

**1980 EDP INDUSTRY ANALYSIS**

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1980 EDP Industry Analysis

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1980 EDP INDUSTRY ANALYSIS

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# 1980 EDP INDUSTRY ANALYSIS

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# 1980 EDP INDUSTRY ANALYSIS

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## I INTRODUCTION



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## I INTRODUCTION

- This report is produced by INPUT as part of the Planning Service for Computer and Communications Users. The report provides information stemming from both primary and secondary research on the information industry conducted by INPUT during 1980. Topics covered include:
  - EDP budgets and growth expectations.
  - EDP objectives, plans and problems.
  - Analysis of major technical issues and resulting trends.
- Information is provided for each of ten major industry sectors:
  - Discrete manufacturing.
  - Process manufacturing.
  - Transportation.
  - Utilities.
  - Banking and finance.
  - Insurance.

- Wholesale and retail distribution.
  - State, local and federal governments.
  - Services.
  - Education, medical and other.
- Over 900 mailed questionnaires were completed and analyzed for this study, including 290 from respondents who participated in previous EDP User Panel surveys.
  - In 1978 and 1979, existing clients and high-level prospects of the User Planning Service were polled to determine research topics of greatest interest. An investigation of EDP plans and budgets was a topic of sufficient interest to become the main focus of the first two annual reports. This interest continues at a high level in the current report.
    - A note of caution is necessary, as results from this year may not be strictly comparable with last year's as a time series. Although there is a 31.9% overlap of participants, no attempt was made to balance the sample population with last year's group for each industry category.
  - Primary research for this report was supplemented by other research projects conducted in 1980 as part of INPUT's Market Analysis Service (MAS), Field Service Program and multiclient study titled Improving The Productivity of Systems and Software Implementation.
  - This report emphasizes the status of EDP departments with respect to current developments, such as improving programmer productivity, user involvement in maintenance and office automation. It is not intended to be a definitive description of trends in these areas, but rather a tool for readers to compare their status to similar companies in their own and other industries.

## II OVERVIEW



## II OVERVIEW

- The recession finally arrived in 1980, but had no major impact on EDP budgeting or spending plans. Fully two-thirds of the respondents indicated no budget cuts due to recession, and the discrete manufacturing sector reported over 70% unaffected by the recession in spite of a severely affected automotive subsector.
- The record-high interest rates had more impact on hardware acquisitions. EDP management opted to rent or lease rather than make large capital investments.
- Interest rates, coupled with a continually retreating announcement of the new price/performance line (H-Series), caused IBM earnings to decline for the first time in over 20 years. Plug compatible mainframe vendors without broad product lines were even more severely impacted.
- By mid-year a moderation of interest rates and a belief that the "H" announcement had slipped to 1981, led the large-scale system user to resume more normal rates of purchase.
- EDP personnel availability, recruiting, training and turnover continued to be the number-one management problems, with indications in the responses to the 1980 User Panel survey that the problem is worsening.

- With a projected decline during the 1980s of new entrants to the workforce, and with the realizations that the new development methodologies of the 1970s were not the hoped-for panacea, productivity improvements appear to offer the only solution.
- Because of the importance of this issue, INPUT's largest research effort in 1980 was a multiclient study titled Improving the Productivity of Systems and Software Implementation.
- In the following sections, these and other issues are analyzed, together with the expectations, plans and problems addressed by the respondents to the 1980 EDP User Panel survey and other INPUT research studies in 1980. These discussions are not intended to be all-inclusive in terms of describing industry issues, but rather reflect the findings with respect to what INPUT considers to be some of the key issues.

III EDP/COMMUNICATIONS SPENDING





### III EDP/COMMUNICATIONS SPENDING

- According to most knowledgeable estimates on the subject, EDP/communications expenditures in the U.S. for 1980 are forecast to fall between \$54 and \$56 billion. This reflects an overall growth of about 10% from last year.

#### I. OUTLOOK FOR 1981

- A majority of the EDP managers and executives interviewed for this year's study indicated that the 1980 recession had not restricted their spending plans.
  - Overall, 66% of the respondents to this study stated that their budgets had not been cut due to the possibility of a recession.
  - Of those whose budgets were affected by the recession, the average budget reduction was 11.8%.
- The growth prospects for the industry as a whole do not seem to hinge on the recession as much as on the continuing EDP personnel shortages.
  - Personnel limitations plus record-high costs of borrowing capital will combine to hold the growth of hardware spending below or, at best, equal to the rate of inflation.
- However, when asked in a separate question on the projected growth in number of mini/microcomputers and terminals, respondents indicated they expected:

- Minicomputers up 61%.
  - Micro/personal computers up 72%.
  - Intelligent terminals up 106%.
  - Non-intelligent terminals up 49%.
- The information processing services industry has proven again to be resistant to downward economic trends and is expected to show an 18% growth this year, and a 20% average annual growth rate (AAGR) for the next five years.
  - The shift from purchase to lease that started in 1979 and continued into 1980 is expected to swing back to more traditional purchase levels for IBM and plug compatible vendors.
    - The long-expected H-series announcement continues to slip in light of IBM's announcements during the year, extending the life of the 303X series.
    - The delay in the "H" announcement, as well as several IBM lease price increases, allowed the plug compatible vendors to resume the rates of growth in 1980 that were severely impacted in 1979 by IBM's 4300 announcements.

## 2. EDP BUDGET GROWTH AND EXPENDITURES

### a. Overall

- Expectations of continuing growth in the EDP industry are supported by the over 900 respondents to this year's study. The average expected increase in EDP expenditures from 1980 to 1981 for all sizes and across all industries is 11.8%, as shown in Exhibit III-1.

EXHIBIT III-1

1980-1981 EDP BUDGET GROWTH

INDUSTRY SECTOR	AVERAGE 1980 BUDGET (\$ MILLION)	EXPECTED INCREASE (PERCENT)	AVERAGE 1981 BUDGET (\$ MILLION)	INCREASE 1980-1981 (\$ MILLION)
DISCRETE MANUFACTURING	\$10.58	13.2%	\$11.99	\$1.41
PROCESS MANUFACTURING	4.38	11.1	4.87	0.49
TRANSPORTATION	14.08	16.1	16.35	2.27
UTILITIES	25.81	12.7	29.09	3.28
BANKING/FINANCE	4.76	9.2	5.20	0.44
INSURANCE	3.30	7.9	3.56	0.26
MEDICAL	1.12	10.8	1.24	0.12
EDUCATION	1.93	4.4	2.02	0.09
RETAIL	2.49	9.5	2.72	0.23
WHOLESALE	1.15	11.3	1.28	0.13
FEDERAL GOVERNMENT	3.61	5.9	3.82	0.21
STATE/LOCAL GOVERNMENT	2.62	8.9	2.85	0.23
SERVICES	2.36	12.2	2.65	0.29
OTHER	1.30	10.5	1.44	0.14
AVERAGE FOR ALL SECTORS	\$ 5.90	11.8%	\$ 6.60	\$ .70

- This year's expected increase cannot be directly compared to last year's expected income, since the 1979 study analyzed spending plans only for respondents with sales or assets over \$1 billion.
  - The comparable expected increase in expenditures from 1980 to 1981 for respondents over \$1 billion is 14.5%, up from the 12.85% expected 1979-1980 increase.
  - Transportation, discrete manufacturing and utilities expect the largest growth, at 16.1%, 13.2% and 12.7% respectively.
  - In addition to these three leading sectors, only the services sector at 12.2% exceeded the average for all sectors of 11.8%.
  - The remaining 10 sectors fell below the average, with federal government (5.9%) and education (4.4%) at the bottom of expected rates of increase in expenditures.
- When applied to the 1980 average budgets of the companies interviewed by INPUT for this study, these budget growth expectations produce increases ranging from a low of \$90,000 for the average educational institution to a high of \$3.28 million for the average public utility firm.
  - Note that these figures are averages for sectors that can be quite diverse. They could vary widely if disaggregated into subsectors of an industry sector.
    - For example, budgets for life insurance companies typically exceed budgets for property and liability companies by a ratio of up to 2:1.

b. Personnel

- The single largest budget category, personnel, remains, as it has the last two years, at about 46% of the current year's expenditures. EDP expenses for personnel in 1980 represent 46.1% of the total budget, with a projected increase to 46.7% of 1981 budgets, as shown in Exhibit III-2.

EXHIBIT III-2

CHANGE IN EDP BUDGETS FOR RESPONDENTS IN  
ALL INDUSTRY SECTORS

BUDGET CATEGORY	1980		1981	
	AVERAGE BUDGET (\$ THOUSAND)	PERCENT OF TOTAL BUDGET	AVERAGE BUDGET (\$ THOUSAND)	PERCENT OF TOTAL BUDGET
PERSONNEL	\$1,944	46.1%	\$2,070	46.7%
MAINFRAME PROCESSORS	571	13.5	595	13.4
PERIPHERALS	377	8.9	388	8.7
MINICOMPUTERS	226	5.4	239	5.4
TERMINALS	199	4.7	212	4.8
COMMUNICATIONS HARDWARE AND SOFTWARE	148	3.5	156	3.5
SOFTWARE	104	2.5	108	2.4
VENDOR MAINTENANCE	99	2.3	104	2.3
PROCESSING SERVICES	85	2.0	85	1.9
SUPPLIES AND OTHER	466	11.0	480	10.8

- Exhibit III-3 shows the ratios of EDP employees to total employees for respondents in each of the industry sectors.
  - As indicated, these ratios tend to be lower for larger organizations, although in some sectors flat or rising ratios of EDP employees correspond with larger organizational size.
  - The insurance and the banking and finance sectors' extensive use of EDP is evident, with ratios of EDP employees about four times the average for all sectors.
  - The high ratio of 22.4 EDP employees per 100 total employees for the smallest firms in the services sector is the result of smaller computer services firms, where EDP employees are a substantial portion of total employees.
- The total amount of EDP spending associated with each EDP employee is provided in Exhibit III-4.
  - As shown by the overall averages for all sectors and for most individual industry sectors, the higher amounts for the larger firms reflect the higher salary levels as well as larger investments in hardware, software and communications. It also reflects the higher level of support staff, training and overhead in larger, more widely dispersed organizations.

c. Equipment

- Returning to Exhibit III-2, the four hardware budget categories of mainframe processors, peripherals, minicomputers and terminals all either decline or remain unchanged as a percent of the total EDP budget from 1980 to 1981.
- Both mainframe processors and peripherals as budget categories are expected to decline by 0.1% and 0.2% respectively of the total EDP budget from 1980 to 1981.

EXHIBIT III-3

EDP EMPLOYEES PER 100 COMPANY EMPLOYEES

INDUSTRY SECTOR	NUMBER OF EDP EMPLOYEES PER 100 COMPANY EMPLOYEES		
	COMPANY SIZE (ANNUAL SALES OR ASSETS)		
	\$0-100 MILLION	\$100-1,000 MILLION	OVER \$1 BILLION
DISCRETE MANUFACTURING	1.5	2.1	1.4
PROCESS MANUFACTURING	1.3	1.2	1.4
TRANSPORTATION	1.1	2.1	1.4
UTILITIES	4.7	4.3	2.2
BANKING/FINANCE	8.1	7.0	7.0
INSURANCE	10.7	7.8	7.0
MEDICAL	1.3	1.6	-
EDUCATION	2.1	1.3	2.8
RETAIL	0.9	1.3	0.6
WHOLESALE	3.4	2.0	3.8
FEDERAL GOVERNMENT	13.0	-	0.4
STATE/LOCAL GOVERNMENT	2.0	1.2	4.1
SERVICES	22.4	1.3	3.0
OTHER	2.7	1.2	1.4
AVERAGE	2.5	2.0	1.8
OVERALL AVERAGE		2.1	

EXHIBIT III-4  
EDP BUDGET PER EDP EMPLOYEE (\$ THOUSAND)

INDUSTRY SECTOR	BUDGET PER EMPLOYEE		
	COMPANY SIZE (ANNUAL SALES OR ASSETS)		
	\$0-100 MILLION	\$100-1,000 MILLION	OVER \$1 BILLION
DISCRETE MANUFACTURING	\$41.6	\$31.6	\$60.8
PROCESS MANUFACTURING	25.2	40.6	53.4
TRANSPORTATION	44.4	59.7	61.7
UTILITIES	37.7	53.6	74.1
BANKING/FINANCE	35.2	40.9	51.2
INSURANCE	34.8	34.5	34.5
MEDICAL	36.0	37.9	-
EDUCATION	29.3	36.5	22.0
RETAIL	36.3	21.2	51.7
WHOLESALE	41.6	35.8	40.4
FEDERAL GOVERNMENT	47.4	-	7.4
STATE/LOCAL GOVERNMENT	31.5	37.2	37.4
SERVICES	35.2	38.4	50.0
OTHER	25.2	33.8	52.2
AVERAGE	\$34.9	\$37.9	\$59.0
OVERALL AVERAGE		\$43.9	



- Although spending for minicomputers and terminals is expected to grow in 1981 over 1980, minicomputers remain at 5.4% and terminals increase to 4.8% of the total EDP budget in 1981.

d. Services

- A new budget category, vendor maintenance services, was included in this year's user survey and accounted for 2.3% of the EDP budget in 1980 and 1981.
- As in the two immediately preceding years, over 900 EDP managers and executives responding to INPUT's EDP User Panel survey in 1980 again forecast a reduction for only one budget category: a drop in spending for outside processing services, as shown in Exhibit III-2.
  - As reported by EDP management, this decline probably reflects an expectation that processing will be brought in-house during the coming year. Personnel shortages and growing applications backlogs (as discussed in later sections) make this highly unlikely to occur in 1981.
  - Based on the results of previous years' surveys and INPUT's other studies of the computer services industry, the level of outside processing services will more than likely increase in 1981 over 1980.
- In addition to software and processing services included in the EDP budget, this year's survey also gathered data on spending for services not under the control of the EDP organization. Spending for software and services by these non-EDP departments is shown in Exhibit III-5.
  - According to EDP management reporting, overall 26% of the organizations are buying outside services, with an average annual expenditure of \$181,000.
  - Although respondents reported a 6% growth in spending in 1980 over 1979, they forecast a 0.4% decline in 1981.

## EXHIBIT III-5

## OUTSIDE SERVICES AND SOFTWARE PURCHASED BY NON-EDP DEPARTMENTS

INDUSTRY GROUP	PERCENT BUYING OUTSIDE SERVICES	AVERAGE PURCHASE (\$ THOU-SAND)	PERCENT OF OUTSIDE SERVICES PURCHASED BY:										PERCENT CHANGE	
			FINANCE	CORPORATE	PERSONNEL	R&D ENGINEERING	OPERATIONS MANUFACTURING	MARKETING AND SALES	OTHER	1979-1980	1980-1981			
DISCRETE MANUFACTURING	23%	\$291	20	2	1	41	14	-	5	2%	(4)%			
PROCESS MANUFACTURING	30	270	16	5	5	24	22	4	3	2	(7)			
TRANSPORTATION	30	255	20	-	2	13	38	-	13	49	(2)			
UTILITIES	40	308	16	-	2	34	14	-	13	12	(1)			
BANKING/FINANCE	36	113	30	13	-	3	13	1	12	8	4			
INSURANCE	24	36	-	17	5	2	1	-	32	-	1			
MEDICAL	8	90	33	7	7	40	-	-	13	15	15			
EDUCATION	20	139	18	5	1	-	5	-	65	.7	4			
RETAIL	33	120	16	18	-	6	9	-	16	15	(6)			
WHOLESALE	29	50	43	2	12	16	8	-	7	8	(10)			
FEDERAL GOVERNMENT	6	2,000	-	-	5	-	-	-	100	10	20			
STATE AND LOCAL GOVERNMENT	25	55	11	-	-	32	6	-	44	(3)	9			
SERVICES	25	42	15	-	2	27	6	-	13	4	5			
OTHER	12	110	-	-	-	-	-	-	85	25	1			
COMBINED FIGURES FOR ALL SECTORS	26%	\$181	19%	7%	3%	21%	12%	1%	19%	6%	(0.4)%			

## IV EDP PLANS AND PROBLEMS



## IV EDP PLANS AND PROBLEMS

### I. PERSONNEL AVAILABILITY AND TRAINING

- The price/performance capabilities of large-scale computers have tripled approximately every six years since 1954. Since 1976, when IBM began responding to emerging plug compatible competitors, price/performance has improved at an even faster pace, with some announcements offering quadrupled improvements.
- These improvements in price/performance have not only made feasible the rapid growth of interactive and data base related applications, but have also made new applications areas economically viable.
- With this growth in the number and complexity of applications, the expenditures for equipment continue to rise despite the dramatic improvements in price/performance.
- The major factor limiting the growth of the EDP industry in the 1980s will be the availability of qualified applications development personnel.
- The most significant EDP problems for each industry sector were quantified based on a percentage ranking of importance by respondents. In Exhibit IV-1, the three most significant problems (noted by 1, 2 and 3) for each industry sector are presented in matrix form.

**EXHIBIT IV-1**  
**MOST SIGNIFICANT EDP PROBLEMS**

INDUSTRY SECTOR	PERSONNEL RE-CRUITING	NEED FOR BETTER PLANNING AND CONTROL	PERSONNEL TRAINING	LACK OF GENERAL MANAGEMENT UNDERSTANDING	EXCESSIVE APPLICATIONS DEVELOPMENT TIME	IN-ADEQUATE EDP FUNDING (BUDGETS)	UNSATISFACTORY HARDWARE MAINTENANCE
DISCRETE MANUFACTURING	1	3	2	-	-	-	-
PROCESS MANUFACTURING	1	2	-	3	-	-	-
TRANSPORTATION	3	2	-	1	-	-	-
UTILITIES	1	2	3	-	-	-	-
BANKING/FINANCE	1	3	2	-	-	-	-
INSURANCE	1	2	3	-	-	-	-
MEDICAL	1	3	2	-	-	-	-
EDUCATION	1	-	3	-	-	2	-
RETAIL	1	2	3	-	-	-	-
WHOLESALE	-	2	3	1	-	-	-
FEDERAL GOVERNMENT	3	-	2	-	-	-	1
STATE AND LOCAL GOVERNMENT SERVICES	1	3	2	-	-	-	-
OTHER	2	1	-	3	-	-	-
	1	-	-	2	3	-	-
ALL SECTORS	1	2	3	-	-	-	-

NOTE: 1, 2 AND 3 REPRESENT THE FIRST, SECOND AND THIRD MOST SIGNIFICANT PROBLEM AREAS EXPRESSED BY EDP USER PANEL RESPONDENTS, RANKED BY RELATIVE IMPORTANCE (SEE APPENDIX C FOR DEFINITIONS)

- For the third year in a row, personnel recruiting or availability rank overwhelmingly as the most significant problem.
- In an unrelated question asking respondents what their major concern about applications development was in 1980, 36% (three times larger than the next category) mentioned personnel-related problems such as recruiting, training, motivating, etc.
- In the analysis of each industry sector, all industry sectors expect an increase in personnel budgets in 1981 over 1980, ranging from a low of 6.3% for the services sector to a high of 13.3% for utilities.
- The third-ranked problem by respondents to this year's EDP User Panel survey is personnel training. Personnel training is another manifestation of the underlying EDP problem of the 1980s: the availability of qualified applications development personnel.
- Training expenditures for respondents from all industry sectors are analyzed in Exhibit IV-2.
  - The average expense for technical training is over three times the expenditures for management training.
  - Technical training expenses are reasonably balanced between in-house and outside sources of training.
  - The percentage of staff participating in technical training is significantly higher than management training.
- When queried about expected training expenditures over the near term and over the next four years, respondents indicated high rates of growth in both periods, as shown in Exhibit IV-3.

EXHIBIT IV-2

TRAINING EXPENDITURES,  
ALL INDUSTRY SECTORS

TYPE OF TRAINING	AVERAGE EXPENSE	AVERAGE EXPENDITURE PER EDP EMPLOYEE	PERCENT OF STAFF ATTENDING	AVERAGE EXPENSE PER ATTENDEE
IN-HOUSE MANAGEMENT TRAINING	\$ 3,721	\$ 35	28.8%	\$360
OUTSIDE MANAGEMENT TRAINING	6,162	58		
IN-HOUSE TECHNICAL TRAINING	\$14,864	139	44.1%	\$815
OUTSIDE TECHNICAL TRAINING	18,111	170		
TOTAL	\$42,858	\$402	-	-



EXHIBIT IV-3

ANTICIPATED CHANGES IN TRAINING EXPENDITURES  
FOR ALL INDUSTRY SECTORS

INDUSTRY SECTOR	AVERAGE 1980 EXPENDI- TURES	PERCENT CHANGE 1980-1981	PERCENT OVERALL CHANGE 1980-1984	AVERAGE 1984 EXPENDI- TURES
DISCRETE MANUFACTURING	\$53,911	22%	45%	\$ 78,361
PROCESS MANUFACTURING	56,456	20	27	71,610
TRANSPORTATION	68,115	11	37	93,207
UTILITIES	93,873	25	34	125,587
BANKING/FINANCE	43,995	28	29	56,567
INSURANCE	54,774	11	22	66,808
MEDICAL	11,233	40	41	15,846
EDUCATION	11,736	37	80	21,140
RETAIL	23,239	15	32	30,780
WHOLESALE	15,693	22	25	19,653
FEDERAL GOVERNMENT	29,220	6	12	32,845
STATE/LOCAL GOVERNMENT	23,923	14	25	29,911
SERVICES	67,245	14	20	80,586
OTHER	18,092	10	18	21,362

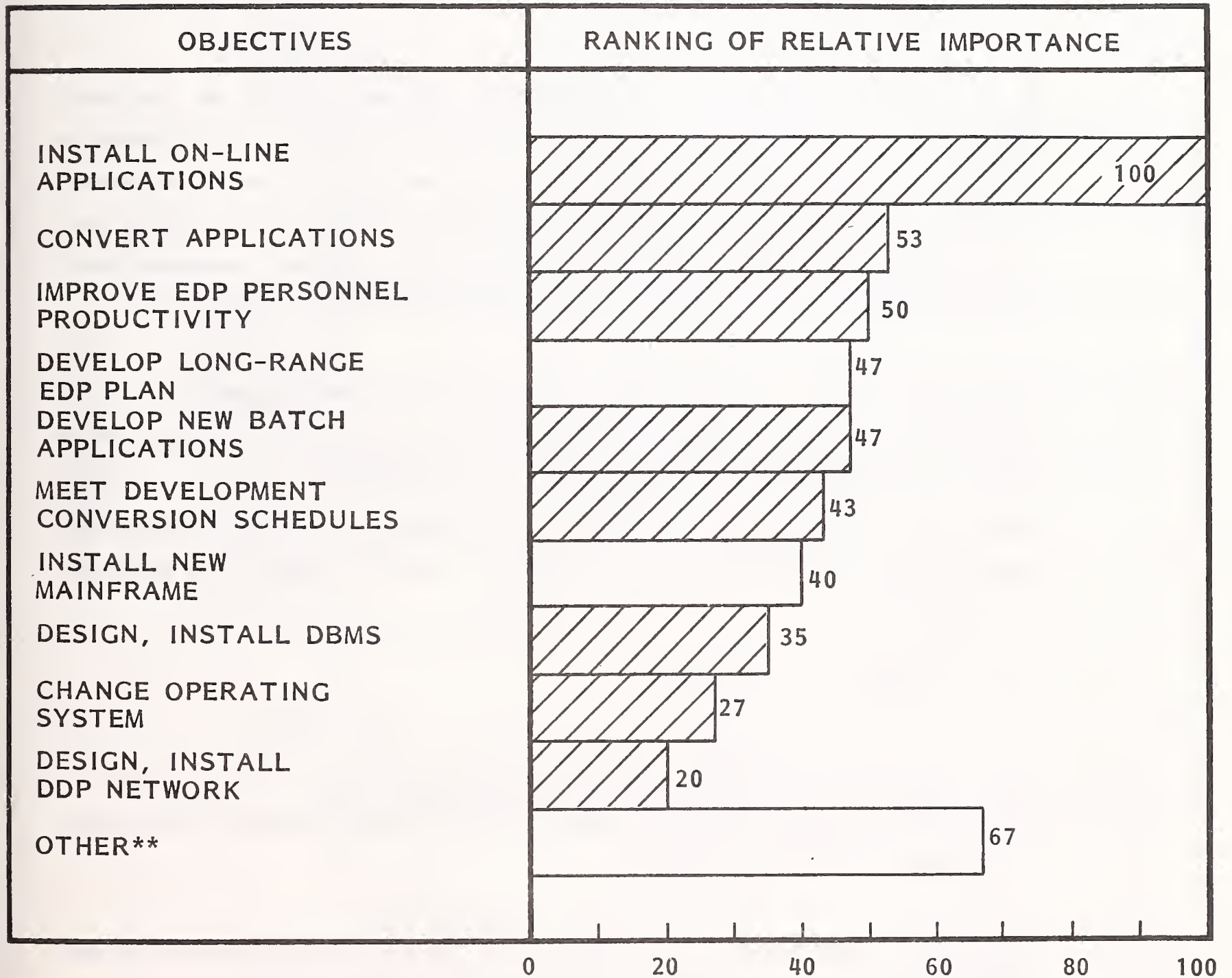
- This exhibit also shows significant variations between industry sectors in the expected 1981 increase in training expenditures. Increases range from a federal government low of 6% to a high of 40% for medical.

## 2. APPLICATIONS DEVELOPMENT AND MAINTENANCE

- As in previous User Panel surveys, respondents were asked their primary EDP objective in the current year. The results of this question, with objectives ranked by relative importance to the User Panel respondents, are shown in Exhibit IV-4.
- Relative importance is a numeric measure ranging in value from 1-100 that is useful in comparing responses to questions asking for priority rankings of a series of possible replies.
  - To calculate relative importance, numeric weights are assigned to the respondents' priority rankings in inverse order: 5 through 1, a weight of 5 for priority 1, weight 4 for priority 2, etc.
  - The numeric weights are summed for each possible reply and the relative importance value calculated by:  $(\text{individual reply sum} / \text{highest reply sum}) \times 100$ .
  - The reply with the highest sum always has a relative importance of 100, and the relative importance value of the other possible replies can be thought of as a "percent" of the highest-ranked reply.
- The largest group of respondents again ranked objectives involving applications as the most important. This compares to lower rankings for such categories as designing and installing DBMS, installing new mainframes, changing operating systems, centralizing EDP control, etc.
- In support of these objectives, users are increasingly faced with decisions on how to accomplish applications development most effectively. In this regard,

### EXHIBIT IV-4

#### 1980 EDP OBJECTIVES: AVERAGE FOR ALL INDUSTRY SECTORS



\*\*SPECIFIC RESPONSES UNDER "OTHER" INCLUDE:

- INSTALL MINICOMPUTERS 17
- INSTALL PERIPHERALS 19
- INTEGRATE OFFICE AUTOMATION WITH EDP 10
- CENTRALIZE EDP CONTROL 8
- DECENTRALIZE EDP CONTROL 3

RELATIVE IMPORTANCE

PRIMARILY SOFTWARE RELATED

NOT PRIMARILY SOFTWARE RELATED - 21 -

certain background information gathered in this study provides useful planning data.

- Exhibit IV-5 indicates that 17% of equipment use and 45% of programming personnel are dedicated to new applications development. Equipment use is up and personnel is down from last year's 16% and 49% respectively. This is the third year of this trend, with corresponding use of 15% and 51% respectively for the year before.
- In like fashion, the burden of maintaining existing systems on computer equipment use has grown in the amount of processing required, but remained a relatively constant 12% to 14% of equipment use over the last three years. This portion of total equipment use is not significant, particularly in light of a resource that has a recent history (with even more dramatic announcements expected shortly) of substantial improvements in price/performance.
- In an examination of the burden of maintaining and enhancing existing programs, these two activities now take 55% of programming personnel time. This is a significant and growing burden on a resource already in critically short supply. In the next section of this report, improving programmer productivity will be addressed as a possible solution to the most significant issue of 1980.

### 3. EDP PLANNING AND CONTROL

- Returning to the most significant EDP problems of 1980, shown in Exhibit IV-1, the problem ranked second by 1980 EDP User Panel respondents is the need for better planning and control.
- Respondents raised this issue in reply to two separate questions about applications development concerns for 1980 and the most important development objective. Some typical replies include:

- "Long- and short-term planning."

EXHIBIT IV-5  
EDP RESOURCE USE

INDUSTRY SECTOR	PERCENT USE									
	COMPUTER EQUIPMENT			PROGRAMMING PERSONNEL			OTHER	NEW PROGRAM DEVELOPMENT	EXISTING PROGRAM MAINTENANCE	ENHANCEMENT OF EXISTING PROGRAMS
	PRODUCTION JOBS	NEW APPLICATIONS DEVELOPMENT	EXISTING PROGRAM MAINTENANCE							
DISCRETE MANUFACTURING	67%	18%	13%	2%	49%	30%	21%			
PROCESS MANUFACTURING	64	20	14	2	51	27	22			
TRANSPORTATION	65	16	11	8	49	29	22			
UTILITIES	63	18	14	5	48	29	23			
BANKING/FINANCE	70	13	13	4	36	35	29			
INSURANCE	61	19	18	2	39	35	26			
MEDICAL	64	20	15	1	45	28	27			
EDUCATION	53	17	13	17	46	31	23			
RETAIL	7	15	9	1	53	27	20			
WHOLESALE	75	14	10	1	49	30	21			
FEDERAL GOVERNMENT	76	8	16	0	31	49	20			
STATE/LOCAL GOVERNMENT	67	17	13	3	41	37	22			
SERVICES	66	19	13	2	40	32	28			
OTHER	68	14	15	3	38	33	29			
ALL SECTORS	65%	17%	14%	4%	45%	31%	24%			

- "Long-range corporate and DP planning."
  - "Security and contingency planning."
  - "Quality control."
  - "Control unjustified word processing."
- The lack of an effective long-range EDP plan was the second or third most significant EDP problem in the results of the 1978 and 1979 EDP User Panel survey.
  - In May of 1979, INPUT's Planning Service for Computer and Communications Users published a report on Planning: A Methodology For Protecting Your EDP Investment. This report contains a step-by-step method for establishing an EDP plan and integrating it into an overall corporate planning methodology.

## V SIGNIFICANT ISSUES





## V SIGNIFICANT ISSUES

- Providing a complete assessment of all of the major issues confronting the leading users of information products and services is an effort well beyond the scope of this report. Rather, the intent is to review those technical areas where major research has been conducted during 1980, primarily programmer productivity, user maintenance and office automation issues.
- I. IMPROVING PROGRAMMER PRODUCTIVITY
- As discussed in Chapter IV, personnel-related issues are by far the major problem according to the over 900 respondents to the 1980 EDP User Panel survey. The personnel problem cited includes recruiting, training, motivating and turnover.
  - While no precise data are available, surveys do indicate that the demand for EDP personnel will exceed the supply into the mid-1980s. Although these are overall trends, the availability of personnel in the local job market does vary widely.
  - In Chapter IV, the installation of on-line applications was identified as the leading EDP objective, as shown in Exhibit IV-4. The design and implementation of these on-line applications further exacerbates the personnel problem since their increased complexity requires more development effort as well as more personnel with more experience and higher skill levels.

- With the realization that the shortage of personnel and the complexity of the work is growing, EDP management is increasingly looking for methods to improve the productivity of their development staffs.
- In Exhibit V-1, the most popular methods for reducing the time and cost (i.e., improving productivity) of applications development is shown for each industry sector.
  - The use of productivity and programming aids is one of the two leading methods, with 25% of all mentions. Specific aids most frequently mentioned by respondents include:
    - TSO (Time Sharing Option), 39 mentions.
    - DMS (Development Management System), 32 mentions.
    - ICCF (Interactive Computer Control Facility), 22 mentions.
    - ADF (Application Development Facility), 15 mentions.
    - Easytrieve (a data retrieval/presentation system), 12 mentions.
  - With 19% of the overall mentions, the use of on-line programming is also a leading method. The response "CRT terminals for programmers" was tabulated separately and shown under "other" methods since it implies individual terminals for each programmer and in most cases was mentioned by respondents in addition to on-line programming.
  - The other leading method, with 24% overall, is the "all other" category, which included:
    - User involvement in development.
    - Hardware upgrade.

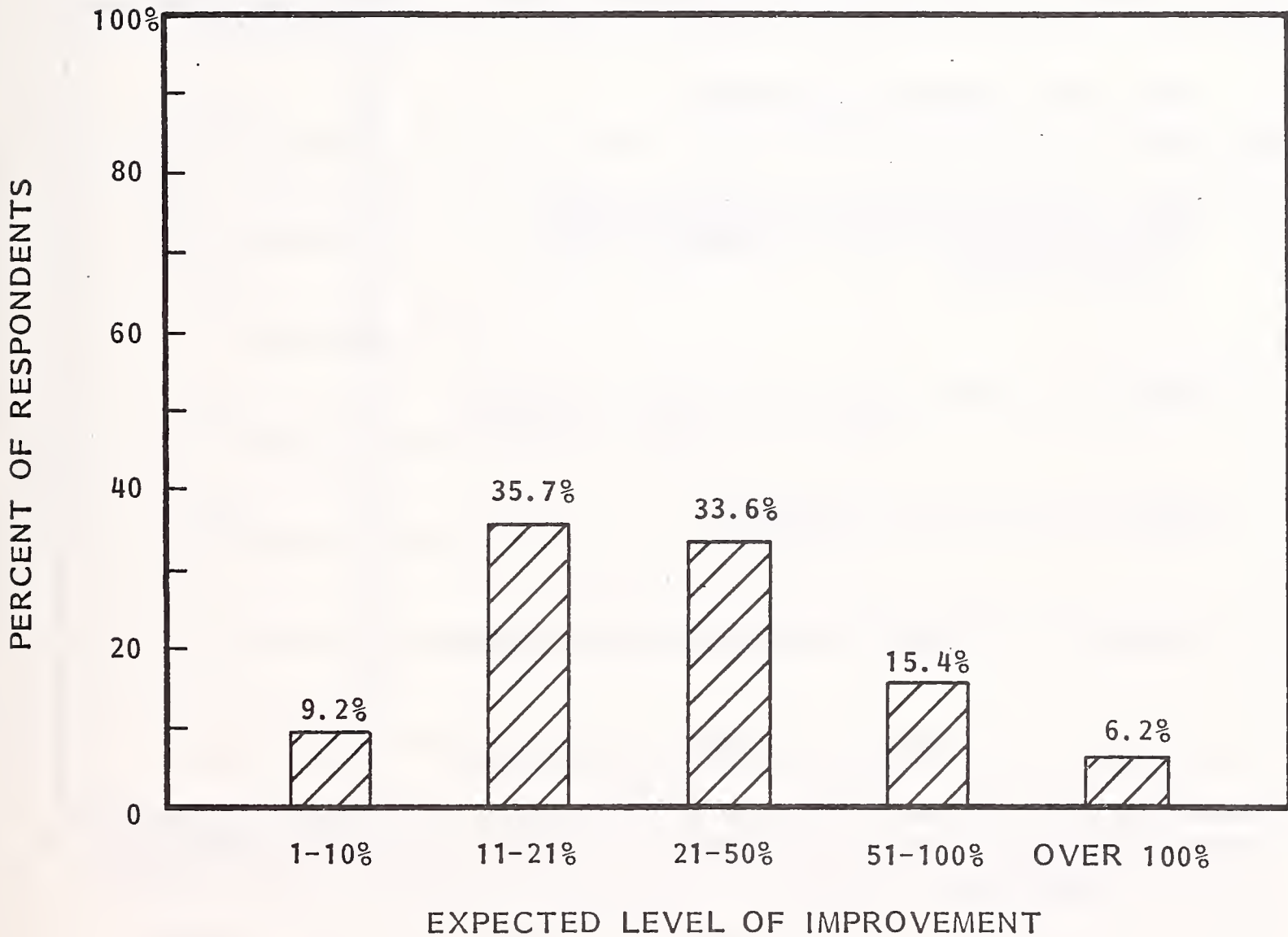
MOST POPULAR METHODS TO REDUCE THE TIME AND COST  
OF APPLICATIONS DEVELOPMENT

INDUSTRY SECTOR	PERCENT OF MENTIONS BY INDUSTRY SECTOR						
	ON-LINE PROGRAM- MING	PURCHASED SOFTWARE PRODUCTS	STRUC- TURED PROGRAM- MING METHODS	PROJECT MANAGE- MENT AND CONTROL SYSTEMS	IMPROVED TRAINING OF PERSONNEL	PRODUC- TIVITY AND PROGRAM- MING AIDS	ALL OTHERS
DISCRETE MANUFACTURING	21%	8%	10%	5%	8%	25%	23%
PROCESS MANUFACTURING	24	10	9	2	4	27	24
TRANSPORTATION	14	9	6	9	9	31	22
UTILITIES	9	8	15	5	10	33	20
BANKING/FINANCE	17	14	4	6	8	30	21
INSURANCE	20	6	12	4	12	27	19
MEDICAL	20	14	6	4	10	26	20
EDUCATION	12	14	12	3	8	18	33
RETAIL	24	7	10	7	5	21	26
WHOLESALE	15	11	11	3	8	30	22
FEDERAL GOVERNMENT	13	-	13	-	19	19	36
STATE AND LOCAL GOVERNMENT	13	5	15	8	9	23	27
SERVICES	25	5	14	7	7	21	21
OTHER	26	5	11	-	-	26	32
AVERAGE	19%	9%	10%	5%	8%	25%	24%

- . CRT terminals for programmers.
  - . Improved documentation.
  - . Standardized methods/systems.
- Respondents were asked what level of improvement they expected from these methods, and the results are shown in Exhibit V-2. For all sectors the expectation of level of improvement is broadly spread, with almost 10% of the respondents expecting only 1-10% improvement and an approximately equal number expecting over 100%.
  - Recognizing the importance of the productivity issue during 1980, INPUT conducted its single largest research study titled Improving the Productivity of Systems and Software Implementation.
    - The methods mentioned by respondents to the EDP User Panel survey (shown in Exhibit V-1) can be effective in improving productivity.
    - These methods are often implemented in a "shot-in-the-dark" approach, and EDP management is usually disappointed with the results.
    - Although most, if not all, of the methods mentioned can contribute to improved productivity, the sequence in which they are implemented, and related organizational and motivational factors, are crucial to the success of a productivity improvement plan.
  - Exhibit V-3 shows the results of a survey of EDP managers performed as part of this productivity study. The first action listed, mentioned by 24% of the respondents, is to institute better planning. It is interesting to note that this action was not mentioned by respondents to the EDP User Panel.

## EXHIBIT V-2

### LEVEL OF IMPROVEMENT EXPECTED FROM STEPS TAKEN TO REDUCE TIME AND COST OF APPLICATIONS DEVELOPMENT, ALL SECTORS



SOURCE: INPUT EDP USER PANEL, 1980

EXHIBIT V-3

ACTION TAKEN TO IMPROVE PRODUCTIVITY  
AS REPORTED BY EDP MANAGERS

ACTION TAKEN	PERCENT* OF RESPONDENTS
INSTITUTE BETTER PLANNING	24%
PROVIDE PROGRAMMERS WITH ON-LINE DEVELOPMENT (CRTS + INTERACTIVE PROCESSING)	24
INCREASE STAFF EDUCATION AND TRAINING	22
GREATER USER INVOLVEMENT	14
IMPLEMENT SOFTWARE PRODUCTIVITY TOOLS	13
IMPLEMENT STRUCTURED DESIGN APPROACH	10

SOURCE: IMPROVING THE PRODUCTIVITY OF SYSTEMS AND SOFTWARE IMPLEMENTATION,  
NOVEMBER, 1980

## 2. USER INVOLVEMENT IN MAINTENANCE

- The cost of hardware and software maintenance continued to rise during the year, with almost every manufacturer increasing monthly maintenance charges and per-call rates. Where rates did decline, as in the case of IBM's new software maintenance strategy, the user is required to perform diagnostic and repair activities formerly performed by the vendor.
- For field service vendors, the major problem is cost increases due to higher wages, transportation costs, benefits and levels of training required. In addition, a substantial effort and expense is required to recruit personnel both to maintain growth and to offset turnover.
- Self-maintenance by user personnel offers a partial solution by shifting some of the on-site labor requirement to the user. Among the opportunities for self-maintenance, users may be required to:
  - Install equipment.
  - Perform diagnostics before calling the vendor.
  - Perform maintenance on hardware system.
  - Perform maintenance on vendor software.
  - Deliver equipment to vendor maintenance depot.
- To utilize these user self-maintenance functions requires that the product design and pricing include this approach to equipment maintenance. A recent example of this is the IBM 3101 display terminal, which requires users to install the terminal, perform diagnostics, return failed terminals for depot maintenance and provide spare terminals to backup failures.

- The 1980 EDP User Panel respondents' attitude toward hardware and software self-maintenance activities are shown in Exhibit V-4. In this exhibit, the responses from users currently performing the activity are combined with responses from those who would consider performing it.
  - The most positive response concerned self-diagnostics, with 42% performing this activity and 35% indicating they were not and would not consider it.
  - The most negative response concerned performing hardware maintenance, with only 7% currently performing this activity and an overwhelming 82% indicating they were not and would not consider it.
- An extensive study of user self-maintenance was completed in August of this year for clients of INPUT's U.S. Field Service Program. This study, which addresses the issue from the perspective of the vendor of field maintenance services, is titled Opportunities in User Self-Maintenance.
- Comparing the results obtained two years ago for INPUT's multiclient study Maintenance Requirements in the Information Processing Industry, 1978-1983, the percentages of users doing self-maintenance or willing to consider it were approximately one-half what they are today. This growth exceeds the levels projected at that time, and is an indication that current user resistance will continue to diminish.

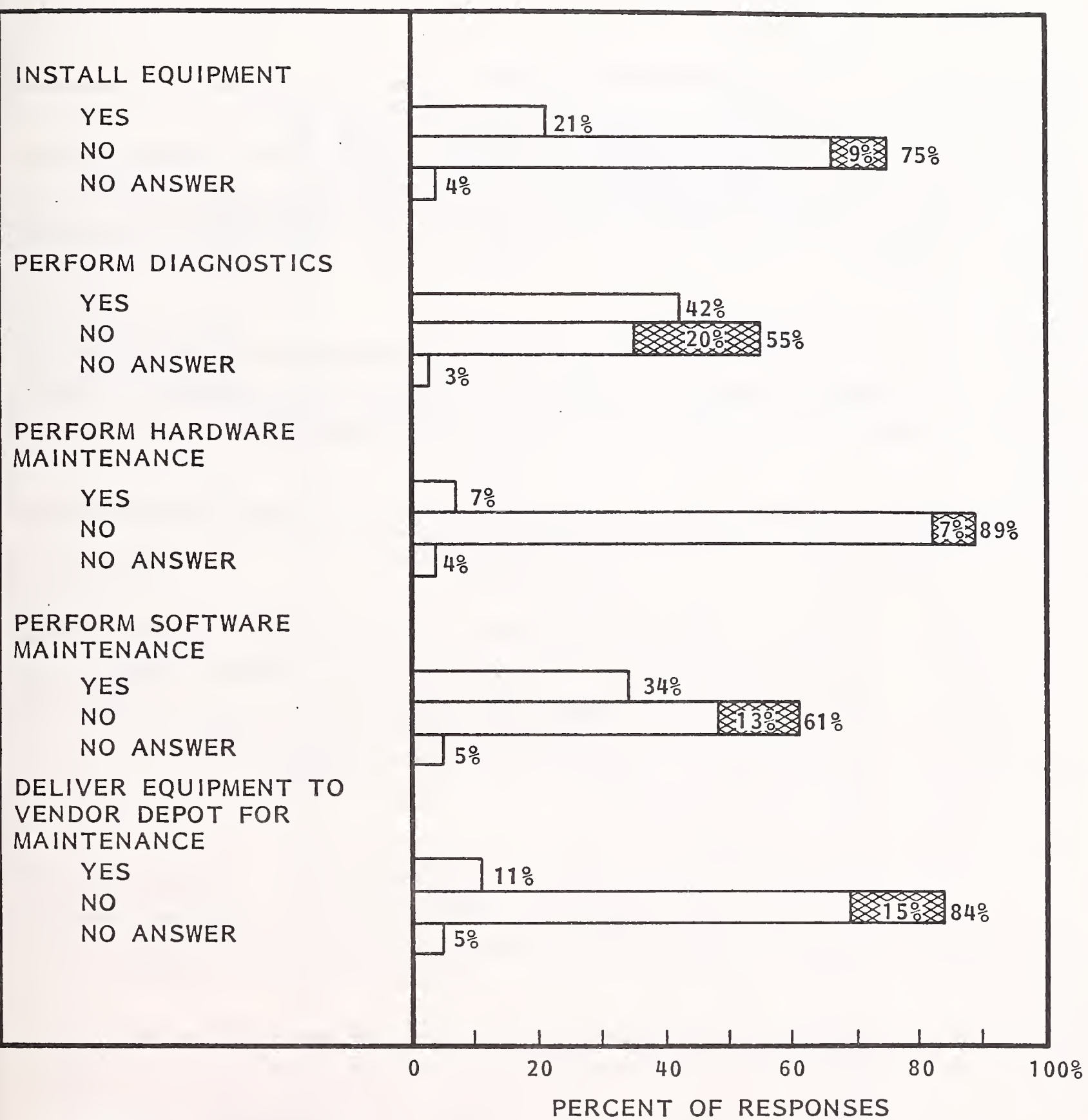
### 3. EDP's ROLE IN OFFICE AUTOMATION

- Office automation involves the processing, verification, storage and retrieval, transmission and distribution of information that has in the past been processed manually by clerical, secretarial and management personnel. Generally the use of word processing is most closely associated with office automation, but some of the other office automation issues include:
  - Electronic mail.



EXHIBIT V-4

DEGREE OF USER SELF-MAINTENANCE  
FOR ALL SECTORS



NOTE: [Hatched Box] INDICATES PERCENT OF RESPONDENTS NOT CURRENTLY PERFORMING FUNCTION, BUT WHO WOULD CONSIDER DOING SO

- Telecopier/facsimile transmission.
  - Image processing.
  - CRT graphics.
  - Data and voice communications.
- In a study of office automation conducted as part of INPUT's Planning Service for the Information Processing Services Industry, the total market for all vendors is forecasted to grow at 39% per year to total nearly \$8 billion in 1984.
  - With this explosive rate of growth forecast in the office automation market, User Panel respondents were again questioned as to the involvement of their company and their department in the major office automation issues.
  - Exhibit V-5 shows, by industry, the percent of respondent companies using systems and programs related to office automation.
    - Data communications are the most widely used, with 84% of the respondents indicating the use of dial-up, WATS, dedicated or TELEX/TWX data communications services. In more than 80% of responses, the EDP department also has management responsibility for data communications.
    - Word processing is the next most widely used category, with 53% overall, but with a much lower EDP involvement in word processing of 30% now and an additional 16% expecting involvement by 1985.
    - Telecopier/facsimile is also widely used by some 42% of the respondents, but EDP involvement with this activity is very low (approximately 14%) and expected to increase by only 5% through 1985.

EXHIBIT V-5

PERCENT OF RESPONDENTS CURRENTLY USING SYSTEMS  
AND PROGRAMS RELATED TO THE OFFICE OF THE FUTURE

INDUSTRY SECTOR	ELEC- TRONIC MAIL	WORD PRO- CESSING	IMAGE PRO- CESSING	TELE- COPIER FAC- SIMILE	CRT GRAPH- ICS	DATA COM- MUNI- CATIONS
DISCRETE MANUFACTURING	8%	42%	10%	60%	27%	85%
PROCESS MANUFACTURING	6	47	8	64	12	90
TRANSPORTATION	25	80	25	65	10	90
UTILITIES	14	75	16	64	32	89
BANKING/FINANCE	4	56	7	41	9	93
INSURANCE	7	62	8	29	2	72
MEDICAL	0	41	8	8	8	46
EDUCATION	9	55	12	10	38	82
RETAIL	9	59	6	56	3	88
WHOLESALE	3	26	3	31	10	85
FEDERAL GOVERNMENT	12	69	12	62	25	81
STATE AND LOCAL GOVERNMENT	8	59	3	15	19	88
SERVICES	4	54	19	40	21	81
OTHER	0	62	6	50	6	75
AVERAGE	7%	53%	9%	42%	18%	84%

- The three remaining categories of office automation are all limited in their use to less than a fifth of the respondents. In addition, EDP involvement was also very limited, with only CRT graphics (at 31%) indicating any substantial EDP responsibility.

1980 ANALYSIS OF EDP IN BANKING AND FINANCE



## BANKING AND FINANCE

### I. INDUSTRY SECTOR OVERVIEW

- The banking and finance sector includes SIC categories 60, 61, 62 and 67.
- INPUT has divided this industry sector into seven subsectors:
  - Commercial banking.
  - Savings and loan associations.
  - Credit unions.
  - Finance companies.
  - Security and commodity brokers.
  - Mortgage banking firms.
  - Other.
- Although as a group banks spend in excess of 8% of total expenses (net of interest) on automation, they are still very labor-intensive. Banks employ over 1.2 million people, which represents over 44% of the total employment in this industry sector.

- There is every indication that industry consolidation through acquisition, merger and liquidation is continuing.
- All SIC subsectors of this industry sector are represented by the respondents, which total 9.7% of the 1980 INPUT survey.
- Exhibit I-1 shows that one-half of the respondents had total assets of between \$101 and \$999 million.
  - Companies with assets of \$100 million or less had the highest percentage of EDP budget as a percentage of sales, but the lowest EDP budget per EDP employee.
  - As with other industries, the largest companies have the highest EDP budget per EDP employee, and the highest ratio of the EDP budget per total number of employees.

## 2. BUDGET AND EXPENDITURE ANALYSIS

- Exhibit I-2 shows the distribution of the ratio of EDP budget to company assets.
  - Most noticeable is the very high percentage of respondents whose EDP budget ratio was between 0% and 0.3% of total assets.
- Between 1979 and 1980, the largest group of respondents had a 10-20% increase in EDP budget growth.
  - However, one out of four reported that the budget growth in 1980 would be greater than 20%.
  - Exhibit I-3 shows that the largest group expects the budget growth to be somewhat more in 1981 than it is in 1980.



EXHIBIT I-1

RESPONDENT PROFILE - BANKING AND FINANCE SECTOR

PROFILE CHARACTERISTIC	COMPANY SIZE IN TERMS OF TOTAL ASSETS			
	\$100 MILLION OR LESS	\$101-999 MILLION	\$1 BILLION OR MORE	NO SIZE DATA
PERCENT OF TOTAL RESPONDENTS	4.5%	50.0%	39.8%	5.7%
AVERAGE TOTAL ASSETS (\$ MILLION)	\$ 49.8	\$ 410.4	\$4,775.9	-
AVERAGE TOTAL EMPLOYEES	398	609	2,383	642
AVERAGE EDP EMPLOYEES	32	44	167	65
EDP EMPLOYEES PER 100 TOTAL EMPLOYEES	8.1	7.2	7.0	10.2
AVERAGE EDP BUDGET (\$ THOUSAND)	\$ 1,125	\$ 1,805	\$ 9,000	\$ 3,785
EDP BUDGET AS A PERCENT OF ANNUAL SALES	2.3%	0.4%	0.2%	-
EDP BUDGET PER EDP EMPLOYEE	\$35,156	\$40,860	\$51,174	\$54,665
EDP BUDGET PER TOTAL NUMBER OF EMPLOYEES	\$ 2,830	\$ 2,857	\$ 3,595	\$ 4,822

EXHIBIT I-2

RATIO OF EDP BUDGET TO COMPANY ASSETS:  
DISTRIBUTION OF RATIOS AMONG RESPONDENTS IN THE  
BANKING AND FINANCE SECTOR

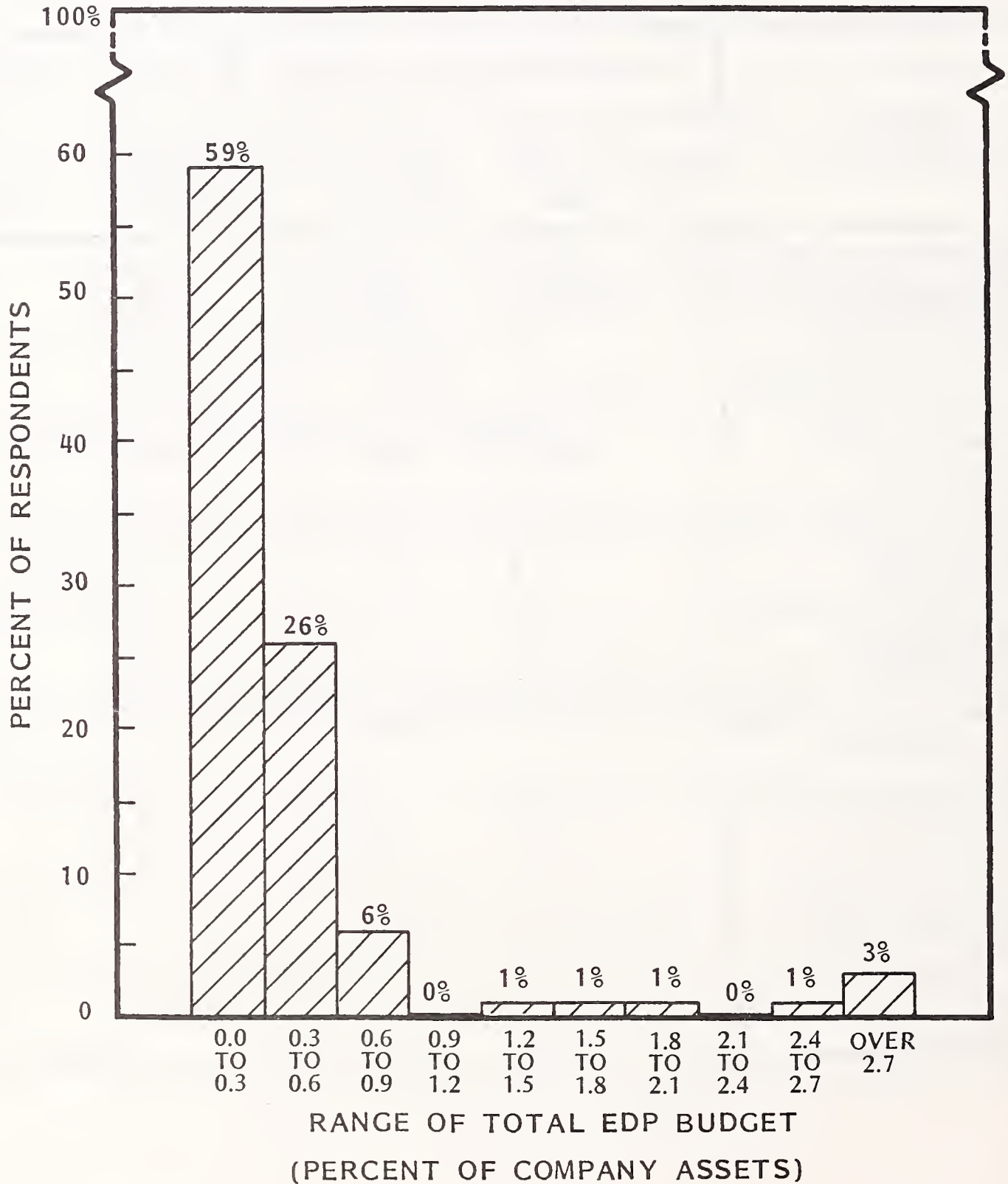
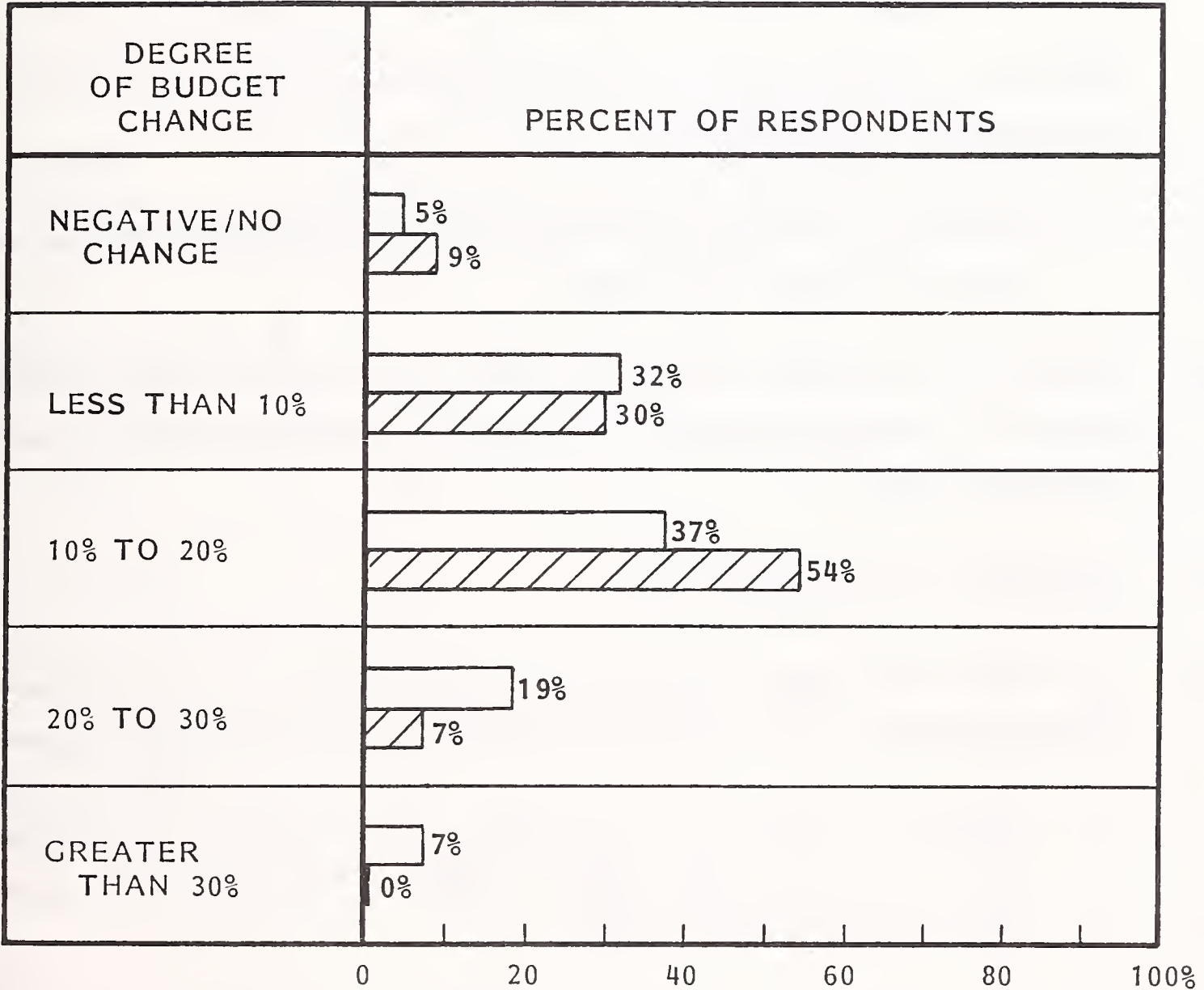


EXHIBIT I-3

ACTUAL AND PLANNED EDP BUDGET GROWTH  
FOR RESPONDENTS IN THE BANKING AND FINANCE SECTOR



□ 1979-1980  
 ▨ 1980-1981

- Exhibit I-4 reveals that the largest percent increase in EDP budget between 1980 and 1981 will be for minicomputers.
  - However, this category represents the lowest percent of total budget of all of the items.
  - Personnel represents over half of the EDP budget, and will continue to increase that portion in 1981.
- More than two-thirds of the respondents reported that they expected to be unaffected by the 1980 recession.
  - Exhibit I-5 shows that, for those who are affected, the reduction will have a relatively minor impact.
- Exhibit I-6 reveals that the largest group of respondents intends to reduce personnel recruiting and payrolls as the primary means of offsetting possible recession impacts.

### 3. MAJOR PLANS AND PROBLEMS

- As in the other industry sectors, the primary objective of the banking and finance industries in 1980 through 1982 will be to install on-line applications.
  - As shown in Exhibit I-7, the need to improve EDP personnel productivity is a high-priority item in 1980 and will become the second-highest-priority item by 1982.
- Exhibit I-8 shows that specific industry applications for the banking and finance sector have the highest relative importance for development in the future.

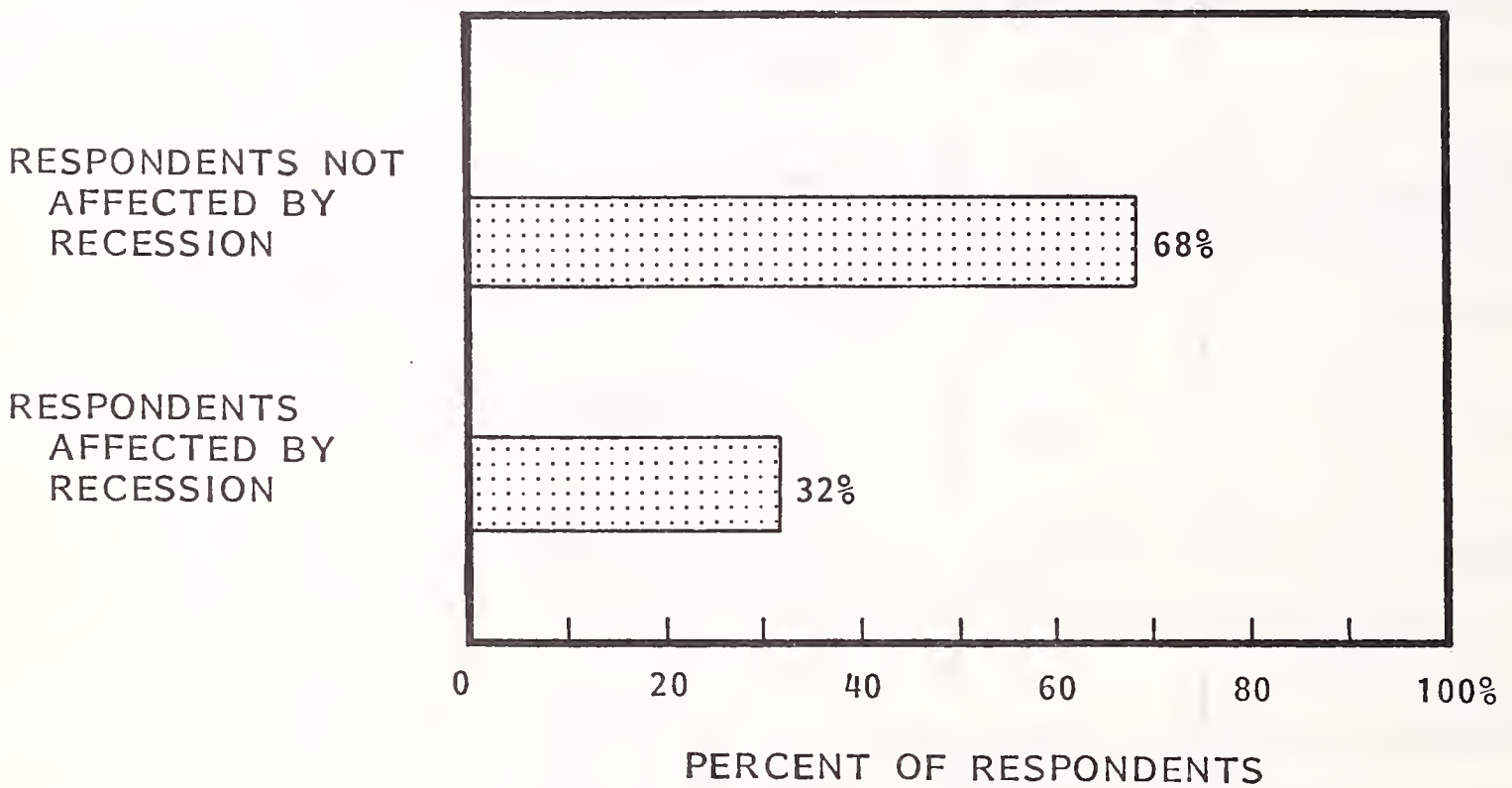
EXHIBIT I-4

ANTICIPATED CHANGES IN EDP BUDGETS  
IN THE BANKING AND FINANCE SECTOR

BUDGET CATEGORY	1980		PERCENT INCREASE (DECREASE) 1980-1981	1981	
	AVERAGE BUDGET (\$ THOUSAND)	PERCENT OF TOTAL BUDGET		AVERAGE BUDGET (\$ THOUSAND)	PERCENT OF TOTAL BUDGET
PERSONNEL	\$1,901	52.0%	9.8%	\$2,087	52.5%
MAINFRAME PROCESSORS	433	11.9	5.6	457	11.5
PERIPHERALS	387	10.6	8.1	418	10.5
MINICOMPUTERS	38	1.0	37.2	52	1.3
TERMINALS	137	3.7	11.4	152	3.8
COMMUNICATIONS HARDWARE AND SOFTWARE	98	2.7	7.9	105	2.6
SOFTWARE	79	2.2	6.1	84	2.2
VENDOR MAINTENANCE	134	3.7	7.8	145	3.6
PROCESSING SERVICES	62	1.7	(5.7)	58	1.5
SUPPLIES AND OTHER	385	10.5	9.0	419	10.5
TOTAL	\$3,654	100.0%	8.9%	\$3,977	100.0%

EXHIBIT I-5

EFFECTS OF RECESSION ON EDP BUDGETS  
IN THE BANKING AND FINANCE SECTOR



AVERAGE PERCENT  
BUDGET REDUCTION FOR  
THOSE AFFECTED BY RECESSION: 13.3%

EXHIBIT I-6

BUDGET AREAS IMPACTED BY POSSIBLE  
RECESSION IN 1980 FOR RESPONDENTS IN THE  
BANKING AND FINANCE SECTOR

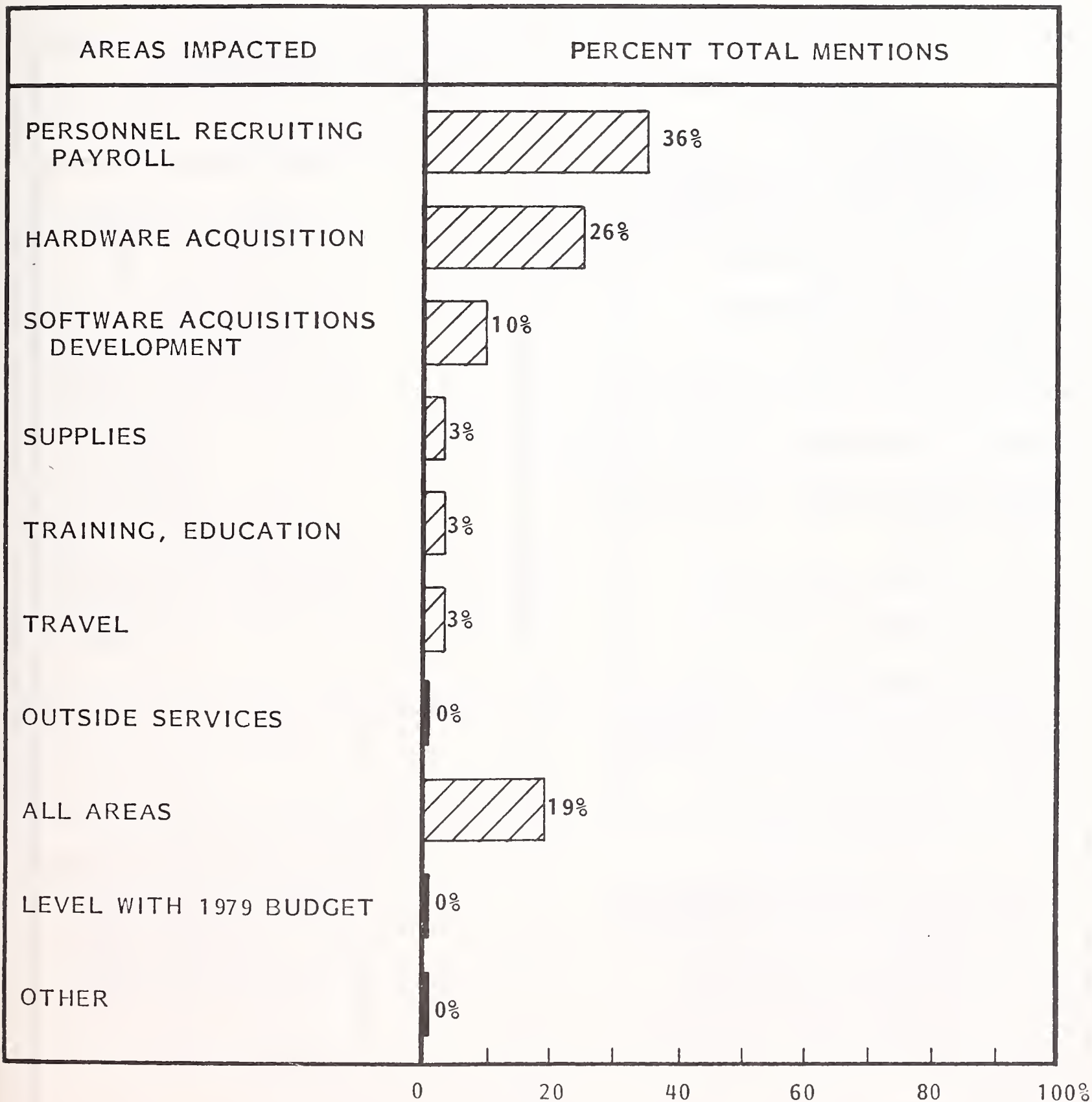


EXHIBIT I-7

EDP OBJECTIVES FOR RESPONDENTS IN THE  
BANKING AND FINANCE SECTOR

OBJECTIVE	RELATIVE IMPORTANCE		
	1980	1981	1982
INSTALL ON-LINE APPLICATIONS	100%	100%	100%
CONVERT APPLICATIONS	77	52	45
IMPROVE EDP PERSONNEL PRODUCTIVITY	76	56	61
DEVELOP LONG-RANGE EDP PLAN	53	35	34
DEVELOP NEW BATCH APPLICATIONS	52	61	51
MEET DEVELOPMENT, CONVERSION SCHEDULES	63	47	56
INSTALL NEW MAINFRAME	33	33	26
DESIGN, INSTALL DBMS	28	34	44
CHANGE OPERATING SYSTEMS	44	7	5
DESIGN, INSTALL DDP NETWORK	4	12	21
INSTALL NEW PERIPHERALS	24	12	22
INSTALL MINICOMPUTERS	6	7	13
INTEGRATE OFFICE AUTOMATION WITH EDP	6	10	26
CENTRALIZE EDP CONTROL	2	13	9
DECENTRALIZE EDP CONTROL	1	1	5
OTHER	17	8	5



EXHIBIT I-8

APPLICATIONS TO BE DEVELOPED BY  
RESPONDENTS IN THE BANKING AND FINANCE SECTOR

APPLICATION	RELATIVE IMPORTANCE	PERCENT OF MENTIONS AS HIGHEST PRIORITY
ACCOUNTING/FINANCE	69	41%
INVENTORY CONTROL	7	-
ORDER ENTRY/BILLING	6	4
PERSONNEL	22	3
PURCHASING	-	-
MARKETING/SALES	9	2
MODELING/FORECASTING	20	1
PERFORMANCE MEASUREMENT/CONTROL	21	1
OTHER**	100	48
TOTAL	-	100%

\*\*SPECIFIC APPLICATIONS INCLUDE:

- MORTGAGE SERVICING
- ON-LINE DEPOSIT SYSTEMS, ATM
- MONEY TRANSFER
- NEW ACCOUNT TYPES (NOW, VRM, CD)
- FOREIGN EXCHANGE
- COMMERCIAL LOAN SYSTEM
- CENTRAL CUSTOMER INFORMATION SYSTEM

- As might be expected in this industry, accounting/finance also has a high relative importance rating and is second highest in percent of priority mentions.
- EDP managers in this sector believe that programming aids will be utilized to improve time and costs associated with applications development.
  - Exhibit I-9 reveals that this industry is not opposed to purchasing software products to achieve its objectives. Since there are many well-proven financial software packages available, this high rating is not unexpected for this industry.
- Exhibit I-10 indicates that respondents in the banking and finance sector generally expect to achieve between 11% and 50% improvement through measures that are being taken to reduce program development time and costs.
- The shortage of qualified EDP personnel clearly stands as the most significant EDP problem in the banking and finance sector. Recruiting and training have the highest relative importance, as shown in Exhibit I-11.
- Exhibit I-12 shows that the computer equipment is applied to production activity for nearly 70% of the time. This is slightly higher than most other industry sectors.
  - Nearly two-thirds of the programming personnel are assigned to existing program maintenance and enhancement of existing programs.
- Exhibit I-13 shows that the Data Processing Division of IBM has over half of the total mainframe installations.
  - Burroughs ranks second, with 12.8% of the installations.
- As expected, IBM 4300 series represents over two-thirds of the mainframes on order.

