part of the basis of the bargain creates an express warranty that the goods shall conform to the affirmation or promise.
   (b) Any description of the goods which is made part of the basis of the bargain creates an express warranty that the goods shall conform to the description. . . .

U.C.C. § 2-313 (1978). *See supra* note 19.

24. Section 2-314 of the U.C.C. reads, in pertinent part:

(1) [A] warranty that the goods shall be merchantable is implied in a contract for their sale if a seller is a merchant with respect to goods of that kind. . . .
(2) Goods to be merchantable must be at least such as
   (a) pass without objection in the trade under the contract description; and
   . . .
   (c) are fit for the ordinary purposes for which such goods are used; and
   (d) run, within the variations permitted by the agreement, of even kind, quality and quantity within each unit and among all units involved; and
   (e) are adequately contained, packaged, and labeled as the agreement may require; and

purpose.[25]

Section 2-102 of the U.C.C. provides that Article 2 "applies to transactions in goods."[26] Goods include "all things which are movable at the time of identification to the contract for sale."[27] Computer software, however, traditionally has fallen outside this definition[28] because the complexity of computer systems often required skilled technicians to use the software[29] and because the expense involved in data processing encouraged the development of a data processing service industry.[30] Courts, in perceiving this dependence upon technical services, viewed computer software as simply a tool of the data processing industry.[31] The absence of these technical services in the personal computer software market undermines this traditional perception of software as services because of software's affordability and ease of operation. Few cases address the goods-services dichotomy in regard to the products of the infant consumer software industry.

A second problem of software under the U.C.C. is conceptual in na-

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(f) conform to the promises or affirmations of fact made on the container or label if any.

(3) [O]ther implied warranties may arise from course of dealing or usage of trade.

U.C.C. § 2-314 (1978). Section 2-316 conditions § 2-314 by stating that all goods must meet certain minimum standards of packaging, labeling, and fitness for ordinary use. *Id.*

25. Section 2-315 states that if, at the time of the formation of the contract, the seller knew the particular purpose for which the purchaser required the goods and the buyer relied on the seller's skill and judgment in selecting the goods, then there is "an implied warranty that the goods shall be fit for such purpose." *Id.* § 2-315 (1978). The § 2-315 "particular purpose" criterion differs from the § 2-314 "ordinary purpose for which the goods are to be used" language because the former requires a seller to have particular knowledge of the specific buyer's intended use whereas the latter concept only applies to customary uses of the goods in question. *See* U.C.C. § 2-315 (1978) & comment 2. Of course, the viability of a § 2-315 breach of implied warranty claim depends in large part on state law.

26. U.C.C. § 2-102 (1978).

27. U.C.C. § 2-105 (1978).

28. *See* Nycum, *supra* note 22, at 2-3.

29. *See* Ware, *Computers and Society: The Technological Setting*, 1 COMPUTER L. SERV. § 1-1, art. 5 (1979).

30. *See* Davis, *An Overview of Computer Data Processing*, 1 COMPUTER L. SERV. § 1-2.1, art. 1 (1968).

31. *See, e.g.*, SDK Medical Computer Serv. Corp. v. Professional Operating Management Group, 371 Mass. 117, 354 N.E.2d 852 (1976) (court holds in ultra vires action against a corporation providing computer services that corporation did not produce anything tangible and found that software and computer-generated reports embodied services).

ture. Most consumer software transforms data that the user specifies into useful information.[32] This transformation involves user input of a tangible set of user instructions[33] resulting in a less tangible output of information.[34] Even assuming that consumer software generally falls within the U.C.C. definition of goods,[35] it is unclear whether both the instructional medium and the output of computer software are goods.[36]

The goods-services controversy surrounding computer software is surmountable. Several jurisdictions have given similar products a hybrid status as both goods and services.[37] In a leading case, *Newmark v.*

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32. Most consumer software utilizes values and specifications entered by the user. These data may consist of either numeric values or text; the software may generate projections or calculations from these data, or rearrange or otherwise process the user's data.

A less common form of computer input comes in the form of analog or digital signals transmitted directly from some device to the computer. Such signals may carry data pertaining to the condition of the user's environment (i.e., the temperature or humidity within a building, or the occurrence of unusual motion within certain premises) or data emanating from another computer (i.e., stock market quotations or electronic mail).

33. *See supra* notes 9-12.

34. Computer output is not a part of software, but rather information that results from the interaction of the software with hardware. Courts have dealt with the issue of property rights in tangible and intangible goods in many contexts. Two recent cases are on point. In Halstead v. United States, 535 F. Supp. 782 (D. Conn. 1982), the court allowed recovery in a case involving erroneous information gleaned from a map. The court held that this information did not render the essence of the transaction between the plaintiff and the defendant a "service" outside of the ambit of § 402A the Restatement (Second) of Torts (1965). *Id.* at 789-91. In Aetna Casualty & Surety Co. v. Jeppesen & Co., 642 F.2d 339 (9th Cir. 1981), an insurance company sought indemnification against the supplier of instrument approach charts for an airplane accident. The Ninth Circuit held that the chart was a defective product, and that the publisher was liable in tort for resulting injuries. *Id.* at 342-43. This liability was not absolute, however, because the court found a duty on the part of the pilots relying upon the charts to utilize other sources of information in order to confirm the chart's accuracy. *Id.*

35. U.C.C. § 2-105(1) (1978).

36. *See* Brannigan and Dayhoff, *Liability for Personal Injuries Caused by Defective Medical Computer Programs*, 7 AMER. J.L. & MED. 123, 130 (1981); Freed, *Products Liability in the Computer Age*, 12 FORUM 461, 472 (1977).

37. *See, e.g.*, Triangle Underwriters, Inc. v. Honeywell, Inc., 604 F.2d 737 (2d Cir. 1979) (sale of "turn-key" computer system, including software and hardware, was a sale governed by the U.C.C. for purposes of the statute of limitations); Hoffman v. Misericordia Hosp., 439 Pa. 501, 267 A.2d 867 (1970) (blood transfusions are a goods-services hybrid); Buckeye Union Fire Ins. Co. v. Detroit Edison Co., 38 Mich. App. 325, 196 N.W.2d 316 (1972) (U.C.C. governs production and sale of electricity even though it is a sale of service). *But see* LeSeur Creamery, Inc. v. Haskon, Inc., 660 F.2d 342 (8th Cir. 1981) (U.C.C. implied warranty and disclaimer provisions do not apply to a transaction that is predominantly a rendition of services).

Gimbel's, Inc.,[38] the New Jersey Supreme Court ascribed limited U.C.C. coverage to a beauty salon's use of defective conditioner on a customer's hair. The *Newmark* court held that a strict, technical definition of "goods" occasionally undermined the policy of the U.C.C. implied warranty provisions.[39] Under the *Newmark* doctrine, a transaction involving goods and services, although not technically a "sale," warrants the coverage of the U.C.C. warranty provisions.[40] *Newmark*, then, may cut the goods-services knot that restrains application of U.C.C. remedies to software defects.

