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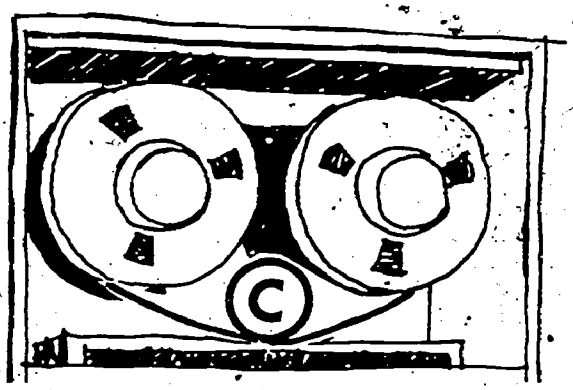
ABSTRACT

A survey was commissioned to establish a baseline on the present modes of legal protection employed by the computer software industry. Questionnaires were distributed to 308 member companies of the Association of Data Processing Service Organizations (ADAPSO), and 116 responses were returned. Results indicated that (1) business executives typically rely upon technological resourcefulness rather than law to protect computer programs; (2) the development of new programs is only minimally dependent upon the availability of legal protection; and (3) the larger the company and the more general the program the more important is the law. Appendices include a table of copyright legal cases, a bibliography, and survey questionnaires. (Author/CMV)

LEGAL PROTECTION OF COMPUTER SOFTWARE

An Industrial Survey



Prepared for

NATIONAL

Commission on New Technological Uses of Copyrighted Works

by

Harbridge House, Inc.

November 1977

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PREFACE

This survey of the computer software industry was undertaken at the request of the Commission on New Technological Uses of Copyrighted Works (CONTU). Its single narrow purpose is to provide a statistical base to CONTU deliberations on the nature and extent of appropriate legal protection for computer software. It is neither a study of individual cases, nor a comprehensive legal analysis, nor a balanced consideration of policy. It is, however, a substantial contribution to the empirical data which is essential to the process of making wise laws.

We are especially indebted to the CONTU technical staff, and particularly Arthur J. Levine and Michael S. Keplinger for their assistance with the design of the survey questionnaire; to Martin A. Goetz of Applied Data Research, Inc., and Jerome Dreyer of the Association of Data Processing Service Organizations, Inc., (ADAPSO) for securing and sustaining the cooperation of the ADAPSO member firms; and to Don Leavitt of Computerworld for extending our inquiry to his readership.

To the extent that we have exercised scholarly pretensions beyond the strict limitations of a survey, a special debt of gratitude is owed to our friend Robert P. Bigelow, President of the Computer Law Association, and through him to other colleagues in the Association who have never failed to extend a helping hand. The case and bibliographical information in the appendices is largely an updated, revised listing of material included in the Computer Law Service Reporter, published by Callaghan & Co., and edited by Bob Bigelow. We have deliberately utilized the format of CLSR to facilitate research by our successors.

Members of the project staff were:

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SUMMARY OF FINDINGS

A written survey of the computer software industry, as represented by membership in the major trade association and readers of the principal trade periodical, characterized the typical company as follows:

It is independently owned and is less than 10 years old. It has fewer than 100 employees, annual sales of under $5 million and spends slightly under $100,000 per year on research and development. It could be located almost anywhere in the U.S. but is more likely to be in the Northeast or California than elsewhere. Its principal markets are apt to be consulting, contract programming, the development of proprietary software packages and data center operations and management. Although its revenues are fairly distributed over each of its markets, it tends to specialize in specific products or service lines. It develops from one to two dozen computer programs per year at its own expense and an equal number are purchased and/or developed at its customer's expense.

This company relies largely upon its technological resourcefulness in a burgeoning industry. It is not particularly concerned with the protection of the software that it develops or purchases and, to the extent that it is, would prefer to rely upon physical, technological, and contractual modes of protection rather than legal monopolies. It is not at all convinced that legal protection is necessary and feels that it is generally ineffective even when invoked. The company may – just "may" – take advantage of legal protection if it is offered, provided that it is simple, accessible and inexpensive. The absence of legal protection, however, will not in any way deter it from developing or marketing new programs.

These perceptions are likely to change as the company gets larger, particularly if it is involved in general business and systems software programs. Indeed, a large company which develops business programs on a proprietary basis, or for the management of a facility, is likely to support legal protection with some degree of enthusiasm. Relative to the number of firms in the indifferent majority, however, it is a lonely, albeit loud, voice in its industry.

The typical company would not change its development or marketing plans if the copyright law were to substantially strengthen available legal protection. It is not especially interested in the recent development of "trapdoor functions" which promise unbreakable ciphers and would probably be even less interested in the creation of utility models or other imaginative new legal devices. The more engineering and technically oriented the company's programming, the more prepared it is to rely upon the uniqueness of its product and its skills for protection – to the extent that it is conscious of protection at all. Conversely, the more generalized its applications or systems programming, the more sensitive it is to the need for protection. But these are shadings at the extremities: the singular outstanding conclusion of the survey is that for the most part the issue of legal protection through a grant of limited monopoly is a matter of monumental insignificance to the industry.

I. BACKGROUND TO THE SURVEY

A. The Software Subcommittee Report

This report presents results of a survey conducted by Harbridge House under the auspices of CONTU (National Commission on New Technological Uses of Copyrighted Works) to assess the attitudes of the computer software industry on legal protection for services and their products under existing patent, copyright and other laws.

The CONTU "Software Subcommittee" report of April 1977 reviewed the literature, the law and testimony concerning the conflicting social interests in the protection of computer software and concluded that "... these interests can best be balanced with respect to computer programs, as with all other works of authorship, by affording such works copyright protection."[1] However, the Subcommittee also noted expressions of reservations among the commissioners, the witnesses, and scholarly commentators. Indeed, tabulating merely the oral and written testimony from 20 ~~Subcommittee~~ witnesses representing 18 organizations Commission it was observed that "11 favored copyright, three favored patent, three favored trade secrecy, eight had no preference, and two perceived no need for protection."[2]

Harbridge House was retained against this background to secure additional empirical data on the nature and effects of software protection to assist the Commission in its deliberations.

B. Highlights of Legal Issues

Thirteen years have passed since the Copyright Office's 1964 decision to accept computer programs as registerable for copyright protection. Yet the adequacy of laws that protect the proprietary interest in computer software, as well as their substance and application, are still in controversy. Section 117 of P.L. 553 clearly preserves the legal status quo on computer related works – and leaves all of the outstanding questions open.[3] Nevertheless, this youthful industry has burgeoned: The EDP Industrial Reporter estimated that $900 million would be spent on software development in 1976.[4] Rough estimates suggest that as many as 10,000 separate computer programs are created daily in the U.S.[5]

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[1] Report, p. 2.

[2] Id., p. 25.

[3] See H.R. Rep. No. 1476, 94th Cong. 2d Sess.; Sen. Rep. No. 473, 94th Cong. 2d Sess. (1976).

[4] EDP Industrial Reporter, published by International Data Corp., March 26, 1976.

[5] Goldberg, Morton D., Legal Protection for EDP Software, 18 Datamation 66 (S/1971).

Given the limited availability of the legal mechanisms available for protecting computer software, it is not surprising that many software developers feel the legal system is unresponsive to their needs. Two recent Supreme Court decisions – Gottschalk v. Benson, 409 U.S. 63 (1972), which characterized the computer program in question as an unpatentable mathematical algorithm or formula, and Dann v. Johnston, 96 S. Ct. 1393 (1976), which for the most part sidestepped the software patentability issue – have generally barred patent protection for computer software.[6] Ironically, though, if the same set of logical steps contained in a computer program were permanently embodied in the circuitry of an item of computer hardware, the resulting "firmware" might presumably be patentable. The peculiar character of computer software complicates the task of devising appropriate legal mechanisms to protect the proprietary interests of computer program producers. Not until the hearings surrounding the passage of the Copyright Act of 1976 did the Congress explicitly proclaim the copyrightability of computer programs.

Computer programs are classified as books by the Copyright Office. As with books, the holder of a software copyright has exclusive right to copy the form of expression of the author's ideas. It is reasonably easy to envision the type of potection offered by statutory copyright to literary works. For computer software, however, what is protected is not as readily discerned. For example, while an unauthorized photo or magnetic copy of a registered computer program would constitute an infringement, the real value of a computer program is not captured until the program is actually put to use in a computer. Yet the unauthorized use of a computer program by entering it into a computer without copying it may not constitute an infringement, nor may storage of that program in an electronic memory or on tape. Moreover, many question the value of copyright protection when a plagiarist can derive the value of a program by substantially duplicating the ideas and techniques embodied in it without technically infringing. The copyright law for literary works is designed to provide the copyright holder a means to control or benefit from the wide distribution of his work. Copyright laws do not intend to limit use of literary works but instead to encourage widespread usage. However, a computer program does not necessarily derive its monetary value from the breadth of its distribution, but rather from the type of application for which it is used.

Bolstering protection for computer software is not without hazards. Arthur Miller characterizes computer programs as processes and warns that a copyright system that grants a monopoly on the utilization of a process, approaches the monopoly power granted by the patent system without the

[6] A complete list of all computer software cases is set forth in Appendix A below.

safeguards attached to the patent examination process.[7] Furthermore, an abundance of software copyrights might seriously hamper future software development. Developers would have to extensively research existing copyrights to avoid infringing other programs. Complex disagreements would occur regarding priority, originality, and private rights versus public domain.