EXHIBIT I-9

METHODS USED TO IMPROVE TIME AND COSTS  
ASSOCIATED WITH APPLICATIONS DEVELOPMENT IN THE  
BANKING AND FINANCE SECTOR

METHOD	PERCENT OF MENTIONS
ON-LINE PROGRAMMING	17%
PURCHASED SOFTWARE PRODUCTS	14
STRUCTURED PROGRAMMING/DESIGN	4
PROJECT MANAGEMENT	6
IMPROVED TRAINING/BETTER QUALIFICATIONS	8
PROGRAMMING AIDS	30
DATA BASE MANAGEMENT SYSTEMS	1
OTHER	
- USER INVOLVEMENT IN DEVELOPMENT	5
- STANDARDIZED METHODS/SYSTEMS	2
- HARDWARE UPGRADE	3
- IMPROVED DOCUMENTATION	1
- CRT TERMINALS FOR PROGRAMMERS	4
- MISCELLANEOUS METHODS	5
- DO NOTHING/NO PLANS	-

EXHIBIT I-10

EXPECTED LEVEL OF IMPROVEMENT IN PROGRAM  
DEVELOPMENT FOR RESPONDENTS IN THE  
BANKING AND FINANCE SECTOR

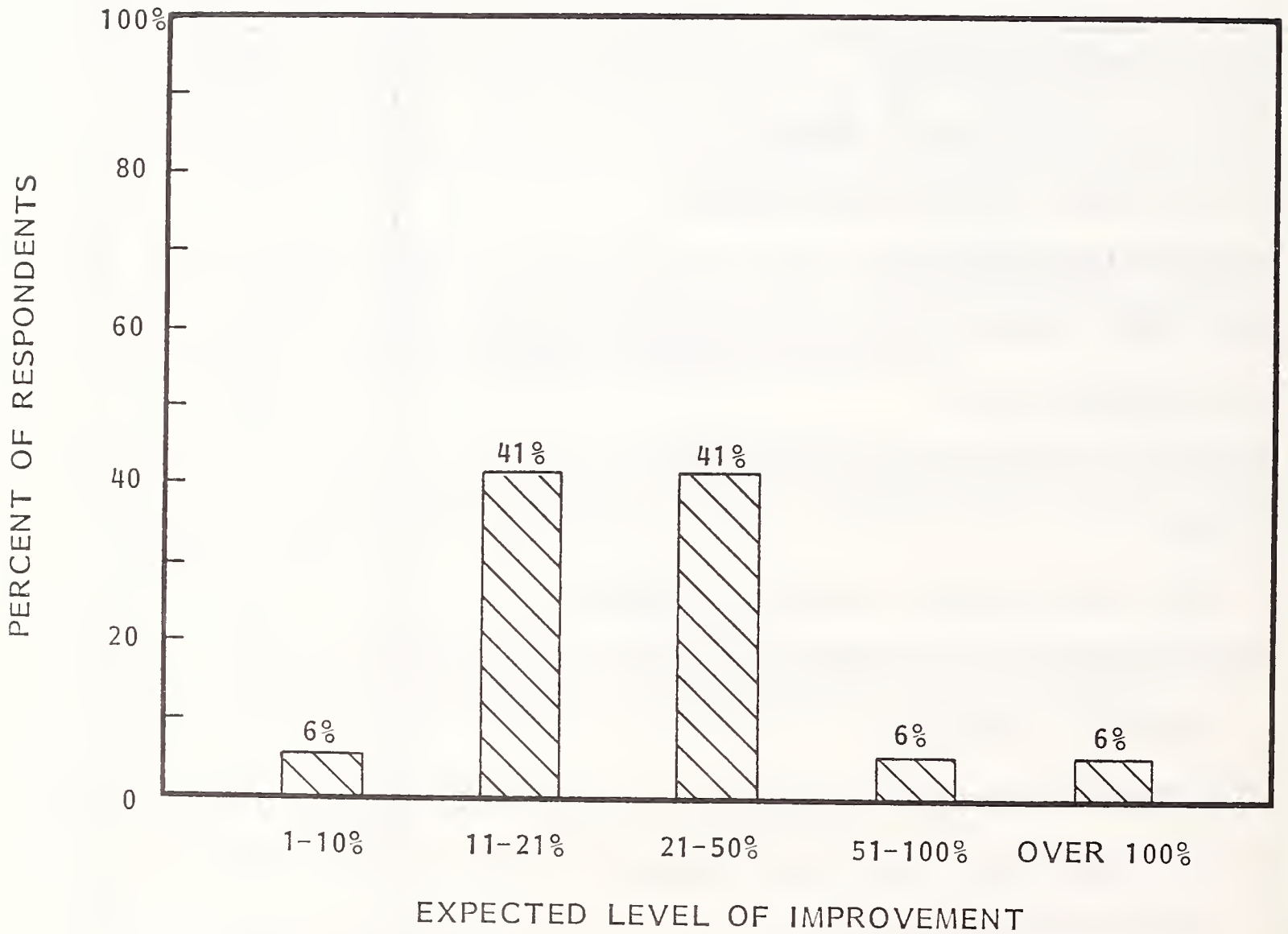


EXHIBIT I-11

MOST SIGNIFICANT EDP PROBLEMS IN THE  
BANKING AND FINANCE SECTOR

PROBLEM	RELATIVE IMPORTANCE	PERCENT OF MENTIONS AS HIGHEST PRIORITY
PERSONNEL RECRUITING	100	34%
NEED FOR BETTER PLANNING AND CONTROL	79	15
PERSONNEL TRAINING	81	6
LACK OF GENERAL MANAGEMENT UNDERSTANDING	47	11
LACK OF USER INVOLVEMENT IN SYSTEMS/APPLICATIONS DEVELOPMENT	52	6
NEED FOR IMPROVEMENT IN OPERATIONS	50	6
EXCESSIVE APPLICATIONS DEVELOPMENT TIME	40	7
INADEQUATE EDP FUNDING	14	3
INADEQUATE SYSTEMS SOFTWARE	33	5
NEED TO IMPROVE DATA COMMUNICATIONS	38	5
UNSATISFACTORY HARDWARE MAINTENANCE	7	0
OTHER	8	2

EXHIBIT I-12

USE OF RESOURCES IN THE  
BANKING AND FINANCE SECTOR

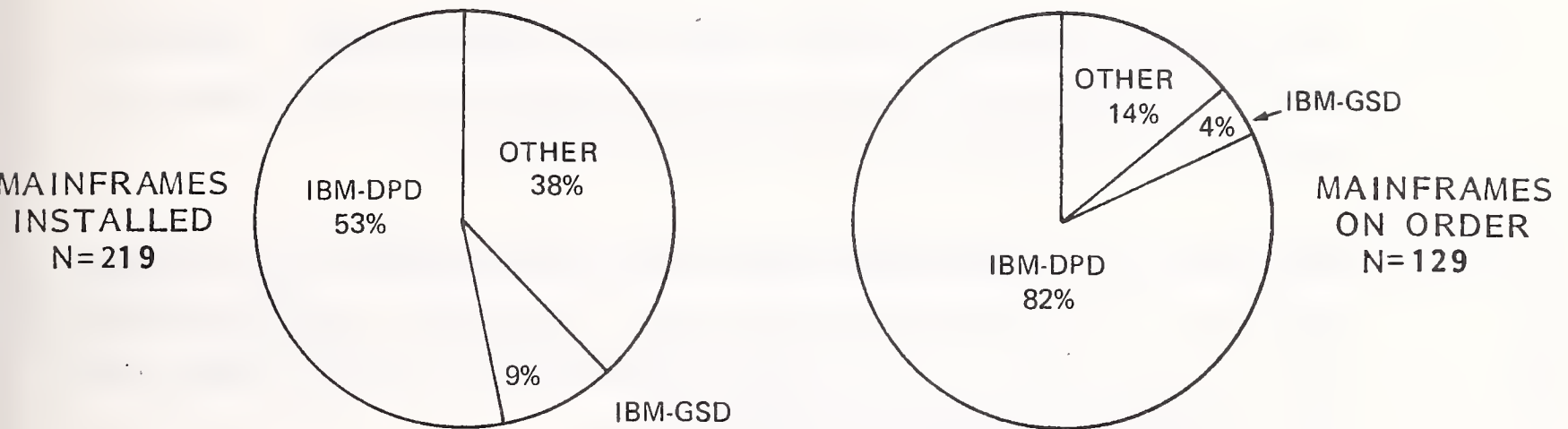
RESOURCE	APPLICATIONS	PERCENT OF USE
COMPUTER EQUIPMENT	PRODUCTION JOBS	69.6%
	NEW APPLICATIONS DEVELOPMENT	13.4
	EXISTING PROGRAM MAINTENANCE	12.6
	OTHER*	4.4
PROGRAMMING PERSONNEL	NEW PROGRAM DEVELOPMENT	35.9
	EXISTING PROGRAM MAINTENANCE	34.7
	ENHANCEMENT OF EXISTING PROGRAMS	29.4

\*OTHER MENTIONS INCLUDE:

- SYSTEM UTILITIES
- RESEARCH
- CONVERSION

EXHIBIT I-13

MAINFRAME EDP HARDWARE PROFILE IN THE  
BANKING AND FINANCE SECTOR



MAINFRAME	INSTALLED			ON ORDER		
	NUMBER OF RESPONSES	NUMBER OF SYSTEMS	PERCENT	NUMBER OF RESPONSES	NUMBER OF SYSTEMS	PERCENT
IBM 3033	9	15	6.8%	3	3	2.3%
IBM 3033N	0	0	0.0	6	6	4.7
IBM 3032	2	2	0.9	0	0	0.0
IBM 3031	10	12	5.5	3	3	2.3
IBM 370 158-168	22	32	14.6	0	0	.0
IBM 4331	3	3	1.4	17	32	24.8
IBM 4341	1	2	0.9	34	60	46.5
IBM 8100	0	0	0.0	1	2	1.6
IBM OTHER 370	34	47	21.5	0	0	0.0
IBM OTHER 360	2	4	1.8	0	0	0.0
SUBTOTAL IBM-DPD	83	117	53.4%	64	106	82.2%
IBM SYSTEMS 1, 3, 32, 34	9	20	9.1%	3	5	3.9%
IBM SYSTEMS 38	0	0	0.0	0	0	0.0
SUBTOTAL IBM-GSD	9	20	9.1%	3	5	3.9%
BURROUGHS	24	28	12.8%	4	4	3.1%
CDC	2	3	1.4	0	0	0.0
DEC	3	7	3.2	0	0	0.0
DATAPPOINT	4	10	4.6	1	1	0.8
HONEYWELL	2	3	1.4	1	1	0.8
HEWLETT-PACKARD	2	4	1.8	1	3	2.3
NCR	5	8	3.7	2	2	1.6
OTHER	13	19	8.6	3	7	5.3
SUBTOTAL	55	82	37.5%	12	18	13.9%
TOTAL	147	219	100.0%	79	129	100.0%

- Burroughs appears to be losing market share, with only 3% of the total mainframes on order.
- While almost two-thirds of the banking and finance sector respondents reported having one or more minicomputers installed, only 10% reported the installation of microcomputers, as shown in Exhibit I-14.
- More than twice as many nonintelligent terminals are installed than intelligent terminals. Furthermore, the growth rate of installations expected between 1980 and 1981 favors a continuation of nonintelligent terminals' domination over intelligent terminals in this industry sector.

#### 4. KEY ISSUE STATUS REVIEW

- The most important EDP development objective in 1980 includes the implementation and development of new applications and on-line applications.
  - Exhibit I-15 shows that plans to improve productivity and/or operations are also an important objective for banking and finance installations.
- Exhibit I-16 shows the investment made in upgrading personnel through training expenditures.
  - Although the expenditure level for technical training and the percentage of staff attending technical development activities is higher than for management training, management represents a higher percentage in this industry than that reported for many other industry sectors.
  - Exhibit I-16 shows that the average expenditure for in-house training is less than that for training performed on the outside for both management and technical personnel.



EXHIBIT I-14

NON-MAINFRAME EDP HARDWARE PROFILE IN THE BANKING AND FINANCE SECTOR

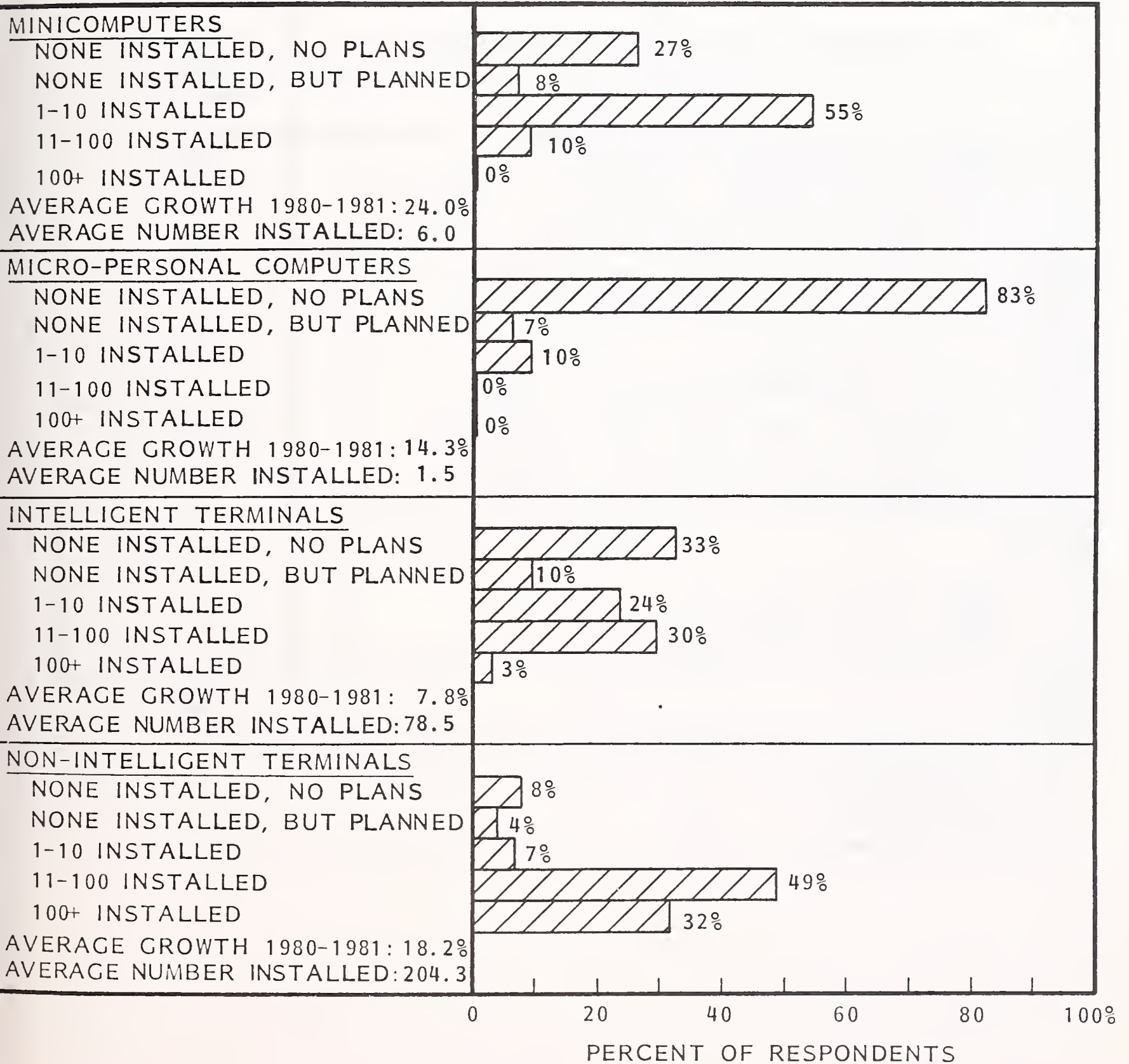


EXHIBIT I-15

MOST IMPORTANT DEVELOPMENT OBJECTIVE  
IN THE BANKING AND FINANCE SECTOR

MOST IMPORTANT EDP DEVELOPMENT OBJECTIVE IN 1980	PERCENT OF TOTAL MENTIONS
DATA BASE DEVELOPMENT	14%
DESIGN OR INSTALL DDP	1
IMPLEMENT/DEVELOP NEW APPLICATIONS	20
IMPLEMENT/DEVELOP ON-LINE APPLICATIONS	14
INSTALL OR UPGRADE MAINFRAME	6
INSTALL MINICOMPUTERS	-
INSTALL OR CONVERT OPERATING SYSTEMS	6
DESIGN/DEVELOP COMMUNICATIONS NETWORK	10
CENTRALIZE OR DECENTRALIZE DP OPERATIONS	2
PLAN/IMPROVE PRODUCTIVITY AND/OR OPERATIONS	17
OTHER	
- REWRITE SOFTWARE	6
- MISCELLANEOUS RESPONSES*	4
TOTAL	100%

\*SPECIFIC RESPONSES INCLUDE:

- CPU INDEPENDENCE
- BRING DP IN-HOUSE
- CONVERT TERMINALS

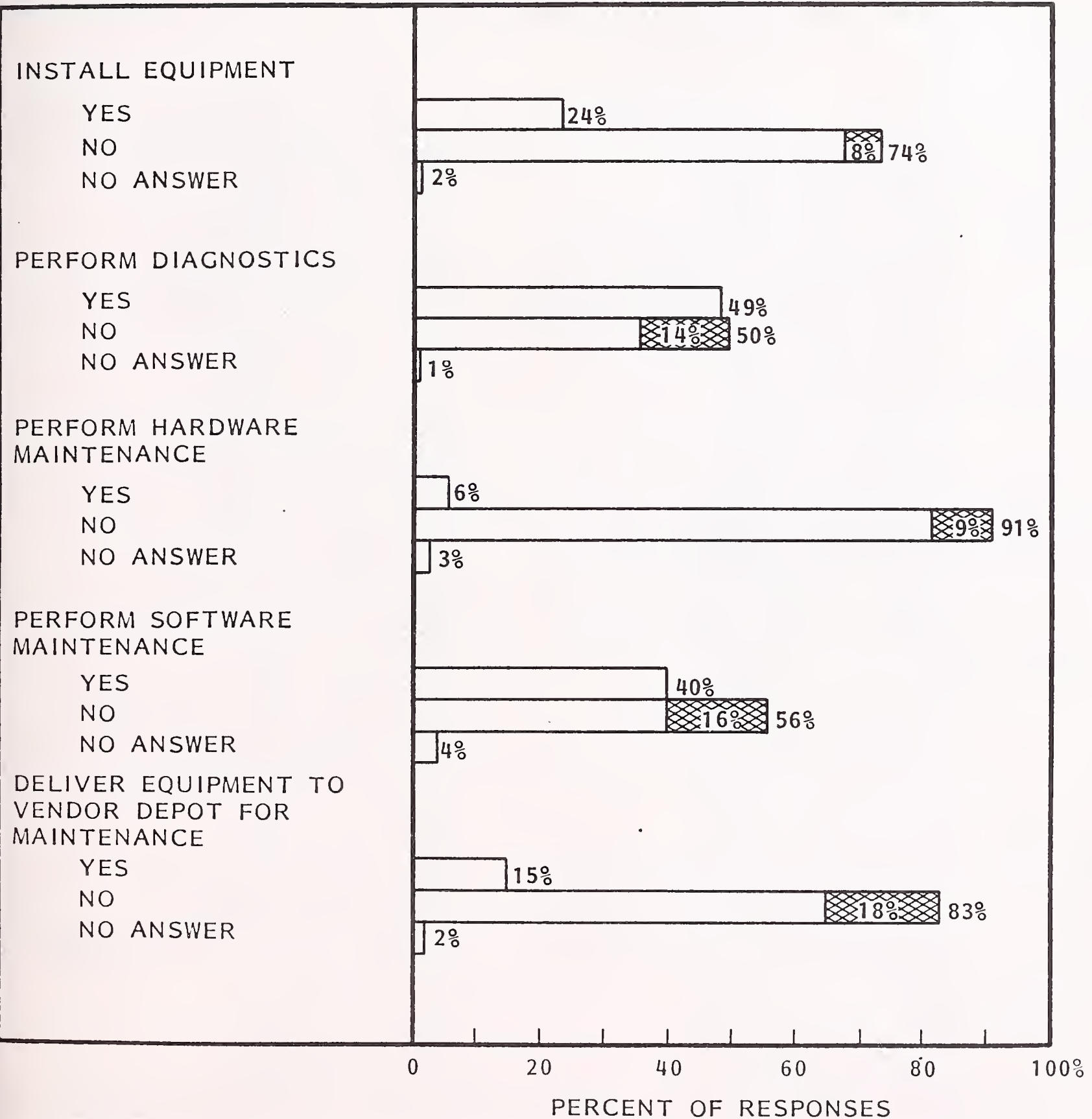
EXHIBIT I-16

TRAINING EXPENDITURES IN THE  
BANKING AND FINANCE SECTOR

TYPE OF TRAINING	AVERAGE EXPENSE	AVERAGE EXPENDITURE PER EDP EMPLOYEE	PERCENT OF STAFF ATTENDING	AVERAGE EXPENSE PER ATTENDEE
IN-HOUSE MANAGEMENT TRAINING	\$ 4,533	\$ 49	35.4%	\$318
OUTSIDE MANAGEMENT TRAINING	6,356	68		
IN-HOUSE TECHNICAL TRAINING	11,984	129	47.0	606
OUTSIDE TECHNICAL TRAINING	18,788	202		
TOTAL	\$41,661	\$448	-	-

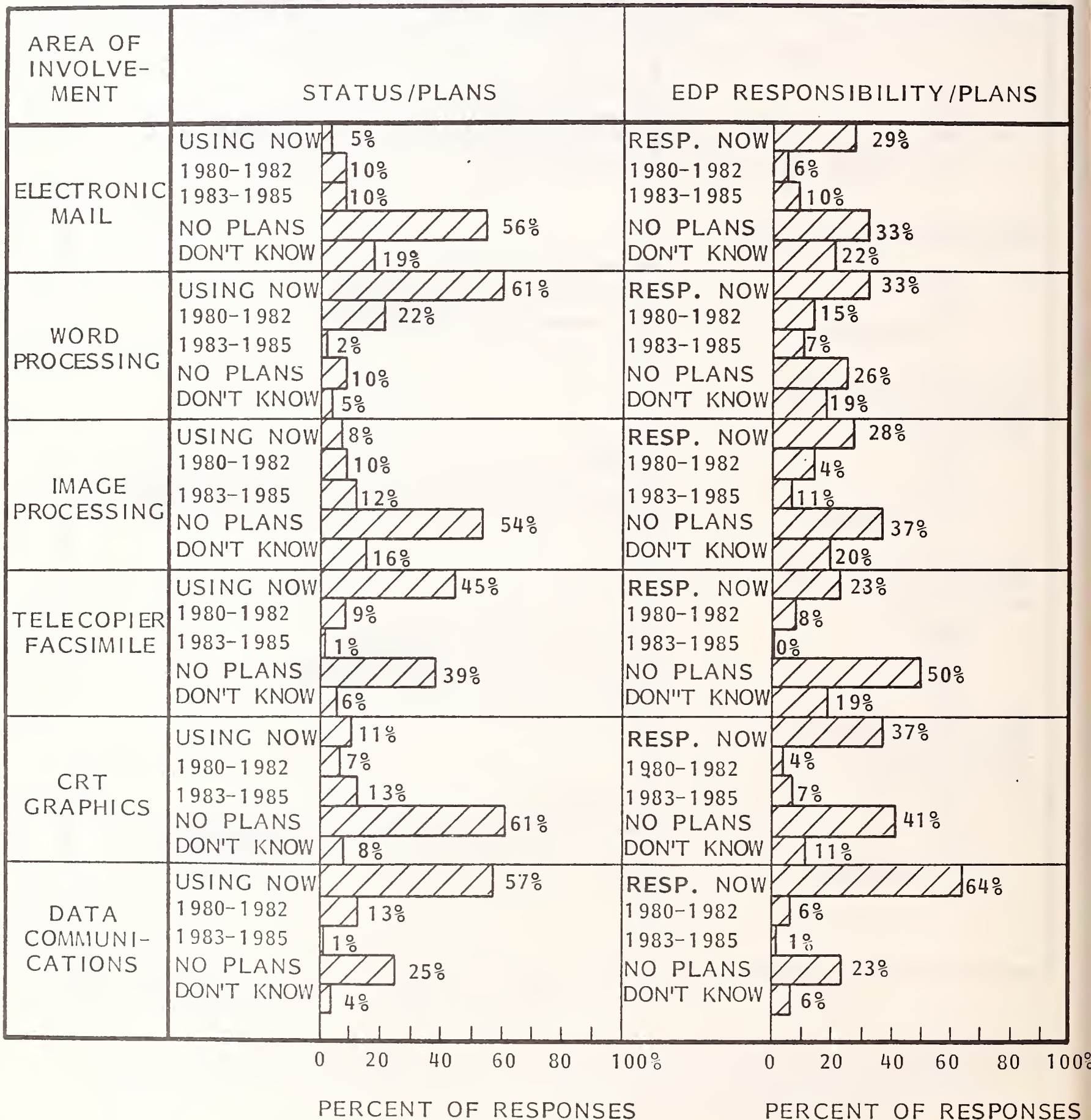
- Exhibit I-17 shows that the majority of maintenance tasks are performed by outside services in the banking and finance sector, with the exception of diagnostics.
- While word processing and data communications are currently in use by more than 50% of the respondents, very low levels of electronic mail, image processing and computer graphics are being used in this industry.
  - Exhibit I-18 shows the distribution of the status of these areas of involvement, and the degree of EDP responsibility for them.

EXHIBIT I-17  
 DEGREE OF USER SELF-MAINTENANCE  
 IN THE BANKING AND FINANCE SECTOR



NOTE: [Cross-hatched box] INDICATES PERCENT OF RESPONDENTS NOT CURRENTLY PERFORMING FUNCTION, BUT WHO WOULD CONSIDER DOING SO

EXHIBIT I-18  
 RESPONDENT INVOLVEMENT IN OFFICE AUTOMATION  
 IN THE BANKING AND FINANCE SECTOR



1980 ANALYSIS OF EDP IN DISCRETE MANUFACTURING





## DISCRETE MANUFACTURING

### I. INDUSTRY SECTOR OVERVIEW

- The discrete manufacturing sector includes the apparel, furniture, printing, leather, fabricated metal products, machinery, equipment, instrument and miscellaneous manufacturing industries as defined by SIC 23, 25, 27, 31 and 34 through 39. This industry sector is characterized by companies that manufacture products sold as units (e.g., automobiles and calculators) rather than bulk products such as petroleum or cement. Of the total INPUT user survey responses, 19.5% are in this industry sector.
- Characteristics of discrete manufacturing include:
  - Very high numbers of total employees, exceeding 15 million in 1978, or 17% of the total civilian workforce.
  - A wide variation in the implementation of technology. Subsectors such as apparel have relatively low levels, while the printing industry has a moderate technology level. The highest levels of all industries are found in the electronics subsector.
  - Management styles vary widely within subsectors. This condition has a major impact upon the levels of EDP implementation within each organization.

- The largest industry subsector is transportation equipment, with revenues totaling approximately 25% of the total discrete manufacturing sector. The automotive industry dominates this subsector.
- Sharply rising costs of labor and materials put heavy pressure upon the industry to raise their prices. Improvements in productivity are regarded as necessary to remain competitive. Technology is considered one of the main means of obtaining improvements in productivity.
- Electronics companies in particular are using technology to reduce product prices.
- Exhibit I-1 shows the respondent profile characteristics for three size categories.
  - A total of 7.9% of the respondents failed to indicate their average annual sales. This group has an average of 6,292 employees, of which only 70 were EDP responsibility. However, the average EDP budget is over \$4 million, representing \$39,000 per EDP employee. The EDP budget per total employees is only \$352, about half the size of the budgets that were reported for the three categories that did report their sales volume.
  - Companies with \$100 million or less in sales volume exactly match last year's sample size, with 39% of the discrete manufacturing sector responses. The EDP budget as a percent of sales is 1.5%, the highest of the three size categories. The EDP budget per total number of employees is the lowest of the three size groups, with \$611 per employee.
  - The \$101 to \$999 million sales size is the largest category of respondents. The ratio of EDP employees to total employees is the highest of the size comparisons, yet the EDP budget as a percent of annual sales is the lowest, at 1.0%. The EDP budget per EDP employee is \$32,505,

EXHIBIT I-1

RESPONDENT PROFILE - DISCRETE MANUFACTURING SECTOR

PROFILE CHARACTERISTIC	COMPANY SIZE IN TERMS OF ANNUAL SALES			
	\$100 MILLION OR LESS	\$101-999 MILLION	\$1 BILLION OR MORE	NO SIZE DATA
PERCENT OF TOTAL RESPONDENTS	39.0%	42.9%	10.2%	7.9%
AVERAGE ANNUAL SALES (\$ MILLION)	\$ 56.3	\$ 357.6	\$6,636.2	-
AVERAGE TOTAL EMPLOYEES	1,396	5,495	95,794	6,292
AVERAGE EDP EMPLOYEES	20	114	1308	70
EDP EMPLOYEES PER 100 TOTAL EMPLOYEES	1.5	2.1	1.4	1.1
AVERAGE EDP BUDGET (\$ THOUSAND)	\$ 844	\$ 3,695	\$ 81,161	\$ 4,071
EDP BUDGET AS A PERCENT OF ANNUAL SALES	1.5%	1.0%	1.2%	-
EDP BUDGET PER EDP EMPLOYEE	\$41,672	\$32,505	\$ 60,761	\$39,000
EDP BUDGET PER TOTAL NUMBER OF EMPLOYEES	\$ 611	\$ 651	\$ 894	\$ 352

close to the \$30,526 value that was reported in this size category in the 1979 report.

- Respondents having \$1 billion or more in annual sales average 1,308 EDP employees in each company. The rate of EDP employees to total employees is 1.4%, the lowest of the three size categories. But the EDP budget per EDP employee is the highest of the categories, at \$60,761. Also the EDP budget per total number of employees is nearly 50% greater than the same ratio for the smaller-sized companies. This reflects the relatively greater utilization of EDP resources within the largest companies compared to smaller companies.

## 2. BUDGET AND EXPENDITURE ANALYSIS

- Exhibit I-2 shows a normal distribution of EDP budgets. Compared to the 1979 distribution, the range is less peaked and has shifted downwards to the 0.6 to 0.9 range from the 1979 peak of 0.9 to 1.2 as a percent of total company sales.
- Actual EDP budget growth in the discrete manufacturing sector was reported to be between 10% and 20% for nearly 40% of the respondents.
  - More than half of the organizations anticipate that the budget increase will continue to be in the 10-20% range in 1981.
  - As shown in Exhibit I-3, more than 10% of the respondent organizations have budgeted more than a 30% increase in EDP expenditures in 1980 compared with 1979. This large increase reflects the major investments that rapid-growth industries such as electronics are making in the development of EDP capability.
  - The recession appears not to have reduced EDP expenditure plans for 1980, and will actually stimulate growth in 1981 as the economy recovers its momentum.

EXHIBIT I-2

RATIO OF EDP BUDGET TO COMPANY SALES:  
DISTRIBUTION OF RATIOS AMONG RESPONDENTS IN THE  
DISCRETE MANUFACTURING SECTOR

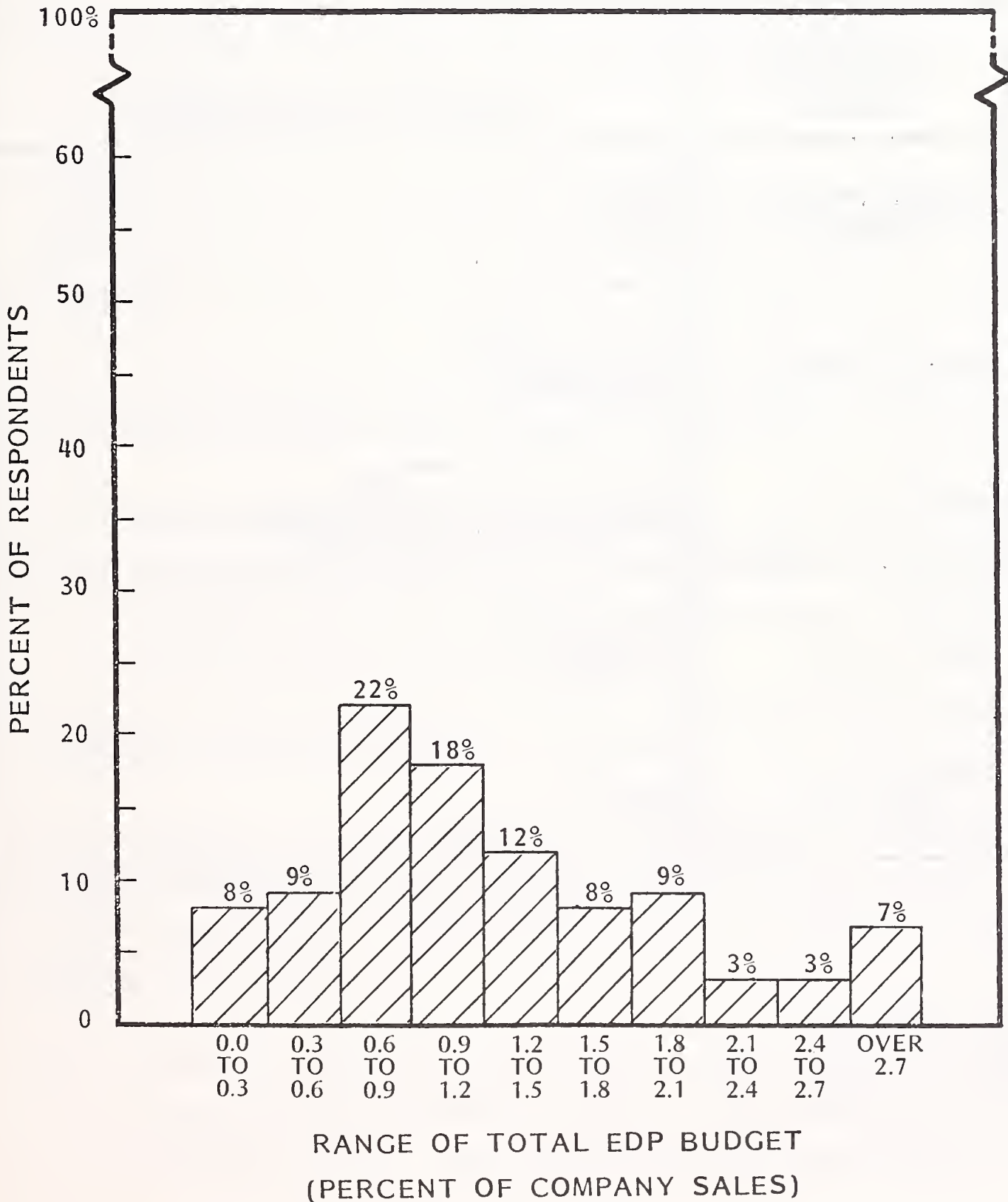
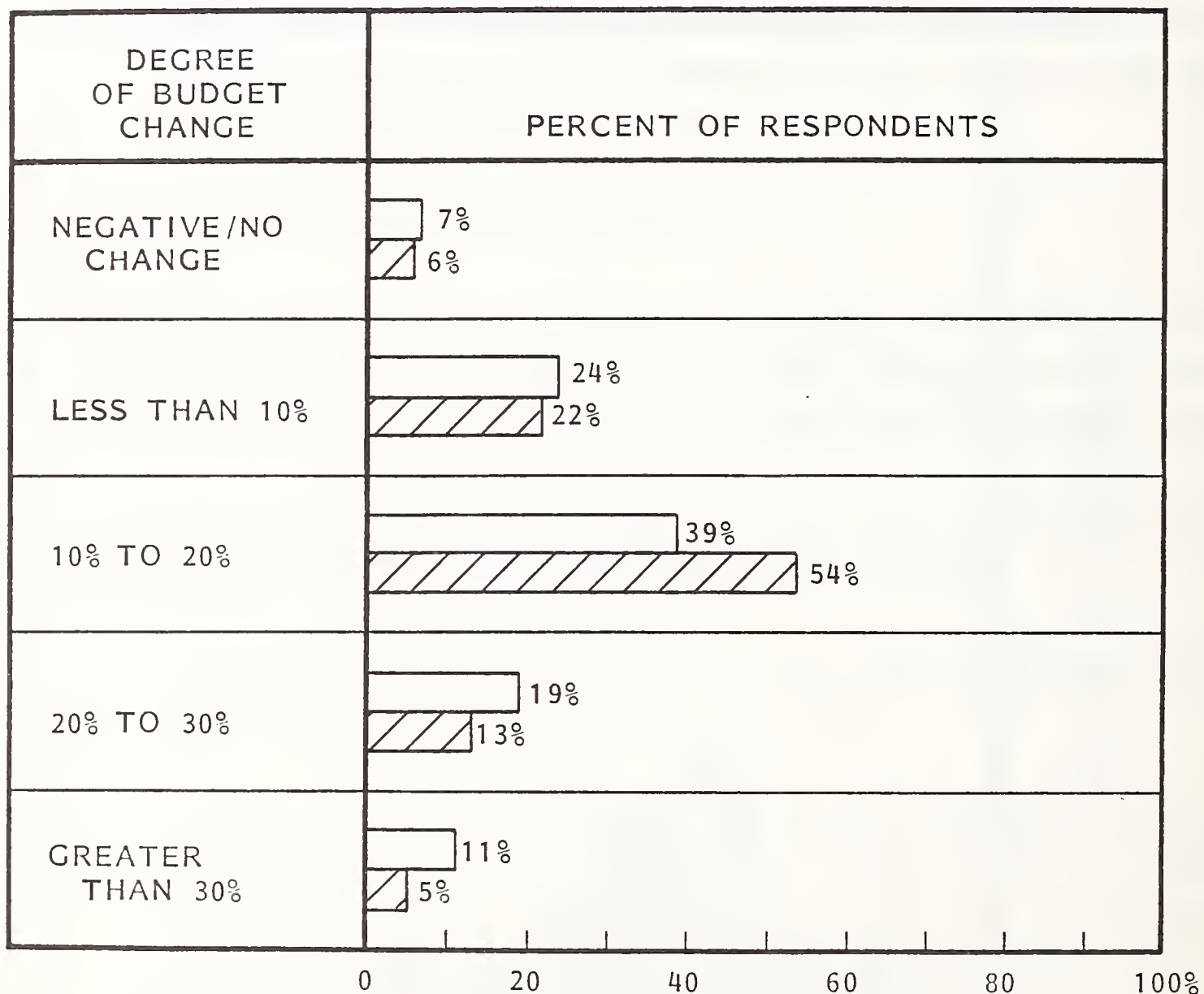


EXHIBIT I-3

ACTUAL AND PLANNED EDP BUDGET GROWTH  
FOR RESPONDENTS IN THE DISCRETE MANUFACTURING SECTOR



□ 1979-1980  
 ▨ 1980-1981

- Exhibit I-4 shows that the budget for personnel, at 43.2% of the total EDP budget, is nearly three times greater than any of the other listed categories.
  - In 1981, the personnel budget is expected to grow to an even greater proportion of the total. This reflects the increasing severity of the shortage of technically qualified EDP personnel, particularly experienced programmers.
  - Communications expenditures have the greatest percentage budget increase of all categories, but will only represent slightly over 5% of the total budget for 1981.
- Fewer than one-third of the discrete manufacturing industry sector respondents reported that their EDP budgets had been affected by the 1980 recession.
  - Those who were affected reduced the EDP budget by an average of 12% from the previous year, as shown in Exhibit I-5.
  - Exhibit I-6 shows that budget reductions were made primarily by reducing personnel additions and payroll increases, but with secondary reductions throughout all EDP expenditure areas. Outside service expenditures were not affected at all.

### 3. MAJOR PLANS AND PROBLEMS

- The installation of on-line applications is far ahead of any other objective between 1980 and 1982 in the discrete manufacturing industry sector. Applications developments also rank second in relative importance in 1980, but decline in 1981 and 1982.
  - Exhibit I-7 shows that improvement of EDP personnel productivity ranks third in importance in 1980, but will move to a solid second position by 1982. This reflects increasing proportions of budget

## EXHIBIT I-4

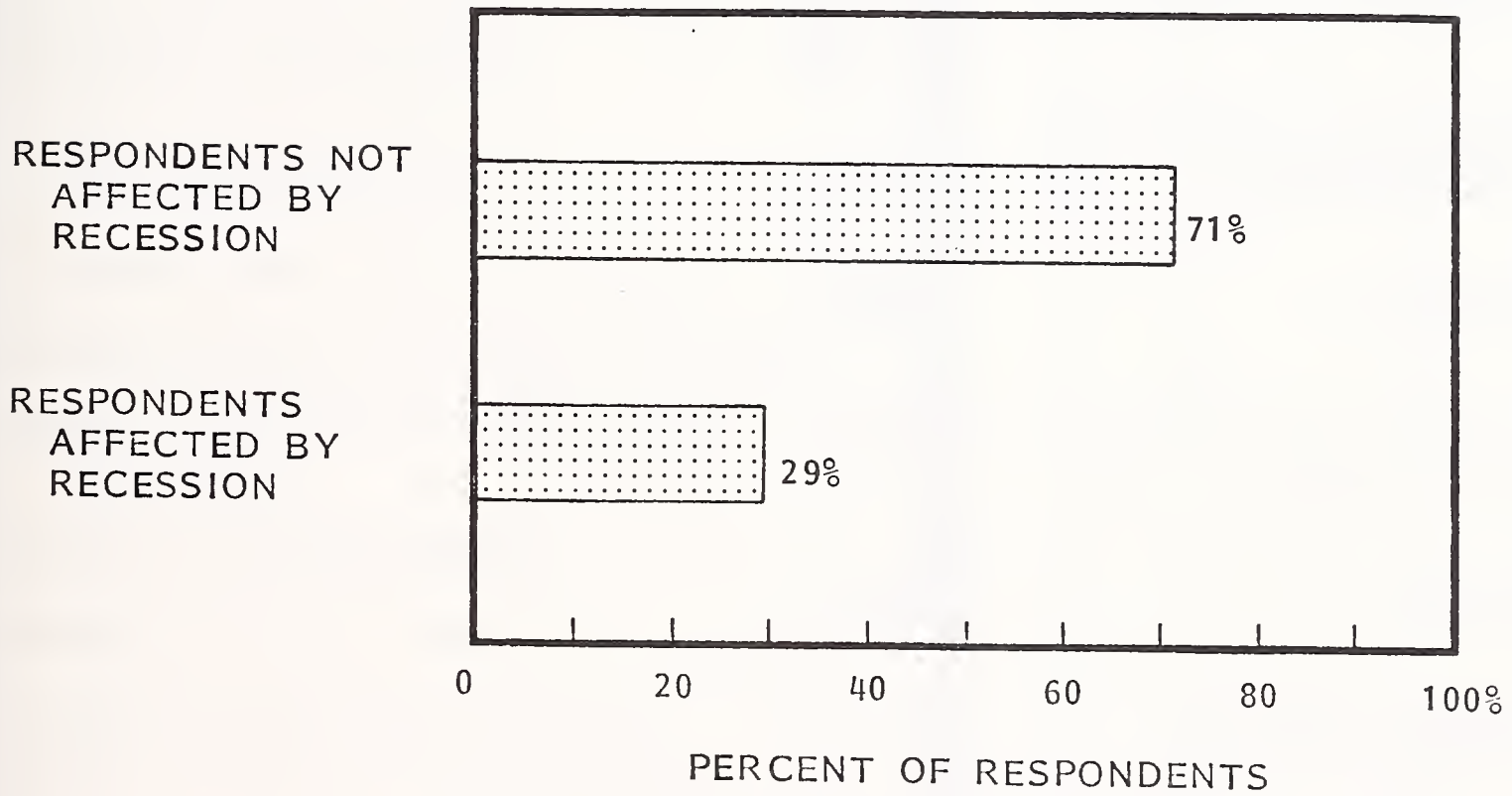
ANTICIPATED CHANGES IN EDP BUDGETS  
IN THE DISCRETE MANUFACTURING SECTOR

BUDGET CATEGORY	1980		PERCENT INCREASE (DECREASE) 1980-1981	1981	
	AVERAGE BUDGET (\$ THOUSAND)	PERCENT OF TOTAL BUDGET		AVERAGE BUDGET (\$ THOUSAND)	PERCENT OF TOTAL BUDGET
PERSONNEL	\$1,527	43.2%	8.7%	\$1,660	44.1%
MAINFRAME PROCESSORS	555	15.7	3.3	573	15.2
PERIPHERALS	328	9.3	0.0	328	8.7
MINICOMPUTERS	153	4.3	5.1	160	4.3
TERMINALS	165	4.7	3.8	171	4.5
COMMUNICATIONS HARDWARE AND SOFTWARE	173	4.8	11.8	193	5.1
SOFTWARE	86	2.4	6.9	92	2.4
VENDOR MAINTENANCE	136	3.9	8.5	148	3.9
PROCESSING SERVICES	86	2.4	3.4	89	2.4
SUPPLIES AND OTHER	328	9.3	7.7	353	9.4
TOTAL	\$3,537	100.0%	6.5%	\$3,767	100.0%



EXHIBIT I-5

EFFECTS OF RECESSION ON EDP BUDGETS  
IN THE DISCRETE MANUFACTURING SECTOR



AVERAGE PERCENT  
BUDGET REDUCTION FOR  
THOSE AFFECTED BY RECESSION: 12.0%

EXHIBIT I-6

BUDGET AREAS IMPACTED BY POSSIBLE  
RECESSION IN 1980 FOR RESPONDENTS IN THE  
DISCRETE MANUFACTURING SECTOR

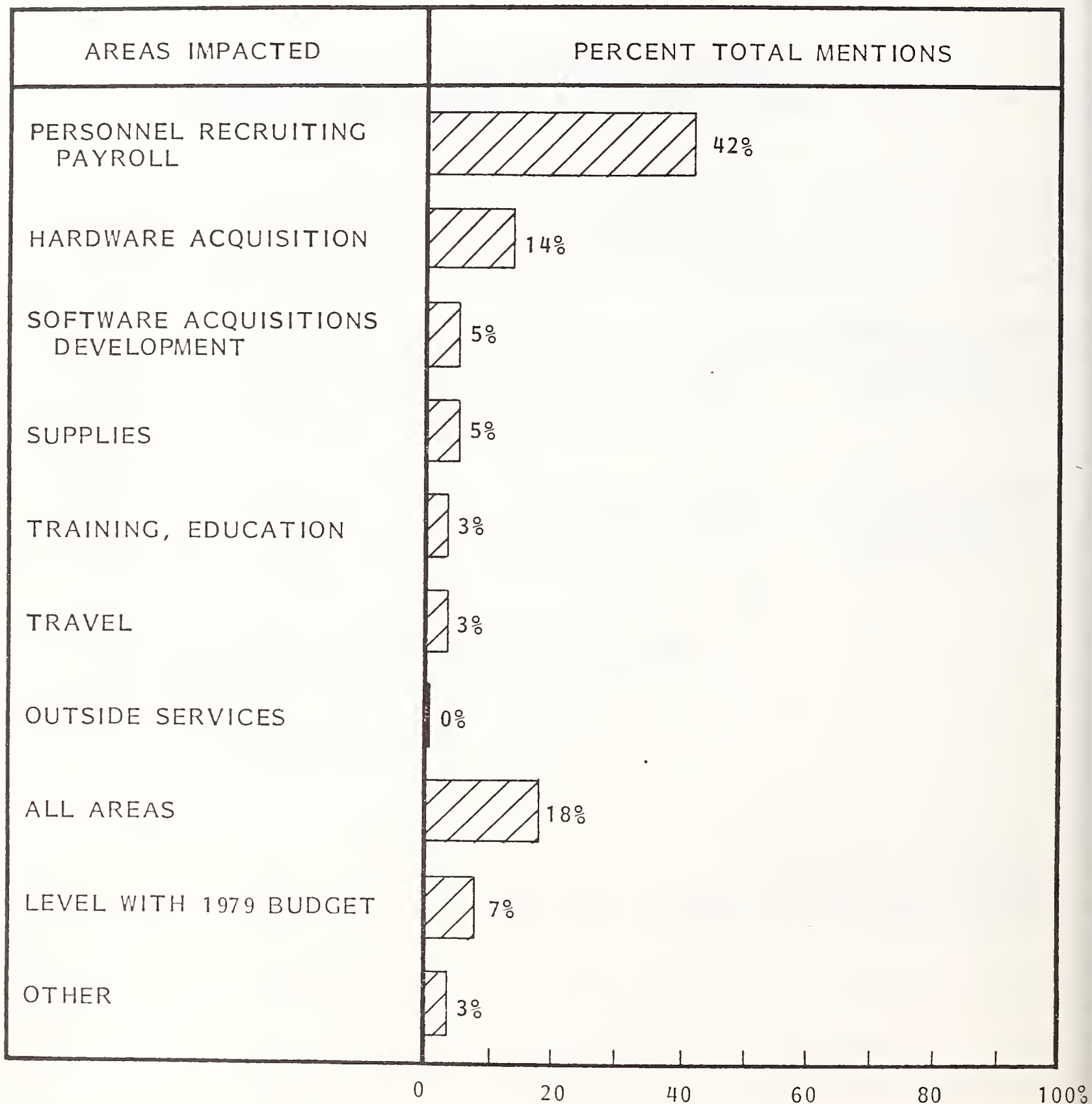


EXHIBIT I-7

EDP OBJECTIVES FOR RESPONDENTS IN THE  
DISCRETE MANUFACTURING SECTOR

OBJECTIVE	RELATIVE IMPORTANCE		
	1980	1981	1982
INSTALL ON-LINE APPLICATIONS	100%	100%	100%
CONVERT APPLICATIONS	46	32	30
IMPROVE EDP PERSONNEL PRODUCTIVITY	41	42	44
DEVELOP LONG-RANGE EDP PLAN	43	27	31
DEVELOP NEW BATCH APPLICATIONS	40	39	33
MEET DEVELOPMENT, CONVERSION SCHEDULES	39	32	37
INSTALL NEW MAINFRAME	40	31	22
DESIGN, INSTALL DBMS	43	38	28
CHANGE OPERATING SYSTEMS	21	7	3
DESIGN, INSTALL DDP NETWORK	27	29	32
INSTALL NEW PERIPHERALS	9	15	12
INSTALL MINICOMPUTERS	19	14	17
INTEGRATE OFFICE AUTOMATION WITH EDP	7	14	27
CENTRALIZE EDP CONTROL	13	10	8
DECENTRALIZE EDP CONTROL	6	5	7
OTHER	7	10	9

expenditures for personnel (noted earlier), higher labor costs and, most importantly, an increasing shortage of skilled programmers.

- Integration of EDP with office automation, while of low priority in 1980, will double in relative importance in 1981 and again in 1982, making this objective the one with the greatest rate of increasing importance between 1980 and 1982.
- Inventory control applications rank the highest in relative importance for development. Over one-third of the respondents gave this application the highest priority, as shown in Exhibit I-8.
- Exhibit I-9 shows that programming aids are considered to be the most helpful means of improving time and costs associated with applications development.
  - On-line programming is also a highly regarded applications development method.
  - The expected level of improvement most often mentioned by respondents is between 21% and 50%, as shown in Exhibit I-10.
- The problem of personnel recruitment continues to be of the highest in relative importance to EDP users.
  - Exhibit I-11 ranks 12 categories of problems by percentage of priority level as reported by the INPUT panel for discrete manufacturing.
- Exhibit I-12 summarizes the reported use of resources for both equipment and personnel.
  - Two-thirds of equipment use is devoted to production jobs. Of the remaining time, new applications development requires nearly 50% more equipment time than does existing program maintenance.

EXHIBIT I-8

APPLICATIONS TO BE DEVELOPED BY  
RESPONDENTS IN THE DISCRETE MANUFACTURING SECTOR

APPLICATION	RELATIVE IMPORTANCE	PERCENT OF MENTIONS AS HIGHEST PRIORITY
ACCOUNTING/FINANCE	78	18%
INVENTORY CONTROL	100	34
ORDER ENTRY/BILLING	70	16
PERSONNEL	24	1
PURCHASING	35	2
MARKETING/SALES	36	3
MODELING/FORECASTING	35	5
PERFORMANCE MEASUREMENT/CONTROL	23	2
OTHER**	54	19
TOTAL	-	100%

\*\*SPECIFIC APPLICATIONS INCLUDE:

- MANUFACTURING SYSTEM
- MATERIAL REQUIREMENTS PLANNING
- CUSTOMER SERVICE
- CAD/CAM
- SHOP FLOOR CONTROL
- PROCESS CONTROL
- ON-LINE RECEIVING
- ENGINEERING SOURCE PROGRAMMING

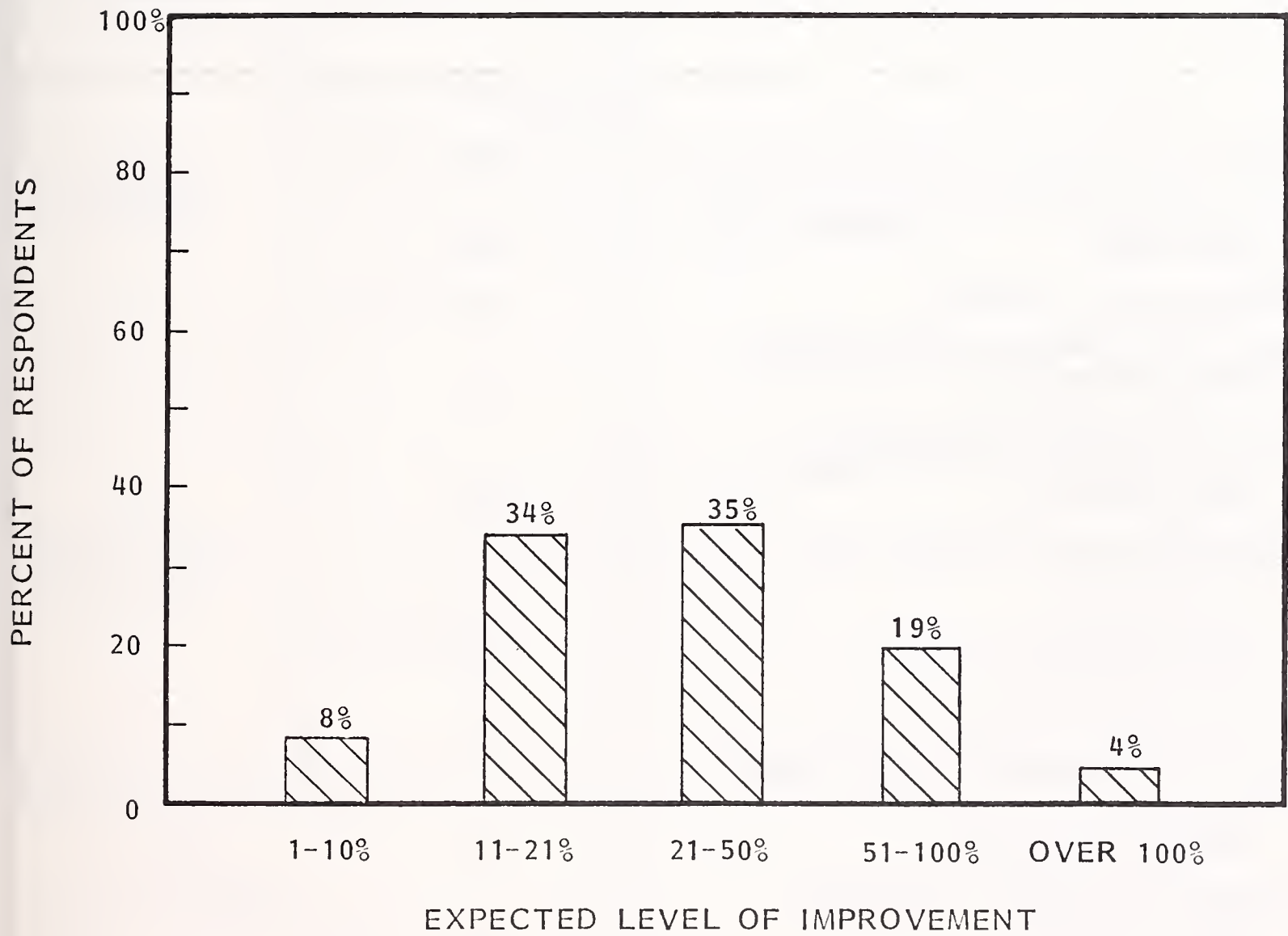
EXHIBIT 1-9

METHODS USED TO IMPROVE TIME AND COSTS  
ASSOCIATED WITH APPLICATIONS DEVELOPMENT IN THE  
DISCRETE MANUFACTURING SECTOR

METHOD	PERCENT OF MENTIONS
ON-LINE PROGRAMMING	21%
PURCHASED SOFTWARE PRODUCTS	8
STRUCTURED PROGRAMMING/DESIGN	10
PROJECT MANAGEMENT	5
IMPROVED TRAINING/BETTER QUALIFICATIONS	8
PROGRAMMING AIDS	25
DATA BASE MANAGEMENT SYSTEMS	4
OTHER	
- USER INVOLVEMENT IN DEVELOPMENT	2
- STANDARDIZED METHODS/SYSTEMS	1
- HARDWARE UPGRADE	3
- IMPROVED DOCUMENTATION	2
- CRT TERMINALS FOR PROGRAMMERS	3
- MISCELLANEOUS METHODS	6
- DO NOTHING/NO PLANS	2

EXHIBIT I-10

EXPECTED LEVEL OF IMPROVEMENT IN PROGRAM  
DEVELOPMENT FOR RESPONDENTS IN THE  
DISCRETE MANUFACTURING SECTOR



## EXHIBIT I-11

MOST SIGNIFICANT EDP PROBLEMS IN THE  
DISCRETE MANUFACTURING SECTOR

PROBLEM	RELATIVE IMPORTANCE	PERCENT OF MENTIONS AS HIGHEST PRIORITY
PERSONNEL RECRUITING	100	24%
NEED FOR BETTER PLANNING AND CONTROL	82	14
PERSONNEL TRAINING	87	13
LACK OF GENERAL MANAGEMENT UNDERSTANDING	63	13
LACK OF USER INVOLVEMENT IN SYSTEMS/APPLICATIONS DEVELOPMENT	62	8
NEED FOR IMPROVEMENT IN OPERATIONS	41	4
EXCESSIVE APPLICATIONS DEVELOPMENT TIME	48	7
INADEQUATE EDP FUNDING	26	1
INADEQUATE SYSTEMS SOFTWARE	28	5
NEED TO IMPROVE DATA COMMUNICATIONS	47	5
UNSATISFACTORY HARDWARE MAINTENANCE	13	1
OTHER	23	5



EXHIBIT I-12

USE OF RESOURCES IN THE DISCRETE  
MANUFACTURING SECTOR

RESOURCE	APPLICATIONS	PERCENT OF USE
COMPUTER EQUIPMENT	PRODUCTION JOBS	67.3%
	NEW APPLICATIONS DEVELOPMENT	17.9
	EXISTING PROGRAM MAINTENANCE	12.7
	OTHER*	2.1
PROGRAMMING PERSONNEL	NEW PROGRAM DEVELOPMENT	49.1
	EXISTING PROGRAM MAINTENANCE	30.2
	ENHANCEMENT OF EXISTING PROGRAMS	20.7

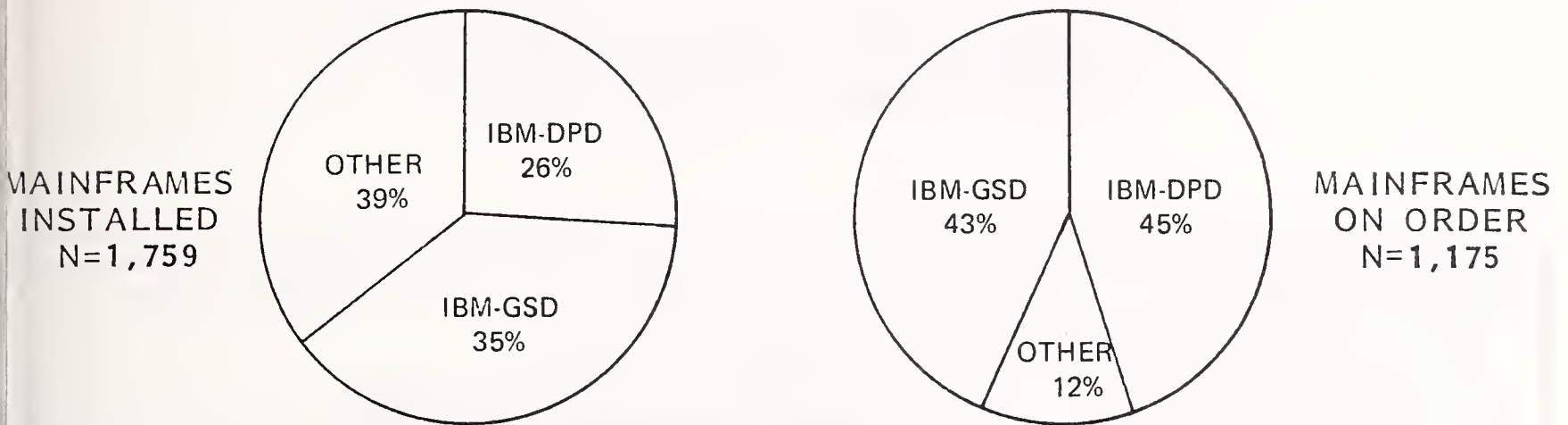
\*OTHER MENTIONS INCLUDE:

- USER RUNS
- HOUSEKEEPING
- TELEPROCESSING
- IN-HOUSE TIMESHARING
- IMS
- OVERHEAD

- However, nearly half of the programmers' time is used for existing program maintenance and enhancement. This continues to be an unpopular task assignment for programmers, yet it is growing in importance as software libraries are enlarged.
- IBM hardware accounts for nearly two-thirds of the installed mainframes, as reported by the respondents. Exhibit I-13 breaks these installations into detailed categories.
  - Of the mainframes on order, non-IBM hardware accounts for only 12% of the total. DEC is the next-largest on-order supplier, with less than 5% of the total.
- Over half of the respondents have from 1-10 minicomputers installed, but more than one-fourth neither have minicomputers nor have plans for any, as shown in Exhibit I-14.
- Over two-thirds of the discrete manufacturing EDP respondents report that they do not use microcomputers and do not plan to use any in the future.
- The average number of non-intelligent terminals installed is nearly twice the number of intelligent terminals.
  - Furthermore, the largest percentage of respondents have no intelligent terminals installed and have no plans for such installations.
- The most important development objective in 1980 for discrete manufacturing industries is the development and implementation of new applications.
  - Exhibit I-15 shows that on-line applications implementation in particular received a relatively high percentage of total mentions by the INPUT panel.

EXHIBIT I-13

MAINFRAME EDP HARDWARE PROFILE IN THE  
DISCRETE MANUFACTURING SECTOR



MAINFRAME	INSTALLED			ON ORDER		
	NUMBER OF RESPONSES	NUMBER OF SYSTEMS	PERCENT	NUMBER OF RESPONSES	NUMBER OF SYSTEMS	PERCENT
IBM 3033	18	56	3.2%	11	23	2.0%
IBM 3033N	3	9	0.5	8	13	1.1
IBM 3032	9	18	1.0	3	6	0.5
IBM 3031	13	22	1.3	2	2	0.2
IBM 370 158-168	34	113	6.4	4	4	0.3
IBM 4331	19	32	1.8	39	125	10.6
IBM 4341	6	9	0.5	72	176	15.0
IBM 8100	8	18	1.0	29	173	14.7
IBM OTHER 370	58	134	7.6	2	3	0.3
IBM OTHER 360	15	49	2.8	0	0	0.0
SUBTOTAL IBM-DPD	183	460	26.1%	170	525	44.7%
IBM SYSTEMS 1, 3, 32, 34	44	611	34.7%	15	444	37.8%
IBM SYSTEMS 38	0	0	0.0	14	56	4.8%
SUBTOTAL IBM-GSD	44	611	34.7%	29	500	42.6%
BURROUGHS	29	69	3.9%	11	20	1.7%
DEC	24	235	13.4	11	57	4.9
HONEYWELL	40	68	3.9	5	9	.8
HEWLETT-PACKARD	5	18	1.0	4	14	1.2
SINGER	3	17	1.0	0	0	0.0
UNIVAC	17	20	1.1	1	5	.4
FOUR-PHASE	7	186	10.6	4	34	2.9
OTHER	48	75	4.3	10	11	.8
SUBTOTAL OTHER	173	688	39.2%	46	150	12.7%
TOTAL	400	1,759	100.0%	245	1,175	100.0%

EXHIBIT I-14

NON-MAINFRAME EDP HARDWARE PROFILE IN THE  
DISCRETE MANUFACTURING SECTOR

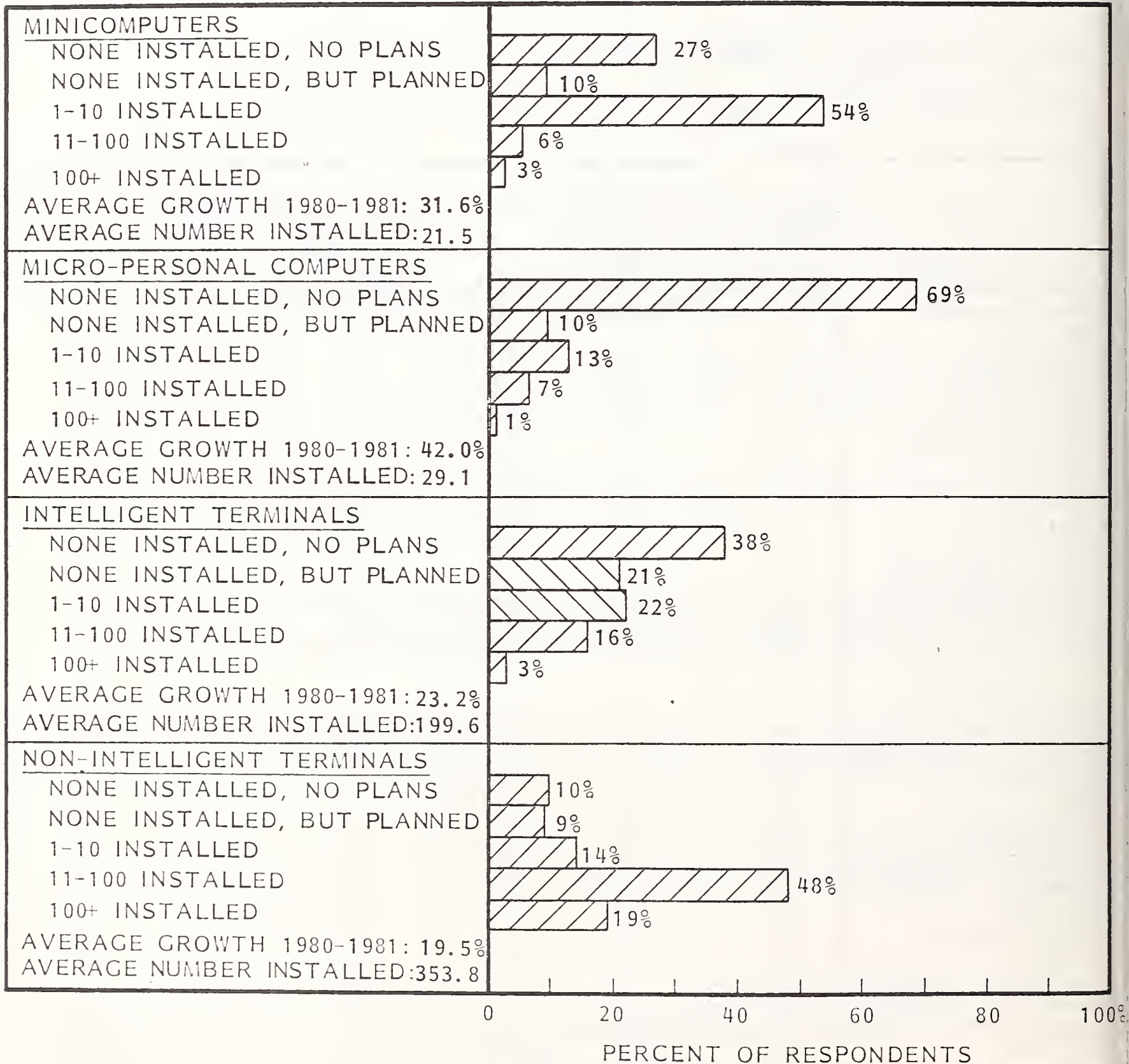


EXHIBIT I-15

MOST IMPORTANT DEVELOPMENT OBJECTIVE  
IN THE DISCRETE MANUFACTURING SECTOR

MOST IMPORTANT EDP DEVELOPMENT OBJECTIVE IN 1980	PERCENT OF TOTAL MENTIONS
DATA BASE DEVELOPMENT	8%
DESIGN OR INSTALL DDP	4
IMPLEMENT/DEVELOP NEW APPLICATIONS	32
IMPLEMENT/DEVELOP ON-LINE APPLICATIONS	17
INSTALL OR UPGRADE MAINFRAME	5
INSTALL MINICOMPUTERS	-
INSTALL OR CONVERT OPERATING SYSTEMS	3
DESIGN/DEVELOP COMMUNICATIONS NETWORK	4
CENTRALIZE OR DECENTRALIZE DP OPERATIONS	2
PLAN/IMPROVE PRODUCTIVITY AND/OR OPERATIONS	6
OTHER	
- REWRITE SOFTWARE	8
- STANDARDIZE SYSTEMS	2
- TRAIN STAFF/USERS	4
- MISCELLANEOUS RESPONSES*	5
TOTAL	100%

\*SPECIFIC RESPONSES INCLUDE:

- DECREASE DEPENDENCE ON HARDWARE VENDOR
- LONG-RANGE PLAN APPROVAL
- PROJECT COMPLETION WITHIN BUDGET
- HARDWARE INDEPENDENCE
- "FIGURE OUT WHAT TO DO"

#### 4. KEY ISSUE STATUS REVIEW

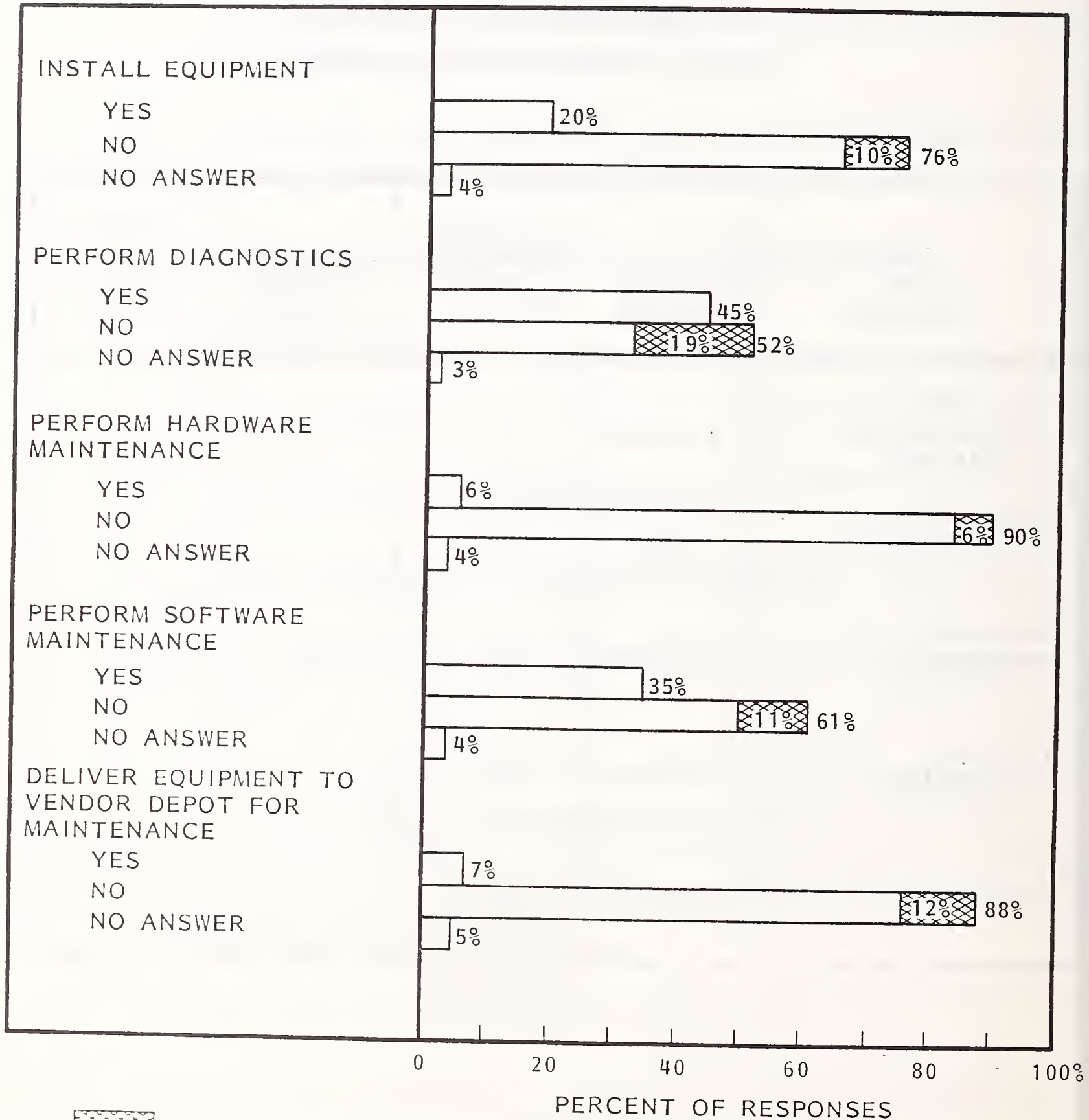
- An average of nearly \$70,000 is expended for EDP training. Exhibit I-16 shows that over half of that amount is spent on outside technical training.
  - More than one out of three employees received technical training, at an average cost of \$993 per attendee.
  - Management training costs are much less for each attendee than technical training costs.
- Exhibit I-17 reveals that the greatest number of respondents do not:
  - Install equipment.
  - Perform diagnostics.
  - Perform hardware or software maintenance.
  - Deliver equipment to a vendor depot for maintenance.
- Less than half of the EDP managers either now have or plan to have electronic mail by 1985.
  - Exhibit I-18 shows that only 9% are now using electronic mail, but that nearly one-third have responsibility for this function.
- Nearly half of the respondents are using word processing, but only 36% have current responsibility for this activity.
- Image processing is a low-priority issue for EDP managers.
- Two-thirds of the respondents are currently using telecopiers and facsimile, but less than one-third are responsible for this function.

