1980 FIELD SERVICE ANNUAL REPORT

ABOUT INPUT

THE COMPANY

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leading international consulting firm. Clients include over 100 of the world's largest and most technically advanced companies.

UNITED STATES, West Coast
2471 East Bayshore Road
Suite 600
Palo Alto, California 94303
500
7

East Coast
-1
Jersey 07662

Floor)

9 Merriwa Street
n N.S.W. 2072

JAPAN
Overseas Data Service Company, Ltd.
Shugetsu Building, No. 12-7 Kita Aoyama
3-Chome Minato-Ku
Tokyo, 107
Japan
(03) 400-7090

1980 FIELD SERVICE ANNUAL REPORT

JULY 1980

INPUT

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1 INTRODUCTION

I INTRODUCTION

- This report is produced by INPUT as part of the 1980 Field Service Program. The report provides information and analysis based on primary and secondary research among vendors and users of maintenance services in the information processing industry. The objective of the report is to provide clients with a comprehensive annual report on key elements of a field service strategy, including:

  - Report the users' perception of the maintenance capability of vendors.
  - Determine the extent that technology will improve and/or change maintenance techniques.
  - Determine the impact of vendor maintenance on user purchase decisions.
  - Evaluate the opportunities for non-manufacturers of equipment (e.g., third-party maintenance and computer services companies) to offer maintenance services.
  - Evaluate the impact of rising labor costs, competitive forces and new products on the delivery and pricing of maintenance services.
  - Determine the prevalent vendor attitudes regarding management issues relative to field service.

- Investigate user maintenance requirements and how much they will pay for maintenance services.

- Analyze the major personnel issues in maintenance organizations.

- Dimension the market for maintenance services over the period 1980-1985.

- The study examines applicable issues relating to the following categories of equipment:

  - Medium and large mainframes.

  - Small business computers.

  - Minicomputers.

  - Peripherals.

  - Terminals.

- The study is an update and an extension of INPUT's 1978 multiclient study, "Maintenance Requirements for the Information Processing Industry." The following elements were added to the current study:

  - System support centers.

  - Remote diagnostics.

  - Software maintenance.

- Research for this study included user and vendor interviews. Methodology and interview forms are presented in Appendices B, D and E.

- The study is designed to provide continuity with earlier work, and to provide a base on which to build future work. Inquiries and comments from clients are invited, relative both to completed work and to work which clients want INPUT to undertake in the future.

II EXECUTIVE SUMMARY

II EXECUTIVE SUMMARY

A. MAINTENANCE MARKETS, 1980-1985

- The growth in maintenance revenues is being impacted by several forces:

  - The rate of growth in the installed base of information processing equipment. INPUT estimates the 1980-1985 rate to be 12% per year.

  - The change in the mix of equipment. As the percent of EDP expenditures shifts from predominantly mainframes to a greater percentage of small computers and intelligent terminals, the average maintenance fee relative to equipment cost increases. INPUT research shows a shift in EDP expenditures for small computers and intelligent terminals from 4.5% of the 1978 total for hardware and software to a forecasted 1981 level of 9.5% for larger users.

  - Inflation, which is leading some vendors to increase maintenance charges relative to equipment prices.

  - New techniques, such as depot maintenance and remote diagnostics, which tend to lower maintenance prices.

- User self-maintenance, which tends to lower maintenance revenues.

- The latter two factors have a minor impact to date on total revenue growth; however, their future impact will be significant.

- The net effect of these factors on growth is that maintenance revenues will grow somewhat faster than the growth in the installed base of equipment.

- INPUT forecasts that maintenance revenues will grow at 15% per year during the 1980-1985 period fueled mainly by growth in the installed base, change in product mix, and inflation.

  - Many vendors, particularly minicomputer manufacturers, will experience faster growth.

  - More aggressive pricing and selling of maintenance services could have a significant impact on the growth rate. This aspect is now being studied by INPUT and will be analyzed in the Field Service Program report now in preparation, "Marketing Field Services."

- Personnel to support this growth will continue to be in short supply.

  - Smaller vendors forecast annual personnel growth in the range of 50%.

  - Minicomputer vendors typically forecast growth in the 25% range.

  - Large vendors who are suppliers to primarily central sites anticipate a growth of only 0-5%.

  - INPUT forecasts an average growth in the 11% range for the early portion of the forecast period, slowing to 8% by 1985 as labor-saving techniques such as systems support centers are implemented by more vendors.

- Market and personnel growth are presented on Exhibit II-1.

  - Data are basically consistent with the results of the 1978 INPUT study "Maintenance Requirements for the Information Processing Industry."

  - To put these revenues in perspective, 1980 maintenance revenues of $6.4 billion are more than double the total semiconductor industry revenues in the U.S.

  - The 1985 revenues of $13.2 billion are forecasted to be achieved with maintenance force totalling 176,000 people.

  - At an average revenue per person of only $75,000, the industry is not realizing its full profit potential.

    . A challenge to increase the productivity of personnel is clear - other segments of industry already realize higher average revenues per maintenance person; one vendor maintaining heating and related systems reports revenues per person approximately twice this amount.

    . Issues of productivity and marketing of field services are basic to the realization of full profit potential; much of this report relates to elements of productivity.

B. SERVICE IS A BUSINESS

- Over the past two years, top management in the computer industry has increasingly recognized service as a major business opportunity.

EXHIBIT II-1

FORECASTED MAINTENANCE REVENUE AND PERSONNEL GROWTH, 1980-1985 (U.S. ONLY)

YEAR	MAINTENANCE REVENUE ($ BILLION)	MAINTENANCE PERSONNEL (THOUSAND)	REVENUE PER MAINTENANCE PERSON ($ THOUSAND)
1979	$ 5.5	99	$55
1980	6.4	110	58
1981	7.3	123	59
1982	8.4	136	62
1983	10.0	151	66
1984	11.5	163	71
1985	13.2	176	75
AAGR	15%	1979-1983 11% 1984-1985 8%	

- Over 90% of the computer industry vendors with sales over $50 million per year either operate field service as a profit and loss center or expect to do so within two years.

- Forty percent of the companies interviewed for this study are structured such that the senior field service executive reports directly to the company's CEO or group general manager. Another 50% have this person reporting to the Senior Vice President of Marketing. Sixty percent of the field service heads bear the title of Vice President or Senior Vice President.

- The fundamental reason for this change in attitude and direction is shown by the example illustrated in Exhibit II-2, which shows the ratio between hardware and service revenues over the seven-year life cycle of a typical system.

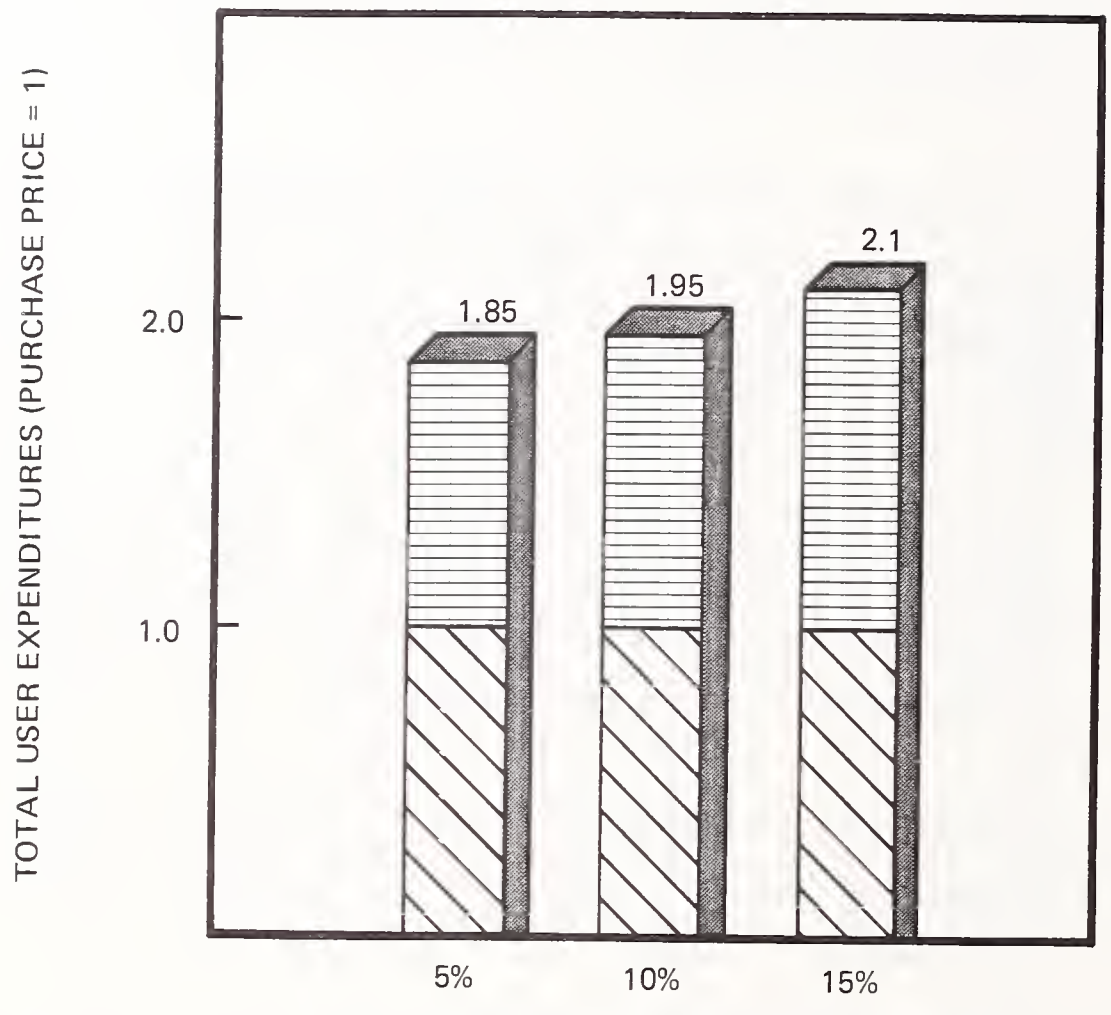
  - The chart assumes current maintenance at 10% of equipment purchase price; while this is higher than some current charges, it is reasonable when viewed in combination with charges for other equipment such as minicomputers which often exceed 10%.

  - Clearly, users are making a financial commitment to service as large as or greater than their commitment to hardware as the relative price of maintenance increases.

- An even more dramatic example is shown in Exhibit II-3 which shows that over a five-year life cycle, maintenance is expected to account for from 40% to 49% of users' expenditures for an IBM 8100 system. And this is a new product based on (relatively) state-of-the-art technology, presumably offering high reliability, sophisticated diagnostics, simple repair procedures, fully debugged software, etc. Equally important, the maintenance charges on the 8100 are at this high level even though users are expected to perform a good deal of the maintenance themselves.

EXHIBIT II-2

TOTAL USER SYSTEM EXPENDITURES OVER A SEVEN YEAR LIFE CYCLE



MAINTENANCE

EQUIPMENT PURCHASE

NOTE: CHART ASSUMES IN YEAR 1 THAT MAINTENANCE IS 10% OF PURCHASE PRICE

EXHIBIT II-3

USER COST DISTRIBUTION OF
TYPICAL IBM 8100 INFORMATION SYSTEMS

COST DISTRIBUTION ITEM	COST OVER A 5 YEAR LIFE	
	SMALL CONFIGURATION ($180,000)	LARGE CONFIGURATION ($310,000)
PROCESSOR, MEMORY AND DISK*	16%	19%
TERMINALS*	11	19
PRINTERS*	14	13
TAPE DRIVES*	7	3
MISCELLANEOUS FEATURES AND ADAPTER*	27	15
SOFTWARE MAINTENANCE**	22	25
HARDWARE MAINTENANCE**	22	25
TOTAL	100%	100%

*PAID ONCE, AT PURCHASE TIME

**CUMULATIVE PAYMENTS' PAID OVER A 5 YEAR PERIOD

SOURCE: INPUT VENDOR WATCH REPORT # , "THE IBM 8100"

- There are other underlying reasons for this enhanced recognition of service as a product. Three of the more important ones are:

  - The diminution of hardware costs due to technological and manufacturing advances, which are beginning to limit the margins that can be achieved through hardware sales. As hardware prices decrease, suppliers must seek new avenues for profit.

  - A growing buyer perception that service, not hardware, is the primary item that distinguishes one vendor from another; this perception parallels the growth in users' demand for higher up time.

  - The rising costs of labor and of the maintenance and distribution of spares. This situation tends to focus attention on obtaining an adequate return on investment for service functions.

I. HISTORIC PERSPECTIVE AND DRIVING FORCES

- The information processing industry has been dominated by IBM (computers), Xerox (office products), and AT&T (communications). All three have traditionally taken a "bundled" approach to service and, as such, have established de facto standards and umbrellas under which the rest of the industry believed it had to operate.

- Led by IBM, which by its recent actions is generally separating service from hardware, the industry is beginning to see the old (perceived) constraints crumble.

- As computer/communications systems become more complex and more important to the everyday conduct of an institution's business, the sensitivity to "down systems" is intensified.

  - An increasing number of users cannot tolerate the loss of the use of a system for any extended period.

- In this environment, service becomes an imperative that can be justified at nearly any price.

- This sensitivity to down time is the principal inhibitor to the acceptance of the "office of the future"; i.e., systems designed to handle data processing, word processing, communications, electronic mail, etc. Few users can tolerate a system outage that would terminate all of these functions simultaneously.

2. THE OPPORTUNITY

- As stated earlier, in 1980, service in the U.S. EDP industry alone will account for approximately $6.5 billion of user expenditures.

- As equipment becomes more inherently reliable, the absolute value of the cost of service will decrease. However, it is neither likely nor necessary that they decrease in direct proportion to the reliability of the device or system.

  - As an example, consider the case of IBM's 327X series of CRT terminals.

    . Maintenance on the 3275 sold for (on average) $40/month.

    . Maintenance on the newer 3278 is priced at (on average) $16/month.

    . Some users interviewed perceive the 3278 to be ten times more reliable than the 3275. If this perception is accurate, IBM's profit on maintenance for the 3278 should be significantly higher than on the 3275.

- With the increased recognition (by users) of the importance of service and the ability of the suppliers to provide better maintenance aids, there is increasing acceptance of the concept of user participation in the service function. (This

will be the subject of a forthcoming INPUT study.) Suppliers are beginning to sell:

- Training.
- Instrumentation.
- Documentation.
- Spare parts.
- Redundant equipment.

C. IMPLICATIONS OF MANAGING FIELD SERVICE AS A BUSINESS

- The continuing shift to profit center operation along with more senior reporting of management implies several major changes in the way field service organizations are managed. Both field service and corporate executives need to have a clear understanding of the implications of these changes and a common sense of priorities as newly formed plans are implemented.

- The issues of greatest concern in this context are listed below and described in subsequent paragraphs:

  - Change in the treatment and control of field service revenues.
  - Performance ultimately measured by return on assets.
  - Senior management organization structures.
  - Increased emphasis on productivity.
  - Marketing and sales.

1. REVENUE TREATMENT

- The immediate result of transferring any operation from a cost center to a profit center is that division management is directly concerned with the revenue portion of the profit equation, where earlier the cost portion received dominant attention.

  - Management will be fighting for maintenance revenues. These revenues will receive increased attention relative to the revenues from the sale of equipment itself.

  - There will be much more "push" on the part of field service to cut deals more favorable to them. Field service management will increasingly have "sign-off" authority on all customer arrangements and will be able to reject or veto contracts not deemed to provide the proper return to the service division, in spite of the potential benefits to marketing or manufacturing operations.

2. RETURN ON ASSET PERFORMANCE MEASUREMENT

- P&L center managers are most frequently measured by return on assets. In the field service business, the assets are people and spares inventories.

  - Management will be constantly pressed to reduce inventory and to keep carrying costs under control.

  - The cost of carrying inventory is critical, typically on the order of 30-40% of inventory value. Interest, space, handling, rate of obsolescence, transportation, insurance and taxes are all on the increase.

  - A great challenge to management today is to stabilize inventory costs, reduce them if possible, while providing adequate customer service - all in the face of shorter and shorter equipment life cycles.

3. ORGANIZATION

- With P&L responsiblity, the field service executive is a member of a top executive team. The other members of the team will frequently have objectives in conflict with those of the field service division, for example:

  - They will be threatened by the marketing division because of the revenue implications.

  - They will be threatened by the manufacturing division because of the spares inventory implications.

- In order to prevent being "whipsawed" by divisional transfer costs, the field service division requires all of the organizational elements of a complete business, including:

  - Finance.

  - Marketing.

  - R&D.

  - Management information systems.

  - Personnel, particularly recruiting and training.

- INPUT recommends that these resources be placed under the direct control of the field service executive as a basic requirement of the proper functioning of a field service operation managed on a P&L basis.

4. PRODUCTIVITY

- The shortage of skilled personnel has been discussed many times in earlier INPUT studies and will not be dealt with in detail here - except to state that

the situation is as bad or worse than predicted. Thus, the pressure to improve productivity is intensifying and is particularly acute in the P&L organizations. There are a few clear trends beginning to emerge that address the productivity problem, all of which should be considered. These are simply listed here, but discussed in more detail in the body of this report. They are:

- Remote diagnostics.

- System support centers.

- A more active role for field service in product design and quality control.

- Intensive training of first-line managers.

- Greater use of built-in test devices.

- Enhanced internal diagnostics.

- Restructured personnel deployment (see Chapter II, Section C).

- Encouraging users to participate in maintenance and installation.

5. MARKETING AND SALES

- As noted in Section 3 above, implementation of an effective marketing organization is a necessary element of the field service P&L organization. One of the principal reasons it is needed has to do with the failure of the traditional hardware marketing organization to recognize and deal with the duality of the field service/customer interface.

  - The FE deals almost exclusively with the customers' operations people, not the people who decide maintenance policy.

- The maintenance buying decisions are made by senior executives whose contact is limited to: a) hearing about problems ("the system is down"), and b) reviewing the budget ("maintenance costs are going up"). They rarely hear about maintenance successes.

- The field service organization needs to develop reasons to interface with the decision makers; they need to get their "story" across in a dynamic and effective manner.

- The field service marketing organization should be chartered with responsibility at both the pre-sale and post-sale levels. In other words, a sales brochure won't do the job. An ongoing information program designed to keep decision-makers involved in the plans of the service organization and to explain their meaning in terms of the future relationship is required. Examples of material appropriate in this context might be:

  - "Our remote diagnostics program and how it will improve your uptime."

  - "Reasons you can feel secure in committing key functions of your business to be implemented on our equipment and services."

  - "Our maintenance philosophy for systems being used in a DDP environment is the following . . ."

- A corollary to the establishment of such a marketing program is that FE managers must be trained to feel comfortable dealing with senior contacts and provided with the necessary presentation and other communications skills.

- Finally, in the marketing arena, INPUT recommends that field service adopt "account strategy planning" for all significant or potentially significant customers. Elements of individual plans (which should be living documents) would include:

- Identification and ranking of all potentially significant customer contacts including users of the system.

- Pricing and contracts.

- Short-term objectives, including revenue targets.

- Long-term marketing/sales objectives and implementation strategy.

- Milestone specifications.

- Competition.

- Identification of potential problems, and plans to deal with them if they arise (e.g., customer on the brink of moving to a third-party maintenance firm).

- This involves a shift from the traditional geographic orientation of field service to a more account-centered orientation.

D. CONTRACT TRENDS

- Users continue to prefer fixed-fee maintenance contracts over T&M by a better than 20:1 ratio. However, there is a trend toward reducing base coverage to prime shift and purchasing additional coverage as needed on a T&M basis.

- There are several emerging trends that are beginning to influence the composition of service agreements:

  - Increased customer involvement in diagnostic, repair and installation procedures.

- The shrinking physical size of some equipment which makes depot maintenance practical for a much greater number of devices.

- The emergence of retail outlets, owned by both vendors and third parties.

- More widespread use of remote diagnostics and system support centers.

- Due to these influences, some important changes in service contracts will be made.

  - On the one hand, vendors will be forced to provide much more flexibility to meet the varied offers from competition.

  - On the other hand, some products will be offered on a "take-it-or-leave it" basis, such as depot maintenance on the IBM 3101 terminal.

  - Service agreements will be tailored to meet the specific needs of individual large customers.

  - A choice of standard plans will be available for the smaller user.

- INPUT believes that within ten years, nearly all post-warranty service will be unbundled, reflecting general recognition of service as a product.

  - Incremental pricing will be standard. Although it is not widely used today, one is beginning to see experiments by industry leaders, particularly IBM, that point to much broader use in the future.

- Hardware maintenance costs (in relation to the installed base) will continue to increase over the next three to four years and may begin to reduce after that time as hardware becomes more reliable.

- However, INPUT believes that service costs relating to maintenance will continue to increase for the foreseeable future.

- The increasing complexity of distributed systems and attendant software will add more to software maintenance costs than cost-saving devices such as systems support centers will deduct.

- Thus, the total cost of service as a percentage of income derived from the sale of a system is expected to increase. This trend is shown conceptually on Exhibit II-4.

E. PERSONNEL CONSIDERATIONS

- Recruiting continues to be the number one problem reported by field service managers.

  - Interestingly enough, morale ranked twelfth out of a list of twelve problems covered in the 1980 survey.

  - At the same time, 40% of the respondents said reducing labor turnover was a major problem.

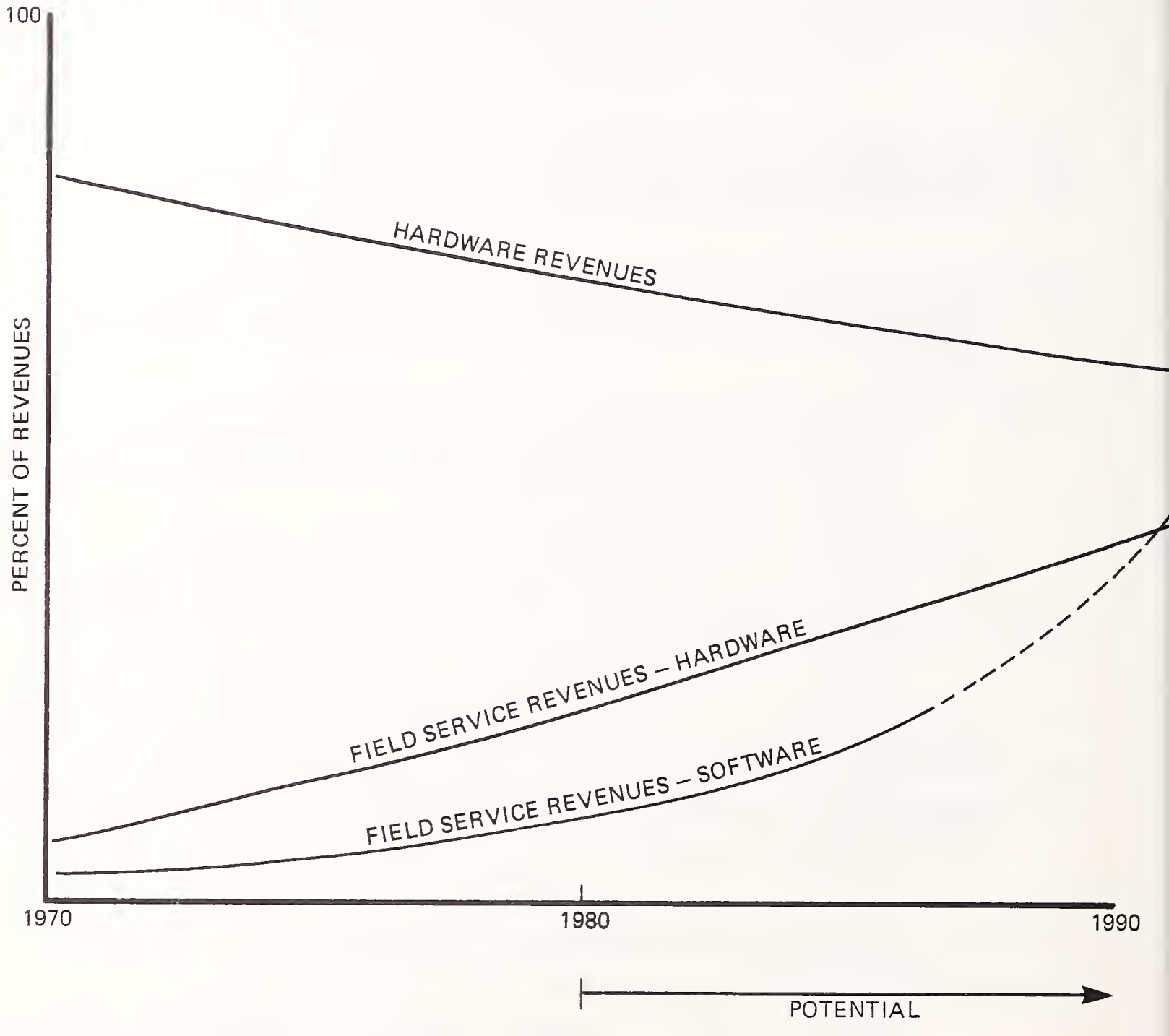
- INPUT interprets this dichotomy as indicative of the fact that a very large percentage of companies do not have the personnel problem in proper perspective. The ability to recruit and retain people is clearly a direct function of employee morale.

  - More attention to career paths is essential.

  - Incentive programs should be carefully evaluated; they are having a positive effect on morale where correctly implemented.

EXHIBIT II-4

THE INCREASING IMPORTANCE OF FIELD SERVICE REVENUES AS COMPARED TO HARDWARE REVENUES



FIELD SERVICE HAS THE POTENTIAL TO BE THE DOMINANT REVENUE SOURCE IN THE LATE 1980s.

NOTE: THIS CHART IS CONCEPTUAL; IT IS NOT BASED ON SPECIFIC DATA

I. SALARY AND INCENTIVE

- In contrast with the results of INPUT's 1978 study findings, some companies are making a determined effort to boost the morale of field service personnel.

- Five companies (out of 20) have instituted incentives. Schemes in force were:

  - Percentage of maintenance contract renewals paid out as bonuses.

  - Each quarter, an outstanding FE was given a week's trip to a resort.

  - Commissions paid on the sale of supplies and spares.

  - Periodic bonuses awarded for "plus" performance.

  - Commissions paid on service contracts and training courses sold.

- Interestingly, all of the companies offering incentives are small (less than $150 million annual sales) and all are headquartered on the West Coast. Turnover in these firms was low by comparison with others.

- One very large company had an incentive scheme whereby selected FEs were able to attend 100% club meetings. This experiment turned out to be counter-productive because selection standards were subjective and not fairly applied.

- As would be expected, there is a direct, inverse correlation between salary and turnover - lower salaries relate to higher turnover.

- The inclusion of software maintenance will have an upward pressure on salaries because programmers are paid at a higher level than field service personnel.

2. SOURCES OF PERSONNEL

- As shown in Exhibit II-5, there has been some shift in thinking between 1978 and 1980. Most vendors perceive (and INPUT agrees) that the majority of new field service people will, in future, come from trade schools and from the ranks of those having no prior technical training or skills.

  - This implies a relatively major investment in training facilities by the vendors themselves.

  - "Hire and train" moves from last position to second position among the alternate sources.

- "Recruit from competition," although decreasing in importance, remains a relatively important source of new people.

  - This industry-wide problem is obviously self-defeating and needs to be dealt with at the industry level.

  - INPUT urges the industry to "get its act together." Forums such as the Association of Field Service Managers can serve as a vehicle to initiate industry-wide discussion that could lead to improving new personnel training.

3. SERVICEPERSON OF THE FUTURE

- By the mid-1980s, the service organization will evolve into a three-tiered structure. At each level, different types of people will be required to meet the service demands of the integrated computer/office/communications systems in place at that time.

- Within this hierarchy, each level has its own role in the service organization, performing different functions and interfacing with customers in different ways and often at different levels (i.e., the skills, training, handling and compensation requirements will be significantly different for each category).

EXHIBIT II-5

VENDOR RATINGS OF PRIMARY SOURCES OF NEW FS PERSONNEL

VARIABLE	YEAR			
	1978*	1980	1982*	1985
HIRE AND TRAIN (NO TECHNICAL PRE-TRAINING)	2.0	1.8	2.8	3.5
RECRUIT FROM COMPETITION	3.0	2.9	2.8	2.1
RECRUIT FROM INDUSTRIES	2.3	2.1	2.6	2.4
TRAIN DISCHARGED ARMED SERVICES PERSONNEL	2.6	2.5	2.4	1.9
RECRUIT FROM OTHER FUNCTIONS WITHIN THE COMPANY	2.7	1.9	2.5	2.2
TRADE SCHOOLS	2.9	3.7	4.0	4.1

(SCALE: 1 = LOW, 5 = HIGH)

*1978 & 1982 RATINGS FROM "MAINTENANCE REQUIREMENT FOR THE INFORMATION PROCESSING INDUSTRY 1978-1983"; SURVEY DONE IN 1978.

NUMBER OF RESPONSES: 19

- Due to economic necessity, some of the functional requirements of the three levels may overlap, depending on customer base, product line density, geographic dispersion of specific products and other factors. In most organizations, however, the lines will be distinctly drawn.

- The three classes of service personnel and their distinguishing characteristics are described as follows:

  a. Local Field Service Technician (LFST)

- LFSTs exist primarily to handle routine service functions such as:

  - "Cookbook" PM diagnostics and routines.

  - Repair at the module or unit replacement level.

  - Cleaning and burnishing of mechanical components.

- Skill and technical training requirements for LFSTs will be relatively minimal.

  - A high school education will be sufficient.

  - Since they interface directly with customers, appearance and communication skills will be important attributes.

  - This category will be largely non-exempt and will be the area within the field service organization most susceptible to union encroachment.

  - Coincident with a heavy influx of this new class of employee, companies will need to have programs in place to detect and train those individuals capable of progressing beyond this basic level.

b. Local Field Support Specialist (LFSS)

- LFSSs serve as backup to the LFSTs, taking charge of problems they cannot deal with. They must have a thorough grounding in the theory of operations of the systems with which they will come in contact.

- Most positions will require the equivalent of a four-year degree. Most will need to comprehend both software and communications.

- LFSSs will be generalists capable of making decisions on non-routine problems as they come across a broad spectrum of products and systems.

- LFSSs are professionals in the usual sense of the word. They need to look and act like professionals.

  - In many organizations, LFSSs will serve an important role in field service marketing and sales. They may, in fact, have responsibility for the creation and sale of maintenance programs for individual customers.

  - Depending on the size of the field service organization, LFSSs may be at regional as well as local levels.

c. Central Site Support Specialists (CSSS)

- Central site support specialists are resident at headquarters or regional locations and are responsible for dealing with highly technical problems beyond the capabilities of field personnel.

- CSSSs are specialists in every sense of the word. They have in-depth knowledge of specific products; indeed, their knowledge may be limited to an individual subset of a complex system, like for example, the central logic unit, or the operating system software package.

- In-house training will frequently include participation in system design, development engineering or software development teams originally responsible for a product.

- It will be extremely difficult to retain these people in the same job for long periods of time since constant updating will be required. Field service should be prepared to staff these positions on a rotating assignment basis.

- CSSSs will often be located in national centers with responsibility for their specialty over large geographic areas. A configuration which is appearing is to have a U.S. center, a European center and a Far East center.

- The change in the distribution of skills in a field service organization is shown graphically in Exhibit II-6.

F. THIRD-PARTY MAINTENANCE (TPM)

- INPUT feels that the time has come to expand the traditional definition of third party maintenance services. There are, in fact, two types of TPM. One is a viable long-term business opportunity, the other is not.

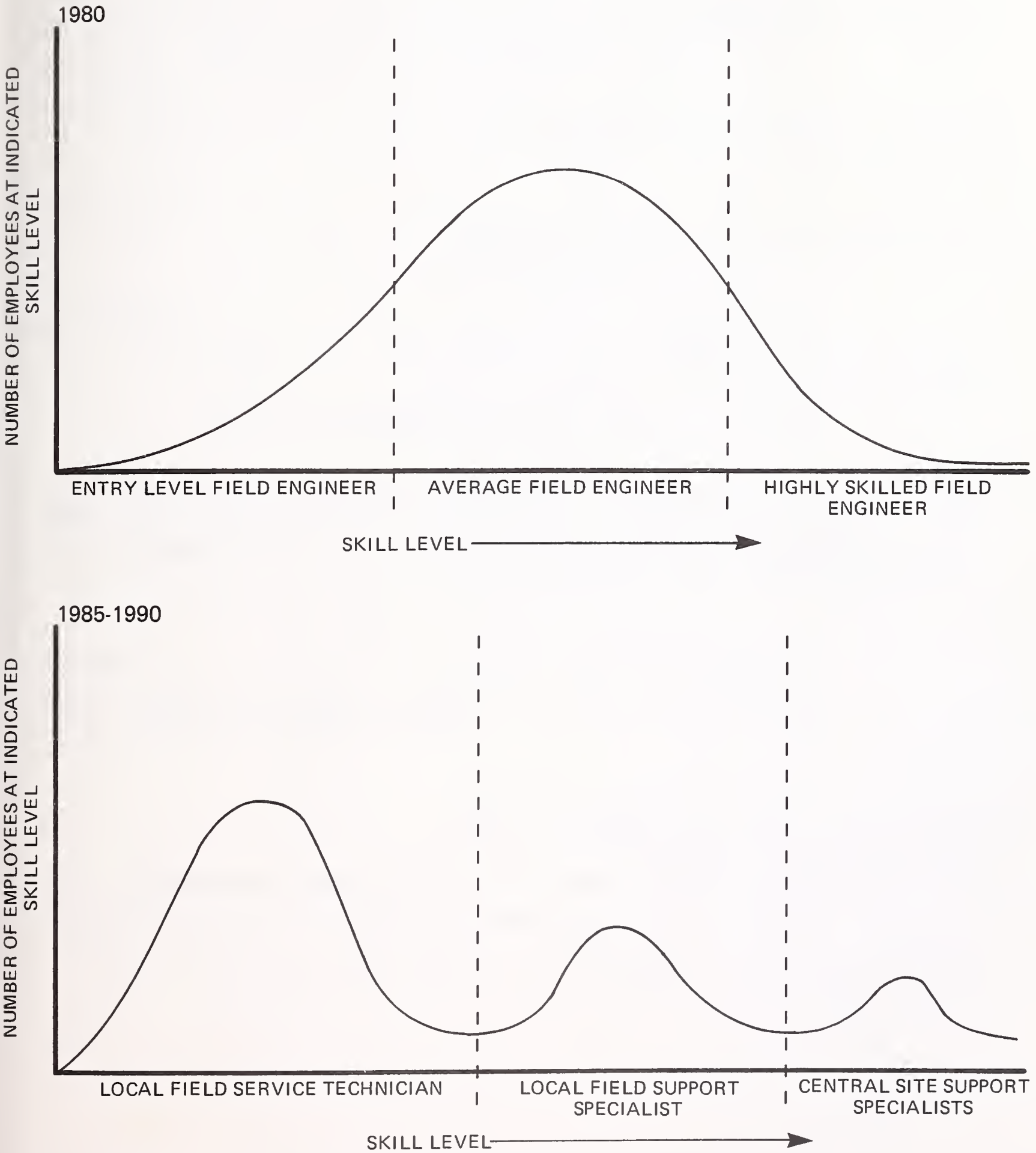
  - TPM firms who rely on contracts to provide maintenance on obsolete equipment and/or mixed vendor installations exist largely because the manufacturers want them to exist.