If the U.C.C. applies to consumer software, damages for breach of express warranty include the difference in value between the defective and warranted software,[41] plus incidental and consequential damages.[42] Express warranties usually appear with warranty disclaimers and limitations on remedies.[43] In general, the U.C.C. permits these limitations.[44] The Code, however, does not permit a limit on consequential damages. Section 2-719 makes limitation of consequential damages prima facie unconscionable in the case of consumer goods.[45] It follows that a court may not limit consequential damages when such damages result from defective software that serves personal, family, or

38. 54 N.J. 585, 258 A.2d 697 (1969).

39. *Id.* at 593, 258 A.2d at 701.

40. *See id.*

41. U.C.C. § 2-714(2) (1978).

42. U.C.C. §§ 2-714(3), 2-715 (1978).

43. *See supra* note 19. *See also* Gemignani, *supra* note 11, at 176-77. A typical limitation remedies clause reads as follows:

> The customer agrees that IBM's liability hereunder for damages, regardless of the form of action, shall not exceed the total amount paid for services under the applicable Service Estimate or in the authorization for the particular service if no Service Estimate is made. This shall be the Customer's exclusive remedy.

Agreement for International Business Machines Corp., *reprinted in* R. FREED, COMPUTERS AND LAW 180 (1976).

44. U.C.C. §§ 2-719, 2-316 (1978).

45. U.C.C. § 2-719(3) states, in pertinent part: "Consequential damages *may be limited or excluded* unless the limitation or exclusion is unconscionable. Limitation of consequential damages for injury to the person in the case of consumer goods is prima facie unconscionable. . . ." *Id.* (emphasis added). It is unclear whether this section's prohibition of limitation of recovery in the case of consumer goods applies to recovery of economic damages in addition to personal damages. One court allowed economic recovery in the case of a breach of warranty. *See* Chatlos Sys., Inc. v. National Cash Register Corp., 670 F.2d 1304 (3d Cir. 1982) (damages for breach of warranty is difference between fair market value of goods as accepted and value goods would have had if they had been as warranted).

household functions.[46] Code remedies differentiate between consequential damages arising from business and personal[47] use of nonconforming merchandise.

The implied warranty provisions of the U.C.C. provide the software consumer with a broader range of recovery than that available under an express warranty theory. The U.C.C. imposes implied warranties of merchantability and fitness for particular purposes.[48] Only the warranty of merchantability protects consumers injured by defective software. A claim based on fitness requires a seller to have actual knowledge of the particular purpose of the consumer's software.[49] The mode of distribution of consumer software effectively prohibits the acquisition of actual knowledge.[50] Merchantability, on the other hand, merely requires a manufacturer's perception of ordinary or reasonable uses of software.[51] Courts seem more willing to imply this lower standard of knowledge in the case of consumer goods.[52] Warranty disclaimers and limitations, however, may foreclose recovery under an implied warranty of merchantability theory.[53] Furthermore, a

46. *See* U.C.C. § 9-109(1) (1978) (defining consumer goods).

47. *Id.*

48. *See* U.C.C. §§ 2-314, 2-315 (1978).

49. The comments to this provision state that the consumer need not expressly inform the distributor of the particular purpose the consumer has in mind for the goods. A distributor has actual knowledge under § 2-315 if circumstances are such that the distributor has reason to conceive of a particular use. U.C.C. § 2-315 comments 1-2 (1978). The implied warranty of fitness includes those requirements covered by § 2-314.

50. There are three ways to sell mass-marketed computer software: mail order, retail (through a computer store or retail chain), or directly from the manufacturer. Only retail sales give the vendor any opportunity to discover the user's particular needs. The retailer, however, is not the manufacturer, and usually has no part in the manufacture of the software.

Mass-marketed software exchanges specificity and cost for generality and affordability. While it is plausible to assume that a non-specific program serves a wide range of uses, the manufacturer's knowledge of such uses is limited to "reasonable" uses and other uses communicated to the manufacturer by the user. The latter may serve to expand the group of "reasonably foreseeable" uses for a product. These uses, however, are rarely communicated to the seller.

51. *See* U.C.C. § 2-314(2)(c) (1978). *See also* U.C.C. § 2-314 comment 8.

52. *See, e.g.*, Blockhead, Inc. v. Plastic Forming Co., 402 F. Supp. 1017, 1024-25 (D. Conn. 1975) (implied warranty of merchantability acts as guarantee by seller that goods are fit for the ordinary purpose for which they are to be used); Hauters v. Zogarts, 14 Cal. 3d 104, 111, 534 P.2d 377, 385, 120 Cal. Rptr. 681, 688 (1975) (burden of proving higher standard of knowledge relieved by plaintiffs' status as individual consumers).

53. *See* U.C.C. § 2-316 (1978) (authorization of modification or limitation of ex-

software manufacturer has several potent U.C.C. defenses to an action brought under such a theory. The manufacturer may assert a lack of proper notice of the defect,[54] and may allege product misuse.[55] The sudden occurrence of many software defects, combined with the difficulties involved in defining proper use of software, strengthens the manufacturer's affirmative defenses.

A serious shortcoming of U.C.C. remedies for defective mass-marketed software lies in the requirement of privity between the software manufacturer and the injured party.[56] Traditionally, a breach of war-

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press and implied warranties where such modification is not unconscionable). *See also* LeSeur Creamery, Inc. v. Haskon, Inc., 660 F.2d 342, 352 (8th Cir. 1981) (implied warranty of merchantability exists by operation of law unless it is "effectively disclaimed"); Earman Oil Co., Inc. v. Burroughs Corp., 625 F.2d 1291, 1298 (5th Cir. 1980) (implied warranty disclaimer exists if the writing includes the word "merchantability").

If a sales contract contains both an express warranty and a general disclaimer of warranty liability, a court will uphold the warranty if it cannot reconcile reasonably the two. Consolidated Data Terminals v. Applied Digital Data Sys., Inc., 708 F.2d 385, 391 (9th Cir. 1983) (express warranty by a computer manufacturer that units would perform at set rate prevails over a general warranty disclaimer). *See supra* notes 19 & 43 for examples of common exclusion and limitation clauses.

A further consideration in the examination of the efficiency of disclaimers is whether the consumer receives adequate knowledge of the warranty disclaimer. The Magnuson-Moss Warranty Federal Trade Commission Improvement Act of 1975, 15 U.S.C. §§ 2301-2312 (1982), requires a seller that offers a written warranty for a consumer product to reveal fully and conspicuously the terms of the warranty. *Id.* § 2302. *See* Skelton v. General Motors Corp., 660 F.2d 311, 322 (7th Cir. 1981) ("written warranty" as defined in § 2301(6) is unambiguous in requiring a writing that influences a parties decision to purchase).

One survey of almost 400 discount stores by the National Mass Retailing Institute (NMRI) produced evidence that fewer than one customer per store per week examined warranties before buying a product. Ritter, *Few Buyers Ask to See Warranties*, St. Louis Post-Dispatch, Feb. 19, 1983, at 23. Because consumers tend to scrutinize a product thoroughly before purchasing it, the frequency of consumers examining warranties after purchase may be even lower than the NMRI figures. Warranty disclaimers must have something to disclaim to be of any value to the warrantor, and it is uncertain whether courts will recognize disclaimers where consumers were ignorant of both the warranty and the disclaimer.