EXHIBIT I-16

TRAINING EXPENDITURES IN THE  
DISCRETE MANUFACTURING SECTOR

TYPE OF TRAINING	AVERAGE EXPENSE	AVERAGE EXPENDITURE PER EDP EMPLOYEE	PERCENT OF STAFF ATTENDING	AVERAGE EXPENSE PER ATTENDEE
IN-HOUSE MANAGEMENT TRAINING	\$ 3,984	\$ 20	17.4%	\$547
OUTSIDE MANAGEMENT TRAINING	13,201	72		
IN-HOUSE TECHNICAL TRAINING	16,984	92	35.8	993
OUTSIDE TECHNICAL TRAINING	35,737	196		
TOTAL	\$69,906	\$380	-	-

EXHIBIT I-17  
 DEGREE OF USER SELF-MAINTENANCE  
 IN THE DISCRETE MANUFACTURING SECTOR

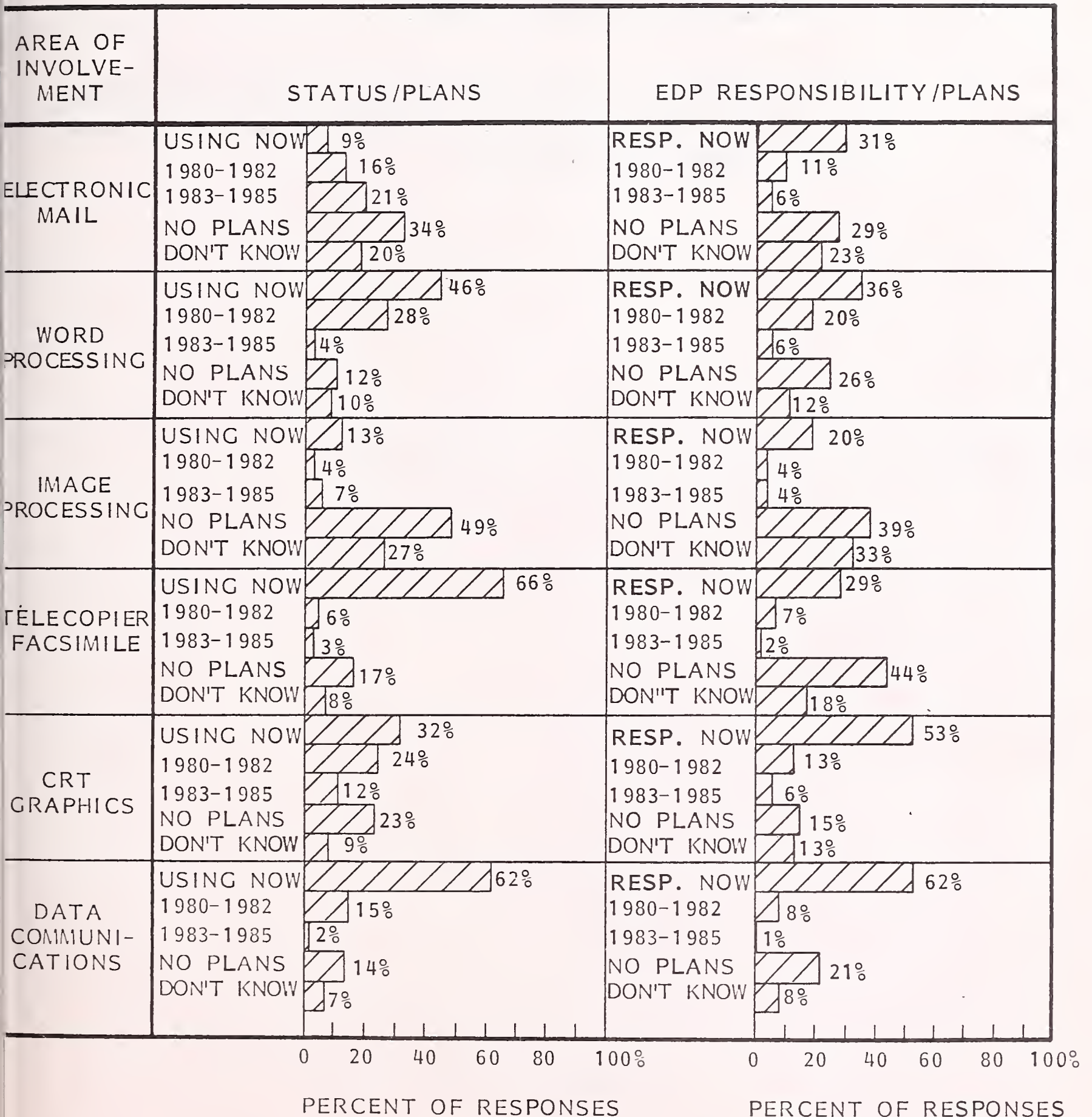


NOTE: [Hatched Box] INDICATES PERCENT OF RESPONDENTS NOT CURRENTLY PERFORMING FUNCTION, BUT WHO WOULD CONSIDER DOING SO



EXHIBIT I-18

RESPONDENT INVOLVEMENT IN OFFICE AUTOMATION  
IN THE DISCRETE MANUFACTURING SECTOR



- Computer graphics is currently an EDP managerial function in over half the industry sector, but only one out of three respondents is currently using this technology.
  - By 1985, over two-thirds of the EDP organizations plan to be both using and responsible for computer graphics.
- Data communications is already well established in EDP organizations, but nearly one-third of the respondents have no plans or no definite timeframe for assuming responsibility for this function.

1980 ANALYSIS OF EDP IN DISTRIBUTION



## DISTRIBUTION

### I. INDUSTRY SECTION OVERVIEW

- This industry sector includes both the wholesale and retail trade and allied stores. These are as defined in SIC codes 50 through 59.
- A most significant statistic relative to the retailing subsector is the large number of establishments (1.2 million).
  - Over 65% of retail industry revenues come from three areas: general merchandise, food stores and automotive dealers/gas service stations.
  - Compared to other industries, there are no really dominant companies.
  - Average sales per employee vary widely, from \$22,000 in eating and drinking establishments, to \$100,000 in building materials and hardware stores.
  - Retailers are looking to computers to help maintain the spiralling costs in this industry. Since much of the data processing activity is in-house, retailers are looking for software products that can help them solve problems. Smaller retailers are beginning to evaluate and purchase turnkey systems.
- The wholesale distribution industry subsector contributes 6.5% of the U.S. GNP.

- Computers and computerized systems are considered key to productivity in this subsector and are increasingly used for receiving and ordering.
- The distribution sector provided 73 responses, representing all of the two-digit SIC categories, 50 through 59. These responses amount to 8% of the 1980 INPUT user survey.
- Exhibit I-1 provides a profile summary of respondents in three size categories, along with a separate category for those companies that declined to give their annual sales volume.
  - Twenty-nine percent of the companies reported annual sales of less than \$100 million, averaging \$61 million. The average responding company in this category employs 970 workers, of which 17 are EDP personnel. The annual EDP budget of \$674,000 (1.1% of annual sales) translates to \$39,802 per EDP employee.
  - Fifty-nine percent of the distribution sector respondents ranged in size from \$101 million to \$999 million in annual sales. The average number of employees is over 5,000, of which 1.4% are involved in EDP. The EDP budget of almost \$1.9 million represents 0.5% of the companies' annual sales. The EDP budget of \$25,136 per EDP employee is the lowest of the three size categories of this industry sector - too low to adequately support the complexity of required systems.
  - The largest size category of firms represents 6.8% of all respondents, with average annual sales of \$2 billion. These companies average 114 EDP employees, which is 0.7% of its workforce. The EDP budget represents only 0.2% of annual sales, but the EDP budget per EDP employee is over \$50,000, the largest for any of the three size categories.

EXHIBIT I-1

RESPONDENT PROFILE - DISTRIBUTION SECTOR

PROFILE CHARACTERISTIC	COMPANY SIZE IN TERMS OF ANNUAL SALES			
	\$100 MILLION OR LESS	\$101-999 MILLION	\$1 BILLION OR MORE	NO SIZE DATA
PERCENT OF TOTAL RESPONDENTS	28.8%	58.9%	6.8%	5.5%
AVERAGE ANNUAL SALES (\$ MILLION)	\$ 61.4	\$ 392.8	\$ 2,000	-
AVERAGE TOTAL EMPLOYEES	970	5,021	18,300	11,750
AVERAGE EDP EMPLOYEES	17	72	114	56
EDP EMPLOYEES PER 100 TOTAL EMPLOYEES	1.7	1.4	0.7	0.5
AVERAGE EDP BUDGET (\$ THOUSAND)	\$ 674	\$ 1,874	\$ 4,984	\$ 2,266
EDP BUDGET AS A PERCENT OF ANNUAL SALES	1.1%	0.5%	0.2%	-
EDP BUDGET PER EDP EMPLOYEE	\$39,802	\$25,136	\$50,267	\$59,130
EDP BUDGET PER TOTAL NUMBER OF EMPLOYEES	\$ 695	\$ 368	\$ 272	\$ 283

## 2. BUDGET AND EXPENDITURE ANALYSIS

- Exhibit I-2 shows that the EDP budget is between 0.3% and 0.6% of total company sales for the largest group of respondents.
  - However, as shown in Exhibit I-3, 34% of the respondents indicated that their EDP budget had grown between 10% and 20% from 1979 to 1980.
  - In 1981, an even larger percent of the respondents (60%) expected their budgets for EDP to grow between 10% and 20% over their 1980 budget.
- Exhibit I-4 reveals that personnel costs represent 45.2% of the total 1980 budget. This will increase by 9.4% in 1981 to an average budget of \$620,000 per company.
  - The highest growth area is for terminals, which will increase in 1981 by an average of 14.9% over the budgeted 1980 level.
  - The overall EDP budget is expected to grow by 6.2% from 1980 to 1981.
- As shown in Exhibit I-5, 34% of the respondents' EDP budgets were affected by the recession in 1980. For those that were affected, the budget reduction averaged 12.4% compared to 1979.
  - Although personnel, recruiting and payroll were mentioned by 32% of the respondents as the major area to be affected by the recession, a significant 29% also stated that hardware acquisition was affected.
  - Exhibit I-6 portrays the distribution of areas affected by the recession in terms of total mentions by respondents.



EXHIBIT I-2

RATIO OF EDP BUDGET TO COMPANY SALES:  
DISTRIBUTION OF RATIOS AMONG RESPONDENTS IN THE  
DISTRIBUTION SECTOR

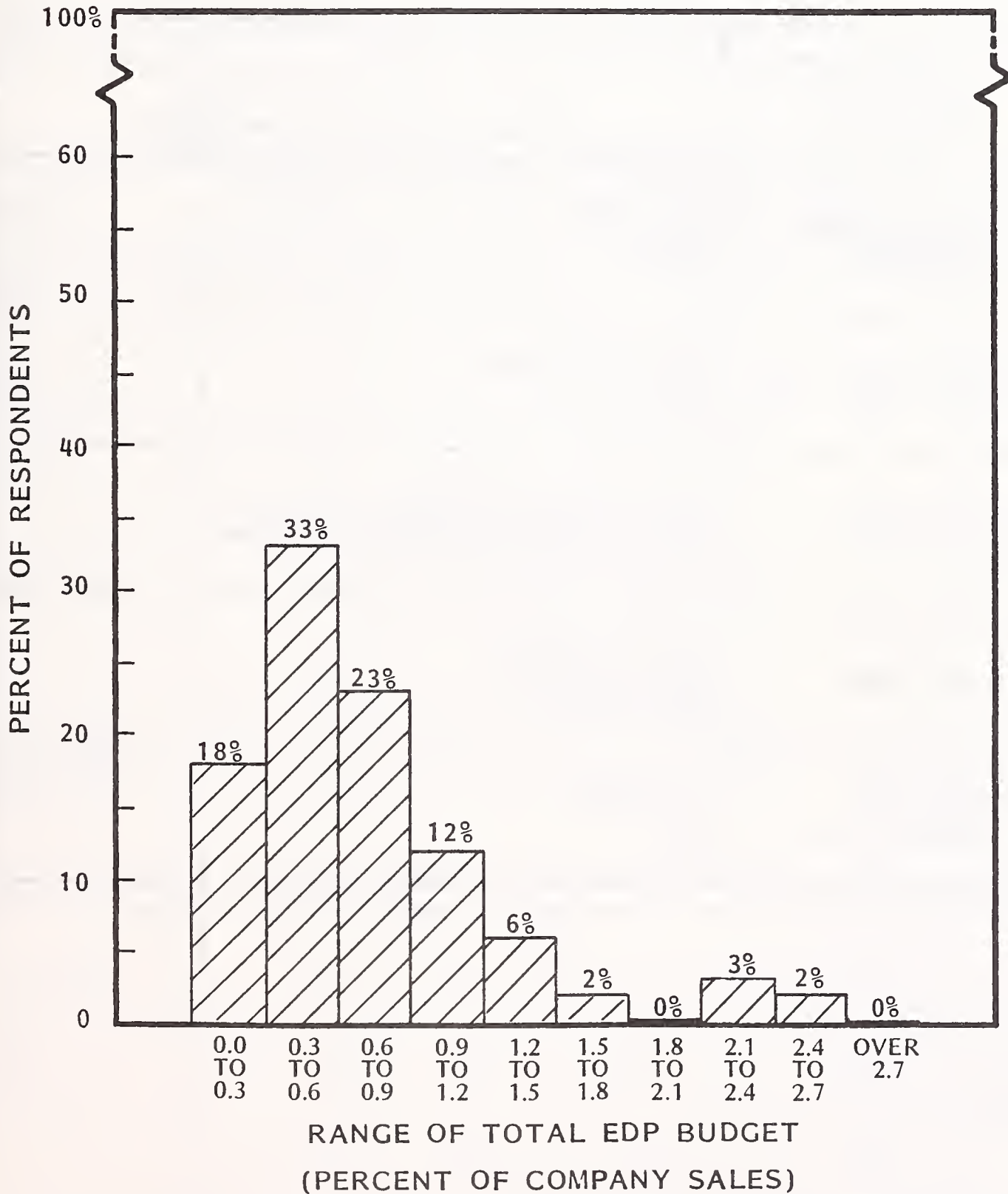
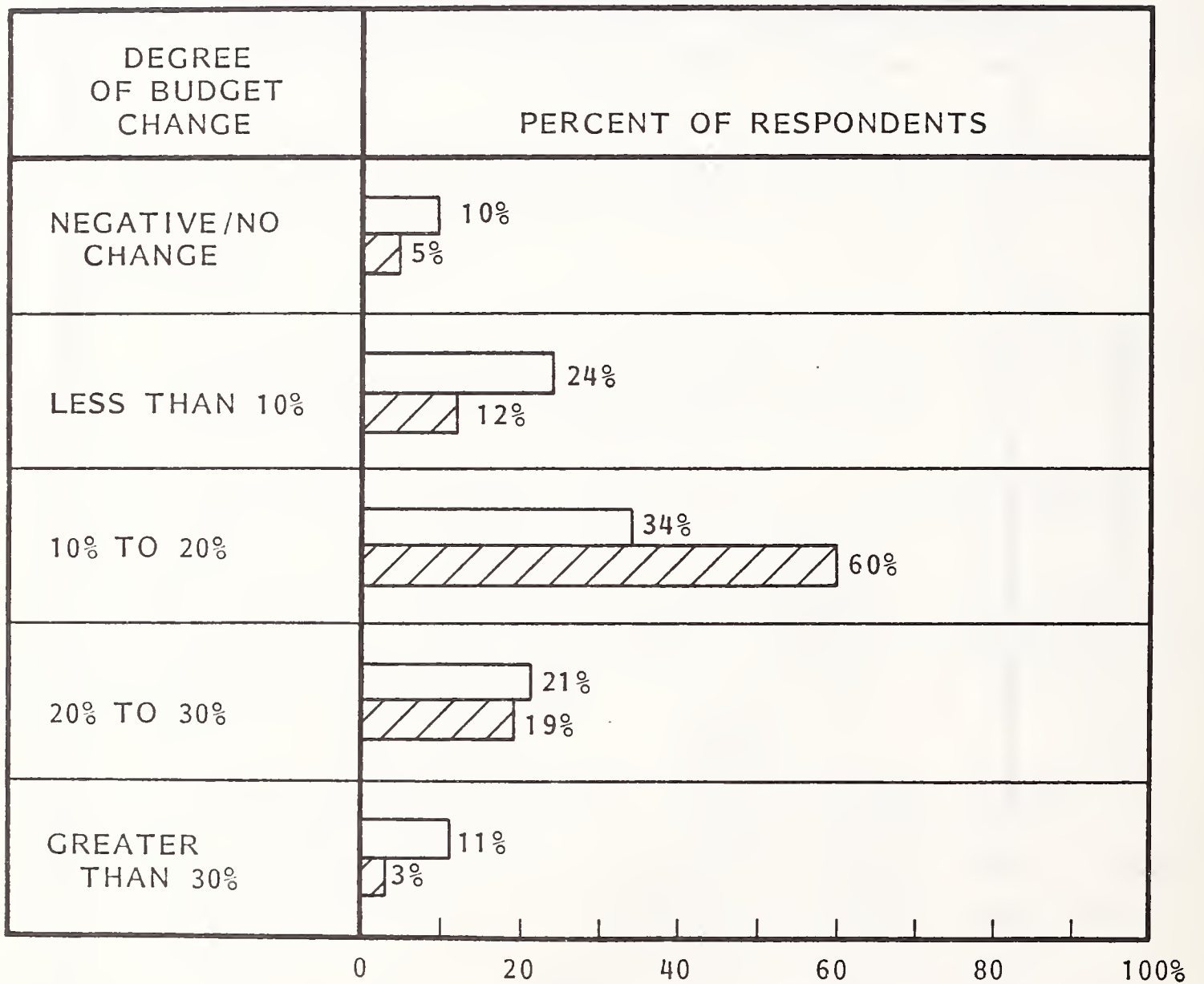


EXHIBIT I-3

ACTUAL AND PLANNED EDP BUDGET GROWTH  
FOR RESPONDENTS IN THE DISTRIBUTION SECTOR



□ 1979-1980  
 ▨ 1980-1981

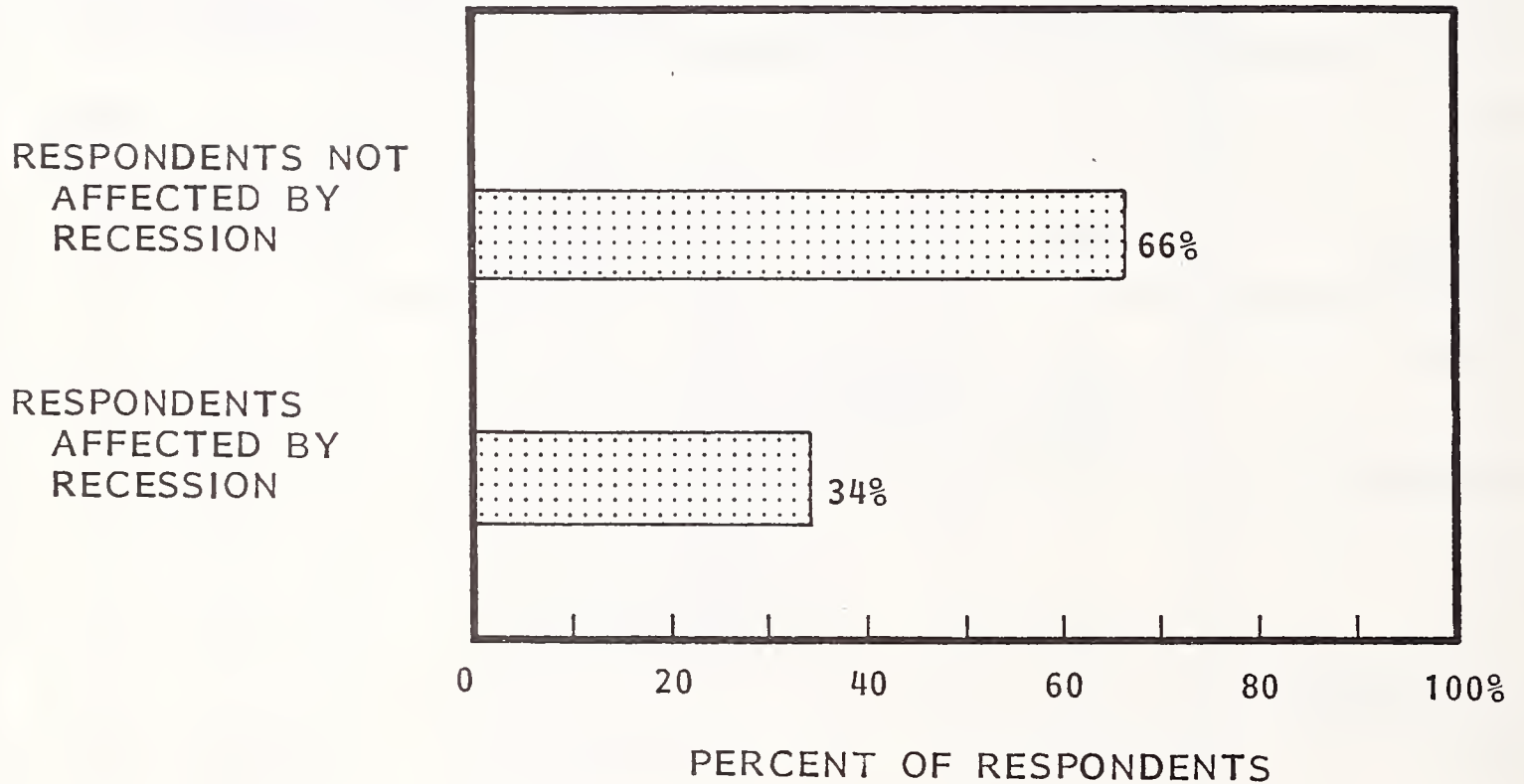
EXHIBIT I-4

ANTICIPATED CHANGES IN EDP BUDGETS  
IN THE DISTRIBUTION SECTOR

BUDGET CATEGORY	1980		PERCENT INCREASE (DECREASE) 1980-1981	1981	
	AVERAGE BUDGET (\$ THOUSAND)	PERCENT OF TOTAL BUDGET		AVERAGE BUDGET (\$ THOUSAND)	PERCENT OF TOTAL BUDGET
PERSONNEL	\$ 567	45.2%	9.4%	\$ 620	46.6%
MAINFRAME PROCESSORS	191	15.2	(3.0)	185	13.9
PERIPHERALS	107	8.6	3.9	111	8.4
MINICOMPUTERS	21	1.7	14.3	24	1.8
TERMINALS	38	3.0	14.9	44	3.3
COMMUNICATIONS HARDWARE AND SOFTWARE	27	2.1	12.0	30	2.3
SOFTWARE	37	3.0	5.7	39	2.9
VENDOR MAINTENANCE	83	6.6	5.4	88	6.6
PROCESSING SERVICES	54	4.3	11.1	60	4.5
SUPPLIES AND OTHER	129	10.3	0.9	130	9.7
TOTAL	\$1,254	100.0%	6.2%	\$1,331	100.0%

EXHIBIT I-5

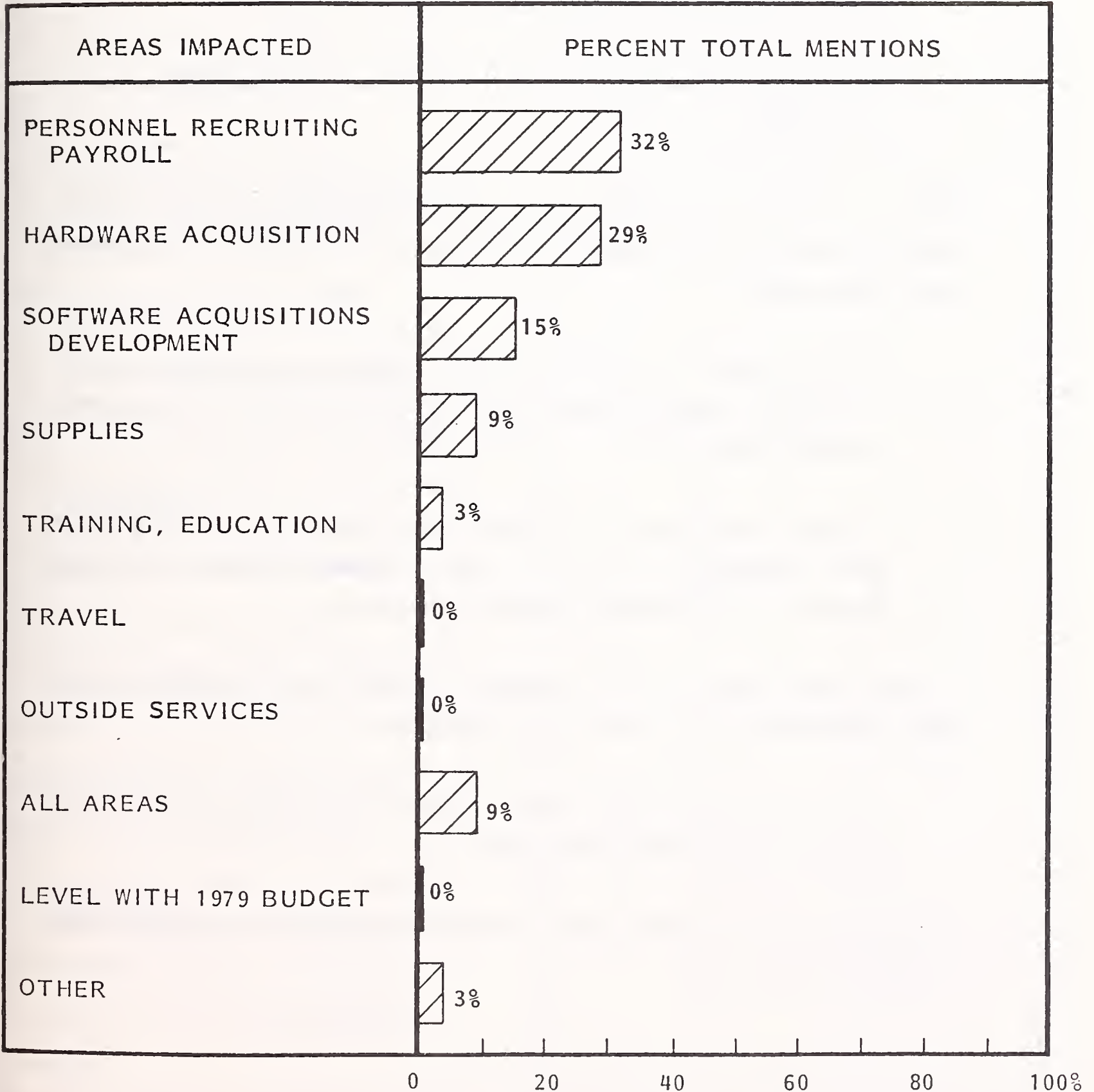
EFFECTS OF RECESSION ON EDP BUDGETS  
IN THE DISTRIBUTION SECTOR



AVERAGE PERCENT  
BUDGET REDUCTION FOR  
THOSE AFFECTED BY RECESSION: 12.4%

EXHIBIT I-6

BUDGET AREAS IMPACTED BY POSSIBLE  
RECESSION IN 1980 FOR RESPONDENTS IN THE  
DISTRIBUTION SECTOR



### 3. MAJOR PLANS AND PROBLEMS

- As in other industry sectors, the outstanding objective for respondents in the distribution sector between 1980 and 1982 is the installation of on-line applications.
  - Exhibit I-7 reveals that the development of new batch applications is of second-highest relative importance in 1980.
  - By 1982, the second-highest objective will be to improve EDP personnel productivity.
- Exhibit I-8 shows that the accounting applications have the highest relative importance and percent of mentions as highest priority of all the applications listed in the exhibit.
  - Strong emphasis on financial control reflects the distribution sector's anticipated squeeze on profitability during the recessionary economic period of 1980-1981.
  - Marketing and sales also received strong emphasis as the distribution sector recognizes the need to support these functions, particularly during times of decreasing consumer purchases.
- On-line programming is the key strategy to improve time and costs for new applications development, as shown in Exhibit I-9.
  - The use of programming aids is also seen as a primary contributor to improved applications development.
- The expected level of improvement in program development peaks at 21-50%, as shown in Exhibit I-10.

EXHIBIT I-7

EDP OBJECTIVES FOR RESPONDENTS IN THE  
DISTRIBUTION SECTOR

OBJECTIVE	RELATIVE IMPORTANCE		
	1980	1981	1982
INSTALL ON-LINE APPLICATIONS	100%	100%	100%
CONVERT APPLICATIONS	46	37	20
IMPROVE EDP PERSONNEL PRODUCTIVITY	46	42	56
DEVELOP LONG-RANGE EDP PLAN	45	25	38
DEVELOP NEW BATCH APPLICATIONS	56	50	49
MEET DEVELOPMENT, CONVERSION SCHEDULES	55	46	48
INSTALL NEW MAINFRAME	44	28	28
DESIGN, INSTALL DBMS	31	30	30
CHANGE OPERATING SYSTEMS	19	15	6
DESIGN, INSTALL DDP NETWORK	12	22	36
INSTALL NEW PERIPHERALS	16	17	18
INSTALL MINICOMPUTERS	12	15	5
INTEGRATE OFFICE AUTOMATION WITH EDP	12	15	26
CENTRALIZE EDP CONTROL	5	5	4
DECENTRALIZE EDP CONTROL	1	3	8
OTHER	7	13	8

EXHIBIT I-8

APPLICATIONS TO BE DEVELOPED BY  
RESPONDENTS IN THE DISTRIBUTION SECTOR

APPLICATION	RELATIVE IMPORTANCE	PERCENT OF MENTIONS AS HIGHEST PRIORITY
ACCOUNTING/FINANCE	100	27%
INVENTORY CONTROL	94	25
ORDER ENTRY/BILLING	65	18
PERSONNEL	30	2
PURCHASING	37	5
MARKETING/SALES	45	8
MODELING/FORECASTING	23	1
PERFORMANCE MEASUREMENT/CONTROL	28	1
OTHER**	51	13
TOTAL	-	100%

\*\*SPECIFIC APPLICATIONS INCLUDE:

- MERCHANDISE INFORMATION
- WAREHOUSE RECEIVING SYSTEM
- POS STORES COMMUNICATIONS SYSTEM
- FASHION REPORTING
- MARKET PLANNING AND TRACKING
- QUALITY CONTROL
- MANUFACTURING - PRODUCT CONTROL



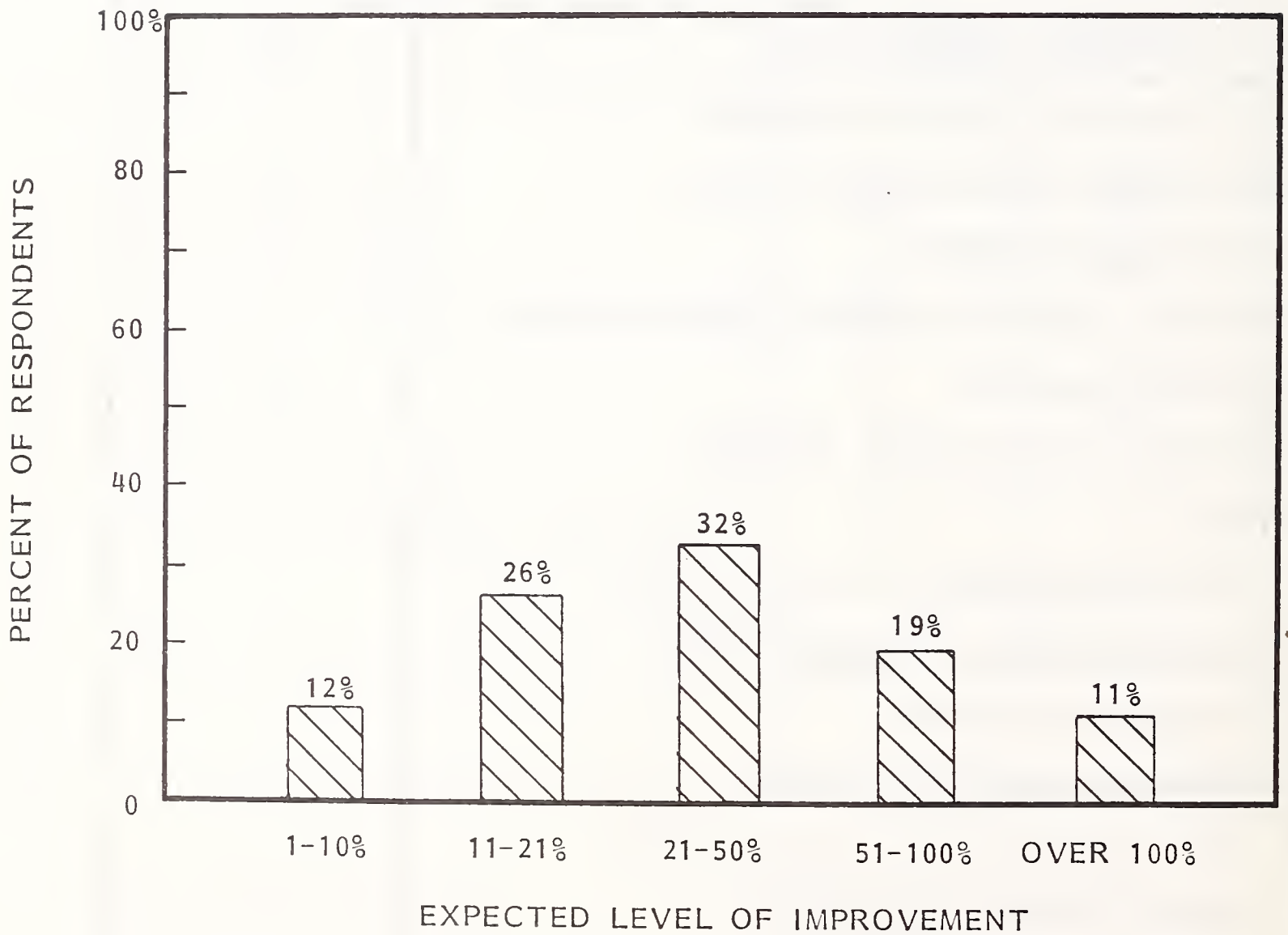
EXHIBIT I-9

METHODS USED TO IMPROVE TIME AND COSTS  
ASSOCIATED WITH APPLICATIONS DEVELOPMENT IN THE  
DISTRIBUTION SECTOR

METHOD	PERCENT OF MENTIONS
ON-LINE PROGRAMMING	20%
PURCHASED SOFTWARE PRODUCTS	9
STRUCTURED PROGRAMMING/DESIGN	10
PROJECT MANAGEMENT	5
IMPROVED TRAINING/BETTER QUALIFICATIONS	6
PROGRAMMING AIDS	26
DATA BASE MANAGEMENT SYSTEMS	4
OTHER	
- USER INVOLVEMENT IN DEVELOPMENT	3
- STANDARDIZED METHODS/SYSTEMS	1
- HARDWARE UPGRADE	1
- IMPROVED DOCUMENTATION	1
- CRT TERMINALS FOR PROGRAMMERS	2
- MISCELLANEOUS METHODS	9
- DO NOTHING/NO PLANS	3

EXHIBIT I-10

EXPECTED LEVEL OF IMPROVEMENT IN PROGRAM  
DEVELOPMENT FOR RESPONDENTS IN THE  
DISTRIBUTION SECTOR



- Exhibit I-11 reveals that personnel recruiting remains the most serious problem for nearly one-fourth of the respondents, as it was in last year's survey.
  - A strong emphasis on improving operations and on planning and control has emerged in the 1980 survey.
- The heavy emphasis on production use of EDP equipment is shown in Exhibit I-12. This is typical of the small EDP operations most frequently found in the distribution sector.
  - Over half of the programming personnel are involved in new program development. This may account for the previously noted problem of applications development planning and control.
- The 1980 survey shows that, while a majority of the mainframes that are installed are IBM, other suppliers have a significant 43% of the distribution sector's installations.
  - NCR and DEC each have over 7% of the installed systems.
- Exhibit I-13 shows that the non-IBM mainframes on order account for 24% of the total.
  - IBM 4300 series and 8100 represent the highest percentages on order, but Honeywell has a surprising 16%.
- Exhibit I-14 shows that 60% of the respondents already have minicomputers installed, and the average growth between 1980 and 1981 is 33%. This is a higher growth rate than that reported in most other industry sectors.
  - High growth is also expected for intelligent terminals, on top of a large base of an average of 139 installed per respondent already.

EXHIBIT I-11

MOST SIGNIFICANT EDP PROBLEMS IN THE  
DISTRIBUTION SECTOR

PROBLEM	RELATIVE IMPORTANCE	PERCENT OF MENTIONS AS HIGHEST PRIORITY
PERSONNEL RECRUITING	100	23%
NEED FOR BETTER PLANNING AND CONTROL	95	12
PERSONNEL TRAINING	86	8
LACK OF GENERAL MANAGEMENT UNDERSTANDING	73	11
LACK OF USER INVOLVEMENT IN SYSTEMS/APPLICATIONS DEVELOPMENT	68	6
NEED FOR IMPROVEMENT IN OPERATIONS	64	12
EXCESSIVE APPLICATIONS DEVELOPMENT TIME	39	6
INADEQUATE EDP FUNDING	36	9
INADEQUATE SYSTEMS SOFTWARE	26	0
NEED TO IMPROVE DATA COMMUNICATIONS	47	5
UNSATISFACTORY HARDWARE MAINTENANCE	11	2
OTHER	24	6

EXHIBIT I-12

USE OF RESOURCES IN THE DISTRIBUTION SECTOR

RESOURCE	APPLICATIONS	PERCENT OF USE
COMPUTER EQUIPMENT	PRODUCTION JOBS	74.7%
	NEW APPLICATIONS DEVELOPMENT	14.7
	EXISTING PROGRAM MAINTENANCE	9.7
	OTHER*	0.9
PROGRAMMING PERSONNEL	NEW PROGRAM DEVELOPMENT	50.6
	EXISTING PROGRAM MAINTENANCE	28.6
	ENHANCEMENT OF EXISTING PROGRAMS	20.8

\*OTHER MENTIONS INCLUDE:

- FILE BACKUP
- SECURITY

EXHIBIT I-13

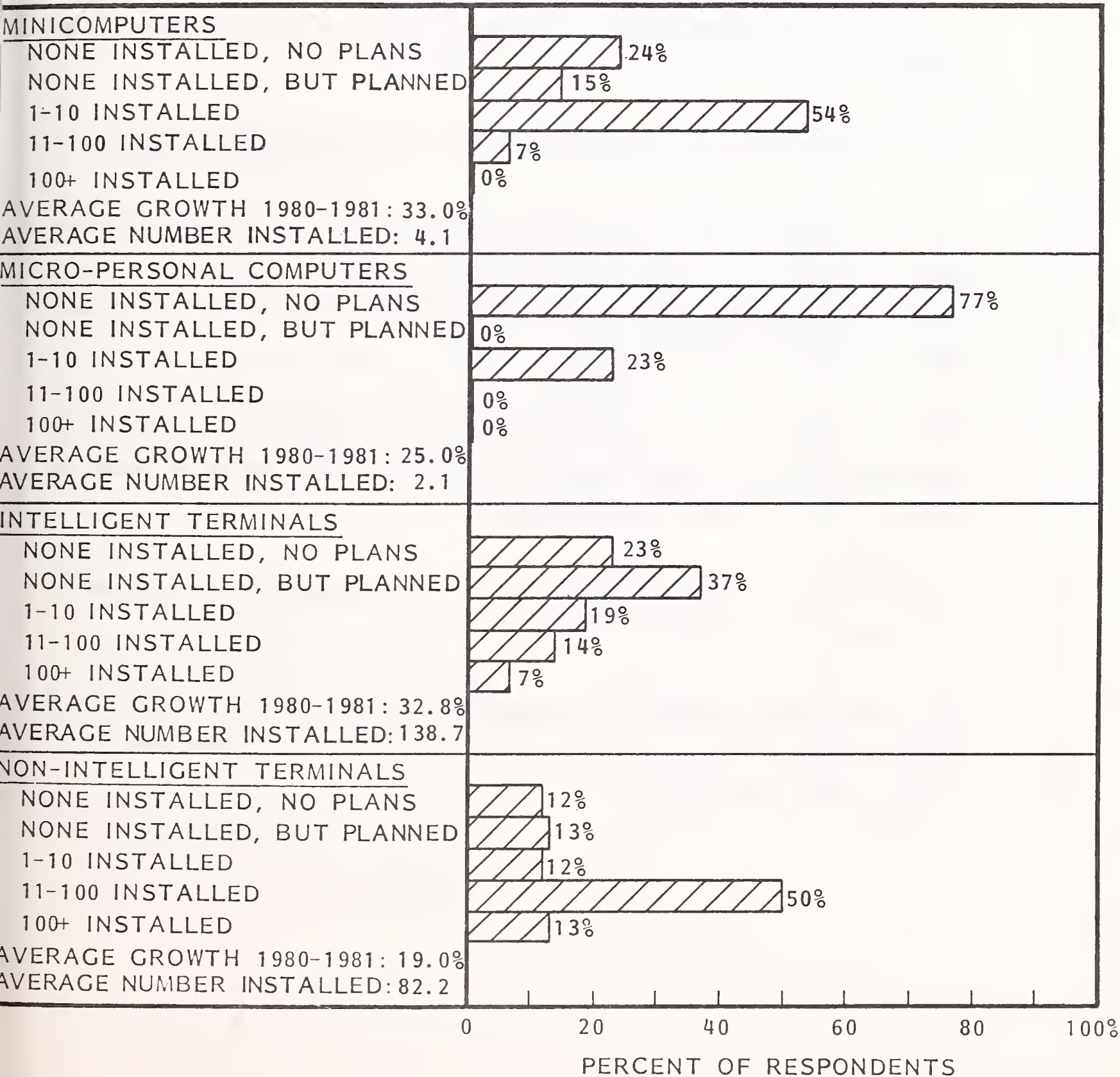
MAINFRAME EDP HARDWARE PROFILE IN THE  
DISTRIBUTION SECTOR



MAINFRAME	INSTALLED			ON ORDER		
	NUMBER OF RESPONSES	NUMBER OF SYSTEMS	PERCENT	NUMBER OF RESPONSES	NUMBER OF SYSTEMS	PERCENT
IBM 3033	1	1	0.6%	1	1	0.6%
IBM 3033N	0	0	0.0	3	3	1.8
IBM 3032	1	1	0.6	0	0	0.0
IBM 3031	4	4	2.4	2	2	1.2
IBM 370 158-168	13	15	8.9	0	0	0.0
IBM 4331	3	3	1.8	17	27	16.6
IBM 4341	0	0	0.0	33	43	26.4
IBM 8100	1	6	3.6	8	27	16.6
IBM OTHER 370	24	29	17.2	0	0	0.0
IBM OTHER 360	5	7	4.1	0	0	0.0
SUBTOTAL IBM-DPD	52	66	39.2%	64	103	63.2%
IBM SYSTEMS 1, 3, 32, 34	15	30	17.8%	7	10	6.1%
IBM SYSTEMS 38	0	0	0.0	4	11	6.7
SUBTOTAL IBM-GSD	15	30	17.8%	11	21	12.8%
BURROUGHS	8	9	5.3%	2	2	1.2%
DEC	10	12	7.1	2	2	1.2
DATA GENERAL	2	2	1.2	0	0	0.0
HONEYWELL	8	10	5.9	2	26	16.0
HEWLETT-PACKARD	1	1	0.6	1	2	1.2
NCR	10	12	7.1	1	1	0.6
TEXAS INSTRUMENTS	1	4	2.4	1	3	1.8
UNIVAC	8	9	5.3	1	1	0.6
FOUR-PHASE	3	4	2.4	1	1	0.6
OTHER	7	10	5.7	1	1	0.8
SUBTOTAL OTHER	58	73	43.0%	12	39	24.0%
TOTAL	125	169	100.0%	87	163	100.0%

EXHIBIT I-14

NON-MAINFRAME EDP HARDWARE PROFILE IN THE DISTRIBUTION SECTOR



#### 4. KEY ISSUE STATUS REVIEW

- As noted previously, the implementation and development of new and on-line applications is the most important objective in the distribution sector. Exhibit I-15 also shows that improvement of productivity and operation ranks high in percentage of total mentions.
- The distribution sector respondents indicated that almost half of their staff received technical training, but only 27% received management training, as shown in Exhibit I-16.
  - In-house training is less expensive than training done on the outside.
- As is the case with other industry sectors, most of the users in the distribution sector do not do self-maintenance. Exhibit I-17 shows that over one-third of the respondents performed diagnostics and software maintenance in-house, but other maintenance is done by outside vendors.
- With the exception of data communications and telecopier and facsimile, respondents in the distribution sector are not currently involved in areas of office automation, as defined in Exhibit I-18.
  - By 1982, a significant number of respondents expect to be involved in word processing and CRT graphics.
  - While EDP managers have responsibility for data communications, less than half have plans for electronic mail responsibility before 1985.



EXHIBIT I-15

MOST IMPORTANT DEVELOPMENT OBJECTIVE  
IN THE DISTRIBUTION SECTOR

MOST IMPORTANT EDP DEVELOPMENT OBJECTIVE IN 1980	PERCENT OF TOTAL MENTIONS
DATA BASE DEVELOPMENT	2%
DESIGN OR INSTALL DDP	8
IMPLEMENT/DEVELOP NEW APPLICATIONS	18
IMPLEMENT/DEVELOP ON-LINE APPLICATIONS	21
INSTALL OR UPGRADE MAINFRAME	11
INSTALL MINICOMPUTERS	3
INSTALL OR CONVERT OPERATING SYSTEMS	1
DESIGN/DEVELOP COMMUNICATIONS NETWORK	-
CENTRALIZE OR DECENTRALIZE DP OPERATIONS	1
PLAN/IMPROVE PRODUCTIVITY AND/OR OPERATIONS	12
OTHER	
- REWRITE SOFTWARE	11
- LONG-RANGE PLANNING	3
- MISCELLANEOUS RESPONSES*	9
TOTAL	100%

\*SPECIFIC RESPONSES INCLUDE:

- SCANNING CAPABILITY
- SUPPLY DP SERVICE TO NEW DISTRIBUTION FUNCTION
- IMPLEMENT USER TERMINAL SYSTEM

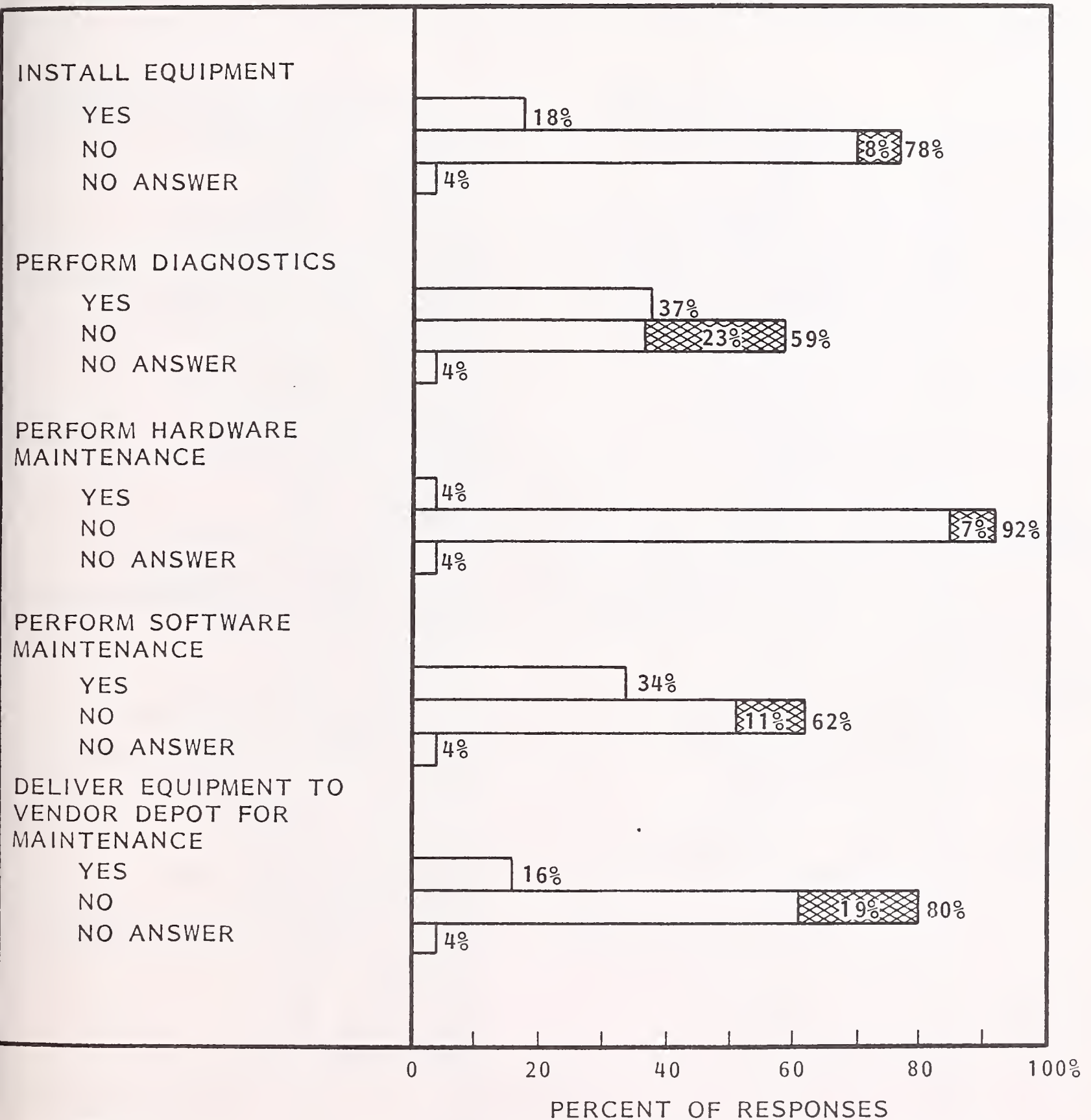
EXHIBIT I-16

TRAINING EXPENDITURES IN THE  
DISTRIBUTION SECTOR

TYPE OF TRAINING	AVERAGE EXPENSE	AVERAGE EXPENDITURE PER EDP EMPLOYEE	PERCENT OF STAFF ATTENDING	AVERAGE EXPENSE PER ATTENDEE
IN-HOUSE MANAGEMENT TRAINING	\$ 790	\$ 13	26.8%	\$223
OUTSIDE MANAGEMENT TRAINING	2,362	40		
IN-HOUSE TECHNICAL TRAINING	6,357	107	46.6	622
OUTSIDE TECHNICAL TRAINING	10,546	178		
TOTAL	\$20,055	\$338	-	-

EXHIBIT I-17

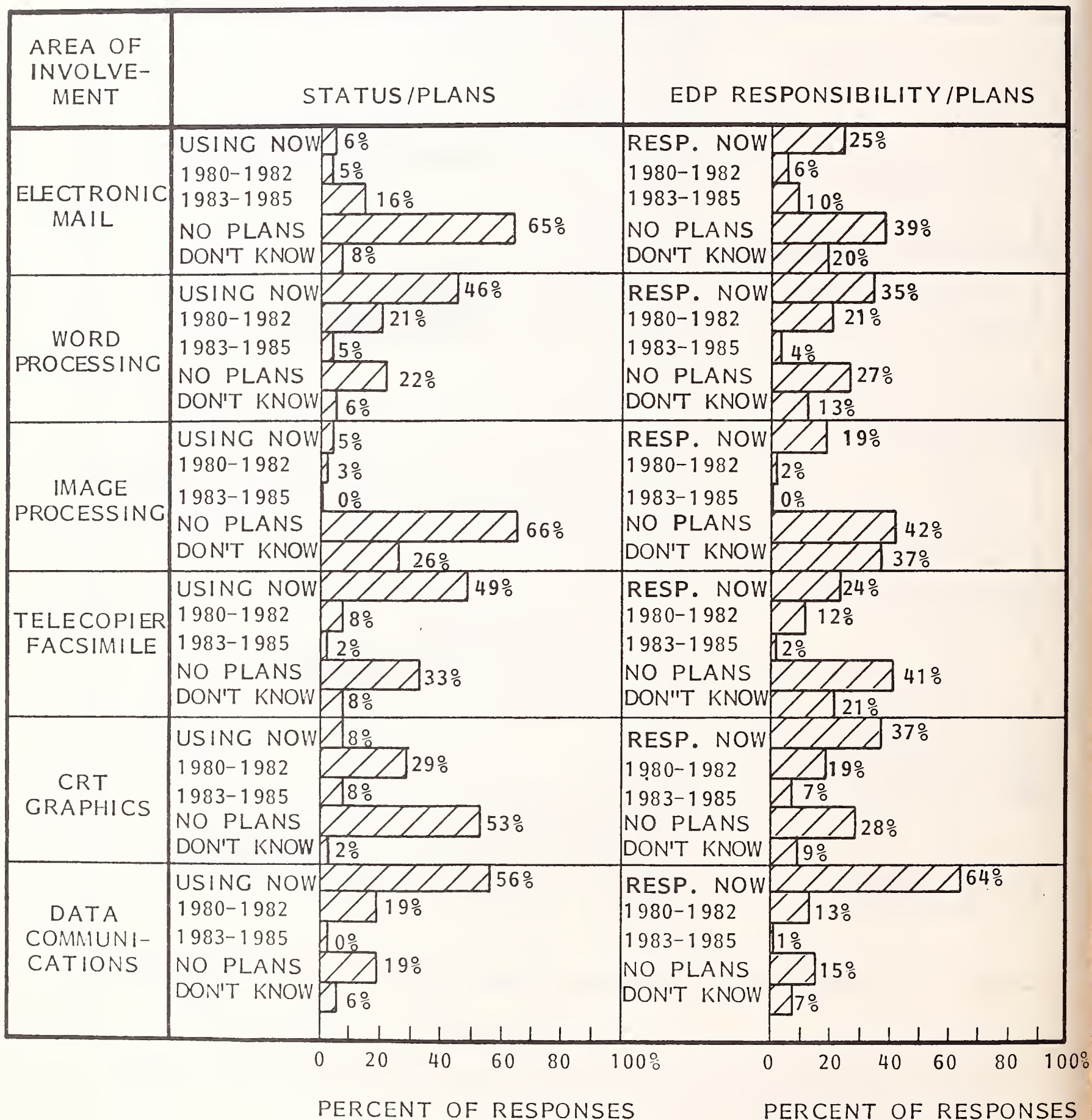
DEGREE OF USER SELF-MAINTENANCE  
IN THE DISTRIBUTION SECTOR



NOTE: [Hatched Box] INDICATES PERCENT OF RESPONDENTS NOT CURRENTLY PERFORMING FUNCTION, BUT WHO WOULD CONSIDER DOING SO

EXHIBIT I-18

RESPONDENT INVOLVEMENT IN OFFICE AUTOMATION  
IN THE DISTRIBUTION SECTOR



1980 ANALYSIS OF EDP IN GOVERNMENT



## GOVERNMENT

### I. INDUSTRY SECTOR OVERVIEW

- This section includes federal, state and local governments. These major groups include SIC codes 82 and 91 through 97. The executive, judicial and legislative branches of government are included as well as national security and international affairs. Educational services, public finance and taxation, the administration of human resources, economic programs and other government administrative agencies are all included.
- The federal government's fiscal 1980 budget for commercial EDP is \$5.3 billion, excluding classified systems.
  - This represents about 1% of total government expenditures.
  - The Department of Defense accounts for over 50% of federal EDP expenditures.
- The federal government has over 11,000 computers installed. The total installed base of computers has grown an average of 11% annually over the last eight years.
- State and local government expenditures in 1977 were \$265.3 billion. Employment levels continue to be nearly five times the size of the federal government, with state and local governments employing 12.7 million people.

- Exhibit I-1 provides a profile summary of respondents for three sizes of government organizations based on a total annual budget of \$100 million or less, \$101 to \$999 million, and \$1 billion or more. A fourth category is included in the profile where the size of the annual budget was not given by the government respondent.
- For the smallest size category, the average annual budget was \$51 million, with the organization employing over 1,700 employees, of which 49 were EDP employees.
  - The average EDP budget is \$1.9 million, representing 3.6% of the total organizational budget. This is the highest of the three size categories.
  - The EDP budget per employee is over \$37,000, with \$1,125 budgeted for each employee.
- The category of medium-size organizations comprises 25% of the government sector samples, with an average annual budget of \$356 million and 6,435 total employees.
  - There is a ratio of 1.2 EDP employees per 100 total employees.
  - The EDP budget per EDP employee is nearly identical for the small-size category, but the EDP budget per total number of employees is considerably smaller than either the smallest or the largest size category.
- The category of largest organizations was represented by only 3.3% of the total respondents. These organizations reported 539 average EDP employees, and an average EDP budget of nearly \$19 million.
  - The EDP budget per EDP employee is \$34,928, lowest of the three size categories for this comparison.



EXHIBIT I-1

RESPONDENT PROFILE - GOVERNMENT SECTOR

PROFILE CHARACTERISTIC	COMPANY SIZE IN TERMS OF ANNUAL BUDGET			
	\$100 MILLION OR LESS	\$101-999 MILLION	\$1 BILLION OR MORE	NO SIZE DATA
PERCENT OF TOTAL RESPONDENTS	34.1%	25.3%	3.3%	37.4%
AVERAGE ANNUAL BUDGET (\$ MILLION)	\$ 51	\$ 356	\$ 2,333	-
AVERAGE TOTAL EMPLOYEES	1,707	6,435	23,333	2,751
AVERAGE EDP EMPLOYEES	49	78	539	72
EDP EMPLOYEES PER 100 TOTAL EMPLOYEES	3	1.2	2.3	2.6
AVERAGE EDP BUDGET (\$ THOUSAND)	\$ 1,896	\$ 2,883	\$18,837	\$ 2,067
EDP BUDGET AS A PERCENT OF TOTAL BUDGET	3.6%	0.8%	0.8%	-
EDP BUDGET PER EDP EMPLOYEE	\$37,597	\$37,199	\$34,928	\$28,011
EDP BUDGET PER TOTAL NUMBER OF EMPLOYEES	\$ 1,125	\$ 448	\$ 807	\$ 758

## 2. BUDGET AND EXPENDITURE ANALYSIS

- Exhibit I-2 reveals that, while the largest group of respondents' EDP budgets range from 1.0-1.5% of the total budget, there is a significant group (16%) that has an EDP budget of over 4.5% of the total budget.
- Exhibit I-3 shows that the EDP budgets for most respondents grew less than 10% from 1979 to 1980. Growth from 1980 to 1981 is not expected to differ significantly from that of the previous year.
- The greatest relative change to EDP budgets between 1980 and 1981 is for an 18.2% increase in software, as shown in Exhibit I-4.
  - As in other sectors, personnel is by far the largest component of budget costs and will continue to increase its relative size from 1980 to 1981.
- Nearly 40% percent of the respondents indicated that the recession would have an impact upon their EDP budget. This is higher than that reported for other industry sectors.
  - Those affected expect a budget reduction averaging over 12.1%, as shown in Exhibit I-5.
- Exhibit I-6 indicates that personnel recruiting and payroll will be the primary means of offsetting budget reductions in the government sector.

## 3. MAJOR PLANS AND PROBLEMS

- The primary EDP objective in the government sector between 1980 and 1982 will be the installation of on-line applications.
  - Exhibit I-7 shows that the need to improve EDP personnel productivity and the installation of new mainframes also rank high on the list of objectives.