    . Their prime competitive edge is price.

    . The equipment suppliers could drive them out of business if they choose to do so, simply by making it difficult to obtain spare parts, or by reducing maintenance prices.

EXHIBIT II-6

SHIFT IN DISTRIBUTION OF SKILL LEVELS OF FIELD SERVICE PERSONNEL



. Another way to preclude end-user TPM is to prevent the TPM vendor from being able to maintain software.

. INPUT uses the term End-User TPM to describe this business.

- The second class of TPM business involves the establishment of long-term contracts between a TPM firm and a manufacturer wherein the TPM firm agrees to handle all of the maintenance of a product or product line within a prescribed geographic territory (which may be national or even international).

- The TPM vendor also participates in the design phase of new products under development by the vendor.

- In this situation, the TPM vendor becomes, in effect, a partner of the manufacturer.

- INPUT uses the term OEM TPM to describe this business.

- In contrast to End-User TPM, OEM TPM is an emerging new business opportunity. There are several premises upon which the business can be approached:

  - Offering services based upon specialized expertise, e.g., CAD/CAM, communications systems, knowledge of specialized process environments, etc.

  - Offering services based on geographic distribution.

  - Offering services based on extensive available facilities such as system support centers, repair depots, automatic test equipment, warehouse locations, transportation facilities, communications networks, etc.

- OEM TPM is receiving increased attention from major vendors, both as buyers and sellers.

  - Some large companies are seriously considering awarding OEM TPM contracts on some of their smaller product lines.

  - A few of the same companies are seriously considering entering the OEM TPM business in certain geographic areas.

- A new phenomenon that may impact the TPM business over the next few years is the interest evidenced by a few large users in getting into the business.

  - A large aerospace company, which maintains its own systems, is now offering End-User TPM in a limited geographic area.

  - A large bank which maintains its own office equipment is seriously considering the creation of a subsidiary which would offer both End-User and OEM TPM services.

- Although TPM accounts for less than 10% of maintenance expenditures today, OEM TPM is growing rapidly. Coincident with the shift to P&L operations within large field service organizations, INPUT expects to see more activity in this sector in the next few years.

G. OTHER RECOMMENDATIONS

- There are, of course, many other policy considerations relating to profitability that concern the way the field engineering organization conducts its business. Some pricing recommendations:

  - Contract terms should call for payment in advance rather than in arrears.

- Zone maintenance coverage should be evaluated in a business context. Too many companies provide coverage based on competition rather than on the real ability to provide service at rational costs.

- Reporting of FE time must be carefully monitored. Too often FEs prevaricate because they don't want to report dead time.

- Field engineering must begin to develop user applications knowledge as applications become involved in the life blood of a business; i.e., in banking, the maintenance strategy must adapt to the critical nature of the system.

- Communications alternatives open to users and to field engineering are increasing, as evidenced by value added networks such as MCI and XTEN from Xerox. Field engineering must consider the changes in communications in product and business plans.

III RESULTS AND ANALYSIS OF THE MAINTENANCE USER SURVEY

III RESULTS AND ANALYSIS OF THE MAINTENANCE USER SURVEY

A. METHODOLOGY AND USER PROFILE

- While organizing, conducting and analyzing the 1980 user survey, INPUT focused on four major objectives:

  - To update significant issues raised in the multiclient study, "Maintenance Requirements in the Information Processing Industry, 1978-1983."

  - To examine user's reactions and responses to new issues; e.g., system support centers, remote diagnostics, software maintenance.

  - To explore and expose changing user attitudes which may suggest new business opportunities and/or opportunities for client vendors to gain efficiencies in present operations.

  - To strike a reasonable balance among prior issues, new issues and changing attitudes so that all significant trends may be readdressed by the "Annual Report" on cycles of three to five years.

- Seventy-six of the 145 users interviewed in 1978 were selected as being representative, and were presented with the new survey questions designed to achieve current objectives. (See Appendix D for user questionnaire.)

- Decision makers (Vice Presidents and Directors of MIS) provided most of the user responses and comments. The telephone interviews lasted from 30 minutes to one and one-half hours each.

- Users continue to acquire equipment from vendors other than their mainframe vendor thereby extending the trend towards multivendor shops and enlarging the opportunities for single-source problem determination and maintenance coordination contracts. However, the opportunities to contract for centralized and/or single-source services may be reaching a peak very soon as users become more efficient at problem determination within their own organizations.

  - The trend to multivendor shops was evidenced by user responses. Asked to identify maintenance vendors in five separate hardware categories and two software categories, respondent users named 48 different hardware vendors and 22 vendors in software maintenance.

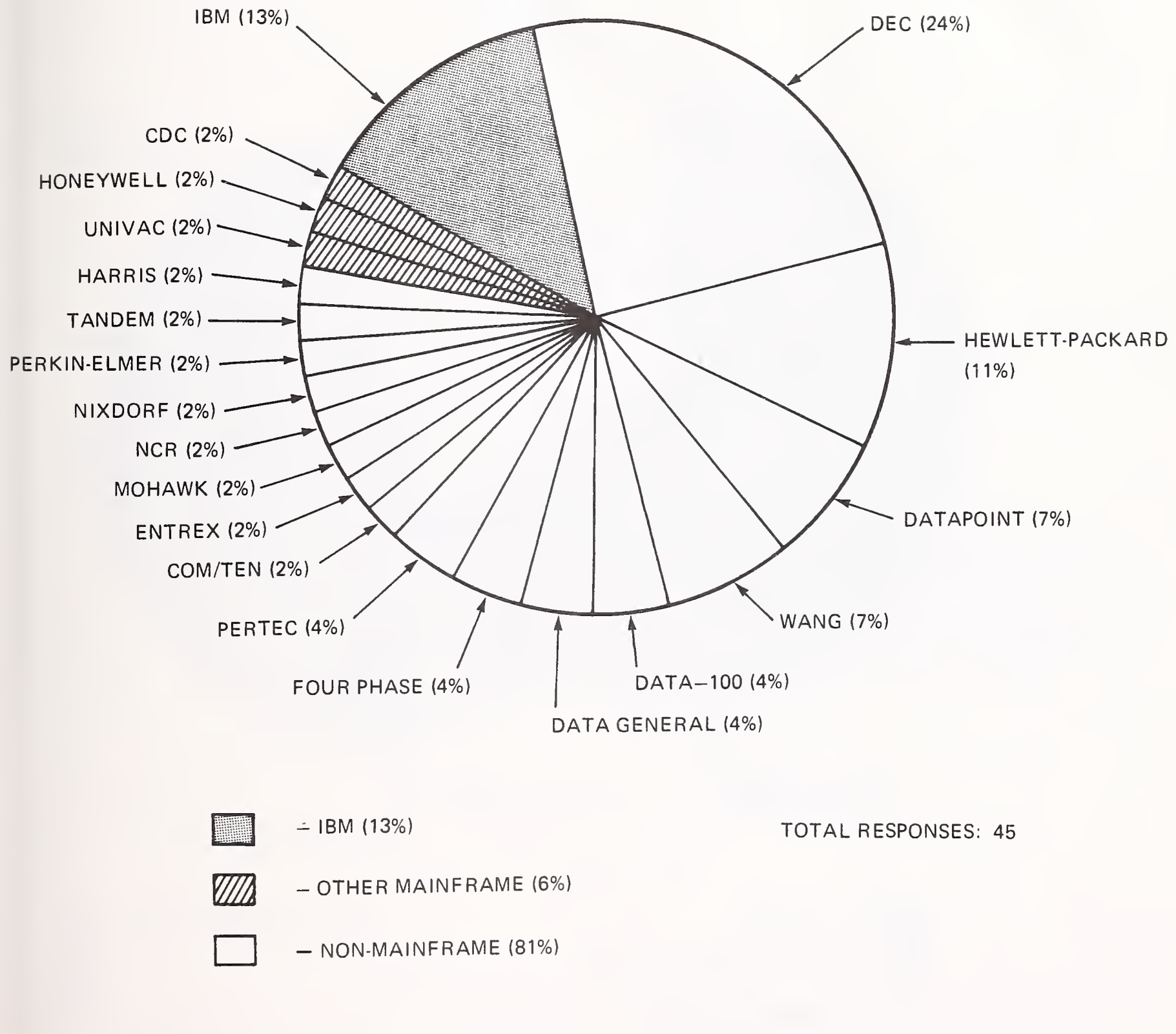
  - The hardware and software maintenance vendors mentioned by respondents are presented in detail in Exhibits III-3 through III-7. Although the profile of maintenance vendors in the survey generally parallels the total U.S. profile of maintenance vendors, the reader should be aware that some differences exist, for example, the concentration on EDP managers means that some vendors who do not sell in this environment are under represented in the profile.

  - As expected, IBM remains the dominant vendor among those interviewed in every category except minicomputers, where Digital Equipment holds a 24% to 13% vendor count edge over IBM as shown in Exhibit III-1.

  - It is important for the reader to remain aware of certain points as the vendor distribution profiles shown in Exhibits III-1 through III-7 are studied: otherwise there may appear to be distortion where, in fact, there is none. For example, a 10% maintenance vendor count for

EXHIBIT III-1

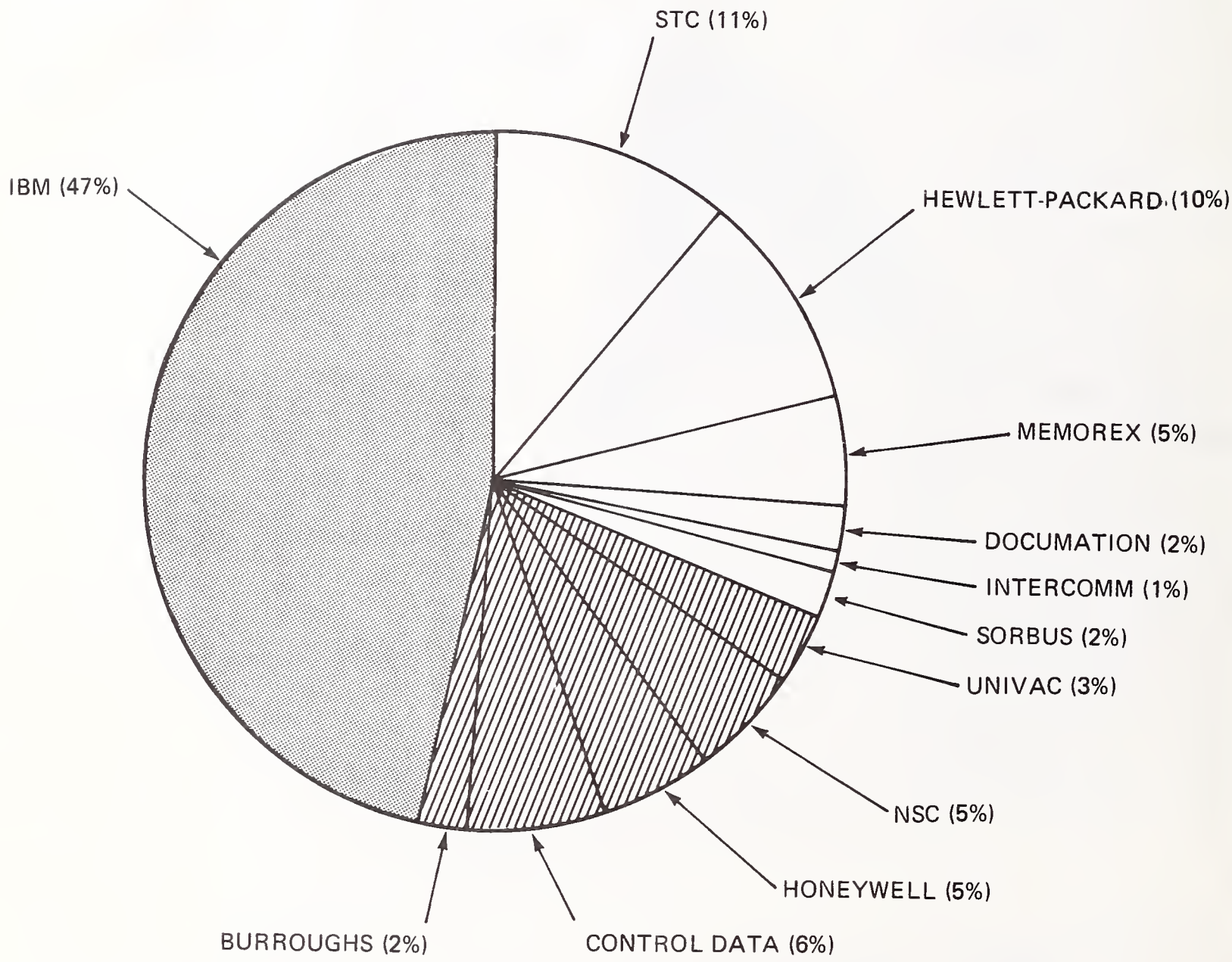
MINICOMPUTER MAINTENANCE VENDORS



TOTAL RESPONSES: 45

EXHIBIT III-2

PERIPHERAL MAINTENANCE VENDORS



— IBM (47%)

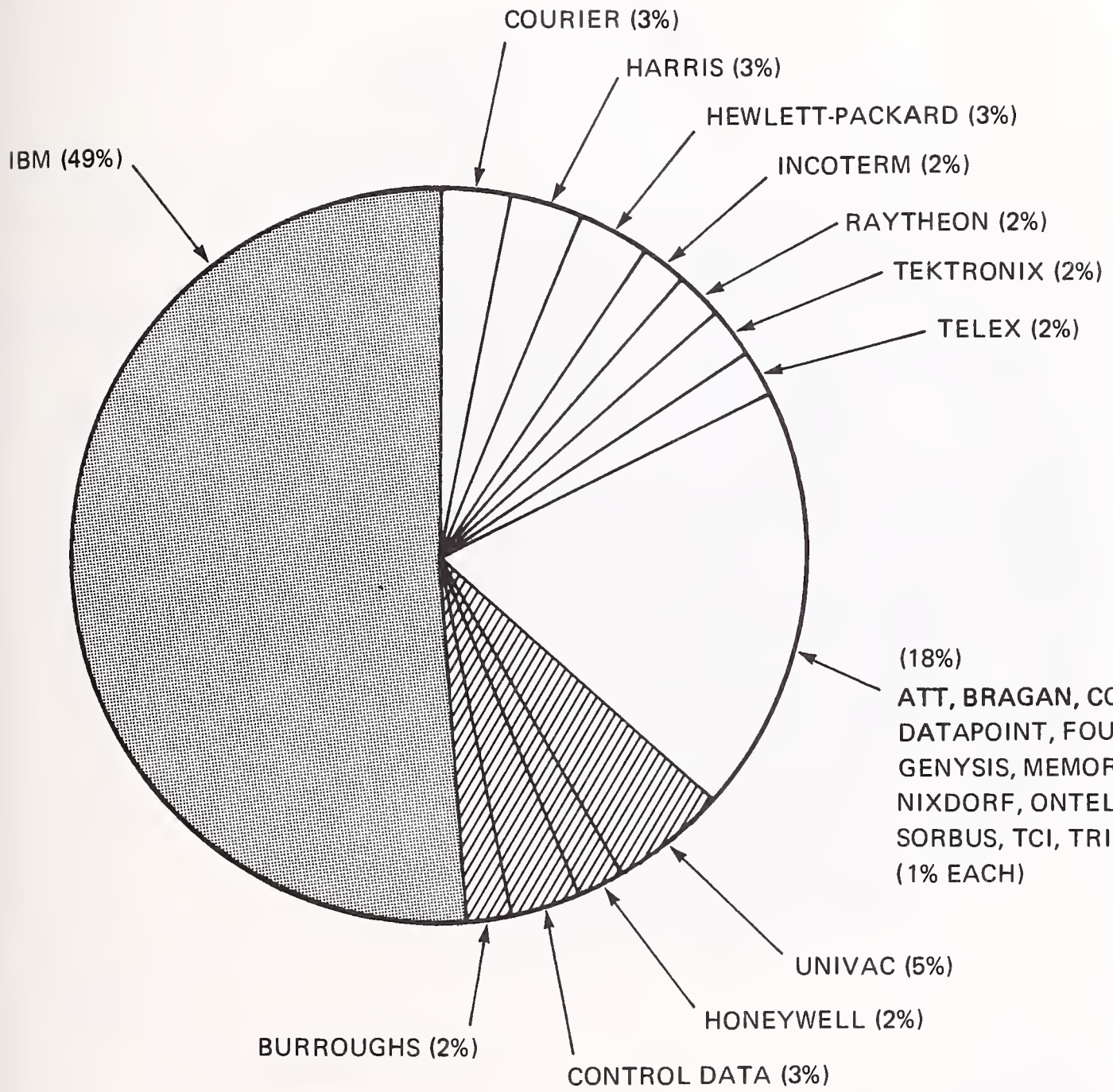
— OTHER MAINFRAME (21%)

— NON-MAINFRAME (31%)

TOTAL RESPONSES: 97

EXHIBIT III-3

TERMINAL MAINTENANCE VENDORS



– IBM (49%)

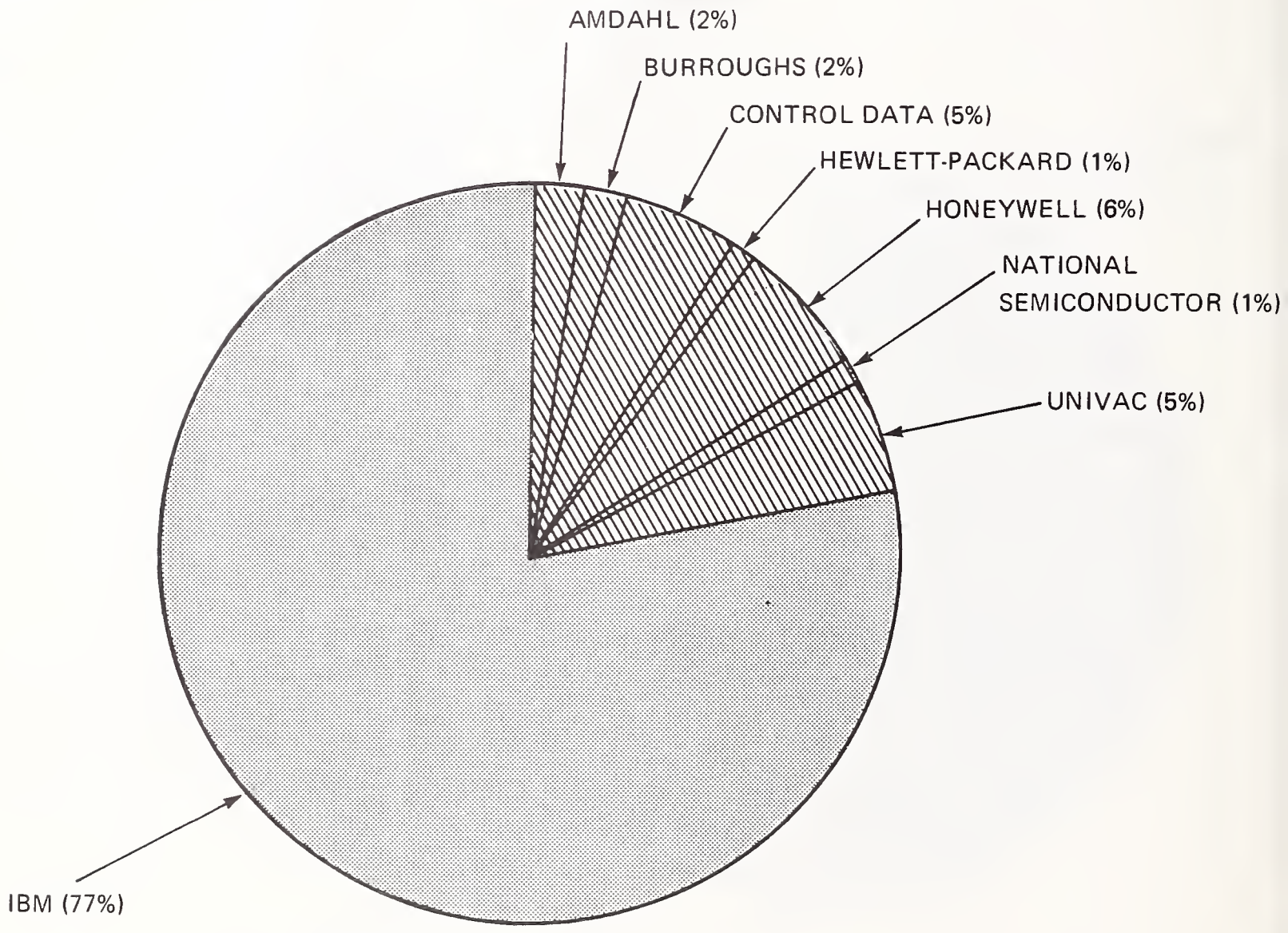
– OTHER MAINFRAME (12%)

– NON-MAINFRAME (35%)

TOTAL RESPONSES: 90

EXHIBIT III-4

MAINFRAME MAINTENANCE VENDORS



– IBM (77%)

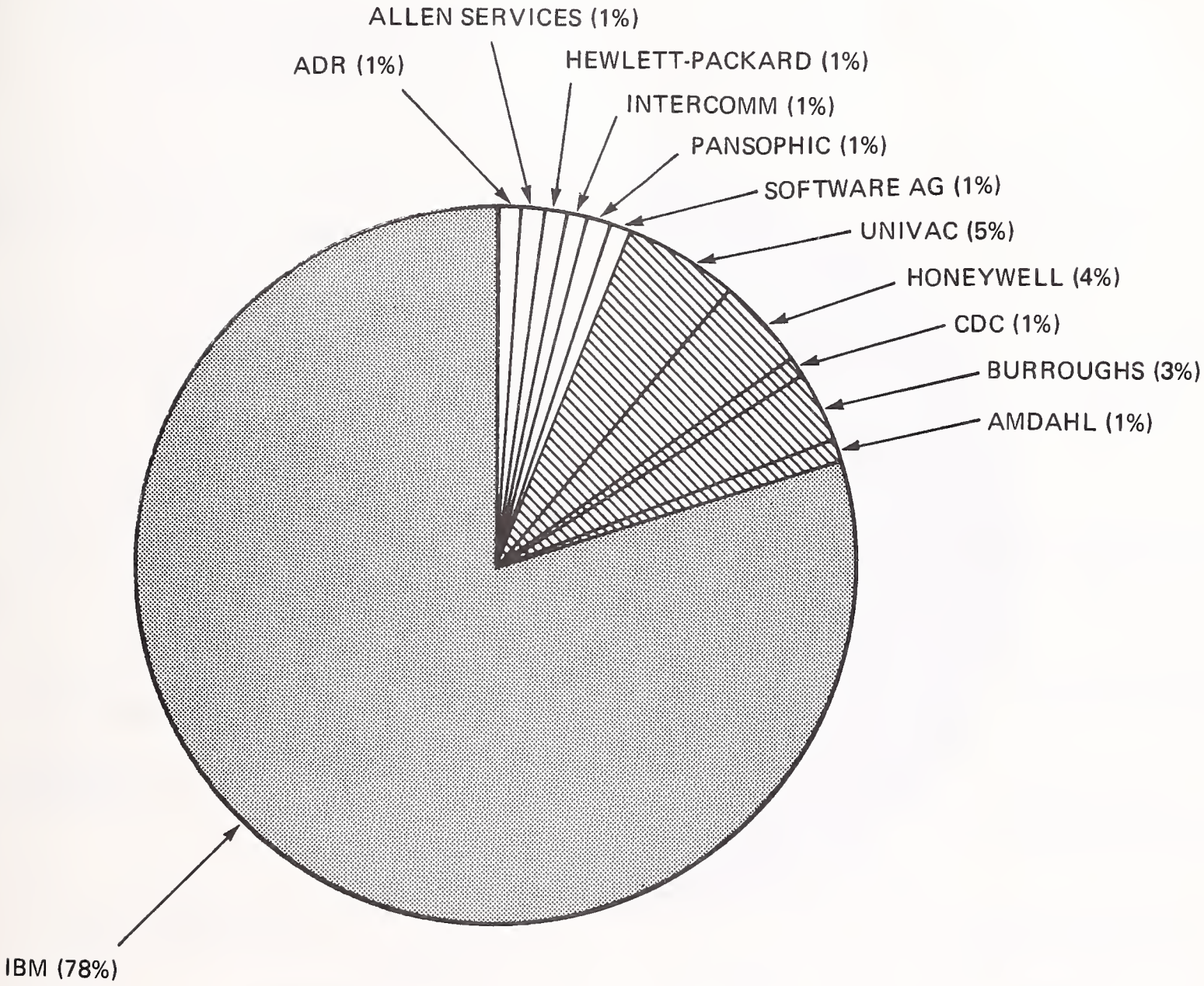
– OTHER MAINFRAME (22%)

– NON-MAINFRAME (0%)

TOTAL RESPONSES: 83

EXHIBIT III-5

SYSTEM SOFTWARE MAINTENANCE VENDORS



TOTAL RESPONSES: 78

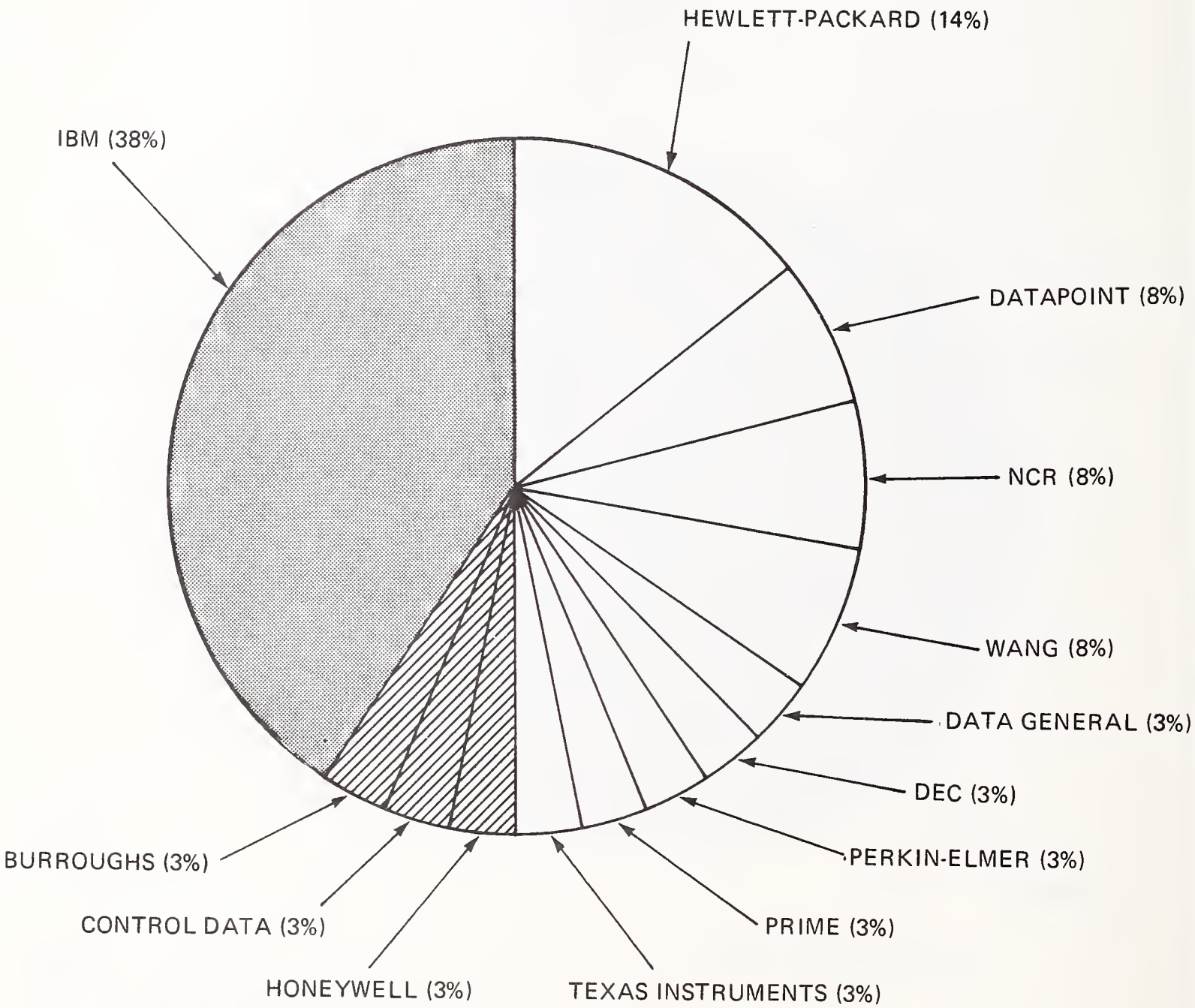
— IBM (78%)

— OTHER MAINFRAME (14%)

— NON-MAINFRAME (6%)

EXHIBIT III-6

SMALL BUSINESS MACHINE MAINTENANCE VENDORS



– IBM (38%)

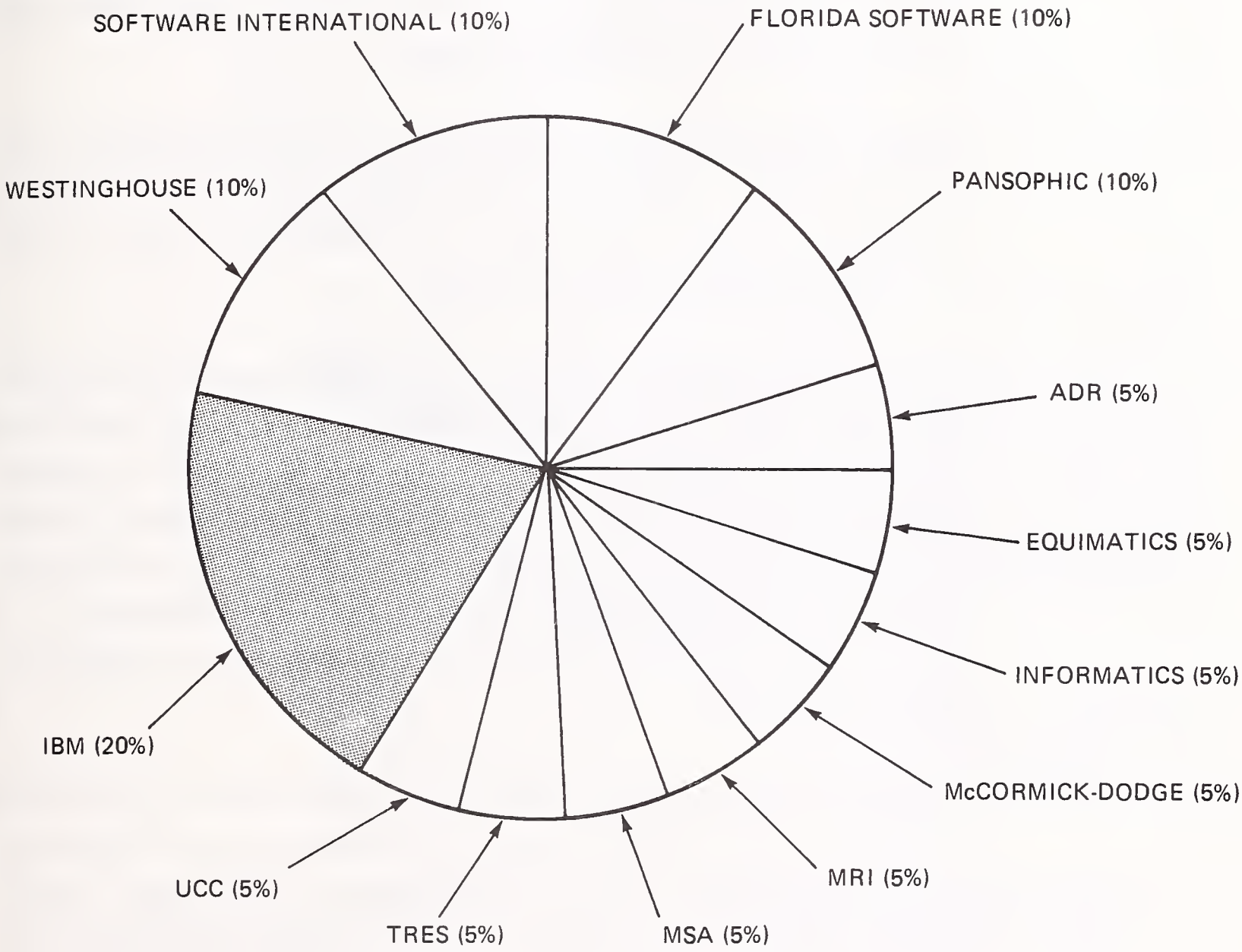
– OTHER MAINFRAME (9%)

– NON-MAINFRAME (53%)

TOTAL RESPONSES: 29

EXHIBIT III-7

APPLICATION SOFTWARE MAINTENANCE VENDORS



TOTAL RESPONSES: 20

– IBM (20%)

– OTHER MAINFRAME (0%)

– NON-MAINFRAME (80%)

Hewlett-Packard is indicated in the category of "Peripheral Maintenance Vendors" shown in Exhibit III-2. This does not imply that Hewlett-Packard enjoys a 10% share of the peripheral market, but rather that Hewlett-Packard was mentioned ten times out of the 97 responses to the question, "Which vendors maintain your peripherals?" (Only 76 user interviews were carried out, but some users named more than one peripheral maintenance vendor.)

- Storage Technology Corporation, Memorex, National (previously Itel), most of Sorbus and Control Data Corporation make up the bulk of "Plug Compatible" peripheral maintenance and collectively account for 29% of the vendors mentioned in Exhibit III-2.