54. *See* U.C.C. § 2-607(3)(a) (1978).

55. Product misuse is not an "ordinary use" under the implied warranty of merchantability provisions of the U.C.C. *See* U.C.C. § 2-315 comment 13 (requirement of a connection between the breach of warranty and the loss sustained).

56. *See* U.C.C. § 2-318 (1978). "Privity" in pre-Code law implied special or particular knowledge showing active concurrence. Spinney v. Sanford-Orlando Kennel Club, Inc., 123 Fla. 113, 166 So. 559 (1936) (persons in privity have a mutual interest in the same action or thing by some relation other than through contract). In the context of U.C.C. remedies for breach of warranty, there are two axis of "private knowledge."

ranty could not lie without privity of contract between the parties.[57] The definitive argument in the repudiation of the privity[58] requirement came in the case of *Henningsen v. Bloomfield Motors, Inc.*[59] In *Henningsen*, the New Jersey Supreme Court refused to embrace the defendant manufacturer's argument that an absence of privity with the consumer barred recovery.[60] *Henningsen* marked the demise of the vertical privity[61] requirement in warranty actions. The drafters of the U.C.C., by recognizing a judicial shift away from privity requirements, provided state legislatures with alternatives to contractual privity that allow for enactments based on existing case law.[62] While courts agree

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The first is the axis of vertical privity, within the distribution chain from manufacturer to purchaser. The second is the axis of horizontal privity, shared by the purchaser and other consumers or users of a particular product. *See generally* W. KIMBLE & R. LESHER, *supra* note 7, § 31, at 42-44.

The U.C.C. position on the requirement of privity in a breach of warranty action reflects the ambiguity surrounding the privity concept. U.C.C. § 2-318 leaves the task of defining privity to the state courts and legislatures. U.C.C. § 2-318 (1978). *Compare* Bishop v. Faroy Sales, 336 So.2d 1340 (Ala. 1976) (Alabama version of Code § 2-318 abolishes vertical privity) *with* Hawkins Constr. Co. v. Matthews Co., 190 Neb. 546, 209 N.W.2d 643 (1973) (manufacturer or seller may be liable under warranty contained in promotional literature even though not in privity of contract with a lessee-purchaser).

57. *See generally* Prosser, *The Fall of the Citadel (Strict Liability to the Consumer)*, 50 MINN. L. REV. 791 (1966); Prosser, *The Assault Upon the Citadel (Strict Liability to the Consumer)*, 69 YALE L.J. 1099 (1960).

58. *See supra* note 56 and accompanying text.

59. 32 N.J. 358, 161 A.2d 69 (1960). In *Henningsen*, the wife of an automobile purchaser was injured in an accident involving a newly-purchased auto. The automobile's manufacturer, Chrysler Corp., sold the auto to a dealer, who in turn sold it to the plaintiff's husband. The plaintiff sued both Chrysler and the dealer. The *Henningsen* court rejected Chrysler's privity of contract defense. The court felt that modern methods of marketing and advertising presented a propitious environment for abandoning the hoary and strained rule of contractual privity in warranty actions. *Id.* at 384, 161 A.2d at 84.

60. *Id.* at 383-84, 161 A.2d at 84.

61. *See supra* note 56 and accompanying text.

62. *See* U.C.C. § 2-318 comments 1-3 (1978).

Section 2-318 of U.C.C. provides three alternatives to the strict rule of contractual privity in warranty actions:

Alternative A

> A seller's warranty whether express or implied extends to any natural person who is in the family or household of his buyer or who is a guest in his home if it is reasonable to expect that such person may use, consume or be affected by the goods and who is injured in person by breach of the warranty. A seller may not exclude or limit the operation of this section.

Alternative B

> A seller's warranty whether express or implied extends to any natural person

that lack of vertical privity is no defense to a breach of warranty action, some view a lack of horizontal privity as a valid defense.[63] Courts find some guidance in section 2-318 of the U.C.C., which deals with third-party beneficiaries of warranties.[64] Two alternatives of this section, however, limit recovery to natural persons and related domestic users.[65] Again, the Code differentiates between natural and other users of mass-marketed goods. The assumption of contractual privity, clearly erroneous in the case of individual consumers of mass-marketed software, appears similarly invalid in the case of business users.

B. *Negligence Theories of Recovery*

The implied warranty of merchantability, the most efficacious U.C.C. remedy for injuries arising from defective computer software, addresses a limited class of consumers.[66] Not only is the scope of protection narrow, but also recovery of damages is limited to the value of the software,[67] and, in special cases, consequential damages.[68] The theory of implied warranty ignores a manufacturer's possible negligence in

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who may reasonably be expected to use, consume or be affected by the goods and who is injured in person by breach of the warranty. A seller may not exclude or limit the operation of this section.

Alternative C

A seller's warranty whether express or implied extends to any person who may be reasonably be expected to use, consume or be affected by the goods and who is injured by breach of the warranty. A seller may not exclude or limit the operation of this section with respect to injury to the person of an individual to whom the warranty extends.

Id.

63. In an action for violation of a third-party beneficiary contract, users other than the purchaser must prove that both the manufacturer and the purchaser intended an enforceable benefit for those users. *See, e.g.*, W.D. Anderson & Sons v. Samedan Oil Corp., 210 F.2d 600 (5th Cir. 1954) (oil and gas contract presumed to benefit contractual parties alone, unless a clear manifestation of other intent); Graham & Hill v. Davis Oil Co., 486 P.2d 240, 242 n.3 (Wyo. 1971) ("third person claiming the benefit has the burden of proving the contract was made for his benefit") (citing Robins Dry Dock & Repair Co. v. Flint, 275 U.S. 303 (1927) (Holmes, J.)).

64. *See supra* note 56.

65. *See supra* note 62 alternatives A & B.

66. *See* U.C.C. § 2-314 (1978); *see also* U.C.C. § 2-318 and comments (1978).

67. *See* U.C.C. § 2-714(2) (valuation of damages is determined by the difference in value of the goods as warranted and as accepted).

68. U.C.C. §§ 2-714(3), 2-715(2) (1978). The Code defines consequential damages to include injuries "to persons or property proximately resulting from any breach of warranty," express or implied. U.C.C. § 2-715(2) and comment 5.

causing the program's defect.[69]

An action under a negligence theory offers a large class of potential plaintiffs a multitude of damages.[70] This flexibility is not without costs. Injured parties first must assert a standard of care and then prove a violation of that standard. No statutory presumptions, as in the case of the implied warranty provisions of the U.C.C., aid the discharge of this burden.[71]

It is evident that the manufacturer of consumer software owes a duty of care at least to the purchaser of the software.[72] It is difficult, however, to define this standard. No state currently requires professional licensing of programmers.[73] Despite the similarity of computer programming to other professional specialties, courts hesitate to impose upon programmers a duty of care greater than that of an expert lay-

69. A breach of warranty action under the Code requires no violation of a duty of care owed to the buyer. Recovery for breach of a U.C.C. § 2-314 warranty requires simply the breach of an implied legal obligation, the manufacturer's warranty of merchantability, and resulting injury. *See* U.C.C. § 2-314.