Other observers question the need for further software protection. Keefe and Mahn[8] note that the marketing of most software packages includes significant supporting services by the seller without which successful marketing or use of the software by a copier would be prohibitively difficult. It is argued that the importance of these support services which accompany software products decrease the need for further software protection. On the other hand, software is early in the product life cycle and many buyers of computer software may be at a stage of relative unsophistication with the product. Perhaps as users become more knowledgeable about the use and maintenance of computer software, protection of proprietary software products may become increasingly important to the survival of the industry.

Many feel that proprietary software products that are distributed on a limited basis and which can be classified as "unpublished" can obtain generous protection through a combination of common law copyright and trade secret law. Common law copyright may offer broader protection than statutory copyright since use as well as copying of a program is often prohibited. But the laws are complicated and vary between states. Common law copyright applies only to products of fairly limited distribution. To preserve trade secret protection, software developers must employ extensive techniques to closely limit disclosure of information about the protected secret. Furthermore, questions have been raised about the future of common law copyright and trade secret laws. The Copyright Act of 1976 specifically preempts state copyright laws pertaining to unpublished works fixed in a tangible medium of expression. Trade secret laws that confer rights equivalent to those within the scope of the Copyright Act are also preempted.[9] How this will affect "unpublished" software products which previously may have benefited from the generally broader state copyright laws cannot be precisely predicted.

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[7] Miller, Arthur, "Computers and Copyright Law," Michigan State Bar Journal 4/67 p. 11-18. See also "Additional Views on Computer Software" by John Hersey, an addendum to the CONTU Software Subcommittee Report of April 1977.

[8] Keefe, Arthur J. and Mahn, Terry G., "Protecting Software: Is It Worth All the Trouble" 62 A.B.A.J. 906 (1976).

[9] H.R. Report #1476, Ibid., and §301 of P.L. 94-533. See also, p. 20 of CONTU report cited supra.

C. The 1973 National Science Foundation Study

To a degree, this work is an expanded update of a modest survey conducted in 1973 for the National Science Foundation as part of a larger project on legal incentives and barriers to utilizing technological innovation. The 1973 study included a brief survey of modes of legal protection utilized by the computer services industry and the perceived adequacy of the laws.[10] At that time, while considering the application of laws to developing technologies which did not fit neatly into established legal categories, we became concerned with computer software, which we defined as the series of instructions and documentary material which makes possible the functioning of computer hardware.

With the assistance of the Association of Data Processing Service Organizations (ADAPSO) we conducted the first survey on modes of legal protection utilized by the software industry. This study indicated that copyright protection ranked third in preferred modes of protection, behind trade secret licenses and leases with confidential disclosure clauses. There was a moderate interest in software protection but little evidence that its presence or absence affected business decisions. Protection was regarded as most significant for general business and financial programs. Eight-seven percent of the respondents could not recall a single instance in which computer programs representing a significant level of innnovation were not developed or marketed because of inadequate protection.

However, this survey reported only the views of 31 respondents of a professional organization of 46 members in a young industry. In an industry which reckons generations as fractions of decades it was appropriate to question the current validity of such a primitive census.

D. The Software Industry

The computer services industry is composed of 2,584 companies who produced $5.3 billion in sales, and $573 million in profits, in 1976.[11] The industry forecasts a compounded growth rate of 18 percent over the next five years as contrasted to a 13 percent growth rate for the computer manufacturing industry.

The industry can be said to be divided into four basic markets which are displayed below in terms of their earned and projected revenues:

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[10] See Miller, R.I., Legal Aspects of Technology Utilization (D.C. Heath & Co., published 1974), Chap. 8. This survey covered 46 companies; there were 31 respondents.

[11] See 1977 Annual Report on "The Computer Services Industry," published by International Data Corporation, Waltham, Massachusetts, and the Association of Data Processing Service Organizations, Inc., of Montvale, New Jersey.

EXHIBIT 1

Product Categories	1976 Revenues ($ millions)	Projected 1981 Revenues
Processing Services	3,065	8,038
Software Packages	550	1,856
Staff Support Services	675	1,087
Facilities Management	495	1,020

All of these markets generate computer programs. That is, they design – and to some extent market – writings which set forth instructions which can direct the operation of an automatic system capable of storing, processing, retrieving or transfering information. Each of them may be presumed to have an interest in the protection of software. The products of these markets are displayed in Exhibit 2 in terms of the fundamental utility or value added by the vendor.

For the purposes of the CONTU software industry survey, these markets were presumed to be represented principally by the 305 member company Association of Data Processing Service Organizations (ADAPSO) and, to a lesser degree, the membership of the Computer and Business Equipment Manufacturer's Association (CBEMA) and the readership of the trade newspaper, Computerworld.

E. Software Protection Publications

An impressive body of scholarly and speculative legal literature has been published on software protection during the past decade. This literature is listed in the Appendix B bibliography. It is noteworthy, however, that in addition to the NSF study cited above, only two other empirical studies have previously been published – one in the United Kingdom and one in Sweden.[12] The British survey concluded that 53 percent of the respondents in the United Kingdom computer industry want stronger legal methods of protecting computer programs. The desirable features of such protection would be informality, immediacy, low cost, and protection against foreign infringers – all of which is quite compatible with copyright. The Swedish study disclosed that although 60 percent of the organizations polled are interested in a system of legal protection that makes it easier than at present to regain investments in software, a clarification of existing legal alternatives might well be sufficient. A degree of copyright and trade secret protection is available in both countries. In neither country did the surveys uncover any industry reluctance to develop programs because of insufficient legal protection.

[12] Anderson, M. and Niblett, B., "Software Protection: A Survey of the U.K. Industry"; Siepel, P., "Software Protection and the Law", Data, June 1975, pp. 43–46.

EXHIBIT 2*

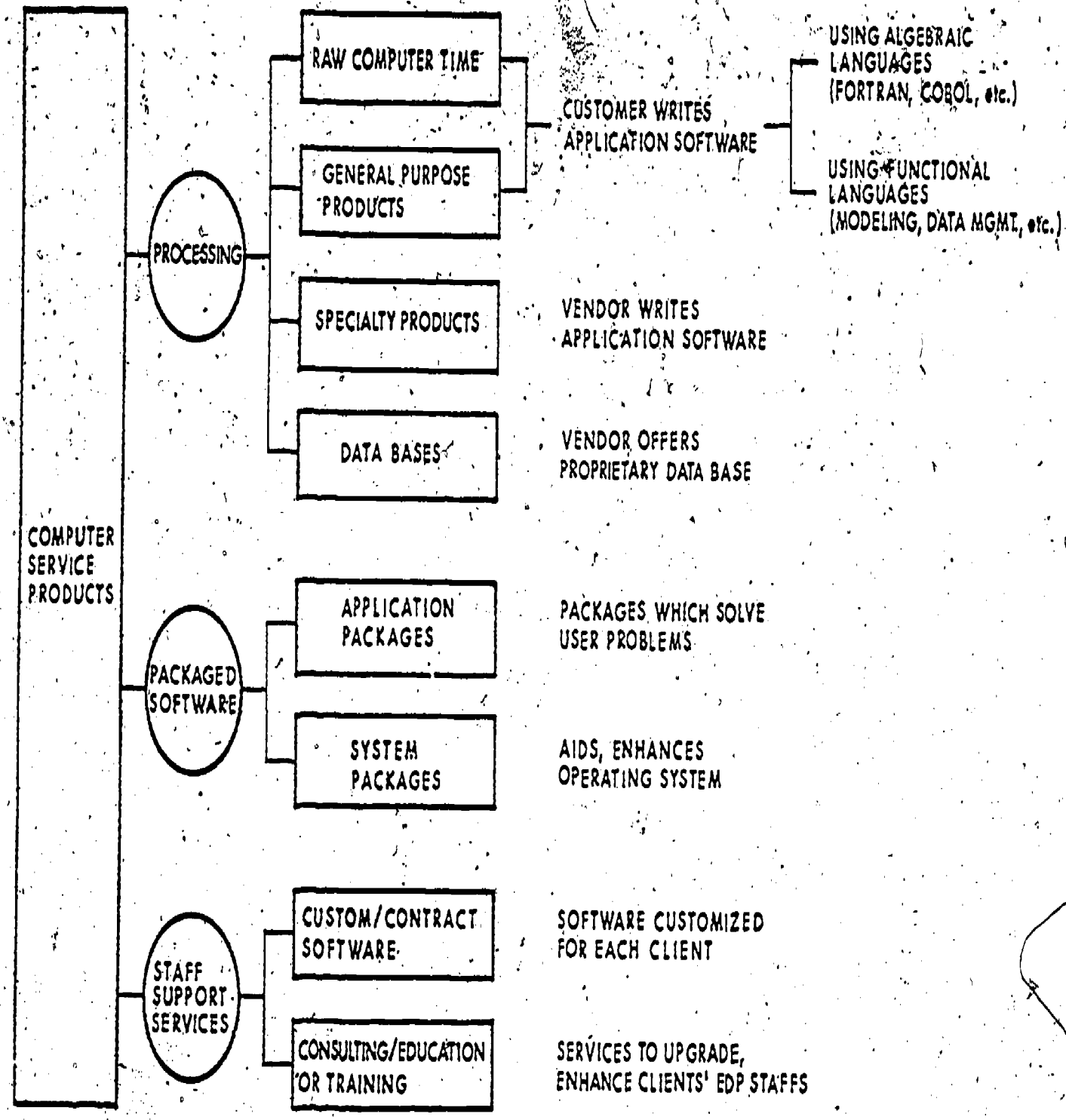


*Chart reproduced with permission of ADAPSO. See Note 11 above.