- A significant number of different vendors (29) service terminals for respondent users shown in Exhibit III-3. Users have found spare terminals to be relatively easy to install and to remove for service. Remote locations exercise local autonomy in many cases to select terminals according to their own criteria. This factor is additional supporting evidence that users are becoming more independent of a single vendor in searching for ways to cut costs and to mitigate the effects of downtime.

- As expected, the mainframe maintenance vendors shown in Exhibit III-4 are also the system software maintenance vendors shown in Exhibit III-5. IBM is absolutely dominant in both cases. Users, almost without exception, depend on mainframe vendors to supply and maintain system software. A notable exception is National Semiconductor (Itel), mentioned as a mainframe maintenance vendor of "Plug Compatible CPU's", which arranges for IBM to supply and maintain system software. The presence of 5% independent vendors of system software maintenance bears watching and suggests another opportunity for field service vendors, that of maintaining, and perhaps also supplying, system software.

- Vendors other than IBM are making significant penetration into the Small Business, Word Processing, and Distributed Data Processing categories shown in Exhibit III-6. The majority of maintenance vendors mentioned were other than mainframe vendors. Datapoint, Hewlett-Packard, Texas Instruments and others are combining to penetrate this market segment to the same extent that they and Digital Equipment have done in the minicomputer market as shown in Exhibit III-1.

- Exhibit III-7 shows that IBM remains the only hardware vendor servicing respondent user application software, and was mentioned only four times out of 20 responses. Most of the 76 respondent users maintain their own applications software.

  . This maintenance activity does not appear to represent a major opportunity for field service companies in the near future, although the heavy user investment in self-maintenance of applications software is a tempting long-term opportunity. The difficulty in maintaining applications software stems largely from the fact that users write, or modify almost all applications software. The standardization which exists in systems software does not exist in applications software.

  . The vendor who devises a method for profitably maintaining applications software will tap a multi-billion dollar market.

B. USER ATTITUDES CONCERNING CONTRACTED MAINTENANCE AND COVERAGE

- Respondent users show no significant tendency to migrate from contract maintenance to time and material as shown in Exhibit III-8. Out of 435 responses concerning which vendor maintains which types of equipment, only eight responses were for time and materials versus contracted maintenance, a

EXHIBIT III-8

MAINTENANCE CONTRACT VERSUS TIME AND MATERIALS USAGE

CATEGORY	CONTRACT		TIME & MATERIALS	
	NUMBER	PERCENT	NUMBER	PERCENT
MAINFRAME	83	100%	0	0%
SMALL BUSINESS COMPUTER	28	97	1	3
MINICOMPUTER	43	96	2	4
PERIPHERAL	96	99	1	1
TERMINAL	90	100	0	0
SYSTEM SOFTWARE	75	96	3	4
APPLICATION SOFTWARE	20	95	1	5
TOTAL	435	98%	8	2%

total of only 2%. Most of the weight in even this low average came from software maintenance which has very little risk of catastrophic failure. Minicomputers, which are mostly integrated into larger engineering systems, make up most of the remainder. The most likely migration will occur in the cases of integrated minicomputers and small business systems easily transported to maintenance or exchange centers.

- Few users appear willing to assume the risk of catastrophic maintenance expenses which are effectively "pooled" risks to most vendors.

- There continues to be general acceptance of the fact that hardware maintenance contracts are good insurance policies for assuring reliability and high residual value of used equipment.

- Regarding extended shift coverage, a review of users interviewed in the 1978 and 1980 surveys indicated no significant trends except a smoothing out of the 1978 "glitch" on the six-day coverage as indicated in Exhibit III-9. While 100% of the respondents had five-day, one-shift coverage, only approximately half of the respondents had coverage beyond that.

- The slight movement from 35% to 40% of users contracting only one shift does not appear to be significant in the sample shown as in Exhibit III-10. The real significance of user attitudes on shift extensions emerges from user comments.

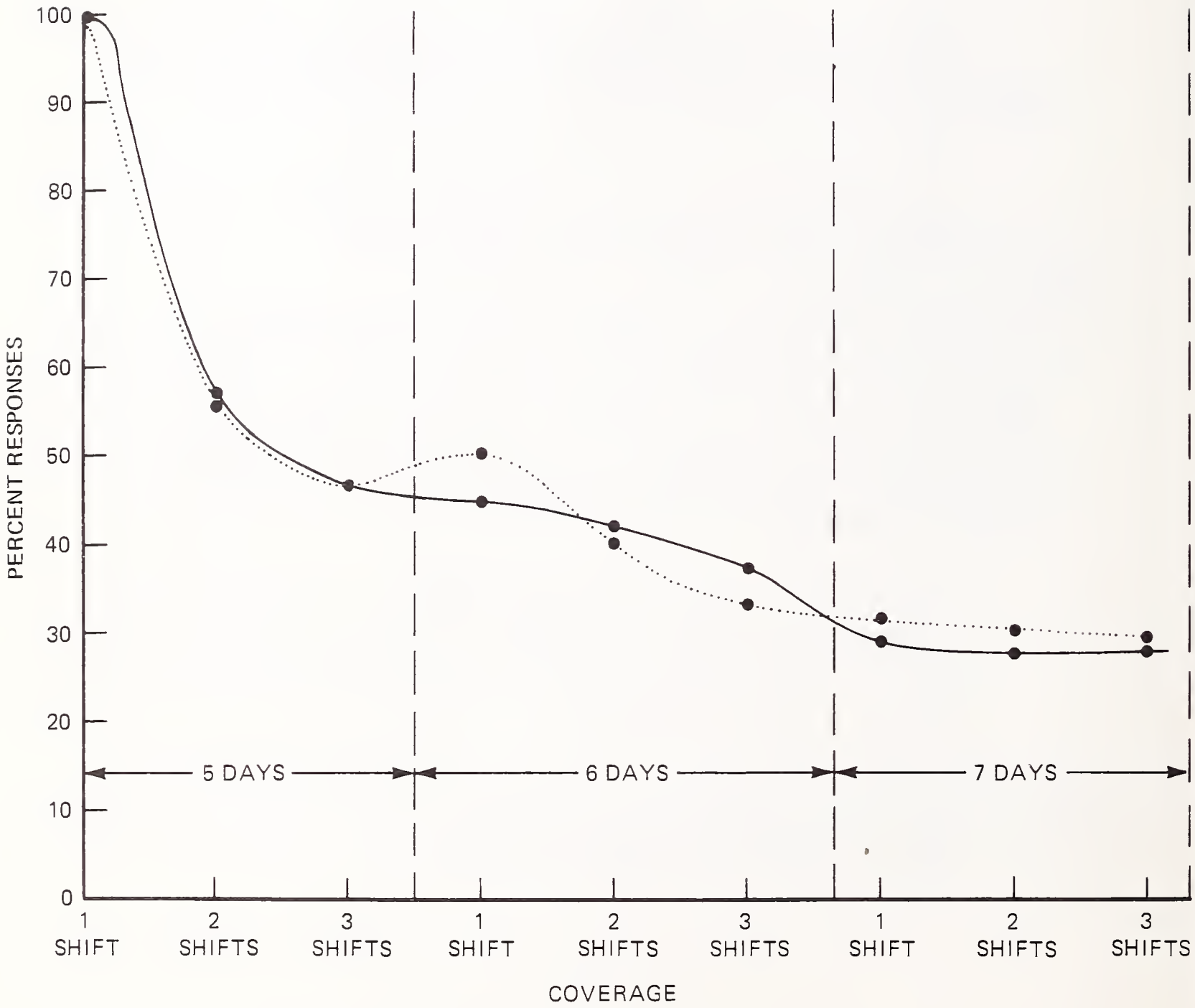
- Users with critical on-line systems are reluctant to risk being unable to find a qualified field engineer after hours.

  . "Had no choice but to go to full coverage when we went on-line."

  . "We'd keep full coverage even if we were no longer on lease."

EXHIBIT III-9

CUMULATIVE MAINTENANCE COVERAGE REQUIREMENTS, 1978 AND 1980



NUMBER OF RESPONSES: 1978 (133)
1980 (76)

EXHIBIT III-10

COMPARATIVE MAINTENANCE COVERAGE REQUIREMENTS, 1978-1980

COVERAGE		1978*		1980	
		NUMBER	PERCENT	NUMBER	PERCENT
5 DAYS	1 SHIFT	46	35%	30	40%
	2 SHIFTS	8	6	4	5
	3 SHIFTS	13	10	8	10
6 DAYS	1 SHIFT	10	8	2	3
	2 SHIFTS	2	2	3	4
	3 SHIFTS	11	8	7	9
7 DAYS	1 SHIFT	3	2	1	1
	2 SHIFTS	1	1	0	0
	3 SHIFTS	39	28	21	28
TOTAL		133	100%	76	100%

*FROM "MAINTENANCE REQUIREMENTS IN THE INFORMATION PROCESSING INDUSTRY, 1978-1983."

- Unusually large accounts use leverage to get the coverage they need.

  . "We need three shifts of coverage to keep 13 mainframes and 600 disk drives operating."

  . "With so many vendors, we can stagger prime shifts among them around the clock and manage to keep at least one field engineer around for problem determination."

- Cost-conscious users maintaining good records of failures, time-of-calls, response times, etc., find ways to balance needs and costs by manipulating shift coverage.

  . "We buy full coverage on our mainframes, which provides us with qualified standby coverage on peripherals."

  . "Just recently went from three shifts to two to save money."

  . "We cut back to single shift on all but the CPU and saved 47% on peripherals. The F.E. was always trying to defer calls to first shift anyway."

- Some users simply have no choice. Shift coverage is dictated by circumstances.

  . Several users stated that full coverage was bundled into the lease contract, affording them no opportunity to save.

  . "We have full coverage on older IBM systems (12-15 years) that are always breaking down. We must be able to get service at any time. GSA won't authorize new systems."

C. MEAN TIME TO RESPOND AND REPAIR AS PERCEIVED BY USERS

- Exhibit III-11 through III-15 graphically display the relationships of response times and repair times as perceived by the users. Cumulative tabulations of the results are included in Appendix C (C-1 through C-5). The data have been displayed in cumulative format rather than by discrete distribution. This format is consistent with most business executives' perceptions of problem areas requiring optimum resource allocation.

  - Each point on the graph represents the percentage of respondents who experience response or repair in the indicated time or less.

  - Response time is measured by the time elapsed from placement of the call by the user, until the arrival of the field engineer.

  - Repair time is the time required on-site to resolve the problem, measured from the time of arrival of the field engineer.

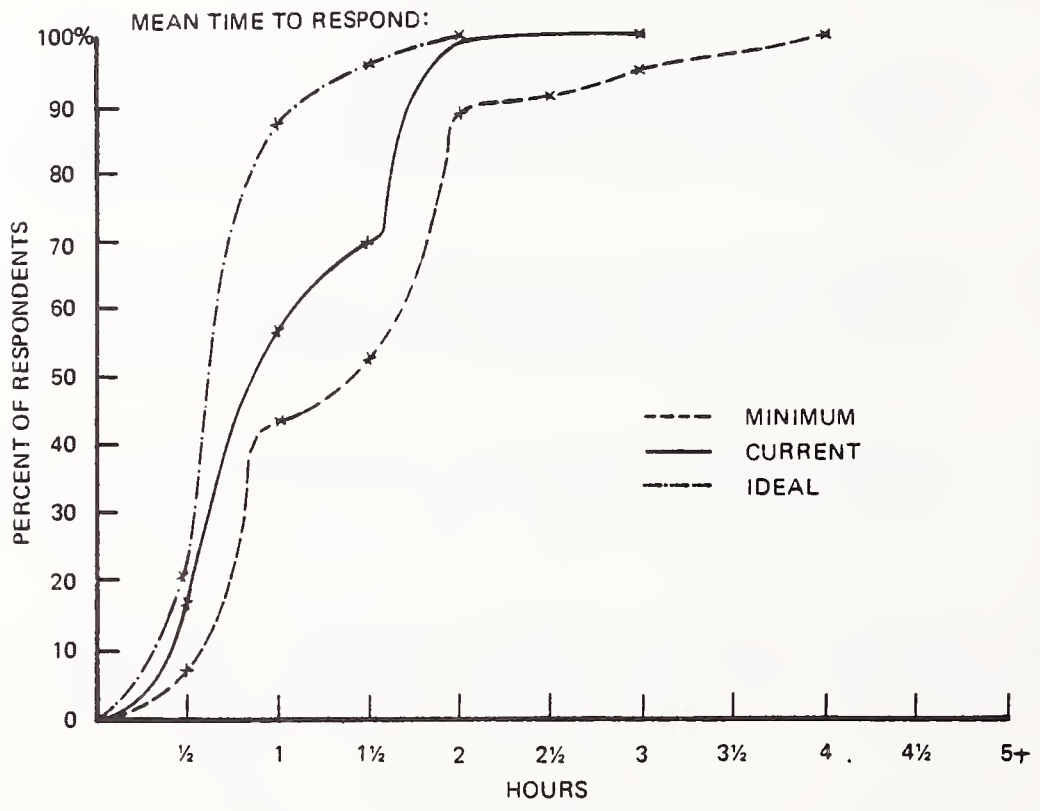
- The exhibits presented in this section will be repeated in Chapter V on the vendor survey, with a comparative analysis of user perceptions versus vendor perceptions in this most important issue. In Chapter IV, certain of these data are separated into IBM user's versus non-IBM users' perceptions, to provide insight into the similarities and differences between the two.

- Ideally, according to 100% of respondent users shown in Exhibit III-11, a qualified field engineer should respond to mainframe calls within two hours and have the equipment running no later than three hours after arrival. When asked about minimum acceptable performance in mainframe maintenance, 88% of the respondent users held the line at two hours for response, while only 73% insisted on a mean time to repair of three hours.

  - Actual response time and mean time to repair mainframes tend to fall neatly between ideal and minimum acceptable performance curves.

EXHIBIT III-11

MAINFRAME MEAN TIME TO RESPOND AND REPAIR: MINIMUM, CURRENT AND IDEAL – USER RESPONSES



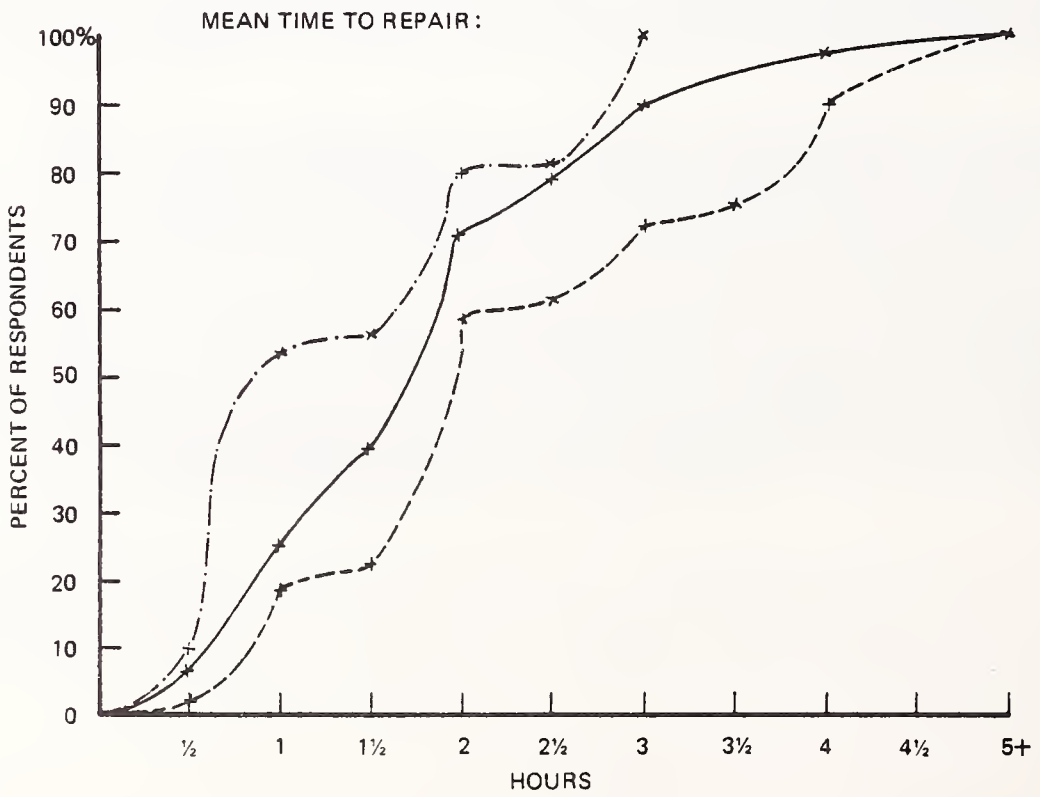


EXHIBIT III-12

SMALL BUSINESS MACHINE MEAN TIME TO RESPOND AND REPAIR: MINIMUM, CURRENT AND IDEAL – USER RESPONSES

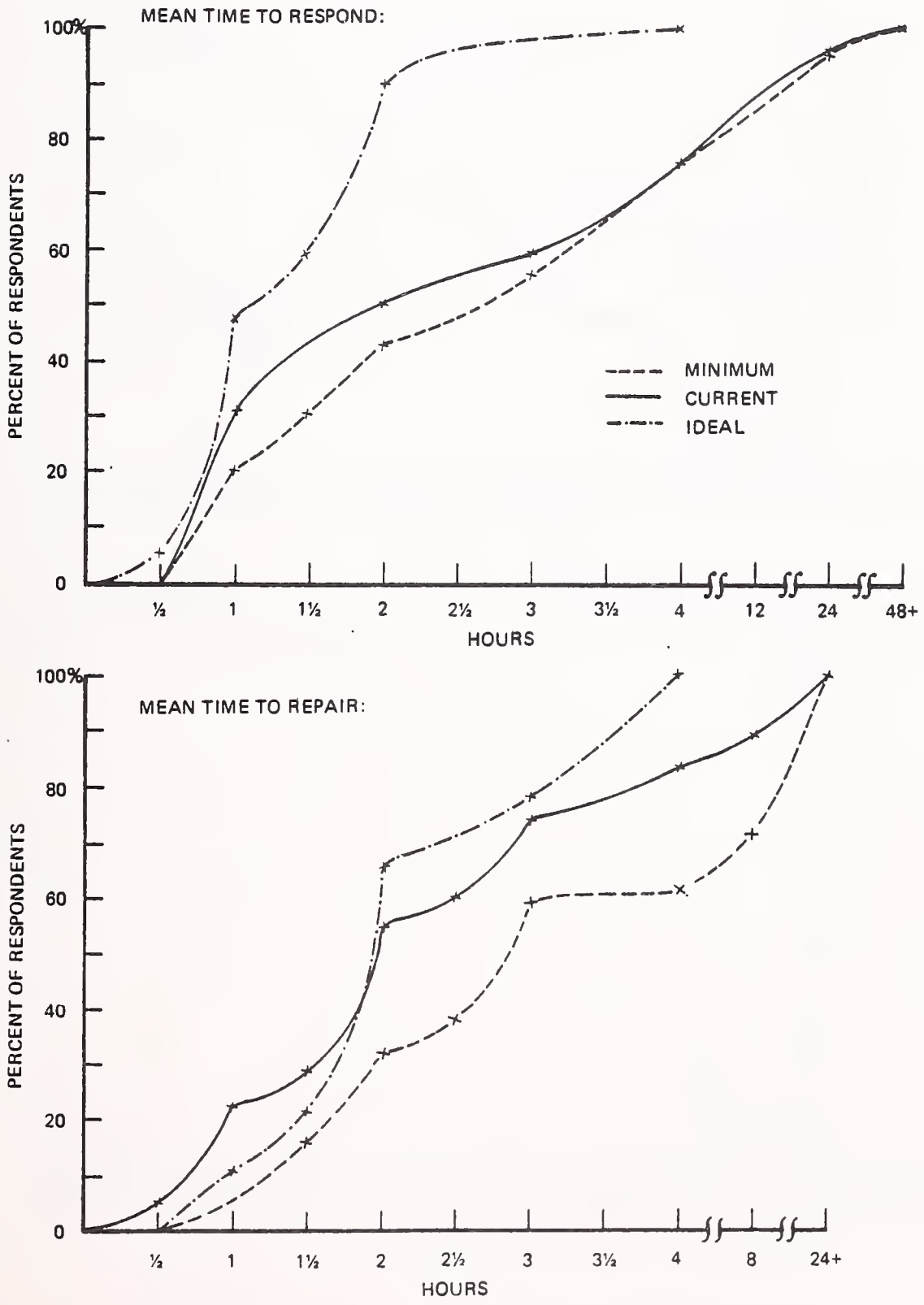


EXHIBIT III-13

MINICOMPUTER MEAN TIME TO RESPOND AND REPAIR: MINIMUM, CURRENT AND IDEAL – USER RESPONSES

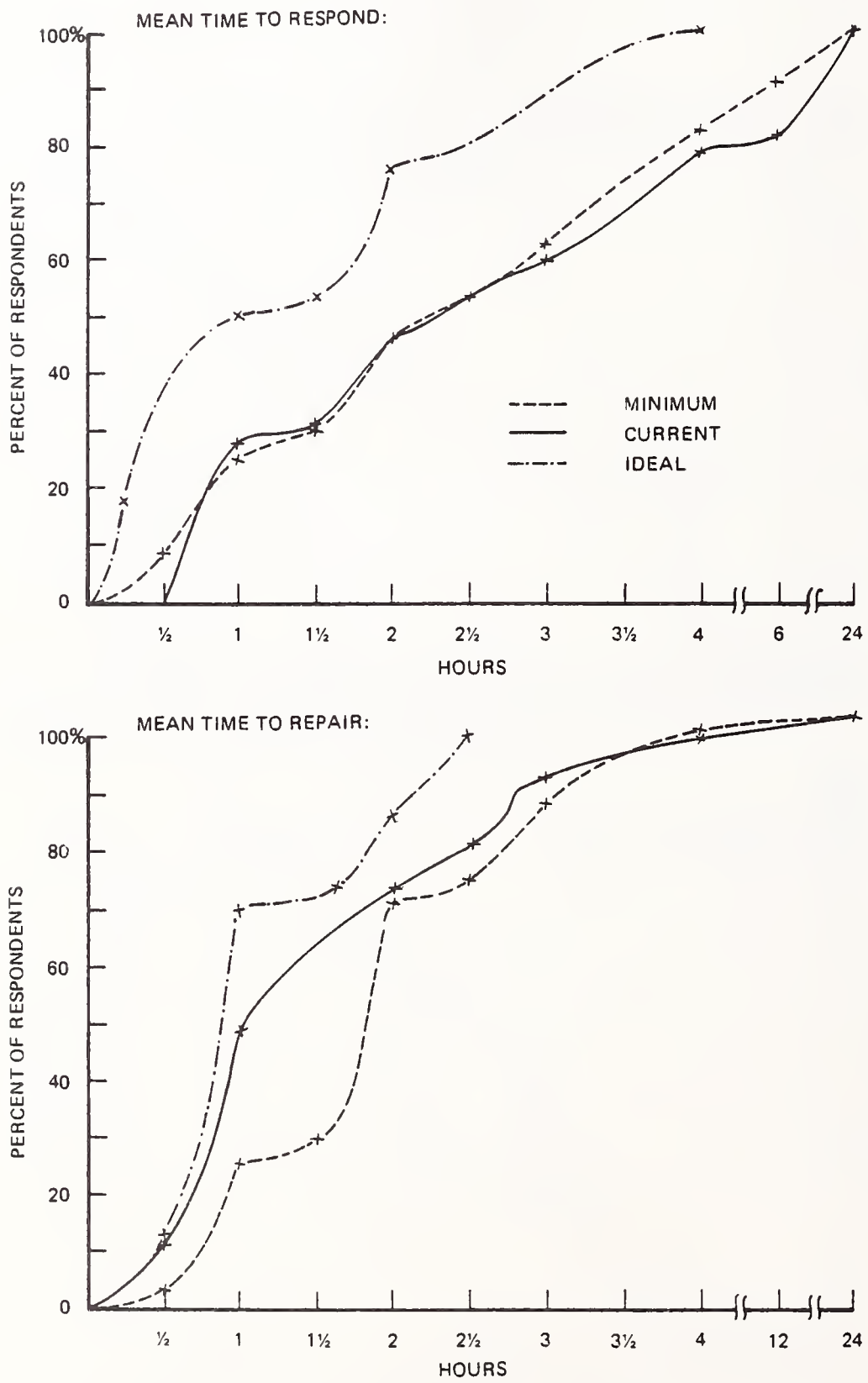
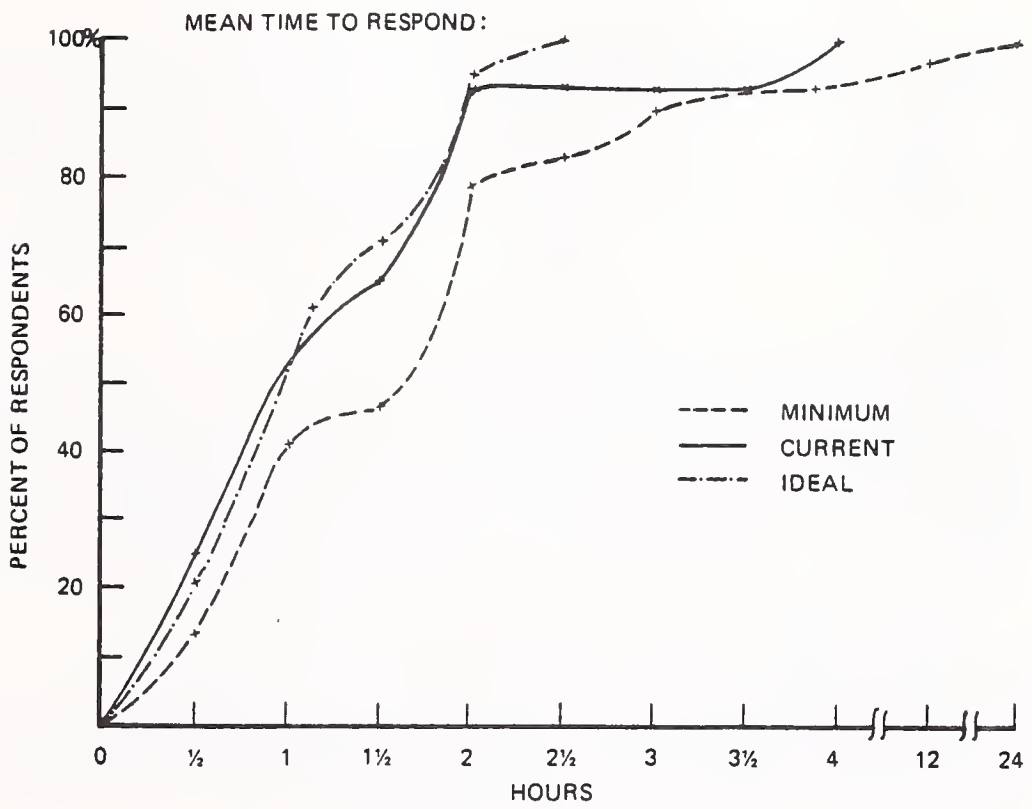


EXHIBIT III-14

PERIPHERAL MEAN TIME TO RESPOND AND REPAIR: MINIMUM, CURRENT AND IDEAL – USER RESPONSES



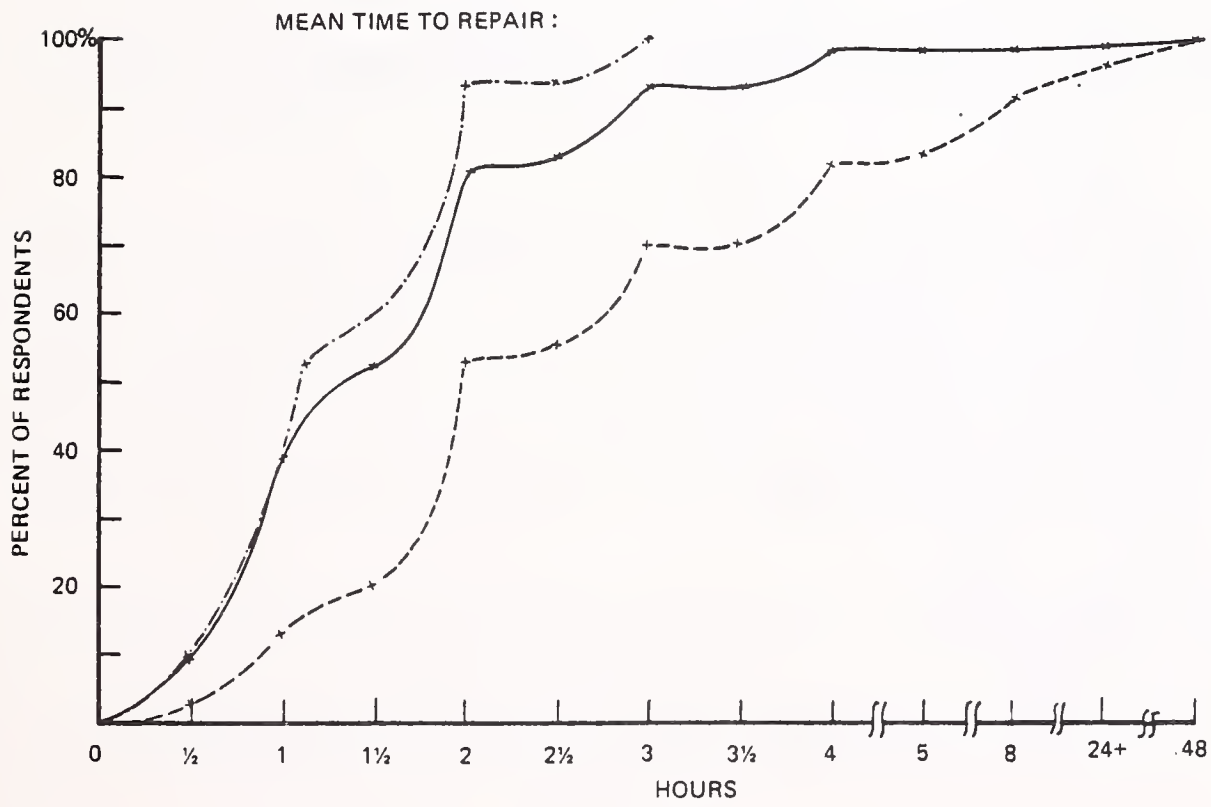
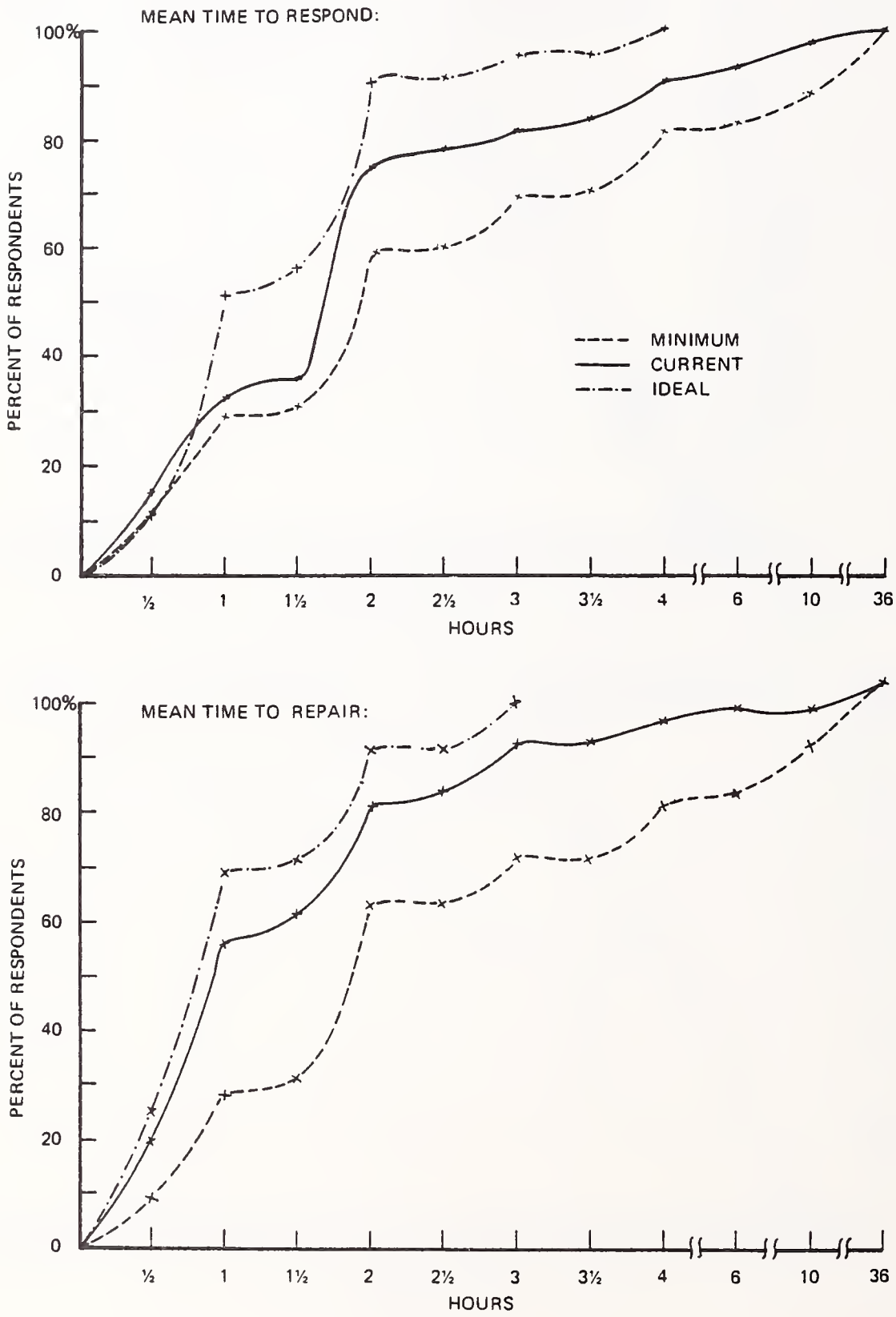


EXHIBIT III-15

TERMINAL MEAN TIME TO RESPOND AND REPAIR: MINIMUM, CURRENT AND IDEAL – USER RESPONSES



- Mainframe maintenance is viewed as critical by users, as can be seen by comparing Exhibit III-11 with later exhibits.