EXHIBIT I-2

RATIO OF EDP BUDGET TO TOTAL BUDGET:  
DISTRIBUTION OF RATIOS AMONG RESPONDENTS IN THE  
GOVERNMENT SECTOR

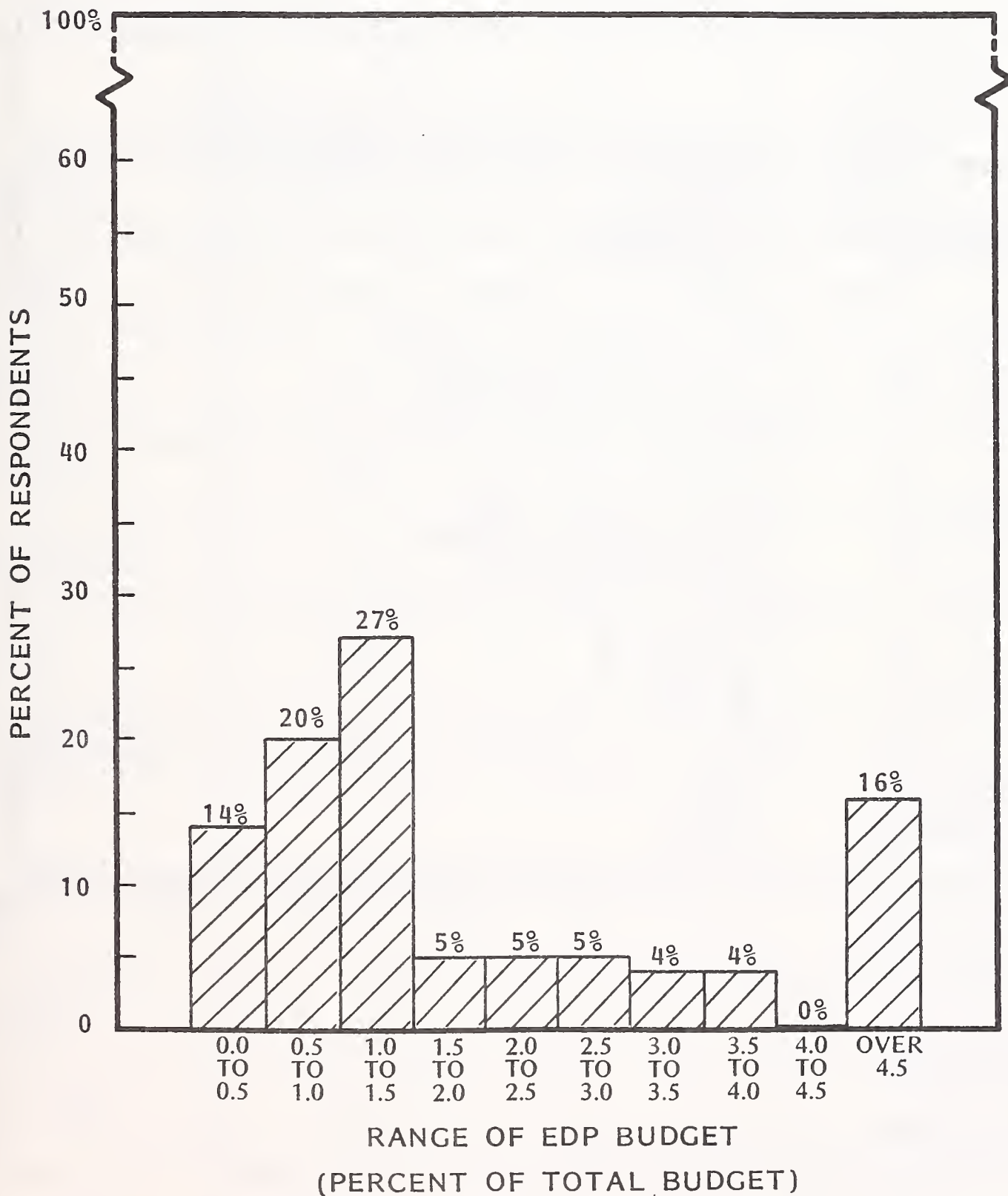
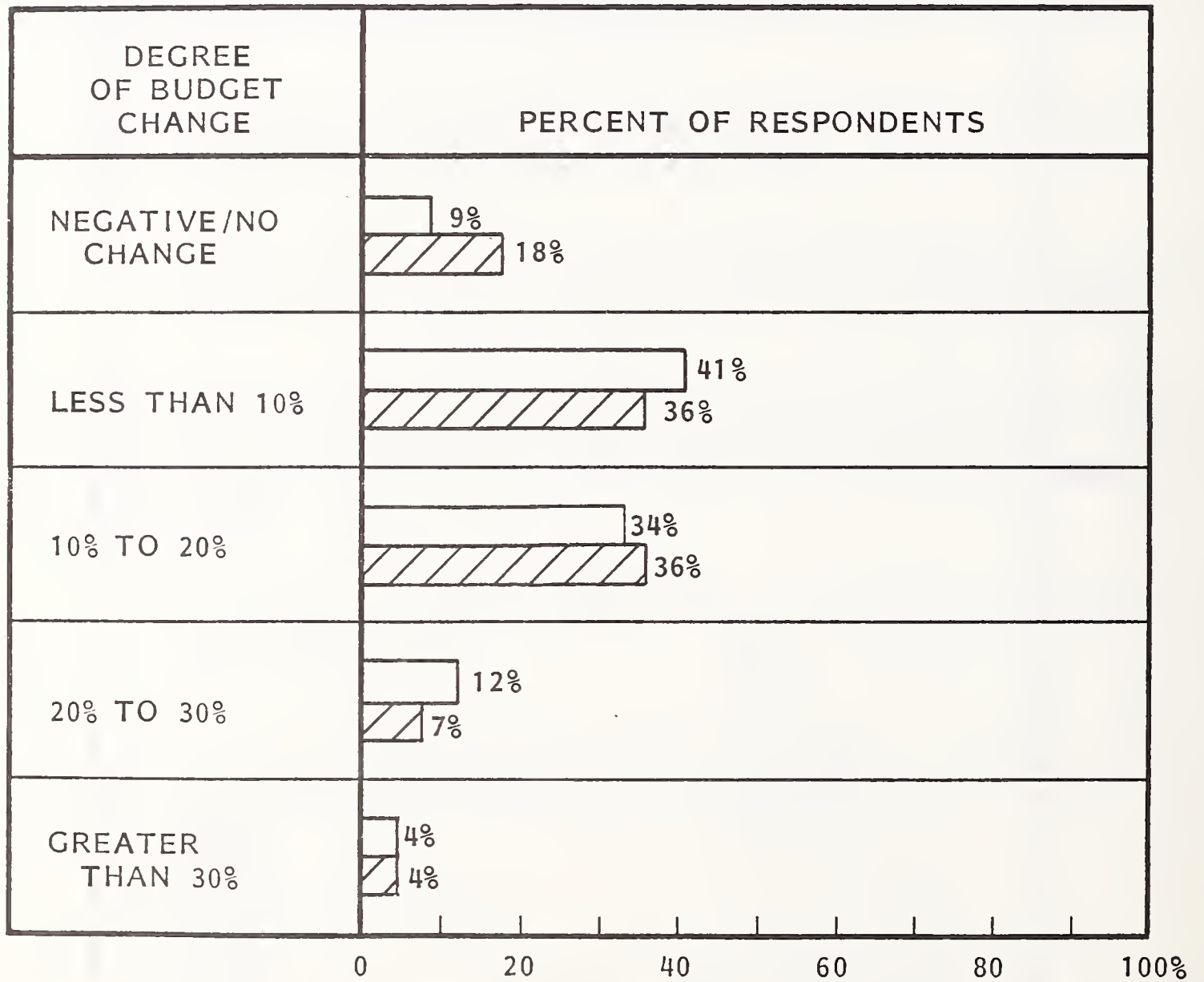


EXHIBIT I-3

ACTUAL AND PLANNED EDP BUDGET GROWTH  
FOR RESPONDENTS IN THE GOVERNMENT SECTOR



□ 1979-1980

▨ 1980-1981

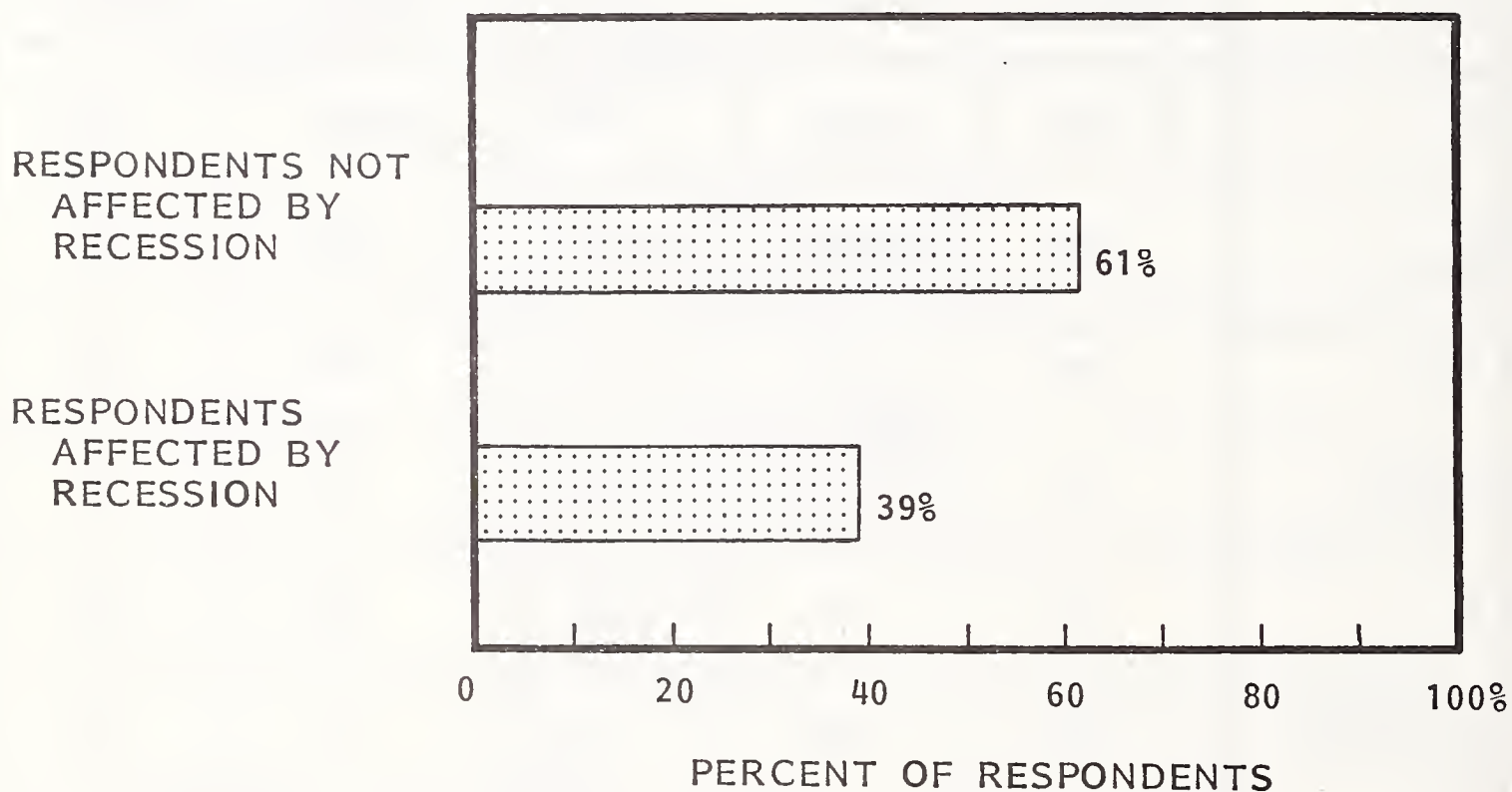
EXHIBIT I-4

ANTICIPATED CHANGES IN EDP BUDGETS  
IN THE GOVERNMENT SECTOR

BUDGET CATEGORY	1980		PERCENT INCREASE (DECREASE) 1980-1981	1981	
	AVERAGE BUDGET (\$ THOUSAND)	PERCENT OF TOTAL BUDGET		AVERAGE BUDGET (\$ THOUSAND)	PERCENT OF TOTAL BUDGET
PERSONNEL	\$ 960	50.4%	7.0%	\$1,027	51.2%
MAINFRAME PROCESSORS	303	15.9	7.2	325	16.2
PERIPHERALS	138	7.2	(9.2)	125	6.3
MINICOMPUTERS	22	1.2	2.8	23	1.1
TERMINALS	84	4.4	0.0	84	4.2
COMMUNICATIONS HARDWARE AND SOFTWARE	54	2.8	5.7	57	2.8
SOFTWARE	38	2.0	18.2	45	2.3
VENDOR MAINTENANCE	102	5.3	4.8	68	5.3
PROCESSING SERVICES	65	3.4	4.1	107	3.4
SUPPLIES AND OTHER	139	7.4	3.2	144	7.2
TOTAL	\$1,905	100.0%	5.2%	\$2,005	100.0%

EXHIBIT I-5

EFFECTS OF RECESSION ON EDP BUDGETS  
IN THE GOVERNMENT SECTOR



AVERAGE PERCENT  
BUDGET REDUCTION FOR  
THOSE AFFECTED BY RECESSION: 12.1%

EXHIBIT I-6

BUDGET AREAS IMPACTED BY POSSIBLE  
RECESSION IN 1980 FOR RESPONDENTS IN THE  
GOVERNMENT SECTOR

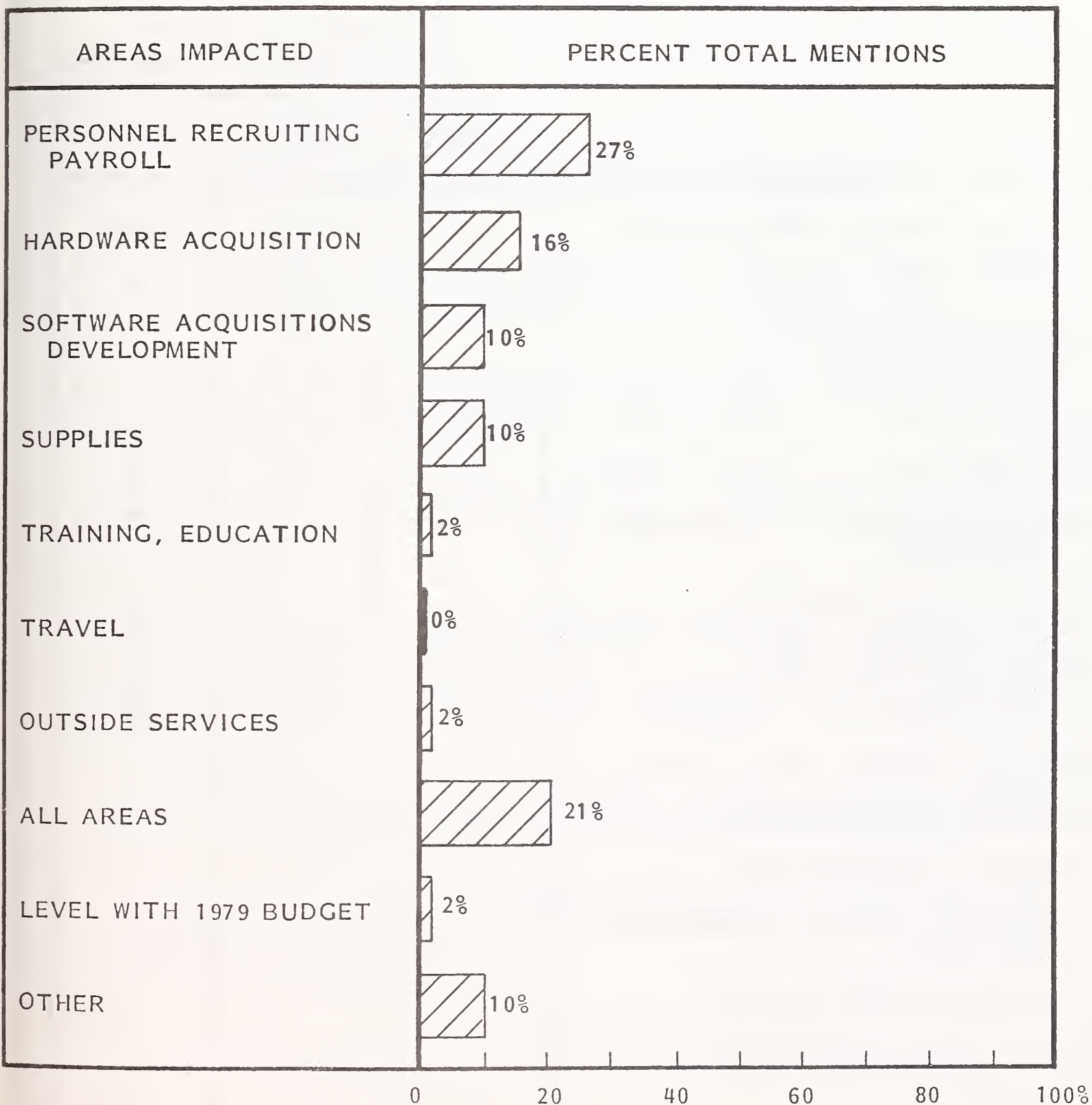


EXHIBIT I-7

EDP OBJECTIVES FOR RESPONDENTS IN THE  
GOVERNMENT SECTOR

OBJECTIVE	RELATIVE IMPORTANCE		
	1980	1981	1982
INSTALL ON-LINE APPLICATIONS	100%	100%	100%
CONVERT APPLICATIONS	68	43	30
IMPROVE EDP PERSONNEL PRODUCTIVITY	71	60	61
DEVELOP LONG-RANGE EDP PLAN	62	34	31
DEVELOP NEW BATCH APPLICATIONS	48	62	49
MEET DEVELOPMENT, CONVERSION SCHEDULES	51	52	48
INSTALL NEW MAINFRAME	71	27	26
DESIGN, INSTALL DBMS	35	49	35
CHANGE OPERATING SYSTEMS	28	18	13
DESIGN, INSTALL DDP NETWORK	23	33	31
INSTALL NEW PERIPHERALS	31	32	25
INSTALL MINICOMPUTERS	28	20	22
INTEGRATE OFFICE AUTOMATION WITH EDP	13	34	29
CENTRALIZE EDP CONTROL	13	11	9
DECENTRALIZE EDP CONTROL	6	7	7
OTHER	11	13	6



- Specific applications have the highest relative importance for respondents in the government sector.
  - Exhibit I-8 lists some of those specific applications that were mentioned by the INPUT panel respondents.
- Exhibit I-9 shows that programming aids are most frequently mentioned as the method used to improve time and costs associated with applications development.
  - The expected level of improvement in program development ranges between 21% and 50% for the largest group of respondents.
  - Exhibit I-10 shows that the government sector reflects less optimism for productivity improvements than many of the industry sectors.
- Exhibit I-11 indicates that personnel recruiting is the most significant EDP problem in the government sector.
  - Closely related to that problem is the need for increased personnel training.
- The roughly two-thirds production/one-third applications development and program maintenance ratio describing the use of computer resources, shown in Exhibit I-12, parallels the average for industrial users.
  - New program development, at 40.1%, is slightly less than the average found for programming personnel assignments in other industries.
- By a count of mainframes, 53% of the government sector has IBM mainframes installed, as shown in Exhibit I-13.

EXHIBIT I-8

APPLICATIONS TO BE DEVELOPED BY  
RESPONDENTS IN THE GOVERNMENT SECTOR

APPLICATION	RELATIVE IMPORTANCE	PERCENT OF MENTIONS AS HIGHEST PRIORITY
ACCOUNTING/FINANCE	83	37%
INVENTORY CONTROL	37	6
ORDER ENTRY/BILLING	8	-
PERSONNEL	56	12
PURCHASING	16	-
MARKETING/SALES	-	-
MODELING/FORECASTING	20	1
PERFORMANCE MEASUREMENT/CONTROL	41	9
OTHER**	100	35
TOTAL	-	100%

\*\*SPECIFIC APPLICATIONS INCLUDE:

- WITHHOLDING TAX SYSTEM
- ATTORNEY CONFLICT SCHEDULE
- LAW ENFORCEMENT
- CLINICAL SUPPORT
- UTILITY MANAGEMENT (WATER)
- AUTOMATED LAND MANAGEMENT
- PUPIL PERSONNEL RESOURCES
- VEHICLE MAINTENANCE

EXHIBIT I-9

METHODS USED TO IMPROVE TIME AND COSTS  
ASSOCIATED WITH APPLICATIONS DEVELOPMENT IN THE  
GOVERNMENT SECTOR

METHOD	PERCENT OF MENTIONS
ON-LINE PROGRAMMING	13%
PURCHASED SOFTWARE PRODUCTS	3
STRUCTURED PROGRAMMING/DESIGN	14
PROJECT MANAGEMENT	4
IMPROVED TRAINING/BETTER QUALIFICATIONS	14
PROGRAMMING AIDS	21
DATA BASE MANAGEMENT SYSTEMS	2
OTHER	
- USER INVOLVEMENT IN DEVELOPMENT	4
- STANDARDIZED METHODS/SYSTEMS	1
- HARDWARE UPGRADE	2
- IMPROVED DOCUMENTATION	-
- CRT TERMINALS FOR PROGRAMMERS	4
- MISCELLANEOUS METHODS	13
- DO NOTHING/NO PLANS	7

EXHIBIT I-10

EXPECTED LEVEL OF IMPROVEMENT IN PROGRAM  
DEVELOPMENT FOR RESPONDENTS IN THE  
GOVERNMENT SECTOR

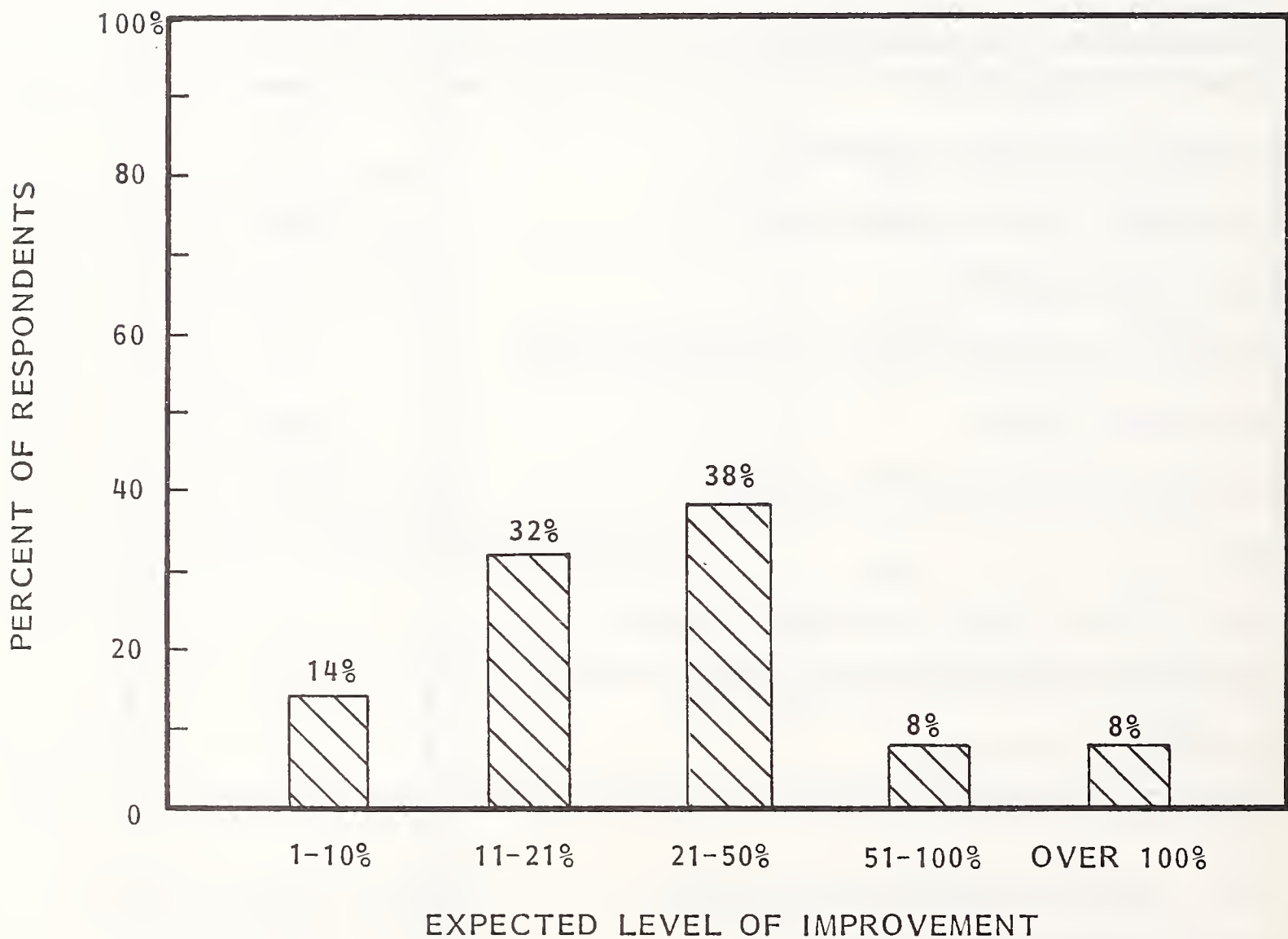


EXHIBIT I-11

MOST SIGNIFICANT EDP PROBLEMS IN THE  
GOVERNMENT SECTOR

PROBLEM	RELATIVE IMPORTANCE	PERCENT OF MENTIONS AS HIGHEST PRIORITY
PERSONNEL RECRUITING	100	32%
NEED FOR BETTER PLANNING AND CONTROL	59	8
PERSONNEL TRAINING	75	11
LACK OF GENERAL MANAGEMENT UNDERSTANDING	53	7
LACK OF USER INVOLVEMENT IN SYSTEMS/APPLICATIONS DEVELOPMENT	48	4
NEED FOR IMPROVEMENT IN OPERATIONS	29	4
EXCESSIVE APPLICATIONS DEVELOPMENT TIME	42	5
INADEQUATE EDP FUNDING	53	11
INADEQUATE SYSTEMS SOFTWARE	31	2
NEED TO IMPROVE DATA COMMUNICATIONS	33	4
UNSATISFACTORY HARDWARE MAINTENANCE	23	4
OTHER	25	8

EXHIBIT I-12

USE OF RESOURCES IN THE GOVERNMENT SECTOR

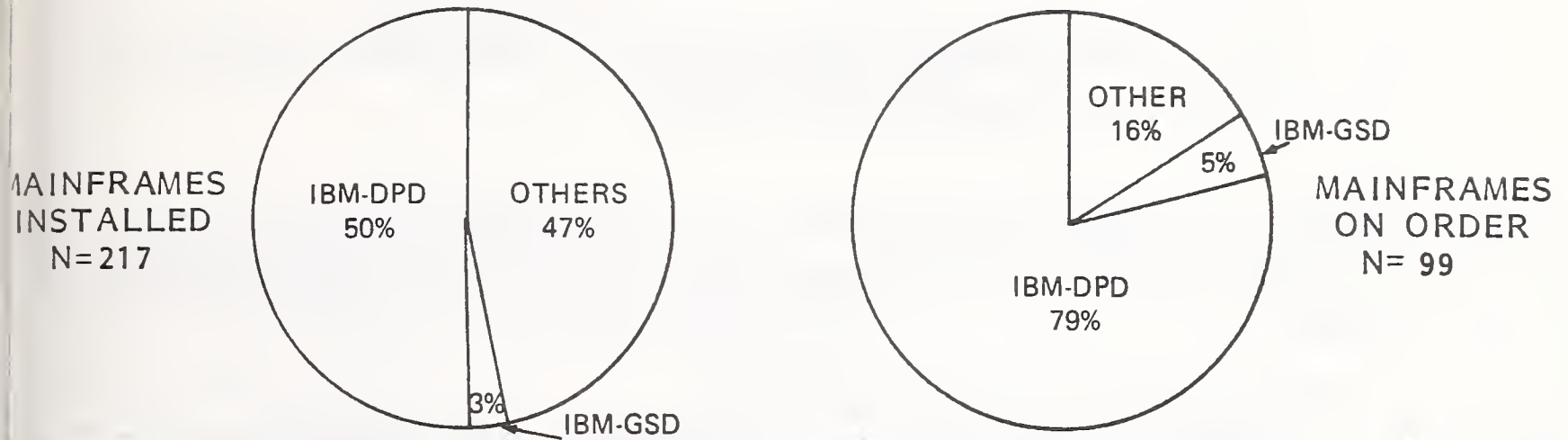
RESOURCE	APPLICATIONS	PERCENT OF USE
COMPUTER EQUIPMENT	PRODUCTION JOBS	68.9%
	NEW APPLICATIONS DEVELOPMENT	14.8
	EXISTING PROGRAM MAINTENANCE	13.5
	OTHER*	2.8
PROGRAMMING PERSONNEL	NEW PROGRAM DEVELOPMENT	40.1
	EXISTING PROGRAM MAINTENANCE	38.2
	ENHANCEMENT OF EXISTING PROGRAMS	21.7

\*OTHER MENTIONS INCLUDE:

- OVERHEAD
- EQUIPMENT MAINTENANCE
- TELEPROCESSING
- SOFTWARE INSTALLATION
- DOS TO OS CONVERSION

EXHIBIT I-13

MAINFRAME EDP HARDWARE PROFILE IN THE  
GOVERNMENT SECTOR



MAINFRAME	INSTALLED			ON ORDER		
	NUMBER OF RESPONSES	NUMBER OF SYSTEMS	PERCENT	NUMBER OF RESPONSES	NUMBER OF SYSTEMS	PERCENT
IBM 3033	2	2	0.9%	3	4	4.0%
IBM 3033N	0	0	0.0	2	2	2.0
IBM 3032	1	5	2.3	1	1	1.0
IBM 3031	5	6	2.8	1	2	2.0
IBM 370 158-168	23	32	14.7	1	1	1.0
IBM 4331	5	11	5.1	5	6	6.1
IBM 4341	0	0	.0	17	21	21.2
IBM 8100	6	13	6.0	4	40	40.4
IBM OTHER 370	22	25	11.5	1	1	1.0
IBM OTHER 360	11	15	6.9	0	0	0.0
SUBTOTAL IBM-DPD	75	109	50.2%	35	78	78.7%
IBM SYSTEMS 1, 3, 32, 34	3	6	2.8%	2	5	5.1%
IBM SYSTEMS 38	1	1	.5	0	0	0.0
SUBTOTAL IBM-GSD	4	7	3.3%	2	5	5.1%
BURROUGHS	18	21	9.7	6	6	6.1
CDC	4	5	2.3	0	0	0.0
DEC	9	12	5.5	1	1	1.0
DATA GENERAL	2	4	1.8	0	0	0.0
DATAPoint	2	7	3.2	0	0	0.0
HONEYWELL	9	10	4.6	1	1	1.0
HEWLETT-PACKARD	6	8	3.7	1	1	1.0
NATIONAL ADVANCED SYSTEMS	2	3	1.4	0	0	0.0
NCR	4	5	2.3	2	2	2.0
UNIVAC	10	12	5.5	5	5	5.1
WANG	1	3	1.4	0	0	0.0
OTHER	9	11	5.1	0	0	0.0
SUBTOTAL OTHER	76	101	46.5%	16	16	16.2%
TOTAL	155	217	100.0%	53	99	100.0%

- The large number of non-EDP mainframes represents the government's tendency to spread business among suppliers as well as the requirement to purchase the lowest bidder's equipment.
- As in other industries, IBM dominates the mainframes on order, with 40.4% of this category being for 8100's.
- Exhibit 1-14 shows that two-thirds of the respondents already have mini-computers installed, with an expected growth rate between 1980 and 1981 of 30.4%.
  - Conversely, two-thirds of the respondents have no microcomputers installed.
  - The highest growth rate, of 31.3% is for the installation of intelligent terminals, but the largest installed base (118.3) is in the nonintelligent terminal category.

#### 4. KEY ISSUE STATUS REVIEW

- As in other sectors, the implementation and development of new applications and on-line applications represent the greatest percentage of total mentions for important development objectives in the government sector.
  - Equally high in importance is the planning and improvement of productivity and/or operation. Exhibit 1-15 lists the percentage of total mentions for a variety of categories.
- Exhibit 1-16 shows that slightly over one-third of the EDP staff attend either management training or technical training.
  - The technical training is nearly four times as expensive as the management training.



EXHIBIT I-14

NON-MAINFRAME EDP HARDWARE PROFILE IN THE GOVERNMENT SECTOR

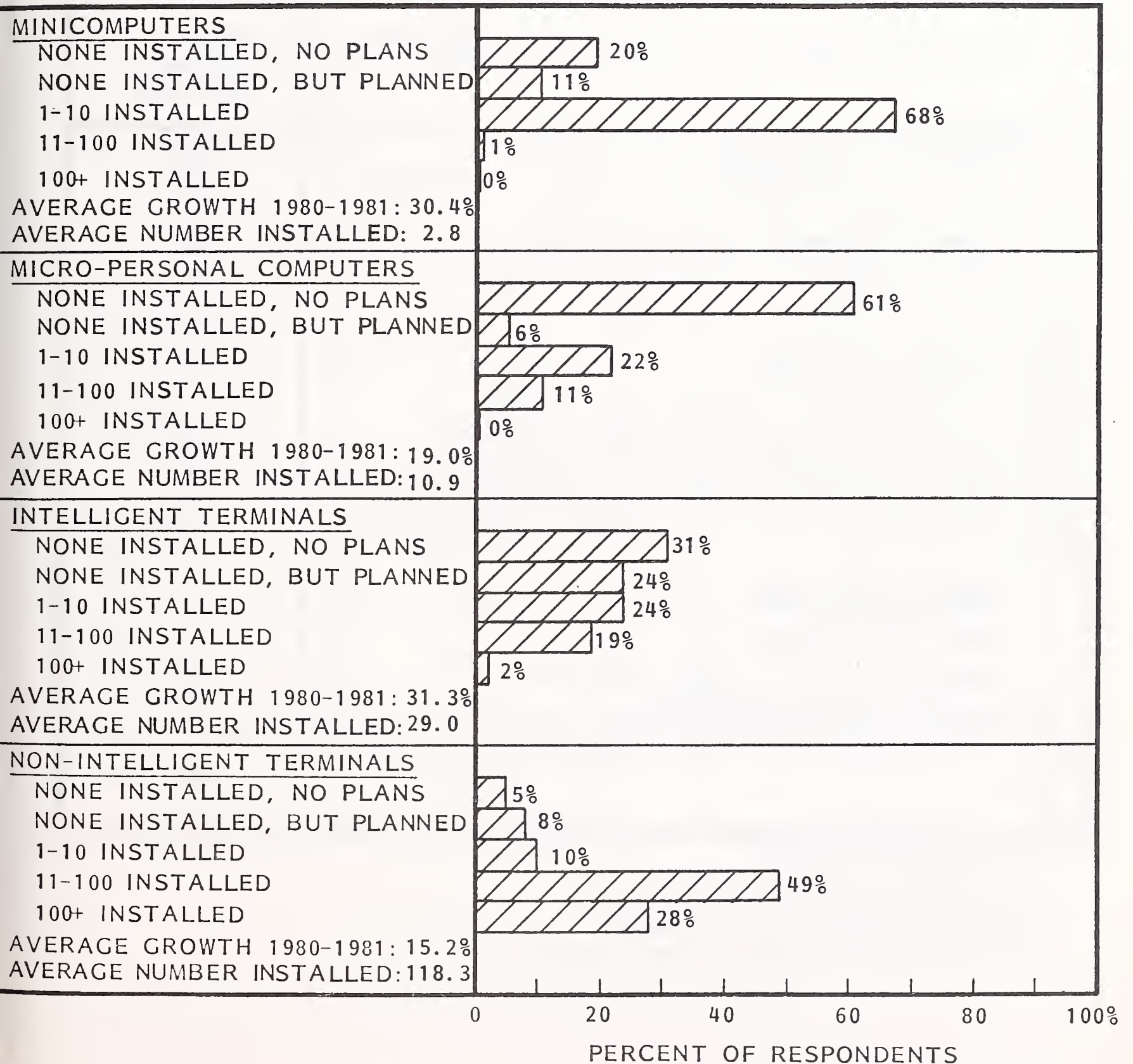


EXHIBIT I-15

MOST IMPORTANT DEVELOPMENT OBJECTIVE  
IN THE GOVERNMENT SECTOR

MOST IMPORTANT EDP DEVELOPMENT OBJECTIVE IN 1980	PERCENT OF TOTAL MENTIONS
DATA BASE DEVELOPMENT	8%
DESIGN OR INSTALL DDP	5
IMPLEMENT/DEVELOP NEW APPLICATIONS	19
IMPLEMENT/DEVELOP ON-LINE APPLICATIONS	15
INSTALL OR UPGRADE MAINFRAME	8
INSTALL MINICOMPUTERS	-
INSTALL OR CONVERT OPERATING SYSTEMS	-
DESIGN/DEVELOP COMMUNICATIONS NETWORK	3
CENTRALIZE OR DECENTRALIZE DP OPERATIONS	1
PLAN/IMPROVE PRODUCTIVITY AND/OR OPERATIONS	18
OTHER	
- REWRITE SOFTWARE	6
- USER INVOLVEMENT	3
- TURN EDP INTO A PROFIT CENTER	3
- MISCELLANEOUS RESPONSES*	11
TOTAL	100%

\*SPECIFIC RESPONSES INCLUDE:

- EXPAND ON-LINE TERMINAL USAGE
- CONTROL UNJUSTIFIED WORD PROCESSING
- SECURITY AND CONTINGENCY PLANNING
- "HOLD OUR GROUND AND NOT GRIND TO A HALT"

EXHIBIT I-16

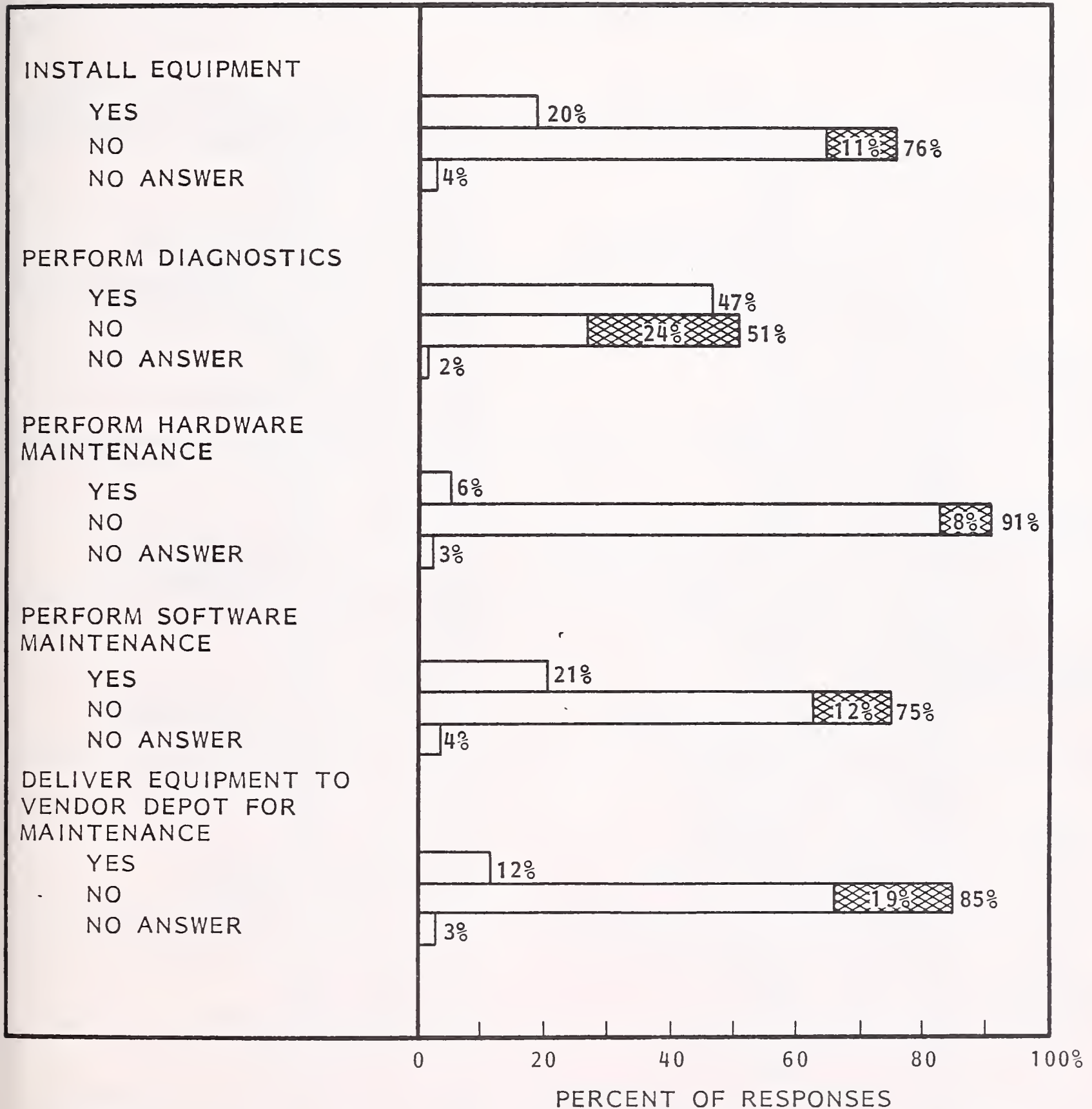
TRAINING EXPENDITURES IN THE  
GOVERNMENT SECTOR

TYPE OF TRAINING	AVERAGE EXPENSE	AVERAGE EXPENDITURE PER EDP EMPLOYEE	PERCENT OF STAFF ATTENDING	AVERAGE EXPENSE PER ATTENDEE
IN-HOUSE MANAGEMENT TRAINING	\$ 2,436	\$ 29	36.5%	\$160
OUTSIDE MANAGEMENT TRAINING	2,447	29		
IN-HOUSE TECHNICAL TRAINING	8,875	105	39.5	559
OUTSIDE TECHNICAL TRAINING	9,674	115		
TOTAL	\$23,432	\$278	-	-

- The percentage of staff attending technical training is considerably less than the level reported by industrial sector respondents to the INPUT 1980 survey.
- Exhibit I-17 confirms that, with the exception of performance of diagnostics, very little self-maintenance is done in the government sector.
- With the exception of computer graphics and data communications, office automation is not yet the responsibility of EDP managers, as shown in Exhibit I-18.
- Word processing and data communications are being used by the majority of the respondents, but other office automation functions have not yet been widely installed.

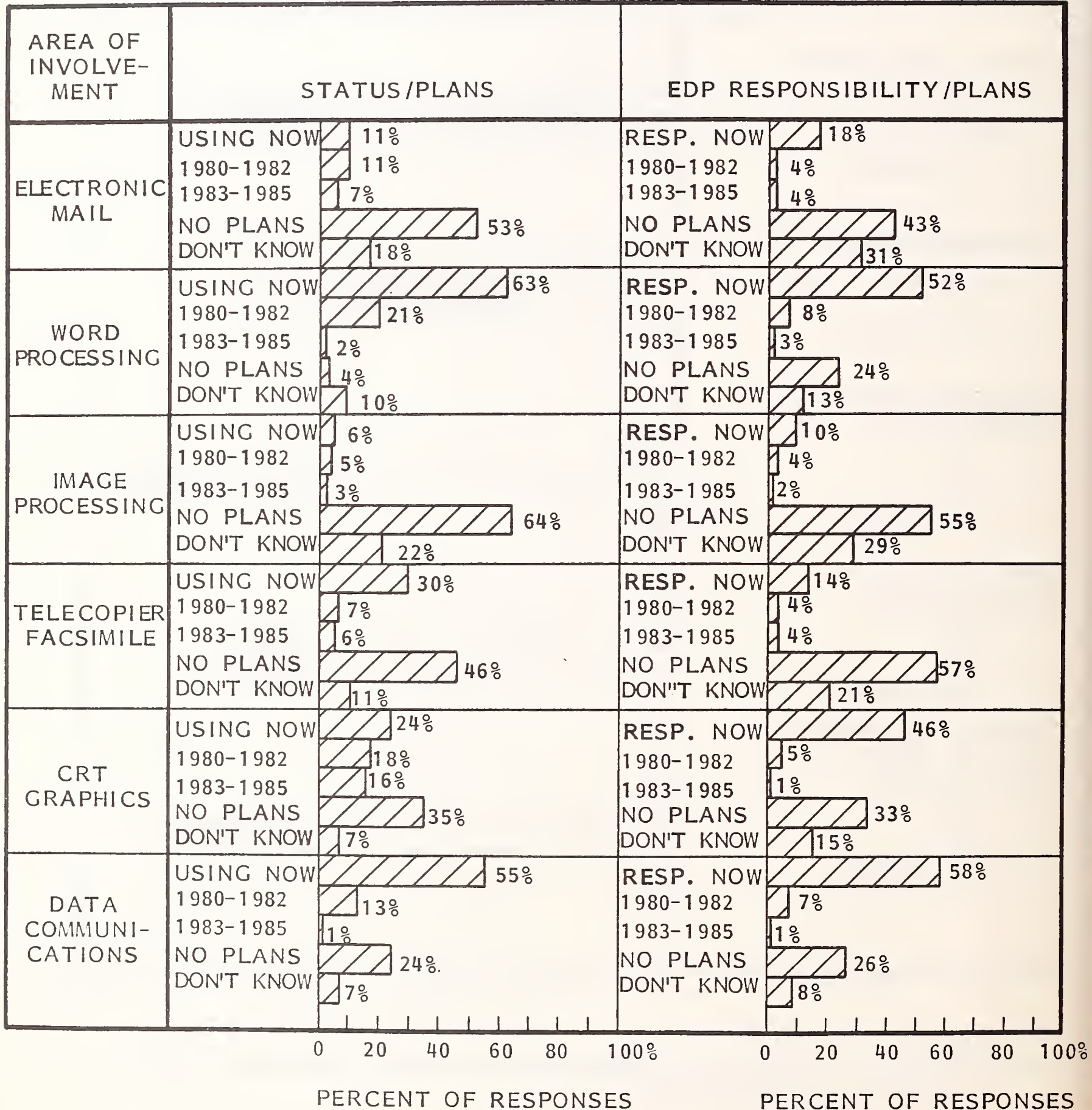
EXHIBIT I-17

DEGREE OF USER SELF-MAINTENANCE  
IN THE GOVERNMENT SECTOR



NOTE: [Hatched Box] INDICATES PERCENT OF RESPONDENTS NOT CURRENTLY PERFORMING FUNCTION, BUT WHO WOULD CONSIDER DOING SO

**EXHIBIT I-18**  
**RESPONDENT INVOLVEMENT IN OFFICE AUTOMATION**  
**IN THE GOVERNMENT SECTOR**



1980 ANALYSIS OF EDP IN INSURANCE





## INSURANCE

### I. INDUSTRY SECTOR OVERVIEW

- INPUT has divided the insurance sector into five subsectors:
  - Life/health insurance.
  - Property/casualty insurance.
  - Government-funded health insurance.
  - Insurance agents and brokers.
  - Other.
- The types of firms included in each subsector are defined in the SIC code 63.
- The market for insurance companies is made up of some 2,000 corporate groups, each group composed of from 1 to 15 companies: 1,200 life/health, and 800 property/casualty groups.
- Financial assets are concentrated in very large and large companies or groups.
  - Very large and large life/health insurance groups (assets exceeding \$1.0 billion) control 78% of the total assets.

- Very large and large property/casualty insurance groups (net premium revenues exceeding \$250 million and 7% of the total number) hold 80% of the total assets.
- In terms of revenues, casualty insurance companies are growing most rapidly, with an average annual growth rate of 13%. Life insurance companies are experiencing a 10% average annual growth rate.
- The insurance sector, while highly automated, is still very labor-intensive. The industry employed nearly 1.7 million people in 1977. Company employment exceeds that of partnerships, agencies and individual brokers by a factor of 4.6. Nonetheless, insurance agents and brokers represent a significant market area for new EDP equipment and services.
- Net premium income (total income less investment income) is the best indicator of daily business activity in the insurance industry. This measure was nearly equally divided in 1978. Almost \$80 billion was for life insurance companies and nearly \$82 billion was for property/casualty insurance companies.
- There were 90 respondents to the 1980 INPUT survey. This represents 9.9% of the total for this year.
- Exhibit I-1 reveals the respondent profile for the insurance sector in terms of company size by total assets.
  - Those with \$100 million or less in assets represented 30% of the total respondents and had an average of 32 EDP employees per company. This category had the highest ratio of EDP budget to total assets as well as the highest EDP budget per total number of employees for the three size categories.
  - The medium-size respondents, between \$101 and \$999 million, represented the largest group of respondents, with 42.2%. All three

EXHIBIT I-1

RESPONDENT PROFILE - INSURANCE SECTOR

PROFILE CHARACTERISTIC	COMPANY SIZE IN TERMS OF TOTAL ASSETS			
	\$100 MILLION OR LESS	\$101-999 MILLION	\$1 BILLION OR MORE	NO SIZE DATA
PERCENT OF TOTAL RESPONDENTS	30.0%	42.2%	13.3%	14.4%
AVERAGE TOTAL ASSETS (\$ MILLION)	\$ 57.6	\$ 373.6	\$ 3,167	-
AVERAGE TOTAL EMPLOYEES	291	1,149	4,472	484
AVERAGE EDP EMPLOYEES	32	87	314	58
EDP EMPLOYEES PER 100 TOTAL EMPLOYEES	11.2	7.5	7.0	11.9
AVERAGE EDP BUDGET (\$ THOUSAND)	\$ 1,061	\$ 3,054	\$10,270	\$ 1,842
EDP BUDGET AS A PERCENT OF ANNUAL SALES	1.9%	0.8%	0.3%	-
EDP BUDGET PER EDP EMPLOYEE	\$34,828	\$34,461	\$34,473	\$31,936
EDP BUDGET PER TOTAL NUMBER OF EMPLOYEES	\$ 3,737	\$ 2,698	\$ 2,424	\$ 3,804

insurance size categories had approximately the same EDP budget per EDP employee of over \$34,000.

- For the largest-size companies of \$1.0 billion or more, the number of EDP employees per 100 total employees was the lowest of the three categories, at 7.0. In addition, the EDP budget as a percentage of total assets was the lowest of the three size categories.

## 2. BUDGET AND EXPENDITURE ANALYSIS

- Exhibit I-2 portrays the distribution of ratios of EDP budget to company assets.
  - The largest number of respondents (29%) indicated that this ratio was between 0.3 to 0.6.
- However, nearly 40% of the respondents indicated that their 1980 budget compared to their 1979 budget had grown between 10% and 20%.
  - As shown in Exhibit I-3, 1981's budget compared to 1980's is projected to rise sharply, with nearly two-thirds of the respondents expecting a 10-20% increase in budget.
- As in other industries, the personnel category represents approximately half of the total EDP budget for both 1980 and 1981.
  - Surprisingly, software is the only budget category that shows a percent decrease between 1980 and 1981. As shown in Exhibit I-4, mini-computers represent the fastest growth but only a small percentage of the budget.
  - The overall average budget is expected to increase by 6.2% from 1980 to 1981.

EXHIBIT 1-2

RATIO OF EDP BUDGET TO COMPANY ASSETS:  
DISTRIBUTION OF RATIOS AMONG RESPONDENTS IN THE  
INSURANCE SECTOR

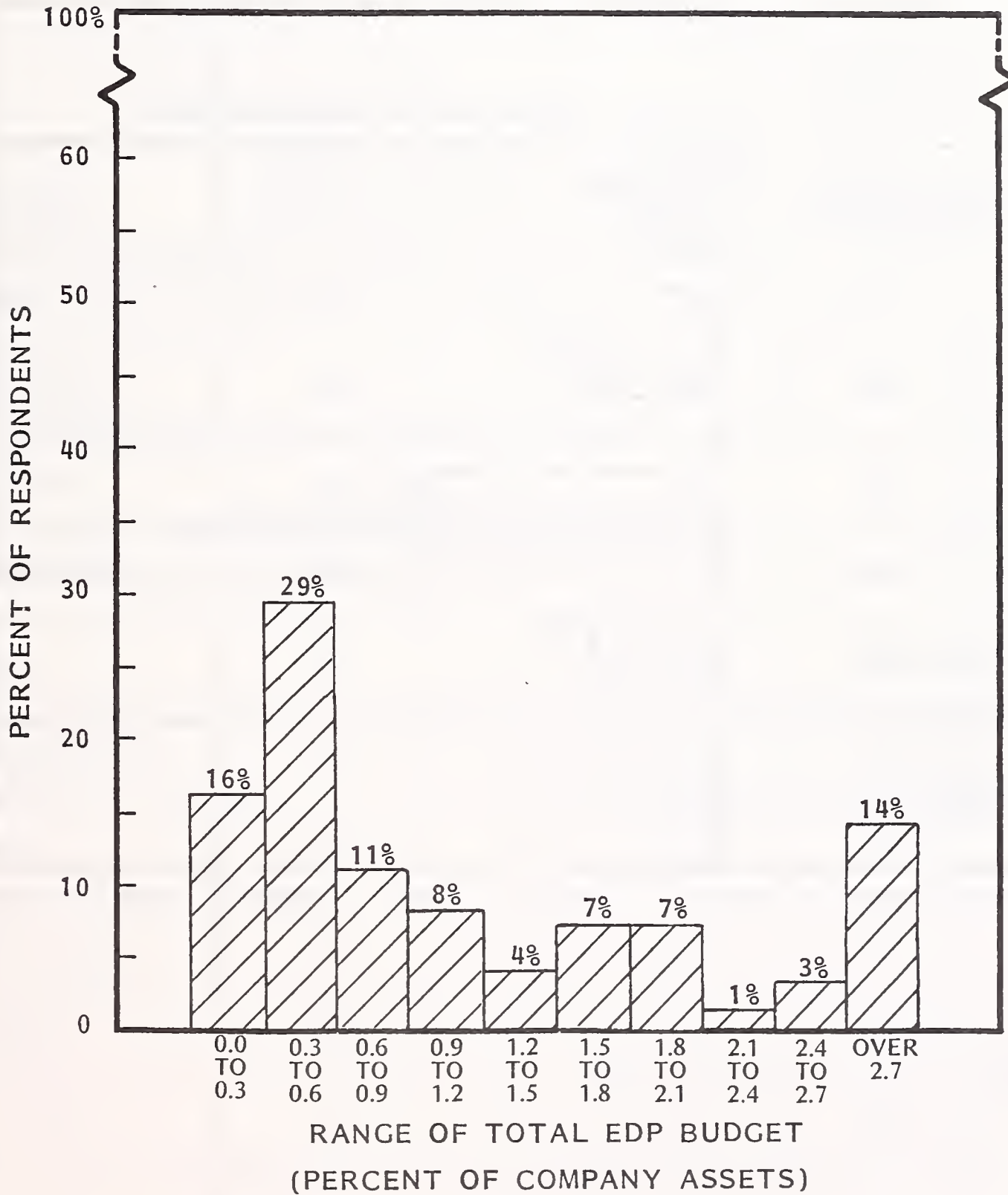
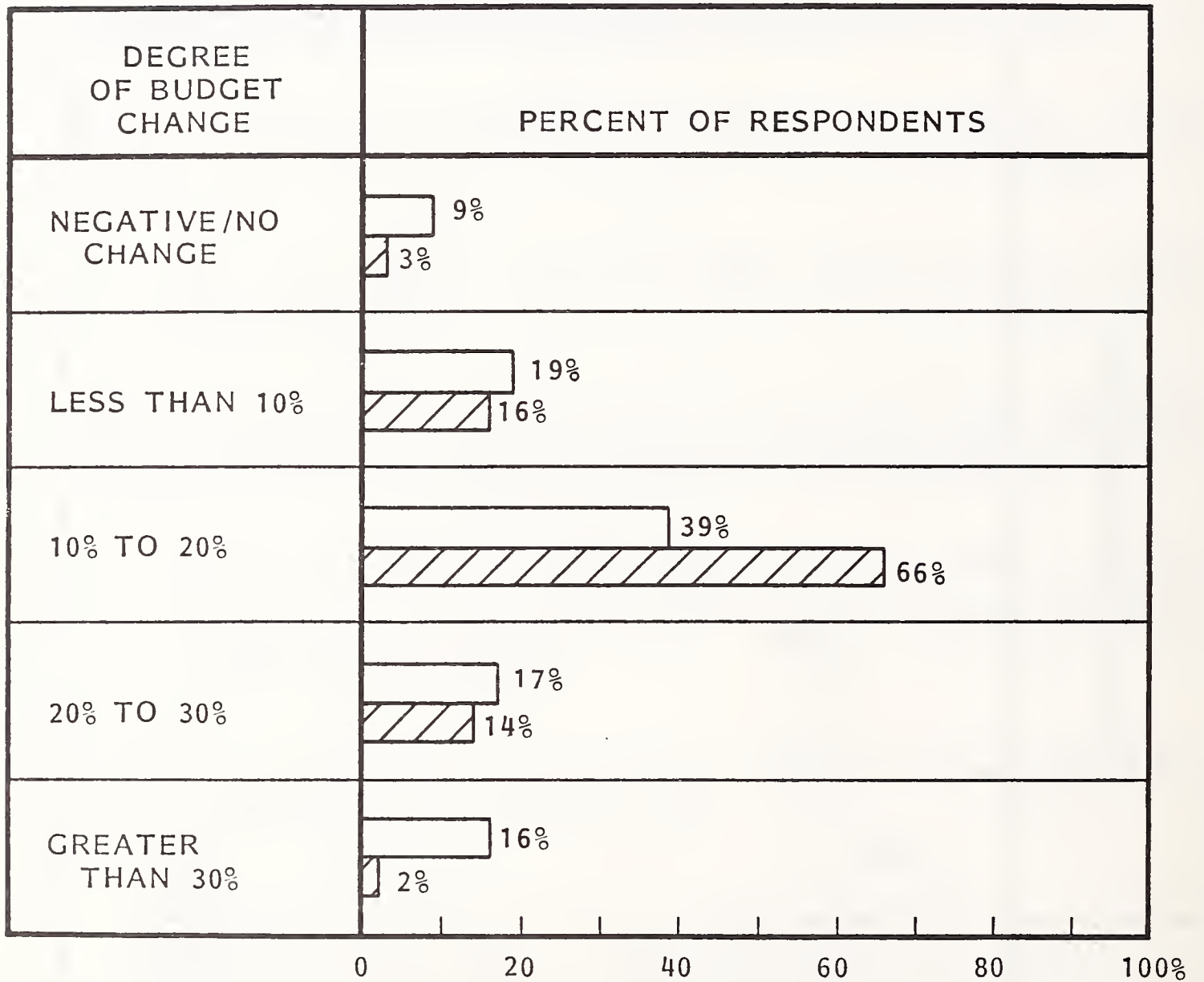


EXHIBIT I-3

ACTUAL AND PLANNED EDP BUDGET GROWTH  
FOR RESPONDENTS IN THE INSURANCE SECTOR



□ 1979-1980  
 ▨ 1980-1981

EXHIBIT I-4

ANTICIPATED CHANGES IN EDP BUDGETS  
IN THE INSURANCE SECTOR

BUDGET CATEGORY	1980		PERCENT INCREASE (DECREASE) 1980-1981	1981	
	AVERAGE BUDGET (\$ THOUSAND)	PERCENT OF TOTAL BUDGET		AVERAGE BUDGET (\$ THOUSAND)	PERCENT OF TOTAL BUDGET
PERSONNEL	\$1,801	49.5%	7.0%	\$1,928	49.9%
MAINFRAME PROCESSORS	496	13.6	6.6	528	13.7
PERIPHERALS	388	10.7	3.4	401	10.4
MINICOMPUTERS	86	2.4	24.5	107	2.8
TERMINALS	156	4.3	11.4	174	4.5
COMMUNICATIONS HARDWARE AND SOFTWARE	56	1.5	13.4	63	1.6
SOFTWARE	100	2.7	(5.9)	94	2.4
VENDOR MAINTENANCE	82	2.3	5.8	87	2.2
PROCESSING SERVICES	47	1.3	8.2	51	1.3
SUPPLIES AND OTHER	428	11.7	0.8	431	11.2
TOTAL	\$3,640	100.0%	6.2%	\$3,864	100.0%

- Exhibit I-5 shows that the insurance sector anticipates minimal impact from the recession.
- For those firms that anticipate a reduction due to the recession, Exhibit I-6 shows that personnel recruiting will be the primary target for reduced budget allocations in 1980.

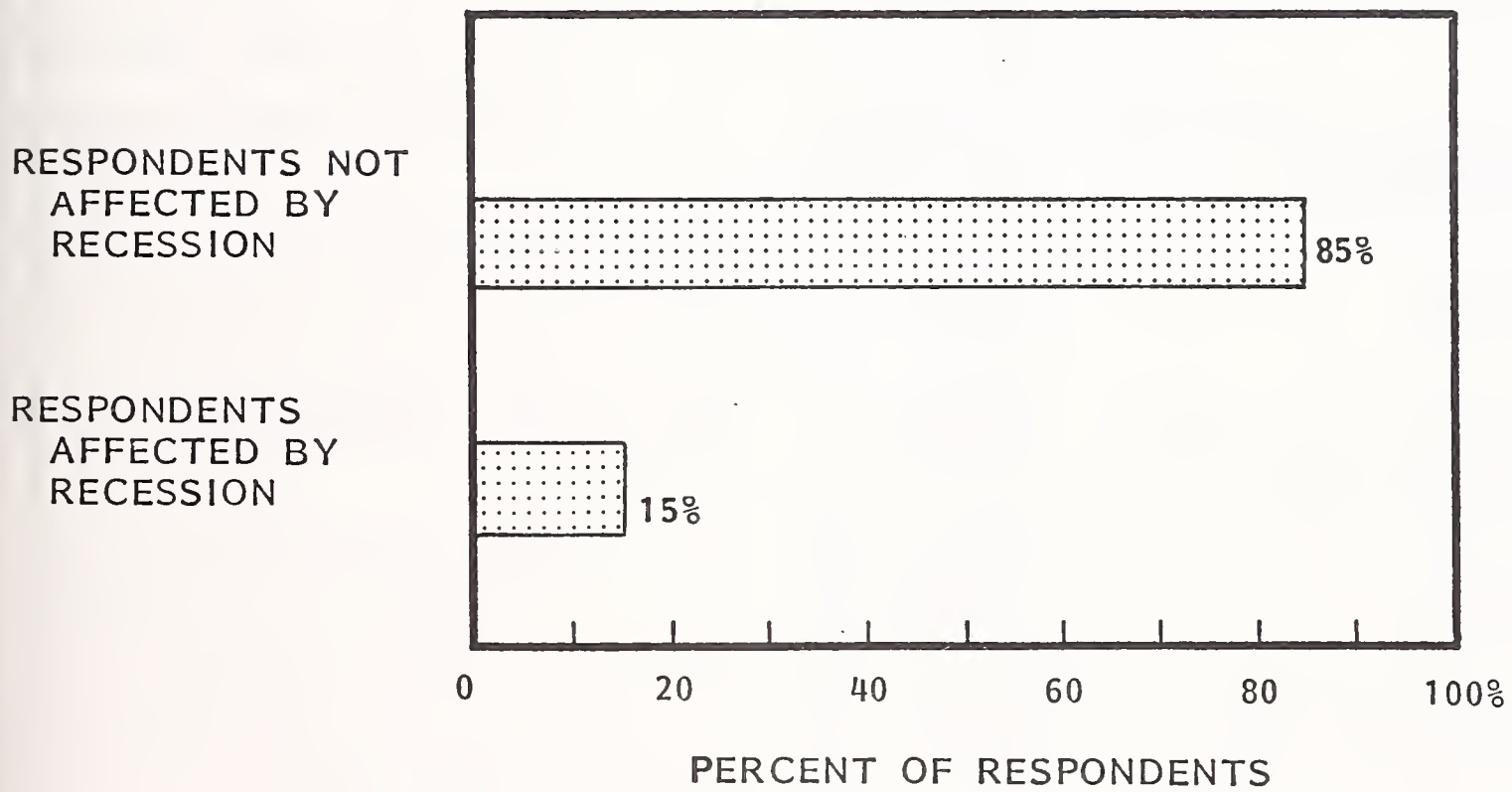
### 3. MAJOR PLANS AND PROBLEMS

- As with the other industry sectors, the insurance industry places the highest relative importance in 1980 through 1982 on the installation of on-line applications.
  - As shown in Exhibit I-7, the integration of office automation with EDP will move strongly upward in relative importance between 1980 and 1982.
- Exhibit I-8 shows that industry-specific applications have the highest priority.
  - The lower relative importance for accounting and finance indicates the maturity of the industry, which already has these applications well in place.
- Programming aids and on-line programming are the two most frequently mentioned methods to improve time and costs associated with applications development.
  - Exhibit I-9 shows the relative distribution of various methods and their percent of mentions by respondents in the insurance sector.
  - Exhibit I-10 portrays the distribution of expected levels of improvement in program development.



EXHIBIT I-5

EFFECTS OF RECESSION ON EDP BUDGETS  
IN THE INSURANCE SECTOR



AVERAGE PERCENT  
BUDGET REDUCTION FOR  
THOSE AFFECTED BY RECESSION: 12.6%

EXHIBIT I-6

BUDGET AREAS IMPACTED BY POSSIBLE  
RECESSION IN 1980 FOR RESPONDENTS IN THE  
INSURANCE SECTOR

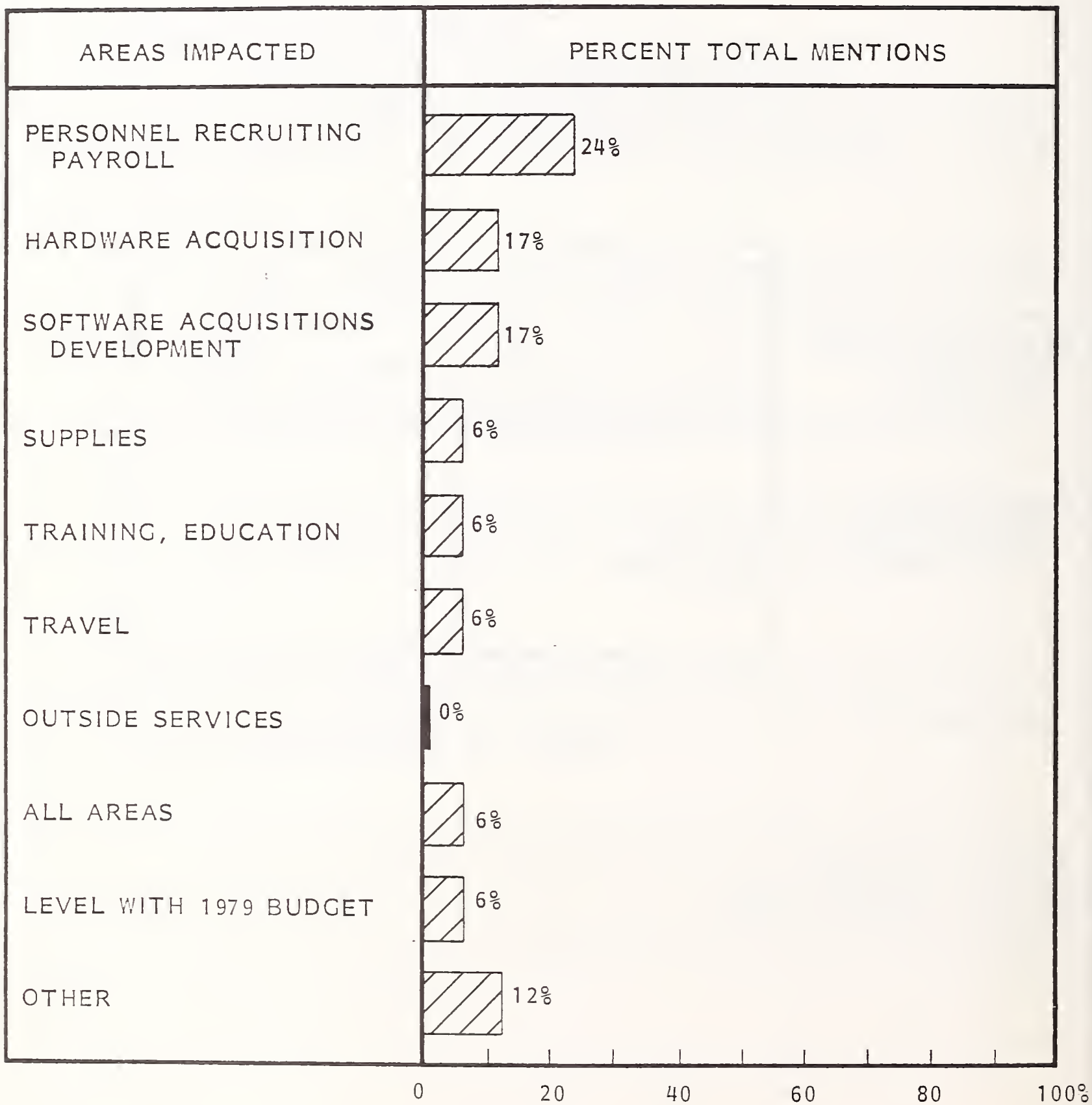


EXHIBIT I-7

EDP OBJECTIVES FOR RESPONDENTS IN THE  
INSURANCE SECTOR

OBJECTIVE	RELATIVE IMPORTANCE		
	1980	1981	1982
INSTALL ON-LINE APPLICATIONS	100%	100%	100%
CONVERT APPLICATIONS	56	45	43
IMPROVE EDP PERSONNEL PRODUCTIVITY	51	52	53
DEVELOP LONG-RANGE EDP PLAN	41	30	30
DEVELOP NEW BATCH APPLICATIONS	58	44	51
MEET DEVELOPMENT, CONVERSION SCHEDULES	38	42	43
INSTALL NEW MAINFRAME	28	47	22
DESIGN, INSTALL DBMS	25	34	42
CHANGE OPERATING SYSTEMS	24	22	11
DESIGN, INSTALL DDP NETWORK	18	24	28
INSTALL NEW PERIPHERALS	11	12	7
INSTALL MINICOMPUTERS	14	3	12
INTEGRATE OFFICE AUTOMATION WITH EDP	8	21	36
CENTRALIZE EDP CONTROL	5	4	6
DECENTRALIZE EDP CONTROL	2	0	0
OTHER	9	5	6

EXHIBIT I-8

APPLICATIONS TO BE DEVELOPED BY  
RESPONDENTS IN THE INSURANCE SECTOR

APPLICATION	RELATIVE IMPORTANCE	PERCENT OF MENTIONS AS HIGHEST PRIORITY
ACCOUNTING/FINANCE	53	23%
INVENTORY CONTROL	7	1
ORDER ENTRY/BILLING	17	2
PERSONNEL	10	2
PURCHASING	-	-
MARKETING/SALES	36	11
MODELING/FORECASTING	18	1
PERFORMANCE MEASUREMENT/CONTROL	18	4
OTHER**	100	56
TOTAL	-	100%

\*\*SPECIFIC APPLICATIONS INCLUDE:

- CLAIMS PROCESSING
- AUTOMATED CLAIMS ADJUDICATION
- POLICY MANAGEMENT SYSTEM
- BRANCH OFFICE SYSTEM
- INSURANCE AGENCY SUPPORT
- COMMERCIAL LINES POLICY WRITING
- HEALTH CLAIMS SYSTEMS
- MEMBERSHIP (CUSTOMER) SYSTEM
- ON-LINE CASUALTY
- GROUP INSURANCE

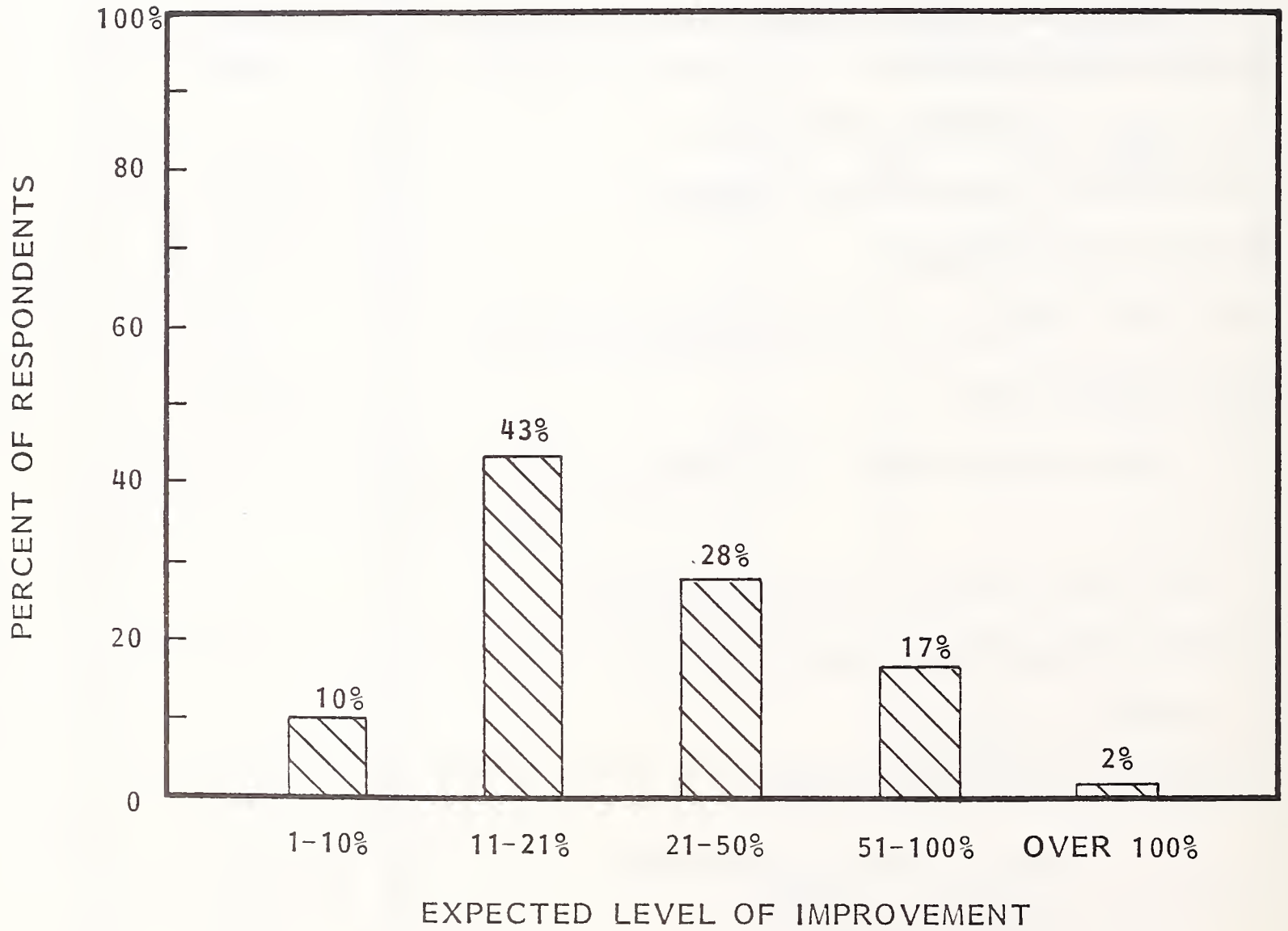
EXHIBIT I-9

METHODS USED TO IMPROVE TIME AND COSTS  
ASSOCIATED WITH APPLICATIONS DEVELOPMENT IN THE  
INSURANCE SECTOR

METHOD	PERCENT OF MENTIONS
ON-LINE PROGRAMMING	20%
PURCHASED SOFTWARE PRODUCTS	6
STRUCTURED PROGRAMMING/DESIGN	12
PROJECT MANAGEMENT	4
IMPROVED TRAINING/BETTER QUALIFICATIONS	12
PROGRAMMING AIDS	27
DATA BASE MANAGEMENT SYSTEMS	1
OTHER	
- USER INVOLVEMENT IN DEVELOPMENT	3
- STANDARDIZED METHODS/SYSTEMS	1
- HARDWARE UPGRADE	1
- IMPROVED DOCUMENTATION	1
- CRT TERMINALS FOR PROGRAMMERS	2
- MISCELLANEOUS METHODS	9
- DO NOTHING/NO PLANS	1

EXHIBIT I-10

EXPECTED LEVEL OF IMPROVEMENT IN PROGRAM  
DEVELOPMENT FOR RESPONDENTS IN THE  
INSURANCE SECTOR



- . Over two-thirds expect the improvement to be between 11% and 50%.
- Exhibit I-11 shows that personnel problems are the most significant in the insurance sector, as in other industry sectors.
  - A significant percentage of highest-priority rankings were given to the need for improvement in operation. This is a higher priority than those reported for other industry sectors.
- The highest percentage of programming personnel use was reported for new program development.
  - Exhibit I-12 shows that new applications developments represent 19% of computer equipment use.
- Exhibit I-13 shows that nearly three-fourths of the insurance sector has IBM mainframe equipment installed.
  - Nearly 40% of those installed are small IBM systems. This significant percentage represents the need for limited equipment in the smaller offices and agencies within the insurance industry.
  - Exhibit I-13 shows that the IBM 4300 series has been ordered in large numbers by the insurance industry sector.
- While half of the respondents indicated that they had one or more mini-computers installed, an equal number have no minicomputers and none planned in the future.
  - As shown in Exhibit I-14, still fewer respondents have personal computers installed.