II. THE SURVEY

A. Objective of the Survey

The basic purpose of this study was to secure data relating investment, development, and marketing of computer software to legal protection. In elaboration of this basic information, however, we wanted to examine the following questions:

(i) If more effective legal protection for software were available, would companies make greater investment in computer software?

(ii) Are companies discouraged from marketing particular products because software elements are not adequately protected by legal structure?

(iii) Have there been any inhibiting effects on technological development because of a lack of confidence in computer software protective procedures?

B. Method of Approach

The first step was the design of a questionnaire to examine the questions discussed above. Drafts of the questionnaire were reviewed by members of CONTU and various persons in the software industry, to obtain their inputs and reactions. The questionnaire was revised and distributed in the form shown in Appendix C.

In order to sample the attitudes that are generally held by industry, we needed a universe for our study which was accessible and representative. With the cooperation of ADAPSO, we developed a mailing list of computer software industrial executives to whom the questionnaire was mailed. Since the membership of ADAPSO is persons rather than firms, there were instances where many persons from one firm were ADAPSO members. We limited the mailing so that only one response from each firm was solicited.

After receiving the initial response, the replies were analyzed by Harbridge House consultants. In many cases nonresponding recipients were called to determine whether or not they would be participating. In other situatuions, respondents were called to explain entires on their replies which were not clear to the analysts.

Finally, cross tabulation of mailed questionnaires was programmed for the Hewlitt-Packard 3000 computer. The smaller number of replies to the published Computerworld questionnaire were manually tabulated and used as a cross check to the larger ADAPSO population.

C. Characteristics of the Sample

Questionnaires were distributed to 308 member companies of ADAPSO. Replies were received from 116 companies, which constitutes a 38 percent response rate. There were 10 responses to the published Computerworld questionnaire. Since this was presumbly an infinitisimal fraction of an indeterminate sample, the Computerworld responses were treated as a control and the responses were not included in the statistical base; they were, however, included in the base of anecdotal information. In this section we shall report on the kinds of companies that participated in terms of their size, product interest, kinds of ownership, and so forth. Some of the information supplied is expressed as a function of some of other information about the applicants.

1. Services and Products

The following is a tabulation of the kinds of services provided by the respondents followed by the percentage of firms that indicated they were active in this area. Since most respondents were active in several markets, the total exceeds 100 percent. The four principal services are underscored.

EXHIBIT 3

Consulting (feasibility studies, systems analysis and design)	39%
Contract Programming (including custom software packages)	51%
Proprietary Software Packages	44%
Data Center Operations and Management	47%
Time-Sharing	16%
Telecommunications	9%
Facility Management	9%
Education	9%
Hardware Products	16%
Batch Processing	5%
Service Bureau	5%
Data Entry	4%
Data Processing	3%
Computer Services	2%
Miscellaneous	8%

Although most of the respondents said that they were involved in four major services/products markets, many reported that no single market dominated revenues. Exhibit 4 expresses services and products as a function of company sales represented by each such service/products (reading horizontally along the top line). For example, for 27 percent of the respondents "consulting" represents 1 to 10 percent of sales; for 4 percent of the respondents 11 to 20 percent of sales is in consulting, for 2.5 percent, consulting represents 31 to 40 percent of sales and so on. The large percentage of "nones" in the chart may mean that respondents taken individually tend to specialize in the products and services sold. (It may also mean that the categories were strictly construed.) The grouping on the low side of the sales classifications suggests that although four service/products are most frequently marketed, revenues are more broadly distributed among all of the markets than might be expected from their dominance.

2. Company Ownership

Seventy-one percent of the responding companies were independently owned. Fifteen percent identified themselves as a "subsidiary" while 8 percent called themselves a "division." Another 7 percent either provided no answer to this question.

3. Number of Employees

Over two thirds of the ADAPSO responding companies had fewer than 100 employees. Nine of the 10 firms which replied to the published Computerworld questionnaire also had fewer than 100 employees. (The tenth had 13,000.) As the graph in Exhibit 5 displays, this seems to be characteristic of the industry.

4. Annual Investment in Research

Exhibit 6 is a summary of the volume of research activity sponsored by the respondents, as measured by the amount spent annual on internally-funded software development, including research.

5. Annual Sales

Exhibit 7 is a breakdown of respondents by their total volume of sales.

Systems programs are the detailed and voluminous programs stored on the machine that allow the computer to function efficiently and take on other programs. Applications programs use the computer to solve problems in the outside world. Exhibit 8 is a breakdown of total annual sales of respondents as between systems software programs and application software programs.

6. Indices of Software Activity

a. Financing of Program Development

Respondents were asked how many programs they had developed over the last three years, which they considered proprietary to their firm. They were

EXHIBIT 4
SERVICES AND PRODUCTS EXPRESSED AS A FUNCTION OF RESPONDENT SALES

SERVICES/ PRODUCTS	PERCENTAGE OF ~~RESPONDENTS~~ SALES											
	1-10%	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	No Ans.	None
CONSULTING	.27	.04		.025	.01		.01		.01		.07	.55
CONTRACT PROGRAMMING	.32	.09	.035	.035		.01	.01	.01		.01	.07	.41
PROPRIETARY SOFTWARE	.155	.07		.025	.01	.02	.01	.01	.035	.07	.11	.48
TIME SHARING	.04	.02	.01	.01	.01			.01	.01	.04	.08	.775
TELECOMMUNI-CATIONS	.05	.02	.01								.09	.835
DATA CENTER OPERATIONS	.02	.02	.025	.025	.01	.01	.035	.06	.12	.14	.07	.465
FACILITY MANAGEMENT	.025	.02	.02		.01						.075	.85
EDUCATION	.085										.08	.79
HARDWARE PRODUCTS	.06	.01	.02	.01			.01			.02	.08	.79
OTHER	.08	.025	.03	.01			.02		.03	.05	.08	.68