- Small business system users expect less as minimum acceptable performance and tend to receive barely acceptable performance in response time. Mean time to repair comes a little closer to the ideal in small business machines, as shown in Exhibit III-12.

  - Only 75% of small business machine users expect a response within four hours, and they are getting exactly that. One hundred percent think four hours would be ideal, while a small percentage find 48 hours acceptable.

  - The majority of small business system users expect a two-hour response and would like to have calls covered in less than one and one-half hours. Most users expect the repair to be completed within three hours after the field engineer's arrival.

  - It is not entirely clear at this point whether small business system users are getting only what they demand or whether they are accepting what they get as minimum acceptable performance. One clue to their needs is the fact that 32% of them expressed a willingness to pay a premium for guaranteed response times, an issue covered in more detail later in this chapter.

- Minicomputer users perceive that they are getting less than acceptable performance in response time, as shown on Exhibit III-13. Over half the respondent users expect field engineers to arrive in less than two and one-half hours, and would like to have them there within one hour. Once on-site, the field engineers perform repairs at mean times close to user ideals.

  - The application has much to do with the response level required. User comment: "If and when we go on-line with the minis, DEC will have to bring service up to the minimum standards or they will be replaced."

- One user indicated that although response times were averaging longer than expected, the Hewlett-Packard equipment was so reliable that he did not need service often enough for it to be a problem. He rated the service very high.

- Ninety-five percent of respondent peripheral users are receiving service approaching or exceeding ideal response times. Peripheral maintenance vendors received both the highest marks for current satisfaction and the highest vendor turnover rate in the past two years. (Vendor turnover is discussed in more detail in more detail later in this chapter.) These factors and higher density in peripherals are major causes contributing to the effects observed in Exhibit III-14.

- Over 50% of the respondent users see two hours as the ideal turnaround time, and most of them have their peripheral units back in service within two and one-half hours. Users are not likely to relax these standards on peripherals.

  - "We replaced Itel disk drives because of high failure rates and slow turnaround on maintenance."

- The message to peripheral vendors is clear: provide maintenance at levels the user perceives to be "ideal" or face the probability of being replaced by a vendor who will provide these levels.

- As with all responses to the survey, answers are impacted by the fact that those interviewed were primarily at large central sites. Smaller, remote sites would not present the same competitive environment, with response times tending to be longer.

- Most terminal users responded that the ideal response time would be one hour or less, with two hours representing minimum performance as shown in Exhibit III-15. Seventy-five percent are getting service within the two-hour standard, therefore terminal maintenance vendors are perceived as doing their job as a

group. Users have demonstrated their willingness over the past two years to replace terminal vendors with poor maintenance and response records at a rate second only to peripheral vendors.

- User comment: "DEC wasn't doing too well maintaining their terminals, so we kept their equipment and contracted CDC for maintenance. CDC guarantees us four-hour response time."

- Another: "Already replaced IBM peripherals with STC because of poor response and turnaround. We aren't satisfied with IBM terminals and are monitoring maintenance performance now expecting that we will have to replace them soon."

- Only 16% of respondent users replied that they would be willing to pay an average of 14% premium for improved response times as shown in Exhibit III-16. This should be enough to encourage some vendors, expecially in small business machines, to tailor some contracts for critical users. A wide variety of responses from users willing to pay for better performance suggests high correlations with remote and/or critical installations. This issue should be discussed individually between vendors and users at the executive-to-executive level.

  - The willingness of users to pay a premium for improved service is probably understated; users resist admitting a willingness to pay more for fear vendors will interpret that as an invitation to raise prices.

  - INPUT believes that users would be willing to pay significantly higher maintenance charges if they in fact believed improved service would result.

D. GENERAL USER SATISFACTION WITH MAINTENANCE

- Respondent users were generally enthusiastic in responding to overall maintenance ratings in all hardware categories and system software maintenance as

EXHIBIT III-16

USERS' WILLINGNESS TO PAY MORE FOR IDEAL MAINTENANCE

CATEGORY	WILLING		NOT WILLING		AMOUNT WILLING TO PAY	
	NUMBER	PERCENT	NUMBER	PERCENT	AVERAGE (%)	RANGE (%)
MAINFRAME	9	12%	64	88%	13%	5-20%
SMALL BUSINESS MACHINE	6	32	13	68	14	5-20
MINICOMPUTER	5	19	22	81	14	5-20
PERIPHERAL	10	13	66	87	11	10-15
TERMINAL	8	17	39	83	17	10-25
TOTAL	38	16%	204	84%	14%	5-25%

shown in Exhibit III-17. This high level of satisfaction is often surprising to field service managers, who spend much of their time dealing with higher levels of dissatisfaction.

- Less than 10% rated overall satisfaction low in any category.

- In every case but one, over half the users gave high marks in overall satisfaction with maintenance vendors.

- The one exception, applications software, actually is deceptive in that the vast majority of the applications software is maintained by the users themselves. All other categories of maintenance have been traditionally serviced by hardware vendors having more total image at stake.

- To an extent this high level of user satisfaction is a "self-fulfilling prophesy;" the user often selects a hardware vendor because he believes that vendor will provide good maintenance.

- Users in the survey showed an inclination to address specific issues when downgrading maintenance service and to give high marks for the total package.

  . One user gave IBM a low rating in maintenance because the nearest service location was over 100 miles away.

  . Another user rated overall IBM service low with the apology that most of the user's equipment was over 12 years old.

- Respondent users rated individual vendors generally in the same high-to-low patterns according to relative density, as shown in Exhibits III-18 and III-19.

  . Although IBM received the greatest number of low marks, these negative responses represented only 5% of all ratings concerning IBM. IBM also received by far the greatest number of high

EXHIBIT III-17

USER SATISFACTION WITH MAINTENANCE

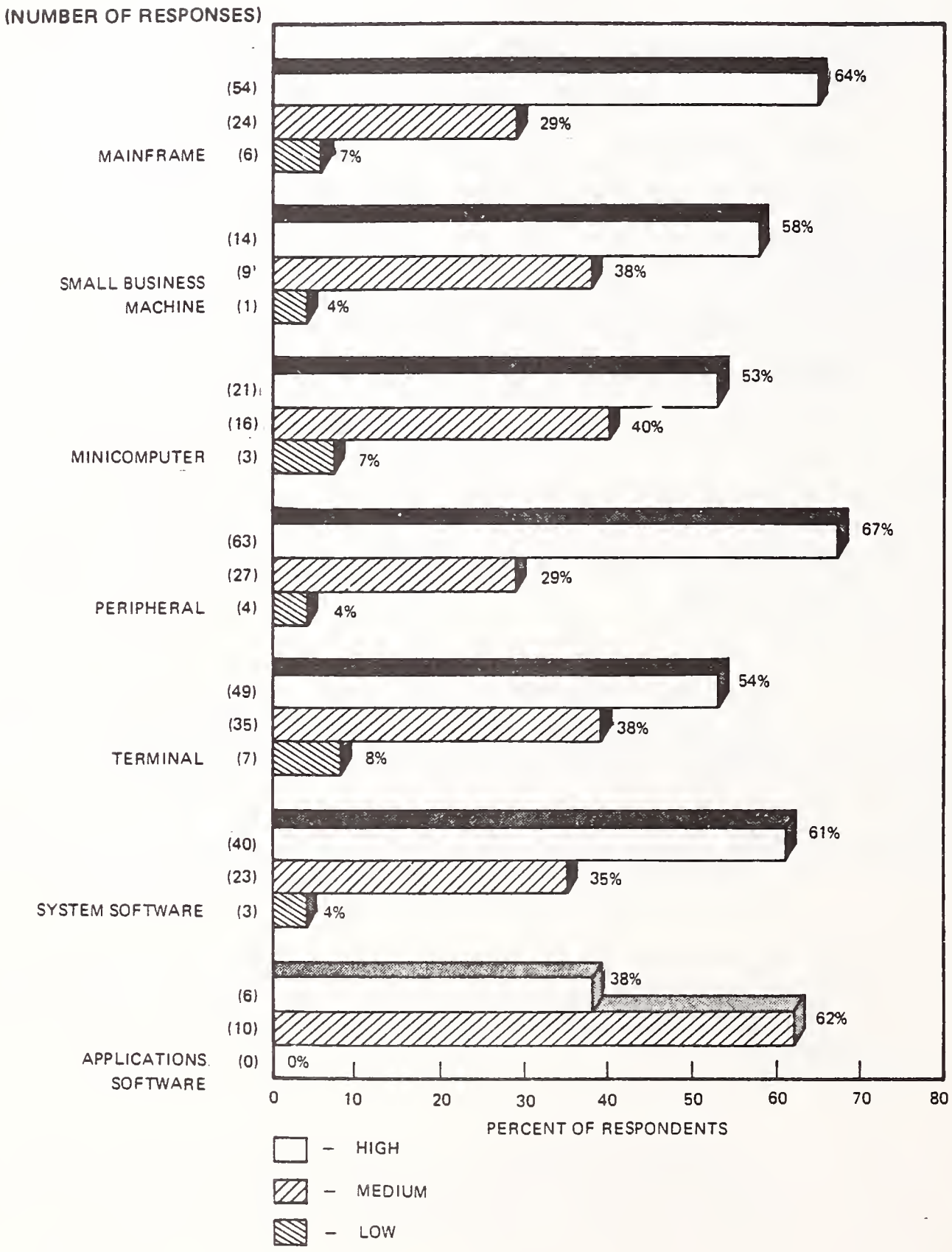


EXHIBIT III-18

USERS' RATINGS OF HARDWARE MAINTENANCE VENDORS

VENDOR	RATING		
	HIGH	MEDIUM	LOW
ATT	1	–	–
AMDAHL	1	–	–
BRAGAN	1	–	–
BURROUGHS	2	2	2
COMPUTER OPTICS	–	1	–
COM/TEN	–	1	–
CDC	13	2	–
COURIER	2	1	–
DATA-100	–	2	–
DATA GENERAL	1	–	–
DATAPOINT	2	3	–
DEC	4	3	1
DOCUMATION	1	1	–
ENTREX	–	1	–
FOUR-PHASE	3	–	–
GE	–	1	–
GTE	1	–	–
GENYSIS	1	–	–
HARRIS	2	–	2
HEWLETT-PACKARD	8	2	2
HONEYWELL	5	8	–
IBM	108	64	9
INTERCOMM	–	1	–
MEMOREX	4	1	1
MOHAWK	1	1	–
NCR	3	–	–
NSC	3	3	–
NIXDORF	1	–	1
PACIFIC TEL	–	1	–
PERKIN-ELMER	–	1	–
PERTEC	1	1	–
PRIME	1	–	–
RAYTHEON	1	–	1
STC	11	–	–
SANDERS	–	1	–
SORBUS	4	1	–
TCI	–	1	–
TEKTRONIX	2	–	–
TELEX	1	1	–
TEXAS INSTRUMENTS	1	–	–
TRIVEX	–	1	–
UNIVAC	11	1	–
WANG	1	–	–
XEROX	1	3	–

EXHIBIT III-19

USERS' RATINGS OF SOFTWARE MAINTENANCE VENDORS

VENDOR	RATING		
	HIGH	MEDIUM	LOW
ADR	–	1	–
AMDAHL	1	–	–
BURROUGHS	1	1	–
CDC	1	–	–
FLORIDA SOFTWARE	2	1	–
HEWLETT-PACKARD	1	–	–
HONEYWELL	1	1	1
IBM	35	22	1
INFORMATICS	1	–	–
INTERCOMM	–	–	1
MRI	1	–	–
MSA	–	2	–
PANSOPHIC	–	3	–
SOFTWARE A G	1	–	–
WESTINGHOUSE	–	1	–

marks. Listed in 60% of all responses, IBM dominates the marketplace.

. Users gave consistently good ratings to STC, CDC, and Univac.

. Among hardware vendors maintaining software, IBM's software service image is as good as its hardware service image: 60% of all ratings concerning IBM's software service were high, while most of the remainder were medium.

- Users remain ready and willing to replace peripheral and terminal vendors when maintenance is inadequate, as shown in Exhibit III-20. A slight increase in mainframe, system software and small business system replacements should be noted when comparing responses from the 1978 and 1980 surveys. The numbers (one or two) are not large enough to establish a trend, but maintenance vendors should all be alert to the fact that users do exercise options to replace equipment in response to poor maintenance.

  - Three users reported voluntary mechanical replacements initiated by maintenance vendors which saved the vendors' reputations.

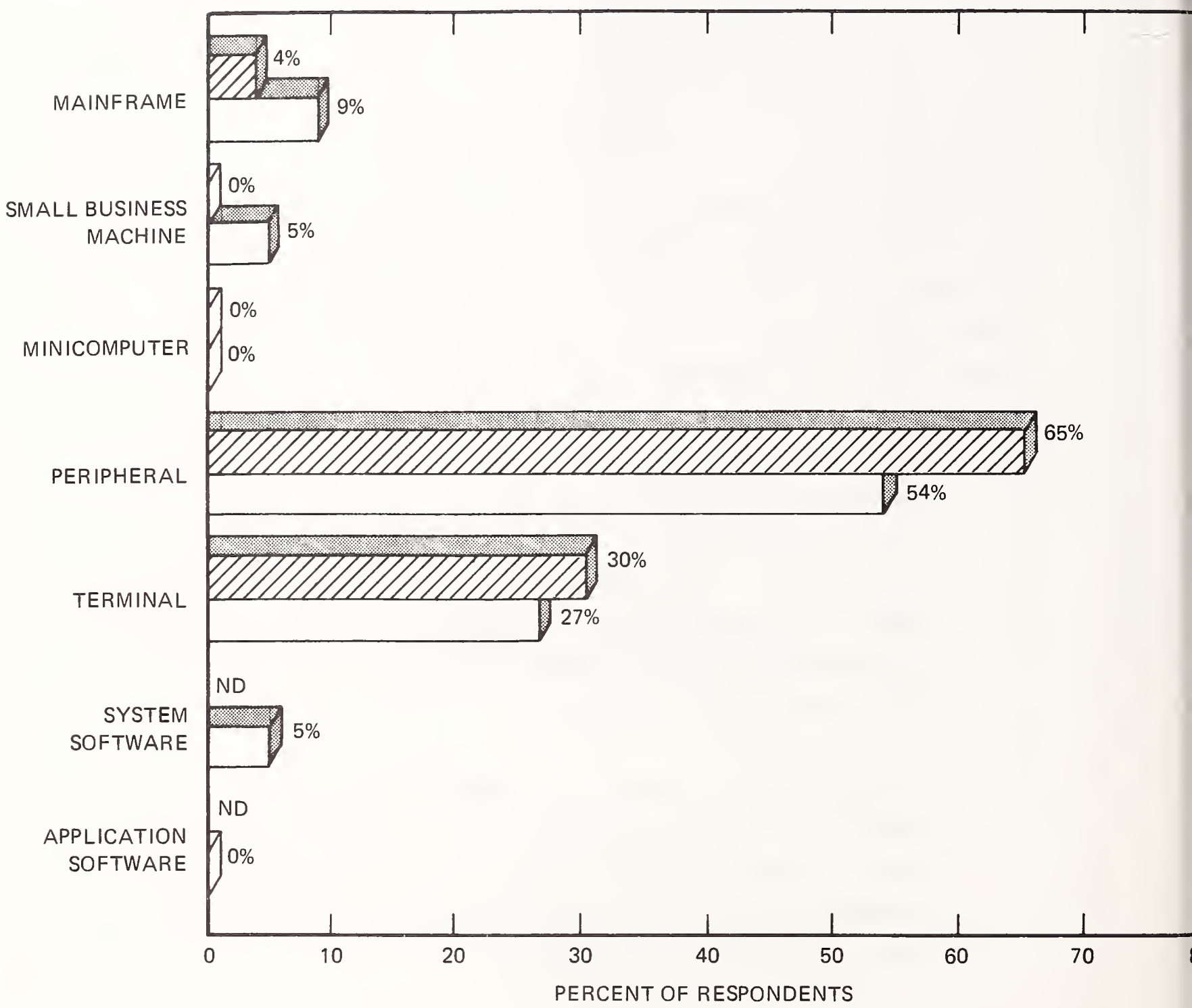
  - One remote user who reported replacing an IBM System 32 because of "poor overall support," now gives the replacement vendor (PRIME) very low ratings as well; the problem of servicing remote locations evidently is not solved by switching vendors.

  - At first glance, the high user satisfaction with peripherals shown in Exhibit III-17 seems inconsistent with the high peripheral turnover shown in Exhibit III-20. However, users are rating current vendors who replaced previous vendors, and their expectations of better performance helped to justify the decisions.

  - IBM leads the list again in absolute turnover volume, but ITEL leads in proportional turnover, as represented in Exhibit III-21. In fairness to IBM, only one mainframe was replaced; this was an instance of an

EXHIBIT III-20

NUMBER OF VENDORS REPLACED DUE TO POOR MAINTENANCE



ND – NO DATA COLLECTED

– 1978* (27 OF 93 USERS QUESTIONED)

– 1980 (22 OF 76 USERS QUESTIONED)

*FROM "MAINTENANCE REQUIREMEN
FOR THE INFORMATION PROCESSING
INDUSTRY 1978–1983."

EXHIBIT III- 21

VENDORS REPLACED DUE TO POOR MAINTENANCE

VENDOR	NUMBER OF UNITS REPLACED	EQUIPMENT REPLACED
AMPEX	1	MEMORY
CALCOMP	1	TAPE
CAMBRIDGE MEMORY	1	MEMORY
DIGITAL EQUIPMENT	1	TERMINAL
HONEYWELL	1	PERIPHERAL
IBM	12	MAINFRAMES
		SBM
		TAPES
		PERIPHERALS
		PRINTERS
ITEL	2	TAPE
		DISK
RAYTHEON	1	TERMINAL
SYSTEM INDUSTRIES	1	DISK
UNIVAC	1	TAPE
3M	1	MICROFILM
TOTAL	23	–

(RESPONSES FROM 19 USERS)

Amdahl mainframe replacing an IBM mainframe with on-site field engineers being the critical issue. Amdahl would commit an on-site engineer, IBM would not! One maintenance vendor change was imposed on a federal department by GSA (according to the department official).

- Exhibit III-22 indicates that respondent users' attitudes toward overall service appear to be unaffected by a shift of coverage. The only discernible shift away from the dominance of high marks is among the users with weekend coverage. On-site coverage seems generally to have little effect on changing attitudes.

E. USER SATISFACTION WITH PERSONNEL AND PROCEDURES

- Respondent users were critical of the rates of improvement in maintenance personnel and first-line management. Users' perceptions of overall trends, shown in Exhibit III-23, are not as significant as the comments. It is clear from the interviews that users expect visible personnel and visible management to improve each year, not to stay the same. From this adjustment in perspective, only 33% of respondent users are satisfied with their field engineers' progress, and only 21% are satisfied with the progress in developing first-line managers.

- Some typical user comments:

  . "There is far too much field engineer turnover, and the new people are unskilled. Only by raising hell do we get maintenance people with some experience, but they are still below par. The field engineers around here are too few and too raw."

  . "Field engineering management is more interested in their profit and loss figures than with the user. Communications between us is poor and all we hear is about the manager's budget, not better service."

EXHIBIT III-22

USERS' SATISFACTION, BY LENGTH OF COVERGE

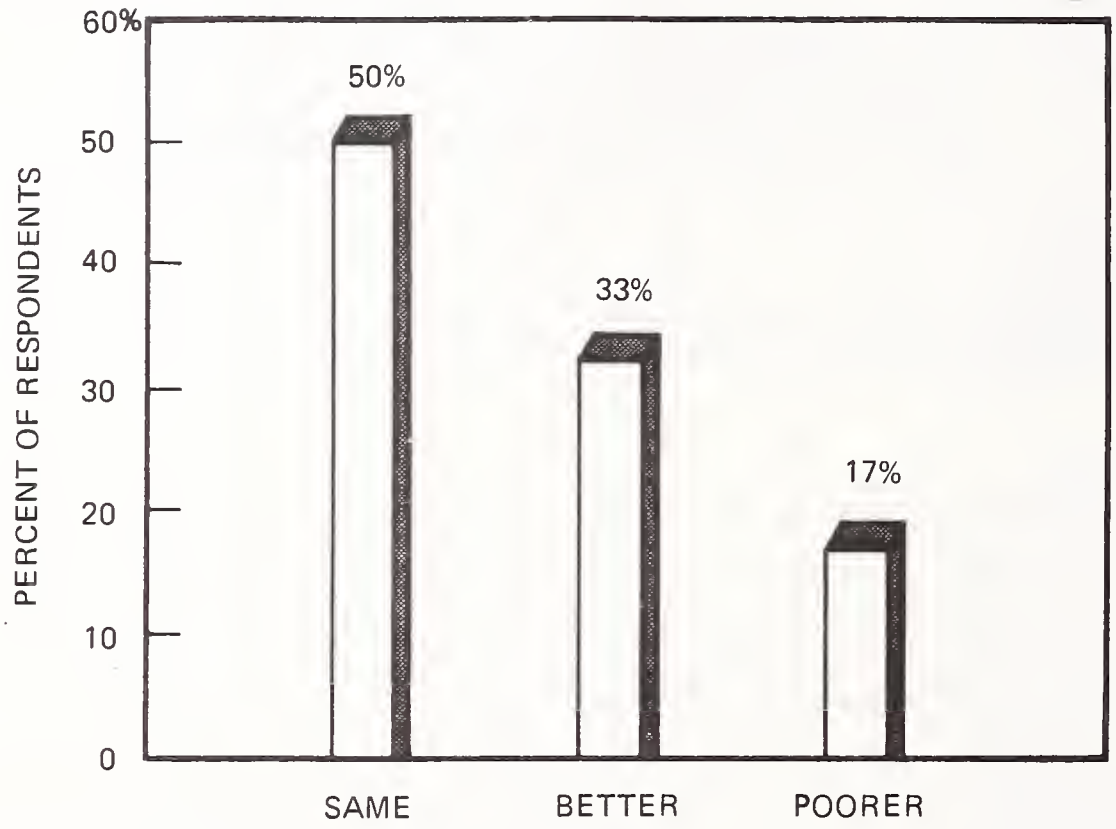
COVERAGE		RATINGS					
		HIGH		MEDIUM		LOW	
		TOTAL NUMBER	ON-SITE NUMBER	TOTAL NUMBER	ON-SITE NUMBER	TOTAL NUMBER	ON-SITE NUMBER
5 DAYS	1 SHIFT	18	2	10	2	2	0
	2 SHIFTS	3	0	1	0	0	0
	3 SHIFTS	4	1	4	1	0	0
6 DAYS	1 SHIFT	2	1	0	0	0	0
	2 SHIFTS	2		1	0	0	0
	3 SHIFTS	2	2	4	1	1	0
7 DAYS	1 SHIFT	0	0	1	0	0	0
	2 SHIFTS	0	0	0	0	0	0
	3 SHIFTS	8	5	13	5	0	0
TOTALS		39 (51%)	11	34 (45%)	9	3 (4%)	0

NUMBER OF RESPONSES: 76

EXHIBIT III-23

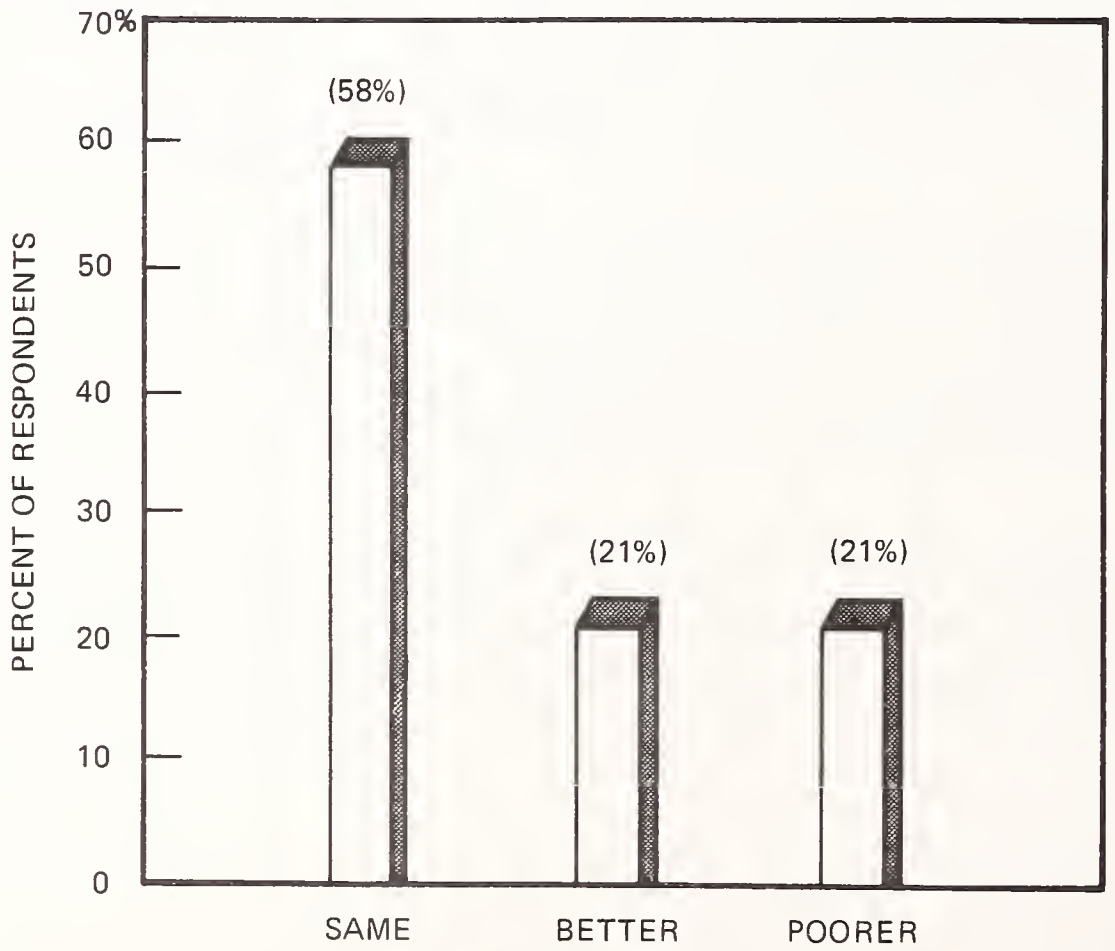
CHANGES IN THE QUALITY OF FIELD ENGINEERS AND FIRST-LINE MANAGERS

FIELD ENGINEERS



NUMBER OF RESPONSES: 76

FIRST-LINE MANAGERS



NUMBER OF RESPONSES: 76

- Users clearly indicate that vendor image is extremely visible through field engineers' and first-line managers' attitudes.

  . "They both FE and managers act like we are their problem. They complain and defend instead of fixing."

  . Mixed attitudes: "Honeywell sent us a very, very good FE, but replaced a retired manager with much poorer 'trainee.' IBM sent a significantly worse FE, but replaced (fired) manager with an excellent new one."

  . "Response time and repair time in system software has been very poor."

- Some vendors get consistent remarks.

  . "Hewlett-Packard managers are excellent communicators, they come to see me all the time."

- Some vendors get it both ways.

  . "IBM FE managers very poor, slow to escalate, slow to respond, poor communicators, and bad attitude."

  . "They are more responsive and alert to our needs. IBM must really be putting emphasis on the FE part of their business. Ditto for managers and field engineers."

- One respondent user has taken it upon himself to eliminate multivendor friction and to create a result-oriented environment.

  . "We have improved maintenance because we forced it. Insisted on weekly vendor meetings dedicated to solving problems instead of pointing fingers. Several managers were reluctant at first but eventually fell into the spirit of the meetings."

- Exhibit III-24 indicates that users perceive vendor escalation procedures and levels of judgment with regard to initiating calls for assistance to be a significant part of the total package they purchase with contracted maintenance. From their comments, users desire a balance in local service engineers and management between fixing the problem themselves (locally) and calling in assistance as needed. "Thresholds of pain" vary, of course, but users tend to give higher marks to field engineers who "manage" to get problems resolved over those who insist on making all the repairs locally, even where local batting averages are high.

  - Some comments from users:

    . "We force the Amdahl FE to get help after two hours. By then he needs it anyway."

    . "Amdahl is best about escalating problems. STC and Courier are slower."

    . "Hewlett-Packard is quick to escalate when IBM is very slow. H-P goes right to the top for a quick fix."

    . "Escalation is good for appearances, but no big deal."

    . "Seldom is the escalation procedure followed. It is ignored, especially by Burroughs. We've had to call district and region to get help."

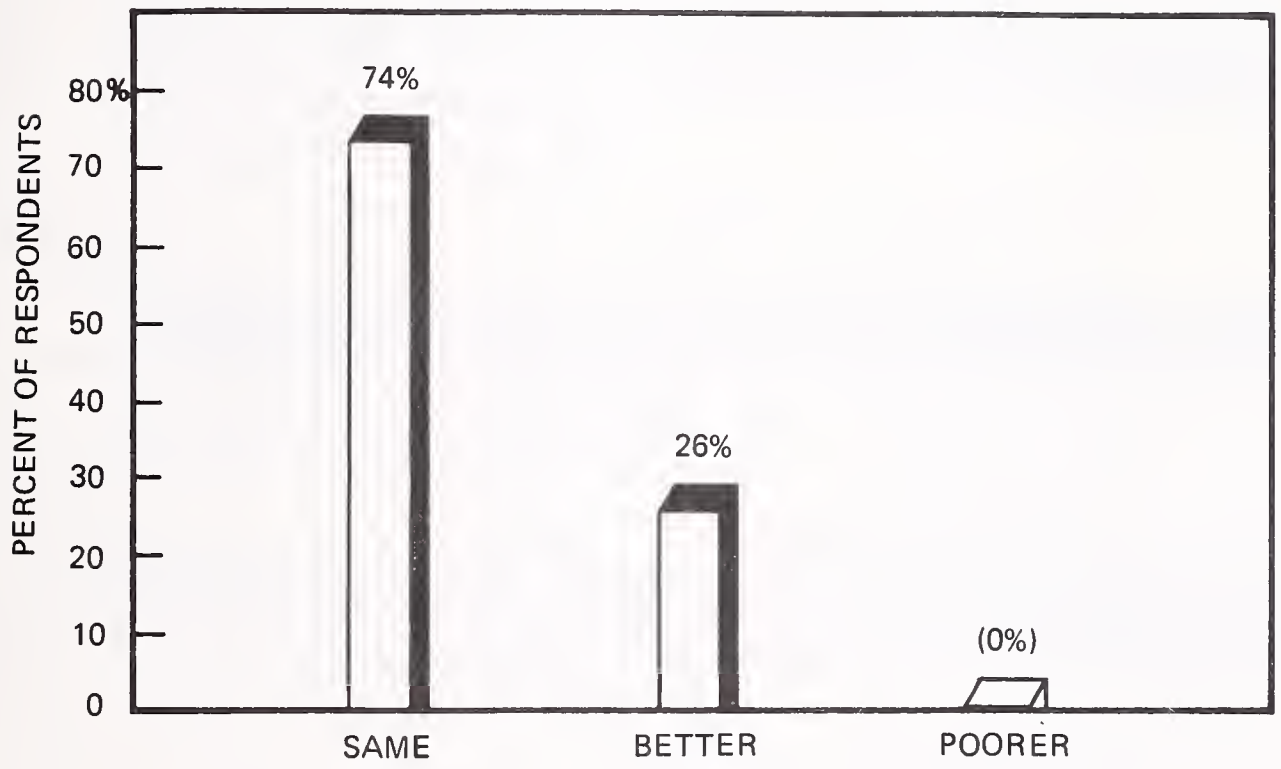
    . "We have our own internal procedure that works. We escalate the problem if they don't."

    . "Would never buy equipment or maintenance contract without a formal, written escalation procedure."

  - The fact that only 19 respondents perceived that their vendors offer escalation procedures is evidence that the field engineer does not publicize their existence. In many cases, the field engineer prefers that the procedures not be implemented.

EXHIBIT III-24

USER SATISFACTION LEVELS WITH ESCALATION PROCEDURES



VENDOR PERCEIVED AS OFFERING ESCALATION PROCEDURES	PERCENT OF RESPONDENTS
AMDAHL	5%
BURROUGHS	5
CONTROL DATA	5
DEC	5
IBM	43
MEMOREX	11
NORTHERN TELECOM	11
PERTEC	5
STC	5
SORBUS	5

NUMBER OF RESPONDENTS: 19

F. USERS' ATTITUDES AND CONCERNS ABOUT UNBUNDLING MAINTENANCE

- Users were mixed in their current attitudes towards the incremental pricing of maintenance, as shown in Exhibit III-25. Most users were not interested, but undertones suggested that some of the reluctance was typical of "leading edge" or "pioneering" type responses. There are a significant number of users in all categories of hardware interested in finding ways to cut costs while retaining services that they need.

  - Among the users surveyed, insurance companies appear to be the most open to innovations. The concept is analogous to insuring for disaster while cutting premiums by accepting larger deductibles.

  - The concept of incremental maintenance charges finds more user acceptance in the terminal and peripheral areas because of the user's ability either to unplug and replace these devices or to carry them off-line.

  - Comments from users desiring maintenance charges to remain bundled generally expressed a desire to forecast fixed costs.

  - One user wants to see a complete breakdown and have the vendors justify every cost. They believe that they could take care of the over-priced constituents themselves.