70. The size of the class varies with the duty owed to the class members. One manufacturer producing a single item of merchandise may owe different standards of care to several classes of consumers. *See* W. PROSSER, THE LAW OF TORTS §§ 30-33, at 143-80 (4th ed. 1971).

Recovery in tort may include compensatory damages for personal injuries, along with limited economic losses. Punitive damages, although rare, also may lie. *See* Nycum, *supra* note 22, at 8-22.

71. Except where procedural presumptions—that is, *res ipsa loquitur* and statutory violations—apply, the plaintiff in a negligence action bears the burden of proving a standard of due care and a violation of that standard. In an action for breach of an implied warranty, the Code implies a warranty analogous to the duty owed in a negligence action, and the plaintiff must prove a violation of that warranty. *See* Gumbs v. International Harvester, Inc., 718 F.2d 88 (3d Cir. 1983) (plaintiff injured by faulty truck axle must show reliance on manufacturer's skill and judgment); Royal Business Mach., Inc. v. Lorraine Corp., 633 F.2d 34 (7th Cir. 1980) (plaintiff-buyer has burden of showing seller's breach of implied warranty).

72. *See* Gemignani, *supra* note 11, at 189-91.

73. Currently, no state has promulgated legislation either requiring the licensing of computer personnel or establishing some minimum professional standards for the industry. *See* 5 COMPUTER L. SERV. § 7-3 (1979).

One data processing executive offered an explanation for the absence of state licensing legislation in testimony before Senate hearings on a computer crime bill. The witness argued that currency of qualifications in the computer industry was the biggest obstacle to the licensing of computer professionals. The witness stated that the rapid obsolescence of professional skills, combined with the enormous administrative problems of monitoring hundreds of thousands of programmers, made private professional organizations the only viable source of industry regulation. *Hearings on S. 1766 Before the Subcomm. on Criminal Laws and Procedures of the Senate Judiciary Comm.*, 97th Cong., 1st Sess. 15 (1979) (statement of Sen. Charles H. Percy).

man.[74] In an important decision, *Chatlos Systems, Inc. v. National Cash Register Corp.*,[75] the court refused to create a new tort of "computer malpractice" that would impose an elevated standard of care on the programming staff of a large and respected computer services corporation.[76] The *Chatlos* court stated, in dictum, that the technological complexity of computer programming does not necessarily imply an elevated standard of responsibility.[77] In the absence of a standard of

74. *See* Nycum, *supra* note 22, at 10. *See infra* notes 75-84 and accompanying text (discussing possible standards for computer programmers). *Cf.* LeSeur Creamery, Inc. v. Haskon, Inc., 660 F.2d 342 (8th Cir. 1981) (court held dairy equipment corporation to higher standard of care for professionals in finding liability for negligent installation of equipment).

75. 479 F. Supp. 738 (D.N.J. 1979), *rev'd on other grounds*, 635 F.2d 1081 (3d Cir. 1980), *aff'd on rehearing*, 670 F.2d 1304 (3d Cir. 1982).

76. *Chatlos* involved a customer of a computer services corporation (NCR) seeking recovery under several legal theories. The system that NCR installed never functioned properly, and the customer, instead of rescinding the transaction, accepted NCR's guarantees that NCR would remedy the problems. While NCR attempted to correct these problems, the customer incurred considerable direct, consequential, and incidental losses arising from the defects in its computer system. The customer asserted claims for breach of contract, breach of express and implied warranties, fraudulent misrepresentation, "computer malpractice," and strict liability in tort. The court, however, never seriously considered the customer's computer malpractice and strict liability claims and disposed of these causes of action as follows:

> The novel concept of a new tort called "computer malpractice" is premised upon a theory of elevated responsibility on the part of those who render computer sales and service. Plaintiff equates the sale and servicing of computer systems with established theories of professional malpractice. Simply because an activity is technically complex and important to the business community does not mean that greater potential liability must attach. In the absence of sound precedential authority, the Court declines the invitation to create a new tort. In view of the findings and conclusions, *infra* the Court deems it unnecessary to rule explicitly on plaintiff's assertion of strict liability in tort.

479 F. Supp. at 741 n.1.

77. *Id.* Despite the court's reluctance to find tort liability on the part of NCR, the court held ultimately that the plaintiff could recover consequential damages based on a breach of both express warranty and implied warranty for a particular purpose. *Id.* at 747. The court found that the transaction was for the "sale of goods" under U.C.C. Art. 2 "notwithstanding the incidental service aspects and the lease arrangement" between Chatlos and NCR. *Id.* at 742. The court went on to hold that NCR breached express warranties in the equipment order and sales contract relating to the goods at issue. *Id.* at 743. The court ruled also that NCR was liable for breach of implied warranty for particular purpose because NCR represented to the plaintiff that the software that the plaintiff purchased would perform certain functions. *Id.* Because the court imposed liability based on these two theories, the court found it unnecessary to address the issue of implied warranty of merchantability. *Id.* at 743 n.3. On appeal, the Court of Appeals for the Third Circuit affirmed the district court's holding pertaining to the two theories of warranty liability, but reversed and remanded on the issue of conse-

care, courts must judge programmer competency according to individual skill and experience. Plaintiffs who rely on this standard in negligence actions will find this standard deficient for two reasons. First, it forces an investigation of industry custom. Second, it can result in the imposition only of a minimum standard of care upon a computer programmer defendant.[78]

After the software consumer has established a manufacturer's standard of care, that consumer must prove a violation of the standard. This violation can occur in any of the three stages of software production: generation of the program,[79] testing and debugging,[80] and final assembly of the product.[81] It is difficult to prove a failure to use due care in program generation because of the judicial rejection of a higher standard of care for programmers.[82] For different reasons, this difficulty also extends to testing and assembly. Rapidly changing methodology make standards of care not only short-lived, but possibly unidentifiable.[83] Industry custom often provides little guidance because technological diversity make testing standards for one type of software inapplicable to other types.[84] While the purchaser of custom-made programs may avoid these manufacturing ambiguities through contract specifications, the consumer of mass-marketed software has no such recourse.

Use of the procedural shortcut of *res ipsa loquitur* is fraught with

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quential damages. 635 F.2d 1081, 1084 (3d Cir. 1980), *aff'd on rehearing*, 670 F.2d 1304 (3d Cir. 1982).

78. Absent a professional classification, courts judge computer programmers and other specialists as expert laymen. *See* Nycum, *supra* note 22, at 10.

79. *See supra* note 10. Several technical articles are helpful in explaining the intricacies of software production. *See What the Small Businessman Should Know About Computer Languages*, 1 COMPUTER L. SERV. § 1-2.3, art. 3 (1981) (an end-user's view of software and related applications); Ross, *The Technology of Firmware*, 1 COMPUTER L. SERV. § 1-2.3, art. 2 (1978); *Programming Language*, 1 COMPUTER L. SERV. § 1-2.3, art. 1 (1967) (an overview of the syntactical expression of the design of a program).