EXHIBIT 5
NUMBER OF EMPLOYEES IN RESPONDENT FIRMS

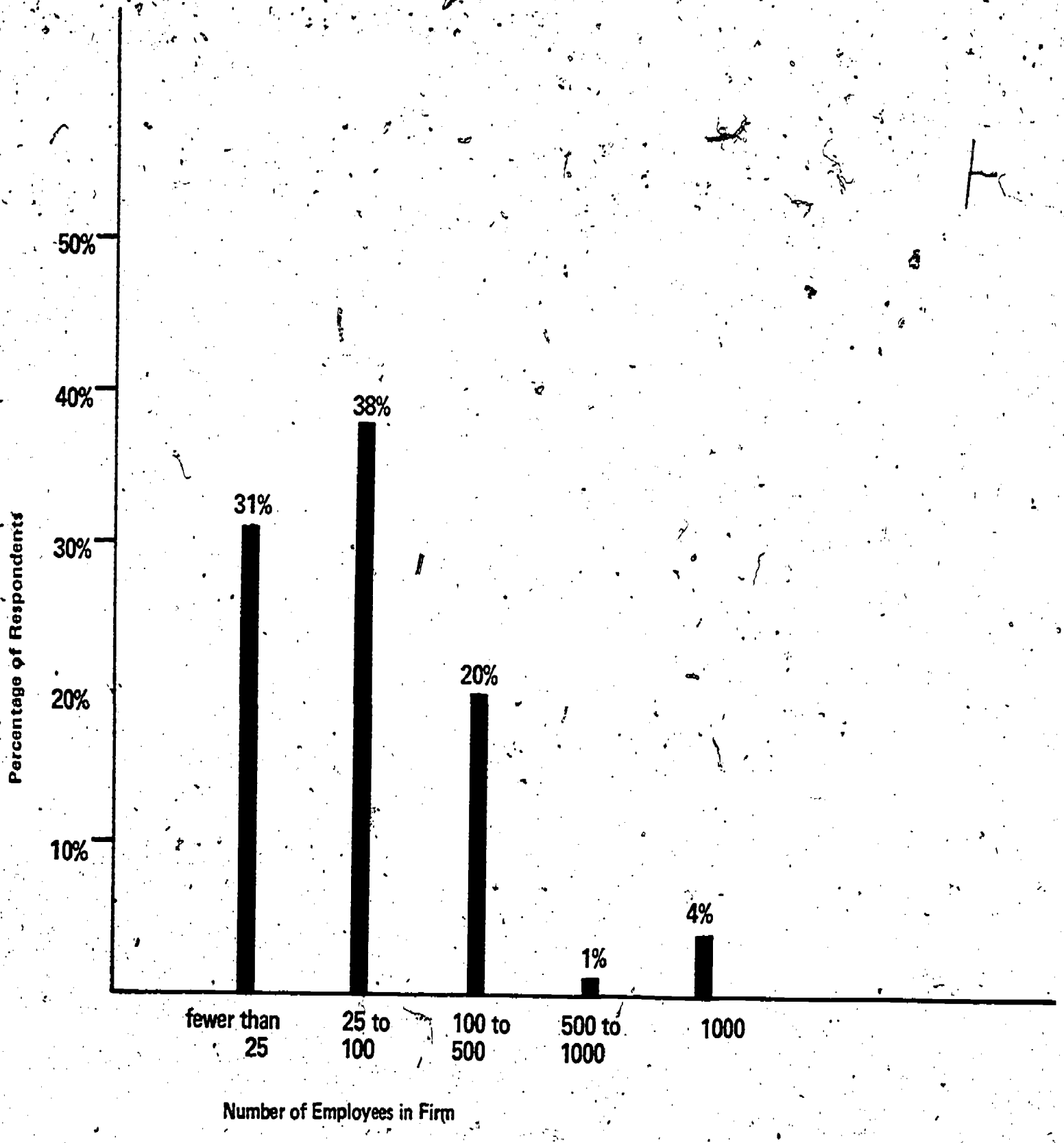


EXHIBIT 6
ANNUAL INVESTMENT IN RESEARCH

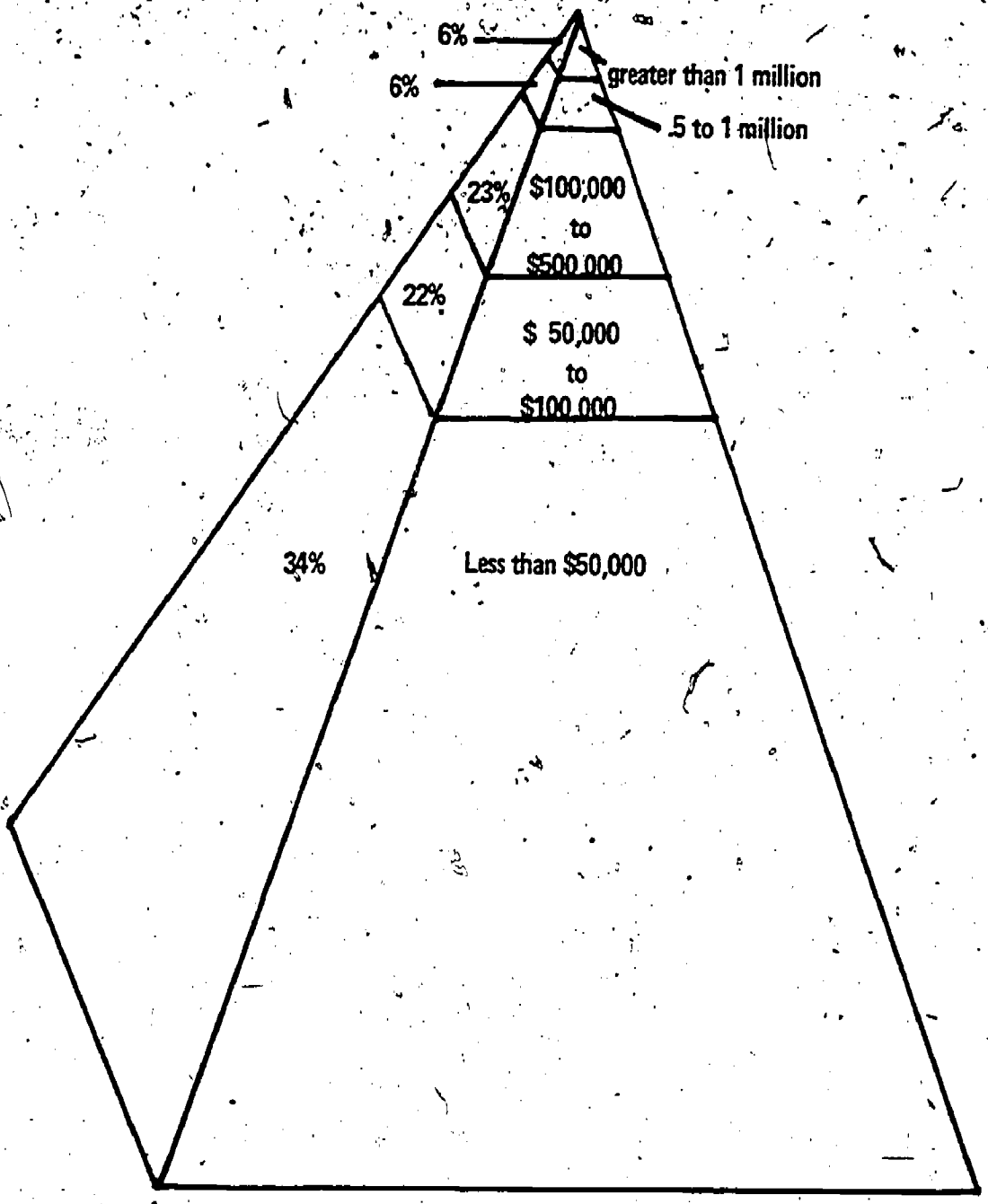


EXHIBIT 7
ANNUAL SALES

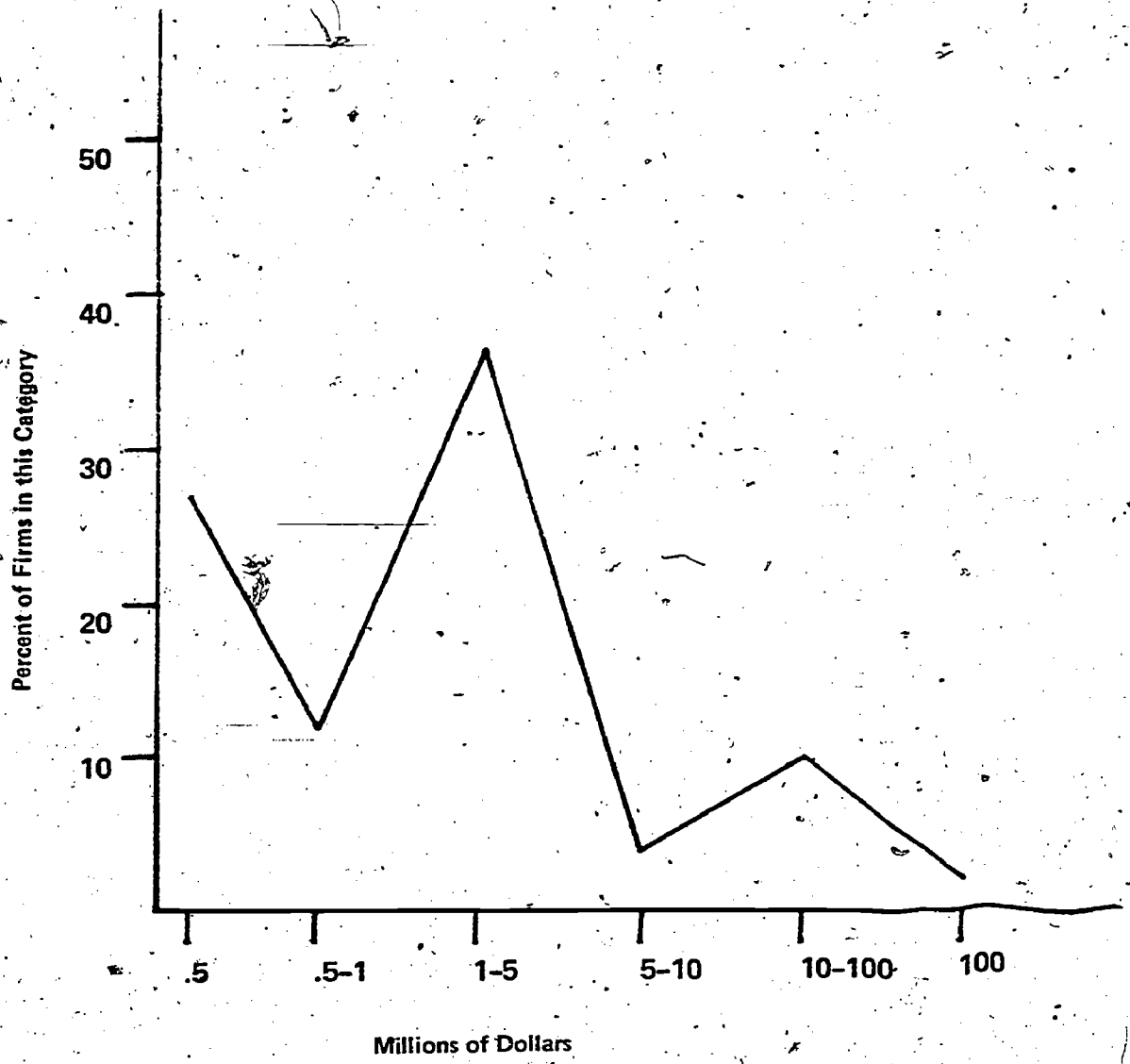
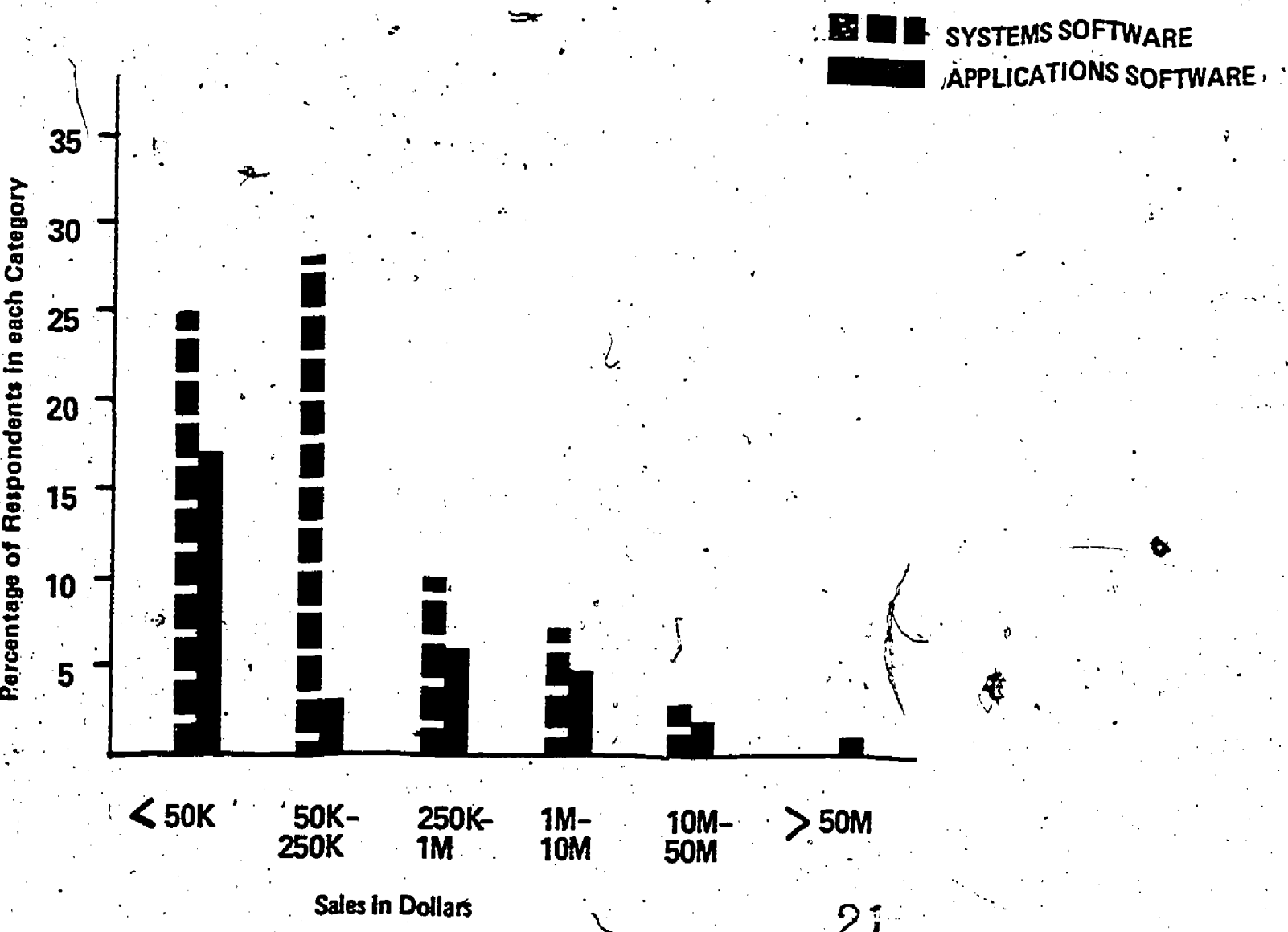