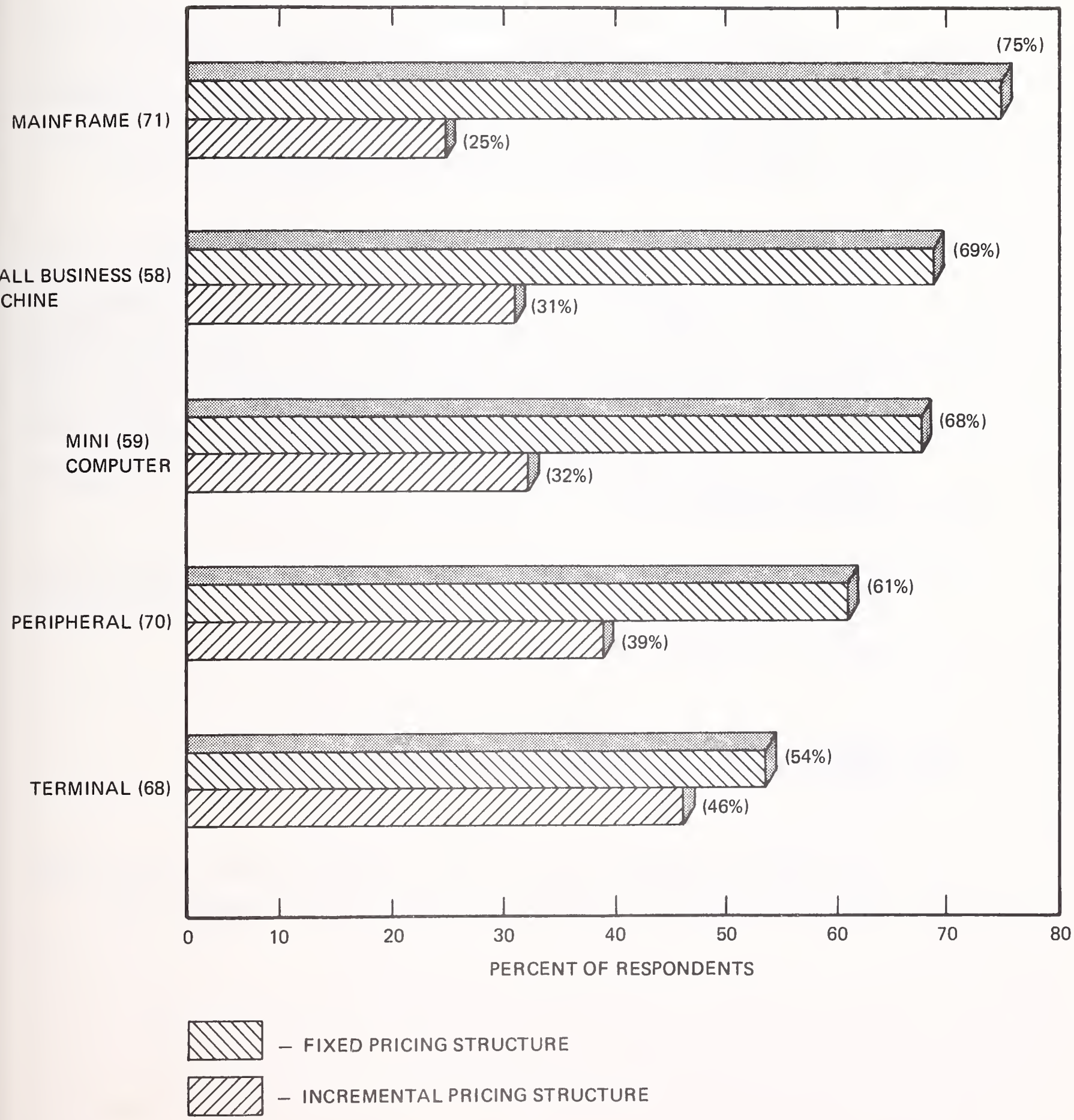
- One-third of the respondent users indicated that they would consider paying for on-site spares.

  - This trend supports the conclusion that users are much more sensitive to downtime than to the total price of maintenance.

  - An opportunity for maintenance vendors to off-load inventory carrying charges of 30% or more of their field inventory, should be welcome news to field service executives; it is an opportunity for major savings.

EXHIBIT III-25

UNBUNDLING OF MAINTENANCE BY EQUIPMENT TYPE



- Respondents have little current interest in carrying equipment to a depot for maintenance as Exhibit III-26 indicates. Only 25% of those not using depot maintenance would consider it for 10-40% savings.

  - Only nonessential equipment, such as spare terminals, would be considered for depot maintenance.

  - Respondents using depot maintenance typically do so because they have no alternative: the product they desire to use is offered only under depot maintenance. Users gained confidence in depot maintenance in those cases where units were specifically designed for depot repair. The prime new product in this category is the IBM 3101 terminal.

- The percentage of responding users installing their own equipment to save maintenance has doubled since the 1978 survey from 17% to 39%. (Users' willingness to perform certain maintenance activities is the subject of an industry issue report being published by INPUT in July 1980). The strongest motivation, especially among multivendor users, is to get the correct field engineer on the way. More users responded that they would consider running diagnostics with better training, as long as vendors would offer them an average discount of 14%.

- Users remain reluctant to perform hardware maintenance. Most do not feel that in-house field engineers could get enough experience to remain proficient except on unreliable equipment.

G. USERS' ATTITUDES TOWARD THIRD-PARTY MAINTENANCE

- Of the nine respondents currently using third-party sources, 63% rated cost savings as a significant factor in the decision, as shown in Exhibit III-27.

EXHIBIT III-26

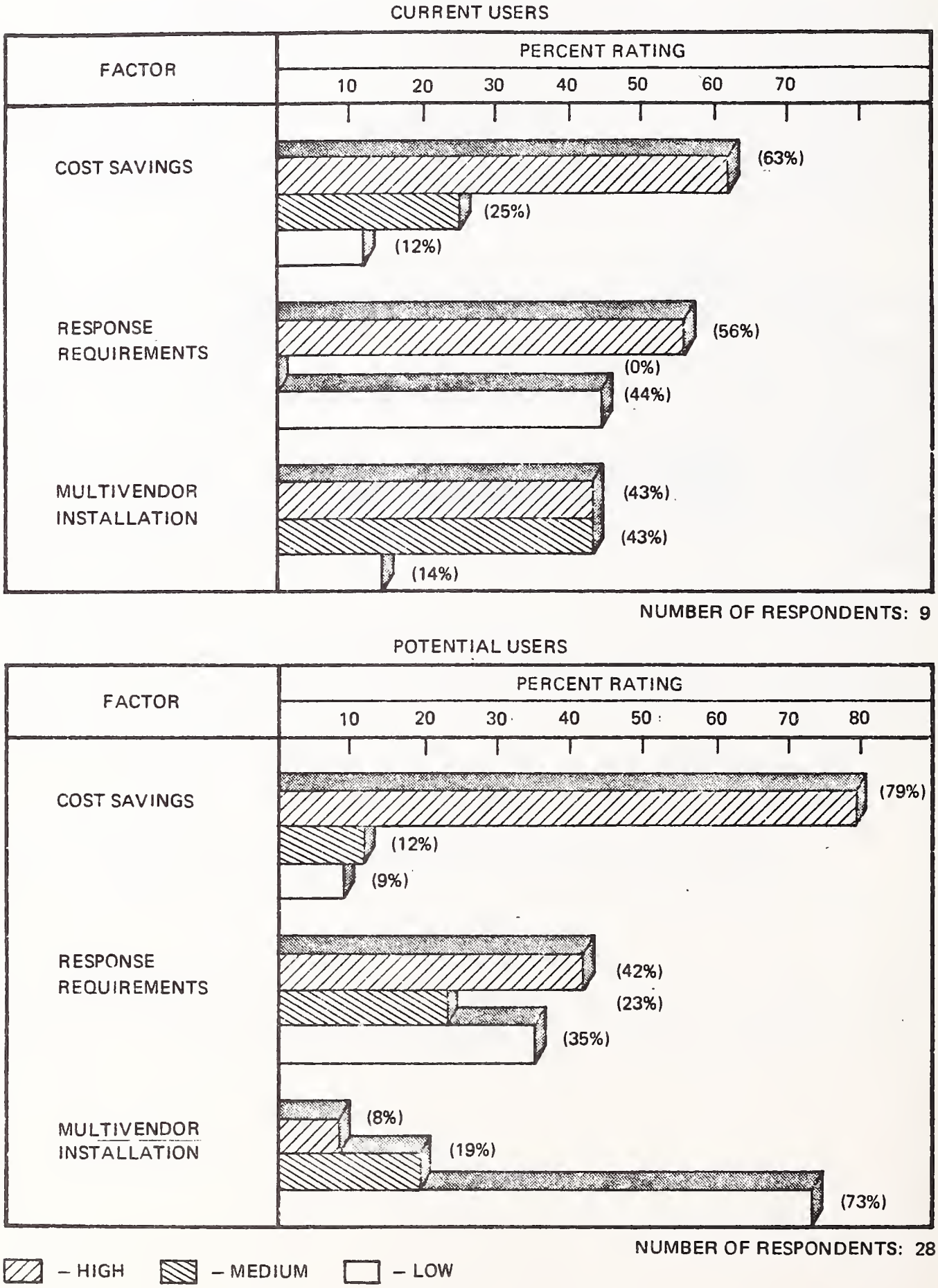
USER ACCEPTANCE OF DEPOT MAINTENANCE

TYPE OF USER	PERCENT RESPONSE (10 20 30 40 50 60 70 80 90)	PERCENT SAVINGS	
		AVERAGE	RANGE
CURRENTLY USING	(12%)	ND	ND
NOT CURRENTLY USING	(88%)		
OF NOT USING:		25%	10-40%
WOULD CONSIDER	(25%)		
WOULD NOT CONSIDER	(75%)		

ND – NO DATA TOTAL RESPONSES: 73

EXHIBIT III-27

COMPARISON OF CURRENT USERS' AND POTENTIAL USERS' PERCEPTIONS OF THIRD-PARTY MAINTENANCE



- Response time was either a significant factor or unimportant. None of the current third-party users rated this factor as medium.

- Eighty percent of the 28 respondent users now giving serious consideration to third-party maintenance are expecting significant savings, as shown in Exhibit III-28.

  - Current users of third-party maintenance are receiving less cost savings (15%) than prospective users are looking for (25%).

  - This is a clear reason why prospective users have not switched to third-party maintenance.

- Current users of third party maintenance are experiencing approximately 50% of the response time performance expectations held by potential users.

- Comments from users reveal some reasons for considering third-party maintenance, as well as some reasons why over 50% of respondent users are <u>not</u> considering third-party sources:

  - "In our locale, what would be available could not compare to the service we are getting from IBM." This same customer rated IBM medium and the first-line manager as poor, but likes his resident field engineer!

  - ". . . only 15% savings on equipment available. Doesn't make sense to create a management problem bringing in another vendor."

  - "Looked at Sorbus and Raytheon and decided no. We feared IBM would get even by giving poor quality and lower priority to their portion."

  - "With all the new announcements planned by IBM, how could a third-party maintain them?

EXHIBIT III-28

COMPARISON OF COST SAVINGS AND RESPONSE TIME REQUIREMENTS BY CURRENT AND POTENTIAL THIRD-PARTY MAINTENANCE USERS

FACTOR	CURRENT USERS		POTENTIAL USERS
	EXPECTED	RECEIVED	EXPECT
COST SAVINGS			
AVERAGE:	18%	15%	25%
RANGE:	10-30%	7-25%	10-60%
RESPONSE REQUIREMENTS			
AVERAGE:	(ND)	2 HRS	1 HR
RANGE:	(ND)	0.5-4 HRS	ON SITE–2 HRS

NUMBER OF CURRENT USER RESPONSES: 9
NUMBER OF POTENTIAL USER RESPONSES: 28
(ND) = NO DATA

- "How long does it take to build up the expertise IBM has?"

- "Used one (third party) in years past and it was a disaster, would never use one again!"

- "Service is the key, not cost. IBM is good, so why switch?"

- "Comma installed our 155 and did an excellent job. Working on getting 155 users together on the idea locally."

- "We are considering it but know that there will be resistance higher up in the company."

- "Would like single source of maintenance service."

H. USERS' SENSITIVITY TO MAINTENANCE PRICING

- When asked what they plan to do about rising maintenance costs, nearly all respondent users had no definitive answer and appeared to be resigned to the inevitability of increases in maintenance prices.

  - Comments were mostly terse:

    . "Pay it."

    . "Continue with who we have."

    . "Reduce to one shift."

    . "Not under my control."

  - Other comments revealed indirect effects of maintenance price increases.

. "We have to factor them (maintenance price increases) into any decision on equipment. It hinders us to a degree."

- One user revealed by his comments that GSA, the contracts watchdog for the federal government, is very concerned about maintenance pricing. GSA is imposing third-party maintenance in some instances, forcing agencies to cut back extended shift coverage, and could be throwing its weight behind standardized labor rates legislation to the detrimant of field service organizations.

- Users do not provide any clues to a correlation of price sensitivity along lines of equipment types. There appears to be more of a general frustration with inflationary trends. Sensitivity was revealed obliquely rather than directly in response to the question. As previously discussed under the topics of "Unbundling," "Third parties," and "Paying for on-site spares;" users are sending some very clear signals to the industry:

  . Maintenance contracts are insurance policies and rightfully belong under the heading of "Risk Management" from the user's perspective.

  . Prudent businesses insure against disaster and budget for ordinary losses to keep premiums down.

  . Some users, now groping for intelligent ways to assess the true risks involved, indicate a willingness to "raise the deductible."

I. USERS' ATTITUDES TOWARD ELIMINATING PREVENTIVE MAINTENANCE

- Users have not budged from their position in 1978 on the subject of preventive maintenance.

- Seventy-eight percent, essentially the same proportion as in 1978, would not consider eliminating PM under any circumstances. The remaining 22% would consider eliminating PM as discounts progress from 5% to 30% of the maintenance contract.

- Users continue to rate the importance of preventive maintenance higher than vendors do, as shown in Exhibit III-29. The high user acceptance of preventative maintenance is largely a reflection of IBM's success in selling the PM concept; should IBM (and others) emphasize more remote maintenance and less PM, users attitudes will shift. PM may become a key vendor issue in the early 1980's.

J. USERS' ATTITUDES TOWARD REMOTE DIAGNOSTICS AND SYSTEM SUPPORT CENTERS

- Exhibit III-30 shows that respondent users agreed that remote diagnostics appeared to provide equal or better service when asked the question directly. Comments varied, however, and suggested that the real benefits of remote diagnostics are not visible to users yet and should be given some "press coverage" by field engineering personnel.

  - Comment: "Difficult to judge, all I can say is that it gets fixed."

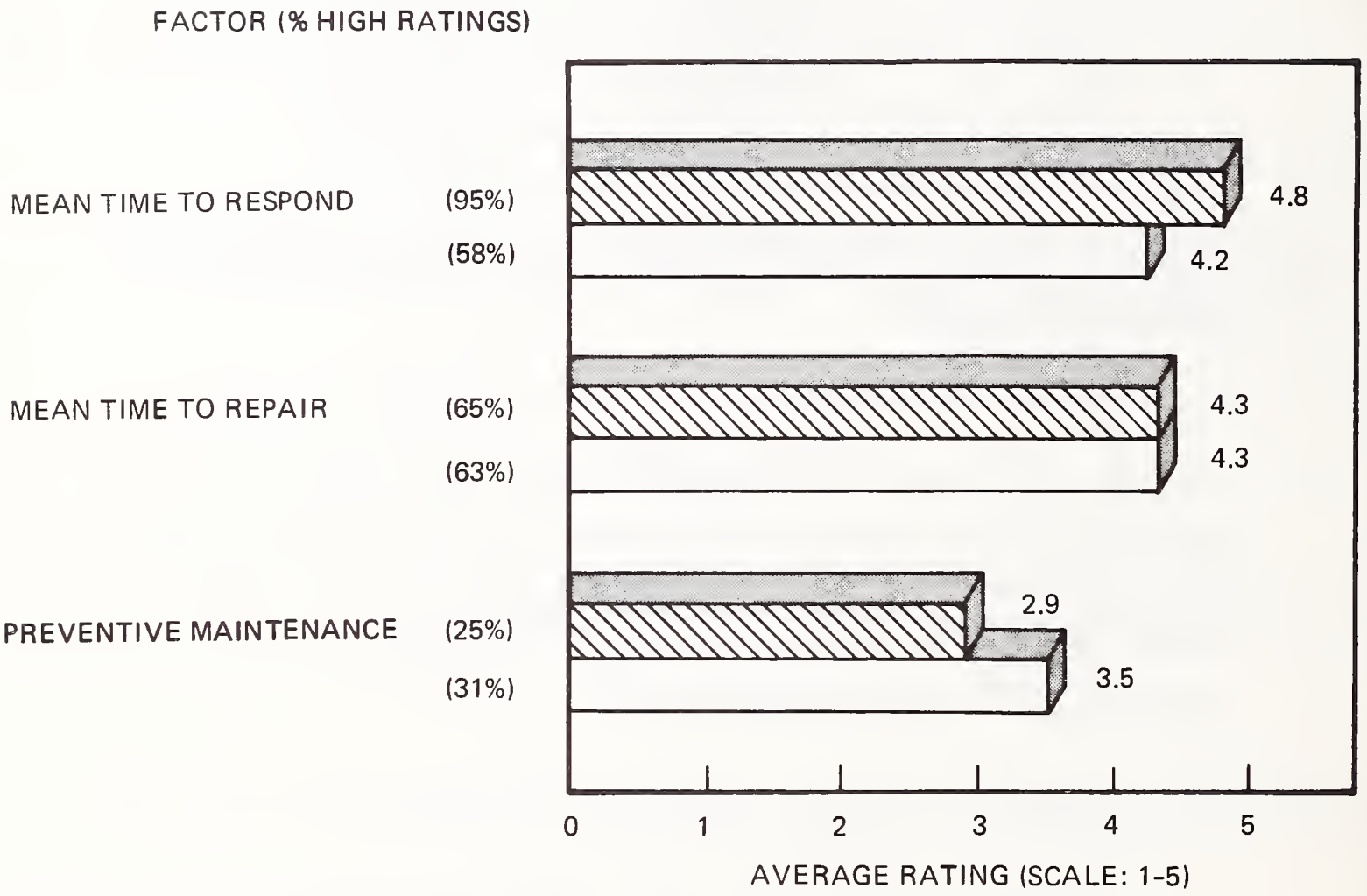
  - A small number of users who rated remote diagnostic effectiveness very highly appeared, from comments, to confuse traditional telephone diagnostic assistance with on-line remote diagnostic capabilities.

  - Users' comments in general express a need for better education programs by vendors.

- Only 20% of respondent users see improvements in service from system support centers, as shown in Exhibit III-31. Reactions have varied from "wait-and-see" attitudes to vociferous resentment.

EXHIBIT III-29

IMPORTANCE OF FIELD MAINTENANCE CHARACTERISTICS – VENDORS' VERSUS USERS' RATINGS

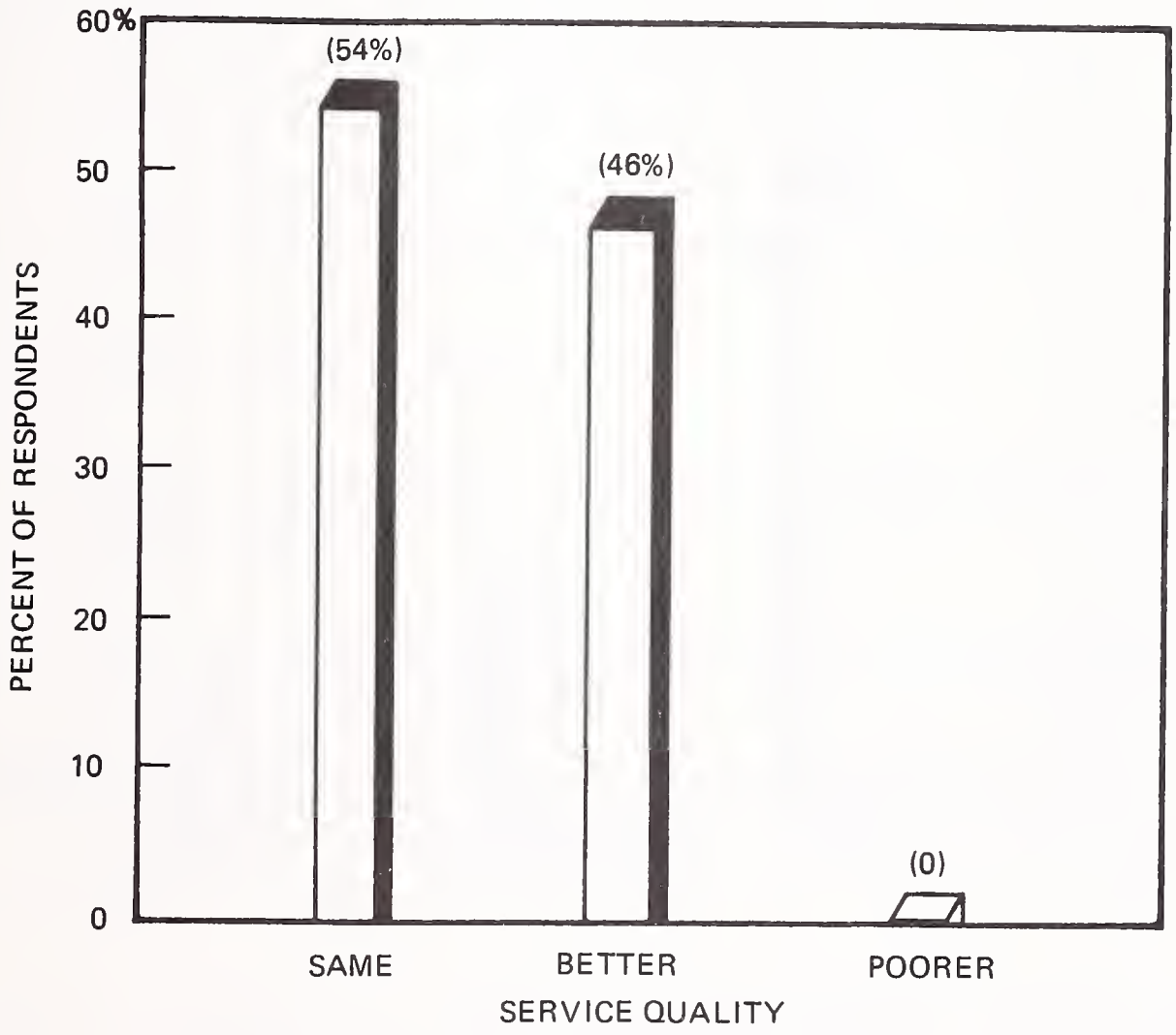


– VENDOR (20 RESPONSES)

– USER (71 RESPONSES)

EXHIBIT III- 30

USERS' SATISFACTION LEVELS WITH REMOTE DIAGNOSTICS

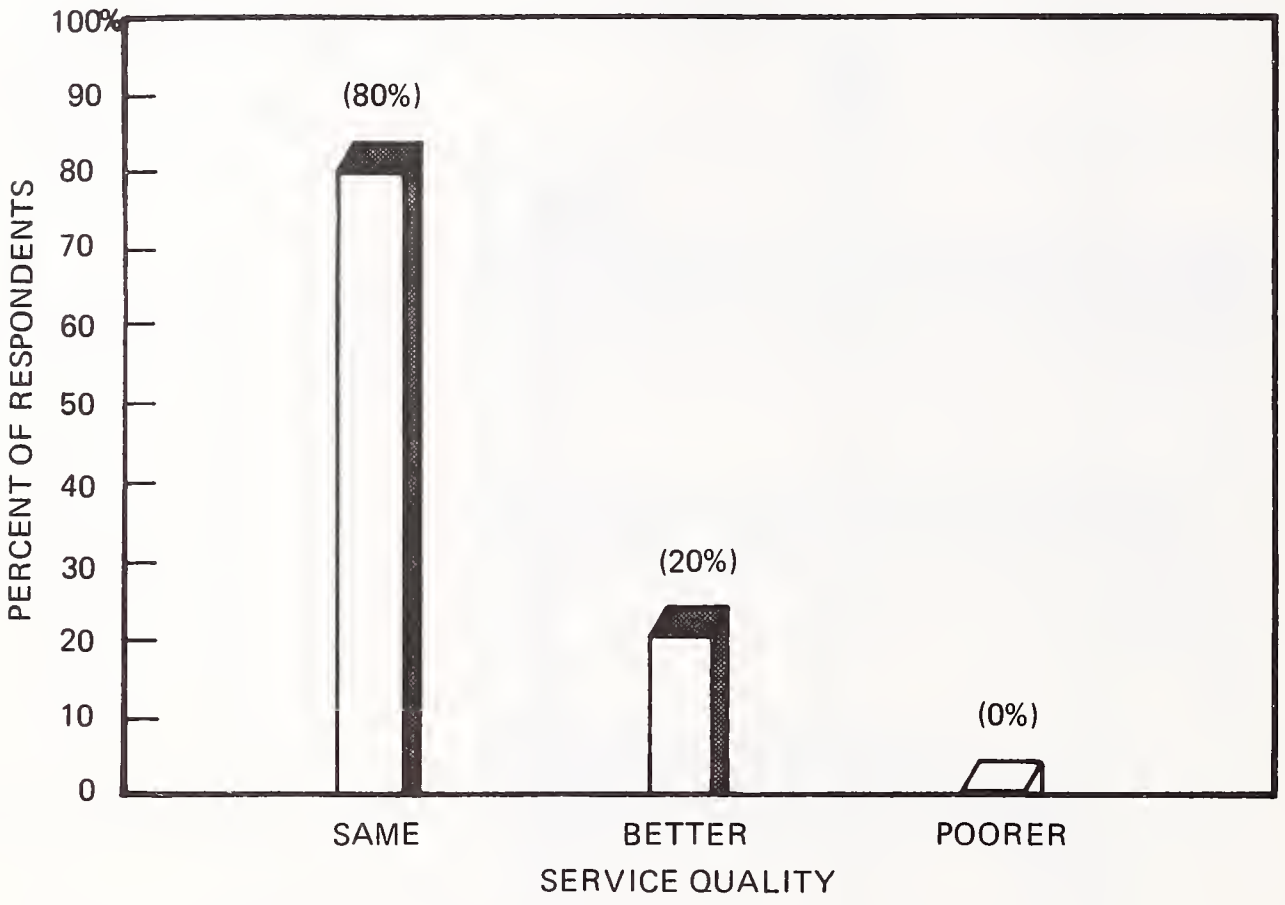


NUMBER OF RESPONDENTS: 41

VENDOR	EQUIPMENT TYPE	PERCENT OF RESPONDENTS
AMDAHL	MAINFRAME	7%
CODEX	MODEM	5
CONTROL DATA	MAINFRAME	2
HEWLETT-PACKARD	MAINFRAME	2
HONEYWELL	MAINFRAME	7
IBM	MAINFRAME	72
UNIVAC	MAINFRAME	5

EXHIBIT III-31

USERS' SATISFACTION LEVELS WITH SYSTEM SUPPORT CENTERS



VENDOR	PERCENT OF RESPONDENTS
CONTROL DATA	3%
DATA — 100	1
DATA GENERAL	1
DOCUMATION	1
HEWLETT-PACKARD	3
HONEYWELL	5
IBM	73
MEMOREX	1
NCR	1
NSC	1
STC	3
TANDEM	1
UNIVAC	5

NUMBER OF RESPONDENTS: 71

- "I am very suspicious of system support centers, remote diagnostics, etc. The system support center is the user fixing his own machine, which is not his job or expertise. Remote diagnostics are not good enough to replace quickly available field engineers. We had a 66-hour down period and remote diagnostics did nothing good. I see fewer good maintenance people available and the forcing by IBM of users to maintenance, which is good for IBM but not the user. What is particularly insulting is IBM is selling this by lies, by saying this is good for overall service. This is bull and if IBM thinks they need to do it this way, they should come out and say so and say why. With this equipment (303X), I need a field engineer to get the machine up quickly."

- "Miss the personal touch."

- "System support centers won't take us seriously unless we have the current release."

- Five users responded that they have never used system support centers and must wait to comment.

- Six users said that they never have any intention of using the system support centers.

- A separate survey done by INPUT on the subject of plug compatible equipment showed a generally more positive reception to IBM's system support centers: this documents the mixed reception among users at this early date in their experience with the centers.

K. SOME USERS' COMMENTS ON GENERAL IMPROVEMENTS THEY WOULD LIKE TO SEE

- "More parts, and keep software working."

- "Little things like replacing indicator lamps without being asked to."

- "More people."
- "Better communications, logging problems between shifts, follow-up by FEs."
- "Can't find anyone to fix old tabulator equipment like collators."
- "Reduce MTTR."
- "Quicker response."
- "Nothing here, we think IBM is great!"
- "Get better quality products to start with."
- "Don't want to hear about FE manager's budget problems."
- "Too much specialization, we need some good old-fashioned generalists."
- "FE must act like part of user's company on-site and do what the user wants, not what he wants."
- "Tell me what was wrong, it is my equipment."

L. CONCLUSIONS

- The greatest concern of users is unscheduled outage. MIS directors provide a service to their companies on a real-time basis as well as providing traditional batch processing services with tight deadlines. Outage is now much more visible to higher-level corporate executives than it was in prior years. In most installations of any size, the MIS executive is now totally accountable for results and takes the heat for interruptions of the data processing service no matter what the source. Vendors who reinforce this concept of "outage" control into their line management and front-line troops find it much easier to communicate with their customers.

- Users are extremely sensitive to any mention of a field engineering manager's budget. The cost of doing business is the vendor's management problem: it has nothing to do with a specific need or benefit that users perceive they have paid for.

- On balance, the use population is satisfied with current levels of service.

  - Many have changed vendors to achieve the desired level of service.

  - Particularly with peripherals and terminals, users continue to replace equipment due to unsatisfactory maintenance.

- Users are receptive to new techniques such as system support centers and remote diagnostics; this gives vendors additional flexibility in structuring their services offerings in the future.

- Users are becoming more aware of the striking similarities between the management of maintenance vendors and risk management. As user groups discuss the topic more, individual users will begin to take the initiative to unbundle maintenance contract constituents. Pioneering maintenance vendors will have many current opportunities to structure some deals that will relieve portions of their own risks, relieve them of recruiting sparsely qualified personnel, and still maintain healthy profit growth curves.

- Users are very clearly expecting that maintenance vendors will be more visible as businesses. Maintenance prices are becoming more visible as price/performance ratios of hardware improve.

  - Users, in general, no longer look at field engineering as the "necessary evil," but as an important business resource compatible with their objectives.

  - As maintenance revenues increase relative to hardware revenues (the current trend among many vendors) the 1980s will see companies whose maintenance revenues become the dominant revenue source.

IV COMPARATIVE ANALYSIS OF IBM AND OTHER MAINTENANCE VENDORS

IV COMPARATIVE ANALYSIS OF IBM AND OTHER MAINTENANCE VENDORS

A. PURPOSE AND SCOPE OF CHAPTER

- As the dominant maintenance vendor among users surveyed, IBM influences on key indicators in the user survey have been separated to test for any significant variances in user attitudes regarding maintenance vendors in general.

- In Chapter III, except for comments users made about particular vendors, the analysis is performed in the aggregate. In this chapter, the analysis of certain key barometers of user concerns is performed in comparative format, IBM maintenance separate from all other maintenance vendors.

- Where users have provided specific information of general interest; the comments, equipment types and names of vendors will be disclosed. The confidentiality of the vendors surveyed for Chapter V is not violated since only user responses are used in this analyses.

B. USERS' GENERAL SATISFACTION WITH MAINTENANCE VENDORS

- As discussed in Chapter III, respondent users tended to give generally good

overall marks to maintenance vendors, reserving comments and lower marks for specific areas. Separation of the IBM influence does not alter the general pattern significantly, as shown in Exhibit IV-1.

- The influence of specific responses discussed later in this chapter tends to shape the general responses depicted by Exhibit IV-1 and this exhibit is therefore referred to again later in this chapter.

- Non-IBM mainframe maintenance vendors have a few more enthusiastic users (71% to 64%), but both groups are doing an excellent job according to sizeable majorities of users.

- The extra-high marks given by respondent users to non-IBM small business machine vendors is more than offset by the presence of unhappy users (7% to none).

- A significant variance to the general pattern emerges in the <u>one</u> category <u>not</u> dominated by IBM.

  - As a minority maintenance vendor in minicomputers, IBM has a significantly superior image among respondent users.

  - Expectations may be high for a quality vendor in a category with historically mixed reviews.

  - The "underdog" effect could be working in reverse.

- As seen in Exhibit IV-1, user attitudes toward peripheral and terminal vendors are not influenced by IBM. The image of maintenance vendors is perfectly balanced between IBM and others.

- IBM maintains a significantly superior image in system software support, as shown in Exhibit IV-2.

EXHIBIT IV-1

USER SATISFACTION WITH HARDWARE MAINTENANCE, IBM AND OTHERS

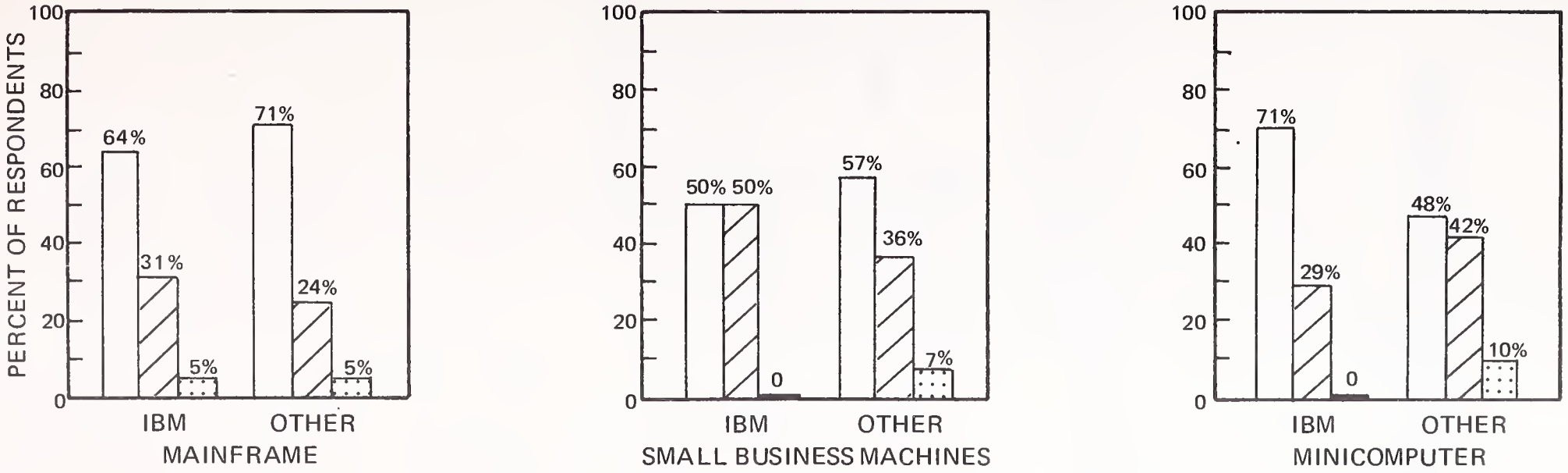
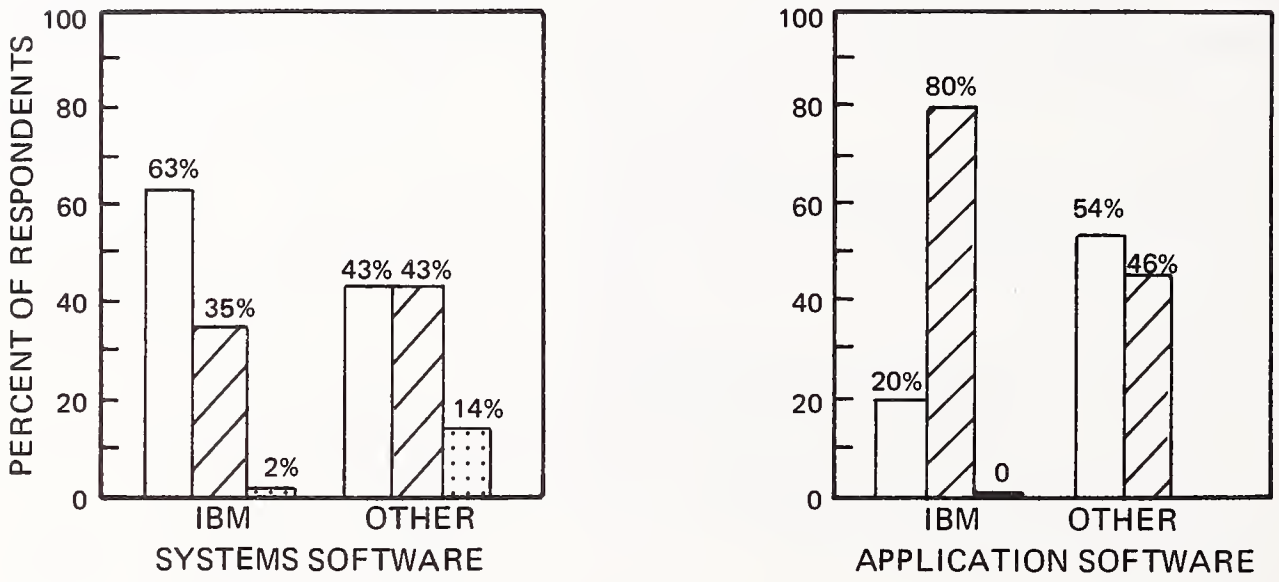


EXHIBIT IV-2

USER SATISFACTION WITH SOFTWARE MAINTENANCE, IBM AND OTHERS



- Other vendors in the plug compatible business acknowledge IBM's superiority in the system control programming area, and design their products to take advantage of it.