80. Testing and debugging complex software often consumes much of a programmer's time, even when the software's design is well-conceived and implemented. *See supra* note 79 and accompanying text.

81. Final assembly of software involves both direct human mediation and autonomous mechanical operations. *See generally* Davis, *supra* note 30, § 1-2.1, art. 1; Davis, *Evolution of Computers and Computing*, 1 COMPUTER L. SERV. § 1-2.1, art. 4 (1977).

82. *See supra* notes 74-77 and accompanying text.

83. *See Hearings on S. 1766 Before the Subcomm. on Criminal Laws and Procedures of the Senate Judiciary Comm.*, 97th Cong., 1st Sess. 125 (1979) (statement of E. Palmer).

84. *Id.* at 120.

problems similar to those involved in establishing a violation of due care.[85] The *res ipsa loquitur* doctrine generates a rebuttable presumption of negligence against a special class of defendants.[86] While the doctrine obviates the need to prove a violation of some ambiguous duty of care, its use poses a special problem. Given the current state of software technology, a software defect may arise in the absence of a violation of care, however high the standard.[87] *Res ipsa loquitur* presumptions fail because the continually advancing state of the art in software engineering affords no basis for determining what "ordinarily occurs."[88]

Computer tort plaintiffs face other problems besides the rapid development of software technology. Advances in the design of small computer systems and software have stabilized the reliability of software technology.[89] Opportunities for defining industry standards of reliability expand as this reliability becomes widespread. Courts seem hesitant, however, to define new standards of care in even the most felicitous of situations.[90] This is so because courts often await legisla-

85. *Res ipsa loquitur* is a doctrine of negligence law that means literally, "the thing speaks for itself." BLACK'S LAW DICTIONARY 1173 (5th ed. 1979). The doctrine amounts to a reduction of the plaintiff's evidentiary burden, that of prosecuting the case, through the court's acceptance of circumstantial evidence. *Res ipsa loquitur* is prescribed when a plaintiff's burden is inequitably burdensome; this occurs when a defendant maintains control over evidence salient to an action, or when conditions beyond the control of either party hinder the presentation of evidence. *See* W. KIMBLE & R. LESHER, *supra* note 7, § 222, at 230-33; W. PROSSER, *supra* note 70, §§ 39-40, at 211-35.

86. *See* W. PROSSER, *supra* note 70, § 39, at 214-16.

87. *See* Gemignani, *supra* note 11, at 191-92; Nycum, *supra* note 22, at 11-12.

88. *See* Note, *Easing Plaintiffs' Burden of Proving Negligence for Computer Malfunctions*, 69 IOWA L. REV. 241 (1983). In this article, the author grapples with the evidentiary problems hindering tort actions for computer malfunctions. The author argues that the doctrine of *res ipsa loquitur* can ease a computer tort plaintiff's burden of proof. *Id.* at 248-56. This argument, however, appears premature in that it assumes negligence. *Res ipsa* does not obviate a duty of care; it simply generates a presumption of liability once a breach of that duty has occured. Computer tort plaintiffs, then, face the same problem with or without *res ipsa loquitur*: proving "negligence in the air."

89. *See supra* note 1 and accompanying text.

90. *See supra* notes 74-77 and accompanying text. The *Chatlos* court involved egregious violations of professional and technical rules of competency. NCR, the defendant computer services corporation, displayed an absolute ignorance of the plaintiff's computer needs. In addition, when the NCR system came to life briefly, it maintained a pace slower than the humans it supposedly replaced. During this interval, defendant NCR knew of the plaintiff's complete dependence upon the NCR-supplied system for

tive or industry definition of standards of care,[91] and because courts believe that existing remedies lessen the need to create new torts.

III. STRICT LIABILITY FOR DEFECTIVE SOFTWARE

Serious deficiencies exist under both the remedial contract and negligence theories. U.C.C. remedies suffer from both ambiguous privity requirements and limited availability of damages.[92] Recovery under a negligence theory hinges upon the problematic definition of a manufacturer's duty of care to the consumer.[93] The doctrine of strict liability in tort can circumvent these problems.

The doctrine of strict liability is a hybrid of implied warranty and negligence law.[94] This doctrine presents courts with a powerful mechanism for balancing the risks and benefits of certain activities. The balancing does not consider the fault of the parties involved in these activities.[95] Strict liability may exist even in instances in which the defendant exercises all possible care.[96] Modern courts assign liability for unusual activities to the party that controls and benefits from the

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inventory management. In a final blow to NCR's credibility, highly-trained computer specialists enlisted by NCR failed to solve the problems with the system.

The prima facie tort doctrine obviates the crafting of a complex standard of care assigned to the computer services industry. The *Chatlos* court had a rare opportunity to define computer malpractice in such a way that few competent parties could feel the sting of the new tort. It is well to note, however, that the plaintiff presented a strong case under a breach of implied warranty theory. Despite this qualification, the *Chatlos* court had no plausible reason to deliver its footnote stricture on computer malpractice.

91. *See supra* notes 73 & 83. There are few legislative initiatives in this area. Most state regulation of the computer services industry pertains to computer crime or rights to privacy issues. *See* 4 COMPUTER L. SERV. § 7-3(c) (1974).

92. *See supra* notes 56-65 and accompanying text.

93. *See supra* notes 74-76, 83-84 and accompanying text.

94. *See* Escola v. Coca-Cola Bottling Co., 24 Cal. 2d 453, 461-68, 150 P.2d 436, 440-44 (1944) (Traynor, J., concurring) (synopsis of the doctrine of strict liability, along with a forceful argument for its expanded use).

For a history of the rise of the American doctrine of strict liability, see W. PROSSER, *supra* note 70, §§ 78, 98, at 505-16, 656-58. *See also* W. KIMBLE & R. LESHER, *supra* note 7, §§ 20-22, at 31-37.

95. *See* Henningsen v. Bloomfield Motors, Inc., 32 N.J. 358, 384, 161 A.2d 69, 84 (1960).

96. *See* W. PROSSER, *supra* note 70, §§ 75, 79, at 492-96, 517-25. *See also* Rylands v. Fletcher, L.R. 3 H.L. 330, 161 (1868) (seminal English case defining strict liability as liability without fault in special cases of abnormal use of land); Ognall, *Some Facets of Strict Tortious Liability in the U.S. and Their Implications*, 33 NOTRE DAME LAW. 239 (1958).

activities.[97] While this shift of liability may offend traditional notions of fault-based liability, it represents a calculated attempt on the part of courts to administer social justice.

Early strict liability case law focused narrowly upon abnormal or dangerous use of real property.[98] Later decisions, cloaked in references to implied warranties, extended the doctrine to defective food and drugs.[99] The second Restatement of Torts stripped the doctrine of these connotations of warranty law, and extended strict liability to all unreasonably dangerous products.[100]

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97. *See, e.g.*, Whitehead v. St. Joe Lead Co., Inc., 729 F.2d 238 (3d Cir. 1984) (manufacturer of lead ingots strictly liable for illness of buyer's employee even though ingots underwent "substantial change" causing lead to become airborne particles). *See also* Nycum, *supra* note 22, at 16.