EXHIBIT I-11

MOST SIGNIFICANT EDP PROBLEMS IN THE  
INSURANCE SECTOR

PROBLEM	RELATIVE IMPORTANCE	PERCENT OF MENTIONS AS HIGHEST PRIORITY
PERSONNEL RECRUITING	100	41%
NEED FOR BETTER PLANNING AND CONTROL	64	8
PERSONNEL TRAINING	63	4
LACK OF GENERAL MANAGEMENT UNDERSTANDING	29	3
LACK OF USER INVOLVEMENT IN SYSTEMS/APPLICATIONS DEVELOPMENT	43	7
NEED FOR IMPROVEMENT IN OPERATIONS	44	14
EXCESSIVE APPLICATIONS DEVELOPMENT TIME	44	11
INADEQUATE EDP FUNDING	6	0
INADEQUATE SYSTEMS SOFTWARE	21	5
NEED TO IMPROVE DATA COMMUNICATIONS	27	4
UNSATISFACTORY HARDWARE MAINTENANCE	7	1
OTHER	10	2



EXHIBIT I-12

USE OF RESOURCES IN THE INSURANCE SECTOR

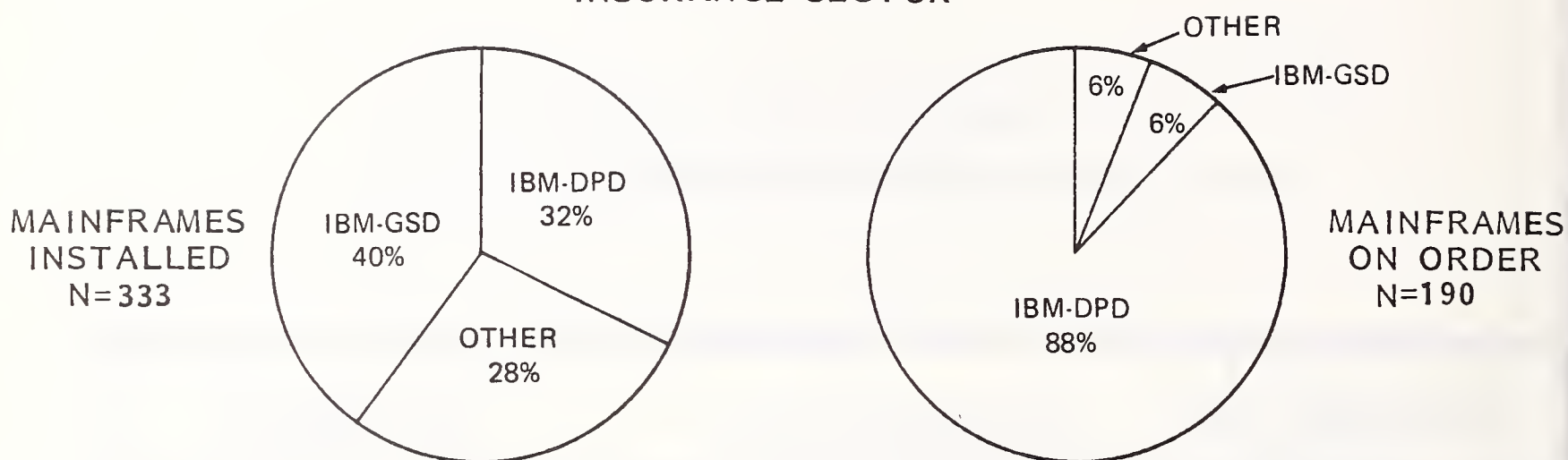
RESOURCE	APPLICATIONS	PERCENT OF USE
COMPUTER EQUIPMENT	PRODUCTION JOBS	61.0%
	NEW APPLICATIONS DEVELOPMENT	19.1
	EXISTING PROGRAM MAINTENANCE	18.3
	OTHER*	1.6
PROGRAMMING PERSONNEL	NEW PROGRAM DEVELOPMENT	39.2
	EXISTING PROGRAM MAINTENANCE	35.2
	ENHANCEMENT OF EXISTING PROGRAMS	25.6

\*OTHER MENTIONS INCLUDE:

- LIBRARY
- MAINTENANCE OF MANUALS
- EXCESS TIME SOLD

EXHIBIT I-13

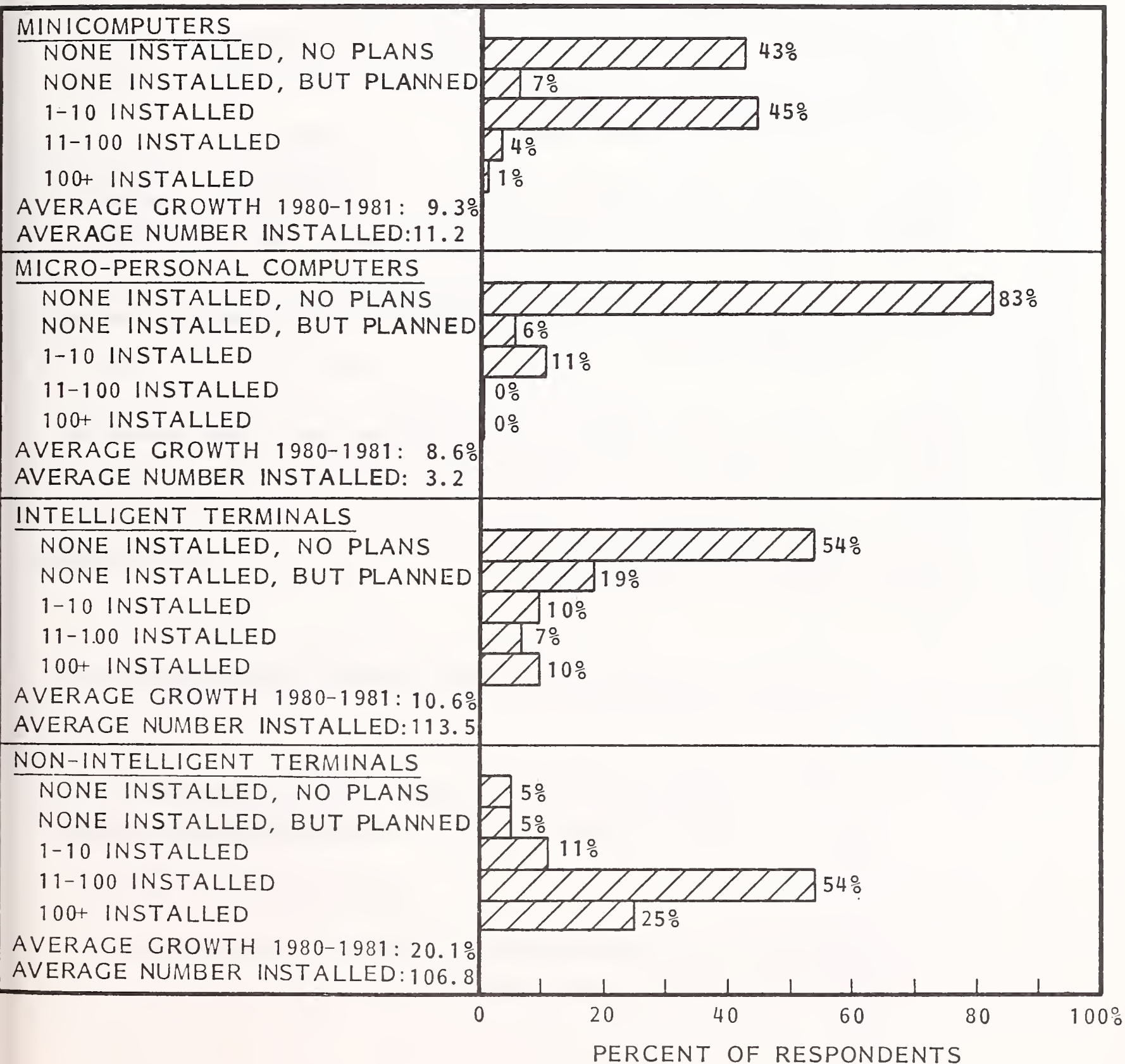
MAINFRAME EDP HARDWARE PROFILE IN THE INSURANCE SECTOR



MAINFRAME	INSTALLED			ON ORDER		
	NUMBER OF RESPONSES	NUMBER OF SYSTEMS	PERCENT	NUMBER OF RESPONSES	NUMBER OF SYSTEMS	PERCENT
IBM 3033	7	8	2.4%	3	3	1.6%
IBM 3033N	0	0	0.0	8	8	4.2
IBM 3032	6	6	1.8	0	0	0.0
IBM 3031	11	13	3.9	2	2	1.1
IBM 370 158-168	19	23	6.9	2	2	1.1
IBM 4331	5	6	1.8	23	84	44.2
IBM 4341	1	1	0.3	40	49	25.8
IBM 8100	2	5	1.5	8	20	10.5
IBM OTHER 370	30	33	9.9	0	0	0.0
IBM OTHER 360	10	11	3.3	0	0	0.0
SUBTOTAL IBM-DPD	91	106	31.8%	86	168	88.5%
IBM SYSTEMS 1, 3, 32, 34	4	133	39.9%	2	11	5.8%
IBM SYSTEMS 38	0	0	0.0	0	0	0.0
SUBTOTAL IBM-GSD	4	133	39.9%	2	11	5.8%
BURROUGHS	2	2	0.6%	1	2	1.1%
HONEYWELL	9	14	4.2	1	5	2.6
UNIVAC	3	4	1.2	0	0	0.0
WANG	2	50	15.0	0	0	0.0
OTHER	22	24	7.3	2	4	2.0
SUBTOTAL OTHER	38	94	28.3%	4	11	5.7%
TOTAL	133	333	100.0%	92	190	100.0%

EXHIBIT I-14

NON-MAINFRAME EDP HARDWARE PROFILE IN THE INSURANCE SECTOR



- The fastest growth is expected to be in the procurement of nonintelligent terminals between 1980 and 1981.
- The insurance industry is a heavy user of nonintelligent terminals for remote data entry and inquiry, and this trend is expected to continue.

#### 4. KEY ISSUE STATUS REVIEW

- Paralleling other industries, Exhibit I-15 shows that the implementation and development of new and on-line applications is the most important development objective in the insurance sector.
- Exhibit I-16 shows that, while less than half of the EDP staff is attending training in the insurance sector, the cost per attendee is a very high \$948.00.
  - In-house technical training is nearly twice as costly as training procured from outside vendors.
- Exhibit I-17 reveals that the insurance sector does very little self-maintenance. Use of outside services is much higher than for other industry sectors.
- Word processing, telecopier and facsimile, and data communications are being currently used in the insurance sector.
  - Only data communications are currently an EDP responsibility for the majority of respondents.
  - Exhibit I-18 portrays the status, plans and EDP responsibility for various areas of involvement in new technology within the insurance sector.
  - Electronic mail, image processing and computer graphics are clearly in their infancy in the insurance industry.

EXHIBIT I-15

MOST IMPORTANT DEVELOPMENT OBJECTIVE  
IN THE INSURANCE SECTOR

MOST IMPORTANT EDP DEVELOPMENT OBJECTIVE IN 1980	PERCENT OF TOTAL MENTIONS
DATA BASE DEVELOPMENT	5%
DESIGN OR INSTALL DDP	5
IMPLEMENT/DEVELOP NEW APPLICATIONS	27
IMPLEMENT/DEVELOP ON-LINE APPLICATIONS	19
INSTALL OR UPGRADE MAINFRAME	4
INSTALL MINICOMPUTERS	1
INSTALL OR CONVERT OPERATING SYSTEMS	5
DESIGN/DEVELOP COMMUNICATIONS NETWORK	-
CENTRALIZE OR DECENTRALIZE DP OPERATIONS	1
PLAN/IMPROVE PRODUCTIVITY AND/OR OPERATIONS	15
OTHER	
- REWRITE SOFTWARE	7
- STANDARDIZE SYSTEMS	5
- MISCELLANEOUS RESPONSES*	6
TOTAL	100%

\*SPECIFIC RESPONSES INCLUDE:

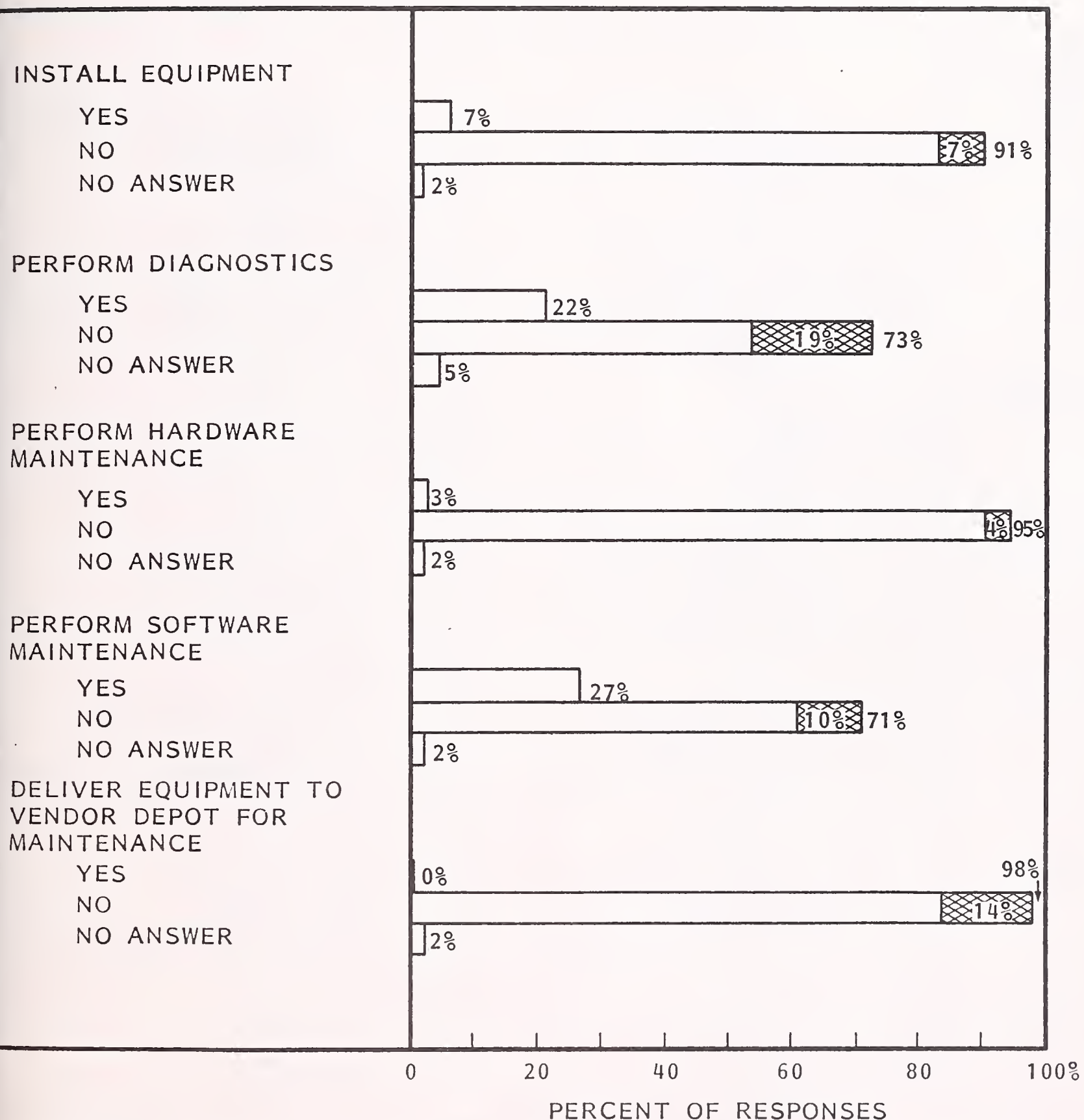
- GREATER AUTOMATION
- INSTALL WORD PROCESSING
- INCREASE USER PARTICIPATION

EXHIBIT I-16

TRAINING EXPENDITURES IN THE  
INSURANCE SECTOR

TYPE OF TRAINING	AVERAGE EXPENSE	AVERAGE EXPENDITURE PER EDP EMPLOYEE	PERCENT OF STAFF ATTENDING	AVERAGE EXPENSE PER ATTENDEE
IN-HOUSE MANAGEMENT TRAINING	\$ 3,053	\$ 33	30.5%	\$374
OUTSIDE MANAGEMENT TRAINING	7,230	78		
IN-HOUSE TECHNICAL TRAINING	25,382	272	44.2	948
OUTSIDE TECHNICAL TRAINING	13,056	140		
TOTAL	\$48,721	\$523	-	-

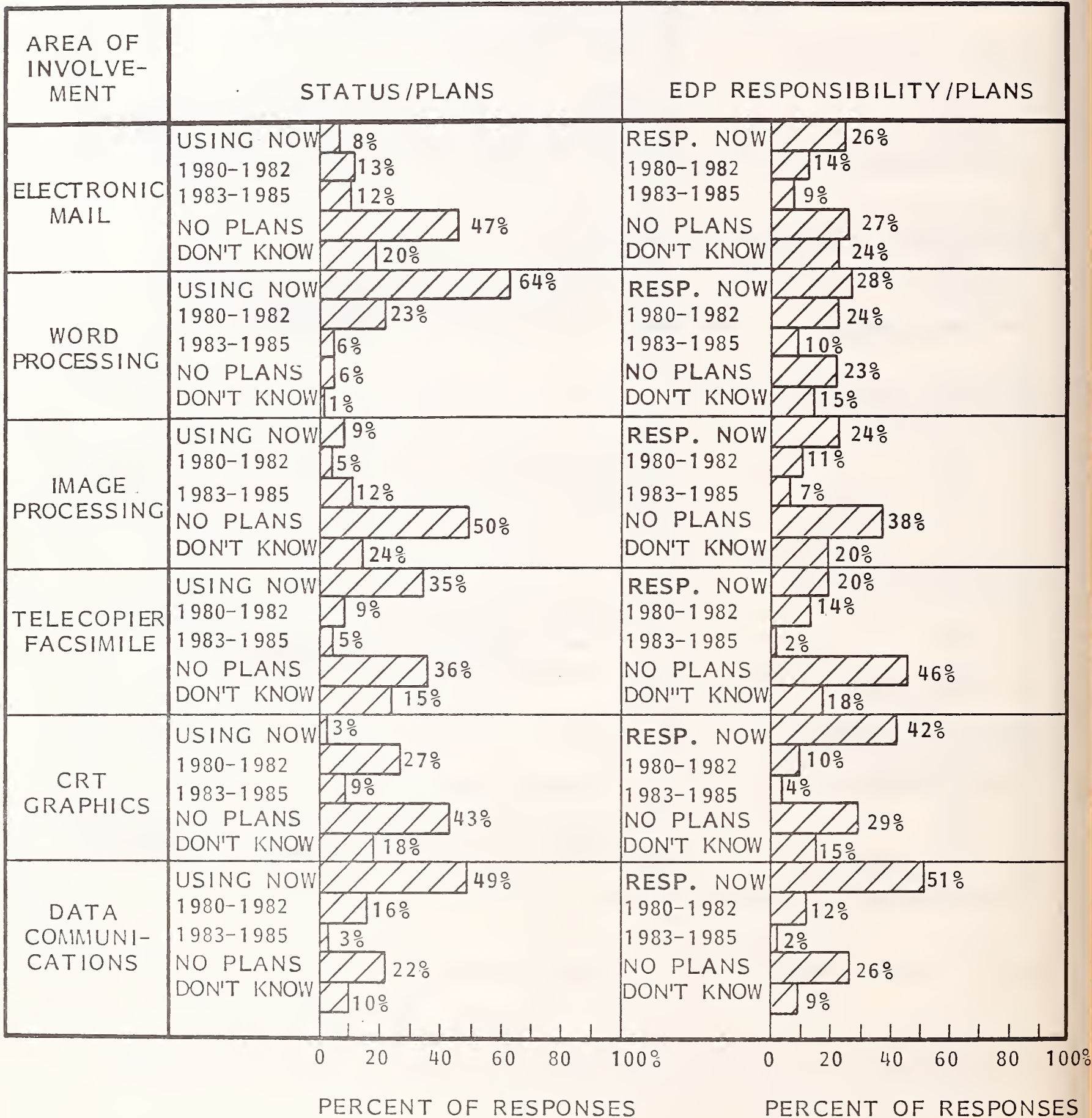
EXHIBIT I-17  
 DEGREE OF USER SELF-MAINTENANCE  
 IN THE INSURANCE SECTOR



NOTE: [Cross-hatched box] INDICATES PERCENT OF RESPONDENTS NOT CURRENTLY PERFORMING FUNCTION, BUT WHO WOULD CONSIDER DOING SO

EXHIBIT I-18

RESPONDENT INVOLVEMENT IN OFFICE AUTOMATION  
IN THE INSURANCE SECTOR





1980 ANALYSIS OF EDP IN OTHER INDUSTRIES



## OTHER INDUSTRIES

### I. INDUSTRY SECTOR OVERVIEW

- The information contained in this section is intended to summarize findings for respondents whose companies are not included in the previously defined industry sectors.
  - It should not be assumed that these findings typify any industry group within this category.
- There were 151 respondents in this category, which represents 16.6% of the total INPUT 1980 survey. Ninety-six of the respondents came from educational services, and 39 from health services.
  - Other respondents include construction, real estate and membership organizations. Together with a few companies that could not be unequivocally placed in any other category.
- As shown in Exhibit I-1, the majority of respondents (62.3%) reported annual revenues of \$100 million or less. The average respondent has 1,403 employees, of which 25 are EDP workers. Its EDP budget averages \$764,000, or 2.2% of annual revenues.

EXHIBIT I-1

RESPONDENT PROFILE - OTHER INDUSTRIES SECTOR

PROFILE CHARACTERISTIC	COMPANY SIZE IN TERMS OF ANNUAL SALES			
	\$100 MILLION OR LESS	\$101-999 MILLION	\$1 BILLION OR MORE	NO SIZE DATA
PERCENT OF TOTAL RESPONDENTS	62.3%	13.9%	1.3%	22.5%
AVERAGE ANNUAL SALES (\$ MILLION)	\$ 35.3	\$ 215.2	\$ 1,827	-
AVERAGE TOTAL EMPLOYEES	1,403	5,422	7,500	1,888
AVERAGE EDP EMPLOYEES	25	72	168	30
EDP EMPLOYEES PER 100 TOTAL EMPLOYEES	1.8	1.3	2.2	1.5
AVERAGE EDP BUDGET (\$ THOUSAND)	\$ 764	\$ 2,608	\$ 4,995	\$ 3,628
EDP BUDGET AS A PERCENT OF ANNUAL SALES	2.2%	1.2%	0.3%	-
EDP BUDGET PER EDP EMPLOYEE	\$30,754	\$36,347	\$29,735	\$118,777
EDP BUDGET PER TOTAL NUMBER OF EMPLOYEES	\$ 557	\$ 481	\$ 666	\$ 1,788

- The category of medium-sized respondents comprises 13.9% of the sample, with average revenues of \$215.2 million, and 5,422 employees, including 72 EDP employees. The overall EDP budget is \$2.6 million, which represents 1.2% of the companies' annual sales.
- Only 1.3% of the respondents had annual revenues of \$1 billion. This group had an average of 7,500 total employees, with 168 EDP employees on the average. The EDP budget as a percentage of annual sales was the lowest of any size category, at 0.3%; but the EDP budget per total number of employees was the highest, at \$666.

## 2. BUDGET AND EXPENDITURE ANALYSIS

- Exhibit I-2 shows that the largest group of respondents budget between 1% and 1.5% of total company sales for EDP.
  - Approximately one-third of the respondents expect the budget to grow less than 10% from 1979 to 1980, while an equal number plan for 10-20% growth.
  - Exhibit I-3 shows that a higher percentage growth rate is expected from 1980 to 1981 than was reported for 1979 to 1980.
- As in other industries, central mainframes for this group of respondents will continue to decline as a major portion of the EDP budget. Expenditures for terminals and personnel represent the largest budget increases between 1980 and 1981.
  - Exhibit I-4 shows that processing services represent the only area expected to experience an actual decline in expenditures in 1981 compared to 1980.

EXHIBIT 1-2

RATIO OF EDP BUDGET TO COMPANY SALES:  
DISTRIBUTION OF RATIOS AMONG RESPONDENTS IN THE  
OTHER INDUSTRIES SECTOR

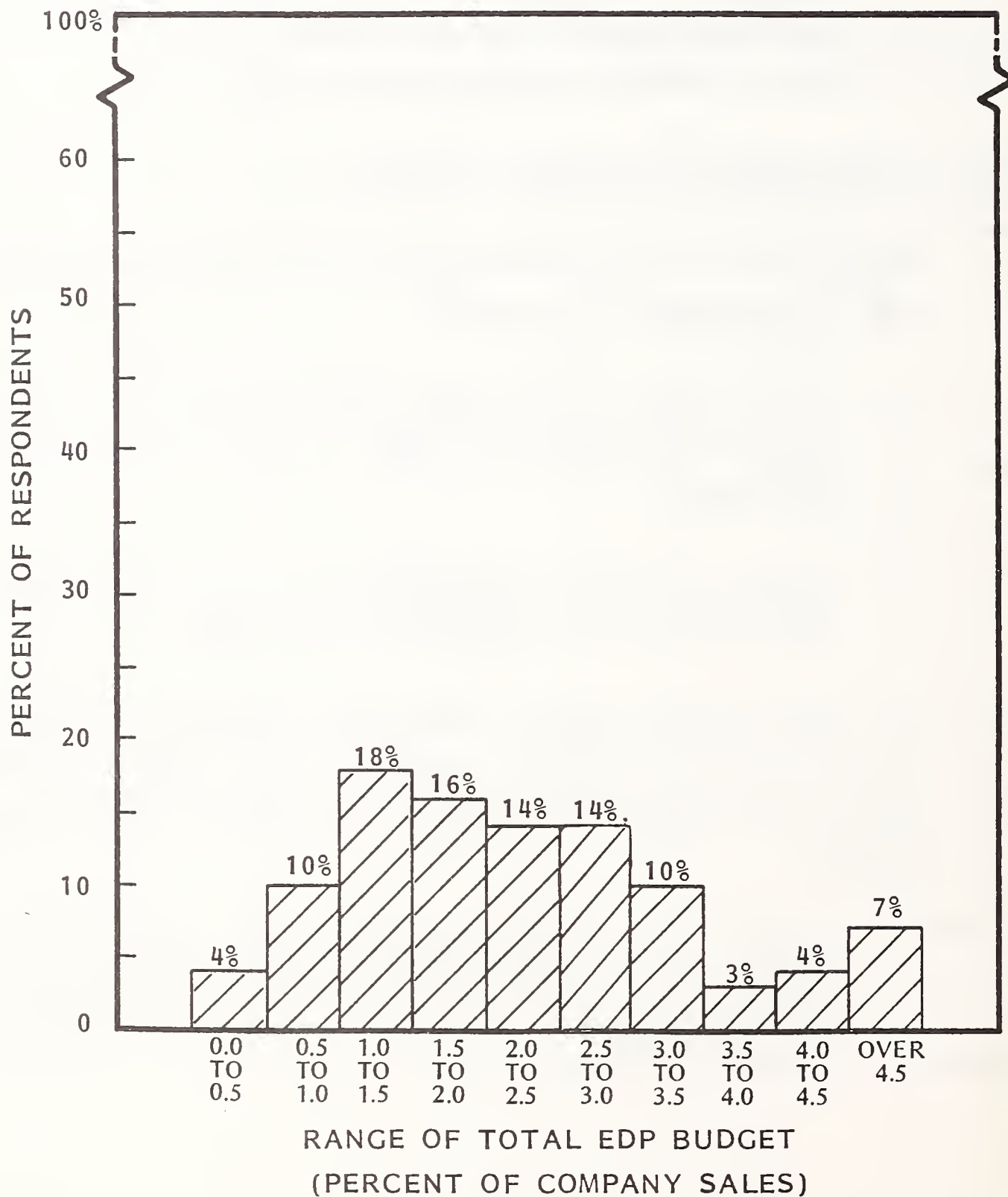
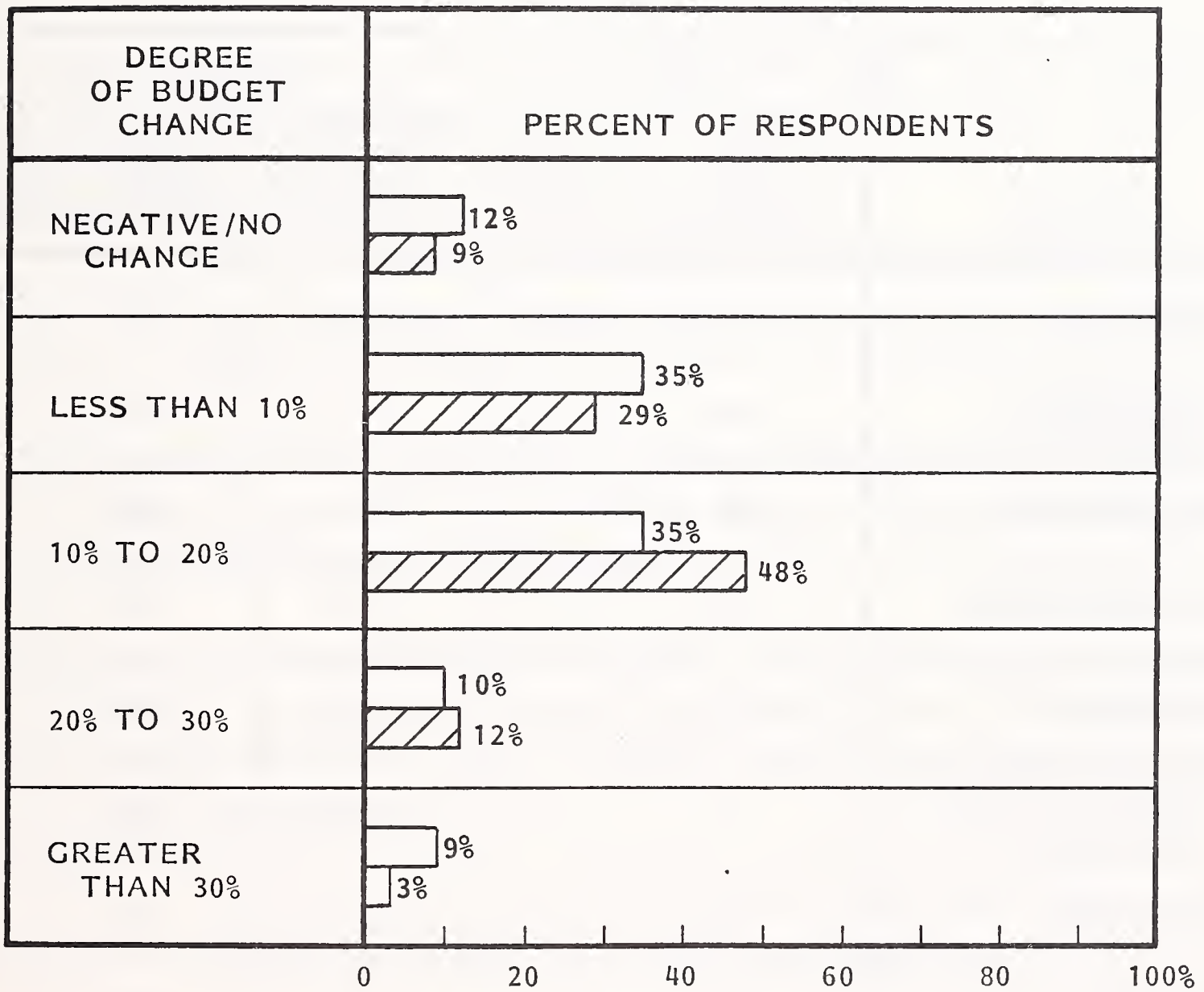


EXHIBIT I-3

ACTUAL AND PLANNED EDP BUDGET GROWTH  
FOR RESPONDENTS IN THE OTHER INDUSTRIES SECTOR



□ 1979-1980  
 ▨ 1980-1981

EXHIBIT I-4

ANTICIPATED CHANGES IN EDP BUDGETS  
IN THE OTHER INDUSTRIES SECTOR

BUDGET CATEGORY	1980		PERCENT INCREASE (DECREASE) 1980-1981	1981	
	AVERAGE BUDGET (\$ THOUSAND)	PERCENT OF TOTAL BUDGET		AVERAGE BUDGET (\$ THOUSAND)	PERCENT OF TOTAL BUDGET
PERSONNEL	\$ 670	53.6%	8.7%	\$ 729	54.6%
MAINFRAME PROCESSORS	172	13.8	0.1	173	12.9
PERIPHERALS	101	8.0	3.6	104	7.8
MINICOMPUTERS	26	2.1	4.9	28	2.1
TERMINALS	43	3.5	13.6	49	3.7
COMMUNICATIONS HARDWARE AND SOFTWARE	23	1.8	7.3	24	1.8
SOFTWARE	34	2.7	1.7	34	2.6
VENDOR MAINTENANCE	63	5.1	7.1	68	5.1
PROCESSING SERVICES	12	0.9	(1.2)	12	0.9
SUPPLIES AND OTHER	107	8.5	7.4	115	8.5
TOTAL	\$1,251	100.0%	6.7%	\$1,336	100.0%



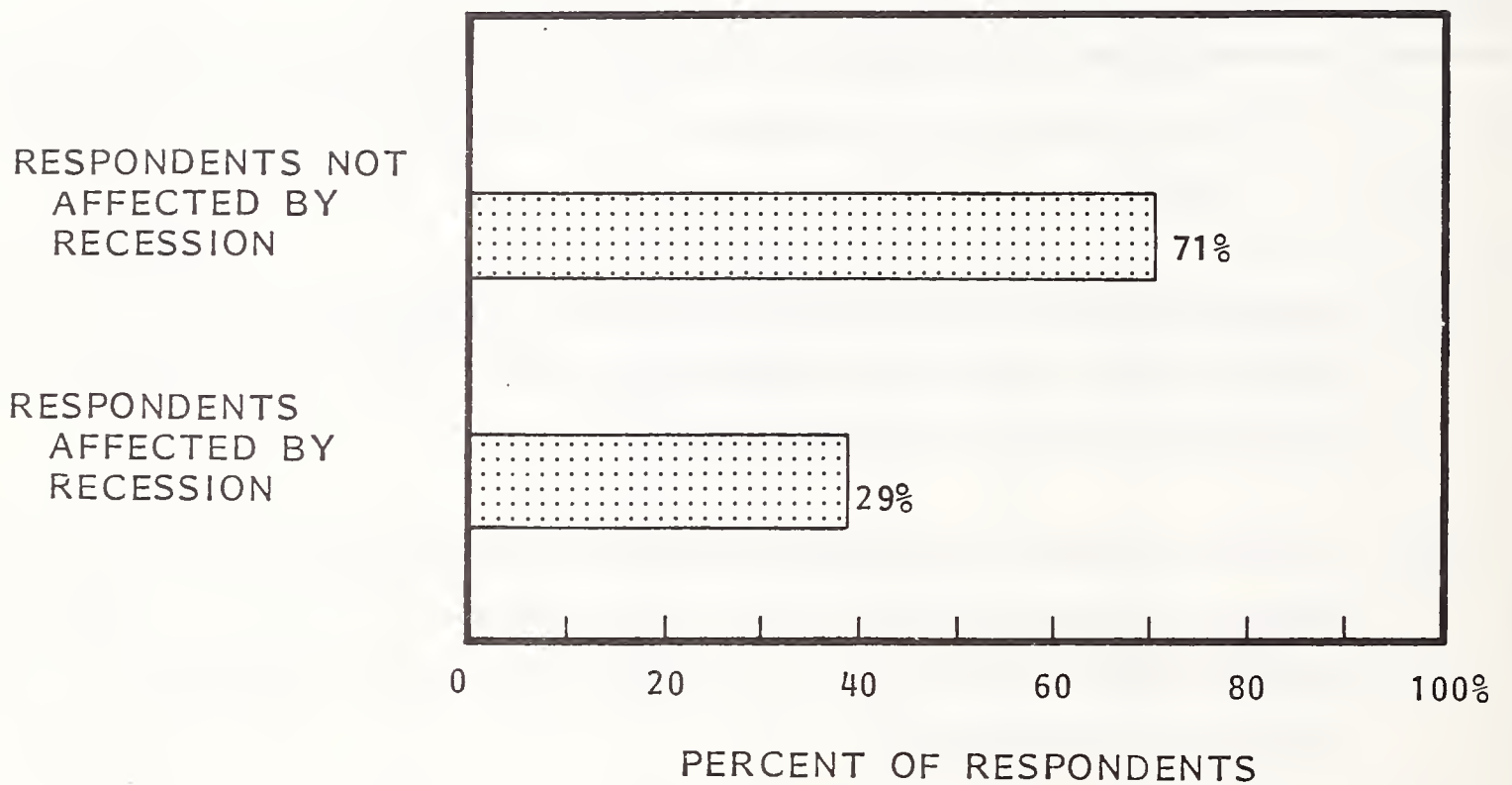
- The recession appears to have a lower impact on this miscellaneous category of industries than upon any other sector in the survey. Exhibit I-5 shows that only 29% will be affected by the recession.
- Exhibit I-6 shows that personnel recruiting and hardware acquisition will be cut back in response to recessionary pressures.

### 3. MAJOR PLANS AND PROBLEMS

- The installation of on-line applications has the highest relative importance from 1980 through 1982 for overall EDP objectives in the "other industries" sector.
  - Exhibit I-7 shows that the objective to improve EDP personnel productivity and to design and install DBMS will also be of high importance by 1982.
- Accounting/finance will receive the greatest emphasis in 1980. As enumerated in Exhibit I-8, personnel and industry-specific applications also rank high in the "other" category of respondents.
- Exhibit I-9 shows that programming aids, on-line programming and purchased software products received the highest relative percent of mention for methods that will be used to improve time and costs associated with applications development.
  - Two-thirds of the respondents expect the improvement to be between 11% and 50%, as shown in the distribution in Exhibit I-10.
- Exhibit I-11 shows that personnel recruiting is their most significant EDP problem.
  - The lack of general management understanding ranks second among highest-priority problems for EDP managers.

EXHIBIT I-5

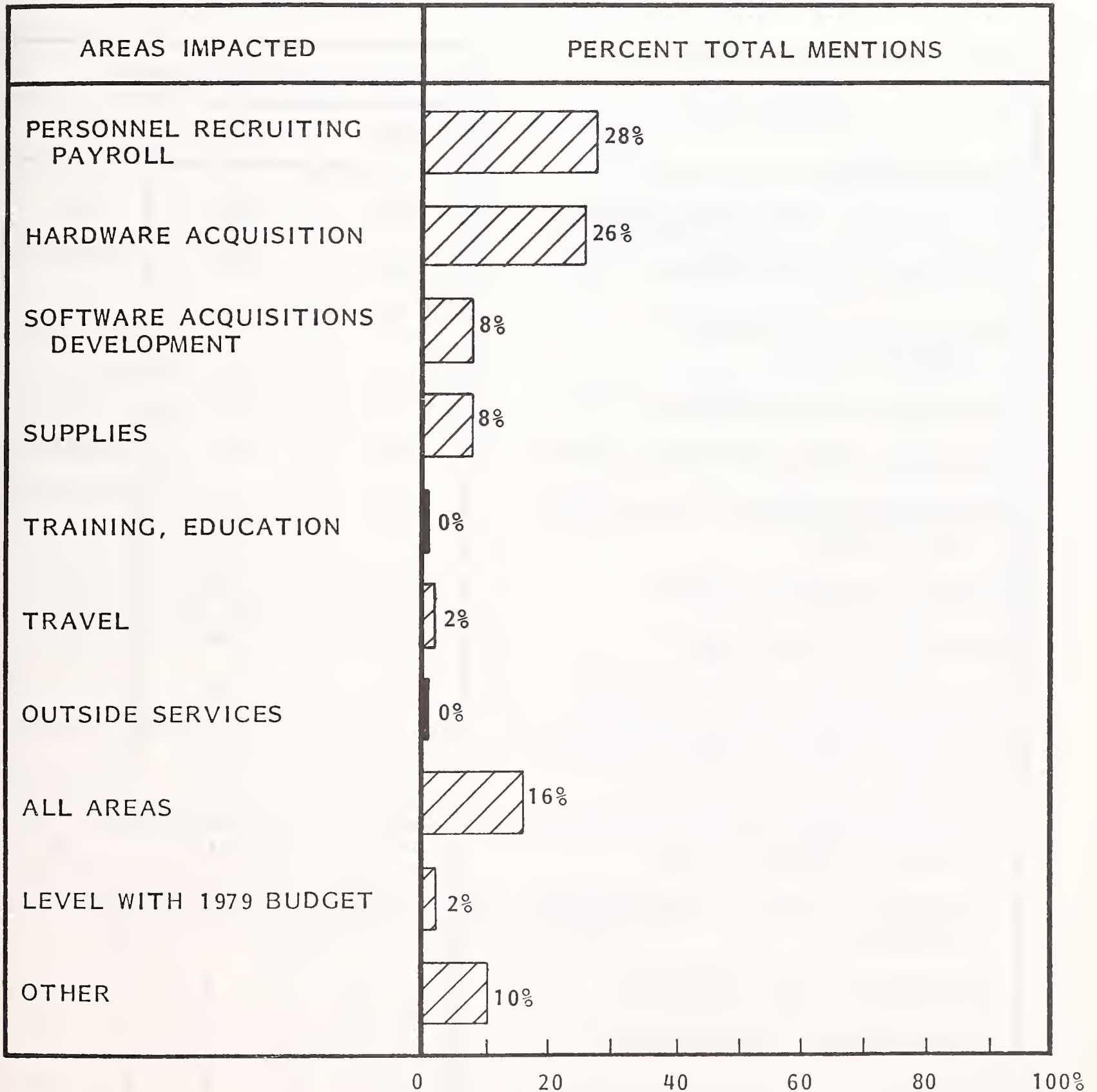
EFFECTS OF RECESSION ON EDP BUDGETS  
IN THE OTHER INDUSTRIES SECTOR



AVERAGE PERCENT  
BUDGET REDUCTION FOR  
THOSE AFFECTED BY RECESSION: 10.7%

EXHIBIT I-6

BUDGET AREAS IMPACTED BY POSSIBLE  
RECESSION IN 1980 BY RESPONDENTS IN THE  
OTHER INDUSTRIES SECTOR



## EXHIBIT I-7

EDP OBJECTIVES FOR RESPONDENTS IN THE  
OTHER INDUSTRIES SECTOR

OBJECTIVE	RELATIVE IMPORTANCE		
	1980	1981	1982
INSTALL ON-LINE APPLICATIONS	100%	100%	100%
CONVERT APPLICATIONS	55	38	30
IMPROVE EDP PERSONNEL PRODUCTIVITY	39	37	38
DEVELOP LONG-RANGE EDP PLAN	46	24	23
DEVELOP NEW BATCH APPLICATIONS	43	43	37
MEET DEVELOPMENT, CONVERSION SCHEDULES	38	43	35
INSTALL NEW MAINFRAME	36	23	29
DESIGN, INSTALL DBMS	31	40	41
CHANGE OPERATING SYSTEMS	28	19	9
DESIGN, INSTALL DDP NETWORK	11	13	15
INSTALL NEW PERIPHERALS	28	16	17
INSTALL MINICOMPUTERS	18	11	10
INTEGRATE OFFICE AUTOMATION WITH EDP	15	28	33
CENTRALIZE EDP CONTROL	6	9	11
DECENTRALIZE EDP CONTROL	3	5	7
OTHER	9	9	9

EXHIBIT I-8

APPLICATIONS TO BE DEVELOPED BY  
RESPONDENTS IN THE OTHER INDUSTRIES SECTOR

APPLICATION	RELATIVE IMPORTANCE	PERCENT OF MENTIONS AS HIGHEST PRIORITY
ACCOUNTING/FINANCE	75	23%
INVENTORY CONTROL	26	6
ORDER ENTRY/BILLING	32	10
PERSONNEL	59	13
PURCHASING	31	5
MARKETING/SALES	7	1
MODELING/FORECASTING	22	3
PERFORMANCE MEASUREMENT/CONTROL	17	1
OTHER**	100	38
TOTAL	-	100%

\*\*SPECIFIC APPLICATIONS INCLUDE:

- REGISTRATION (YOUTH ORGANIZATION)
- TRUST FUND APPLICATIONS (LABOR ORGANIZATION)

EXHIBIT I-9

METHODS USED TO IMPROVE TIME AND COSTS  
ASSOCIATED WITH APPLICATIONS DEVELOPMENT IN THE  
OTHER INDUSTRIES SECTOR

METHOD	PERCENT OF MENTIONS
ON-LINE PROGRAMMING	26%
PURCHASED SOFTWARE PRODUCTS	5
STRUCTURED PROGRAMMING/DESIGN	11
PROJECT MANAGEMENT	-
IMPROVED TRAINING/BETTER QUALIFICATIONS	-
PROGRAMMING AIDS	26
DATA BASE MANAGEMENT SYSTEMS	11
OTHER	
- USER INVOLVEMENT IN DEVELOPMENT	-
- STANDARDIZED METHODS/SYSTEMS	-
- HARDWARE UPGRADE	-
- IMPROVED DOCUMENTATION	5
- CRT TERMINALS FOR PROGRAMMERS	-
- MISCELLANEOUS METHODS	5
- DO NOTHING/NO PLANS	11

EXHIBIT I-10

EXPECTED LEVEL OF IMPROVEMENT IN PROGRAM  
DEVELOPMENT FOR RESPONDENTS IN THE  
OTHER INDUSTRIES SECTOR

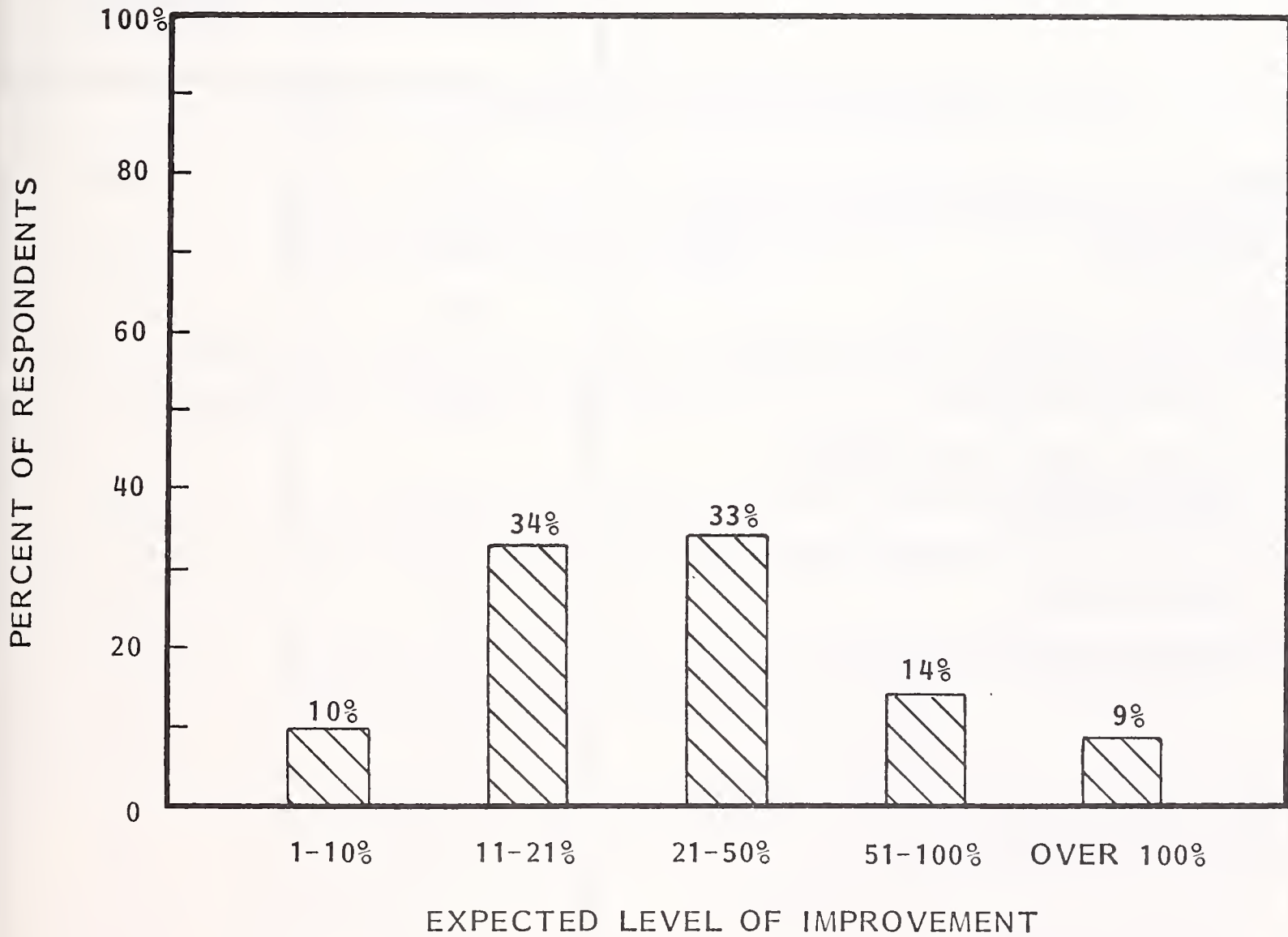


EXHIBIT I-11

MOST SIGNIFICANT EDP PROBLEMS IN THE  
OTHER INDUSTRIES SECTOR

PROBLEM	RELATIVE IMPORTANCE	PERCENT OF MENTIONS AS HIGHEST PRIORITY
PERSONNEL RECRUITING	100	29%
NEED FOR BETTER PLANNING AND CONTROL	61	12
PERSONNEL TRAINING	61	4
LACK OF GENERAL MANAGEMENT UNDERSTANDING	59	15
LACK OF USER INVOLVEMENT IN SYSTEMS/APPLICATIONS DEVELOPMENT	47	4
NEED FOR IMPROVEMENT IN OPERATIONS	39	4
EXCESSIVE APPLICATIONS DEVELOPMENT TIME	40	11
INADEQUATE EDP FUNDING	44	7
INADEQUATE SYSTEMS SOFTWARE	29	4
NEED TO IMPROVE DATA COMMUNICATIONS	37	4
UNSATISFACTORY HARDWARE MAINTENANCE	12	2
OTHER	16	4



- A relatively large amount of computer time is spent on new applications development and existing program maintenance. Other activities such as research and academic support also rank higher for this industry category than was generally found in specific industrial sectors, because of the influence of the education subsection.
  - Exhibit I-12 shows that programming personnel spend 44.8% of their time assigned to new program development.
  
- By a count of mainframes, slightly less than half of the "other industries" category respondents have IBM shops, as indicated by the upper pie chart of Exhibit I-13.
  - DEC has 16.7% of the installations in the non-IBM category.
  - More than two-thirds of the mainframes on order are IBM, with a large number of 4300 series computers.
  
- Exhibit I-14 shows that a large proportion of respondents have minicomputer installations, but that the rate of growth is only 10.1%.
  - Nearly half of the respondents have micro/personal computers installed. This is considerably higher than found in industry.
  - The highest growth rate of EDP hardware is for intelligent terminals, at a 28.2% rate of growth between 1980 and 1981.
  - The highest average installed base is reserved for nonintelligent terminals, at 83.6. The growth rate is 21.3% lower than that for intelligent terminals.

EXHIBIT I-12

USE OF RESOURCES IN THE OTHER INDUSTRIES SECTOR

RESOURCE	APPLICATIONS	PERCENT OF USE
COMPUTER EQUIPMENT	PRODUCTION JOBS	57.4%
	NEW APPLICATIONS DEVELOPMENT	17.6
	EXISTING PROGRAM MAINTENANCE	13.5
	OTHER*	11.5
PROGRAMMING PERSONNEL	NEW PROGRAM DEVELOPMENT	44.8
	EXISTING PROGRAM MAINTENANCE	30.4
	ENHANCEMENT OF EXISTING PROGRAMS	24.8

\*OTHER MENTIONS INCLUDE:

- INSTRUCTION/RESEARCH
- EDUCATION
- ACADEMIC SUPPORT
- ONE-TIME PROGRAMS

EXHIBIT I-13

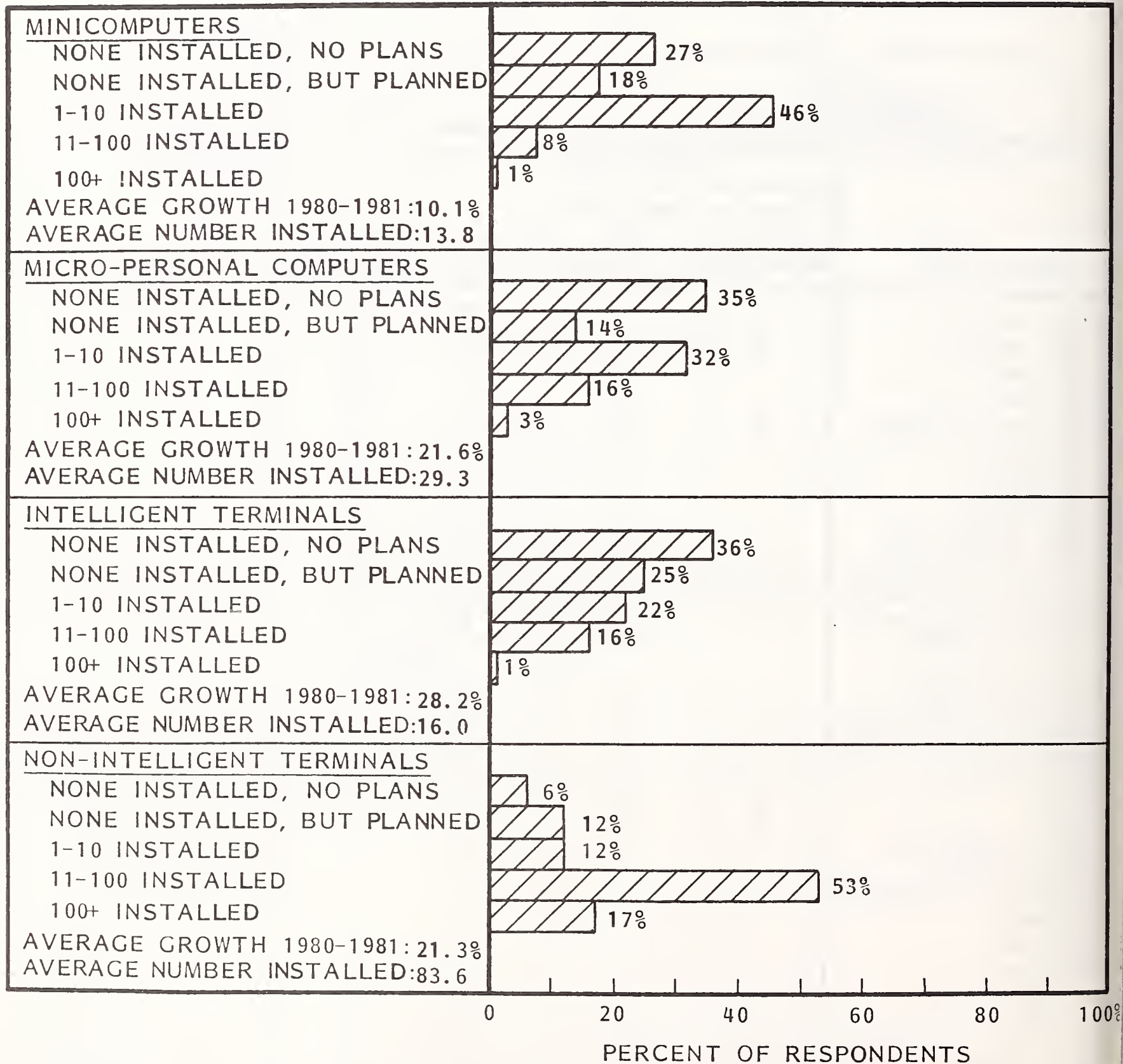
MAINFRAME EDP HARDWARE PROFILE IN THE  
OTHER INDUSTRIES SECTOR



MAINFRAME	INSTALLED			ON ORDER		
	NUMBER OF RESPONSES	NUMBER OF SYSTEMS	PERCENT	NUMBER OF RESPONSES	NUMBER OF SYSTEMS	PERCENT
IBM 3033	1	1	0.3%	3	3	1.7%
IBM 3033N	0	0	0.0	1	1	0.6
IBM 3032	3	4	1.3	0	0	0.0
IBM 3031	7	8	2.7	3	3	1.7
IBM 370 158-168	22	25	8.4	3	3	1.7
IBM 4331	11	13	4.3	19	28	15.6
IBM 4341	1	1	0.3	40	53	29.4
IBM 8100	2	2	0.7	5	12	6.7
IBM OTHER 370	39	52	17.4	4	5	2.8
IBM OTHER 360	17	17	5.7	0	0	0.0
<b>SUBTOTAL IBM-DPD</b>	<b>103</b>	<b>123</b>	<b>41.1%</b>	<b>78</b>	<b>108</b>	<b>60.2%</b>
IBM SYSTEMS 1, 3, 32, 34	10	16	5.4%	5	9	5.0%
IBM SYSTEMS 38	0	0	0.0	3	8	4.4
<b>SUBTOTAL IBM-GSD</b>	<b>10</b>	<b>16</b>	<b>5.4%</b>	<b>8</b>	<b>17</b>	<b>9.4%</b>
BURROUGHS	17	22	7.4%	3	3	1.7%
CDC	8	9	3.0	4	4	2.2
DEC	34	50	16.7	3	7	3.9
DATA GENERAL	5	6	2.0	2	4	2.2
HONEYWELL	9	9	3.0	3	4	2.2
HEWLETT-PACKARD	7	7	2.3	2	2	1.1
PRIME	3	3	1.0	2	4	2.2
SYCOR	2	8	2.7	2	19	10.6
UNIVAC	11	11	3.7	1	1	0.6
FOUR-PHASE	5	7	2.3	1	1	0.6
OTHER	23	28	9.4	6	6	3.1
<b>SUBTOTAL OTHER</b>	<b>124</b>	<b>160</b>	<b>53.5</b>	<b>29</b>	<b>55</b>	<b>30.4</b>
<b>TOTAL</b>	<b>237</b>	<b>299</b>	<b>100.0%</b>	<b>115</b>	<b>180</b>	<b>100.0%</b>

EXHIBIT I-14

NON-MAINFRAME EDP HARDWARE PROFILE IN THE  
OTHER INDUSTRIES SECTOR



#### 4. KEY ISSUE STATUS REVIEW

- As with other industry sectors, the most important development objectives for EDP are for new and on-line applications.
  - As shown in Exhibit I-15, data base development also ranks as a significant 16% of the totals mentioned.
- Less than one-third of the respondents received management or technical training.
  - The cost of technical training is nearly three times that of management training. Both categories represent a high average expense per attendee compared to training in other industry sectors.
  - Exhibit I-16 shows that the average training expense in this sector is relatively low.
- Exhibit I-17 mirrors other industries in that only diagnostic maintenance is performed in-house. Other maintenance services are acquired from outside vendors.
- Except for image processing and telecopier and facsimile, office automation ranks high in EDP responsibility, as reported by respondents in the "other industries" sector.
  - Exhibit I-18 reveals that word processing and data communications are fairly widespread already, and that computer graphics will be found in over half of the respondent companies by 1982.
  - All of the currently active functions are under the EDP manager's control.

EXHIBIT I-15

MOST IMPORTANT DEVELOPMENT OBJECTIVE  
IN THE OTHER INDUSTRIES SECTOR

MOST IMPORTANT EDP DEVELOPMENT OBJECTIVE IN 1980	PERCENT OF TOTAL MENTIONS
DATA BASE DEVELOPMENT	16%
DESIGN OR INSTALL DDP	4
IMPLEMENT/DEVELOP NEW APPLICATIONS	20
IMPLEMENT/DEVELOP ON-LINE APPLICATIONS	18
INSTALL OR UPGRADE MAINFRAME	8
INSTALL MINICOMPUTERS	-
INSTALL OR CONVERT OPERATING SYSTEMS	2
DESIGN/DEVELOP COMMUNICATIONS NETWORK	6
CENTRALIZE OR DECENTRALIZE DP OPERATIONS	1
PLAN/IMPROVE PRODUCTIVITY AND/OR OPERATIONS	11
OTHER	
-- REWRITE SOFTWARE	4
- TRAIN STAFF/USERS.	4
- MISCELLANEOUS RESPONSES*	6
TOTAL	100%

- \*SPECIFIC RESPONSES INCLUDE:
- LONG-RANGE PLANNING
  - MEET BUDGET GOAL
  - MORE COMPETITIVE SALARIES
  - "GET TO NOLAN'S THIRD PHASE"

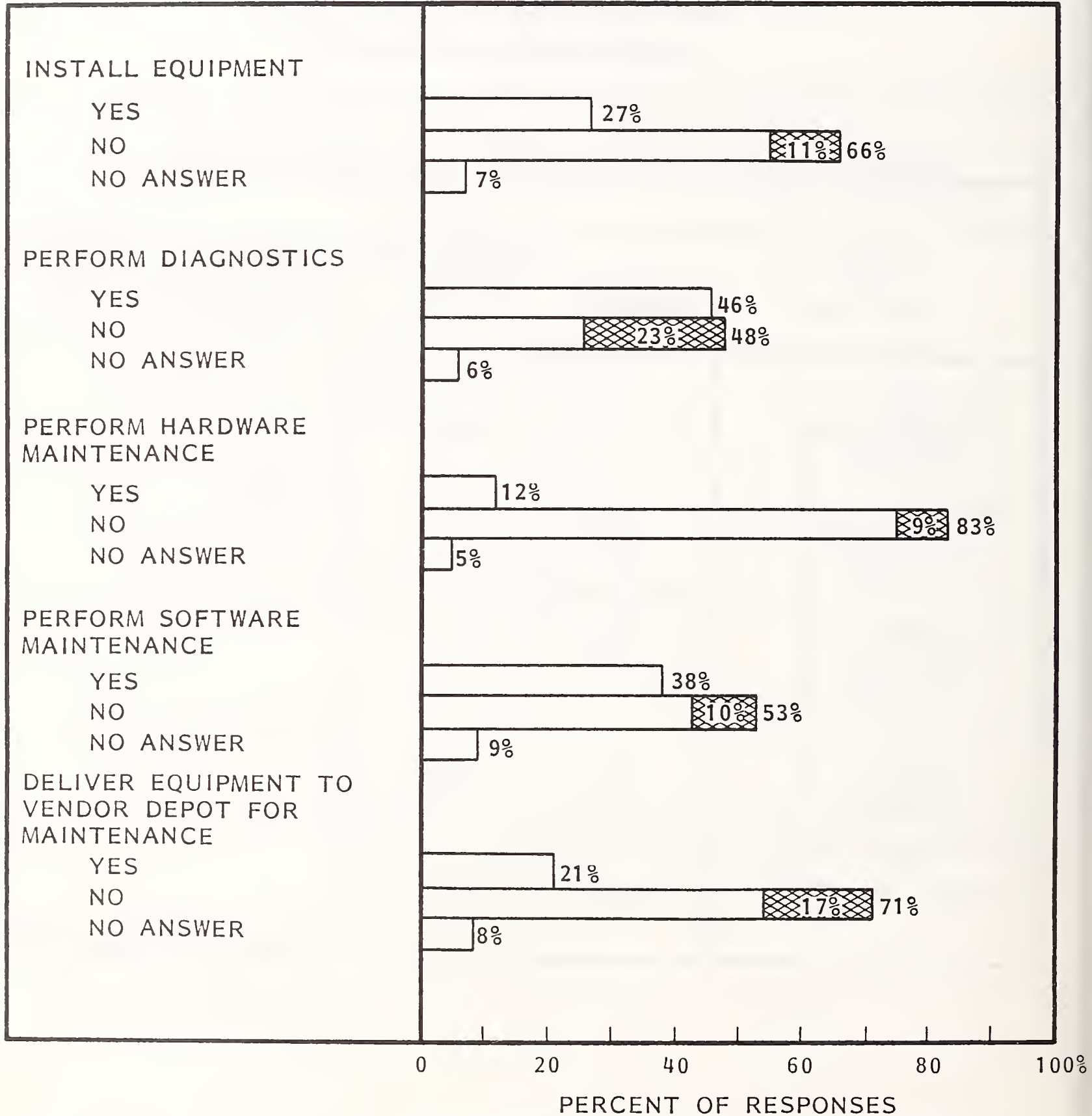
EXHIBIT I-16

TRAINING EXPENDITURES IN THE  
OTHER INDUSTRIES SECTOR

TYPE OF TRAINING	AVERAGE EXPENSE	AVERAGE EXPENDITURE PER EDP EMPLOYEE	PERCENT OF STAFF ATTENDING	AVERAGE EXPENSE PER ATTENDEE
IN-HOUSE MANAGEMENT TRAINING	\$ 1,215	\$ 35	24.5%	\$331
OUTSIDE MANAGEMENT TRAINING	1,333	39		
IN-HOUSE TECHNICAL TRAINING	3,180	92	31.3	815
OUTSIDE TECHNICAL TRAINING	5,149	149		
TOTAL	\$10,877	\$315	-	-

EXHIBIT I-17

DEGREE OF USER SELF-MAINTENANCE  
IN THE OTHER INDUSTRIES SECTOR

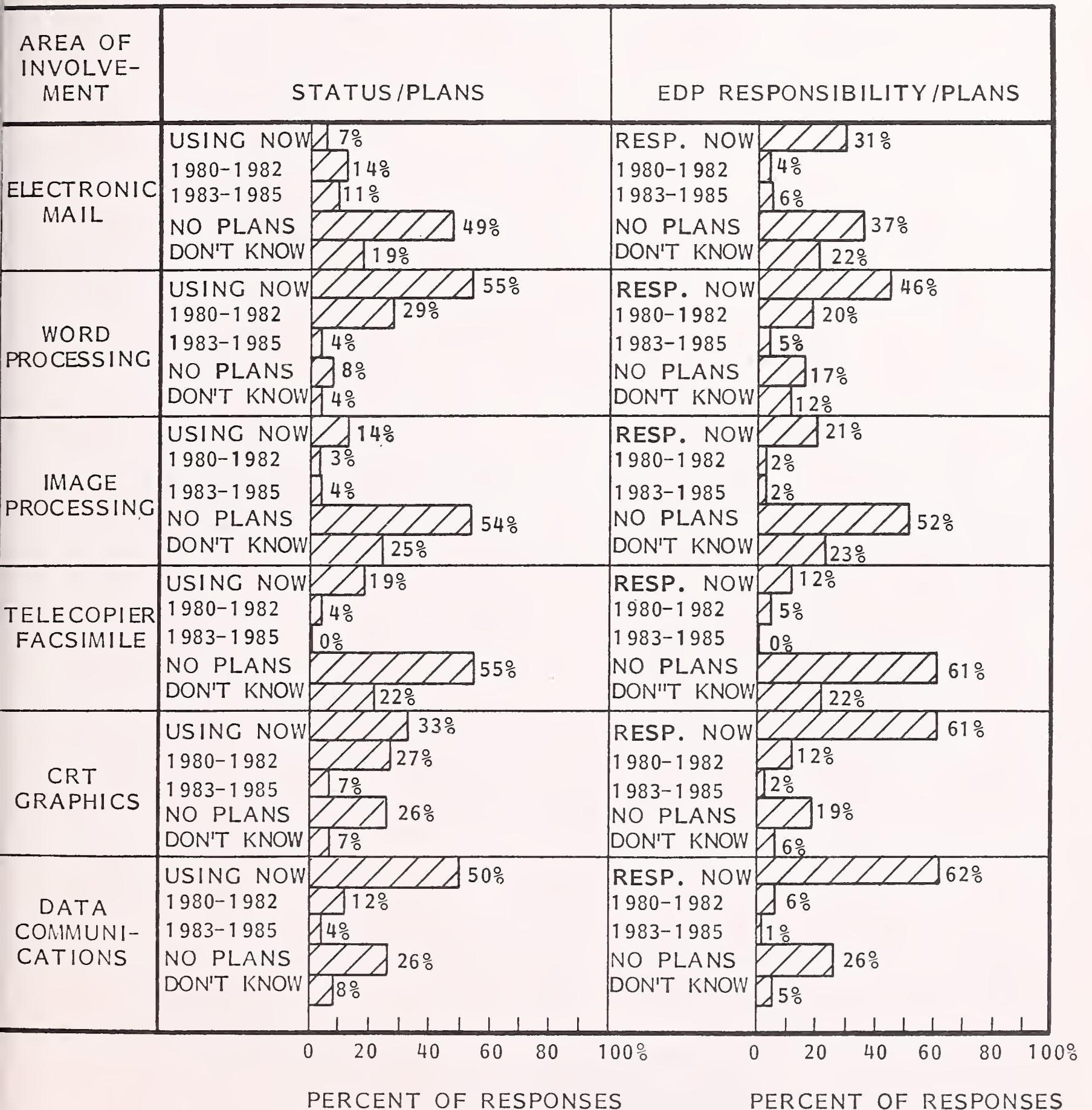


NOTE:  INDICATES PERCENT OF RESPONDENTS NOT CURRENTLY PERFORMING FUNCTION, BUT WHO WOULD CONSIDER DOING SO



EXHIBIT I-18

RESPONDENT INVOLVEMENT IN OFFICE AUTOMATION  
IN THE OTHER INDUSTRIES SECTOR





1980 ANALYSIS OF EDP IN PROCESS MANUFACTURING



## PROCESS MANUFACTURING

### I. INDUSTRY SECTOR OVERVIEW

- The process manufacturing sector has been the most rapidly growing industry sector in the United States in recent years. Products produced by companies in this sector tend to be sold in volume measures (petroleum, cement) rather than in the unit measures (automobiles, television sets) characteristic of discrete manufacturing companies.
- This industry sector is characterized by a limited number of companies with high revenues per establishment, particularly in the tobacco and petroleum subsectors.
- Process manufacturing shipments are over 60% higher than discrete manufacturing shipments, yet process manufacturing has only 60% of the employees of discrete manufacturing.
- Approximately one-half of the shipment value from the industry is derived from the mining and food products subsectors, with shipments being nearly equally split between the two subsectors.
- With the major exception of the chemical and petroleum industries, the technologies used in process manufacturing are generally older than in discrete manufacturing.
- This industry sector includes SIC categories 10 through 13, 20 through 22, 24, 26, 28 through 30, 32 and 33.