EXHIBIT 8
SALES IN SYSTEMS AND APPLICATION SOFTWARE PROGRAMS



further asked to differentiate between programs developed at their own expense, those developed in a shared basis with customers, and those incorporating proprietary products of others which had been purchased. The listing in Exhibit 9 shows the percentage of respondents who developed programs in the volumes indicated for the three categories stated:

EXHIBIT 9

No. of Programs	Solely at Own Expense	Expenses Shared with Customers	Incorporating Purchased Proprietary Products of Others
No Programs	9%	39%	57%
1 - 10	28	16	12
11 - 25	9	6	3
26 - 50	9	3	1
51 - 100	5	3	2
101 - 200	6	3	0
201 - 500	3	2	0
501 - 999	1	0	0
- 999	3	1	0
Don't Know	6	7	3
Not Applicable	4	4	3
No Answer	16	16	19

b. Generation of Programs

The tabulation in Exhibit 10 below expresses the number of programs produced by respondents over the last three years, differentiated by the purpose of generation, that is, whether the program was to be leased, licensed, sold (permanent use) or generated for internal use. Each verticial column reflects 100 percent of the sample population. The "no programs" entry means that, for example, "44 percent of the sample does not generate programs for licensing"; "...53 percent does not generate programs for lease", and so on. The large number of "no programs" and "no answers" suggests to us that, notwithstanding a high response rate, the answers to the question were not generally known. Accordingly, we used this characteristic sparingly in our data analysis below.

7. Miscellaneous Characteristics of the Sample

The following characteristics will further outline the nature of the sample as to the position of the particular respondent in the firm, the age of the company and the geographic distribution of the respondents.

EXHIBIT 10

Percentage of Respondents in this Category

VOLUME OF ACTIVITY*	LICENSE	LEASE	SALE	INTERNAL USE
No Programs	.44	.53	.51	.24
1-10	.17	.09	.1	.1
11-25	.01	.01	.02	.05
26-50	.01	.01	.01	.05
51-100	.01	.02	.01	.04
101-200	.03	.01	.01	.09
201-500	.01	.01	.01	.05
501-999	0	0	.02	0
7999	.01	0	0	.07
Don't Know	.06	.04	.05	.07
Not Applicable	.03	.03	.03	.03
No Answer	.22	.25	.23	.21

*Expressed as number of programs.

a. Respondent's Position in Firm

EXHIBIT 11

Position	Percent of Those Replying
President	56%
Vice President	19
General Manager	3.5
Controller	1
Managing Partner	1
Systems Analyst	1
Division Manager	1
Treasurer	2
Financial Analyst	2.5
Marketing Representative	1
Director, Market Research	2
Director, DP	1
Director, Corporate Development	1
Administrative Director	1
Director, Computer Services	1
Manager, Creative Services	1
General Counsel	1
No Answer	6