Consumers are often least able to perceive or correct defects in mass-marketed merchandise. Consumers are also inefficient insurers against the harm resulting from these defects. In La Rossa v. Scientific Design Co., 402 F.2d 937 (3d Cir. 1968), the court clearly articulated this consumer protection rationale for strict liability:

> The disparity in position and bargaining power which forces the consumer to depend entirely on the manufacturer and the difficulty of requiring the injured party in consumer products cases to trace back along the channel of trade to the source of production in the search for the origin of the defect in order to prove negligence have been among the reasons for the emergence of the doctrine of strict liability in tort. An additional element has been the recognition that the mass producer of a product made for consumer use should as a matter of public policy bear the responsibility of an insurer against a defect in the product which causes harm to the consumer.

Id. at 942.

98. *See* W. PROSSER, *supra* note 70, § 78, at 505-16 (and cases cited therein). *See also* Harris, *Liability Without Fault*, 6 TUL. L. REV. 337 (1932).

99. *See, e.g.*, Coca-Cola Bottling Works v. Shelton, 214 Ky. 118, 282 S.W. 778 (1926) (defective beverage); Pillars v. R.J. Reynolds Tobacco Co., 117 Miss. 490, 78 So. 365 (1918) (toe found in chewing tobacco).

100. Section 402A of the Restatement (Second) of Torts (1966) reads, in pertinent part:

> (1) One who sells any product in a defective condition unreasonably dangerous to the user or consumer or to his property is subject to liability for physical harm thereby caused to the ultimate user or consumer, or to his property, if
>
> (a) the seller is engaged in the business of selling such a product, and
>
> (b) it is expected to and does reach the user or consumer without substantial change in the condition in which it is sold.
>
> (2) The rule stated in Subsection (1) applies although
>
> (a) the seller has exercised all possible care in the preparation and sale of his product, and
>
> (b) the user or consumer has not bought the product from or entered into any contractual relation with the seller.

Id. See generally W. PROSSER, *supra* note 70, § 98, at 656-58 (and cases cited therein).

Greenman v. Yuba Power Products, Inc.[101] marked the first judicial interpretation of the Restatement's strict liability provisions. In *Greenman*, a California court rejected the defendant's warranty defenses to a products liability action.[102] The court held that strict liability barred the traditional defenses of absence of privity and lack of timely notice.[103] *Greenman* led a long string of cases applying strict liability in tort to defective consumer products.[104]

Greenman's interpretation of section 402A made contractual privity unnecessary in implied warranty actions.[105] The text of the section

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101. 59 Cal. 2d 57, 377 P.2d 897, 27 Cal. Rptr. 697 (1963). The plaintiff sued a power tool manufacturer for injuries resulting from a defect in the tool. The California Supreme Court found the manufacturer strictly liable even though the plaintiff did not give timely statutory notice of the breach of warranty to the manufacturer under the State Uniform Sales Act. *Id.* at 59-60, 377 P.2d at 899-900, 27 Cal. Rptr. at 700-01.

102. *Id.*

103. *Id.* at 59, 377 P.2d at 899, 27 Cal. Rptr. at 701 (to establish the manufacturer's liability, "it was sufficient that plaintiff proved he was injured while using the [tool] in a way it was intended to be used as a result of a defect in design and manufacture of which plaintiff was not aware that made the [tool] unsafe for its intended use").

104. *See, e.g.*, CNG Producing Co. v. Columbia Gulf Transmission Corp., 709 F.2d 959, 963 (5th Cir. 1983) (venting of liability under *Greenman* rule); Pike v. Benchmaster Mfg. Co., 696 F.2d 38, 41 (6th Cir. 1982) (*Greenman* criteria jury submissible); Murphy v. E.R. Squibb & Son, — Cal. App. 3d —, —, 202 Cal. Rptr. 802, 803 (1984) (*Greenman* not applicable where defective product is incidental to performance of professional service); Doyle v. Rhodes, — Ill. 2d —, —, 461 N.E.2d 382, 390 (1984) (rule that consumer or user entitled to believe that product will perform job for which it was built applied to Illinois Road Construction Injuries Act); Spring Motors Distrs., Inc. v. Ford Motor Co., 191 N.J. Super. 22, 35, 465 A.2d 530, 537 (App. Div. 1983) (quoting Seely v. White Motor Co., 63 Cal. 2d 9, 403 P.2d 145, 45 Cal. Rptr. 17 (1965)); Jerry v. Borden Co., 45 A.D.2d 344, 347, 358 N.Y.S.2d 426, 432 (1974) (manufacturer has burden of showing design or means of manufacturing product); Lobianco v. Property Protection, Inc., 292 Pa. Super. 346, 359, 437 A.2d 417, 424 (1981) (application of *Greenman* to suit involving homeowner's seeking strict liability of faulty burglar alarm manufacturer following theft of owner's jewels not justified because only owner knows what property is at home); Nugent v. Utica Cutlery Co., 636 S.W.2d 805, 814 (Tex. Civ. App. 1982) (warranties do not have to arise from contract but may arise from liability imposed by law). *But see* Hardin v. Montgomery Elev. Co., 435 So.2d 331, 333 (Fla. Dist. Ct. App. 1983) (*Greenman* does not provide a defense to a manufacturer whose defective product undergoes an inspection before it reaches the ultimate user).

105. Although the landmark case of Henningsen v. Bloomfield Motors, Inc., 32 N.J. 358, 161 A.2d 69 (1960), rejects the need for vertical privity in implied warranty actions, the extent of liability to third-party beneficiaries, on the horizontal axis of the privity relationship, is unclear today. *See supra* notes 62-65 and accompanying text.

It is well to note a recent state case, Garcia v. Texas Instruments, Inc., 610 S.W.2d 456 (Tex. 1980), in which the court extended the implied warranty of merchantability to cover employees of a product's purchasers. *Garcia* involved an employee injured by concentrated acid contained in an allegedly defective package. The employee brought

disposed of the need for fault-finding and obviated definition of a standard of care owed the consumer.[106] Although section 402A effectively circumvents the deficiencies under a U.C.C. or negligence action for injuries arising from defective computer software, the section poses two obstacles to potential plaintiffs. First, the defective product must present a risk "unreasonably dangerous to the user or consumer or to his property."[107] Second, the defect must cause "physical harm."[108] The "unreasonably dangerous" requirement thrusts upon the consumer the same difficulties clouding the use of *res ipsa loquitur* in a negligence action.[109]

Two recent cases, *Delk v. Holiday Inns, Inc.*[110] and *Sanchez v. Bock Laundry Machine Co.*,[111] indicate that the burdens involved in proving a technologically complex product's "unreasonably dangerous" nature are far less formidable than those involved in proving a manufacturing standard of care for such products. *Delk* proposed that ordinary consumer expectations should determine the reasonableness of a product's danger.[112] *Sanchez* found this standard particularly appropriate in

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suit four years after the incident, apparently after the state statute of limitations on negligence actions had lapsed. The *Garcia* court read the U.C.C.'s prescription for "judicial interpretation" of the Code's privity requirement broadly. Despite the relationship of the employee and the vendor of the acid, the court held that § 2-314 of the Texas Commercial Code extended to the employee. *Id.* at 462-63.