- As discussed in Chapter III, some users have specific concerns about trends away from personal attention in system software support.

- In the area of applications software, the few users who are not doing their own maintenance gave IBM a dominantly "medium" rating, while vendors of applications software received a somewhat higher rating.

C. USERS' ATTITUDES TOWARD RESPONSE TIMES AND MEAN TIMES TO REPAIR

- Exhibits IV-3 through IV-7 present data in cumulative format similar to Chapter III, Exhibits III-13 through III-17.

- A major difference in the graphics requires explanation as cross-references are made. Each category of "Response Time" and "Mean Time To Repair" has been separately displayed in this chapter to avoid confusion.

  . "Minimum" graphs are cumulative user responses to minimum acceptable performance and should represent the longest acceptable times in most cases.

  . "Current" graphs display the cumulative perceptions of users as to actual average response times and repair times as performed by IBM and other vendors.

  . "Ideal" graphs are cumulative displays of users' "wish books" on average response times and Mean Time To Repair.

EXHIBIT IV-3

MAINFRAME TIME TO RESPOND AND REPAIR, IBM AND OTHERS – USER RESPONSES

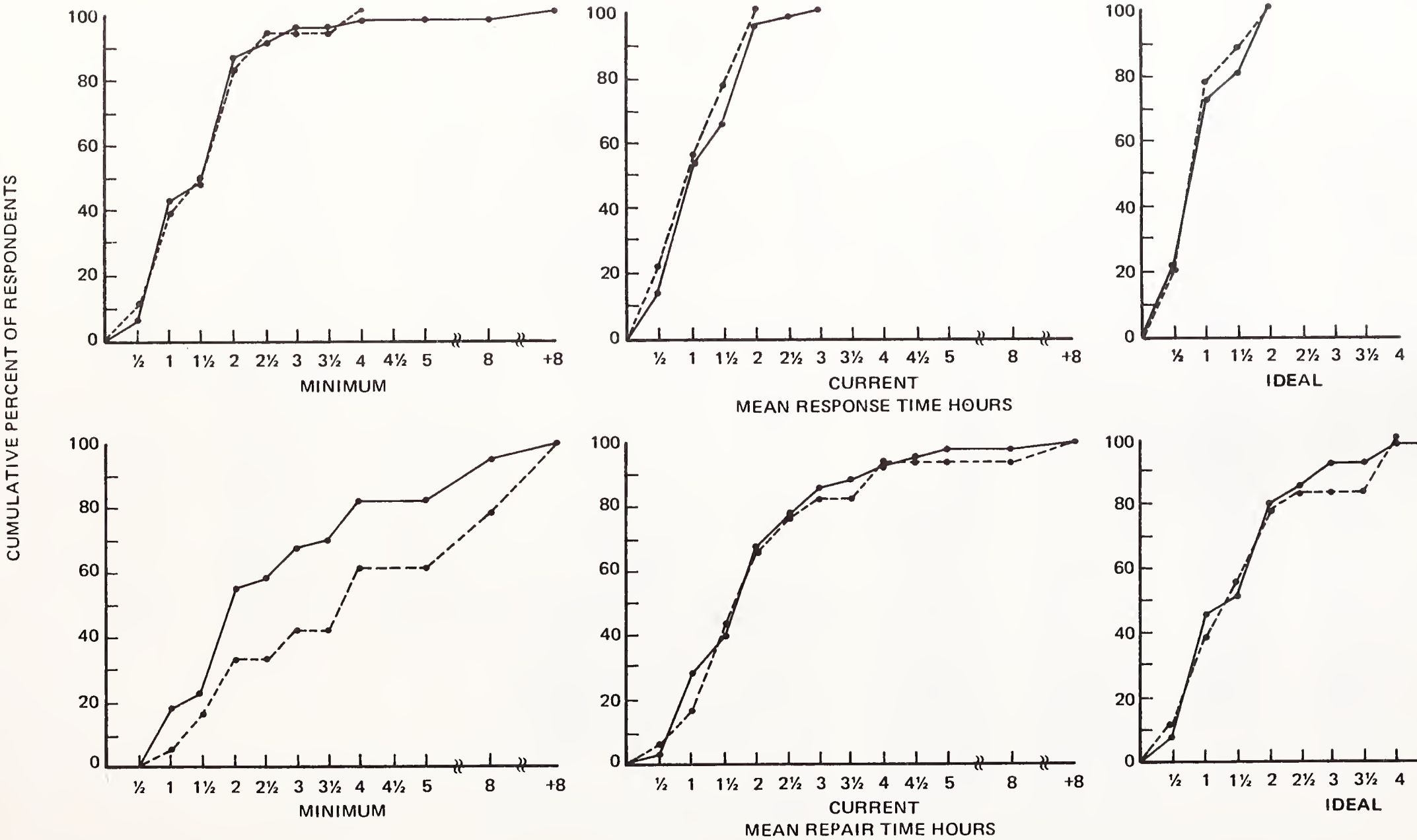


EXHIBIT IV-4

SMALL BUSINESS MACHINES TIME TO RESPOND AND REPAIR, IBM AND OTHERS — USER RESPONSES

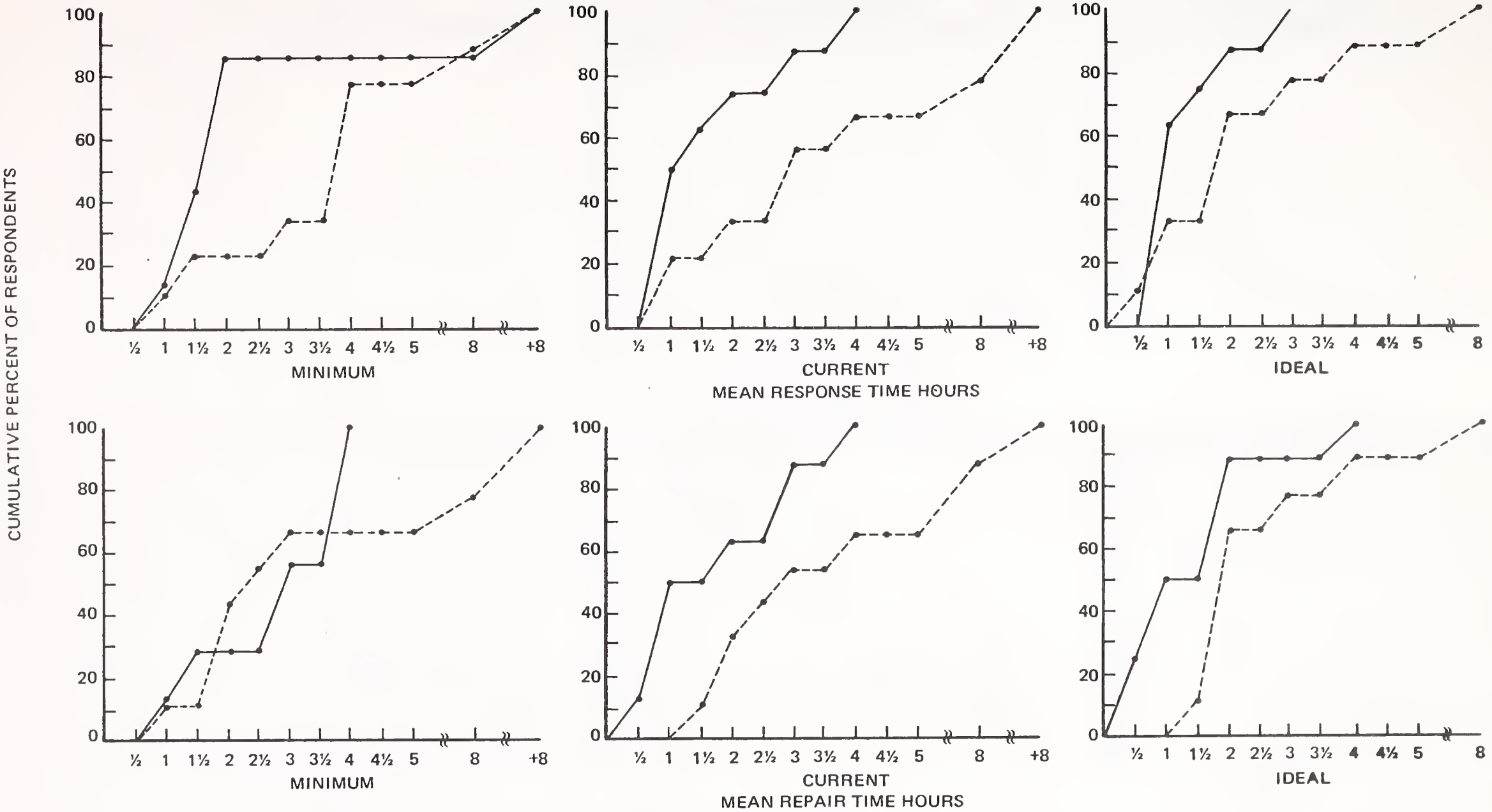


EXHIBIT IV-5

MINICOMPUTERS TIME TO RESPOND AND REPAIR, IBM AND OTHERS – USER RESPONSES

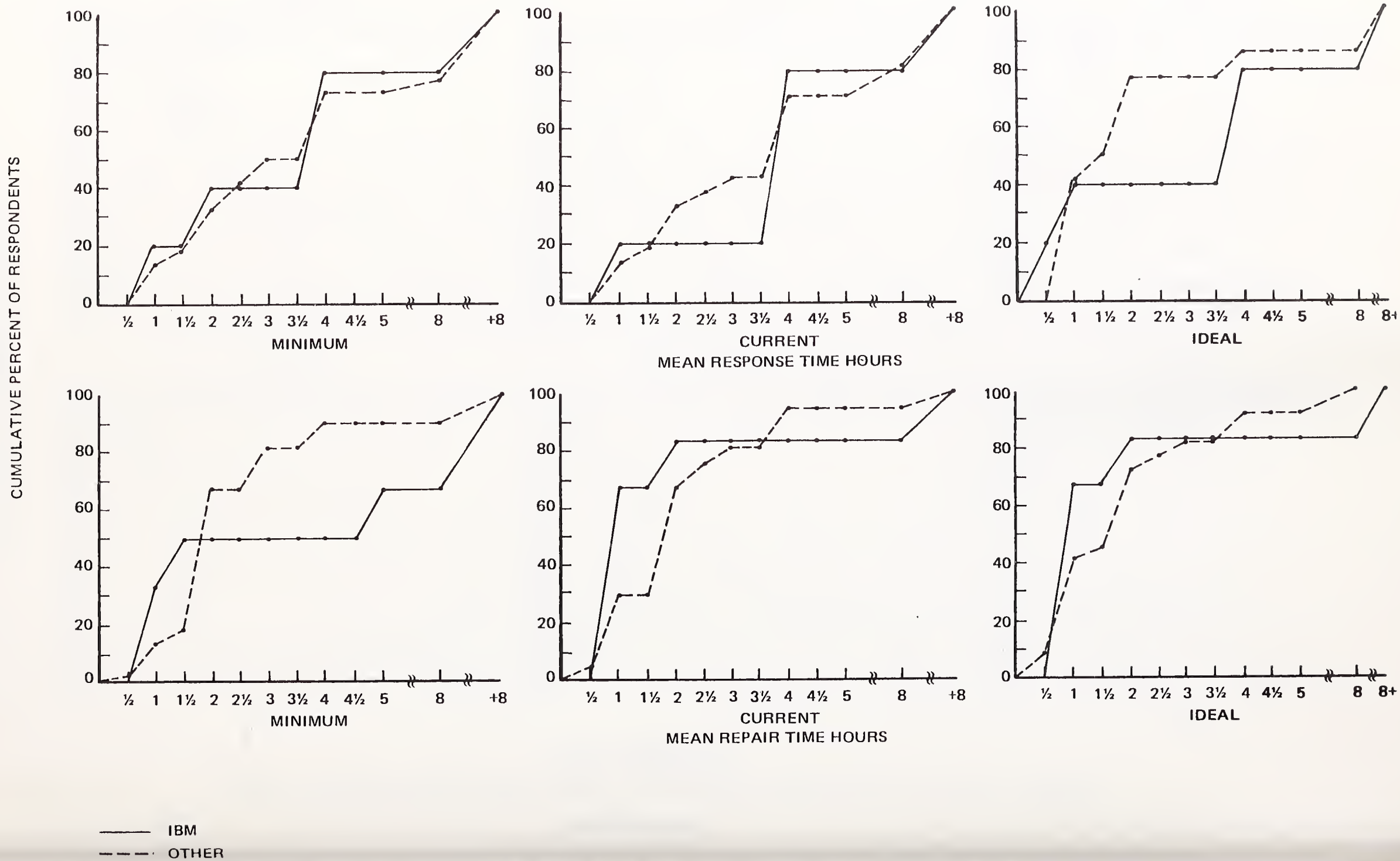


EXHIBIT IV-6

PERIPHERALS TIME TO RESPOND AND REPAIR, IBM AND OTHERS – USER RESPONSES

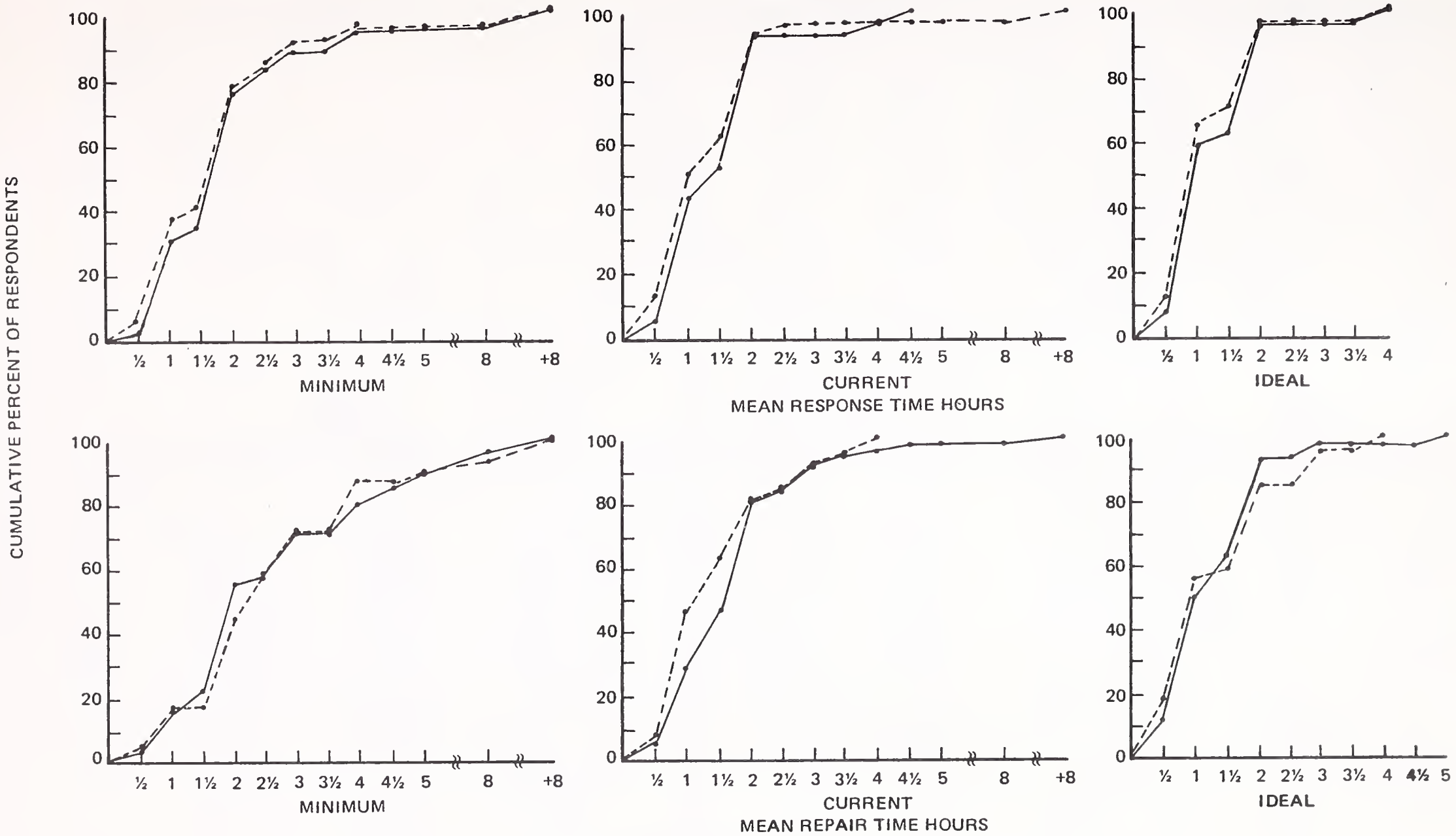
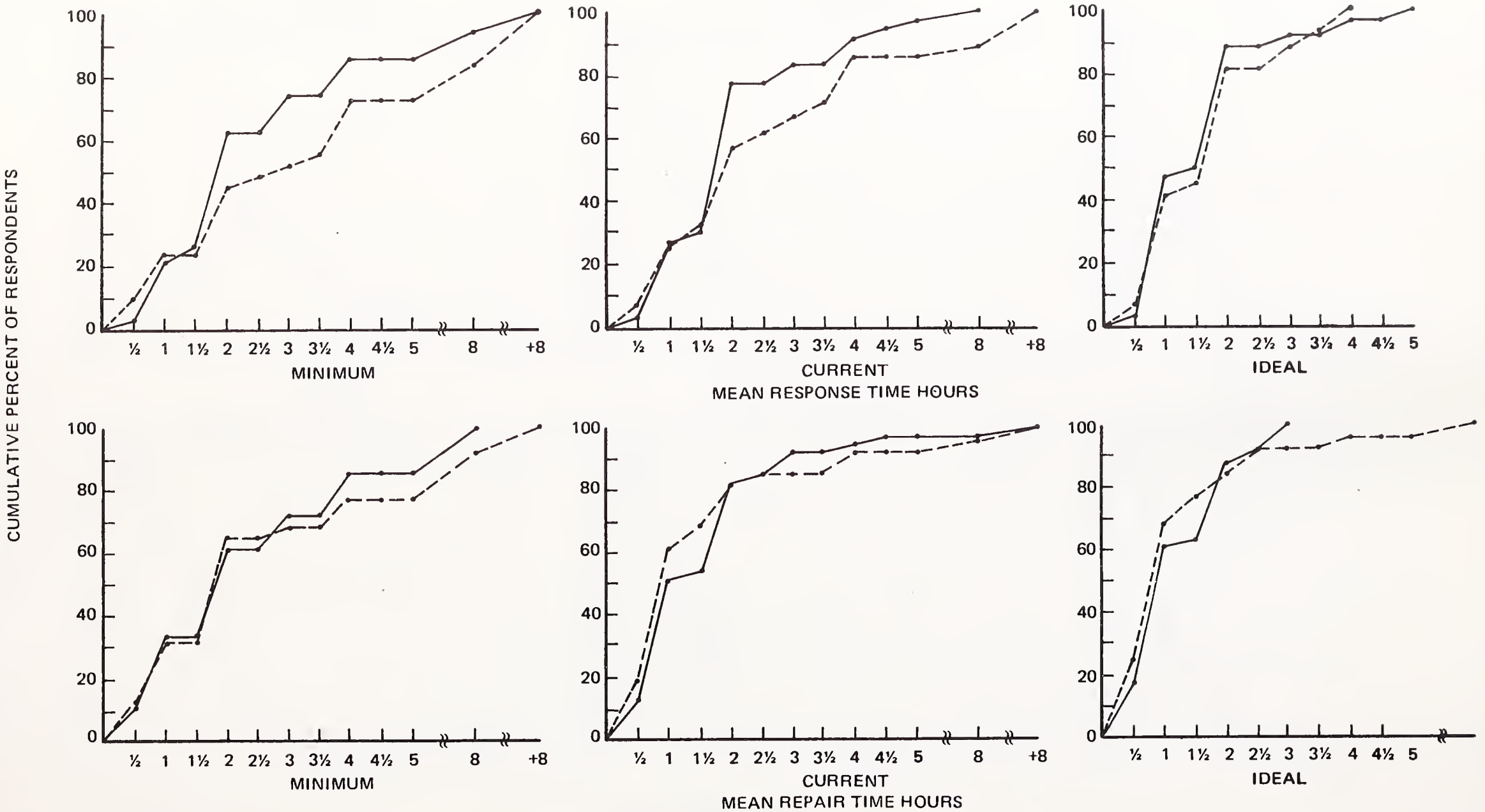


EXHIBIT IV-7
TERMINALS TIME TO RESPOND AND REPAIR, IBM AND OTHERS – USER RESPONSES



- In the mainframe maintenance vendor category in Exhibit IV-3, there appears to be no perceptible difference in users' attitudes toward IBM and non-IBM performance.

  - This observation is consistent with general attitudes discussed earlier (refer to Exhibit IV-1).

  - The one noticeable difference in users' attitudes shown in Exhibit IV-3 is in a relaxed expectation of "minimum" acceptable repair times of mainframes by non-IBM maintenance vendors. This anamoly might explain the slight edge in general satisfaction scored by "others" in Exhibit IV-1.

  - Equivalent performance as perceived by users versus lower expectations (Exhibit IV-3) results in higher satisfaction (Exhibit IV-1).

- The observations made above regarding mainframes are even more pronounced in the small business machines category, shown in Exhibit IV-4.

  - Non-IBM maintenance vendors do not respond as quickly as IBM, nor are they expected to do so.

    . IBM users have become accustomed to 90% of all calls being covered in two hours, and this expectation carries over to the small business machine user.

    . The standard of two hours is graphically relaxed for non-IBM vendors, whose users show a tendency to set four hours as the response time standard.

  - User expectations in repair times are virtually the same up to four hours, but a marked difference emerges for IBM users at that point.

  - IBM small business machine users do not accept repair times over four hours.

  - Over 30% of the users of non-IBM small business machines relax the four-hour standard as expected minimum performance, extending their expectations beyond eight hours.

- A self-fulfilling prophecy is apparently at work in the case of small business machines and may very well be influencing attitudes of users in all categories. It is graphically clear, by comparing Exhibits IV-4 and IV-1, that users' satisfaction is a more accurate reflection of expectations than actual performance.

- Minicomputer users, shown in Exhibit IV-5, have relaxed repair time standards for IBM in the one category not dominated by IBM.

  - Users would ideally like to see IBM repair minicomputers more quickly than other vendors, which may be an early warning to IBM that a tougher minimum standard is not far ahead.

  - IBM is already perceived as making faster repairs than other vendors, and its performance is much better than the minimum standard.

  - Minicomputer users are accustomed to longer response times established by smaller vendors with less density. As a minority participant in this field, IBM is expected to do no better.

  - The "ideal" in response times is slightly relaxed in the case of minicomputers.

  - Consistent with the observations made with respect to small business machines above, users gave higher satisfaction marks in the case of performance versus expectations (compare IV-5 with IV-1).

- In the peripherals and terminals categories shown in Exhibits IV-6 and IV-7, acceptable performance, actual performance and ideal performance in response and Mean Time To Repair were perceived by users without general discrimination between IBM and others.

  - Expectations and performance characteristics in peripherals and terminals were consistent with satisfaction marks given by users (Exhibit IV-1).

  - Being the most volatile markets in terms of users' willingness to replace for poor performance, peripheral and terminal users will continue to control performance, at least in the plug compatible area, by exercising their options.

D. REPLACEMENTS DUE TO POOR MAINTENANCE

- IBM equipment was replaced 6% of the times they were mentioned by users as the maintenance vendor. Non-IBM vendors were replaced twice as frequently as a group, with a total of 12%, as shown in Exhibit IV-8.

  - Peripherals were exchanged most often over the past two years, with "other" maintenance vendors affected almost twice as often as IBM in both percentage (22% to13%) and volume (11 to 6).

  - No particular equipment stands out as being the most-often replaced. Among the rejects:

    . "IBM replaced a printer-3211, problem couldn't be corrected."

    . "IBM 3036 console."

EXHIBIT IV-8

REPLACEMENT OF EQUIPMENT DUE TO POOR MAINTENANCE, IBM AND OTHERS

EQUIPMENT TYPE	IBM	OTHER
MAINFRAME	1.5%	–
SMALL BUSINESS MACHINE	9	–
PERIPHERAL	13	22%
TERMINALS	5	2
TOTALS	6%	12%

- "Univac U14 tape drive, just a poor piece of equipment, basically."
- "IBM-3410 tape drive."
- "Calcomp tapes and controllers."
- "Cambridge core memory, Raytheon maintained it."
- "Ampex core memory."
- "3M microfilm processor."
- "Itel tapes and disks."
- "Systems Industries disk drive."
- "IBM System 32, overall support very bad."
- "IBM 3203 printer."
- "Itel disk drives - high failure rate."
- "Raytheon terminals."
- "Honeywell card punch and printers."
- "IBM peripherals."
- "IBM 3762 terminals."
- "IBM 360/30."

E. USERS' PERCEPTIONS OF CHANGES IN THE QUALITY OF FIELD PERSONNEL, IBM AND OTHERS

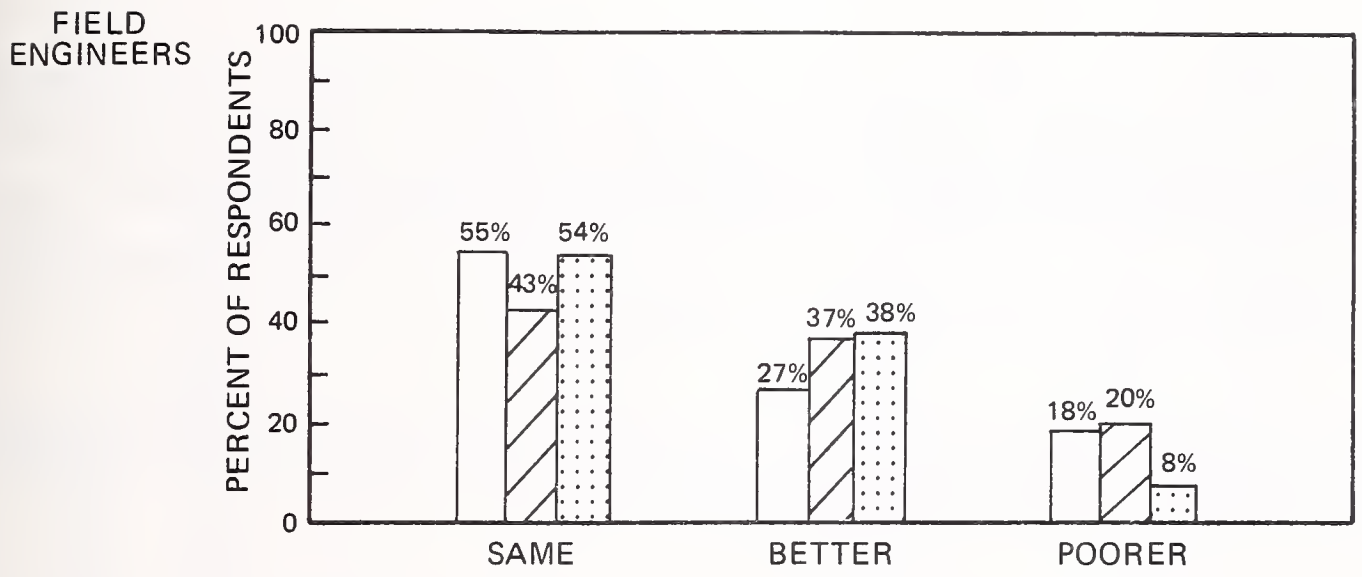
- For comparative purposes, the user survey questions regarding quality of personnel were sorted into three groups, as shown in Exhibit IV-9:
  - Pure IBM - 33 of 76 users.
  - Mixed vendor shops - 30 of 76.
  - Non-IBM - 13 of 76.
- One conclusion that might be drawn from this analysis is that first-line managers tend to perform better in a competitive (mixed) environment, while the field engineers tend to do more "finger pointing."
- IBM first-line managers are possibly a little too confident in a non-competitive environment, as 30% of pure IBM users indicate management quality slipping. While non-IBM first-line managers are not perceived as getting poorer, very few (8%) are perceived as actually improving.

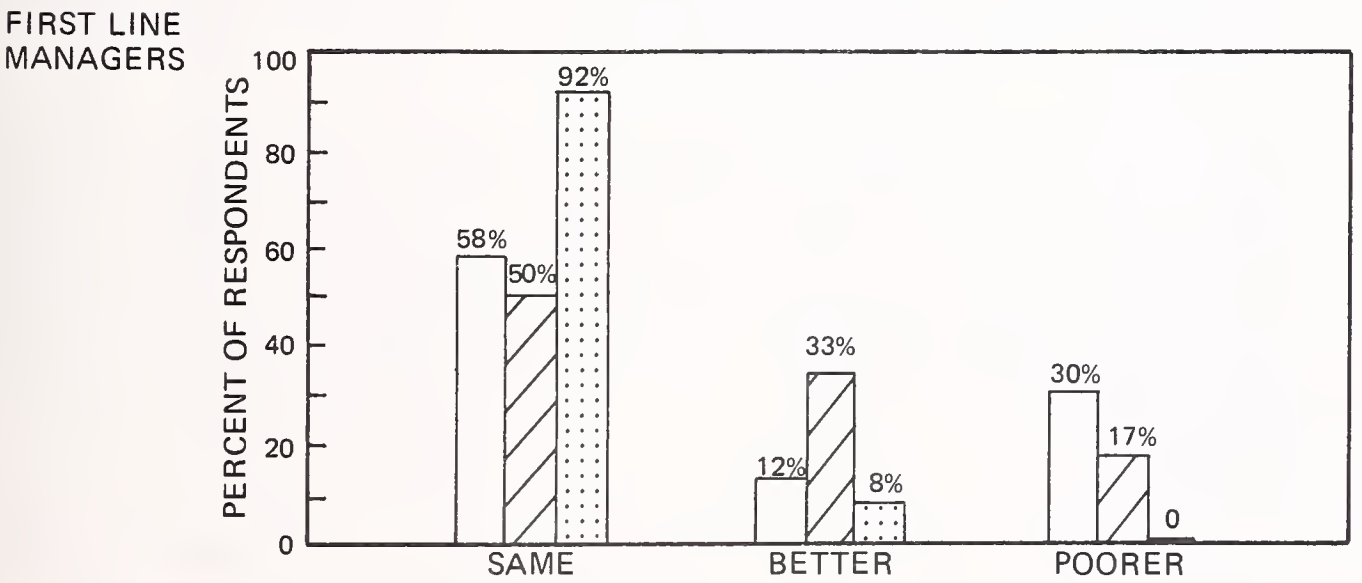
F. USER SATISFACTION WITH SYSTEM SUPPORT CENTERS, REMOTE DIAGNOSTICS AND ESCALATION PROCEDURES

- "System support centers" and "remote diagnostics" mean different things to different users.
  - Some users have narrow perspectives.
    - System support centers are where user systems software personnel call for assistance in maintaining software.

EXHIBIT IV-9

CHANGES IN QUALITY OF FIELD ENGINEERS AND FIRST LINE MANAGERS, IBM AND OTHERS





PURE IBM (33 RESPONSES)

IBM/MIXED (30 RESPONSES)

OTHERS (13 RESPONSES)

. Remote diagnostics are wired into the system and are accessible by remote terminals for experts to diagnose problems (or potential problems) and dispatch the correct level of field engineer.

- Some users have broad perspectives which tend to mix system support centers and remote diagnostics.

- Various degrees of separate definitions exist for support centers, from very narrow to all-encompassing.

- Conclusions drawn concerning the attitudes of users towards system support centers and remote diagnostics should be carefully examined within the context of definitions used, and should be considered premature until more universally accepted definitions are evident. INPUT intends to develop useful definitions in the course of work later this year.

- Users generally feel better about non-IBM system support centers than IBM system support centers, as shown in Exhibit IV-10.