- Process manufacturing EDP managers returned 127 responses, or 14% of the total for this report. All major industry subsectors are represented.
- Exhibit I-1 provides a profile summary of respondents in the process manufacturing sector in four categories: \$1 million or less, \$101-109 million, \$1 billion or more, and a fourth category that accounts for respondents who declined to state their annual sales volume.
  - For companies of \$100 million or less, there were 1.3 EDP employees per 100 total employees. The average budget was slightly over \$1 million and represented 1.5% of the annual sales in this category. This is three times larger than the comparable percentage reported for the larger firms.
  - However, the EDP budget per EDP employee was the lowest of the three sales size categories. This appears to reflect the more modest expenditures for the smaller systems that are utilized by firms of less than \$1 million in size.
  - Well over half of the total sector respondents were in the \$101-109 million size. The ratio of EDP employees per 100 total employees is the lowest for the three size categories, at 1.2.
  - The highest number of EDP employees per 100 total employees is in the largest sales size category. These large firms also have the largest EDP budget per EDP employee, at over \$53,000 each. It also has the highest EDP budget per total number of employees, at \$767.00 per employee.
  - As in the discrete manufacturing profile, the larger the company size, the larger the EDP budget per total number of employees. This reflects investment for sophisticated communications networks and other leading-edge technology.

EXHIBIT I-1

RESPONDENT PROFILE - PROCESS MANUFACTURING SECTOR

PROFILE CHARACTERISTIC	COMPANY SIZE IN TERMS OF ANNUAL SALES			
	\$100 MILLION OR LESS	\$101-999 MILLION	\$1 BILLION OR MORE	NO SIZE DATA
PERCENT OF TOTAL RESPONDENTS	17.3%	63.0%	15.7%	3.9%
AVERAGE ANNUAL SALES (\$ MILLION)	\$ 71.6	\$ 381.3	\$3,892.8	-
AVERAGE TOTAL EMPLOYEES	2,972	3,936	23,494	2,020
AVERAGE EDP EMPLOYEES	41	48	338	22
EDP EMPLOYEES PER 100 TOTAL EMPLOYEES	1.3	1.2	1.4	1.1
AVERAGE EDP BUDGET (\$ THOUSAND)	\$ 1,045	\$ 1,941	\$ 18,014	\$ 934
EDP BUDGET AS A PERCENT OF ANNUAL SALES	1.5%	0.5%	0.5%	-
EDP BUDGET PER EDP EMPLOYEE	\$25,197	\$40,468	\$ 53,352	\$42,482
EDP BUDGET PER TOTAL NUMBER OF EMPLOYEES	\$ 344	\$ 480	\$ 767	\$ 463

## 2. BUDGET AND EXPENDITURE ANALYSIS

- Exhibit I-2 shows that for three out of four respondents in the process manufacturing sector, the ratio of EDP budget to company sales was less than 1%. The distribution peaks at 0.3-0.6%.
- Nearly one-half of the respondents reported that their EDP budget grew between 10% and 20% from 1979 to 1980.
  - Moreover, a slightly higher percentage reported that the budget would continue to increase by between 10% and 20% from 1980 to 1981.
  - The very strong peak of the distribution of EDP budget growth clearly shows that the recession has had little impact on the processing industries.
  - Less than 10% of the respondents thought that the budget would not increase in both 1980 and 1981 over previous years.
  - Exhibit I-3 shows the distribution of the expected growth rate for 1980 and 1981 compared to previous years.
- Exhibit I-4 shows that, for process manufacturing as a whole, the EDP budget will increase by 9.2% from 1980 to 1981.
  - The personnel category is by far the largest single component of the total budget in both 1980 and 1981.
  - The software category represents the largest relative increase from 1980 to 1981.
  - Processing services represent the only area where the 1981 budget is expected to be less than that of 1980.



EXHIBIT I-2

RATIO OF EDP BUDGET TO COMPANY SALES:  
 DISTRIBUTION OF RATIOS AMONG RESPONDENTS IN THE  
 PROCESS MANUFACTURING SECTOR

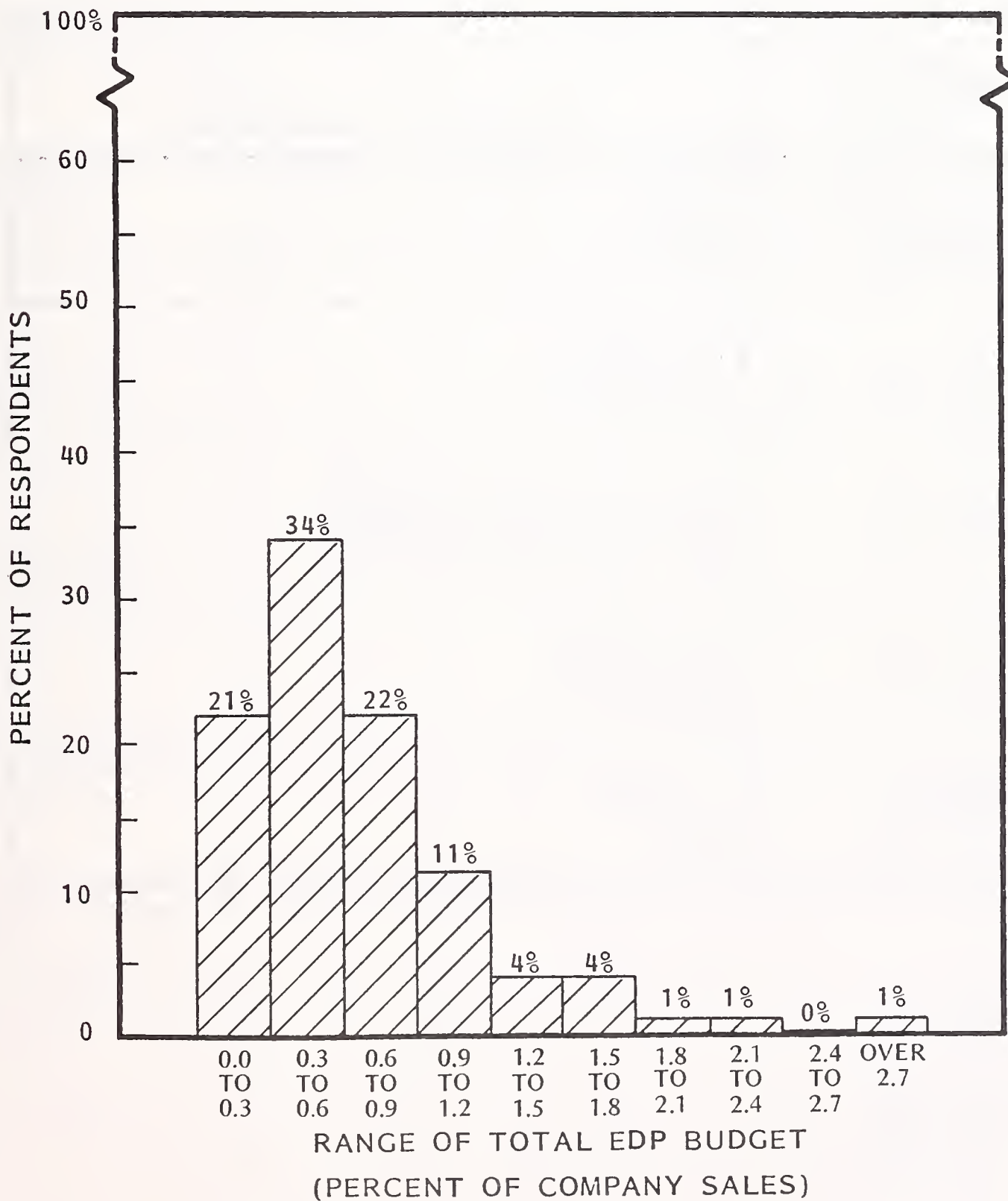
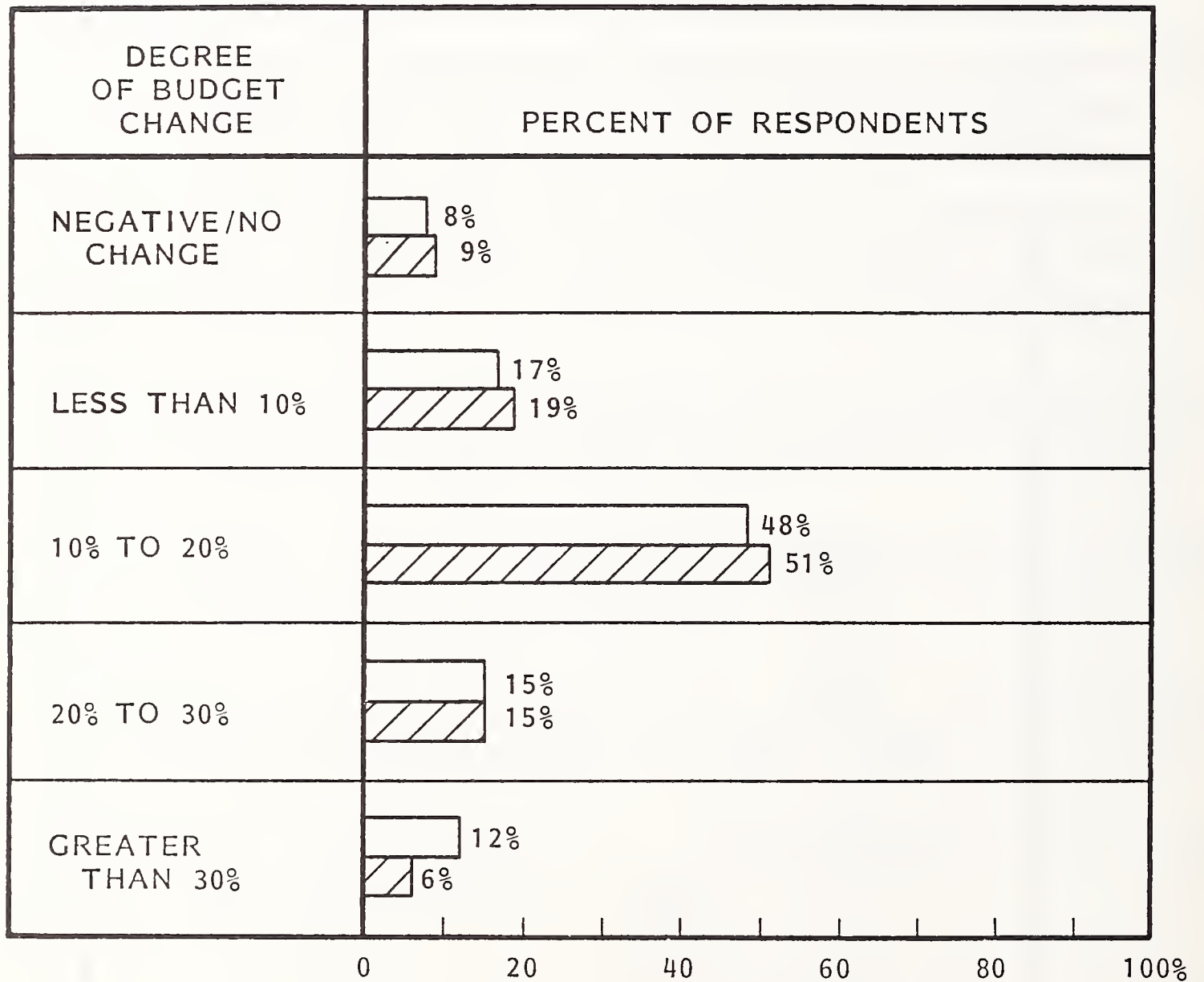


EXHIBIT I-3

ACTUAL AND PLANNED EDP BUDGET GROWTH  
FOR RESPONDENTS IN THE PROCESS MANUFACTURING SECTOR



□ 1979-1980  
▨ 1980-1981

## EXHIBIT I-4

ANTICIPATED CHANGES IN EDP BUDGETS  
IN THE PROCESS MANUFACTURING SECTOR

BUDGET CATEGORY	1980		PERCENT INCREASE (DECREASE) 1980-1981	1981	
	AVERAGE BUDGET (\$ THOUSAND)	PERCENT OF TOTAL BUDGET		AVERAGE BUDGET (\$ THOUSAND)	PERCENT OF TOTAL BUDGET
PERSONNEL	\$2,433	54.5%	10.4%	\$2,686	55.1%
MAINFRAME PROCESSORS	695	15.6	10.0	764	15.7
PERIPHERALS	358	8.0	9.2	391	8.0
MINICOMPUTERS	120	2.7	8.0	130	2.7
TERMINALS	115	2.6	8.0	124	2.5
COMMUNICATIONS HARDWARE AND SOFTWARE	176	3.9	5.4	186	3.8
SOFTWARE	117	2.6	12.4	131	2.7
VENDOR MAINTENANCE	78	1.8	4.9	82	1.7
PROCESSING SERVICES	79	1.8	(8.7)	72	1.5
SUPPLIES AND OTHER	292	6.5	5.7	309	6.3
TOTAL	\$4,463	100.0%	9.2%	\$4,875	100.0%

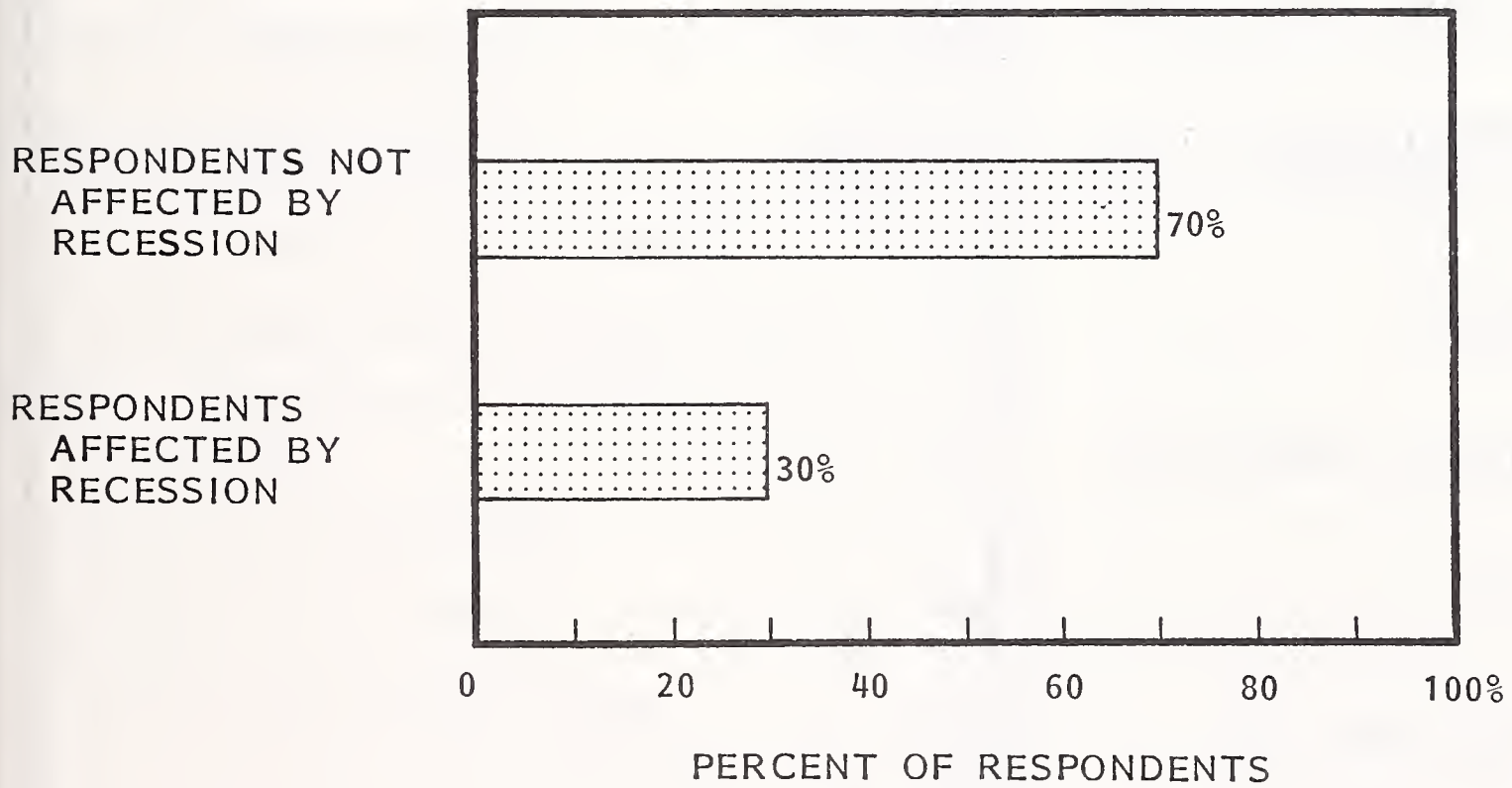
- Reflecting the fact that the process manufacturing sector has been one of the fastest-growing sectors in the U.S. economy in recent years, Exhibit I-5 confirms that fewer than one out of three EDP budgets are expected to be affected by the 1980 recession.
  - Those that were affected reduced the EDP budget by an average of 11.8%.
  - Exhibit I-6 shows that the budget reduction will impact the personnel, recruiting and payroll areas more forcefully than any other areas.
  - Travel, supplies, training, education and outside services are the least impacted areas.

### 3. MAJOR PLANS AND PROBLEMS

- As was the case in discrete manufacturing, the installation of on-line applications is far ahead of any other objective for EDP between 1980 and 1982.
  - Evidence that new batch applications are still considered of high importance is shown in Exhibit I-7. This objective ranks second only to on-line applications in relative importance in 1980.
  - The improvement of EDP personnel productivity remains the second-highest objective in 1981 and 1982.
  - Integration of office automation with EDP, while relatively low in importance in 1980, will become consistently more significant in 1981 and 1982, while the importance of batch applications will decline throughout the same period.
- Inventory control applications rank the highest in relative importance for development by respondents in the process manufacturing sector.

EXHIBIT I-5

EFFECTS OF RECESSION ON EDP BUDGETS  
IN THE PROCESS MANUFACTURING SECTOR



AVERAGE PERCENT  
BUDGET REDUCTION FOR  
THOSE AFFECTED BY RECESSION: 11.8%

EXHIBIT I-6

BUDGET AREAS IMPACTED BY POSSIBLE  
RECESSION IN 1980 FOR RESPONDENTS IN THE  
PROCESS MANUFACTURING SECTOR

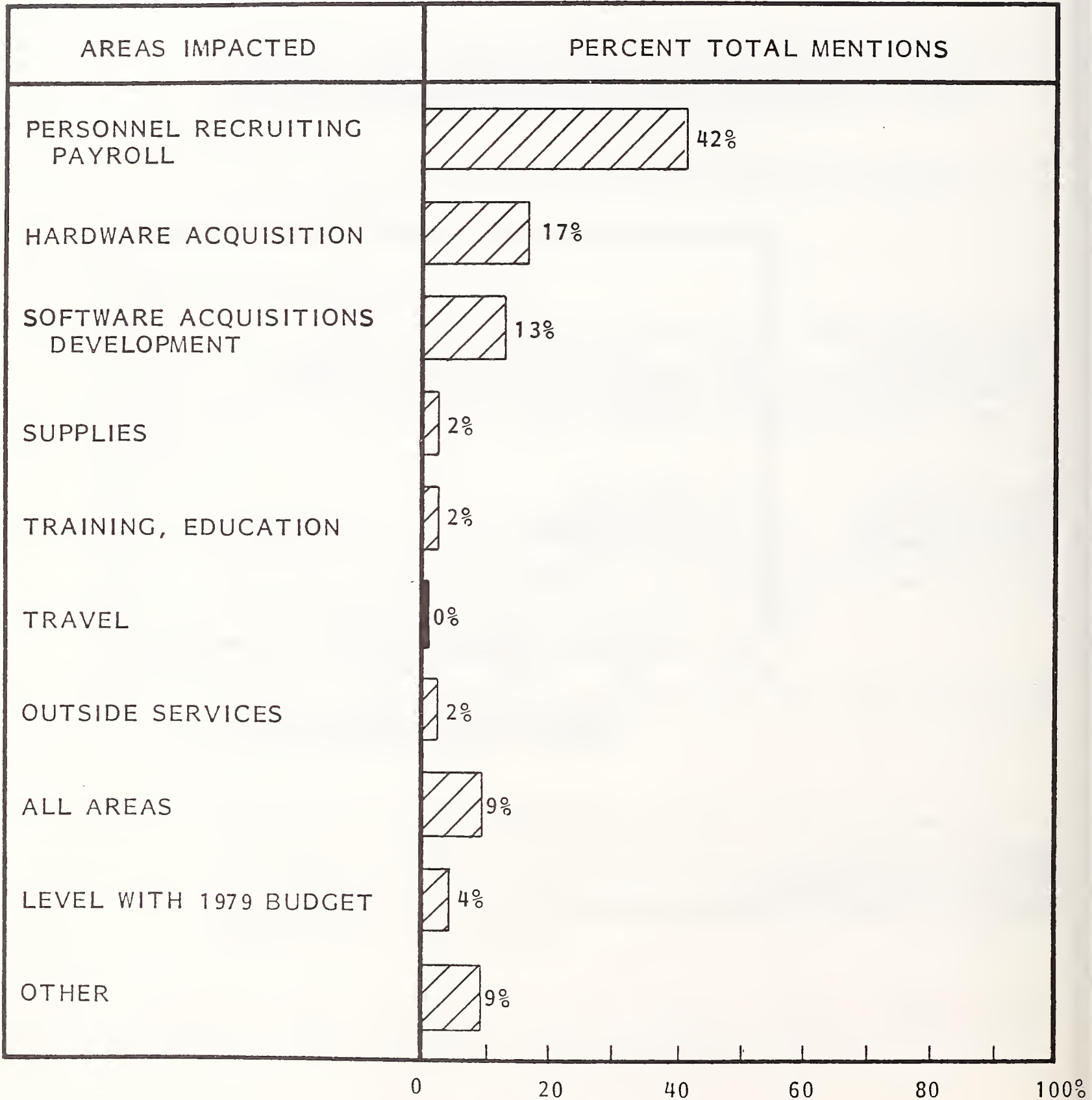


EXHIBIT I-7

EDP OBJECTIVES FOR RESPONDENTS IN THE  
PROCESS MANUFACTURING SECTOR

OBJECTIVE	RELATIVE IMPORTANCE		
	1980	1981	1982
INSTALL ON-LINE APPLICATIONS	100%	100%	100%
CONVERT APPLICATIONS	37	29	25
IMPROVE EDP PERSONNEL PRODUCTIVITY	47	42	48
DEVELOP LONG-RANGE EDP PLAN	41	22	20
DEVELOP NEW BATCH APPLICATIONS	48	43	38
MEET DEVELOPMENT, CONVERSION SCHEDULES	31	36	43
INSTALL NEW MAINFRAME	35	15	27
DESIGN, INSTALL DBMS	34	33	31
CHANGE OPERATING SYSTEMS	19	5	7
DESIGN, INSTALL DDP NETWORK	28	35	35
INSTALL NEW PERIPHERALS	15	15	11
INSTALL MINICOMPUTERS	20	22	16
INTEGRATE OFFICE AUTOMATION WITH EDP	7	13	25
CENTRALIZE EDP CONTROL	8	13	13
DECENTRALIZE EDP CONTROL	4	7	4
OTHER	10	8	7

- Order entry/billing is next to inventory control in relative importance and had an equal percentage of mentions as the highest priority.
- Exhibit I-8 shows that the strong emphasis on financial control applications found in 1979 continues to be of major importance in 1980. The new batch applications represent a core of rewritten financial applications.
- Exhibit I-9 shows that the process manufacturing sector is depending upon programming aids to improve the time and costs associated with applications development. Nearly one out of four are also anticipating that on-line programming will improve applications development efficiency.
- The expected level of improvement in program development is equally divided between 11% and 21% by one-third of the respondents, and 21-50% by another third. Almost another third anticipates greater than 50% improvement, while only 6% saw less than 10% improvement in program development.
  - The distribution of these expectations obtained from INPUT panel respondents is shown in Exhibit I-10.
- Personnel recruiting was the most significant EDP problem in the process manufacturing sector. Exhibit I-11 shows that the need for better planning and control was also of major importance, but had only about half as many highest-priority rankings as the personnel recruiting problem.
  - Exhibit I-11 shows that the need for improved data communications was the lowest in relative importance of all of the factors listed.
- The two-thirds production/one-third new development and maintenance ratio describing the use of computer resources shown in Exhibit I-12 parallels the average for all industries. It also continues the relationships that were established last year.



EXHIBIT I-8

APPLICATIONS TO BE DEVELOPED BY  
RESPONDENTS IN THE PROCESS MANUFACTURING SECTOR

APPLICATION	RELATIVE IMPORTANCE	PERCENT OF MENTIONS AS HIGHEST PRIORITY
ACCOUNTING/FINANCE	81	15%
INVENTORY CONTROL	100	25
ORDER ENTRY/BILLING	89	25
PERSONNEL	38	7
PURCHASING	26	-
MARKETING/SALES	41	5
MODELING/FORECASTING	48	6
PERFORMANCE MEASUREMENT/CONTROL	27	3
OTHER**	50	14
TOTAL	-	100%

\*\*SPECIFIC APPLICATIONS INCLUDE:

- MANUFACTURING SYSTEM
- RESEARCH AND DEVELOPMENT
- MATERIAL REQUIREMENTS PLANNING
- OIL AND GAS ACCOUNTING AND PRODUCTION
- PRODUCT MOVEMENT
- TRUCK DISPATCH
- OPERATIONS COST REPORTING

EXHIBIT I-9

METHODS USED TO IMPROVE TIME AND COSTS  
ASSOCIATED WITH APPLICATIONS DEVELOPMENT IN THE  
PROCESS MANUFACTURING SECTOR

METHOD	PERCENT OF MENTIONS
ON-LINE PROGRAMMING	24%
PURCHASED SOFTWARE PRODUCTS	10
STRUCTURED PROGRAMMING/DESIGN	9
PROJECT MANAGEMENT	2
IMPROVED TRAINING/BETTER QUALIFICATIONS	4
PROGRAMMING AIDS	27
DATA BASE MANAGEMENT SYSTEMS	2
OTHER	
- USER INVOLVEMENT IN DEVELOPMENT	2
- STANDARDIZED METHODS/SYSTEMS	1
- HARDWARE UPGRADE	2
- IMPROVED DOCUMENTATION	2
- CRT TERMINALS FOR PROGRAMMERS	5
- MISCELLANEOUS METHODS	5
- DO NOTHING/NO PLANS	5

EXHIBIT I-10

EXPECTED LEVEL OF IMPROVEMENT IN PROGRAM  
DEVELOPMENT FOR RESPONDENTS IN THE  
PROCESS MANUFACTURING SECTOR

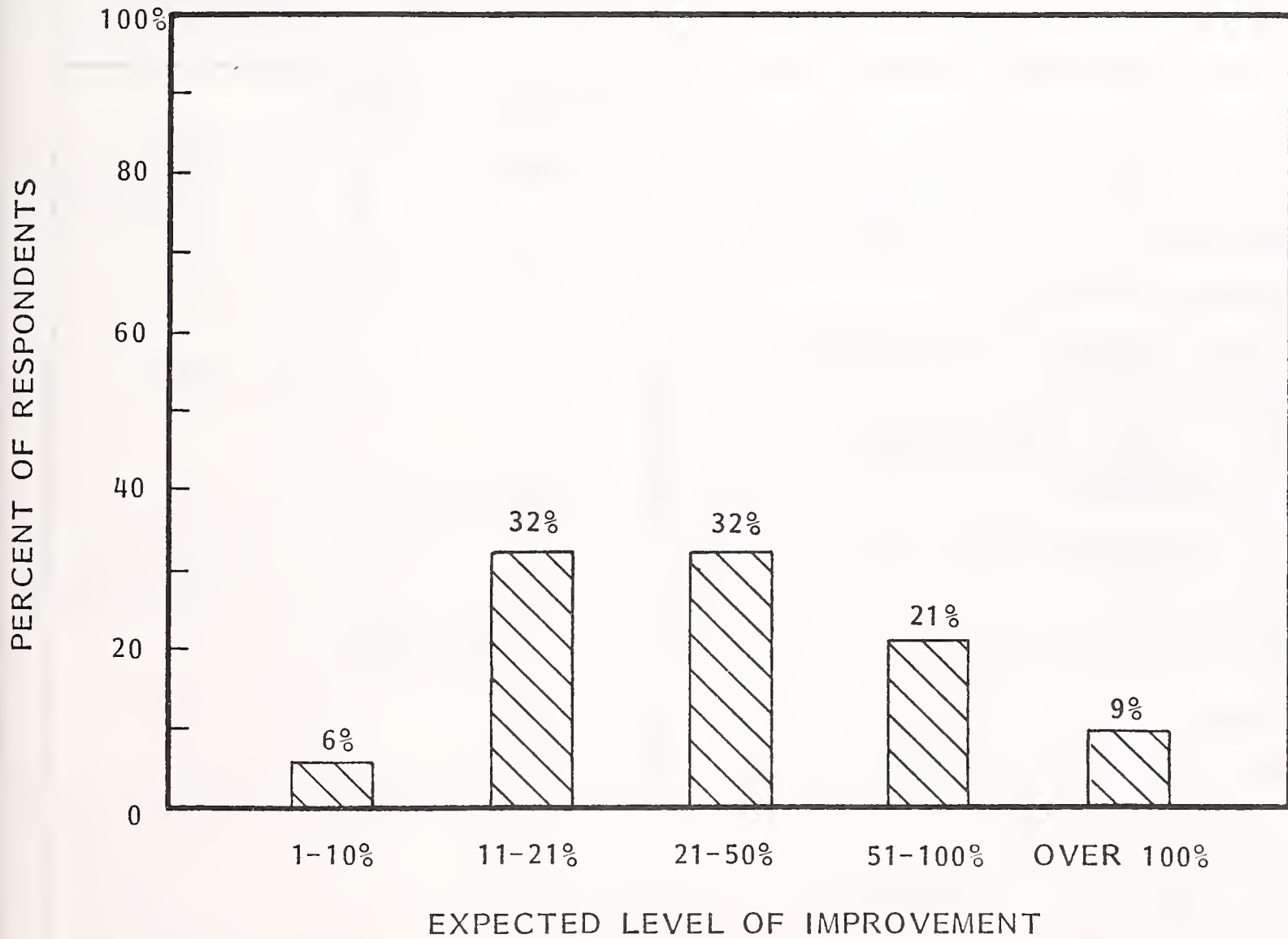


EXHIBIT I-11

MOST SIGNIFICANT EDP PROBLEMS IN THE  
PROCESS MANUFACTURING SECTOR

PROBLEM	RELATIVE IMPORTANCE	PERCENT OF MENTIONS AS HIGHEST PRIORITY
PERSONNEL RECRUITING	100	25%
NEED FOR BETTER PLANNING AND CONTROL	94	12
PERSONNEL TRAINING	68	9
LACK OF GENERAL MANAGEMENT UNDERSTANDING	82	10
LACK OF USER INVOLVEMENT IN SYSTEMS/APPLICATIONS DEVELOPMENT	79	12
NEED FOR IMPROVEMENT IN OPERATIONS	74	7
EXCESSIVE APPLICATIONS DEVELOPMENT TIME	52	7
INADEQUATE EDP FUNDING	26	4
INADEQUATE SYSTEMS SOFTWARE	37	4
NEED TO IMPROVE DATA COMMUNICATIONS	12	2
UNSATISFACTORY HARDWARE MAINTENANCE	18	4
OTHER		

EXHIBIT I-12

USE OF RESOURCES IN THE PROCESS  
MANUFACTURING SECTOR

RESOURCE	APPLICATIONS	PERCENT OF USE
COMPUTER EQUIPMENT	PRODUCTION JOBS	64.1%
	NEW APPLICATIONS DEVELOPMENT	19.7
	EXISTING PROGRAM MAINTENANCE	14.4
	OTHER*	1.8
PROGRAMMING PERSONNEL	NEW PROGRAM DEVELOPMENT	51.1
	EXISTING PROGRAM MAINTENANCE	27.1
	ENHANCEMENT OF EXISTING PROGRAMS	21.8

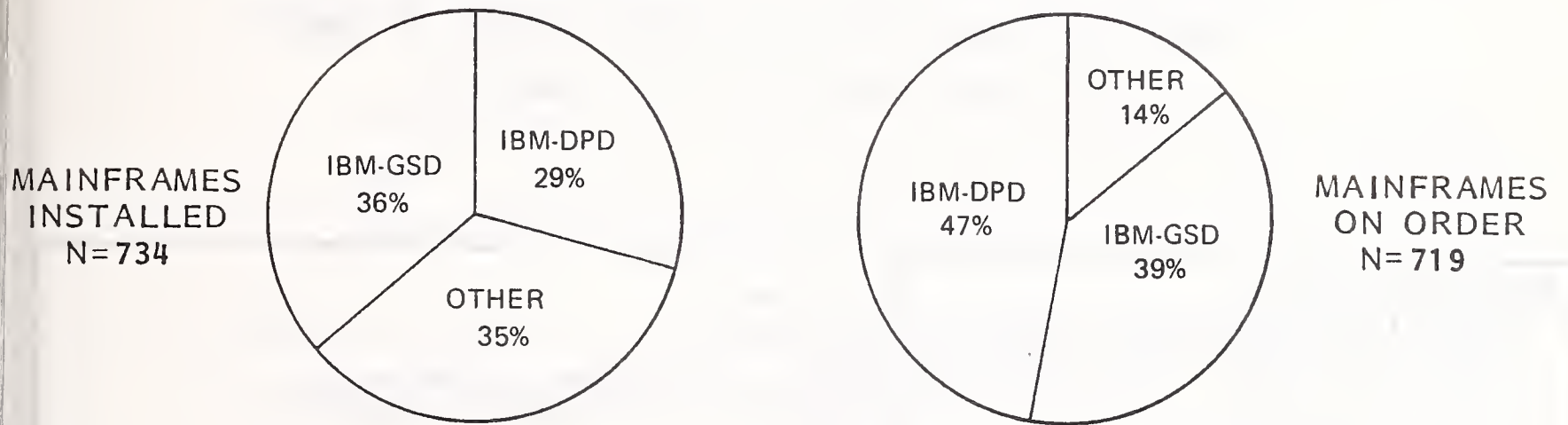
\*OTHER MENTIONS INCLUDE:

- DBA
- RERUNS
- TESTING
- SYSTEMS SOFTWARE

- The emphasis on new program development for over 50% of the programming personnel may account for a previously noted problem in this industry - the need for better planning and control.
- IBM hardware accounts for nearly two-thirds of the installed mainframes in the process manufacturing sector. Exhibit I-13 shows that, of the one-third that is non-IBM mainframe, Datapoint ranks highest, with 5.3%, and Four-Phase is next, with 4.6%.
  - As in the discrete manufacturing sector, IBM totally dominates the mainframes on order, claiming all but 14%.
  - Datapoint has over half of the non-IBM mainframes on order, with 9%.
- Exhibit I-14 shows that well over half of the process manufacturing sector has between one and ten installed minicomputers.
- More than one-fourth of the respondents reported that they had between one and ten microcomputers installed. However, most respondents neither have microcomputers nor plan to install them.
- In the process manufacturing sector, 40% of the respondents have between one and ten intelligent terminals installed. This is approximately twice as many users as the discrete manufacturing sector.
- Over half of the respondents have between 11 and 100 nonintelligent terminals installed.
  - The rate of growth for intelligent terminals between 1980 and 1981 exceeds the average growth of nonintelligent terminals, indicating that the process manufacturing sector is moving toward intelligent terminals and distributed data processing.

EXHIBIT I-13

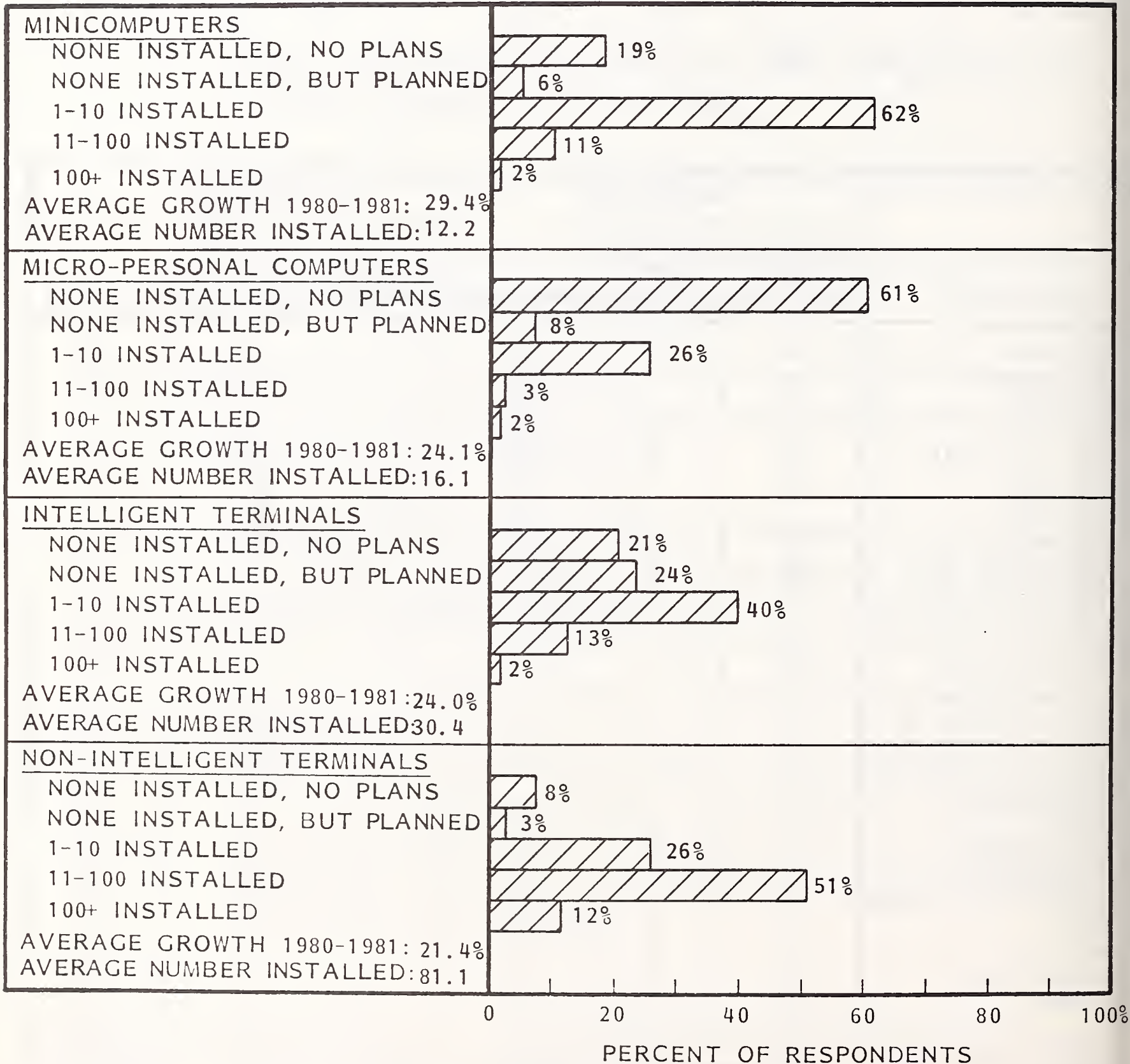
MAINFRAME EDP HARDWARE PROFILE IN THE  
PROCESS MANUFACTURING SECTOR



MAINFRAME	INSTALLED			ON-ORDER		
	NUMBER OF RESPONSES	NUMBER OF SYSTEMS	PERCENT	NUMBER OF RESPONSES	NUMBER OF SYSTEMS	PERCENT
IBM 3033	9	11	1.5%	4	4	0.6%
IBM 3033N	1	1	0.1	6	7	1.0
IBM 3032	6	6	0.8	1	1	0.1
IBM 3031	13	15	2.0	3	3	0.4
IBM 370 158-168	25	40	5.4	0	0	0.0
IBM 4331	12	12	1.6	33	82	11.4
IBM 4341	1	1	0.1	53	83	11.5
IBM 8100	10	23	3.1	22	152	21.1
IBM OTHER 370	53	85	11.6	2	3	0.4
IBM OTHER 360	11	16	2.2	0	0	0.0
SUBTOTAL IBM-DPD	141	210	28.4%	124	335	46.5%
IBM SYSTEMS 1, 3, 32, 34	38	261	35.6%	16	222	30.9%
IBM SYSTEMS 38	0	0	0.0	18	60	8.3
SUBTOTAL IBM-GSD	38	261	35.6%	34	282	39.2%
BURROUGHS	14	17	2.3%	5	8	1.1%
DEC	13	21	2.9	1	1	0.1
DATAPoint	9	39	5.3	4	65	9.0
HONEYWELL	13	31	4.2	1	10	1.4
HEWLETT-PACKARD	8	15	2.0	3	3	0.4
NCR	11	22	3.0	1	1	0.1
UNIVAC	19	21	2.9	3	5	0.7
FOUR-PHASE	7	34	4.6	2	2	0.3
OTHER	26	63	8.8	5	7	1.2
SUBTOTAL OTHER	120	263	36.0	25	102	14.3%
TOTAL	299	734	100.0%	183	719	100.0%

EXHIBIT I-14

NON-MAINFRAME EDP HARDWARE PROFILE IN THE  
PROCESS MANUFACTURING SECTOR





#### 4. KEY ISSUE STATUS REVIEW

- The most important development objective in the process manufacturing sector is the implementation and development of new applications.
  - Implementation and development of on-line applications and improvement in productivity and/or operations are the other outstanding objectives in process manufacturing, as shown in Exhibit I-15.
- Exhibit I-16 shows that over half of the EDP staff attends technical training seminars, at an average expense per attendee of \$739.00.
  - As in the discrete manufacturing sector, management training costs per attendee are much lower than technical training, and fewer staff members receive management training.
  - Exhibit I-16 shows the impact of rapid developments in technology on EDP, and also the level of effort made to obtain technically qualified staff members through training.
- Exhibit I-17 reveals that self-maintenance is used to perform diagnostics and software maintenance in approximately one-third of the respondent organizations.
  - Few users install their own equipment, perform hardware maintenance or deliver equipment to the vendor's depot for maintenance.
- Only 7% of the process manufacturing sector respondents are currently using electronic mail.
  - Nearly half have no plans for electronic mail, and only one-third indicated current responsibility for this function.

EXHIBIT I-15

MOST IMPORTANT DEVELOPMENT OBJECTIVE  
IN THE PROCESS MANUFACTURING SECTOR

MOST IMPORTANT EDP DEVELOPMENT OBJECTIVE IN 1980	PERCENT OF TOTAL MENTIONS
DATA BASE DEVELOPMENT	9%
DESIGN OR INSTALL DDP	6
IMPLEMENT/DEVELOP NEW APPLICATIONS	35
IMPLEMENT/DEVELOP ON-LINE APPLICATIONS	14
INSTALL OR UPGRADE MAINFRAME	2
INSTALL MINICOMPUTERS	2
INSTALL OR CONVERT OPERATING SYSTEMS	4
DESIGN/DEVELOP COMMUNICATIONS NETWORK	2
CENTRALIZE OR DECENTRALIZE DP OPERATIONS	2
PLAN/IMPROVE PRODUCTIVITY AND/OR OPERATIONS	14
OTHER	
- REWRITE SOFTWARE	1
- STANDARDIZE SYSTEMS	2
- TRAIN STAFF/USERS	2
- MISCELLANEOUS RESPONSES*	5
TOTAL	100%

\*SPECIFIC RESPONSES INCLUDE:

- GENERATION OF ACCURATE AND TIMELY REPORTS
- INSTALLATION OF A PREVENTIVE MAINTENANCE SYSTEM
- QUALITY CONTROL
- MARKETING OF SYSTEMS

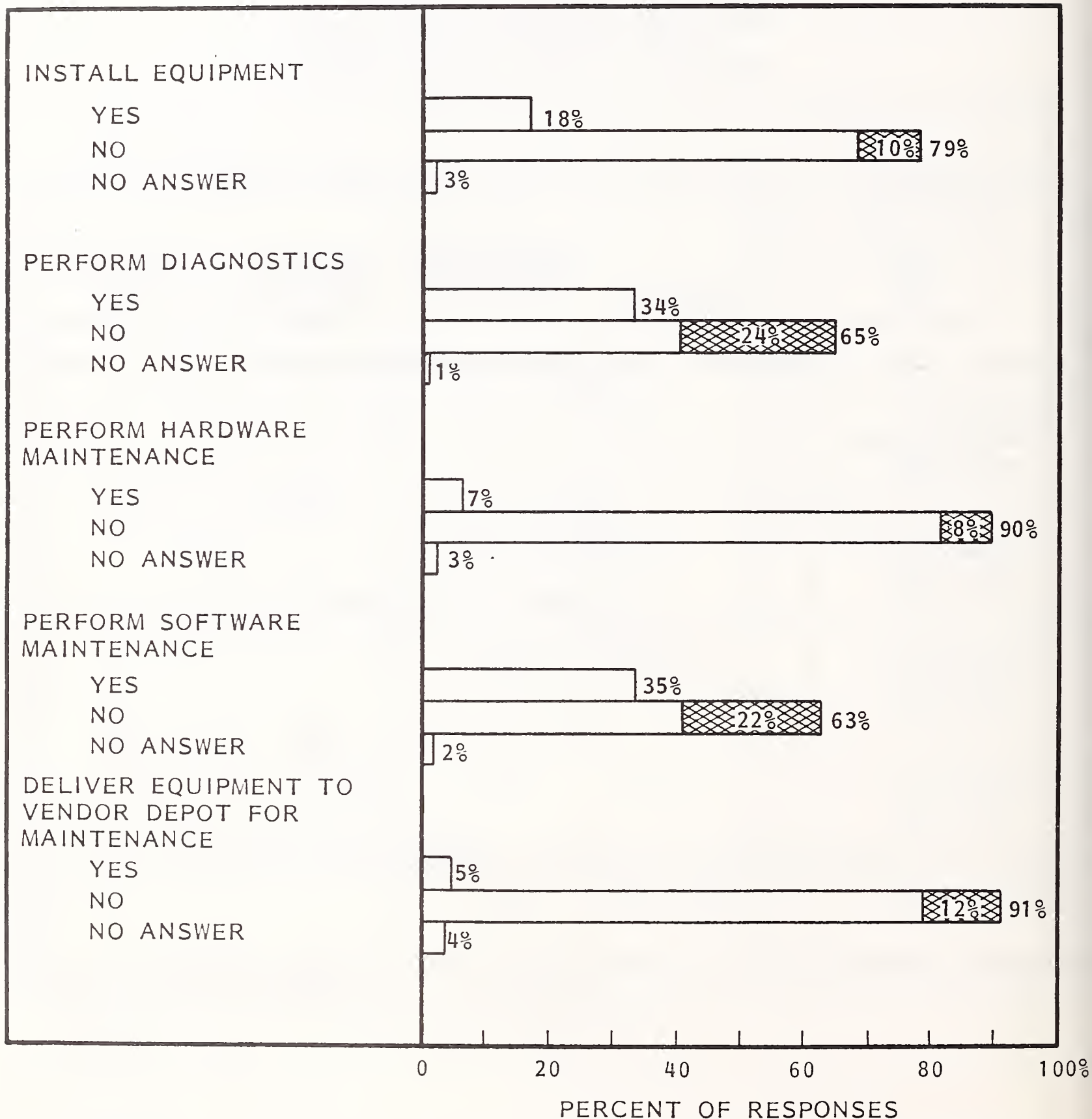
EXHIBIT I-16

TRAINING EXPENDITURES IN THE  
PROCESS MANUFACTURING SECTOR

TYPE OF TRAINING	AVERAGE EXPENSE	AVERAGE EXPENDITURE PER EDP EMPLOYEE	PERCENT OF STAFF ATTENDING	AVERAGE EXPENSE PER ATTENDEE
IN-HOUSE MANAGEMENT TRAINING	\$ 6,648	\$ 76	34.5%	\$478
OUTSIDE MANAGEMENT TRAINING	7,201	83		
IN-HOUSE TECHNICAL TRAINING	16,512	189	53.3	739
OUTSIDE TECHNICAL TRAINING	17,139	196		
TOTAL	\$47,500	\$544	-	-

EXHIBIT I-17

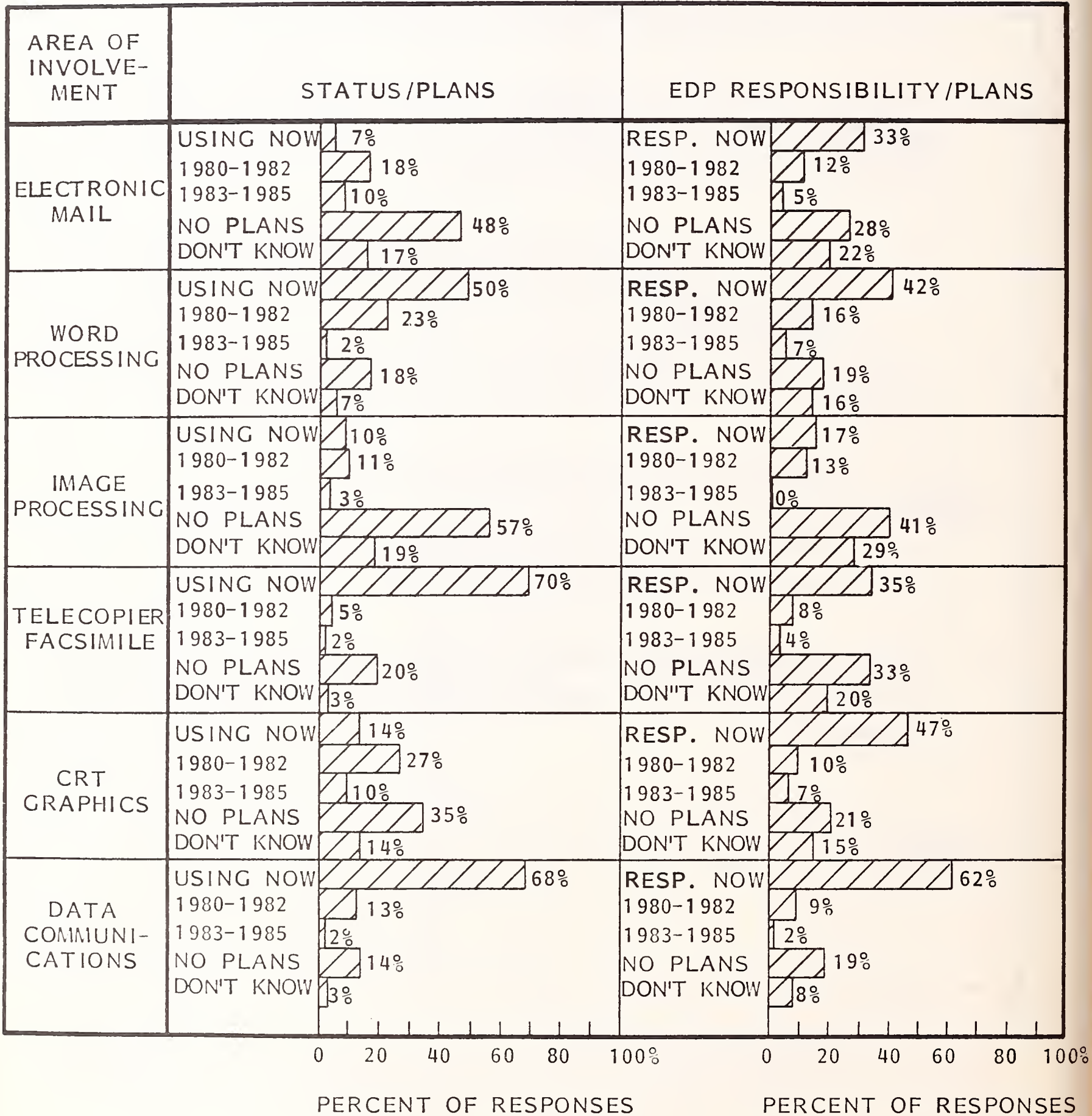
DEGREE OF USER SELF-MAINTENANCE  
IN THE PROCESS MANUFACTURING SECTOR



NOTE:  INDICATES PERCENT OF RESPONDENTS NOT CURRENTLY PERFORMING FUNCTION, BUT WHO WOULD CONSIDER DOING SO

- Approximately half of the respondents are using word processing equipment, and nearly the same proportion have responsibility for this function.
- Image processing appears to be a low-priority item for EDP managers. Two-thirds have no plans or do not know when image processing might be used in their organization, nor do they have responsibility for this activity.
- As shown in Exhibit I-18, telecopier and facsimile activities are currently used by over two-thirds of the respondents, but only one-third of the EDP managers have current responsibility for this function.
  - Over half indicated that they had no plans or did not know whether they would have responsibility for telecopier and facsimile activities.
- Computer graphics is apparently just starting to be used, with only 14% of the respondents indicating that they are using this technology now.
  - By 1985, over half plan to have this capability.
  - Computer graphics will be the responsibility of EDP managers, according to the responses shown in Exhibit I-18.
- Data communications are currently in use by two-thirds of the respondents, and nearly an equal number indicated that this activity was an EDP manager's responsibility.

EXHIBIT I-18  
 RESPONDENT INVOLVEMENT IN OFFICE AUTOMATION  
 IN THE PROCESS MANUFACTURING SECTOR



1980 ANALYSIS OF EDP IN THE SERVICES INDUSTRY





## SERVICES

### I. INDUSTRY SECTOR OVERVIEW

- Although total revenues for the services sector amount to only approximately \$75 billion per year, it is an important computer market primarily because of the high information (paper-handling) content of the work.
  - This group includes SIC codes 73 (business services) and 89 (miscellaneous services). Forty-eight respondents are included in this sector, representing 5.3% of the total INPUT survey population.
- Exhibit I-1 shows that the largest proportion (68.8%) of respondents were in the \$100 million or less annual revenue size category.
  - This group had an average of 78 EDP employees, and the EDP budget represents 13.7% of annual sales. This is a very high ratio compared to smaller firms in other industry sectors.
  - Firms having revenues between \$101 and \$999 million reported an average of 242 EDP employees, with an annual budget of slightly over \$2 million, representing 0.6% of the annual sales. The EDP budget per total number of employees is the smallest of the size categories, at \$506.
  - For the large firms with annual revenues of \$1 billion or more, the average EDP budget represents only 0.3% of annual sales. However,

## EXHIBIT I-1

## RESPONDENT PROFILE - SERVICES SECTOR

PROFILE CHARACTERISTIC	COMPANY SIZE IN TERMS OF ANNUAL SALES			
	\$100 MILLION OR LESS	\$101-999 MILLION	\$1 BILLION OR MORE	NO SIZE DATA
PERCENT OF TOTAL RESPONDENTS	68.8%	10.4%	2.1%	18.8%
AVERAGE ANNUAL SALES (\$ MILLION)	\$ 17.6	\$ 295.8	\$ 1,300	-
AVERAGE TOTAL EMPLOYEES	278	4,020	3,000	311
AVERAGE EDP EMPLOYEES	78	242	90	114
EDP EMPLOYEES PER 100 TOTAL EMPLOYEES	27.9	6.0	3.0	25.4
AVERAGE EDP BUDGET (\$ THOUSAND)	\$ 2,017	\$ 2,037	\$ 4,500	\$ 3,540
EDP BUDGET AS A PERCENT OF ANNUAL SALES	13.7%	0.6%	0.3 %	-
EDP BUDGET PER EDP EMPLOYEE	\$35,174	\$38,443	\$50,000	\$27,554
EDP BUDGET PER TOTAL NUMBER OF EMPLOYEES	\$ 7,876	\$ 506	\$ 1,500	\$ 4,975

the EDP budget per EDP employee is the highest of the three categories, at \$50,000 each.

- The fourth column in Exhibit I-1 shows that the profile for those respondents who did not report annual revenues falls between the extremes of the other three respondent categories.

## 2. BUDGET AND EXPENDITURE ANALYSIS

- An unusual distribution of EDP budget to company revenues is shown in Exhibit I-2, where over half the respondents reported that their budget was more than 5% of total company revenues.
  - This indicates the very high use of EDP in the services sector compared to industrial and government sectors.
  - Exhibit I-3 shows that continued EDP budget growth in 1980 and 1981 can be expected to be between 10% and 20% for the largest group of respondents.
- Exhibit I-4 shows that the growth in minicomputers between 1980 and 1981 represents the largest budget increase category.
  - Processing services is the only category that shows a decrease in budget between 1980 and 1981.
- Exhibit I-5 reveals that a relatively high percentage of the respondents in the services sector expect to be affected by the recession.
  - The average budget reduction for those affected is 12.4%, which is very close to the reduction reported by other industry sectors.
  - Exhibit I-6 shows that, like other industries, personnel recruiting and payroll will bear the brunt of the impact of the recession.

EXHIBIT 1-2

RATIO OF EDP BUDGET TO COMPANY SALES:  
DISTRIBUTION OF RATIOS AMONG RESPONDENTS IN THE  
SERVICES SECTOR

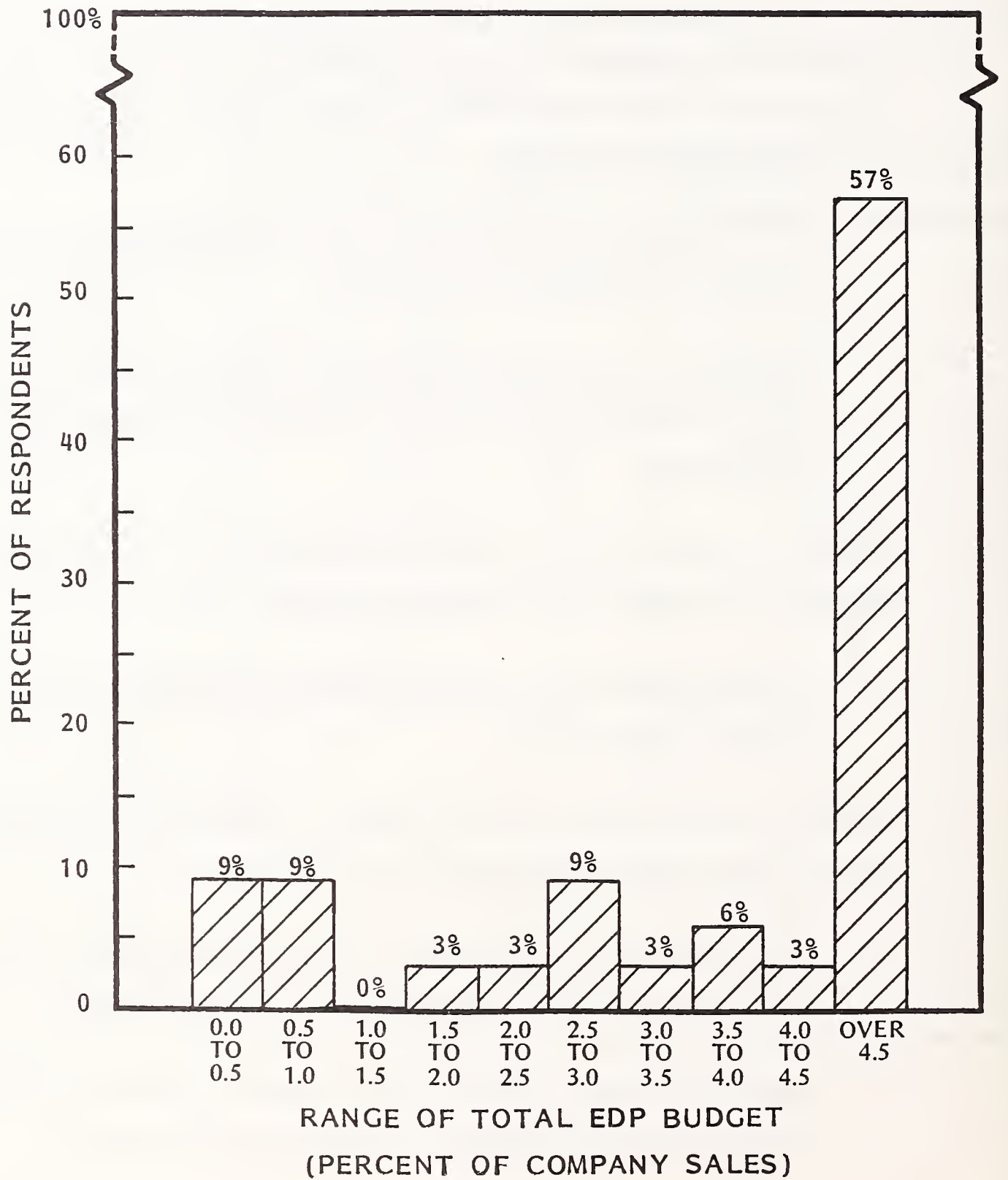
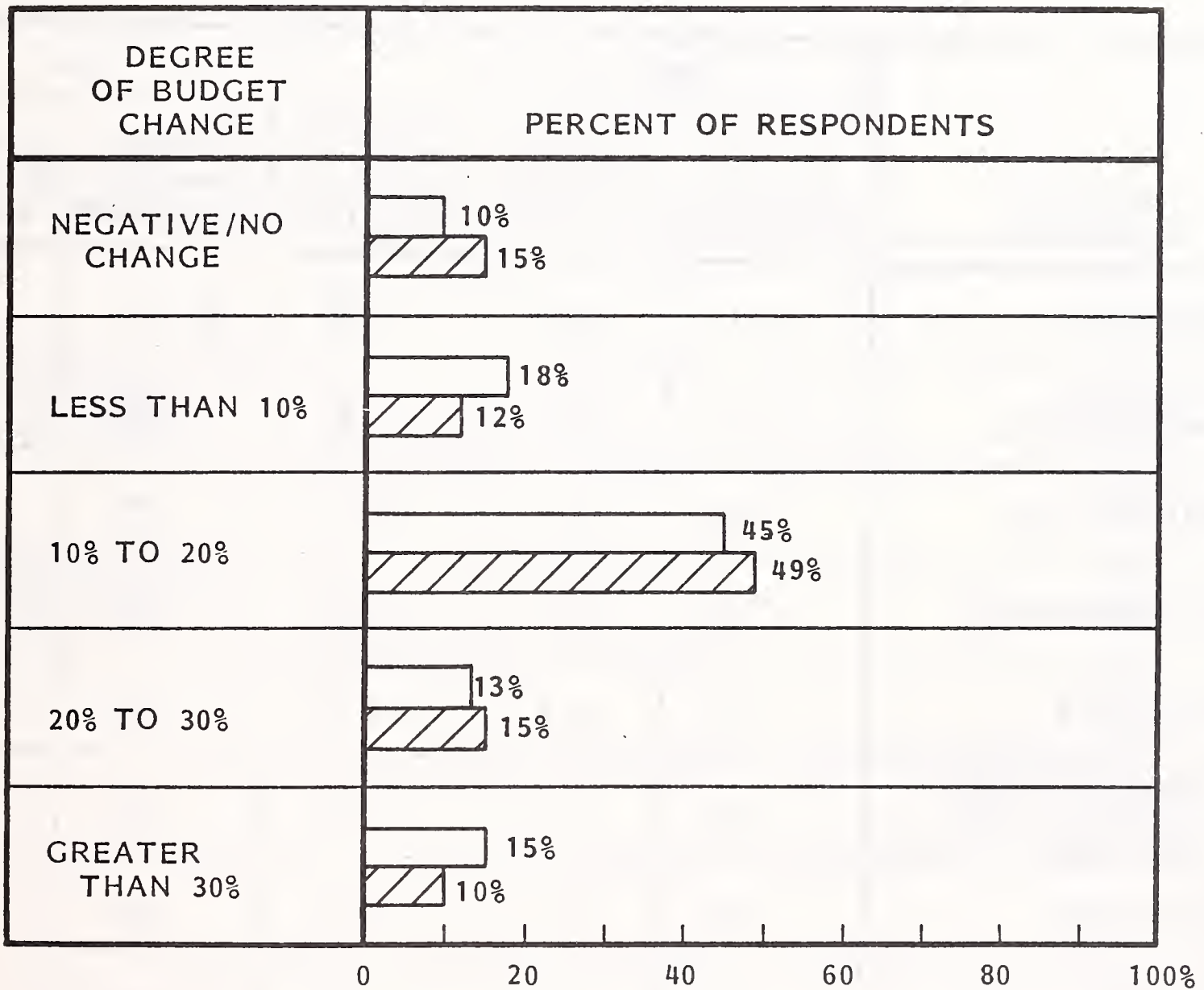


EXHIBIT I-3

ACTUAL AND PLANNED EDP BUDGET GROWTH FOR RESPONDENTS IN THE SERVICES SECTOR



□ 1979-1980  
 ▨ 1980-1981

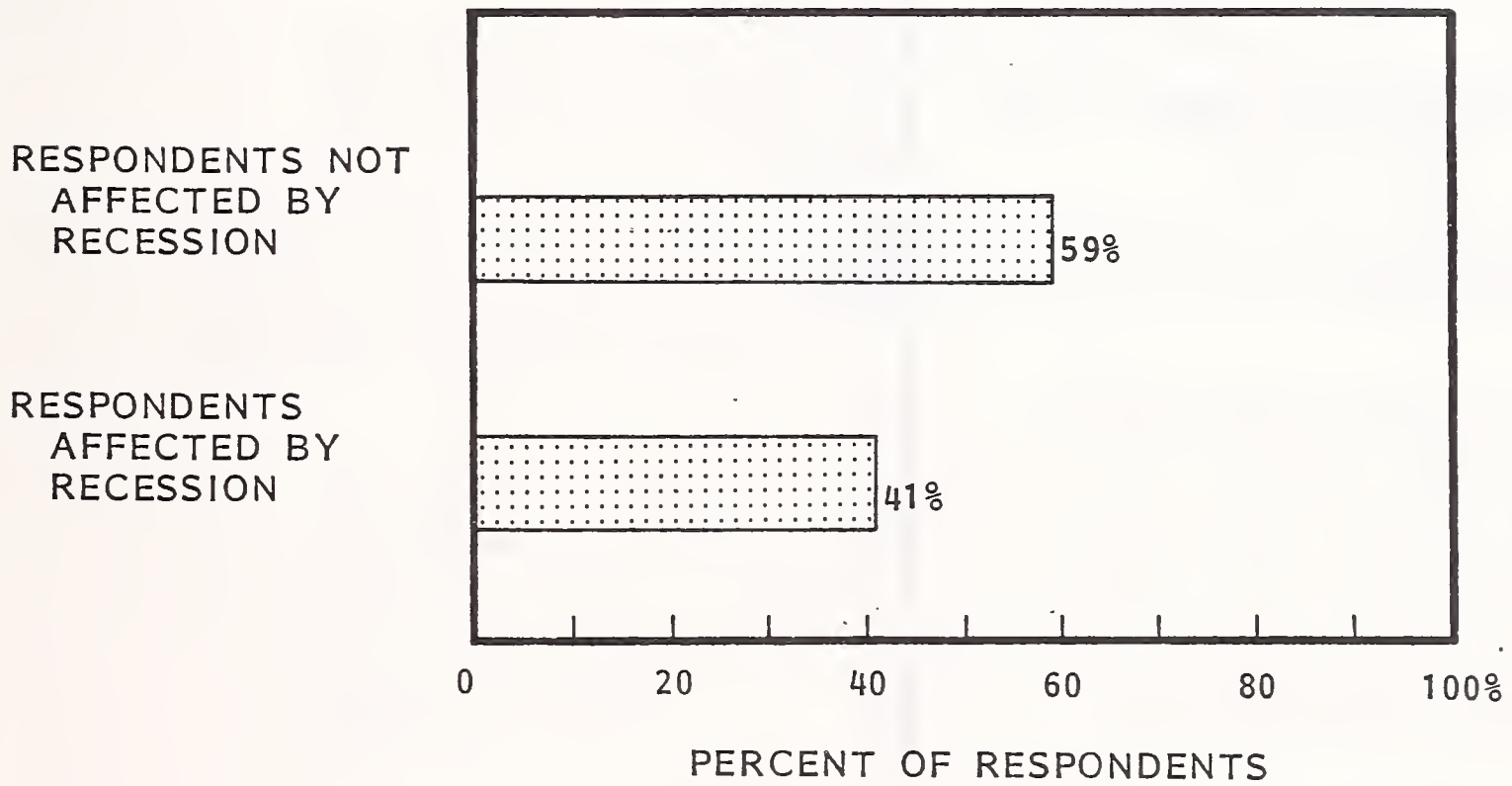
EXHIBIT I-4

ANTICIPATED CHANGES IN EDP BUDGETS  
IN THE SERVICES SECTOR

BUDGET CATEGORY	1980		PERCENT INCREASE (DECREASE) 1980-1981	1981	
	AVERAGE BUDGET (\$ THOUSAND)	PERCENT OF TOTAL BUDGET		AVERAGE BUDGET (\$ THOUSAND)	PERCENT OF TOTAL BUDGET
PERSONNEL	\$ 971	39.7%	6.3%	\$1,032	39.3%
MAINFRAME PROCESSORS	376	15.4	1.9	383	14.6
PERIPHERALS	269	11.0	10.7	298	11.3
MINICOMPUTERS	137	5.6	19.9	165	6.3
TERMINALS	118	4.8	14.8	136	5.2
COMMUNICATIONS HARDWARE AND SOFTWARE	142	5.8	5.9	151	5.7
SOFTWARE	52	2.2	5.0	54	2.1
VENDOR MAINTENANCE	92	3.8	6.5	98	3.7
PROCESSING SERVICES	23	0.9	(9.4)	21	0.8
SUPPLIES AND OTHER	265	10.8	9.2	290	11.0
TOTAL	\$2,445	100.0%	7.4%	\$2,628	100.0%

EXHIBIT I-5

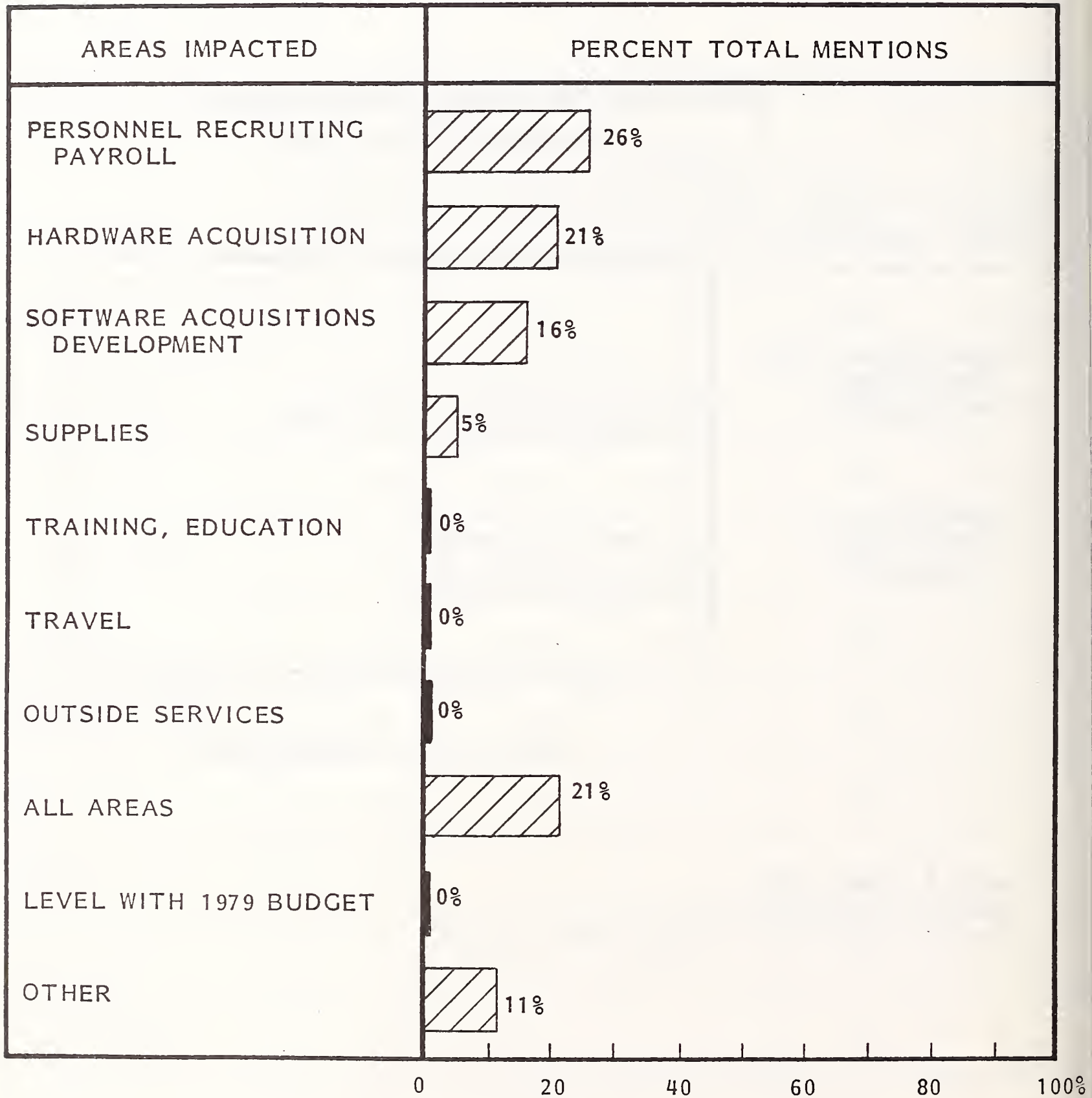
EFFECTS OF RECESSION ON EDP BUDGETS  
IN THE SERVICES SECTOR



AVERAGE PERCENT  
BUDGET REDUCTION FOR  
THOSE AFFECTED BY RECESSION: 12.4%

EXHIBIT I-6

BUDGET AREAS IMPACTED BY POSSIBLE  
RECESSION IN 1980 FOR RESPONDENTS IN THE  
SERVICES SECTOR





### 3. MAJOR PLANS AND PROBLEMS

- As with other industry sectors, Exhibit I-7 shows that the installation of on-line applications represents the highest EDP objective between 1980 and 1982.
  - Another high objective throughout this period is the need to meet development and conversion schedules. This reflects the high level of new minicomputers on order.
- Accounting/finance applications are of greatest relative importance in the services sector. As shown in Exhibit I-8, 28% of the respondents mentioned this application as the highest priority.
  - Specific applications, as listed in this exhibit, are also high in importance and highest in priority.
- On-line programming, programming aids and structured programming/design, are the primary efficiency-improvement techniques favored by this group of respondents, as shown in Exhibit I-9.
  - Forty-three percent of the respondents expect between 11% and 21% improvement in program development through new methods. The distribution shown in Exhibit I-10 indicates that only 7% of the respondents felt that new methods would produce less than 10% improvement levels.
- Exhibit I-11 reveals that the need for better planning and control, and personnel recruiting are the primary EDP problems in the services sector.
  - Improved data communications also emerges as a significant problem for the services sector.