106. Strict liability reduces the need for a standard of care because strict liability is a "no-fault" method of distributing the risks associated with dangerous products of high utility. *See supra* notes 95-96. This does not imply that evidence of a standard of care has no place in a strict liability action. Evidence of industry custom, state of the art, and other conventions may bolster a defendant's affirmative defenses to a products liability claim. Such evidence is especially relevant in attacking the "unreasonableness" of the product's defect. *See* Gelsumino v. E. W. Bliss Co., 10 Ill. App. 3d 604, 294 N.E.2d 110 (1973) (custom is relevant in determining the standard of care in defendants's creation of the design of a product; evidence of adopting this standard, however, does not avoid the issue of strict liability).

107. *See* RESTATEMENT (SECOND) OF TORTS § 402A comment i.

108. *See id.* comments l, o.

109. *See supra* notes 86-87 and accompanying text.

110. 545 F.Supp. 969 (S.D. Ohio 1982).

111. 107 Ill. App. 3d 1024, 438 N.E.2d 569 (1982).

112. *Delk* involved a group of motel guests suing a motel and the suppliers of the motel's furnishings for injuries sustained in a fire. The court applied the consumer expectancy test in rejecting the plaintiffs' claim of "unreasonable danger" in the motel's use of flammable carpets and wall coverings. A product is defective, the court held, if "it is more dangerous than an ordinary consumer would expect when used in an intended or reasonably foreseeable manner." *Delk*, 545 F.Supp. at 971.

products liability cases complicated by conflicting expert testimony.[113] The consumer expectations standard suggested by both *Delk* and *Sanchez* provides a way around the problem of technological transilience in establishing a product's unreasonable danger. Increasingly reliable software, independent of the changing applications of such software, molds consumer expectations in such a way as to make basic software defects "unreasonable."[114] To illustrate this point in a simplified context, while an automobile owner of seventy years ago considered a wet morning a reasonable cause of his auto not starting, modern owners would probably consider such a cause unreasonable. Yet modern owners might consider defects occurring at speeds unknown several decades ago expected and highly reasonable. Changes in the reliability of such products forced a shift in consumer expectations of "unreasonable defects."

Section 402A presents a second problem for consumers seeking recovery for injuries arising from defective mass-marketed software. The section addresses only physical harm to the user or to his property.[115] Pure economic loss lies outside the ambit of section 402A because existing remedies—contractual or tort damages—generally provide adequate recovery for these injuries.[116] This assumption of comparable remedies, however, is unavailable in the case of economic injuries arising from defective computer software.[117] Courts cautiously have ex-

113. In *Sanchez*, an employee of a commercial laundry sustained injuries while operating a clothes dryer manufactured by the defendant. Testimony offered in the case was of a highly technical nature. 107 Ill. App. 3d at 1025-28, 438 N.E.2d at 570-72. Conflicting expert testimony clouded the issue of the dryer's "unreasonably dangerous" nature. The court held that the issues of reasonableness of a product's risks were jury submissible, especially when the level of expert testimony tended to obfuscate the issues. *Id.* at 1030, 438 N.E.2d at 573.

114. For a discussion of the burgeoning public acceptance of computers as reliable and useful devices, see Blundell, *supra* note 1, at 185.

115. *See supra* note 106.

116. Section 402A does not expressly exclude recovery of economic losses. *See* RESTATEMENT (SECOND) OF TORTS § 402A (1966).

Not all commentators share the approach of the Restatement to economic losses. For positions advocating the extension of strict liability to pure economic losses, see Note, *Product Liability: Expanding the Property Damage Exception in Pure Economic Loss Cases*, 54 CHI.[-]KENT L. REV. 963 (1978); Note, *Manufacturer's Strict Tort Liability to Consumers for Economic Loss*, 41 ST. JOHN'S L. REV. 401 (1967).

For opposing views, see generally Prosser, *supra* note 57; Spiedel, *Products Liability, Economic Loss and the UCC*, 40 TENN. L. REV. 309 (1973); Note, *Economic Loss from Defective Products*, 4 WILLAMETTE L.J. 402 (1967).

117. *See supra* notes 7 & 14 and accompanying text.

tended liability for pure economic losses,[118] while Congress, in the Uniform Model Products Liability Act,[119] has excluded direct or consequential economic loss from the ambit of the Act.[120]

There exists an additional problem with using section 402A in defective software cases.[121] Neither the section nor its accompanying comments address strict liability for defective design.[122] This silence, combined with the Restatement's disposition towards a negligence standard for defective design,[123] makes strict liability for defective software design unclear. Design errors, however, comprise the most serious class of defects in mass-marketed computer software.[124] Judicial limitation of section 402A to manufacturing defects leaves a large group of software consumers with the onerous task of proving negligent design.[125] Although courts have experimented with strict liability for defective product design, the present scope of strict liability is narrow.[126]

Because the application of the doctrine of strict liability to computer software involves a delicate balancing of costs to both the manufacturer and the consumer, courts must weigh many criteria before assigning such liability.[127] Three central criteria guide this judicial balancing: the manufacturer's control over the design and distribution

118. *See generally* Note, *Products Liability in Commercial Transactions*, 60 MINN. L. REV. 1061 (1976).

119. 44 Fed. Reg. 62,717 (1979).

120. *Id. See also* Gemignani, *supra* note 11, at 197.

121. W. KIMBLE & R. LESHER, *supra* note 7, § 133, at 162-63; Phelm & Foer, *Problems of Proof in Defective Design Litigation*, 54 CHI. B. REC. 257 (1973).

122. Comment a to § 402A states that sellers of products are subject to strict products liability despite the exercise of "all possible care in the preparation and sale of the product." RESTATEMENT (SECOND) OF TORTS § 402A comment a. Further comments expand the meaning of "preparation" to include assembly, packaging, and labeling. *Id.* at comments g, h, and j. The Restatement omits any mention of the design or plan guiding preparation of products within the ambit of § 402A.

123. *See* RESTATEMENT (SECOND) OF TORTS § 398 (product manufacturer's duty of care regarding product design is one of "reasonable care").

124. *See supra* note 120 and accompanying text. A sharp definition of software "design" and "assembly" may be impossible. A programmer's discretion within the confines of a program's design resembles both design and assembly; this discretion both shapes the end product and is shaped by the program's blueprint or design.

125. Proof of negligent design is the most elusive problem facing injured software users. *See supra* notes 10-11. *See also* Note, *supra* note 88, at 245-46.

126. *See* Pike v. Frank G. Hough Co., 2 Cal. 3d 465, 467 P.2d 229, 85 Cal. Rptr. 629 (1970); Wright v. Massey-Harris, Inc., 68 Ill. App. 2d 70, 215 N.E.2d 465 (1966).