b. Age of Company

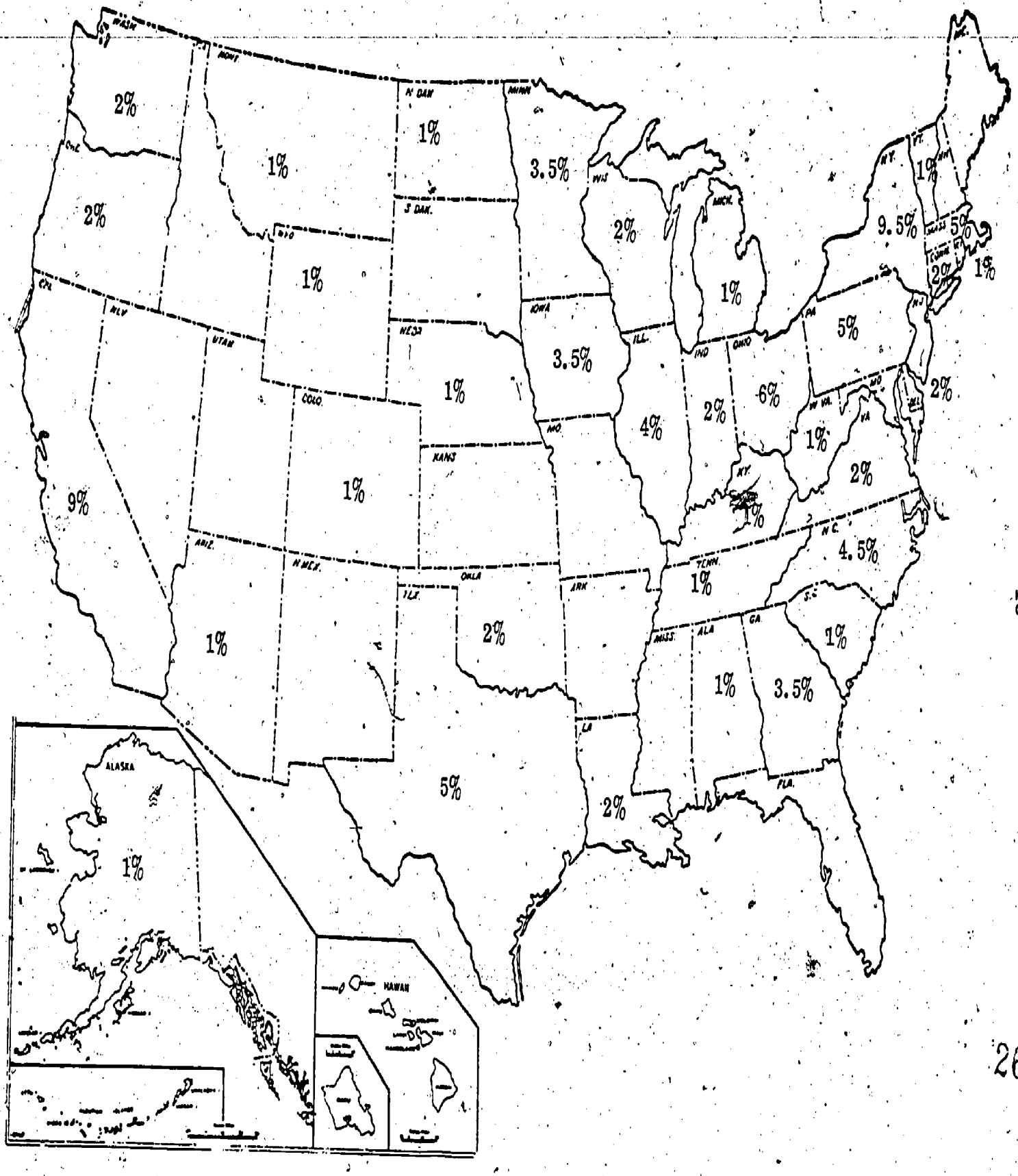
EXHIBIT 12

Firm's Age	Percent of Those Responding
< 1 year	0%
1 - 2 years	3
3 - 5 years	9
6 - 10 years	42
11 - 15 years	13
16 - 20 years	12
21 - 20 years	2
26 - 100 years	4
No Answer	14

c. Geographic Distribution of Respondents

The distribution of the sample is shown in Exhibit 13.

EXHIBIT 13



Australia— 1%

Japan— 1%

8. The Sample Summarized

The typical respondent to this survey is the President of his company, which is independently owned and is less than 10 years old. The company has fewer than 100 employees, annual sales of under $5 million, and spends less than $100,000 annually on research. The firm could be located almost any place in the United States, but is most likely to be located in the Northeast or in California. The firm is most likely to be involved in consulting, contract programming and the development of proprietary software. To the extent that it is able to discriminate among markets, its revenues are fairly evenly divided among them unless it engages in data center operations, in which case it will derive most of its revenues from that single activity.

D. Attitudes of the Respondents

1. Use and Evaluation of Various Protection Techniques

The respondents were asked to indicate their utilization of various techniques to protect software and to state their assessment of its effectiveness on a ranking scale of 0-5 with "0" designated as "not at all effective" and 5 as "completely effective."

EXHIBIT 14
PREFERRED MODE OF PROTECTION
(Figures Indicate Percentage of Respondents Answering in Each Category)

Mode of Protection	Degree of Effectiveness						Frequency of Use*
	Not at all Effective	Rarely Effective	Somewhat Effective	Fairly Effective	Very Effective	Completely Effective	
Patent	.82	0	0	.18	0	0	.04
Copyright	.55	0	.05	.1	.15	.15	.2
Trade Secret	.29	.05	.14	.24	.14	.14	.21
Release of Object Program Only	.17	0	.04	.08	.33	.38	.3
Know-How Requirement	.28	.17	0	.17	.17	.22	.13
Cryptographic Coding	.5	0	.17	.25	.08	0	.4
Other Means of Limiting Access	.27	0	0	.13	.06	.53	.17

*The figures in this column relate to the entire sample.

Only 30 percent of the sample responded to this question with 20 percent indicating that the question was "not applicable" and 50 percent replying that they did not know or simply leaving the question blank. Although it might be presumed from this low response that 70 percent of the sample simply do not believe that protection of programs is particularly important, this may be stretching the implications of silence. Exhibit 14 should be read by observing, for example, that 20 percent of the sample used copyright protection. Of that total population, 55 percent of them believe that it is not at all effective; only 15 percent stated that it was completely effective.

Those firms which had rated the various protection techniques as being completely effective ("5") or not at all effective ("0") were asked to indicate in terms of their experience whether a form of protection has differential effects: Does it tend to be effective against contracting parties? Against those who have obtained unauthorized possession? Against plagiarizers? Against pirates who sell stolen programs to others?

The most common response was that nonlegal modes of protection were sufficient for most purposes. In this connection it should be noted that 17 percent of the respondents said that they used other (undesignated) means of limiting access, and that well over half regarded these means as completely effective. The next most common observation was that legal protection was inadequate. A somewhat smaller number volunteered that protection itself was unnecessary in any event. If this view is shared by any sizable number of those who did not respond to this question – and we believe that to be a reasonable presumption – then the ranks of the disinterested may be substantial. The Computerworld sample suggests that this view is not shared by those who develop and/or market proprietary business programs.

There were also a handful of enthusiastic responses from some of the larger firms indicating a heavy reliance upon legal protection and satisfaction with the protection afforded for particular proprietary programs. One firm, for example, noted that copyright was extensively used and highly regarded for a series of graphic packages composed in Fortran III, while another graphic series in BASIC was less efficiently protected by copyright and less frequently used.

Six companies (5 percent of the total sample) indicated that their use of a particular form of protection resulted in a legal action of some sort (which could include a threat of lawsuit as well as actual litigation). Four of these used copyright while two used trade secrets.

In the 1973 NSF survey, the smaller sample of respondents rated effectiveness on a scale of 0-3. Moreover, the modes of protection were largely restricted to legal alternatives. In the CONTU survey not only was the ranking scale (0-5) larger, but the alternatives included a greater technological range, such as the release of an object program only, as well as cryptographic coding. Therefore, the two studies cannot be directly compared on a numerical basis. But with appropriate allowances for differences in scale and choice of alternatives it is possible to compare the two surveys in some respects:

The NSF survey included the legal alternative of "leases with confidential disclosure clauses." In the fact-oriented CONTU survey this category was subsumed by releasing of the object program only and other means of limiting access. The restricted release, by whatever legal or commercial arrangement the restriction was secured, ranked first in the preferred modes of protection.

There was virtually no shift in opinion between the NSF and CONTU surveys among those who used trade secret. That is, if you could use them at all, they were fairly effective. However, the more sophisticated CONTU survey also asked for an evaluation of a know-how requirement on the part of a user. To the extent that this may be considered a kind of trade secret, it was less frequently used and less effective than a program which could be withheld by its authors.

Copyright, as in 1973, ranked third in the preferred modes of protection. However, the ratio of respondents in the NSF survey who reported using copyright protection compared to the ratio in the CONTU survey was almost two to one. We are uncertain as to why this is so. It might have been a function of the product lines represented by the respective surveys (that is, more business programming represented in the survey); or it may have been a consequence of the ambiguity of silence rather than a quality of the sample. On the other hand, with respect to those who said they did use copyright, three times as many respondents (on a percentage basis) in 1977 said it was not at all effective as compared to 1973. A slightly increased number also said that it was completely effective. We explain these developments by observing that as copyright usage has increased, more respondents have used this relatively inexpensive, accessible mechanism to try to protect more programs that are easily designed around.

Patent protection kept its place on the bottom of the list for utility and efficacy. Moreover, the overwhelming opinion of the small number that used it was that it was not at all effective. However, a few firms found it fairly effective; they were generally among that small proportion of the CONTU sample which observed that the hardware protects the software.

2. Importance of Protection for Various Product Lines

Respondents were asked to assess the importance of legal protection for various proprietary software product lines. The table below expresses the respondents' answers as a percentage of all affirmative responses for a particular category. Thus, 50 percent of all firms which market general business and financial programs state that protection has great significance whereas 53 percent of the firms which market engineering and scientific programs believe that protection is of no significance at all. (The data has been expressed in this form since the response rate for each category differed depending upon the respondents markets.)

EXHIBIT 15
SIGNIFICANCE OF SOFTWARE PROTECTION BY FUNCTION*

	No Significance	Some Significance	Great Significance
(a) General business and financial applications (e.g., accounting, inventory control, payroll)	.17	.33	.5
(b) Business planning operations (e.g., planning models, simulations, operations research)	.5	.24	.26
(c) Complex production/distribution control operations (e.g., linear programming)	.55	.19	.26
(d) Engineering and scientific applications	.53	.19	.28
(e) Data and statistical analysis	.51	.17	.31
(f) Project management and control	.54	.23	.23
(g) Systems software (e.g., compilers, monitors, new techniques for more efficient machine utilization)	.4	.17	.43

*Figures indicate percentage of respondents answering in each category.

With allowances for a difference in the way in which the data is expressed,[13] the CONTU results are strikingly similar to those of the 1973 NSF survey. What they show is that the more universal and widely marketed the program the more important is protection. This is a characteristic of general business programs, which can be addressed to such functions as payroll and receivables anywhere, and also of systems software in which a program can be used for a particular computer in a variety of installations. On the other hand, the more technical and unique the program the less significant protection appears to be. This finding is consistent with information which was supplied to us about the programs which were being marketed.