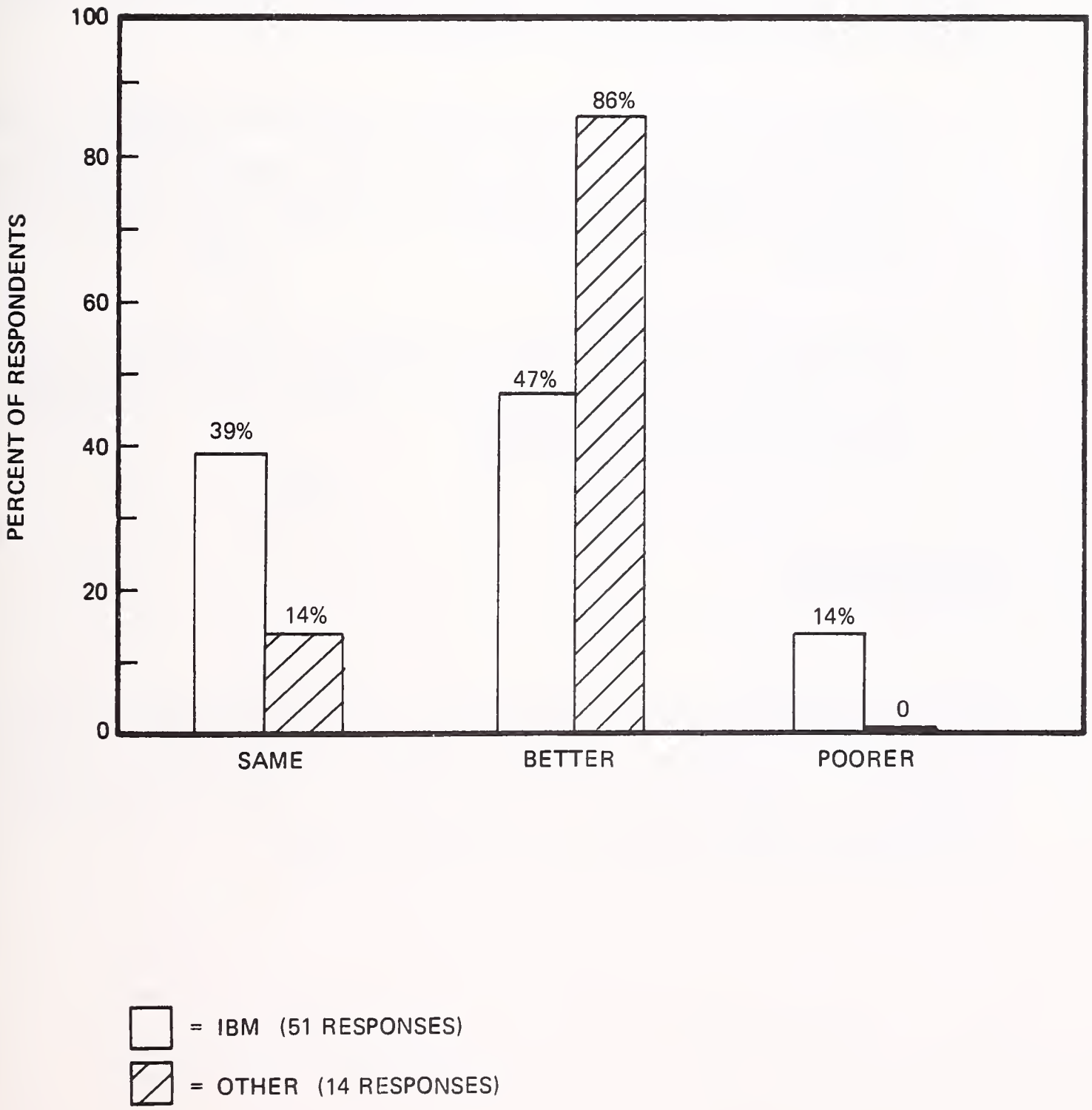
  - These users tend to think of system support centers in traditional terms: the place where field engineers get their diagnostic assistance and remote guidance for solving users' problems.

  - The non-IBM users tend to peceive the system support center as the source of specialized physical assistance through escalation of problems; their higher level of satisfaction may partly be a result of the non-availability of this assistance before the system support center was instituted.

  - Some dissatisfied IBM users have perceived the system support center as the place where all their local software maintenance people have gone, leaving the user without the traditional "personal touch."

EXHIBIT IV-10

USER SATISFACTION LEVELS WITH SYSTEM SUPPORT CENTERS, IBM AND OTHERS



- Users perceive remote diagnostics mostly in terms of hardware assistance to the local field engineer, and give non-IBM maintenance vendors more credit for improving service.

  - There is more awareness in the non-IBM environment than in the IBM environment of hard-wired remote diagnostics and firmware diagnostics which may be exercised from a remote terminal.

  - None of the users reported that service had deteriorated because of remote diagnostics, as shown in Exhibit IV-11.

- Users were equally satisfied with IBM and other vendors when it came to escalation procedures, as shown in Exhibit IV-12.

  - Users were asked to indicate their perceptions of changes in quality; therefore the fact that none of the users perceived escalation procedures as being poorer than last year doesn't mean that they are all satisfied.

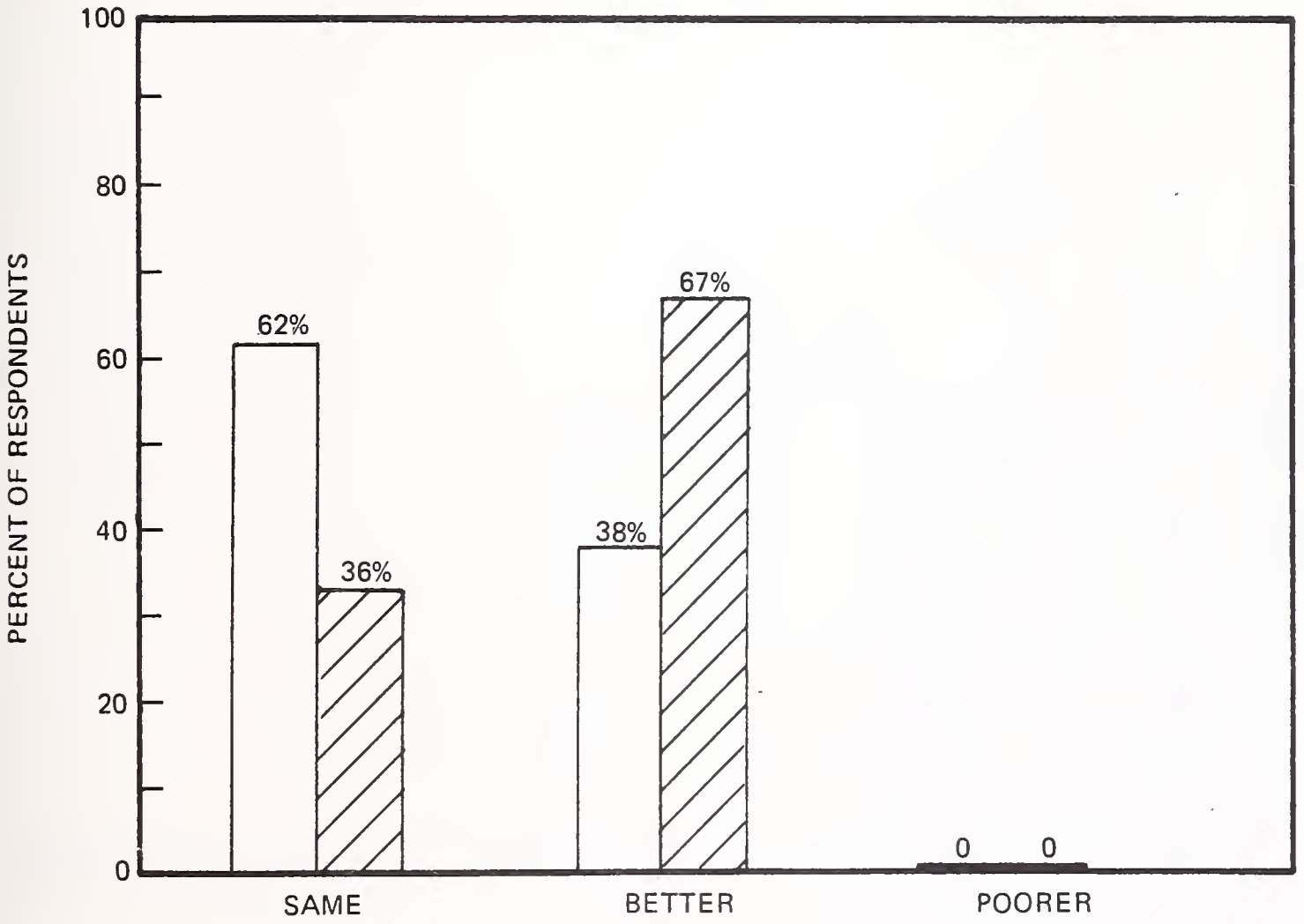
  - Comments from several users were included in Chapter III to reinforce the conclusion that improvement is needed in the management of escalation procedures in general.

G. CONCLUSIONS

- IBM remains the dominant vendor for equipment and service, but, contrary to the opinions of a number of other maintenance vendors, IBM is expected to perform at a higher standard than others and is severely criticized for not exceeding the expected performance of other vendors.

EXHIBIT IV-11

USER SATISFACTION LEVELS WITH REMOTE DIAGNOSTICS, IBM AND OTHERS

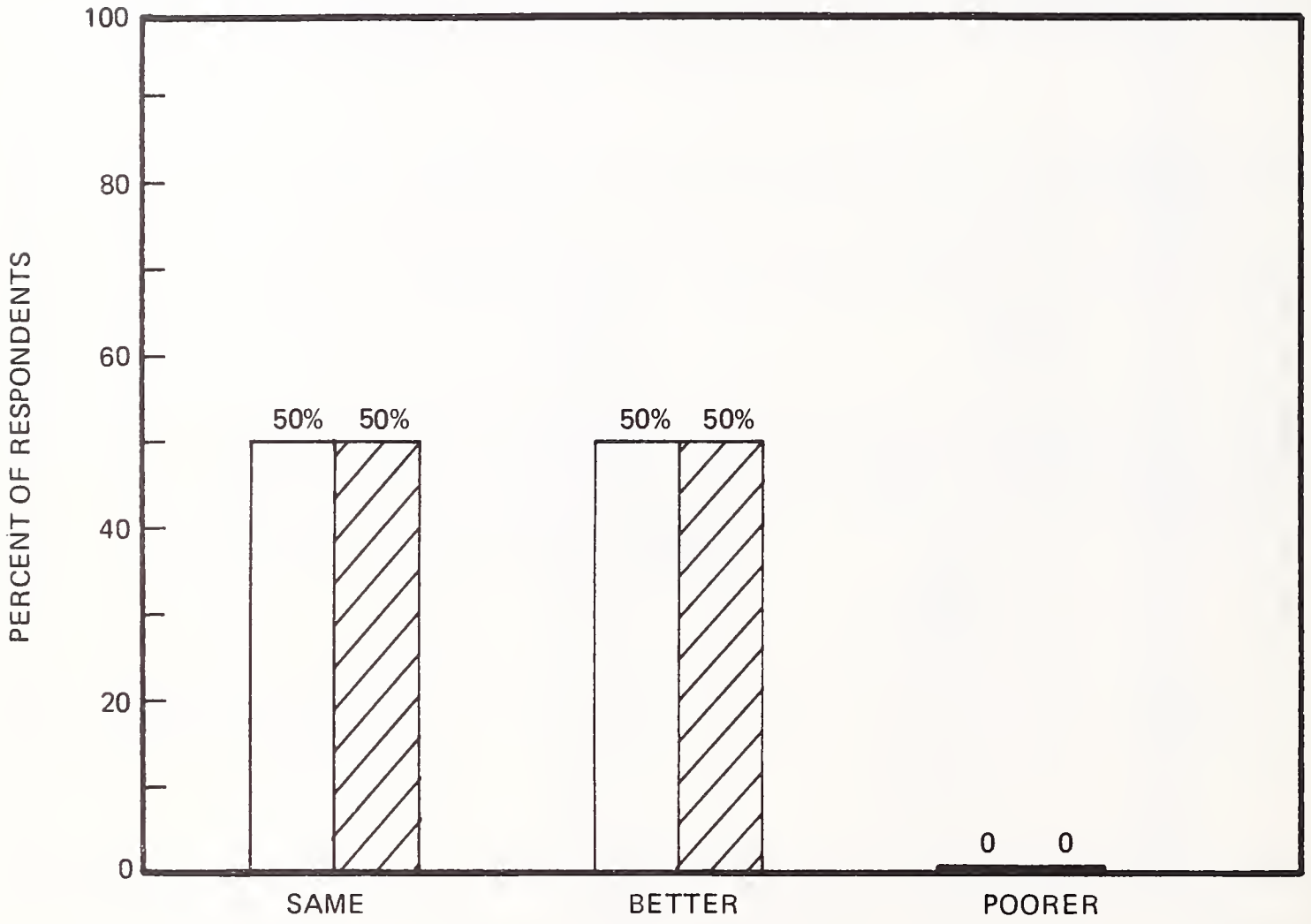


= IBM (26 RESPONSES)

= OTHER (9 RESPONSES)

EXHIBIT IV-12

USER SATISFACTION WITH ESCALATION PROCEDURES, IBM AND OTHER



- Alert non-IBM maintenance vendors can take advantage of the "underdog" syndrome by stretching actual performance beyond expected performance, winning high marks well before attaining the performance expected of IBM.

- As other vendors become more visible, they are expected to move their own standards up to industry standards within a reasonable time. This fact is evidenced by users' expectations of peripheral and terminal vendors.

V RESULTS OF VENDOR SURVEY

V RESULTS OF VENDOR SURVEY

A. METHODOLOGY AND VENDOR PROFILE

- INPUT selected 20 maintenance vendors from the 50 surveyed in 1978 as a representative cross section required to achieve the specific objectives of the "1980 Annual Report." These objectives were:

  - To followup on significant industry trends discussed in the 1978 multiclient study, "Maintenance Requirements in the Information Processing Industry, 1978-1983."

  - To indicate new nonproprietary maintenance vendor techniques and concerns vital to long-range planning in the industry.

  - To merge information from a representative sample of maintenance vendors with ongoing user research, thereby providing balance in the report by analyzing both user and vendor data.

- A 21-page questionnaire (see Appendix E for a complete copy) was mailed to the selected maintenance vendor executives.

- In every case but one, either the top field service executive or an executive reporting directly to him responded to the questions. This indicates a high level of interest in sharing common concrns and ideas that may benefit the entire industry.

- Eight top executives responded directly.

- Eleven executives reporting to the top executive, including national service directors, directors of planning and others, completed the questionnaires for their companies.

- Follow-up telephone interviews were conducted as required to clear up ambiguities.

- Half of the respondent vendors maintained a front-line field service force of more than 400 personnel. The respondents included:

  - Three large vendors, averaging almost 3,700 service engineers in the field, with a range of 2,519 to 5,672.

  - Nine mid-sized field engineering organizations, averaging 552 service engineers in the field, with a range of 301 to 900.

  - The remaining eight vendors averaged 128 service engineers, with a range of 7 to 249.

B. VENDOR ORGANIZATIONAL STRUCTURES

- Recognition of the increasing importance of field service as a business unto itself and as a viable supporting division of information products companies can be seen in the restructuring of organizations, reporting lines of authority, and trends toward profit center orientation.

  - More than half (60%) of the respondent vendors' service organizations are headed by vice presidents, as shown in Exhibit V-1.

  - Twenty percent of the field service top executives are division or group vice presidents, with the remaining leaders heading up major field service departments.

EXHIBIT V-1

TITLE OF SENIOR FIELD ENGINEERING PERSON AND SUPERIOR OF VENDORS INTERVIEWED

SENIOR FIELD ENGINEERING PERSON:

TITLE	NUMBER	PERCENT
GROUP/DIVISION VICE PRESIDENT	4	20%
VICE PRESIDENT MARKETING	2	10
VICE PRESIDENT FIELD ENGINEERING/SERVICE	4	20
VICE PRESIDENT	2	10
DIRECTOR CUSTOMER/FIELD ENGINEERING	8	40
TOTAL	20	100%

REPORTS TO:

TITLE	NUMBER	PERCENT
PRESIDENT/GROUP GENERAL MANAGER	7	37%
DIRECTOR FIELD OPERATIONS	1	5
SENIOR GROUP VICE PRESIDENT MARKETING	11	58
TOTAL	19	100%

- An increasing number of field service top managers, 37% of vendors surveyed, report to the chief executive officer or a group general manager.

- Over one-half of the respondent vendor top executives report to senior vice presidents of integrated marketing groups.

- The trend toward profit center accountability continues, as indicated in Exhibit V-2.

  - All respondent vendors except one reported that they were either operating as a profit center or expected to be doing so within the next three years.

  - The proportion of vendor maintenance organizations structured as profit centers has grown from 63% to 70% since 1978.

  - The ratio of planned conversions tells the real story of the 1980s. Most of the responding vendors reluctant to change in 1978 are planning to convert to profit centers during the first half of the new decade.

- The dynamic character of field service organizational structure is evident also in the fact that 70% of the respondent vendors created major structural changes during the past year. Some of the changes mentioned were:

  - "Now reporting to the company president."

  - "Set up an operations group reporting to vice president of field engineering."

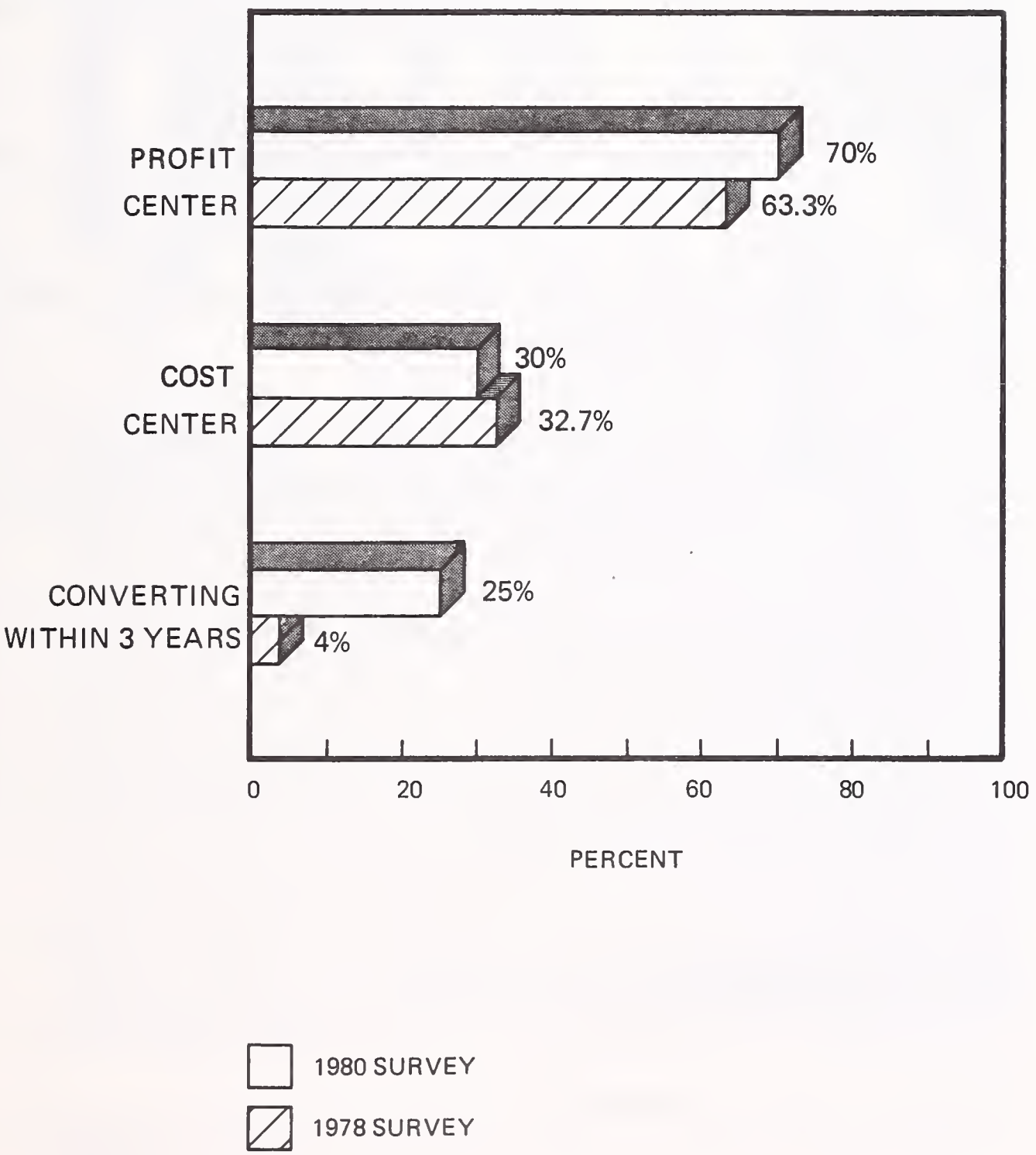
  - "Installed centralized dispatch."

  - "Raised service organization from division level to group level."

  - "Created second level line manager between region manager and first line manager."

EXHIBIT V-2

PROFIT CENTER OR COST CENTER ORGANIZATION OF RESPONDING VENDORS



- "Organized area business team ... profit responsibility for service, another for software support; both working closely with area sales management."

- "Placed training and factory support engineering under service ... placed a logistics management information system into effect."

- "Incorporated customer training into service department."

- "In seven major districts, area managers were added between district and regional levels."

- Twelve of the twenty respondent vendors reported changes in the number of field engineering locations ranging from a minus 10% to plus 163%.

  - The average of all changes, including the eight reporting no change in the number of locations, was plus 15%.

  - The average number of locations per respondent vendor grew from 118 to 122 over the past year, a weighted average of 3.4% growth in the number of field engineering locations.

  - Half the respondent vendors reported greater than the median of 80 field engineering locations.

  - Exactly half the respondents reported growth in the number of locations greater than the average of 15%.

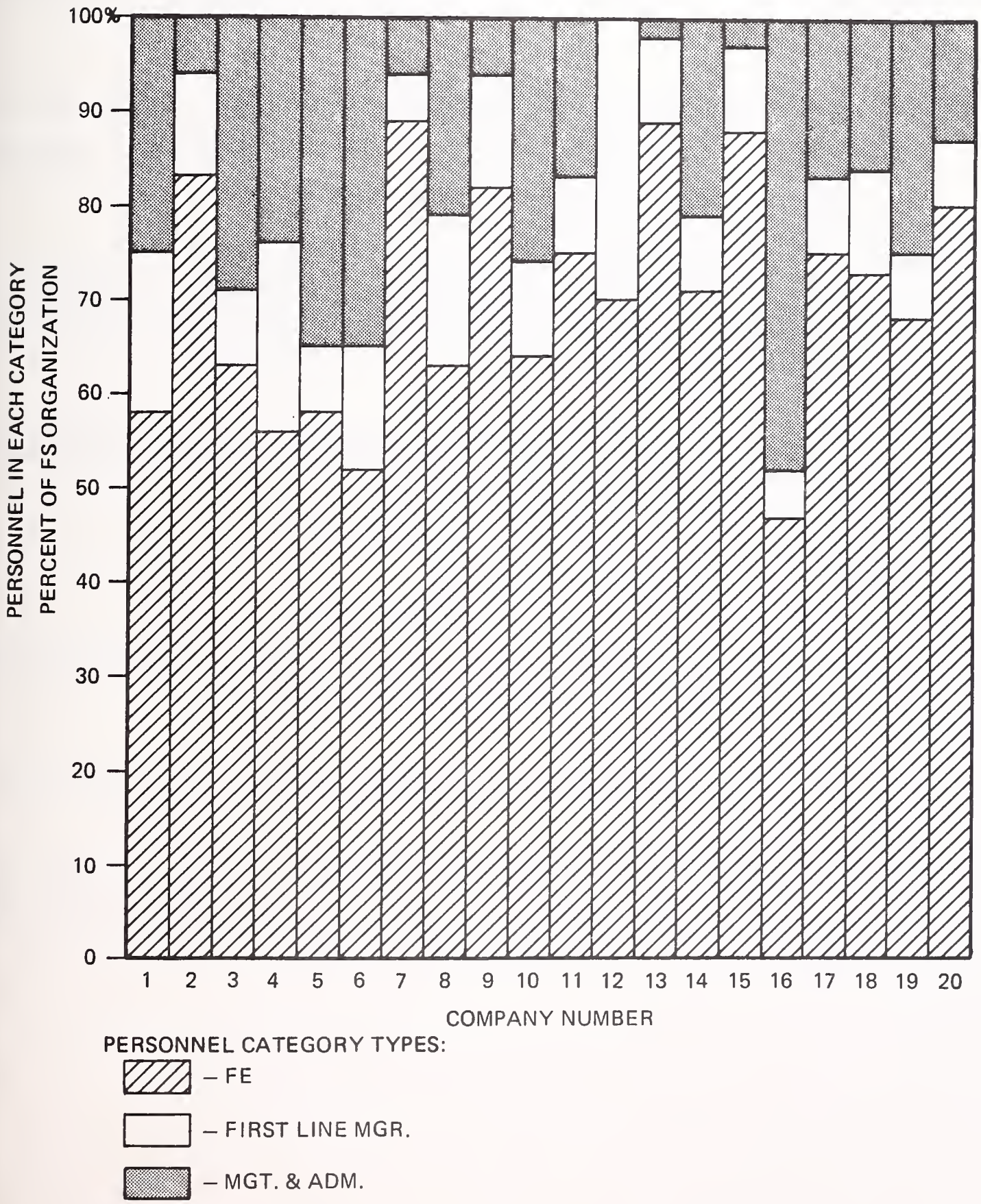
C. MAINTENANCE PERSONNEL CONCERNS

1. COMPOSITION OF WORK FORCE

- Exhibit V-3 shows that the distribution of personnel levels within each of the

EXHIBIT V-3

COMPOSITION OF RESPONDING FIELD SERVICE ORGANIZATIONS



respondent vendor organizations varied considerably with no discernable pattern. To an extent this is undoubtedly due to differences in job descriptions among respondents

- The front-line troops make up 65% of the total personnel assigned to service departments and divisions among the respondent vendors. Proportionate field engineering populations range from 45% to 88%.

- Structural differences among respondents account for the variances in reported proportions of field engineers, first-line managers and administrative personnel.

  - Some maintenance vendor organizations provide their own personnel for administrative support functions in finance, accounting, personnel, training, logistics and continuation engineering.

  - Other respondents depend in part or entirely on general administrative departments for support, and do not list personnel for certain administrative and engineering functions.

  - There is no significant degree of correlation between personnel distribution and profit center accountability.

2. PERSONNEL GROWTH AND TURNOVER

- During the past year, 16 of the twenty respondent vendors reported personnel growth of up to 210%.

  - Half the vendors responding reported 15% or greater personnel growth.

  - The average growth reported by maintenance vendors was 37%, distorted by two organizations experiencing explosive growths of 210% and 96%.

- After removing the two top growth organizations from the average, vendors still averaged 20% growth in 1980.

- Field engineering turnover compounded recruiting problems already becoming critical because of growth, as shown in Exhibit V-4.

  - Nineteen of the vendors reported hiring 3,706 field engineers to replace 2,316 for a net gain of 1,390.

  - Because of turnover, 2.7 new hires are required to gain one employee necessary for growth.

  - The average vendor hired 195 new field engineers to replace 122 for a gain of 73.

  - Attrition was due to several familiar causes and some new causes as reported by vendors. Comments, some of which follow, ran 76% voluntary resignations versus 12% each for promotions and involuntary separations.

    . "Wanted to leave the area."

    . "More money."

    . "Career change."

    . "Move to warm climate."

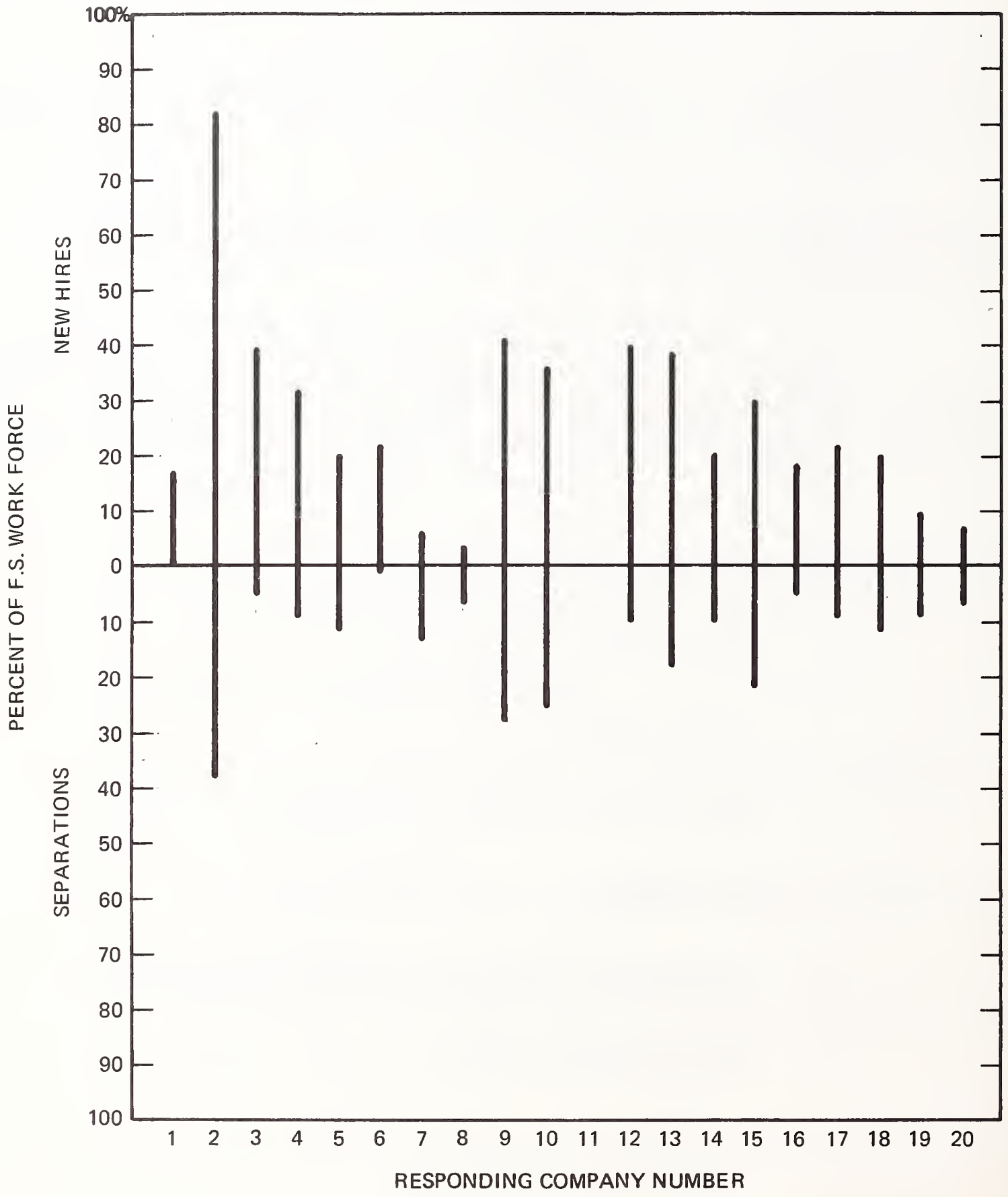
    . "Car mileage."

    . "Joined customers who elect to maintain own equipment."

    . "Spare parts not available."

EXHIBIT V-4

COMPARISON OF FE NEW HIRES AND SEPARATIONS – 1979

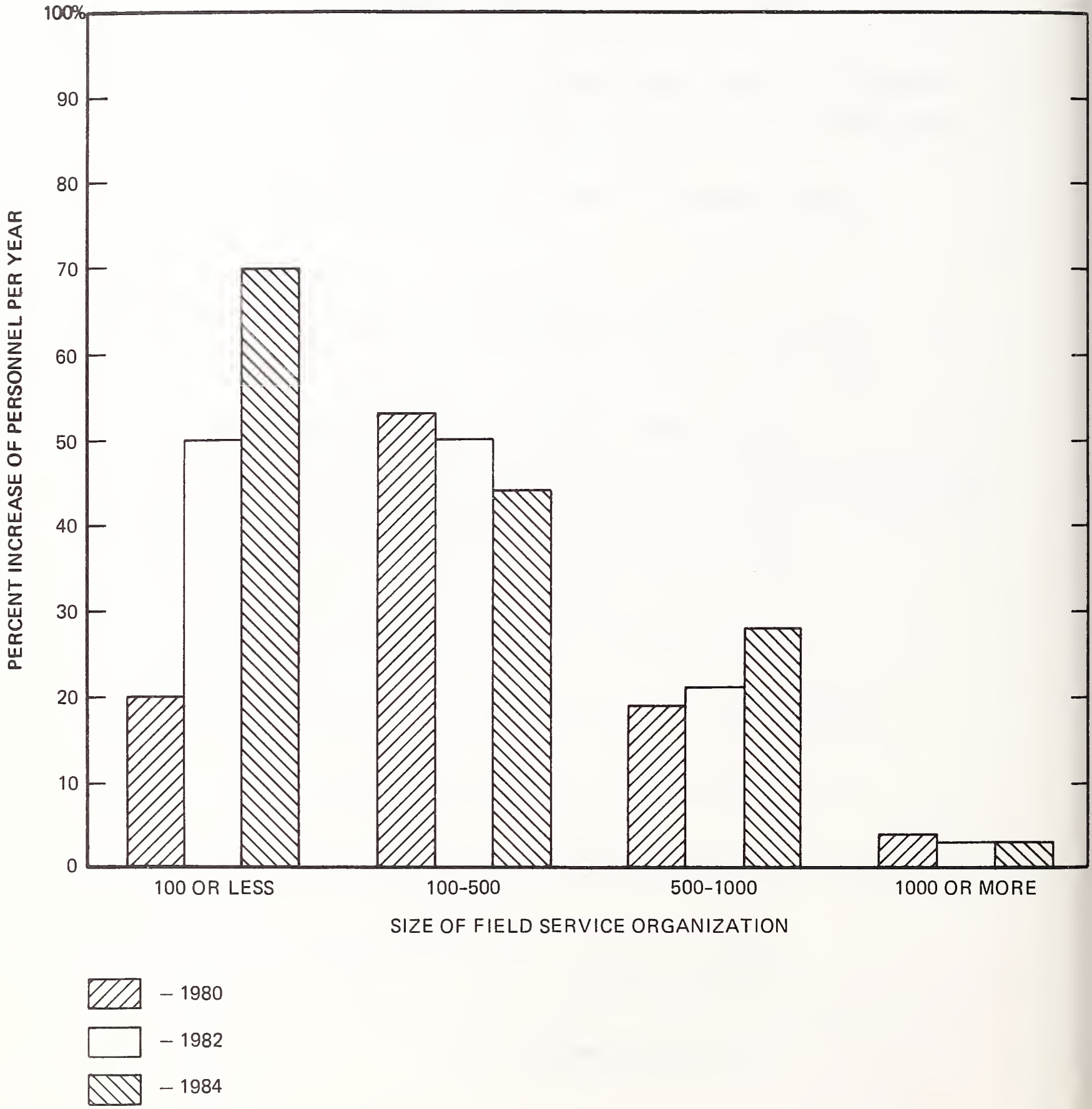


  - "Too much overtime."
  - "Merger-related."
  - "Inadequate training available."
  - "Competition, job-hopping."
  - "Incompatible with our organizational philosophy."