127. For a discussion of the utilitarian balancing, see La Rossa v. Scientific Design

of products, the difficulty of an injured consumer in obtaining legal redress under contract or negligence law, and the feasibility of equitably distributing the costs of strict liability through increased prices or insurance.[128] Only the third criterion, the feasibility of cost-spreading, creates an obstacle to the application of strict liability to defective consumer software. Few, if any, software manufacturers or distributors have the requisite capital to act as self-insurers.[129] More important, products liability insurance for computer software remains elusive.[130] Cost-spreading in the form of higher software prices is not viable because the excess revenues cannot guarantee insurance against consumer injuries. Insurers, however, inevitably will provide at least minimal products liability insurance to the maturing consumer software industry.[131]

Co., 402 F.2d 937 (3d Cir. 1968); Escola v. Coca-Cola Bottling Co., 24 Cal. 2d 453, 150 P.2d 436 (1944). *See also* W. PROSSER, *supra* note 70, § 75, at 492-96.

128. *See* Nycum, *supra* note 22, at 16. In addition to these criteria, courts have cited market deterrence in assigning strict liability to an accident producing activity. *See, e.g.*, McKay v. Rockwell Int'l Corp., 704 F.2d 444, 452 (9th Cir. 1983); *In re* Agent Orange Prod. Liab. Litig., 506 F. Supp. 762, 793 (E.D.N.Y. 1980). This criterion encourages the marketing of products incorporating cost-justified safety features. McKay v. Rockwell Int'l Corp., 704 F.2d at 452. The interpretation of "cost-justified" is critical: the marginal cost of the safety features must not exceed the producer's enterprise liability for product accidents. In the case of mass-marketed software, the utility of some products may discourage courts from assigning strict products liability for defects. *See* Phillips v. Kimwood Mach. Co., 269 Or. 485, 495, 525 P.2d 1033, 1038 (1974).

129. *See* Keane, *The Data Processing Industry—An Insider's Report*, 1 COMPUTER L. SERV. § 1-4, art. 2 (1974) (rapidly changing needs of business users of computer systems spawned a host of small, venture-capitalized software manufacturers and computer services firms).

130. *See* Tangorra, *Insurance Against Disaster*, DATAMATION 71 (general liability insurance tailored for the computer services industry covers only the premises or manufacturing plant, not the distributed products or services); Freed, *supra* note 36, at 477 (software defect insurance nonexistent).

131. At the present time, insurers provide three types of coverage to the data processing industry:

1) Basic All-Risk (covers hardware, software, direct and indirect loss-related expenses)
2) Professional Liability for Errors and Omissions (optional contract, tailored for providers of computer services)
3) Computer Fraud or Infidelity (covers criminal conversion, destruction of property, etc.)

Tangorra, *supra* note 130, at 71. These types of insurance, however, protect only the computer services industry, not necessarily software manufacturers. Yet the presence of such specialized insurance coverage, recently underwritten, indicates that similar protection is feasible in the software manufacturing industry.

If there exists an adequate method of cost-spreading, the remaining criteria for imposing strict liability to consumer software should present few difficulties to the injured consumer.[132] The software manufacturer is best able to minimize the appearance of defects during the manufacturing process.[133] A judicial policy of a manufacturer's strict liability for these defects assures the exercise of maximum care in the course of software manufacture.[134] Such a policy would minimize the onerous evidentiary problems facing injured consumers.[135]

Application of the doctrine of strict liability to economic and physical injuries resulting from defective software necessarily will impose immediate costs upon both the manufacturer and the consumer.[136] The long-term effects of this application appear salubrious. Judicial recognition of the doctrine does not create new liability; rather, it shifts the liability currently borne by the consumer.[137] This shift can bolster consumer confidence in state-of-the-art technology. For example, professionals such as physicians and architects may contract for expensive, custom-made computer software, and thus gain express indemnification and warranty provisions in order to protect themselves from possible liability stemming from software defects.[138] Mass-marketed software, although attractively priced, forces the professional user to assume higher malpractice insurance costs to cover potential damages arising from use of this software.[139] The software manufacturer's strict

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132. A possible alternative to both liability insurance and voluntary self-insurance is a minimum-capitalization requirement. This scheme would resemble the traditional capitalization laws for corporations, but would demand a much higher level of starting capital reserves.

133. *See* Nycum, *supra* note 22, at 14.

134. *Id.* at 19.

135. *See supra* notes 78, 82-87 and accompanying text.

136. *See supra* notes 119-31 and accompanying text.

137. *See* W. PROSSER, *supra* note 70, § 75, at 492-96.

138. The parties negotiate these warranties, and may fairly represent the needs of both the vendor and the vendee. This bargaining freedom compares favorably with some skeleton warranties, *supra* note 19, common in most computer transactions.

139. *See generally* Watrous, *Liability for Medical Appliances in Malpractice Suits: The Fly in the Ointment*, 10 TEXAS TECH. L. REV. 405, 417 (1979).

It is important to note that professionals have a responsibility to implement modern technology. *See* The T.J. Hooper, 60 F.2d 737 (2d Cir. 1932), *cert. denied*, 287 U.S. 662 (1932). The *Hooper* doctrine makes a failure to employ modern advances in safety technology prima facie evidence of unreasonably dangerous conduct. *See* Petras & Scarpelli, *supra* note 15, at 15-17.

The so-called "locality" rule of industry custom conditions the efficacy of the *Hooper* doctrine in expanding professional use of mass-marketed computer software. Jurisdic-

liability to the consumer obviates this need for increased insurance coverage and can stimulate professional consumption of the less expensive, mass-marketed software. Lower overhead can result in less expensive professional services. Furthermore, a more subtle effect of the manufacturer's strict liability is enhanced product quality.[140] Enhanced quality and stimulated professional consumption may help energize the software market by spurring sales and reducing the cost of the manufacturer's burden of liability.

IV. CONCLUSION

The extraordinary growth of the microcomputer industry has created a temporary judicial vacuum in the area of liability for defective consumer software. Despite its arcane technology and mystique,[141] the microcomputer industry strongly resembles traditional industries. At the same time, the industry's mutable product—consumer software—sets it apart from ordinary industries. The often tautological relationship of computer programs and raw information has led to much judicial confusion.[142] Vestiges of the goods-services debate over computer software still remain in most jurisdictions.[143] It is understandable that courts have relied upon often inappropriate, though established, case law in handling litigation involving products of a new technological species. Yet the new species of mass-marketed microcomputer software, along with a multitude of users, demand a reformulated judicial policy on the issue of liability for software defects. Existing remedies in tort and contract law provide neither adequate compensation for injured consumers nor the proper stimulus for sustained implementation of computer technology. Strict liability provides the most utilitarian and socially balanced approach to protecting consumers and insuring industry growth.

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tions that adhere to the "locality" rule are often reluctant to impose the *Hooper* doctrine of care beyond existing industry standards of care. This attitude weakens the *Hooper* doctrine because it removes the impetus for assimilation of new technology. *Id.* at 28.

140. *See* Nycum, *supra* note 22, at 17.

141. In an optimistic note, one observer has remarked that "the mystique which surrounds the operation of computers today [is] similar to that which once surrounded aviation." Note, *supra* note 88, at 251. Computer software, especially of the mass-marketed type, is not sui generis; growing public acceptance and reliance will bring software squarely into the scope of products liability.

142. *See supra* notes 16, 34 and accompanying text.

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