EXHIBIT I-7

EDP OBJECTIVES FOR RESPONDENTS IN THE  
SERVICES SECTOR

OBJECTIVE	RELATIVE IMPORTANCE		
	1980	1981	1982
INSTALL ON-LINE APPLICATIONS	100%	100%	100%
CONVERT APPLICATIONS	85	64	63
IMPROVE EDP PERSONNEL PRODUCTIVITY	68	40	59
DEVELOP LONG-RANGE EDP PLAN	90	36	48
DEVELOP NEW BATCH APPLICATIONS	32	32	25
MEET DEVELOPMENT, CONVERSION SCHEDULES	70	54	68
INSTALL NEW MAINFRAME	56	40	55
DESIGN, INSTALL DBMS	36	49	48
CHANGE OPERATING SYSTEMS	46	13	29
DESIGN, INSTALL DDP NETWORK	30	27	34
INSTALL NEW PERIPHERALS	36	25	40
INSTALL MINICOMPUTERS	26	36	18
INTEGRATE OFFICE AUTOMATION WITH EDP	14	13	38
CENTRALIZE EDP CONTROL	7	10	7
DECENTRALIZE EDP CONTROL	5	8	5
OTHER	16	16	11

EXHIBIT I-8

APPLICATIONS TO BE DEVELOPED BY  
RESPONDENTS IN THE SERVICES SECTOR

APPLICATION	RELATIVE IMPORTANCE	PERCENT OF MENTIONS AS HIGHEST PRIORITY
ACCOUNTING/FINANCE	100	28%
INVENTORY CONTROL	54	12
ORDER ENTRY/BILLING	48	7
PERSONNEL	18	2
PURCHASING	17	-
MARKETING/SALES	35	5
MODELING/FORECASTING	30	-
PERFORMANCE MEASUREMENT/CONTROL	38	10
OTHER**	87	36
TOTAL	-	100%

\*\*SPECIFIC APPLICATIONS INCLUDE:

- ALARM MONITORING
- ENGINEERING APPLICATIONS
- REGIONAL I/O PROCESSING
- INTERACTIVE TEXT APPLICATIONS
- ON-LINE CREDIT SEARCH
- REGISTRATION, STUDENT CONTROL
- DAILY CYCLE PROCESSING
- HOSPITAL PATIENT CARE
- ON-LINE CHEMICAL SEARCH
- MIS AND COMMUNICATIONS

EXHIBIT I-9

METHODS USED TO IMPROVE TIME AND COSTS  
ASSOCIATED WITH APPLICATIONS DEVELOPMENT IN THE  
SERVICES SECTOR

METHOD	PERCENT OF MENTIONS
ON-LINE PROGRAMMING	25%
PURCHASED SOFTWARE PRODUCTS	5
STRUCTURED PROGRAMMING/DESIGN	14
PROJECT MANAGEMENT	7
IMPROVED TRAINING/BETTER QUALIFICATIONS	7
PROGRAMMING AIDS	21
DATA BASE MANAGEMENT SYSTEMS	1
OTHER	
- USER INVOLVEMENT IN DEVELOPMENT	4
- STANDARDIZED METHODS/SYSTEMS	-
- HARDWARE UPGRADE	-
- IMPROVED DOCUMENTATION	1
- CRT TERMINALS FOR PROGRAMMERS	4
- MISCELLANEOUS METHODS	10
- DO NOTHING/NO PLANS	1

EXHIBIT I-10

EXPECTED LEVEL OF IMPROVEMENT IN PROGRAM  
DEVELOPMENT FOR RESPONDENTS IN THE  
SERVICES SECTOR

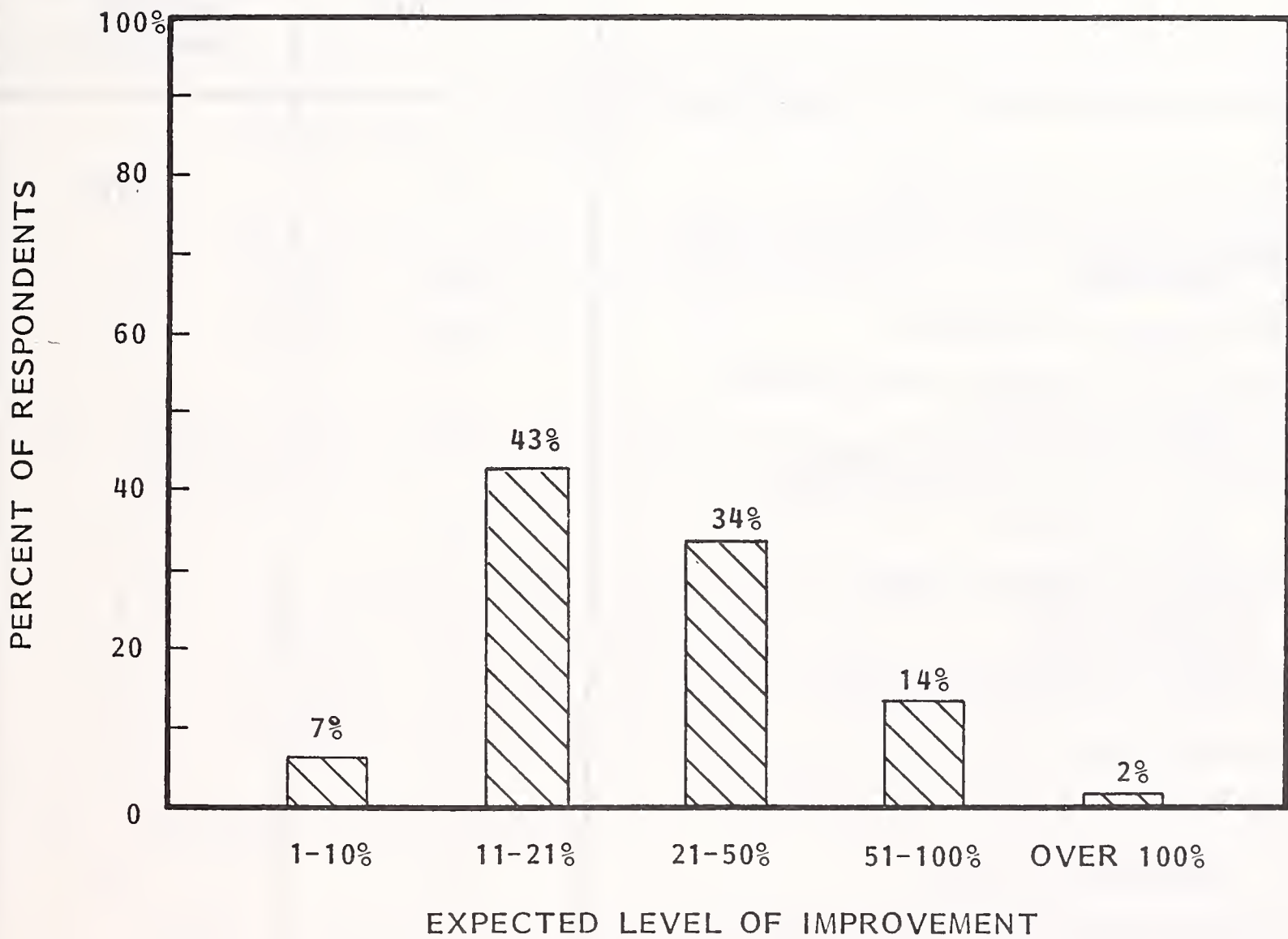


EXHIBIT I-11

MOST SIGNIFICANT EDP PROBLEMS IN THE SERVICES SECTOR

PROBLEM	RELATIVE IMPORTANCE	PERCENT OF MENTIONS AS HIGHEST PRIORITY
PERSONNEL RECRUITING	99	24%
NEED FOR BETTER PLANNING AND CONTROL	100	12
PERSONNEL TRAINING	67	7
LACK OF GENERAL MANAGEMENT UNDERSTANDING	76	17
LACK OF USER INVOLVEMENT IN SYSTEMS/APPLICATIONS DEVELOPMENT	72	7
NEED FOR IMPROVEMENT IN OPERATIONS	58	5
EXCESSIVE APPLICATIONS DEVELOPMENT TIME	52	5
INADEQUATE EDP FUNDING	34	7
INADEQUATE SYSTEMS SOFTWARE	38	2
NEED TO IMPROVE DATA COMMUNICATIONS	69	9
UNSATISFACTORY HARDWARE MAINTENANCE	15	0
OTHER	30	5

- The typical two-thirds production/one-third new development and maintenance ratio describing the use of computer resources, reflects the level of use found in other industries.
  - Exhibit I-12 shows the nearly balanced distribution of personnel effort between new program development, existing program maintenance and enhancement of existing programs.
- By count of mainframes, only slightly over one-third of the services sector respondents have IBM shops, as indicated by the upper pie chart of Exhibit I-13.
  - The users are replacing older machines with minicomputers, particularly Datapoint and DEC.
  - The services sector is unique in that it is the only one where mainframes on order are generally non-IBM, as shown in the right-hand pie chart of Exhibit I-13.
- Exhibit I-14 shows that the respondents have an average of 26.9 minicomputers installed, but only 21% have microcomputers.
  - The average number of nonintelligent terminals installed exceeds the intelligent terminals by a factor of almost 2, but the growth rate of intelligent terminals is slightly greater, at 18.8%, than that for nonintelligent terminals, at 16.6%.

#### 4. KEY ISSUE STATUS REVIEW

- Exhibit I-15 shows that the implementation and development of new applications and on-line applications are considered the primary development objectives for the services sector.

EXHIBIT I-12

USE OF RESOURCES IN THE SERVICES SECTOR

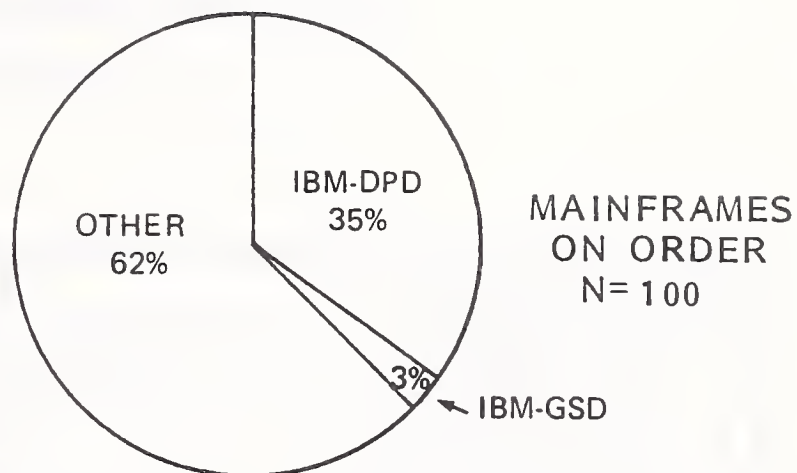
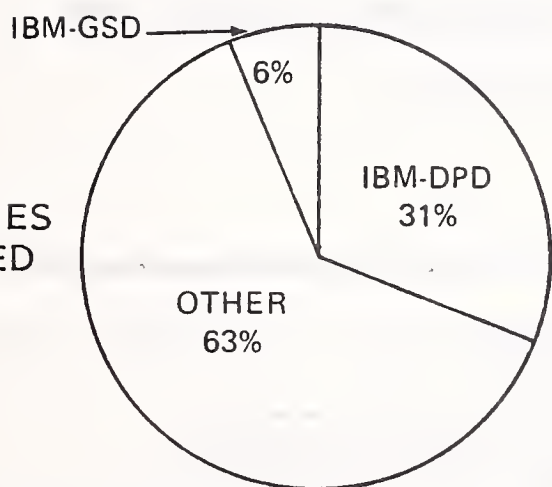
RESOURCE	APPLICATIONS	PERCENT OF USE
COMPUTER EQUIPMENT	PRODUCTION JOBS	65.5%
	NEW APPLICATIONS DEVELOPMENT	18.6
	EXISTING PROGRAM MAINTENANCE	13.4
	OTHER*	2.5
PROGRAMMING PERSONNEL	NEW PROGRAM DEVELOPMENT	39.7
	EXISTING PROGRAM MAINTENANCE	31.7
	ENHANCEMENT OF EXISTING PROGRAMS	28.6

- \*OTHER MENTIONS INCLUDE:
- INSTRUCTION/RESEARCH
  - ONE-TIME PROGRAMS



EXHIBIT I-13

MAINFRAME EDP HARDWARE PROFILE IN THE SERVICES SECTOR



MAINFRAME	INSTALLED			ON ORDER		
	NUMBER OF RESPONSES	NUMBER OF SYSTEMS	PERCENT	NUMBER OF RESPONSES	NUMBER OF SYSTEMS	PERCENT
IBM 3033	4	7	4.8%	2	2	2.0%
IBM 3033N	0	0	0.0	2	2	2.0
IBM 3032	1	1	0.7	0	0	0.0
IBM 3031	5	7	4.8	1	1	1.0
IBM 370 158-168	7	12	8.2	1	1	1.0
IBM 4331	3	3	2.0	9	11	11.0
IBM 4341	0	0	0.0	10	14	14.0
IBM 8100	1	1	0.7	1	3	3.0
IBM OTHER 370	8	11	7.5	1	1	1.0
IBM OTHER 360	3	3	2.0	0	0	0.0
<b>SUBTOTAL IBM-DPD</b>	<b>32</b>	<b>45</b>	<b>30.7%</b>	<b>27</b>	<b>35</b>	<b>35.0%</b>
IBM SYSTEMS 1, 3, 32, 34	2	9	6.1%	1	2	2.0%
IBM SYSTEMS 38	0	0	0.0	1	1	1.0
<b>SUBTOTAL IBM-GSD</b>	<b>2</b>	<b>9</b>	<b>6.1%</b>	<b>2</b>	<b>3</b>	<b>3.0%</b>
AMDAHL	3	3	2.0%	2	2	2.0%
BURROUGHS	3	5	3.4	1	2	2.0
CDC	2	2	1.4	1	1	1.0
DEC	12	29	19.7	8	9	9.0
DATA GENERAL	3	4	2.7	1	5	5.0
DATAPoint	5	8	5.4	2	35	35.0
HONEYWELL	6	8	5.4	1	5	5.0
NIXDORF	1	12	8.2	0	0	0.0
NCR	4	7	4.8	1	1	1.0
UNIVAC	2	2	1.4	1	1	1.0
FOUR-PHASE	1	3	2.0	0	0	0.0
OTHER	7	10	6.8	1	1	1.0
<b>SUBTOTAL OTHER</b>	<b>49</b>	<b>93</b>	<b>63.2%</b>	<b>19</b>	<b>62</b>	<b>62.0%</b>
<b>TOTAL</b>	<b>83</b>	<b>147</b>	<b>100.0%</b>	<b>48</b>	<b>100</b>	<b>100.0%</b>

EXHIBIT I-14

NON-MAINFRAME EDP HARDWARE PROFILE IN THE SERVICES SECTOR

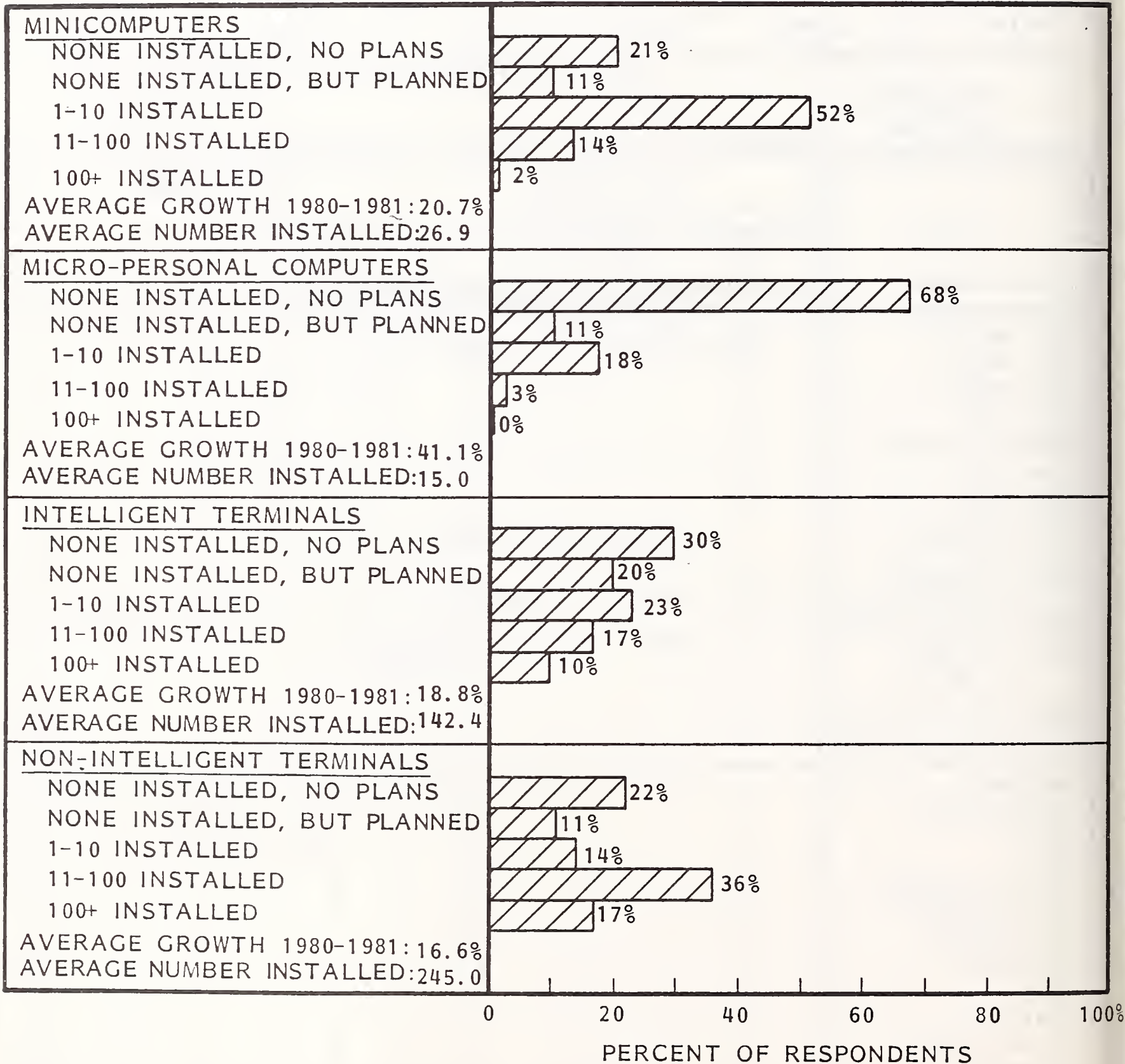


EXHIBIT I-15

MOST IMPORTANT DEVELOPMENT OBJECTIVE  
IN THE SERVICES SECTOR

MOST IMPORTANT EDP DEVELOPMENT OBJECTIVE IN 1980	PERCENT OF TOTAL MENTIONS
DATA BASE DEVELOPMENT	5%
DESIGN OR INSTALL DDP	2
IMPLEMENT/DEVELOP NEW APPLICATIONS	20
IMPLEMENT/DEVELOP ON-LINE APPLICATIONS	19
INSTALL OR UPGRADE MAINFRAME	12
INSTALL MINICOMPUTERS	-
INSTALL OR CONVERT OPERATING SYSTEMS	5
DESIGN/DEVELOP COMMUNICATIONS NETWORK	2
CENTRALIZE OR DECENTRALIZE DP OPERATIONS	-
PLAN/IMPROVE PRODUCTIVITY AND/OR OPERATIONS	14
OTHER	
- REWRITE SOFTWARE	9
- LONG-RANGE PLANNING	5
- MISCELLANEOUS RESPONSES*	7
TOTAL	100%

\*SPECIFIC RESPONSES INCLUDE:

- FILE SECURITY
- MANAGEMENT INVOLVEMENT
- ENCOURAGE USE OF COMPUTER

- As shown in Exhibit I-16, more than one-half of the services sector staff receive technical training.
  - The average expense for technical training is very much higher than for management training. However, the overall average expenditure per EDP employee is lower for both management and technical training than is found in other industry sectors.
  
- As is the case for other industries, the services sector is not currently performing or would consider performing its own installation or maintenance of equipment or software, as shown in Exhibit I-17.
  
- Exhibit I-18 shows a fairly high level of interest in office automation issues, and it is a correspondingly high-priority item for the EDP manager.
  - Word processing, telecopier and facsimile, and data communications are in widespread use in this industry sector.

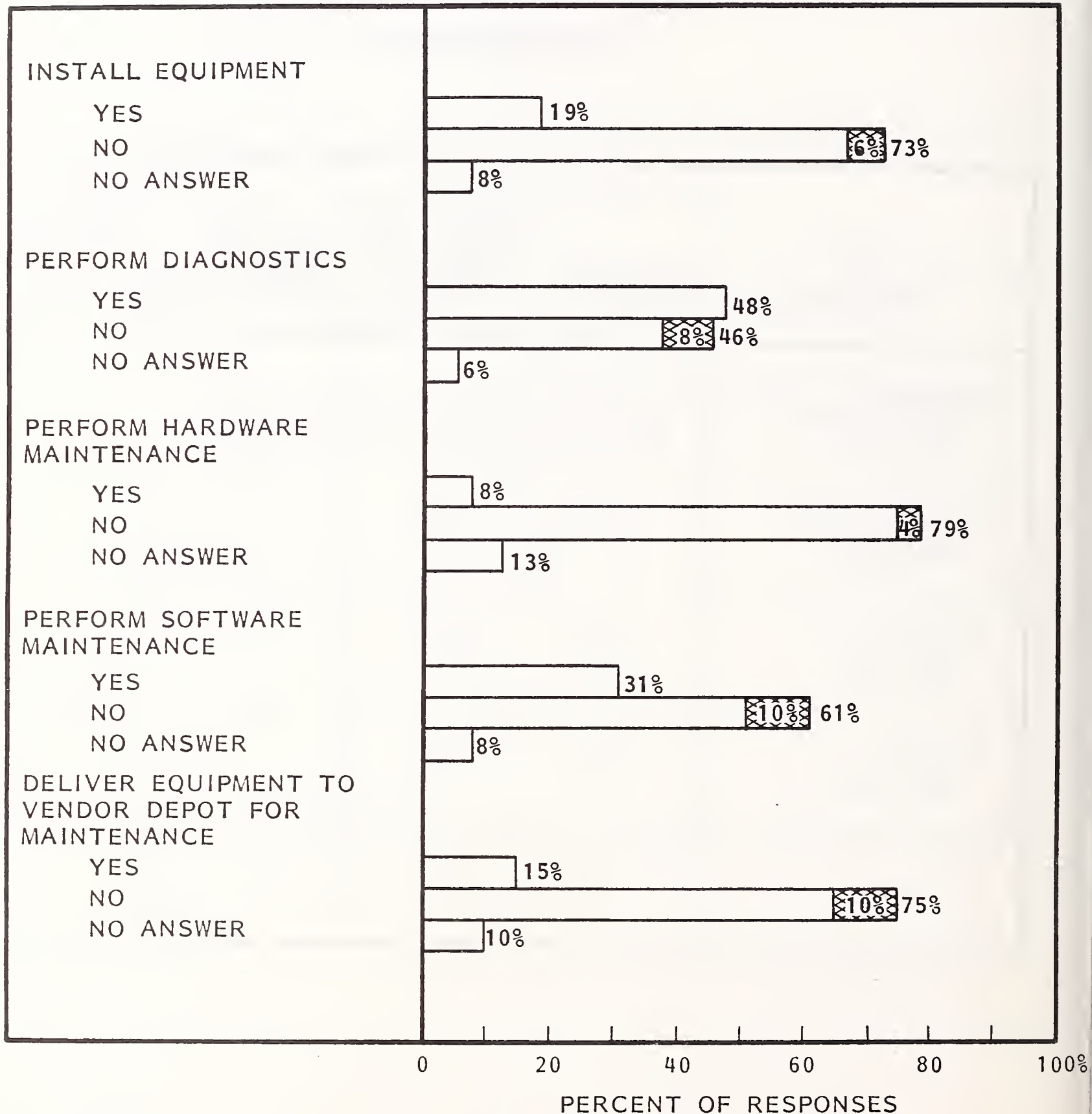
EXHIBIT I-16

TRAINING EXPENDITURES IN THE  
SERVICES SECTOR

TYPE OF TRAINING	AVERAGE EXPENSE	AVERAGE EXPENDITURE PER EDP EMPLOYEE	PERCENT OF STAFF ATTENDING	AVERAGE EXPENSE PER ATTENDEE
IN-HOUSE MANAGEMENT TRAINING	\$ 3,339	\$ 46	44.8%	\$ 238
OUTSIDE MANAGEMENT TRAINING	4,046	55		
IN-HOUSE TECHNICAL TRAINING	22,085	301	53.2	1,220
OUTSIDE TECHNICAL TRAINING	23,897	326		
TOTAL	\$53,367	\$728	-	-

EXHIBIT I-17

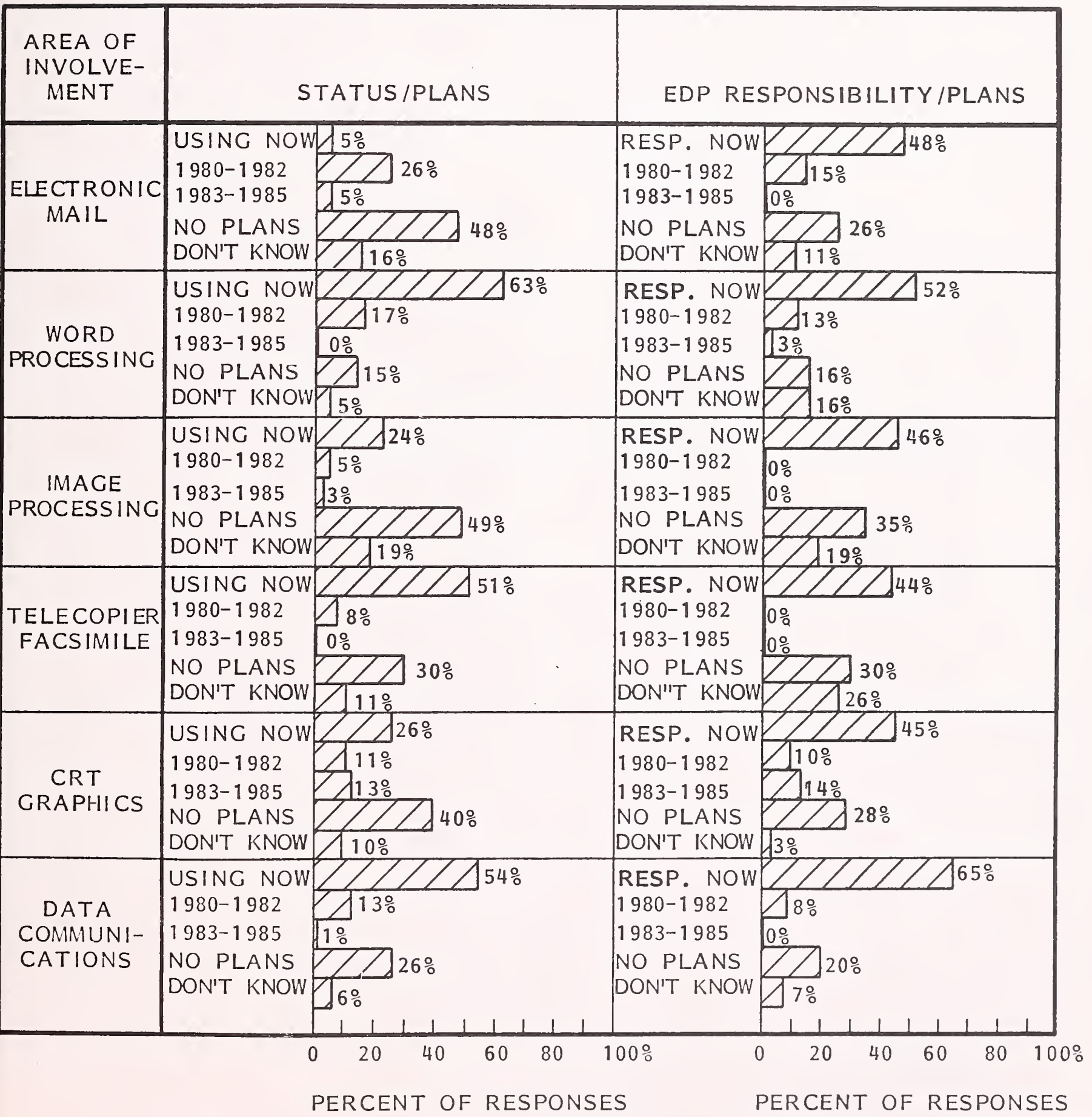
DEGREE OF USER SELF-MAINTENANCE  
IN THE SERVICES SECTOR



NOTE: [Hatched Pattern] INDICATES PERCENT OF RESPONDENTS NOT CURRENTLY PERFORMING FUNCTION, BUT WHO WOULD CONSIDER DOING SO

EXHIBIT I-18

RESPONDENT INVOLVEMENT IN OFFICE AUTOMATION  
IN THE SERVICES SECTOR



0 20 40 60 80 100%

0 20 40 60 80 100%

PERCENT OF RESPONSES

PERCENT OF RESPONSES





1980 ANALYSIS OF EDP IN TRANSPORTATION



## TRANSPORTATION

### I. INDUSTRY SECTOR OVERVIEW

- The transportation sector is composed of railroads, local and suburban transit (such as taxis), trucking, U.S. Post Office, water transport, air transport and pipelines. This diverse group is defined by SIC codes 40 through 45 and 47.
  - Airlines have over 50% of the revenues in this sector.
  - Over half of the industry revenues were derived by the "Fortune 50" transportation companies, which include 16 airlines, 16 railroads, 14 motor freight companies and four water transportation companies.
- The widely different structures of these subsectors have retarded cross-subsector applications development.
  - Rate structures, particularly in the trucking industry, are extremely complex and have not been automated to their full potential.
- The railroads and pipeline companies typically use the rights-of-way to carry communications systems.
  - Southern Pacific, through Southern Pacific Communications Company (SPCC), is one example.

- SPCC functions as a Value Added Network (VAN) selling voice, data and facsimile services.
- Companies in the transportation sector comprise 2.2% of the total responses to this survey, similar to the level of the contribution of transportation to the GNP.
  - All seven subsectors are included in the survey responses.
- Exhibit I-1 provides a profile summary of respondents for the transportation sector. They are broken down into three categories by size of annual revenues. The fourth category is for those respondents who declined to state their annual revenue size.
  - Although the numbers of firms with sales less than \$100 million constitute the majority of all the firms in the transportation sector, they represent, for the most part, small proprietorships.
  - The \$100 million or less size category averages only 14 EDP employees and has the smallest ratio of EDP employees per 100 total employees, at 1.1.
  - The EDP budget per EDP employee is also the smallest of the three size categories in the transportation sector, at \$44,444. This reflects not only the small staff size but the relatively unsophisticated equipment used by these smaller proprietorships.
- The category of medium-size respondents comprises 60% of the sector sample, with average revenues of \$313 million and over 4,000 employees, including an average of 82 EDP employees. The number of EDP employees per 100 total employees is about double the ratio found for the smaller firms. The EDP budget as a percentage of annual sales is highest of all three size categories, at 1.6%.

EXHIBIT I-1

RESPONDENT PROFILE - TRANSPORTATION SECTOR

PROFILE CHARACTERISTIC	COMPANY SIZE IN TERMS OF ANNUAL SALES			
	\$100 MILLION OR LESS	\$101-999 MILLION	\$1 BILLION OR MORE	NO SIZE DATA
PERCENT OF TOTAL RESPONDENTS	10%	60%	25%	5%
AVERAGE ANNUAL SALES (\$ MILLION)	\$ 41	\$ 313	\$ 2,664	-
AVERAGE TOTAL EMPLOYEES	1,180	4,216	44,600	450
AVERAGE EDP EMPLOYEES	14	82	642	200
EDP EMPLOYEES PER 100 TOTAL EMPLOYEES	1.1	1.9	1.4	44.4
AVERAGE EDP BUDGET (\$ THOUSAND)	\$ 600	\$ 5,193	\$39,620	\$11,000
EDP BUDGET AS A PERCENT OF ANNUAL SALES	1.5%	\$ 1.6%	1.5%	-
EDP BUDGET PER EDP EMPLOYEE	\$44,444	\$59,696	\$61,694	\$55,000
EDP BUDGET PER TOTAL NUMBER OF EMPLOYEES	\$ 508	\$ 1,281	\$ 888	\$24,444

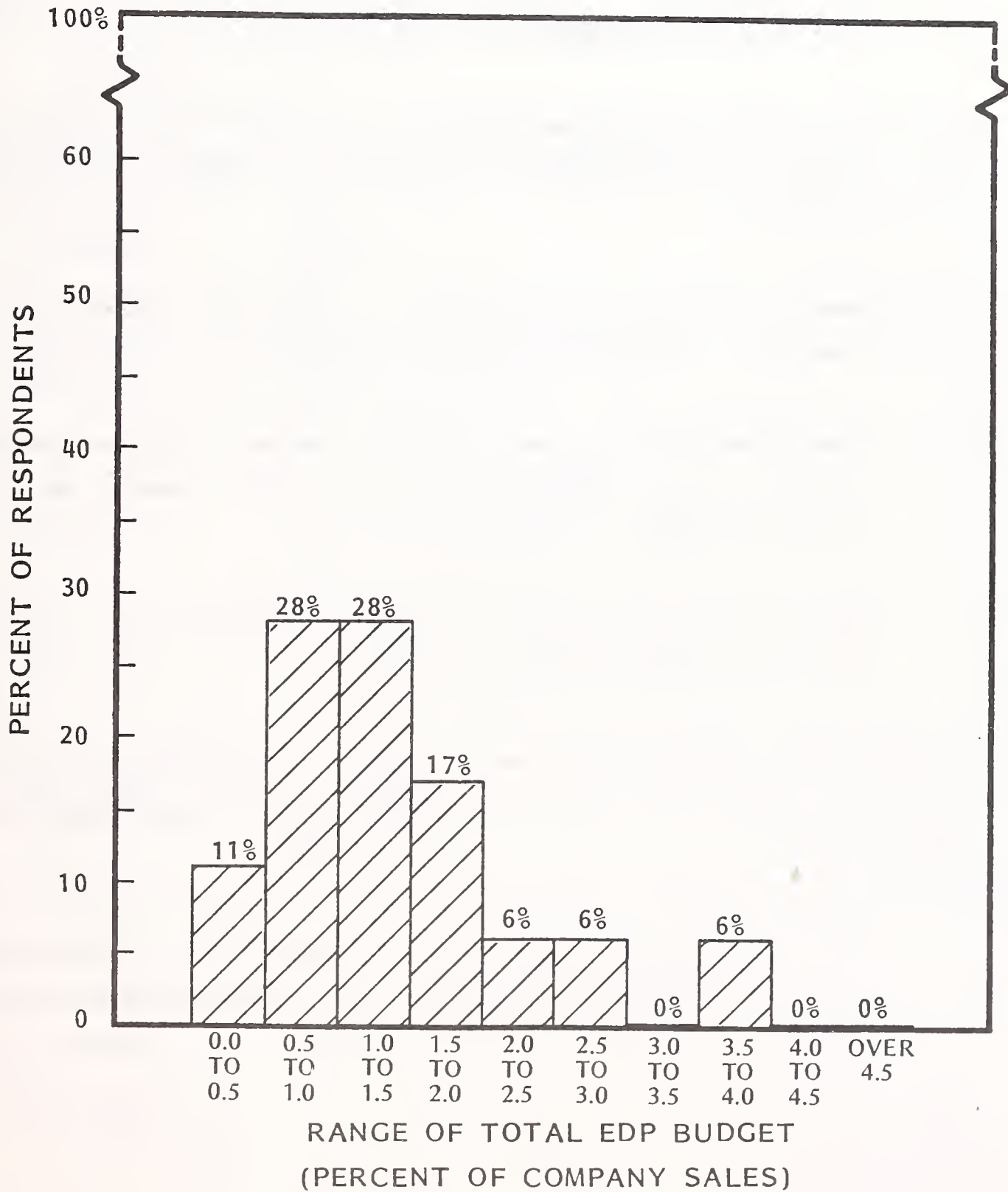
- Although the EDP budget per EDP employee ranks between the smallest and the largest firms, the EDP budget per total number of employees is more than twice the size of the smaller firms and almost 50% higher than even the largest firms.
- The largest firms (with annual revenues of \$1 billion or more) represent 25% of the respondents. Average annual sales are over \$2.5 billion, and these firms each have an average of 612 EDP employees.
- The number of EDP employees per 100 total employees falls between the smallest- and the medium-sized firms, but the EDP budget as a percent of sales is the same as the smallest firm, at 1.5%.
- The EDP budget per EDP employee was the highest of the three size categories, reflecting the use of more sophisticated equipment and technology.
- The category in which no average annual sales is given involves data collected from the U.S. Post Office. These data vary considerably from those reported by the rest of the transportation sector.

## 2. BUDGET AND EXPENDITURE ANALYSIS

- Exhibit I-2 shows the distribution of EDP budget by company revenues. Contrary to last year's pattern, where the largest number of respondents reported that the ratio fell between 1.7% and 2.0% of company sales, this year shows an even split between 0.5-1.0% and 1.0-1.5%.
- The decrease in the ratio may reflect in part the difficulties that the airline industry has experienced during 1980 as well as the uncertainty in the trucking industry concerning the impact of deregulation.
- A plurality of respondents reported that their EDP budget would increase less than 10% in 1980 compared to 1979. Last year this range also represented a

EXHIBIT I-2

RATIO OF EDP BUDGET TO COMPANY SALES:  
DISTRIBUTION OF RATIOS AMONG RESPONDENTS IN THE  
TRANSPORTATION SECTOR



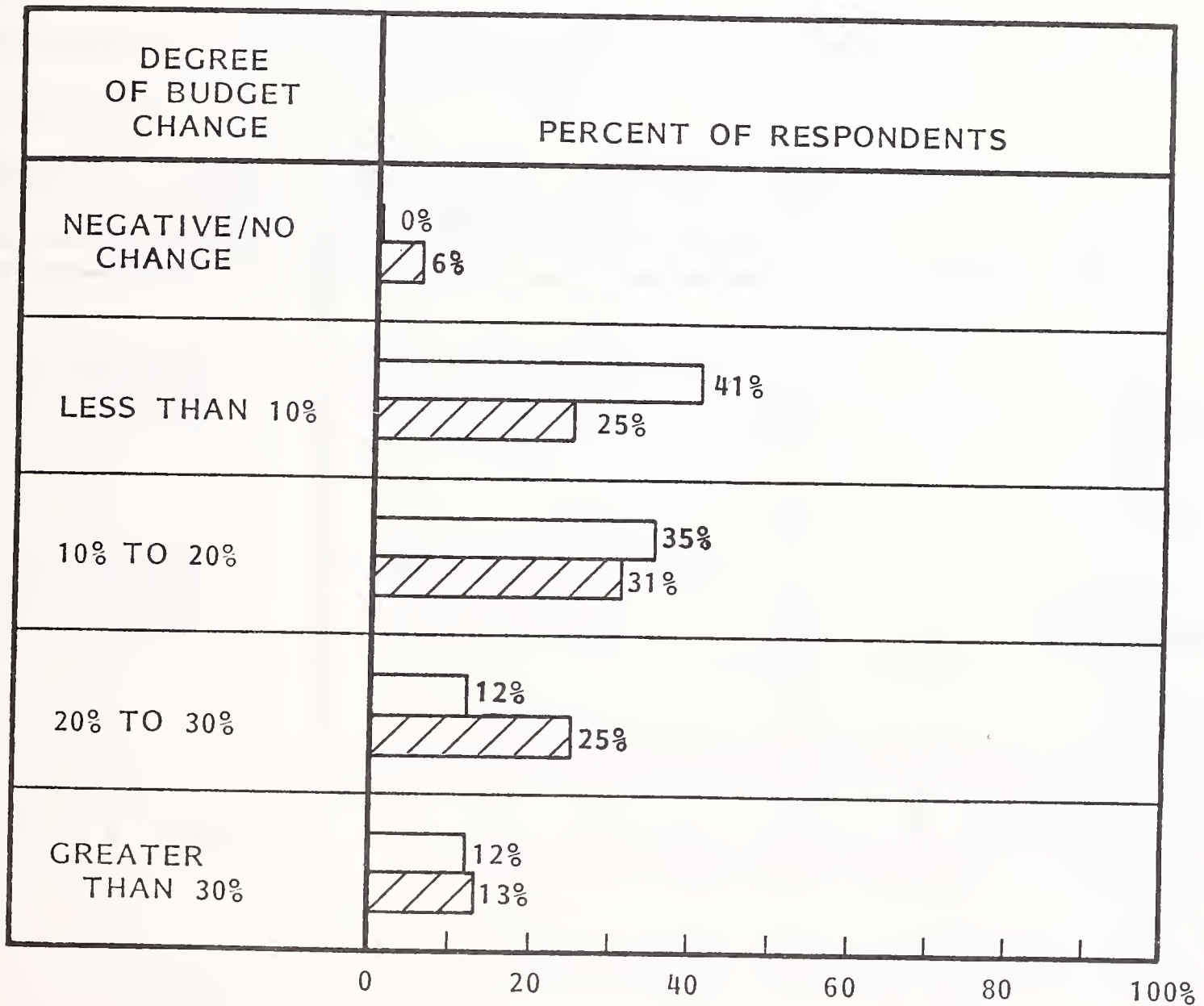
plurality. However, only 33% of the respondents were in this category in 1979 compared with 41% in 1980, as shown in Exhibit I-3.

- The second-largest group reported a 10-20% increase, whereas last year the second-largest group reported a greater than 20% average increase.
- However, 1981 respondents expect the budget to resume its previous rate of increase. The largest category (31%) expects the EDP budget in 1981 to be 10-20% greater than it was in 1980.
- Exhibit I-4 shows a very large increase in the budget for minicomputers in 1981. However, the percentage of minicomputer dollars to overall budget remains fairly low.
- The personnel budget is by far the largest category, with slightly over half of the total budget in 1980, but decreasing to slightly less than half in 1981.
  - Expenditures for terminals represent the second-highest expenditure category in both 1980 and 1981, with 1981 showing an increase compared to 1980.
  - Expenditures for processing services and software show relative decreases from 1980 to 1981.
- The recession appears to have had an impact on the transportation sector. However, it appears that respondents plan to resume their ambitious growth plans in 1981.
  - Exhibit I-5 shows that, although nearly three-fourths of the respondents were unaffected by recession, the average percent budget reduction for those affected was a relatively high 14.5%.



EXHIBIT I-3

ACTUAL AND PLANNED EDP BUDGET GROWTH  
FOR RESPONDENTS IN THE TRANSPORTATION SECTOR



□ 1979-1980  
 ▨ 1980-1981

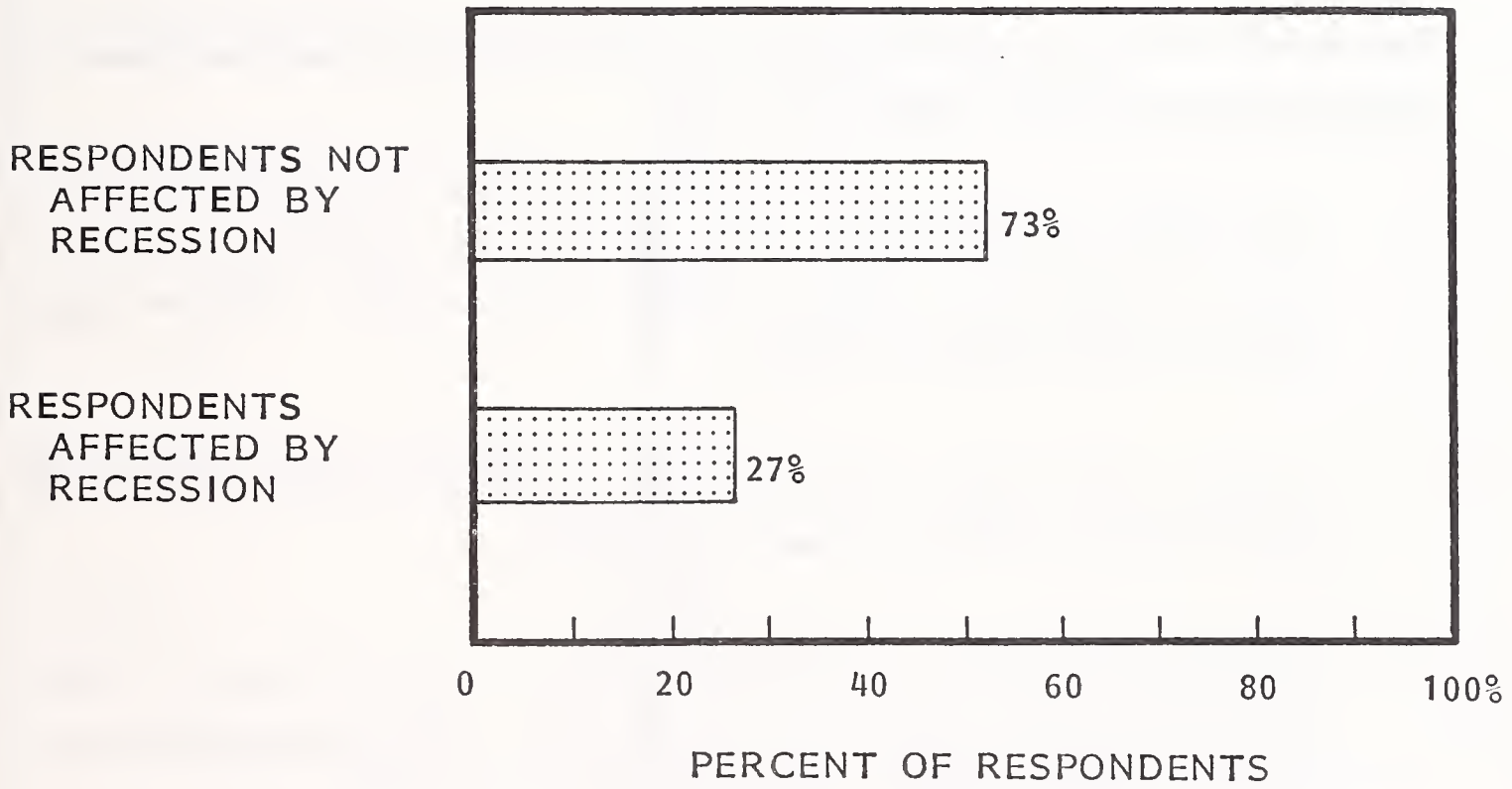
EXHIBIT I-4

ANTICIPATED CHANGES IN EDP BUDGETS  
IN THE TRANSPORTATION SECTOR

BUDGET CATEGORY	1980		PERCENT INCREASE (DECREASE) 1980-1981	1981	
	AVERAGE BUDGET (\$ THOUSAND)	PERCENT OF TOTAL BUDGET		AVERAGE BUDGET (\$ THOUSAND)	PERCENT OF TOTAL BUDGET
PERSONNEL	\$4,584	50.2%	7.9%	\$ 4,947	49.3%
MAINFRAME PROCESSORS	815	8.9	8.4	884	8.8
PERIPHERALS	540	5.9	4.7	565	5.6
MINICOMPUTERS	406	4.4	54.6	628	6.3
TERMINALS	1,085	11.9	16.6	1,266	12.6
COMMUNICATIONS HARDWARE AND SOFTWARE	475	5.2	6.2	504	5.0
SOFTWARE	134	1.5	(2.9)	130	1.3
VENDOR MAINTENANCE	264	2.9	4.1	275	2.7
PROCESSING SERVICES	93	1.0	(19.4)	75	0.7
SUPPLIES AND OTHER	742	8.1	3.7	769	7.7
TOTAL	\$9,138	100.0%	9.9%	10,043	100.0%

EXHIBIT I-5

EFFECTS OF RECESSION ON EDP BUDGETS  
IN THE TRANSPORTATION SECTOR



AVERAGE PERCENT  
BUDGET REDUCTION FOR  
THOSE AFFECTED BY RECESSION: 14.5%

- This is a more severe impact than was reported last year, when respondents who were affected by the recession anticipated an average reduction of only 12%.
- The personnel recruiting and payroll budget area is the most heavily impacted by the 1980 recession. Exhibit I-6 shows that 60% of the respondents mentioned this as the primary impact area.
  - Respondents also indicated that they would make general cuts across all budget areas or in other unspecified categories.

### 3. MAJOR PLANS AND PROBLEMS

- The installation of on-line applications continues to be by far the highest in relative importance from 1980 through 1982.
  - The design and installation of distributed data processing networks is next in importance in 1980 and 1981, but tails off in 1982 as these networks begin to be completed.
  - In 1982, the second most important objective is expected to be improvement in EDP personnel productivity.
  - As shown in Exhibit I-7, the installation of a new mainframe is also expected to be of high importance in 1981. These expectations are probably related to IBM's 4300 series delivery schedules.
- Exhibit I-8 lists the applications that are expected to be developed by respondents in the transportation sector. While accounting/finance had the second highest relative importance, only 5% mentioned this application as having the highest priority.
  - Applications that are specific to the industry are highest on the priority list, including:

EXHIBIT I-6

BUDGET AREAS IMPACTED BY POSSIBLE  
RECESSION IN 1980 FOR RESPONDENTS IN THE  
TRANSPORTATION SECTOR

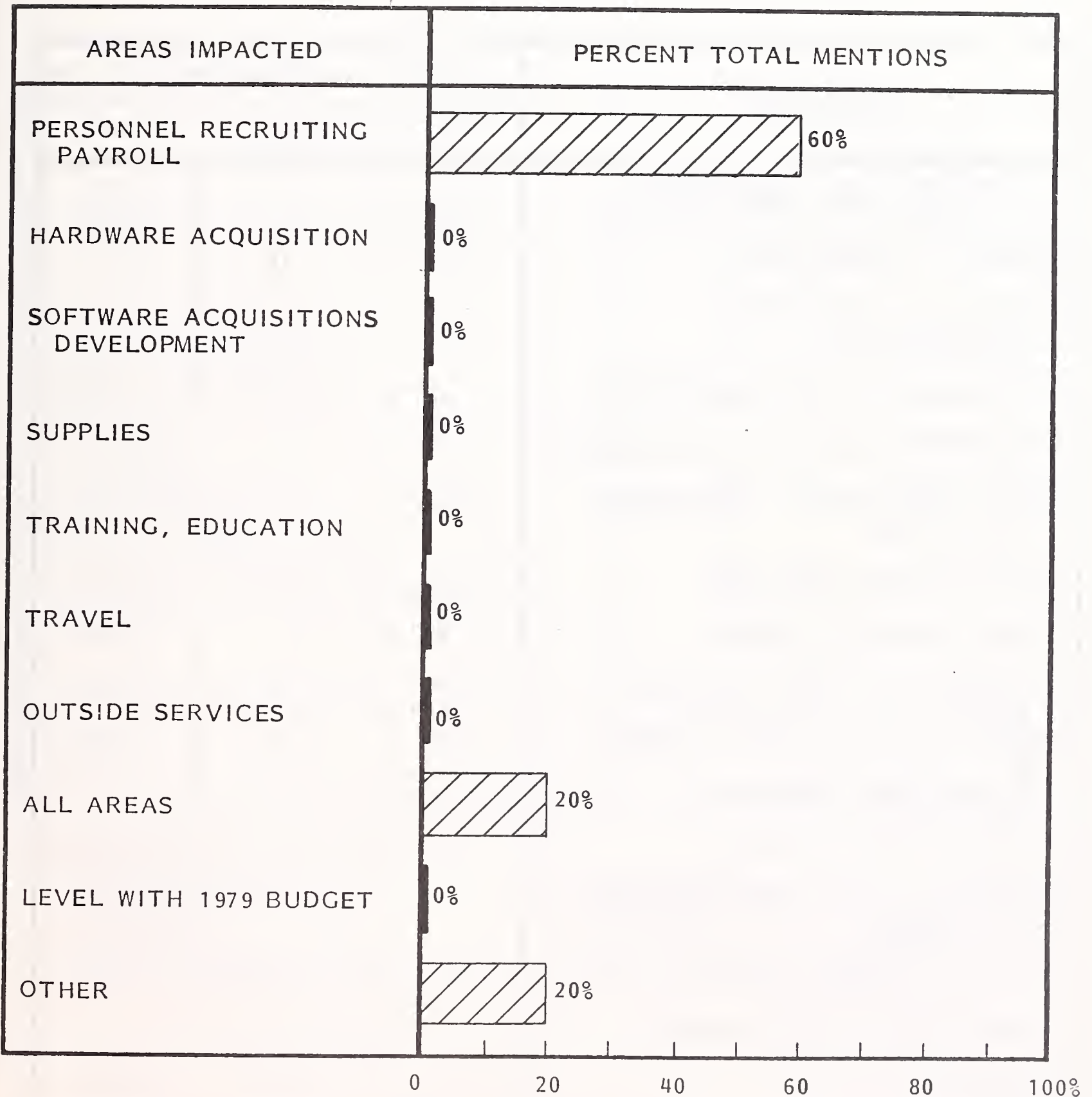


EXHIBIT I-7

EDP OBJECTIVES FOR RESPONDENTS IN THE  
TRANSPORTATION SECTOR

OBJECTIVE	RELATIVE IMPORTANCE		
	1980	1981	1982
INSTALL ON-LINE APPLICATIONS	100%	100%	100%
CONVERT APPLICATIONS	26	12	33
IMPROVE EDP PERSONNEL PRODUCTIVITY	36	55	53
DEVELOP LONG-RANGE EDP PLAN	36	24	42
DEVELOP NEW BATCH APPLICATIONS	28	18	16
MEET DEVELOPMENT, CONVERSION SCHEDULES	36	12	22
INSTALL NEW MAINFRAME	26	55	33
DESIGN, INSTALL DBMS	34	45	42
CHANGE OPERATING SYSTEMS	45	24	20
DESIGN, INSTALL DDP NETWORK	58	55	49
INSTALL NEW PERIPHERALS	32	24	13
INSTALL MINICOMPUTERS	28	31	13
INTEGRATE OFFICE AUTOMATION WITH EDP	8	20	47
CENTRALIZE EDP CONTROL	6	4	2
DECENTRALIZE EDP CONTROL	0	0	0
OTHER	0	14	16

EXHIBIT I-8

APPLICATIONS TO BE DEVELOPED BY  
RESPONDENTS IN THE TRANSPORTATION SECTOR

APPLICATION	RELATIVE IMPORTANCE	PERCENT OF MENTIONS AS HIGHEST PRIORITY
ACCOUNTING/FINANCE	77	5%
INVENTORY CONTROL	23	5
ORDER ENTRY/BILLING	61	20
PERSONNEL	46	5
PURCHASING	11	5
MARKETING/SALES	65	15
MODELING/FORECASTING	45	-
PERFORMANCE MEASUREMENT/CONTROL	52	5
OTHER**	100	40
TOTAL	-	100%

\*\*SPECIFIC APPLICATIONS INCLUDE:

- NETWORK CONTROL
- YARD TERMINAL SYSTEM
- DISPATCH
- AIRLINE RESERVATION MANAGEMENT
- EQUIPMENT CONTROL
- COMPUTER-AIDED DECISIONS FOR OPERATIONS
- ON-LINE FREIGHT BILL TRANSMISSION
- VEHICLE MAINTENANCE (RAIL)

- . Network control.
  - . Equipment control, including yard and terminal systems and dispatching.
  - . Airline reservation management.
  - . Vehicle maintenance (rail).
  - . On-line freight bill transmission.
- Order entry/billing has the characteristics of an industry-specific application in the form of automated freight bills. This category has the highest percent of first priority mentions for priority apart from industry-specific mentions.
- The transportation sector is relying most heavily on programming aids to improve time and costs associated with applications development.
    - Next highest in percent of mentions is on-line programming and user involvement in development.
    - Exhibit I-9 lists the percent of mentions of particular methods used to improve time and costs for applications development.
  - The use of the methods for application program development is expected to result in improvements ranging from 11-21%, as reported by nearly half of the respondents in Exhibit I-10.
    - Over 40% expect the improvement to be between 20-100%.
    - This is slightly less optimistic than the profile for improvement percentages expected in the process industries.



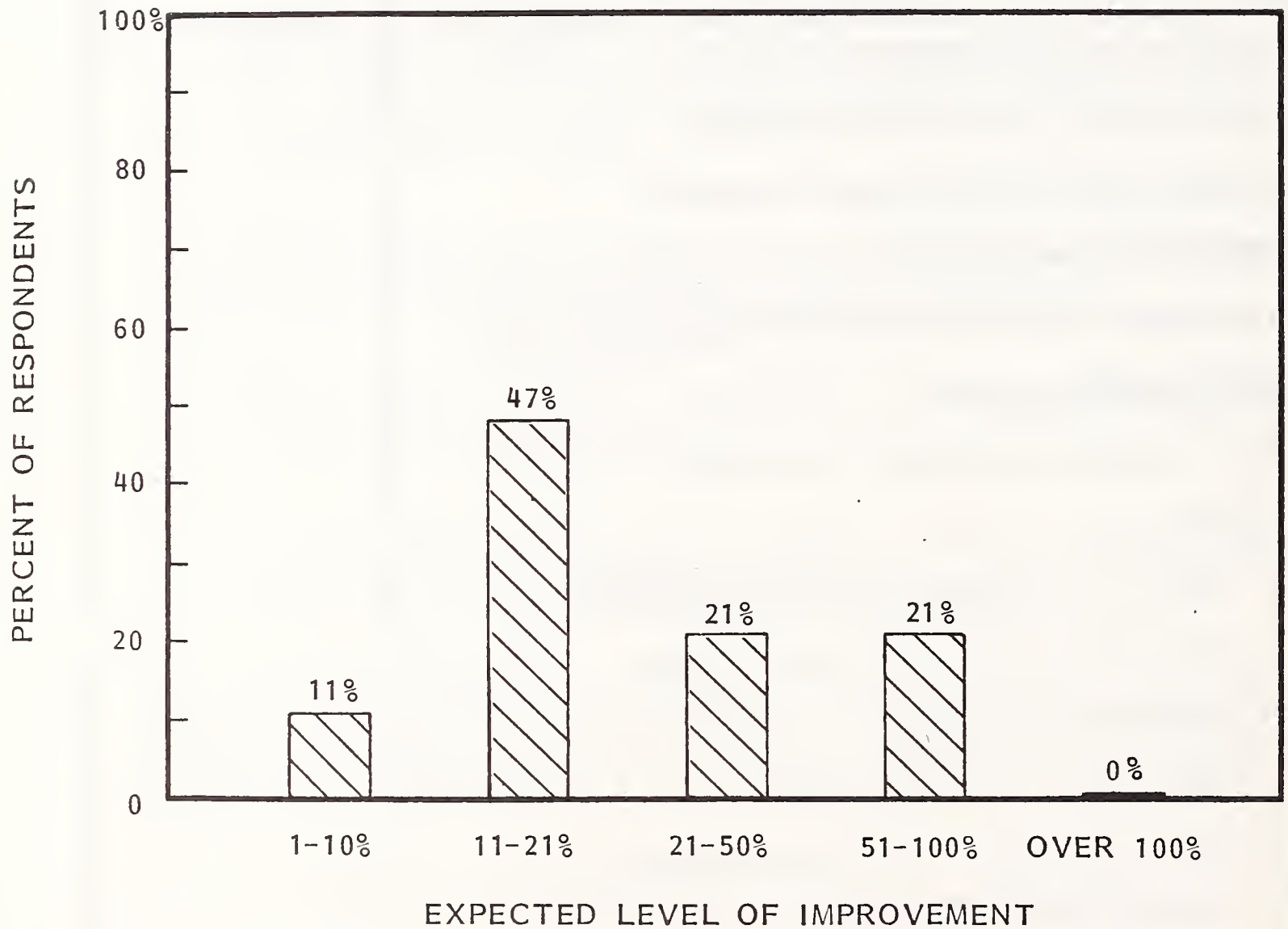
EXHIBIT I-9

METHODS USED TO IMPROVE TIME AND COSTS  
ASSOCIATED WITH APPLICATIONS DEVELOPMENT IN THE  
TRANSPORTATION SECTOR

METHOD	PERCENT OF MENTIONS
ON-LINE PROGRAMMING	14%
PURCHASED SOFTWARE PRODUCTS	9
STRUCTURED PROGRAMMING/DESIGN	6
PROJECT MANAGEMENT	9
IMPROVED TRAINING/BETTER QUALIFICATIONS	9
PROGRAMMING AIDS	31
DATA BASE MANAGEMENT SYSTEMS	-
OTHER	
- USER INVOLVEMENT IN DEVELOPMENT	11
- STANDARDIZED METHODS/SYSTEMS	3
- HARDWARE UPGRADE	-
- IMPROVED DOCUMENTATION	-
- CRT TERMINALS FOR PROGRAMMERS	-
- MISCELLANEOUS METHODS	5
- DO NOTHING/NO PLANS	3

EXHIBIT I-10

EXPECTED LEVEL OF IMPROVEMENT IN PROGRAM  
DEVELOPMENT FOR RESPONDENTS IN THE  
TRANSPORTATION SECTOR



- Exhibit I-II reveals that the most significant EDP problem in the transportation sector is the lack of general management understanding. Furthermore, this category received the highest percentage of top-priority rankings.
  - The need for better planning and control was second in both relative importance and percent of highest-priority rankings.
  - Other problems are listed and ranked, as shown in Exhibit I-II.
- The relative importance of personnel recruiting, although still high, is not as high as it was in the 1979 respondent ratings.
  - This reflects the concern of some members of the industry over the impact of the recession and the means for reducing budgets by personnel recruitment cuts, as noted previously.
- The roughly two-thirds production/one-third new development and maintenance ratio describing the use of computer resources shown in Exhibit I-12, parallels the average for all industries.
  - In terms of the use of personnel, new program development is balanced almost exactly with existing program maintenance and enhancement of these programs.
  - These ratios are very similar to those reported in 1979.
- Exhibit I-13 reveals that non-IBM mainframes are installed at more than half of the respondent companies.
  - Of the non-IBM installed hardware, Data 100 is heavily mentioned, with 28% of the total.
  - Univac, with 9.3%, and Data General, with 5.3%, are second and third respectively in the installed category for non-IBM mainframes.

EXHIBIT I-11

MOST SIGNIFICANT EDP PROBLEMS IN THE  
TRANSPORTATION SECTOR

PROBLEM	RELATIVE IMPORTANCE	PERCENT OF MENTIONS AS HIGHEST PRIORITY
PERSONNEL RECRUITING	74	15%
NEED FOR BETTER PLANNING AND CONTROL	87	15
PERSONNEL TRAINING	63	0
LACK OF GENERAL MANAGEMENT UNDERSTANDING	100	20
LACK OF USER INVOLVEMENT IN SYSTEMS/APPLICATIONS DEVELOPMENT	48	5
NEED FOR IMPROVEMENT IN OPERATIONS	33	0
EXCESSIVE APPLICATIONS DEVELOPMENT TIME	33	10
INADEQUATE EDP FUNDING	20	5
INADEQUATE SYSTEMS SOFTWARE	43	5
NEED TO IMPROVE DATA COMMUNICATIONS	54	10
UNSATISFACTORY HARDWARE MAINTENANCE	15	5
OTHER	52	10

EXHIBIT I-12

USE OF RESOURCES IN THE TRANSPORTATION SECTOR

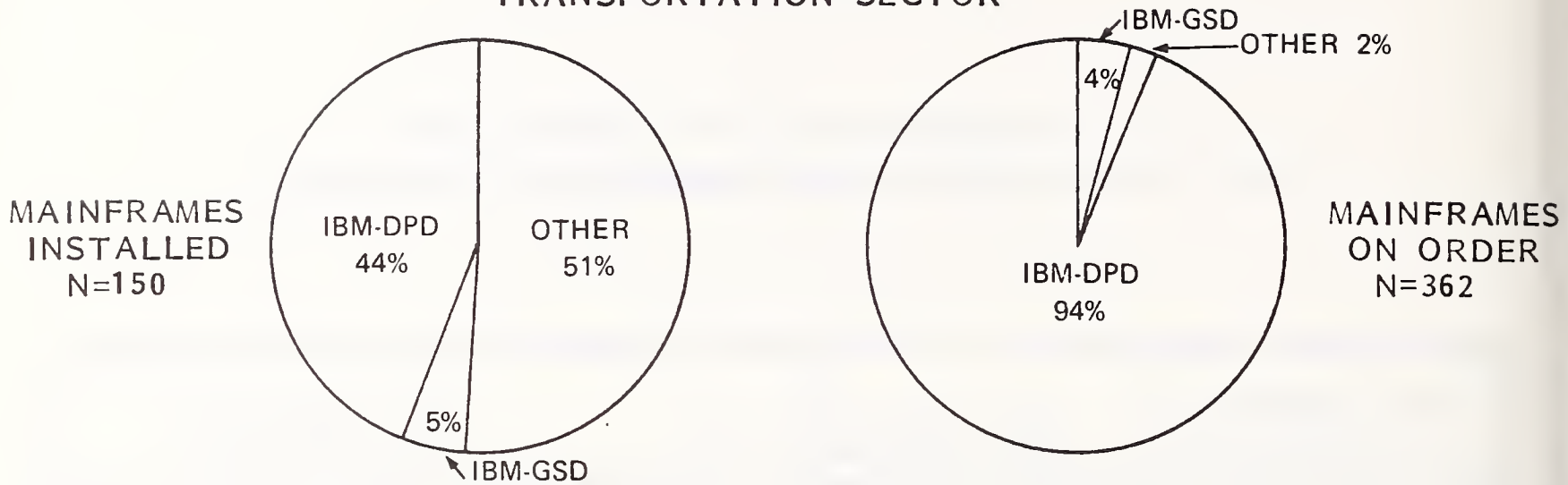
RESOURCE	APPLICATIONS	PERCENT OF USE
COMPUTER EQUIPMENT	PRODUCTION JOBS	65.1%
	NEW APPLICATIONS DEVELOPMENT	16.0
	EXISTING PROGRAM MAINTENANCE	11.1
	OTHER*	7.8
PROGRAMMING PERSONNEL	NEW PROGRAM DEVELOPMENT	49.1
	EXISTING PROGRAM MAINTENANCE	28.8
	ENHANCEMENT OF EXISTING PROGRAMS	22.1

\*OTHER MENTIONS INCLUDE:

- ON-LINE
- PRODUCTION RERUNS
- SYSTEMS SOFTWARE

EXHIBIT I-13

MAINFRAME EDP HARDWARE PROFILE IN THE  
TRANSPORTATION SECTOR



MAINFRAME	INSTALLED			ON ORDER		
	NUMBER OF RESPONSES	NUMBER OF SYSTEMS	PERCENT	NUMBER OF RESPONSES	NUMBER OF SYSTEMS	PERCENT
IBM 3033	4	26	17.3%	1	1	0.3%
IBM 3033N	0	0	0.0	2	3	0.8
IBM 3032	1	1	0.7	0	0	0.0
IBM 3031	3	5	3.3	1	2	0.6
IBM 370 158-168	6	8	5.3	0	0	0.0
IBM 4331	2	10	6.7	5	25	6.9
IBM 4341	0	0	0.0	9	30	8.3
IBM 8100	0	0	0.0	4	279	77.1
IBM OTHER 370	8	12	8.0	0	0	0.0
IBM OTHER 360	2	4	2.7	0	0	0.0
SUBTOTAL IBM-DPD	26	66	44.0%	22	340	94.0%
IBM SYSTEMS 1, 3, 32, 34	4	7	4.7%	2	15	4.1%
IBM SYSTEMS 38	0	0	0.0	0	0	0.0
SUBTOTAL IBM-GSD	4	7	4.7%	2	15	4.1%
AMDAHL	4	6	4.0%	0	0	0.0%
DATA 100	1	42	28.0	1	6	1.6
DATA GENERAL	1	8	5.3	0	0	0.0
ITEL	1	2	1.3	0	0	0.0
NCR	1	2	1.3	0	0	0.0
UNIVAC	5	14	9.3	1	1	0.3
OTHER	3	3	2.1	0	0	0.0
SUBTOTAL OTHER	16	77	51.3%	2	7	1.9%
TOTAL	46	150	100.0%	26	362	100.0%

- The Data Processing Division of IBM totally dominates the "mainframes on-order" category, with 94%.
  - This reflects the on-order 4300 and 8100 systems required in large distributed communications networks.
  - The others represent only 2% of the mainframes on order, indicating no significant swing away from IBM mainframes in the future.
- Exhibit I-14 shows that 84% of the respondents in the transportation sector have at least one minicomputer installed.
- Less than one out of five respondents in 1980 had a microcomputer installation. Nearly two-thirds had none installed and had no plans to install any.
- While more than half of the respondents reported having intelligent terminals installed, the largest growth rate between 1980 and 1981 is expected to be for nonintelligent terminals. Well over half of the respondents reported that they had more than one hundred of these already within their organization.