Respondents were requested to provide information about their best selling programs. Thirty-five percent of the sample reported about 113 computer programs. Fifty-four percent of the programs pertained to systems software. All of the rest of the respondents reported programs in categories "b" through "f" in Exhibit 15 above. We regard it as highly significant that the overwhelming majority of those respondents who chose to provide information about programs

[13] In the NSF survey "not applicable" answers were included as a part of the population. In the CONTU survey, for the purposes of this question, the population was defined to include only those answered affirmatively.

were those for whom software protection is regarded as of great significance. Accordingly, we cross tabulated some of the data about the sample (presented in Section C above) with the attitudes of the firms which were predominantly in general business and systems software programming. For each of the characteristics below, we sought to determine what percentage of the sample in that group believed that software protection had ("some" or "great") significance.

Significance of protection as a function of:

a. **Internal Cost of Development**

EXHIBIT 16

	<$50K	$50–$100K	$100–$500K	$500K–$1M	$1–$10M
General Business	.49	.58	.63	.29	.43
Systems Software	.18	.32	.37	.57	.57

b. **Annual Sales**

EXHIBIT 17

	<$500K	$500K–$1M	$1M–$5M	$5M–$10M	$10–$100M	>$100M
General Business	.39	.57	.68	.40	.33	.50
Systems Software	.19	.29	.39	.40	.33	.50

c. Services and Products

EXHIBIT 18

	Consulting	Contract Programming	Proprietary Software	Time-Sharing	Telecommunications	Data Center Operations	Facility Management	Education	Hardware
General Business	.53	.56	.63	.61	.40	.60	.70	.30	.61
Systems Software	.33	.30	.43	.39	.10	.25	.50	.40	.33

The displays above should be read as follows: Looking, for example, at the first entry under "Internal Cost of Development for General Business – "Forty-nine percent of all respondents who said that they had sales of less than $50,000 felt that software protection was significant."

A ranking order immediately becomes apparent: of the two markets in the software industry interested in legal protection, it is more important to the general business market than to the systems software market, as measured by any selected function. Since most of the respondents are small firms it is important to note that measured in terms of either the cost of development or sales, less than half of that majority thought that protection was important. The degree of importance appears to increase to a peak of investment cost between $100,000 and $500,000 and sales at $1 to $5 million. On the basis of some of the comments on questionnaires, we might be tempted to generalize "the larger the company, the more important is protection." However, this conclusion cannot be statistically supported because our sample had too few large companies. The most positive statement we can make is that this is demonstrable to a point. The product lines most impacted are facilities management and proprietary software. Thus, protection is most important to larger general business firms which might be generating programs for security systems or accounting functions.

3. Effectiveness of Contractual Restraints

It will be recalled from Exhibit 14 above that 53 percent of the sample indicated that "other means" of limiting access were completely effective. The NSF survey and the comments of respondents suggested that contractual arrangements with customers were the most commonly used devices to minimize unauthorized dissemination. Respondents were asked whether contractual arrangements normally restrain customers from duplicating programs: Fifty-five percent replied in the affirmative, 16 percent in the negative and the balance either felt that the question was inapplicable or had no opinion. This response should be considered in the light of the normal means by which programs are ordinarily transferred from the developers to their customers. A somewhat larger proportion of programs which are generated for the use of customers (rather than for internal use) appear to be transferred by lease or by license than by outright sale.[14] It is not surprising, then, that contractual restraint is regarded as effective. The developer exercises a maximum degree of contractual control when title to a program (and, presumably, update services) remain with the firm.

4. Effect of Legal Protection on Marketing Plan

The critical test of the effectiveness of laws is the degree to which their presence or absence influences behavior. Accordingly, our sample was asked whether it had ever rejected or abandoned a marketing program for a proprietary software product because of the inadequacy of legal protection. Conversely, they were asked whether they would change a marketing program because legal protection was improved. Note that in each instance the stress was on legal protection, a narrower category than the full scope of protection probed earlier. The response was unequivocal: Seventy-four percent of the sample had never rejected or abandoned a program because of the presence or absence of protection and 85 percent would not change their marketing even if protection were provided.

The minority opinion was represented by the 4 percent of the entire sample which had rejected or abandoned programs for lack of protection and 15 percent which would change its marketing program if legal protection were improved. The affirmative responses, broken down into the categories set forth above were:

a. Internal Cost of Development

EXHIBIT 19

	<$50K	$50-$100K	$100-$500K	$500K-$1M	$1-$10M
General Business	.03	0	.04	.2	.2
Systems Software	.1	.2	.15	.14	.33

[14] See Exhibit 10 above.

b. Annual Sales

EXHIBIT 20

	<$500K	$500K-$1M	$1M-$5M	$5M-$10M	$10-$100M	>$100M
General Business	0	.13	.3	.33	.10	0
Systems Software	.1	.21	.17	.2	.17	0

c. Services and Products

EXHIBIT 21

	Consulting	Contract Programming	Proprietary Software	Time-Sharing	Telecommunications	Data Center Operations	Facility Management	Education	Hardware
General Business	.3	.2	.1	.6	0	0	.13	0	0
Systems Software	.13	.14	.24	.11	0	.13	.1	.3	.18

In this instance an affirmative response appears to be linear with the quantitative factors, that is, the larger a company is, the more likely it is to change its marketing plan because of the presence or absence of legal protection. Indeed, the marketing plans of the small companies which make up a majority of the sample would be almost completely unaffected by any change in the law. By product line, the only services that would be even nominally affected seem to be the marketing or proprietary systems software and general business consulting. (We have reservations about the latter; the reader should note that the minority opinion was so small that 30 percent refers to only four companies.)

5. Effects on Research and Development Plans

The lack of significance of legal protection on marketing plans was reaffirmed by the responses to an open question with a substantially larger scope. The question was expanded in three respects:

- The respondent was not restricted to his own business experience. He was asked whether he was "aware of any situation" of rejection or abandonment for lack of protection.
- The "legal" modification was omitted.
- The question was expanded to include development as well as marketing.

Since a particular concern of the survey is the effect of legal protection on technological development of software, the response to the open question was highly significant. The response was almost precisely identical to the answers to the marketing inquiry: Seventy-seven percent of the sample knew of no instance of aborted marketing or development. Only 3 percent responded in the affirmative. We regarded the 3 percent as too small a fraction of the sample to cross tabulate against research and development investment.

There is no question that development programs have been occasionally abandoned because of inadequate protection. One company with annual sales of $140,000 stated that it had abandoned development of a "system implementation language" and would resume development if it could be protected. A second company with annual sales of $400 million stated that it refrains from developing applications packages that can be used with the hardware of other companies because of the lack of protection. But these situations appear to be so few and far between that they are statistically insignificant. Whether they have sufficient technological significance to have policy implications beyond their numbers was beyond the scope of the survey.

6. Effect of the Copyright Act of 1976

We asked the respondents whether the Copyright Act of 1976 will cause changes in the company marketing program in 1978. Seventy-six percent replied in the negative, 3 percent in the affirmative. (We were rather surprised that of the 21 percent which failed to give a "yes" or "no" answer, only 3 percent said they did not know, since only 1 percent of the respondents were identified as lawyers.) We believe that the response to this question should be considered with the opinion disclosed earlier, that 15 percent said that an improvement in legal protection would cause a change in their marketing program. If so, it would appear that the Copyright Act of 1976 is (correctly) perceived by most as not affecting their markets.

7. Other Comments

Thirty-eight percent of the respondents were kind enough to offer miscellaneous responses to an open solicitation for advice that might be helpful to CONTU. The comment most often repeated was that an apparent lack of interest in legal protection was related to the fact that they did not market proprietary software. Some felt that legal protection is inherently complex and expensive. A few observed that the rapid development of new technology helps to deter pirating. Some suggested that a new mode of intellectual property protection might be appropriate. Only 1 percent of the sample underscored a positive need for further legal protection.

APPENDIX A
TABLE OF CASES

An Overview

In re Calma Co., 5 C.L.S.R. 216 (Comp. Gen. 1969)

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APPENDIX B
BIBLIOGRAPHY

I. The Protection of Proprietary Rights

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APPENDIX C
COMPUTERWORLD QUESTIONNAIRE

Contu Researcher Asks Help

How Effective Is Your Software Protection?

The National Commission on New Technological Uses of Copyrighted Works (Contu) was established to consider problems related to the reproduction and use of copyrighted works on DP systems, among other things. To do this, it has contracted with various research firms to gather data in specific areas of interest.

One of these firms has turned to Computerworld, and particularly the software developers or vendors among our readers, for help.

Harbridge House developed the following questionnaire to accumulate statistics, rather than folklore, on what forms of protection are being used for software and how effective that protection is.

CW has been assured (by Harbridge House) that information provided by readers will be treated as confidential, not going forward in the company's report to Contu nor in a summary report of the results with which the researchers will provide CW.

The completed questionnaire should be sent to Richard I. Miller, Harbridge House, Inc., 11 Arlington St., Boston, Mass. 02116.

Contu Questionnaire

(Please Use 1976 for All "Annually" Based Questions)

1. Name of Company _____

   Address _____

   Respondent's Name, Phone No. and Company Position

   _____

2. Please list the three major services/products provided by your company, indicating also the percent of annual sales each represents.

   1. _____ % annual sales _____
   2. _____ % annual sales _____
   3. _____ % annual sales _____

3. How many employees does your company have? _____

4. What are the total annual sales of your company? $_____

5. How much does your company invest annually in software development and research? $_____

6. Please indicate below how often during the past year you utilized the following forms of software protection, and indicate how effective you consider them to be. (If you do not know, please indicate with "DK".)