#### 4. KEY ISSUE STATUS REVIEW

- As in the other industry sectors, implementation and development of new applications (including on-line applications) is the most important EDP development objective in the transportation sector in 1980.
  - Exhibit I-15 shows that improvement in productivity is the second most important objective.
- The shortage of qualified technical personnel and the rapid growth of more complex applications in the transportation sector is reflected by heavy training expenditures, as shown in Exhibit I-16.

EXHIBIT I-14

NON-MAINFRAME EDP HARDWARE PROFILE IN THE  
TRANSPORTATION SECTOR

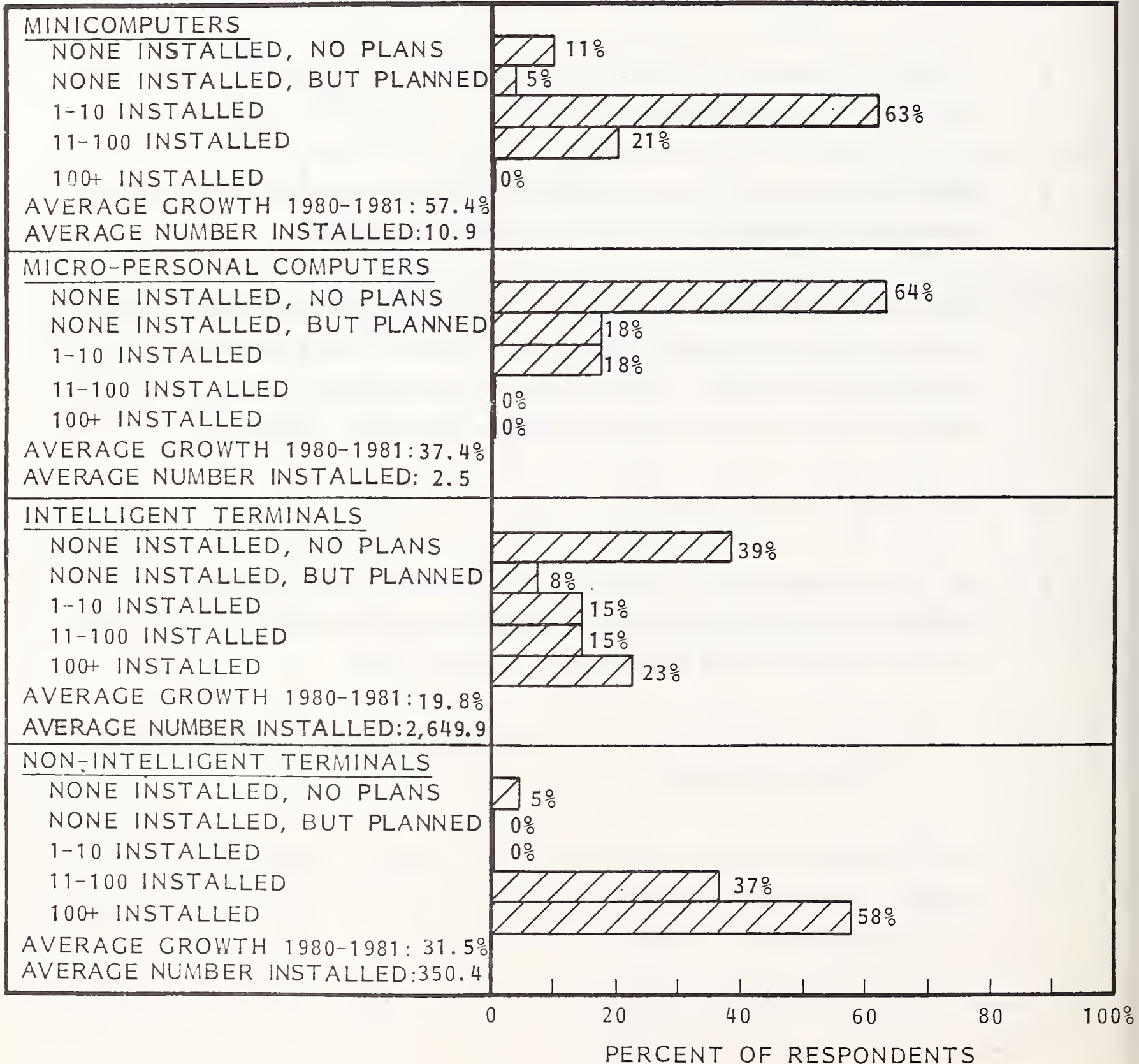




EXHIBIT I-15

MOST IMPORTANT DEVELOPMENT OBJECTIVE  
IN THE TRANSPORTATION SECTOR

MOST IMPORTANT EDP DEVELOPMENT OBJECTIVE IN 1980	PERCENT OF TOTAL MENTIONS
DATA BASE DEVELOPMENT	10%
DESIGN OR INSTALL DDP	5
IMPLEMENT/DEVELOP NEW APPLICATIONS	30
IMPLEMENT/DEVELOP ON-LINE APPLICATIONS	15
INSTALL OR UPGRADE MAINFRAME	-
INSTALL MINICOMPUTERS	-
INSTALL OR CONVERT OPERATING SYSTEMS	5
DESIGN/DEVELOP COMMUNICATIONS NETWORK	10
CENTRALIZE OR DECENTRALIZE DP OPERATIONS	-
PLAN/IMPROVE PRODUCTIVITY AND/OR OPERATIONS	20
OTHER - LONG-RANGE CORPORATE AND DATA PROCESSING PLANNING	5
TOTAL	100%

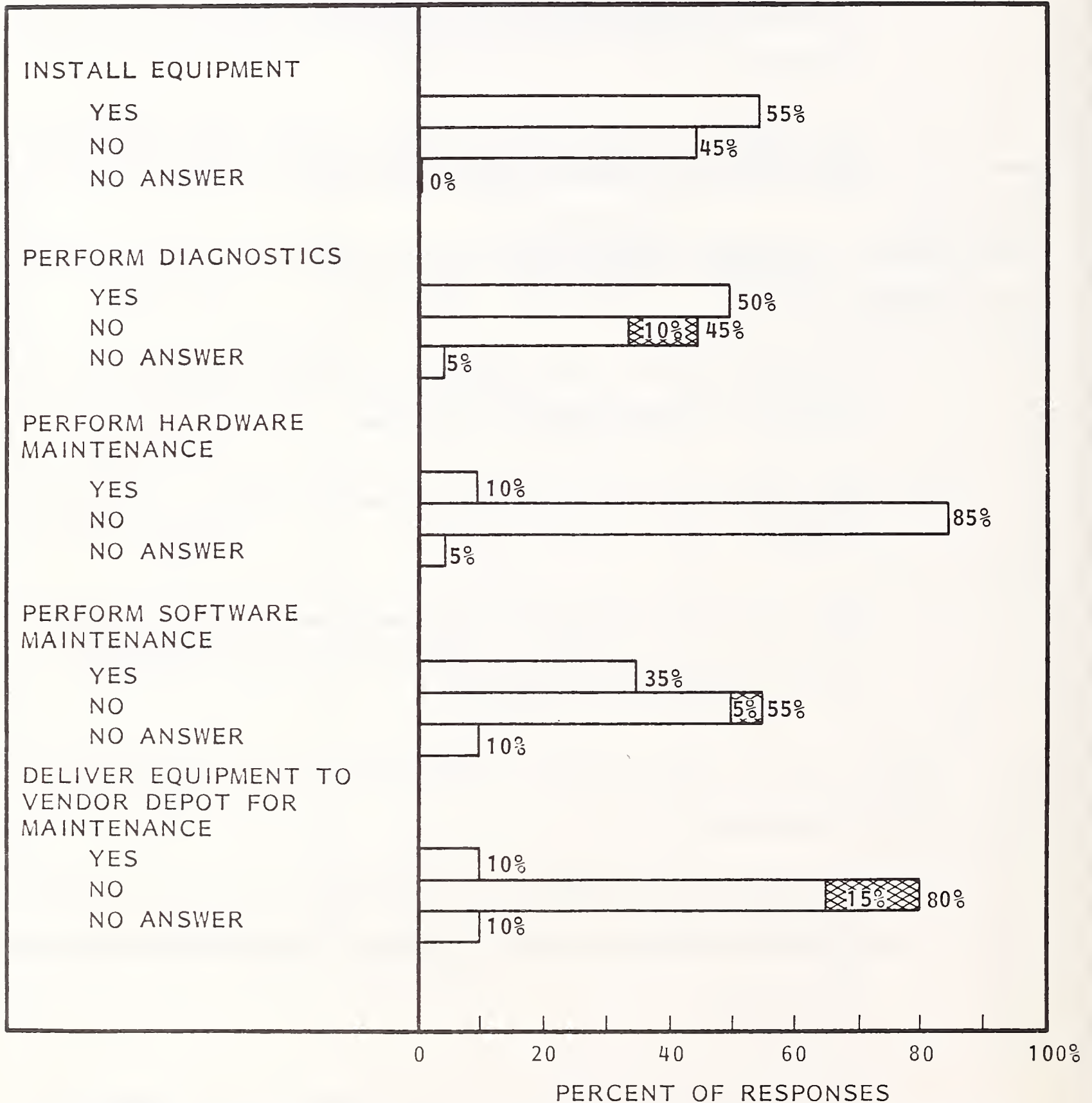
EXHIBIT I-16

TRAINING EXPENDITURES IN THE  
TRANSPORTATION SECTOR

TYPE OF TRAINING	AVERAGE EXPENSE	AVERAGE EXPENDITURE PER EDP EMPLOYEE	PERCENT OF STAFF ATTENDING	AVERAGE EXPENSE PER ATTENDEE
IN-HOUSE MANAGEMENT TRAINING	\$ 6,645	\$ 50	36.4%	\$247
OUTSIDE MANAGEMENT TRAINING	5,319	40		
IN-HOUSE TECHNICAL TRAINING	21,323	160	55.8	556
OUTSIDE TECHNICAL TRAINING	19,954	150		
TOTAL	\$53,241	\$400	-	-

- Over half of the EDP staff attended in-house and outside training sessions, which were three to four times as costly per employee than were management training sessions.
  - Exhibit I-16 reveals that outside management training resulted in the lowest average expenditure per EDP employee of any of the training categories.
  - Over half of the training funds are spent in-house. This is less than the 60% of in-house training funds reported in 1979.
- Exhibit I-17 shows the degree of user self-maintenance in the transportation sector.
    - A surprising 55% of the respondents said they installed their own equipment, and 50% performed diagnostics.
    - Few of the respondents performed hardware or software maintenance in-house.
    - Only 10% of the respondents deliver equipment to vendor depots for maintenance. By far the largest group has maintenance performed on-site by an outside maintenance firm.
- Exhibit I-18 shows respondents' involvement in office automation as defined by six functional areas.
    - The majority consider electronic mail an EDP responsibility, but only 25% are now actively using this technology. Fifty-five percent have no plans to use it or do not know when electronic mail will be implemented.
    - Word processing has already been well established in the transportation sector. However, only 44% of the EDP managers reported that they

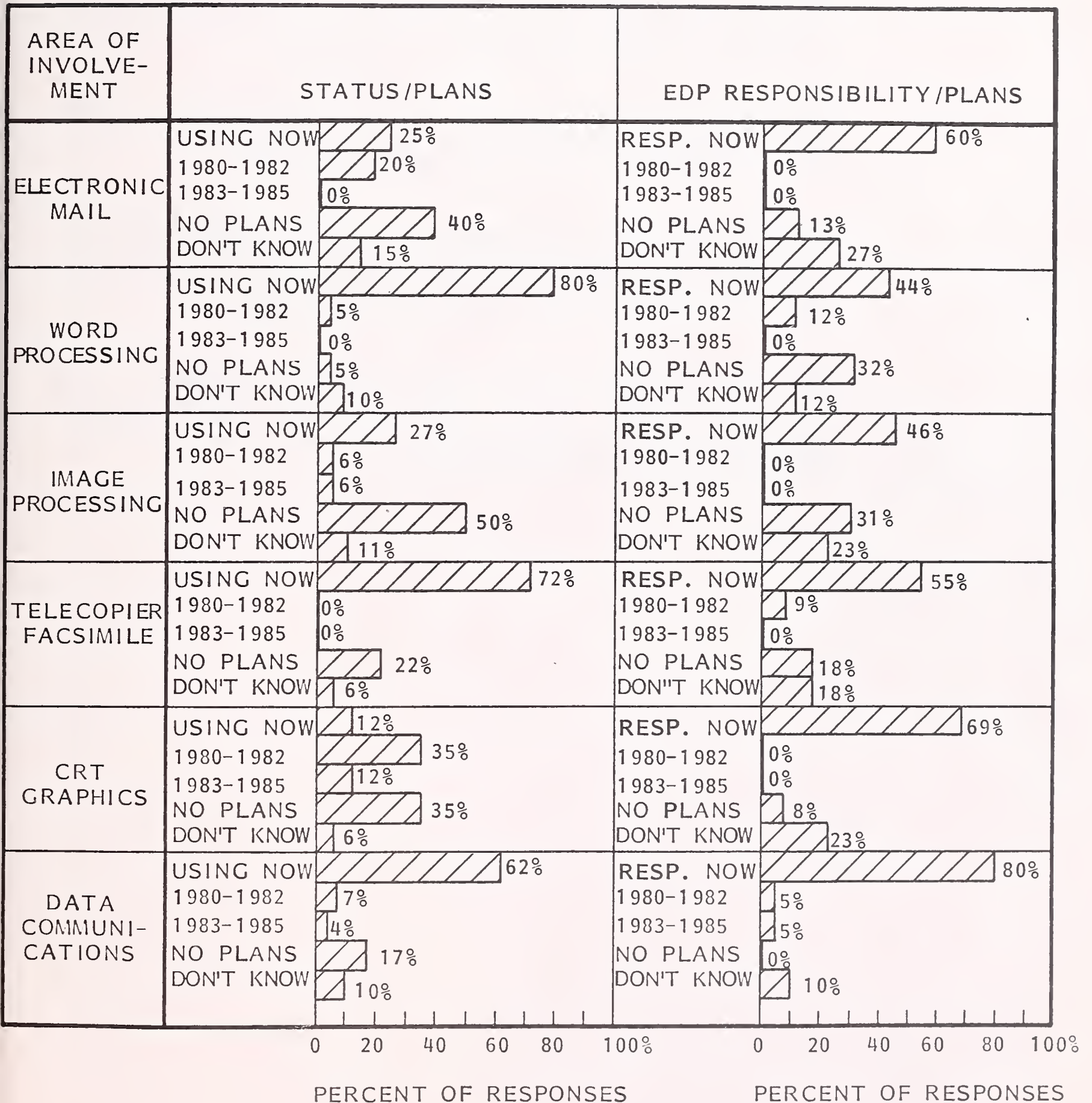
EXHIBIT I-17  
 DEGREE OF USER SELF-MAINTENANCE  
 IN THE TRANSPORTATION SECTOR



NOTE: INDICATES PERCENT OF RESPONDENTS NOT CURRENTLY PERFORMING FUNCTION, BUT WHO WOULD CONSIDER DOING SO

EXHIBIT I-18

RESPONDENT INVOLVEMENT IN OFFICE AUTOMATION  
IN THE TRANSPORTATION SECTOR



had responsibility for this function at present, and another 44% reported that they did not know when or if they would be responsible for this function in the future.

- Respondents in the transportation section are not considering installing image processing at this time. However, most EDP managers expect to be responsible for this function when it is installed.
- EDP managers are responsible for telecopier and facsimile activity, which is already widely used in the transportation sector.
- Computer graphics is only starting to be used but nearly half of the respondents expect to be using graphics techniques by 1982. They also indicate that this will be part of their EDP responsibility.
- Data communications are also used as might be expected in the transportation sector. This area is also considered an EDP management responsibility by 90% of the respondents.

1980 ANALYSIS OF EDP IN THE UTILITIES INDUSTRY





## UTILITIES

### I. INDUSTRY SECTOR OVERVIEW

- The utilities sector is comprised of telephone communications companies (which employ more than 50% of the data industry's personnel) and gas and electric suppliers.
  - Together these subsectors contribute 4% of the nation's GNP.
  - Over half of the revenues in the utilities sector come from the gas and electric subsector.
- Eighty percent of the electric power capacity is privately owned.
  - The industry is more dispersed than is generally known, with the Fortune 500 companies accounting for only 60% of the total revenues.
  - The National Rural Electric Cooperative Association represents 1,000 small electrical utilities.
  - Utilities are large-scale users of EDP both for operations (switching and transmission control) and for customer billing and record keeping.
  - Minicomputers and microcomputers that are used for operations and do not fall under the EDP managers' control have been omitted from this survey.

- The utilities industry sector for this report has 44 respondents representing 4.8% of the survey total. Most come from SIC 49: gas, electric and sanitary services.
- Exhibit I-1 provides a profile summary of respondents for three sizes of utilities companies based on total annual revenues.
  - This sample includes 20.5% of the respondents with revenues of less than \$100 million a year, averaging \$57 million each.
  - There were an average of 4.6 EDP employees per 100 total employees, and the EDP budget as a percent of annual sales was 3.7%. These are the highest ratios in the utilities sectors for the three revenue size categories.
- The category of medium-size respondents comprises some 48% of the sample, with an average of 210 EDP employees per company.
  - The average number of EDP employees per 100 total employees, and the EDP budget per EDP employee, lie in the mid-range between the smallest size category and the largest size category.
  - The EDP budget per total number of employees (\$2,308) is the highest average of the three size categories.
- About 32% of the sample have annual revenues of more than \$1 billion.
  - The ratio of EDP employees per 100 total employees is 2.2, the lowest of the three size categories.
  - The EDP budget as a percent of annual sales is also the lowest ratio of the three size categories.

EXHIBIT I-1

RESPONDENT PROFILE - UTILITIES SECTOR

PROFILE CHARACTERISTIC	COMPANY SIZE IN TERMS OF ANNUAL SALES			
	\$100 MILLION OR LESS	\$101-999 MILLION	\$1 BILLION OR MORE	NO SIZE DATA
PERCENT OF TOTAL RESPONDENTS	20.5%	47.7%	31.8%	0%
AVERAGE ANNUAL SALES (\$ MILLION)	\$ 57.3	\$ 453.1	\$3432.5	-
AVERAGE TOTAL EMPLOYEES	1,208	4,873	36,828	-
AVERAGE EDP EMPLOYEES	56	210	824	-
EDP EMPLOYEES PER 100 TOTAL EMPLOYEES	4.6	4.3	2.2	-
AVERAGE EDP BUDGET (\$ THOUSAND)	\$ 2,326	\$11,243	\$61,071	-
EDP BUDGET AS A PERCENT OF ANNUAL SALES	3.7%	2.5%	1.8%	-
EDP BUDGET PER EDP EMPLOYEE	\$37,676	\$53,567	\$74,148	-
EDP BUDGET PER TOTAL NUMBER OF EMPLOYEES	\$ 1,753	\$ 2,308	\$ 1,658	-

- However, the EDP budget per EDP employee is the highest of the three size categories. Exhibit I-1 shows that, in the utilities sector, the larger the company, the higher the EDP budget per EDP employee.

## 2. BUDGET AND EXPENDITURE ANALYSIS

- The distribution of budget shown in Exhibit I-2 is nearly identical to last year's pattern, where the largest number of respondents had budgets ranging between 0.5 and 1.0 as a percentage of total company sales.
  - This year the 14% of companies that had EDP budget ratios of 4.0 and above as a percent of sales is larger than that reported in the 1979 survey.
- EDP expenditures in the utilities sector will increase in 1980 by greater than 30% for the largest single group of respondents.
  - Exhibit I-3 shows that the actual EDP budget in 1980 has a higher growth than was reported in 1979's survey.
  - The planned budget for 1980-1981 shows somewhat less growth rate than expected for 1979-1980.
- Exhibit I-4 reveals that the greatest percent increase in EDP budget between 1980 and 1981 is a 65% increase in minicomputer expenditures.
  - The largest reported decrease is for processing services, which will decline by over 8% between 1980 and 1981.
  - On the average, the total EDP budget is expected to increase by 10.6% from 1980 to 1981. This is less than the average increase of 16% that was reported between 1979 and 1980. It partially reflects the impact of the recession as well as a deceleration of the previous growth in energy use within the U.S.

EXHIBIT I-2

RATIO OF EDP BUDGET TO COMPANY SALES:  
DISTRIBUTION OF RATIOS AMONG RESPONDENTS IN THE  
UTILITIES SECTOR

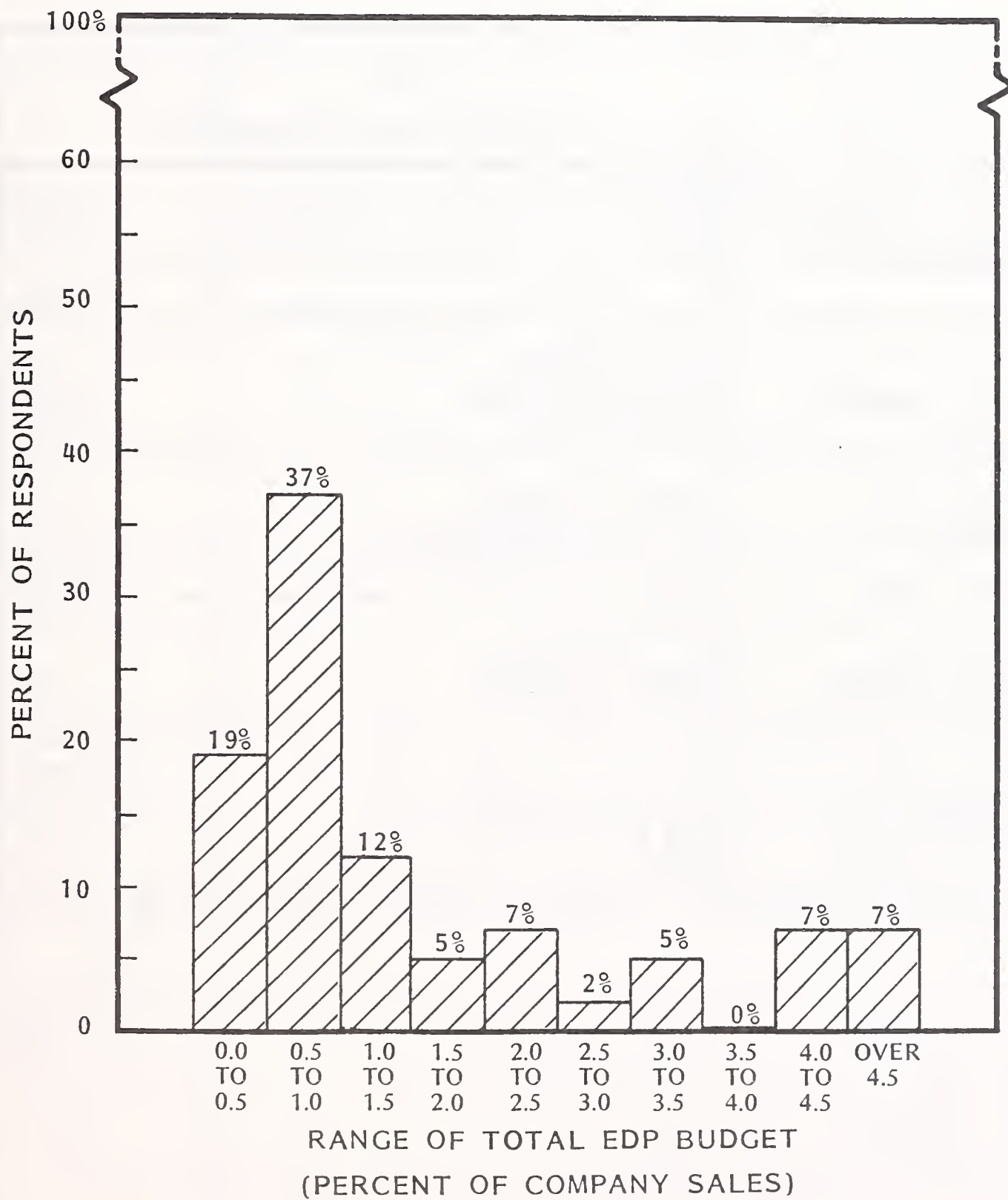
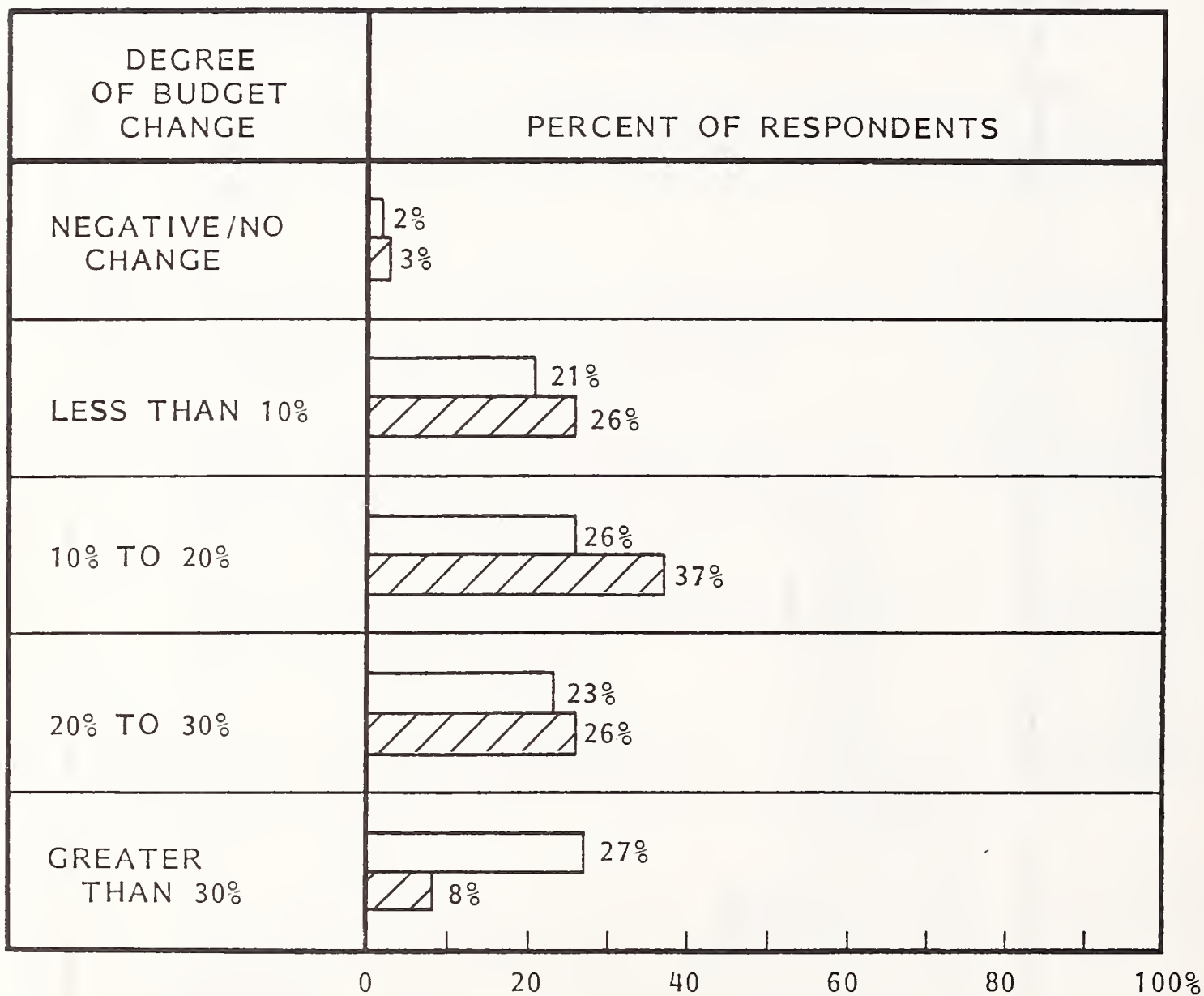


EXHIBIT I-3

ACTUAL AND PLANNED EDP BUDGET GROWTH FOR RESPONDENTS IN THE UTILITIES SECTOR



□ 1979-1980  
 ▨ 1980-1981

EXHIBIT I-4

ANTICIPATED CHANGES IN EDP BUDGETS  
IN THE UTILITIES SECTOR

BUDGET CATEGORY	1980		PERCENT INCREASE (DECREASE) 1980-1981	1981	
	AVERAGE BUDGET (\$ THOUSAND)	PERCENT OF TOTAL BUDGET		AVERAGE BUDGET (\$ THOUSAND)	PERCENT OF TOTAL BUDGET
PERSONNEL	\$2,364	45.2%	13.3%	\$2,677	46.3%
MAINFRAME PROCESSORS	1,014	19.4	9.1	1,107	19.1
PERIPHERALS	381	7.3	11.6	426	7.4
MINICOMPUTERS	57	1.2	65.4	95	1.6
TERMINALS	462	8.8	9.6	507	8.8
COMMUNICATIONS HARDWARE AND SOFTWARE	165	3.1	(1.4)	162	2.8
SOFTWARE	201	3.8	(0.5)	200	3.5
VENDOR MAINTENANCE	103	2.0	8.1	111	1.9
PROCESSING SERVICES	145	2.8	(8.1)	134	2.3
SUPPLIES AND OTHER	337	6.4	8.5	366	6.3
TOTAL	\$5,229	100.0%	10.6%	\$5,785	100.0%

- However, most of the respondents reported that they were unaffected by the recession.
  - Exhibit I-5 shows that the 40% of respondents affected by recession expect the budget to be reduced by an average of 7.6%.
- Exhibit I-6 shows that all budget areas will be impacted by the 1980 recession for the largest group (34%) of respondents.
  - Hardware acquisition, supplies, training and education, and outside services are not affected at all.
  - A surprising 27% of the respondents indicated that software acquisition and development would be affected by the recession. This may reflect that 20% report a reduction in personnel recruiting, which is required for software development.

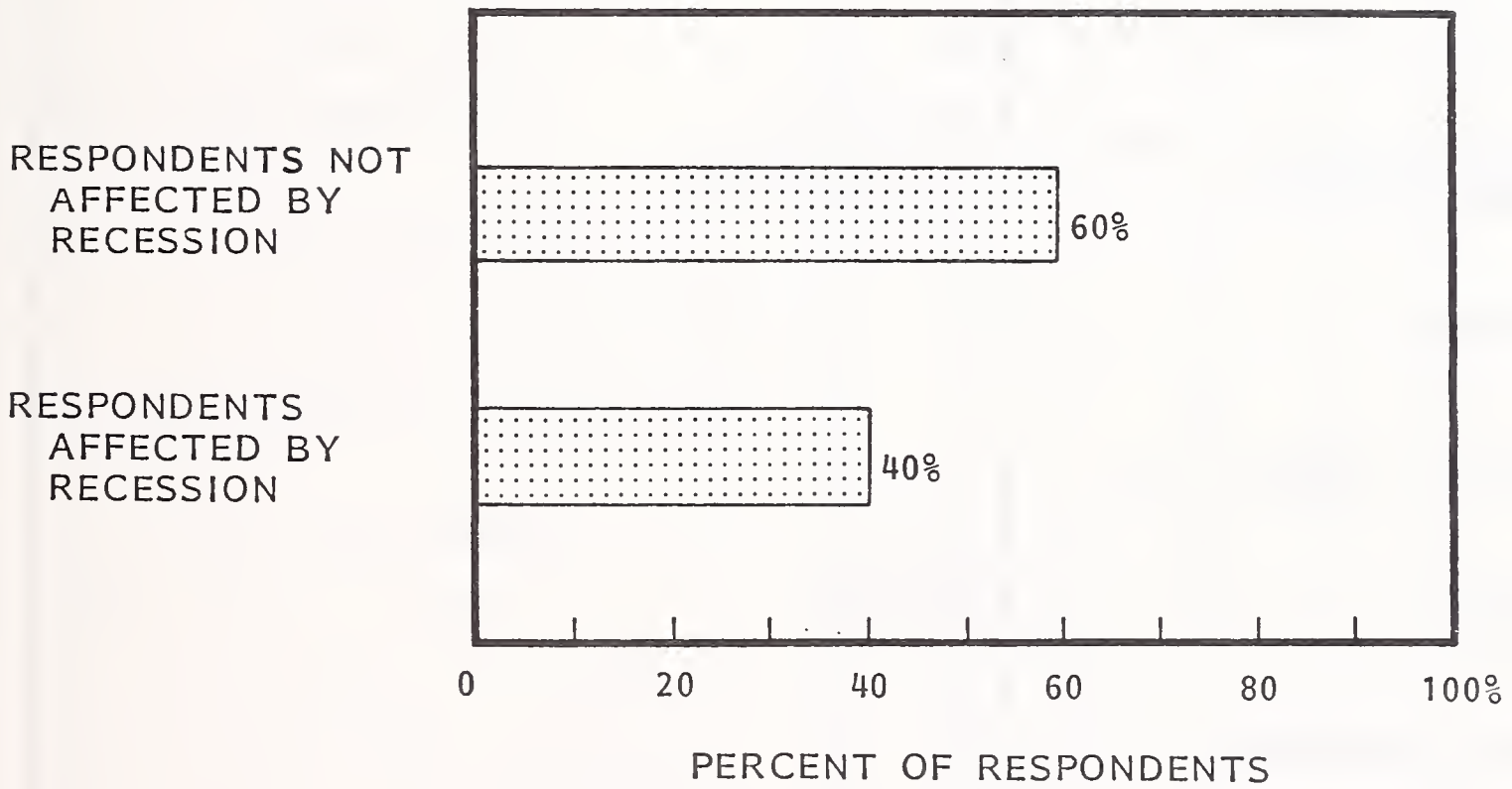
### 3. MAJOR PLANS AND PROBLEMS

- The primary objective for 1980 through 1982, as reported by respondents in the utilities sector, is to install on-line applications.
  - Exhibit I-7 shows that the need to improve EDP personnel productivity also ranks near the top-priority objective for all three years.
  - Even though installation of minicomputers represents a high proportion of the budget, this objective had the lowest priority of any of those listed in Exhibit I-7 in 1980 through 1982.
- Key applications to be developed in this timeframe are shown in Exhibit I-8. Accounting/finance has the highest relative importance as well as the greatest percentage of mentions as highest priority.



EXHIBIT I-5

EFFECTS OF RECESSION ON EDP BUDGETS  
IN THE UTILITIES SECTOR



AVERAGE PERCENT  
BUDGET REDUCTION FOR  
THOSE AFFECTED BY RECESSION: 7.6%

EXHIBIT I-6

BUDGET AREAS IMPACTED BY POSSIBLE  
RECESSION IN 1980 FOR RESPONDENTS IN THE  
UTILITIES SECTOR

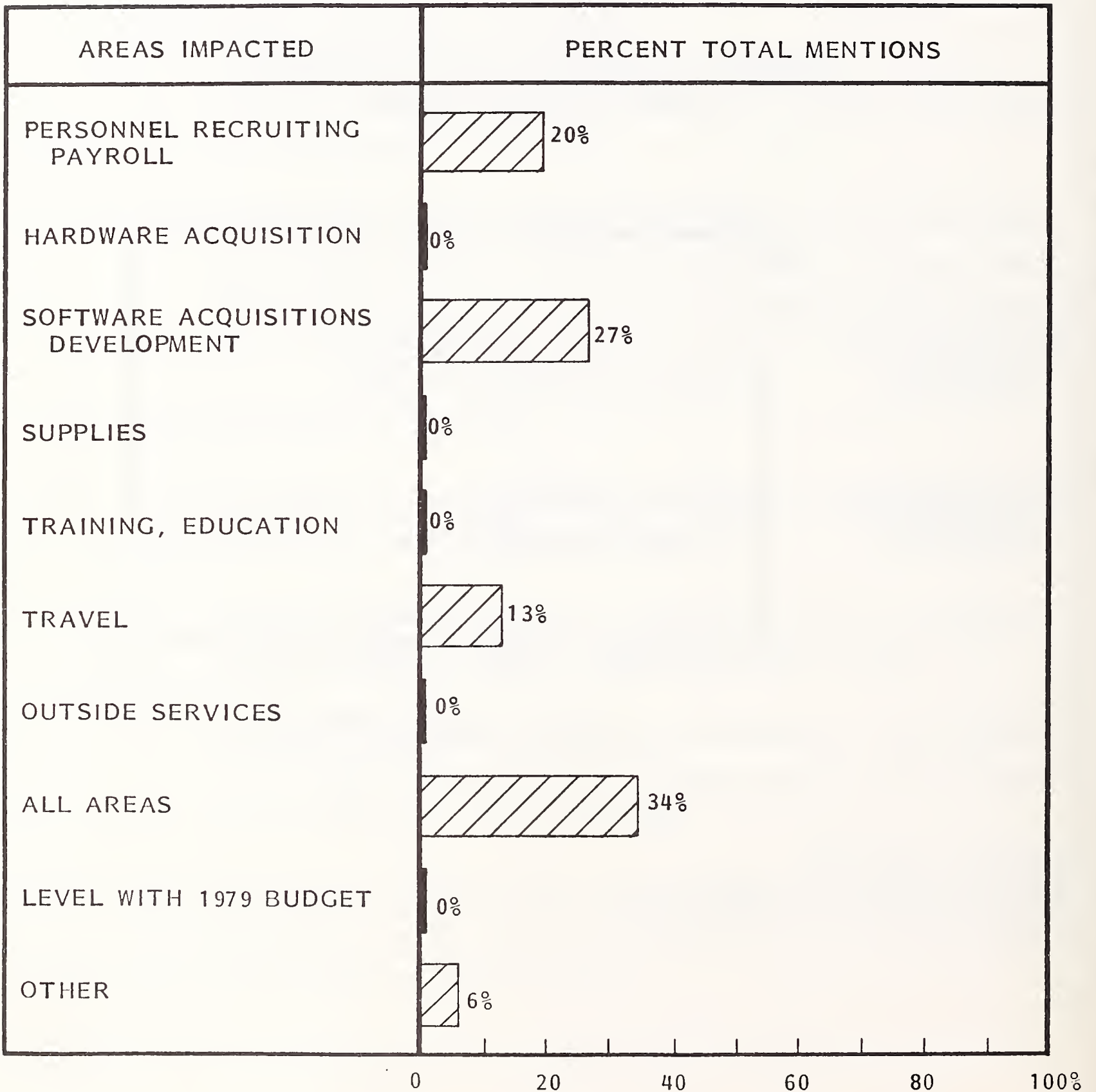


EXHIBIT I-7

EDP OBJECTIVES FOR RESPONDENTS IN THE  
UTILITIES SECTOR

OBJECTIVE	RELATIVE IMPORTANCE		
	1980	1981	1982
INSTALL ON-LINE APPLICATIONS	100%	100%	100%
CONVERT APPLICATIONS	51	30	14
IMPROVE EDP PERSONNEL PRODUCTIVITY	59	61	60
DEVELOP LONG-RANGE EDP PLAN	53	47	42
DEVELOP NEW BATCH APPLICATIONS	57	69	63
MEET DEVELOPMENT, CONVERSION SCHEDULES	42	42	44
INSTALL NEW MAINFRAME	42	28	30
DESIGN, INSTALL DBMS	60	52	54
CHANGE OPERATING SYSTEMS	33	7	7
DESIGN, INSTALL DDP NETWORK	13	28	33
INSTALL NEW PERIPHERALS	16	10	9
INSTALL MINICOMPUTERS	3	1	5
INTEGRATE OFFICE AUTOMATION WITH EDP	13	16	26
CENTRALIZE EDP CONTROL	14	16	16
DECENTRALIZE EDP CONTROL	6	7	12
OTHER	17	18	15

EXHIBIT I-8

APPLICATIONS TO BE DEVELOPED BY  
RESPONDENTS IN THE UTILITIES SECTOR

APPLICATION	RELATIVE IMPORTANCE	PERCENT OF MENTIONS AS HIGHEST PRIORITY
ACCOUNTING/FINANCE	100	28%
INVENTORY CONTROL	72	18
ORDER ENTRY/BILLING	61	21
PERSONNEL	39	7
PURCHASING	38	5
MARKETING/SALES	21	7
MODELING/FORECASTING	34	5
PERFORMANCE MEASUREMENT/CONTROL	31	-
OTHER**	50	9
TOTAL	-	100%

\*\*SPECIFIC APPLICATIONS INCLUDE:

- ENERGY CONTROL SYSTEMS
- COMMON MANUFACTURING SYSTEMS
- RESPONSIBILITY ACCOUNTING SYSTEM
- CUSTOMER INFORMATION SYSTEM

- Exhibit I-9 shows that one-third of the respondents expect programming aids to be one of the ways to improve time and costs associated with applications development.
  - Only 9% depended upon on-line programming in 1980, whereas 30% proposed to use that method in the 1979 survey.
- Exhibit I-10 portrays the distribution of expected levels of improvement in program development.
  - More than 90% expect greater than 10% improvement in their level of program development efficiency.
- Similar to the other industry sectors, personnel recruiting is seen as the most significant EDP problem in the utilities sector. Exhibit I-11 lists the relative importance and the percentage of priority rankings for other problem areas.
- The two-thirds production/one-third new development and maintenance ratio describing the use of computer resources shown in Exhibit I-12 is similar to the pattern exhibited by other industries.
  - The number of respondents in 1980 are also almost exactly proportional to those reporting use in 1979, with the exception that existing program maintenance and enhancement of existing programs occupies slightly less programming personnel time than was reported in 1979.
- Exhibit I-13 indicates that two-thirds of the respondents have IBM shops.
  - Honeywell has the largest number of non-IBM installed mainframes, at 5.7%.
  - IBM-DPD has a high percentage of 4300s and 8100s on order.

EXHIBIT I-9

METHODS USED TO IMPROVE TIME AND COSTS  
ASSOCIATED WITH APPLICATIONS DEVELOPMENT IN THE  
UTILITIES SECTOR

METHOD	PERCENT OF MENTIONS
ON-LINE PROGRAMMING	9%
PURCHASED SOFTWARE PRODUCTS	8
STRUCTURED PROGRAMMING/DESIGN	15
PROJECT MANAGEMENT	5
IMPROVED TRAINING/BETTER QUALIFICATIONS	10
PROGRAMMING AIDS	33
DATA BASE MANAGEMENT SYSTEMS	4
OTHER	
- USER INVOLVEMENT IN DEVELOPMENT	3
- STANDARDIZED METHODS/SYSTEMS	-
- HARDWARE UPGRADE	3
- IMPROVED DOCUMENTATION	1
- CRT TERMINALS FOR PROGRAMMERS	3
- MISCELLANEOUS METHODS	5
- DO NOTHING/NO PLANS	1

EXHIBIT I-10

EXPECTED LEVEL OF IMPROVEMENT IN PROGRAM  
DEVELOPMENT FOR RESPONDENTS IN THE  
UTILITIES SECTOR

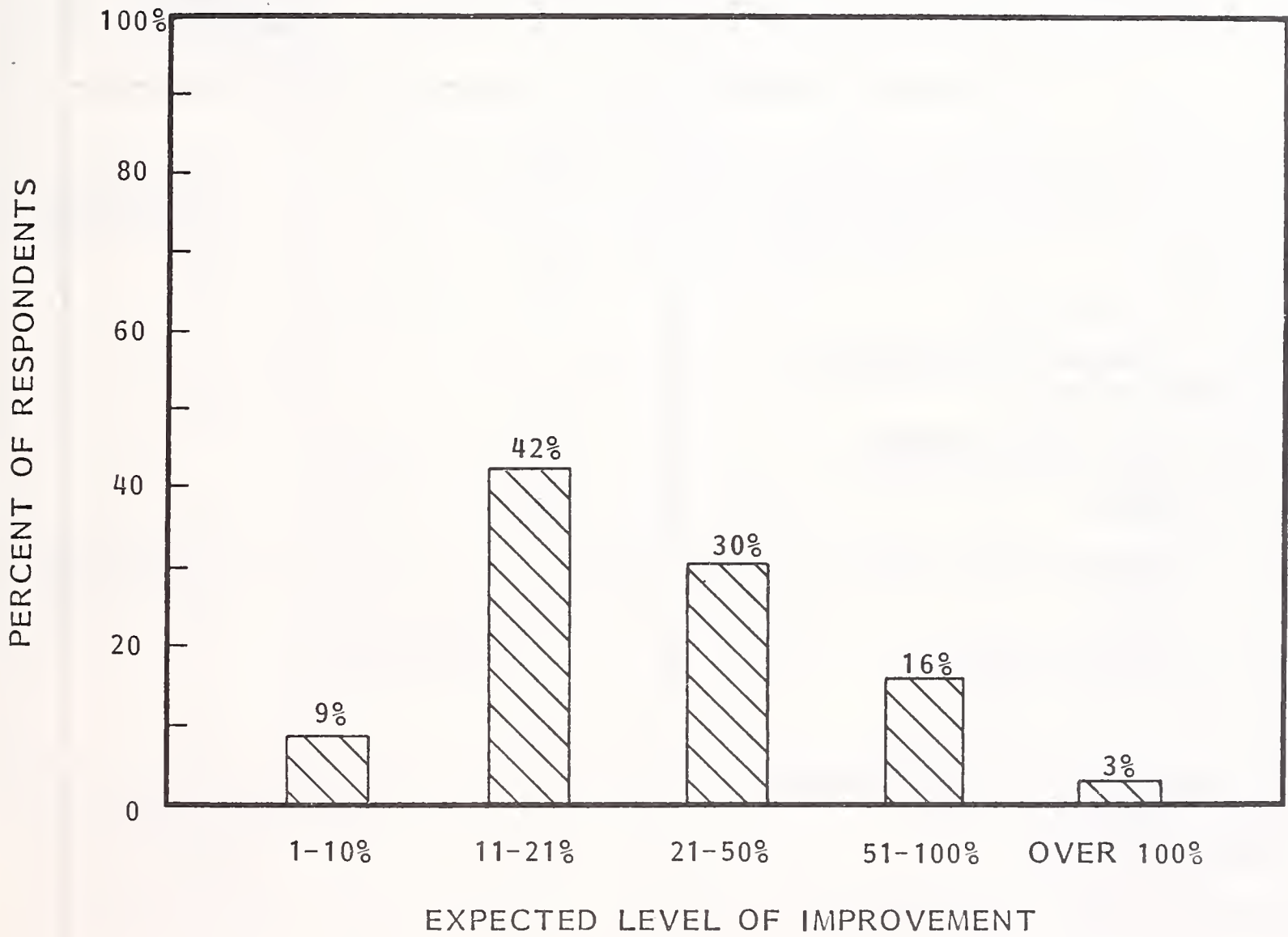


EXHIBIT I-11

MOST SIGNIFICANT EDP PROBLEMS IN THE UTILITIES SECTOR

PROBLEM	RELATIVE IMPORTANCE	PERCENT OF MENTIONS AS HIGHEST PRIORITY
PERSONNEL RECRUITING	100	31%
NEED FOR BETTER PLANNING AND CONTROL	91	18
PERSONNEL TRAINING	69	5
LACK OF GENERAL MANAGEMENT UNDERSTANDING	52	13
LACK OF USER INVOLVEMENT IN SYSTEMS/APPLICATIONS DEVELOPMENT	36	3
NEED FOR IMPROVEMENT IN OPERATIONS	37	0
EXCESSIVE APPLICATIONS DEVELOPMENT TIME	42	5
INADEQUATE EDP FUNDING	27	5
INADEQUATE SYSTEMS SOFTWARE	20	2
NEED TO IMPROVE DATA COMMUNICATIONS	39	10
UNSATISFACTORY HARDWARE MAINTENANCE	4	0
OTHER	15	8



EXHIBIT I-12

USE OF RESOURCES IN THE UTILITIES SECTOR

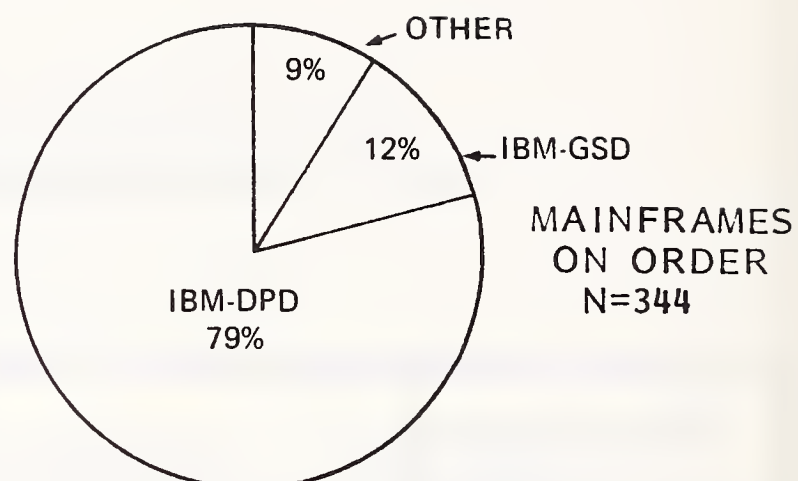
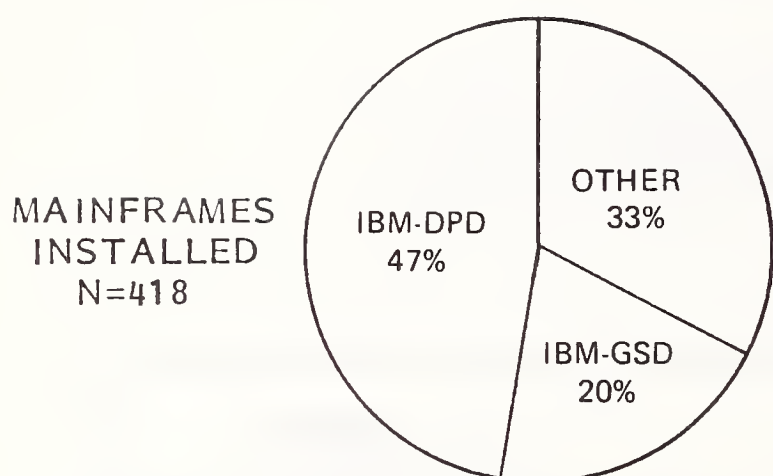
RESOURCE	APPLICATIONS	PERCENT OF USE
COMPUTER EQUIPMENT	PRODUCTION JOBS	63.0%
	NEW APPLICATIONS DEVELOPMENT	18.0
	EXISTING PROGRAM MAINTENANCE	13.9
	OTHER*	5.1
PROGRAMMING PERSONNEL	NEW PROGRAM DEVELOPMENT	47.9
	EXISTING PROGRAM MAINTENANCE	28.9
	ENHANCEMENT OF EXISTING PROGRAMS	23.2

\*OTHER MENTIONS INCLUDE:

- SYSTEM OVERHEAD
- UTILITIES, LOGS
- UNUSED CAPACITY
- ENGINEERING

EXHIBIT I-13

MAINFRAME EDP HARDWARE PROFILE IN THE  
UTILITIES SECTOR



MAINFRAME	INSTALLED			ON ORDER		
	NUMBER OF RESPONSES	NUMBER OF SYSTEMS	PERCENT	NUMBER OF RESPONSES	NUMBER OF SYSTEMS	PERCENT
IBM 3033	9	30	7.2%	4	11	3.2%
IBM 3033N	2	2	0.5	5	9	2.6
IBM 3032	5	8	1.9	1	1	0.3
IBM 3031	9	21	5.0	4	8	2.3
IBM 370 158-168	18	36	8.6	0	0	0.0
IBM 4331	5	16	3.8	16	60	17.4
IBM 4341	1	2	0.5	21	58	16.9
IBM 8100	6	17	4.1	12	122	35.5
IBM OTHER 370	9	57	13.6	1	1	0.3
IBM OTHER 360	2	5	1.2	0	0	0.0
SUBTOTAL IBM-DPD	66	194	46.4%	64	270	78.5%
IBM SYSTEMS 1, 3, 32, 34	5	83	19.9%	4	21	6.1%
IBM SYSTEMS 38	1	1	0.2	3	22	6.4
SUBTOTAL IBM-GSD	6	84	20.1%	7	43	12.5%
AMDAHL	5	14	3.3%	0	0	0.0%
BURROUGHS	7	19	4.5	1	3	0.9
CDC	1	4	1.0	0	0	0.0
DEC	4	10	2.4	3	5	1.5
HONEYWELL	5	24	5.7	1	2	0.6
HEWLETT-PACKARD	7	9	2.2	1	9	2.6
PRIME	3	4	1.0	1	1	0.3
UNIVAC	4	4	1.0	1	1	0.3
FOUR-PHASE	1	5	1.2	0	0	0.0
OTHER	14	47	11.2	5	10	2.8
SUBTOTAL OTHER	51	140	33.5%	13	31	9.0
TOTAL	123	418	100.0%	84	344	100.0%

- Exhibit I-14 reveals that, as of 1980, nearly two-thirds of the utilities respondents have at least one minicomputer installed. Only one-third have installed microcomputers, while nearly two-thirds have no plans to install micros in the future.
  - The highest growth rate in the hardware category is for nonintelligent terminals. This is on top of an already large installed base of nonintelligent terminals.

#### 4. KEY ISSUE STATUS REVIEW

- The implementation and development of new and on-line applications are the most important EDP development objectives, as shown in Exhibit I-15.
- Exhibit I-16 shows that nearly 60% of the EDP personnel received technical training in 1980, at an average expense of \$878 per attendee.
  - One out of three staff members received management training, at a much lower cost per attendee than that paid for technical training.
- With the exception of software maintenance and diagnostics, users performed a relatively low level of self-maintenance in the utilities sector.
  - Exhibit I-17 portrays the distribution of maintenance performed internally and procured from outside vendors in 1980.
- Exhibit I-18 shows that an unusually high percentage (81%) of respondents are already using word processing, and that half of these installations are the responsibility of the EDP manager.
  - Data communications are also already installed by the majority of respondents, and are clearly an EDP responsibility.

EXHIBIT I-14

NON-MAINFRAME EDP HARDWARE PROFILE IN THE UTILITIES SECTOR

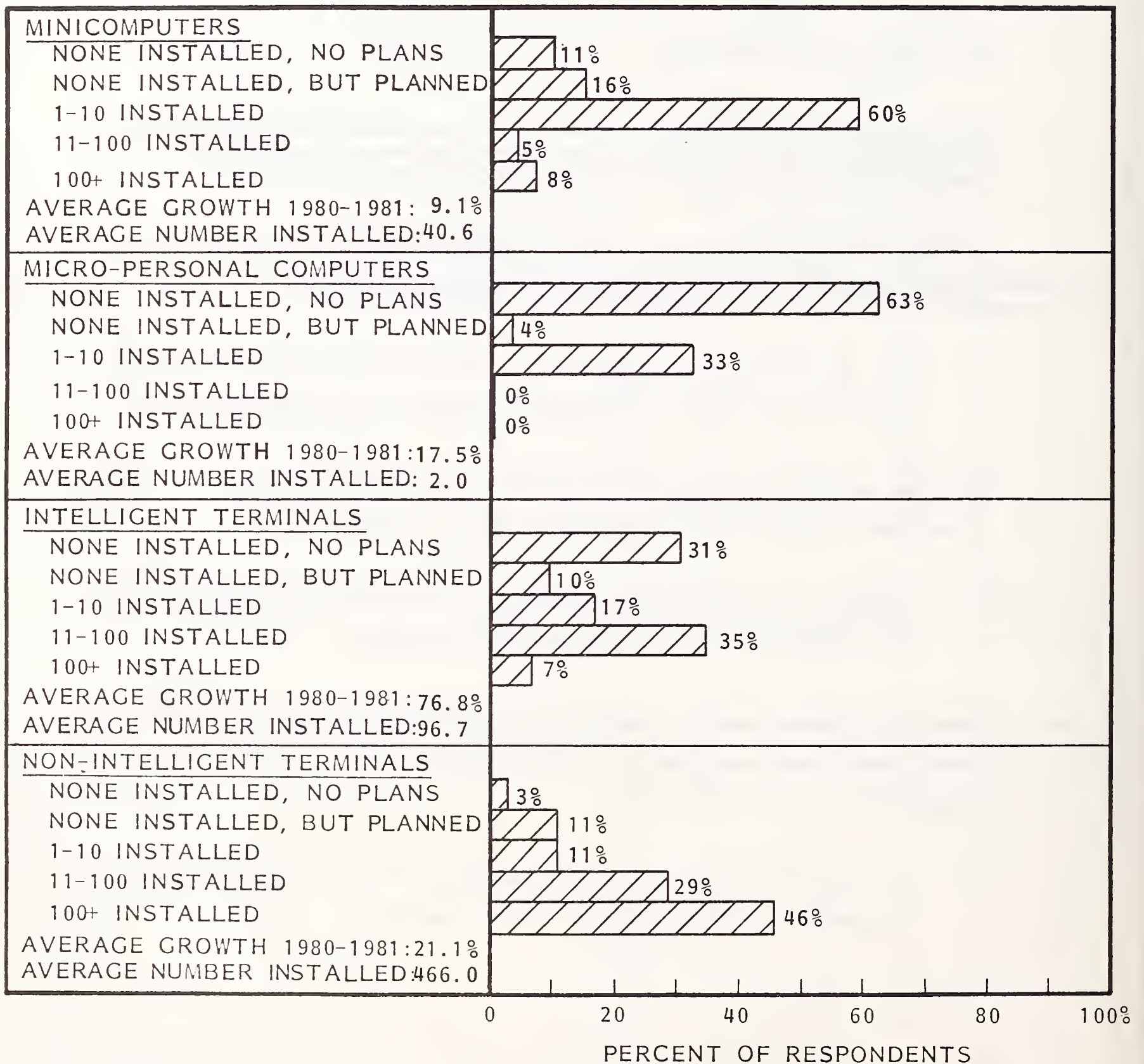


EXHIBIT I-15

MOST IMPORTANT DEVELOPMENT OBJECTIVE  
IN THE UTILITIES SECTOR

MOST IMPORTANT EDP DEVELOPMENT OBJECTIVE IN 1980	PERCENT OF TOTAL MENTIONS
DATA BASE DEVELOPMENT	10%
DESIGN OR INSTALL DDP	-
IMPLEMENT/DEVELOP NEW APPLICATIONS	24
IMPLEMENT/DEVELOP ON-LINE APPLICATIONS	17
INSTALL OR UPGRADE MAINFRAME	2
INSTALL MINICOMPUTERS	-
INSTALL OR CONVERT OPERATING SYSTEMS	10
DESIGN/DEVELOP COMMUNICATIONS NETWORK	2
CENTRALIZE OR DECENTRALIZE DP OPERATIONS	-
PLAN/IMPROVE PRODUCTIVITY AND/OR OPERATIONS	14
OTHER	
- REWRITE SOFTWARE	5
- TRAIN STAFF/USERS	2
- LONG-RANGE EDP/CORPORATE PLAN	7
- MISCELLANEOUS RESPONSES*	7
TOTAL	100%

\*SPECIFIC RESPONSES INCLUDE:

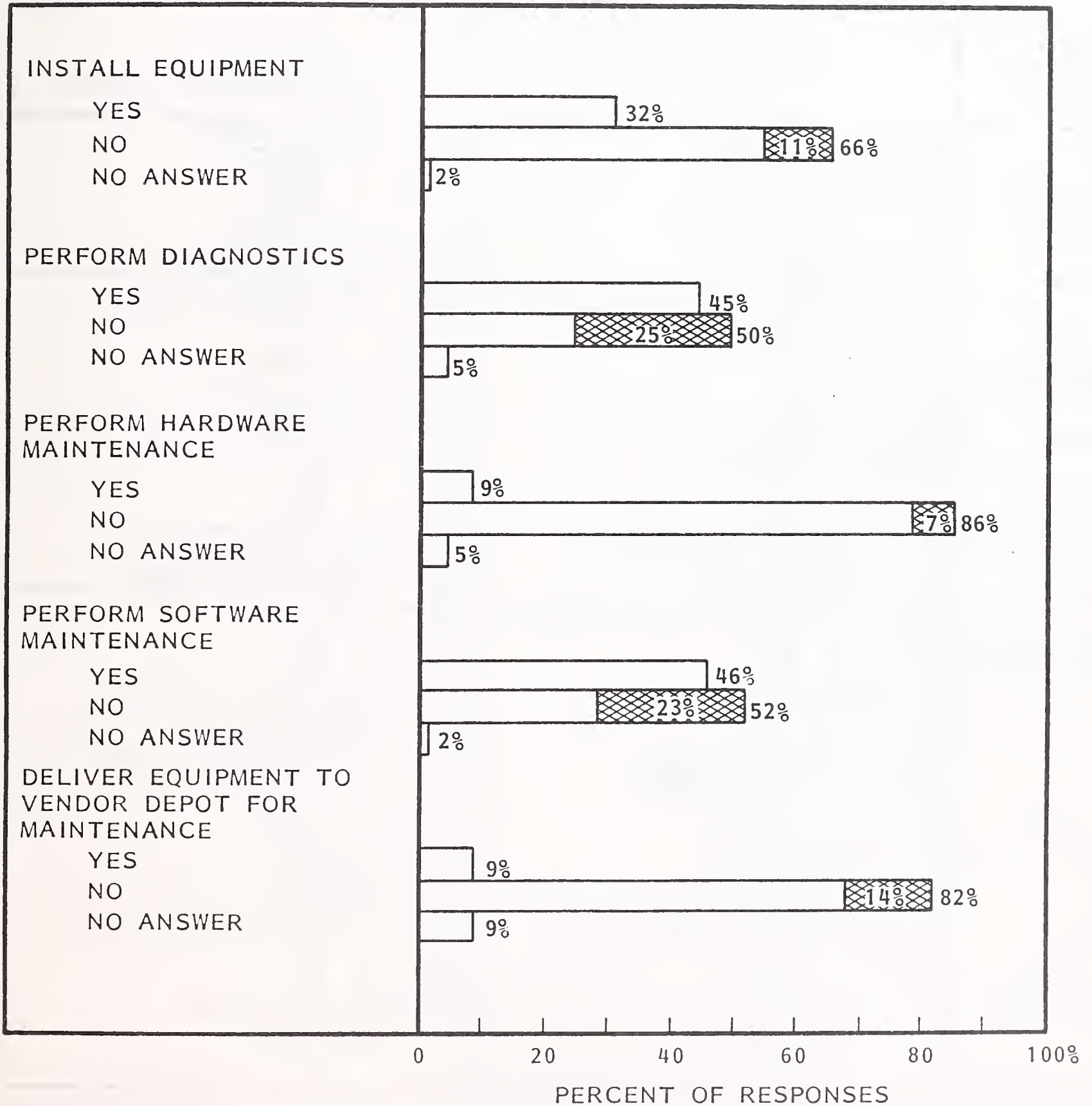
- SPECIFY SYSTEM STANDARDS
- CONTROL ASSETS INVENTORY
- RESEARCH

EXHIBIT I-16

TRAINING EXPENDITURES IN THE  
UTILITIES SECTOR

TYPE OF TRAINING	AVERAGE EXPENSE	AVERAGE EXPENDITURE PER EDP EMPLOYEE	PERCENT OF STAFF ATTENDING	AVERAGE EXPENSE PER ATTENDEE
IN-HOUSE MANAGEMENT TRAINING	\$ 9,734	\$ 31	33.0%	\$332
OUTSIDE MANAGEMENT TRAINING	5,223	16		
IN-HOUSE TECHNICAL TRAINING	45,507	144	59.2	878
OUTSIDE TECHNICAL TRAINING	27,314	86		
TOTAL	\$87,778	\$277	-	-

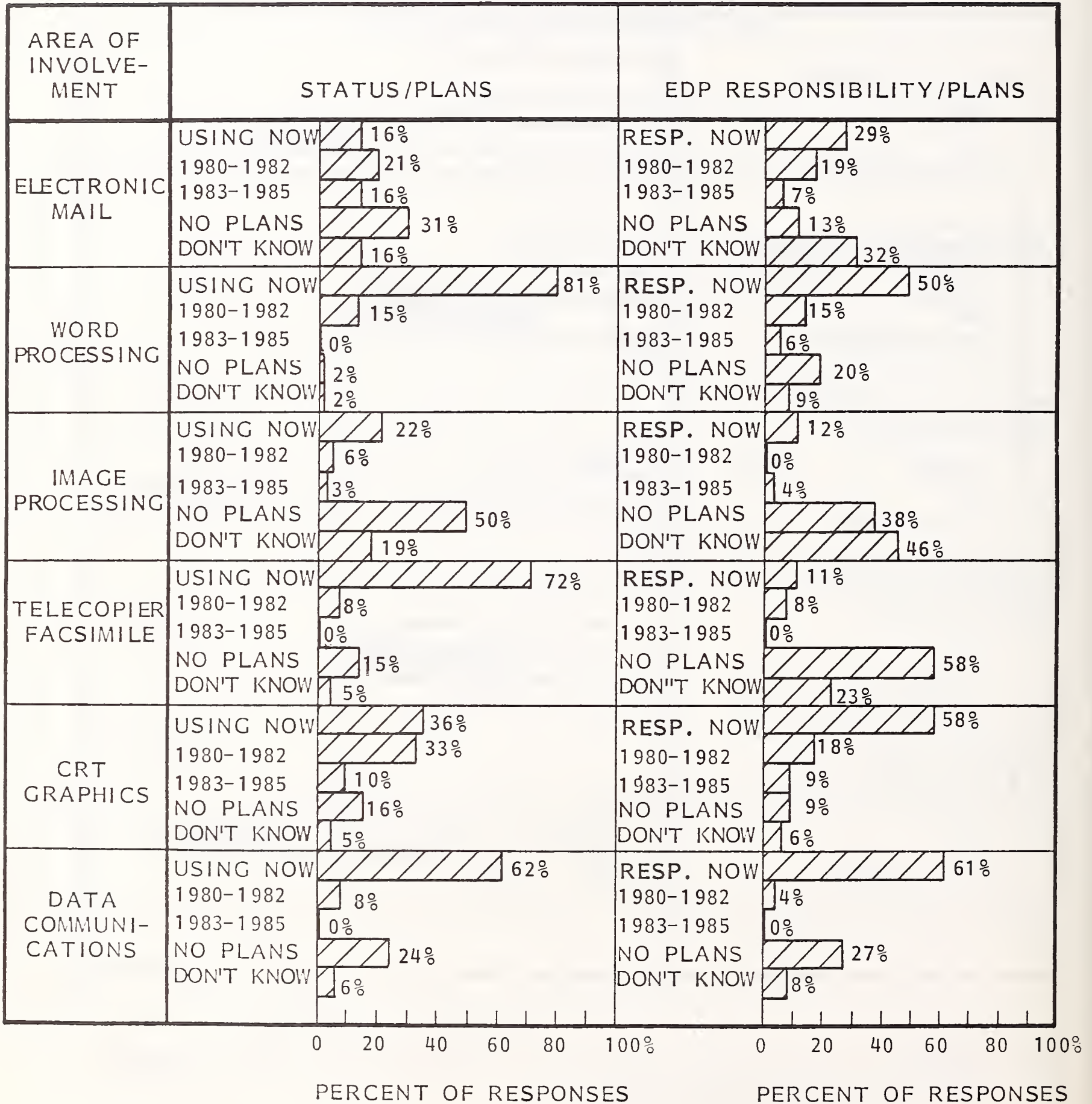
EXHIBIT I-17  
 DEGREE OF USER SELF-MAINTENANCE  
 IN THE UTILITIES SECTOR



NOTE: INDICATES PERCENT OF RESPONDENTS NOT CURRENTLY PERFORMING FUNCTION, BUT WHO WOULD CONSIDER DOING SO

EXHIBIT I-18

RESPONDENT INVOLVEMENT IN OFFICE AUTOMATION  
IN THE UTILITIES SECTOR





- Few respondents are currently using electronic mail, while less than one-third of the EDP managers have responsibility for this function as of 1980.
- Over two-thirds of the respondents expect to be using computer graphics by 1982, with a proportionate number of EDP managers having responsibility for this function in a comparable period.





## ABOUT INPUT

INPUT provides planning information, analysis, and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions. Continuing services are provided to users and vendors of computers, communications, and office products and services.

The company carries out continuous and in-depth research. Working closely with clients on important issues, INPUT's staff members analyze and interpret the research data, then develop recommendations and innovative ideas to meet clients' needs. Clients receive reports, presentations, access to data on which analyses are based, and continuous consulting.

Many of INPUT's professional staff members have nearly 20 years experience in their areas of specialization. Most have held senior management positions in operations, marketing, or planning. This expertise enables INPUT to supply practical solutions to complex business problems.

Formed in 1974, INPUT has become a leading international consulting firm. Clients include over 100 of the world's largest and most technically advanced companies.

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