PROTECTION TECHNIQUES	USE Number of Times in the Last Calendar or Fiscal Year: In Business Operations and/or Negotiations	USE Number of Times in the Last Calendar or Fiscal Year: In Legal Action	EFFECTIVENESS Rank order on scale of 0-5*
1. Contract or license backed up by: a. Patent			
b. Copyright			
c. State trade secret law			
d. Release of object program only			
e. None of the above			
2. Requirement for "know-how"			
3. Use of cryptographic protection			
4. Use of other means to limit access to the software program			

*0 = not effective at all; 5 = completely effective.

7. Please list the proprietary software products you market below and indicate next to each whether there is no significance, some or great significance regarding the importance of legal protection for each of the products.

   1. _____
   2. _____
   3. _____
   4. _____
   5. _____
   6. _____

8. Have you ever rejected or abandoned a marketing program for a proprietary software product because of the inadequacy of legal protection?

   Yes _____ No _____

9. Do you know of any situation where software products representing a significant level of innovation are not developed or marketed because of inadequate protection?

   Yes _____ No _____ Please Identify _____

   _____

   _____

   _____

   _____

10. Do you contemplate any change in your marketing program because of the Copyright Act of 1976, effective January 1, 1978? Yes _____ No _____

11. How would you change your marketing program if legal protection were otherwise improved for computer software? _____

    _____

    _____

    _____

Thank you for your participation.

APPENDIX D
ADAPSO QUESTIONNAIRE

HARBRIDGE HOUSE INC

Eleven Arlington Street, Boston, Massachusetts 02116. Telephone (617) 267-6410. Cable: HARBRIDGE BOSTON.

RICHARD I. MILLER
Vice President

June 1, 1977

Dear ADAPSO Member:

Public Law 93-573, enacted on December 31, 1974, established a National Commission on New Technological Uses of Copyrighted Works (CONTU). Among other things it requires the Commission to study and compile data on the reproduction and use of copyrighted works "in conjunction with automatic systems capable of storing, processing, retrieving, and transferring information . . . " and the creation of new works by application or intervention of such systems. The Commission must recommend such changes in copyright law or procedures as may be necessary to assure access to copyrighted works and provide recognition of the rights of copyright owners.

The ADAPSO Software Protection Committee has been monitoring CONTU hearings (as well as other developments pertaining to computer software). Accordingly, Marty Goetz and Jerry Dreyer--speaking for the organization as a whole--were quick to declare their interest in a fact-finding survey which this firm is performing for CONTU on software protection. They join me in requesting that you fill out and return the attached questionnaire by June 15 (a self addressed return envelope is enclosed). We feel that this is a unique and most valuable opportunity for you to play a significant part in the formulation of recommendations for new legislation which will affect your work for years to come, and your help is both needed and deeply appreciated.

The information you submit will be treated as confidential and disclosed only to regular employees of Harbridge House for their use in preparing the Harbridge House report to CONTU. The report will be presented in a form that will preclude attribution of statistics or comments to the company providing them, either directly or by inference.

The final question asks for general comments that may be helpful to the CONTU staff. Please describe here any problems encountered in software protection that were not identified in earlier answers, as well as any thoughts you have on the best overall approach to the protection of proprietary software (whether by changes in the copyright law or otherwise).

Do not hesitate to contact me or my associates, Francis J. Kelley and Deborah C. Notman, if you have any questions about the survey or any part of the questionnaire.

Very truly yours,

Richard I. Miller
Vice President

ADAPSO QUESTIONNAIRE

by
Harbridge House, Inc.

Please fill in:
Name of Company _____

Address _____

Date Company Founded _____ State _____

Respondent's Position in Company _____

Respondent's Name and Phone Number _____

PLEASE RELATE ALL "ANNUAL" OR "BASE YEAR" QUESTIONS TO 1976 OR THE MOST RECENT YEAR FOR WHICH FIGURES ARE AVAILABLE. IF OTHER THAN 1976, PLEASE INDICATE THE YEAR ENDING _____.

1. What are the services and products provided by your company?

		% of Annual Sales
a. Consulting (feasibility studies, systems analysis and design).	_____	_____
b. Contract Programming (including custom software packages).	_____	_____
c. Proprietary Software Packages	_____	_____
d. Time-sharing	_____	_____
e. Telecommunications	_____	_____
f. Data Center Operations and Management	_____	_____
g. Facility Management	_____	_____
h. Education	_____	_____
i. Hardware Products	_____	_____
j. Others? Please list: _____		_____
_____		_____
_____		_____

2a. Is your company a division or subsidiary of another company?

Division ____ Subsidiary ____ Neither ____

2b. Name of parent company (if applicable), or affiliates:

_____

3. How many employees does your company have?

____ Fewer than 25
____ 25 to 100
____ 100 to 500
____ 500 to 1,000
____ More than 1,000

4. How much does your company spend annually on internally funded software development, including research?

____ Less than $50,000	____ $500,000 to $1 million
____ $50,000 to $100,000	____ $1 to $10 million
____ $100,000 to $500,000	____ More than $10 million

5. What are the **total annual sales** of your company?

____ Less than $500,000	____ $5 to $10 million
____ $500,000 to $1 million	____ $10 to $100 million
____ $1 to $5 million	____ More than $100 million

6. With respect to software products (including both contract programming and proprietary packages), please indicate the breakdown of total annual sales as between:

	Less than $50,000	$50,000 to $250,000	$250,000 to $1 million	$1 million to $10 million	$10 million to $50 million	More than $50 million
a. Systems software programs:						
b. Application software programs:						

7. How many programs have you developed over the last three years which are regarded as proprietary to your firm?

a. Solely at your own expense _____.
b. Incorporating in your own material proprietary products of others which you have purchased _____.
c. Involving arrangements for sharing of expense with customer _____.

8. What is the number of new programs produced over the last three years for:

a. License* _____.
b. Lease* _____.
c. Sale (permanent use) _____.
d. Internal use _____.
e. Other _____.

*It would be helpful to the Commission if you could provide a sample of your standard form.

9. Please indicate below how often during the past year you utilized the following forms of software protection, and indicate how effective you consider them to be. (If you do not know, please indicate with "DK".)

PROTECTION TECHNIQUES	USE Number of Times in the Last Calendar or Fiscal Year:		EFFECTIVENESS
	In Business Operations and/or Negotiations	In Legal Action	Rank order on scale of 0-5*
1. Contract or license backed up by: a. Patent			
b. Copyright			
c. State trade secret law			
d. Release of object program only			
e. None of the above			
2. Requirement for "know-how"			
3. Use of cryptographic protection			
4. Use of other means to limit access to the software program.			

*0 = not effective at all; 5= completely effective.

10. If in the preceding question you marked any protection as **completely effective** or **not effective at all**, please explain in terms of your actual business experience. Indicate if a protection technique is effective against some parties but not others; i.e. (i) the party with whom you have a contract, (ii) other parties who have obtained unauthorized possession of your proprietary products, (iii) someone who copies your ideas or programs for his own use, and (iv) someone who copies your ideas or programs and attempts to market them to others.

11. How important from a business standpoint is legal protection for each of the proprietary software products you market in the categories below?

	No Significance	Some Significance	Great Significance
a. General business and financial applications (e.g., accounting, inventory control, payroll)			
b. Business planning operations (e.g., planning models, simulations, operations research)			
c. Complex production/distribution control operations (e.g., linear programming)			
d. Engineering and scientific applications			
e. Data and statistical analysis			
f. Project management and control			
g. Systems software (e.g., compilers, monitors, new techniques for more efficient machine utilization)			

12. Please provide the following information for your **five** "best selling" programs (in terms of number of copies, not dollar value).

	*Type of Program	Sold or Licensed /Leased	Date First Marketed	No. of Copies Distributed		Optional Information**	
				Since Inception	In latest calendar/ fiscal year	Development Cost	Price to Customer
Program 1							
Program 2							
Program 3							
Program 4							
Program 5							

*Designate "a" or "b", etc., according to type of program categories in question 11 above.

**This information would be helpful to the Commission if you are free to provide it.

13. Do your contractual arrangements with customers normally restrain them from duplicating programs supplied by you, beyond normal use and backup?

Yes ____ No ____

14. Have you ever rejected or abandoned a marketing program for a proprietary software product because of the inadequacy of legal protection?

Yes ____ No ____

If yes, please describe:

15. Are you aware of any situation (other than one described in #14 above) where software products representing a significant level of innovation are not developed or marketed because of inadequate protection?

Yes ____ No ____

Please identify each situation by industry/function and comment on the loss of economic/social value in each case.

16. Do you contemplate any change in your marketing program because of the Copyright Act of 1976, effective January 1, 1978?

Yes ____ No ____

17. Would your marketing program be changed if legal protection were otherwise improved for computer software?

Yes ____ No ____

If yes, how?

18. Please provide below any additional information or comments that you think would be helpful to CONTU in its study. [Include here any problems encountered in software protection that were not identified in earlier answers, as well as any thoughts you have on the best overall approach to the protection of proprietary software (whether by changes in the copyright law or otherwise).]

Thank you very much for your cooperation in this project.