- Maintenance vendors expect growth in personnel much greater than the field engineering growth projected in 1978, as shown in Exhibit V-5.
  - Sixteen respondent vendors reported expected growth in all three years of the projection.
  - Small to middle-sized companies, as expected, indicate the greatest growth potential.
    - Greater density in larger companies increases utilization.
    - Smaller companies project growth of support departments as they move from cost centers to autonomous profit centers.
    - Smaller companies also are adding geographic coverage.
  - Vendors' comments on reasons for personnel growth included:
    - "127% increase in total system population."
    - "Large dispersed communications networks."
    - "Growth of trade revenues in service contracts and time and material business."
    - "Increase in market share."

EXHIBIT V-5

EXPECTED INCREASE IN FIELD SERVICE ORGANIZATION SIZE - 1980–1982–1984



- "Going to international service organization and third party."
- "Acquisition of new company."
- "Expanded product base."
- "Increased complexity of equipment."

- The modest growth expected by the larger vendors is noteworthy.
  - These vendors who responded tend to concentrate on central site maintenance; vendors who are heavily involved in distributed systems tend to forecast higher growth rates.
  - The sizeable population of field engineers in these larger vendors is the basic reason for INPUT's estimate that the overall growth will be 11% per year in the early 1980s.

3. SOURCES OF NEW MAINTENANCE PERSONNEL

- The trend toward trade schools as a primary source of new field engineers has become even more evident since 1978, as shown in Exhibit V-6.
  - Eleven of the respondent vendors (55%) rated trade schools of great importance in 1980. In 1978, only 46% gave trade schools high ratings.
  - Trade schools were rated second in importance to recruiting from competition in 1978, but were projected into first place by 1982. This current survey finds trade schools already in first place with only two vendors rating them of little or no importance in 1985.

- The traditional source of technicians trained by the armed forces remains in third place as a source, with exactly 50% of respondent vendors considering the source as having little or no importance. By 1985, 65% of the vendors move the armed forces into last place by rating the source low or not applicable.

EXHIBIT V-6

RATINGS OF PRIMARY SOURCES OF NEW FS PERSONNEL

VARIABLE	YEAR			
	1978*	1980**	1982*	1985**
HIRE AND TRAIN (NO TECHNICAL PRE-TRAINING)	2.0	1.8	2.8	3.5
RECRUIT FROM COMPETITION	3.0	2.9	2.8	2.1
RECRUIT FROM INDUSTRIES	2.3	2.1	2.6	2.4
TRAIN DISCHARGED ARMED SERVICES PERSONNEL	2.6	2.5	2.4	1.9
RECRUIT FROM OTHER FUNCTIONS WITHIN THE COMPANY	2.7	1.9	2.5	2.2
TRADE SCHOOLS	2.9	3.7	4.0	4.1

(SCALE: 1 = LOW, 5 = HIGH)

*1978 & 1982 RATINGS FROM "MAINTENANCE REQUIREMENT FOR THE INFORMATION PROCESSING INDUSTRY 1978-1983"; SURVEY DONE IN 1978.

**1980 AND 1985 FIGURES FROM CURRENT SURVEY

NUMBER OF RESPONSES: 19

- Recruiting from competition, which ranked as the number one source of new personnel in 1978, has now shipped to second place, with 19 respondents rating competitive sources evenly from high to low in importance. Recruiting from competition moves into a virtual tie with the armed forces for last place in 1985, according to respondents.

- Respondent vendors give little importance in 1980 to hiring and training personnel with no technical background, but place this source very closely behind trade schools by 1985. Seventy-five percent of the respondent vendors rate this source of new field engineers as medium to high in 1985.

- Other sources of replacement or new-hires in field service include four-year degree schools as specified by one vendor. This vendor rated universities as high in importance both now and in 1985, and gave only low marks to all other sources.

  - Another vendor rated universities as medium in importance now and in 1985.

  - The third vendor who specified a source other than those listed said that he rated two-year associate degree colleges medium in 1980, but very high by 1985.

4. FIELD ENGINEERING SALARIES

- Field engineering trainees could be hired into base pay ranges from $4.73 per hour ($9,800 per year) to $1,900 per month ($22,800 per year), as shown in Exhibit V-7. The actual base salaries paid to trainees by respondent vendors averaged from $12,000 to $20,220 per year.

- Base salary ranges for qualified field engineers on respondent vendor payrolls are from $12,000 to $25,800 per year. The actual salaries paid to qualified field engineers average from $15,000 to $23,000 per year, as shown in Exhibit V-8.

EXHIBIT V-7

ANNUAL SALARY RANGE OF AVERAGE TRAINEE

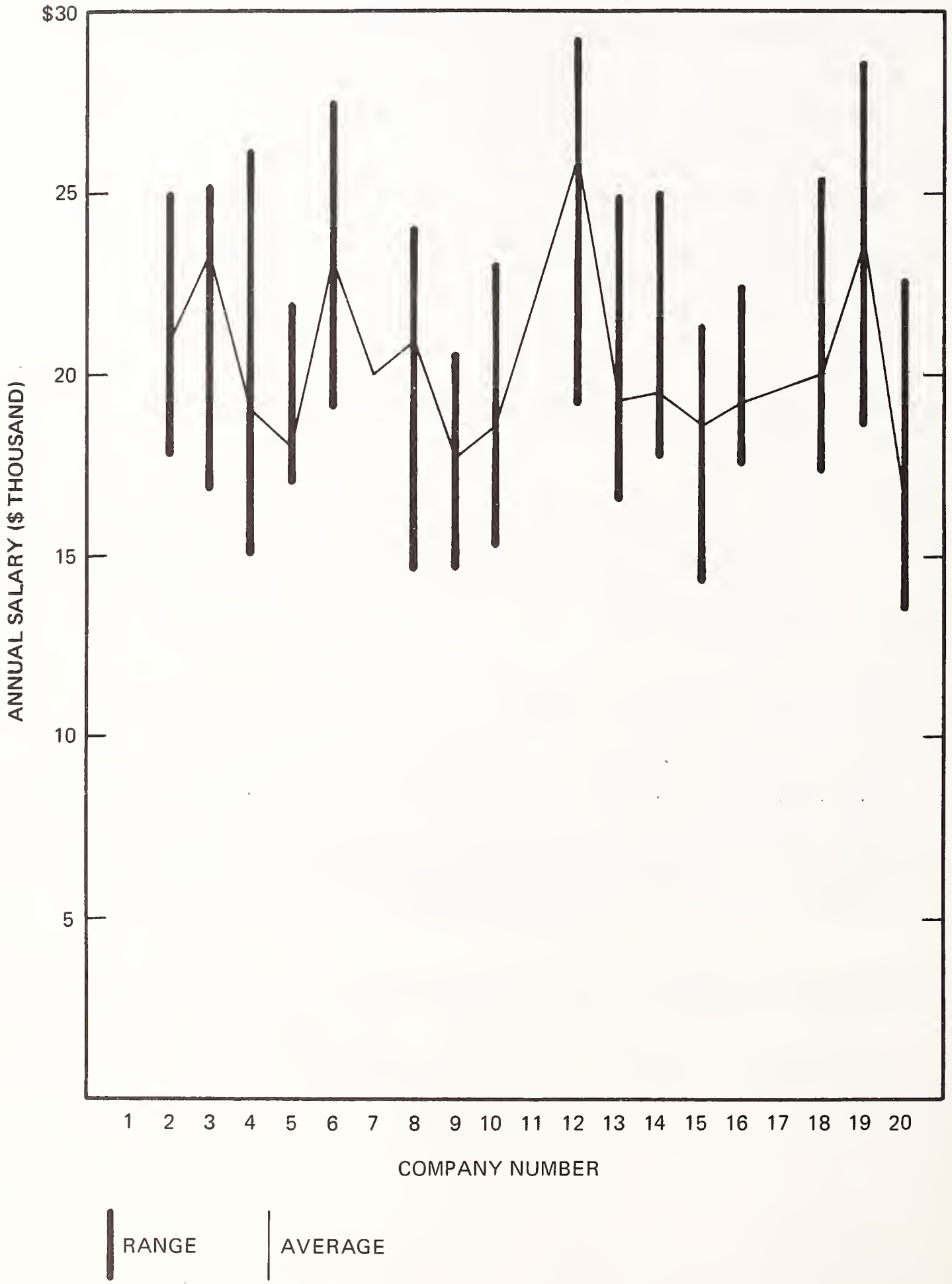
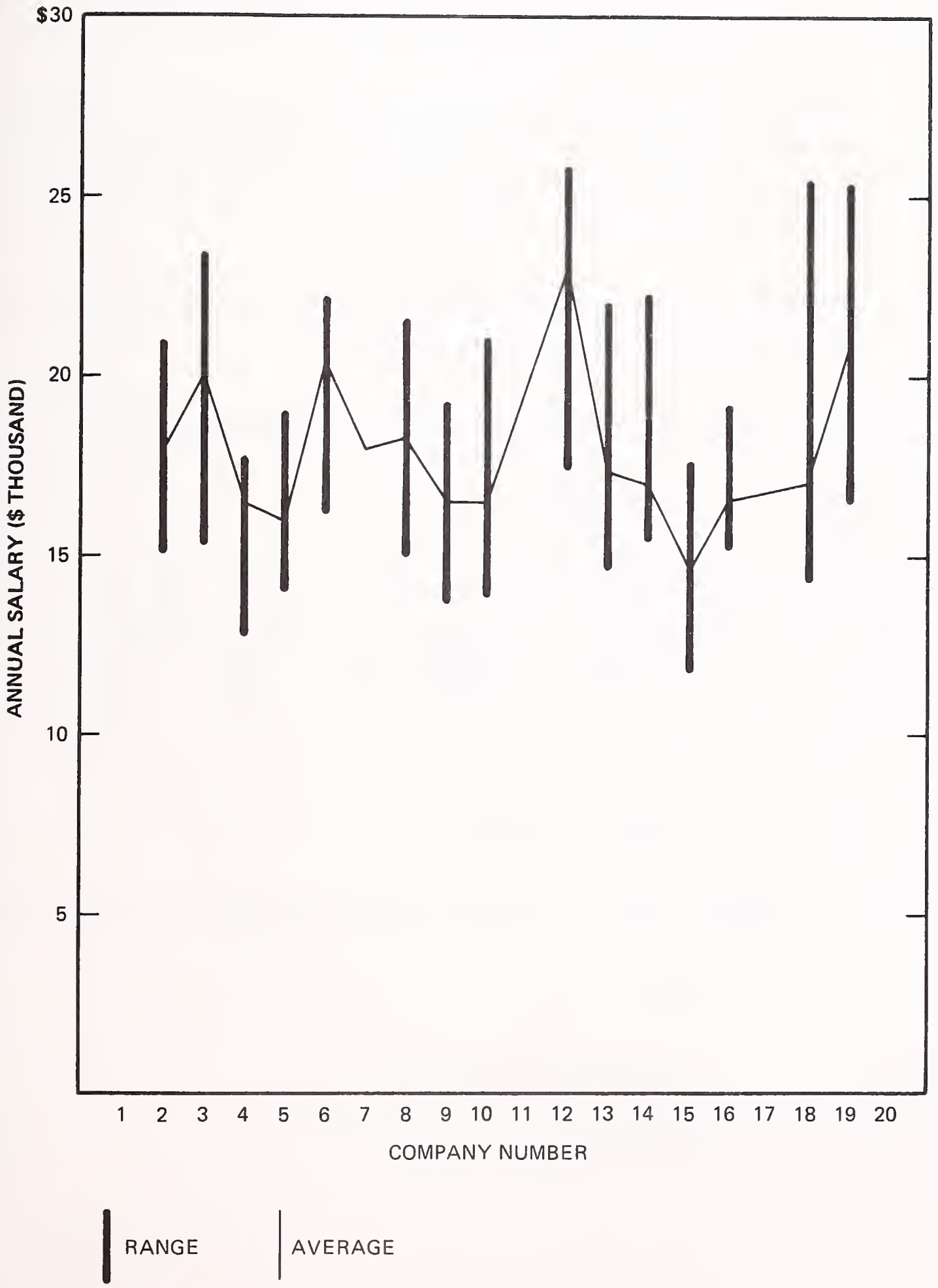


EXHIBIT V-8

ANNUAL SALARY RANGE OF AVERAGE QUALIFIED FE



- Exhibit V-9 indicates that annual salary brackets for senior field engineers range from $13,500 to $29,280 per year, and average from $17,000 to $26,000 per year.

- The relatively narrow range of salaries from trainee to senior field engineer shows little room for income growth commensurate with growth in capability; this fact undoubtedly contributes to turnover.

- Exhibit V-10, "Comparison of Average Salaries," provides a snapshot of the average salaries paid all field engineers by respondent vendors. The distribution of average salaries remains consistent from trainee to senior in all companies except numbers 7 and 8.

- Respondent vendors reported increases in salary ranges from 6% to 15% in 1980, with the average adjustment being 9.5%.

  - Reasons given for increases in salary ranges included:

    . "Competition."

    . "Cost of living."

    . "Increasing FE responsibilities."

    . "Inflation."

    . "Supply and demand."

  - Reasons cited by vendors for individual increases in salaries included:

    . "Merit."

    . "Exceptional performance."

    . "Seniority."

EXHIBIT V-9

ANNUAL SALARY RANGE OF AVERAGE SENIOR FE

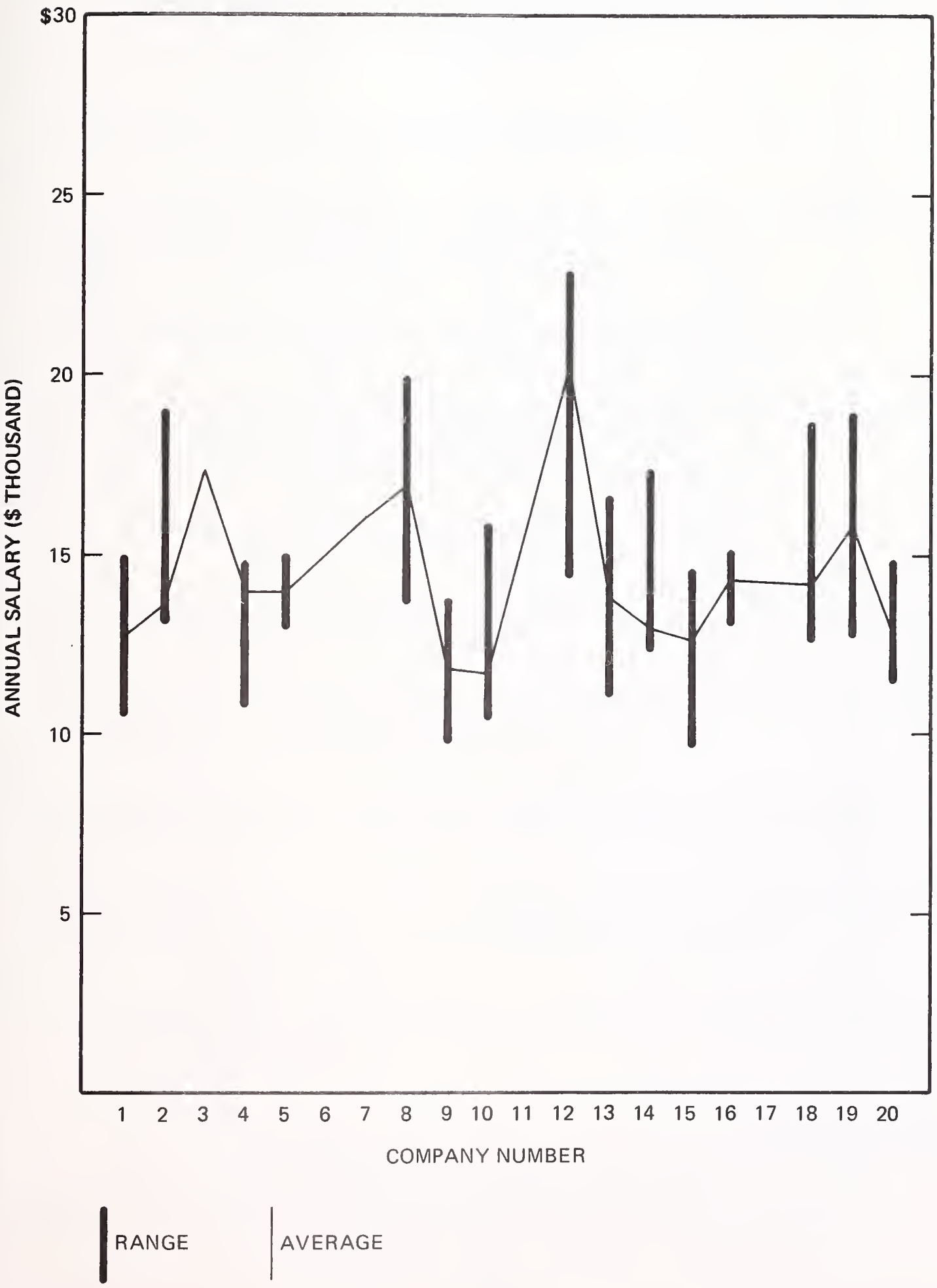
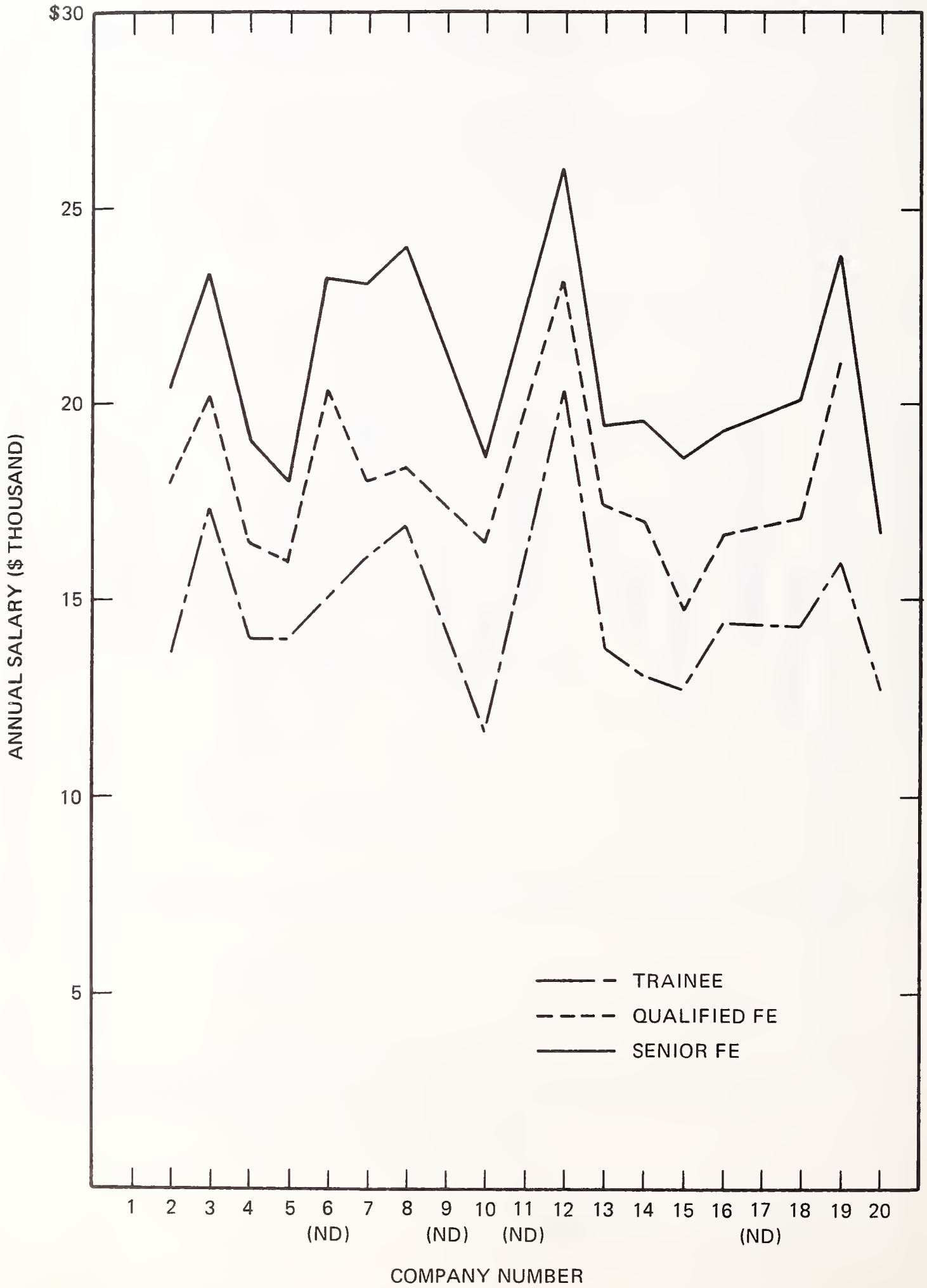


EXHIBIT V-10

COMPARISON OF AVERAGE SALARIES



ND = NO DATA

. "Promotion."

. "Six-month reviews below mid-range, annual reviews above mid-range."

- It is relevant that the inflation rate in 1979 was greater than the average salary increase reported by vendors; this can be a contributor to unrest among current field engineers.

5. INCENTIVE PROGRAMS FOR FIELD ENGINEERS

- Five respondent vendors, all with West Coast headquarters, reported some form of incentive program for field engineers, including:

  - Commissions on service contracts and training courses sold.

  - Quarterly award to "CE of the Quarter," one for each region; one week combined business and pleasure meeting.

  - "Extra mile" awards for plus performers.

  - Percentage of contract revenues allocated as bonuses (2 vendors).

- The absence of incentive programs at 15 respondent vendors often reflects unsuccessful incentive programs tried in the past.

6. AFFIRMATIVE ACTION AND EQUAL EMPLOYMENT OPPORTUNITY

- Only 7 of 20 vendors surveyed responded with a percentage of new hires required to meet affirmative action guidelines at their companies.

  - The average number of new hires required for the seven respondents was 15%.

  - Three vendors reported increases in recruiting costs ranging from 5% to 30% resulting from affirmative action requirements.

- One vendor's training costs increased by 30% to meet guidelines.

- One vendor claimed that the size of the field organization increased by 10% to accomodate affirmative action programs.

- None of the respondent vendors reported any problems associated with affirmative action guidelines other than those cited above.

D. VENDOR RATINGS OF COMMON PROBLEMS AND CHALLENGES

- The morale of the maintenance force was rated surprisingly low in Exhibit V-11, despite the significant turnover experienced by respondent vendors.

  - Only two out of 20 vendors consider morale a significant factor.

  - This indicates that vendors tend to spend more effort on recruiting than on retention.

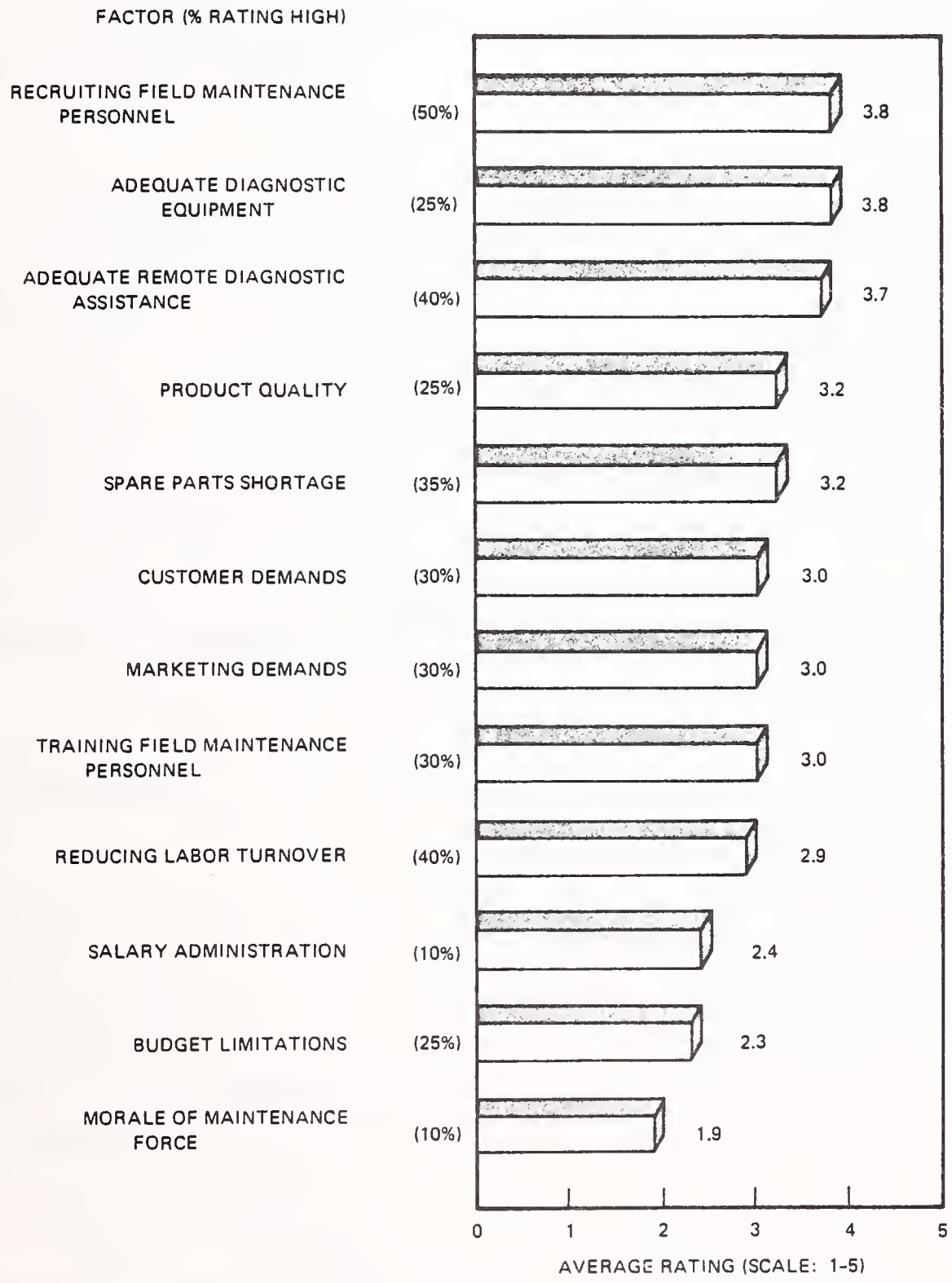
- Respondent vendors left little to the middle ground regarding employee turnover, rating the problem evenly as high or low. Although 40% rated turnover highly, more respondents rated the subject of little importance, bringing down the weighted average of the responses.

- Recruiting and diagnostic equipment virtually tied for the first concern of respondents by weighted average; however 50% of the vendors rated recruiting high in importance versus only 25% of them rating diagnostic equipment high.

- Mainframe and terminal vendors represent all but one of the 40% of respondents indicating a high level of concern with adequate remote diagnostic assistance. Only one small business machine maintenance vendor indicated a high level of concern with adequate remote diagnostic assistance, which is noteworthy considering the remote and dispersed characteristics of small business machines.

EXHIBIT V-11

VENDOR RATINGS OF PROBLEMS RELATED TO FIELD SERVICE



NUMBER RESPONSES: 20

- A significant point was made by all respondent executives. All but three of the problems and challenges listed in the questionnaire received more than "medium" attention as current management challenges. No single category received less than 10% in high ratings from respondents, as shown in Exhibit V-11.

E. COMPARISONS OF VENDORS' AND USERS' PERCEPTIONS OF MAINTENANCE

1. IMPORTANCE OF FIELD MAINTENANCE CHARACTERISTICS

- Exhibit V-12 shows that every respondent vendor but one rated mean time to respond as being of absolute importance.

  - The one vendor giving mean time to respond a low rating operates entirely in a remote diagnostic and system support center mode.

  - Response is immediate at the support center, but not "in person," as the question was asked.

- Response time received high ratings from a greater percentage of vendors (95%) than users (58%).

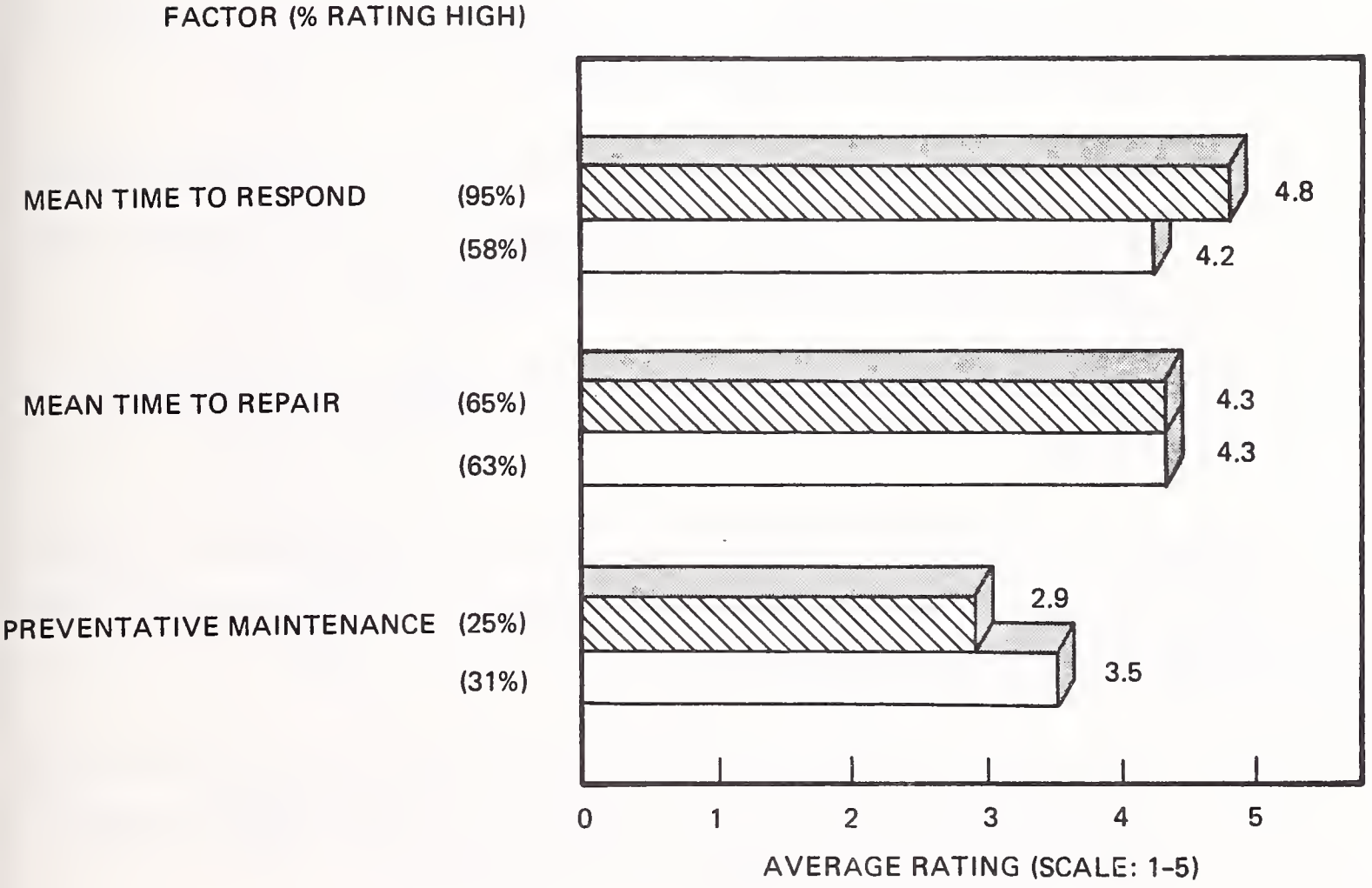
- As in 1978, users continue to rate the importance of preventive maintenance more highly than vendors do.

  - The attitude of users toward preventive maintenance appears to be a holdover from heavy sales pitches for PM on electromechanical equipment.

  - Users do not display the vendors' level of awareness regarding current advantages of on-line testing techniques, allowing better methods of anticipating rather than preventing trouble calls.

EXHIBIT V-12

IMPORTANCE OF FIELD MAINTENANCE CHARACTERISTICS – VENDORS' VERSUS USERS' RATINGS



– VENDORS (20 RESPONSES)

– USERS (71 RESPONSES)

- An educational opportunity is evident for vendors to sell users on the advantages of becoming more involved in running on-line tests and examining "log recs" for instances where preventive maintenance may be more effectively scheduled.

- Vendors and users tend to agree on the importance of mean time to repair, as shown in Exhibit V-12.

  - The management of mean time to repair is a key variable in the cost of doing business as a maintenance vendor.

  - Mean time to repair directly affects users' system availability and the measurements of reliability under which the users themselves must perform as service departments to their companies.

2. COMPARATIVE ATTITUDES OF VENDORS AND USERS BY EQUIPMENT CATEGORIES

- Exhibits V-13 through V-17 repeat the data shown on Exhibits III-11 through III-15 discussed in the user analysis in Chapter III, with the exception that vendors' responses are also shown.

  - The exhibits in this chapter are modified with an overlay of the actual response times and repair times as reported by maintenance vendors in each of the five major equipment type categories.

  - As in the user chapter, the graphics display the cumulative percentage of responses indicating average repair times and response times equal to or less than the amount on the horizontal axis.

  - While certain general tendencies may be inferred from the data, direct correlations may not be drawn since vendors and users cannot be exactly matched in the surveys.

EXHIBIT V-13

MAINFRAME
MEAN TIME TO RESPOND AND REPAIR – VENDOR VERSUS USER

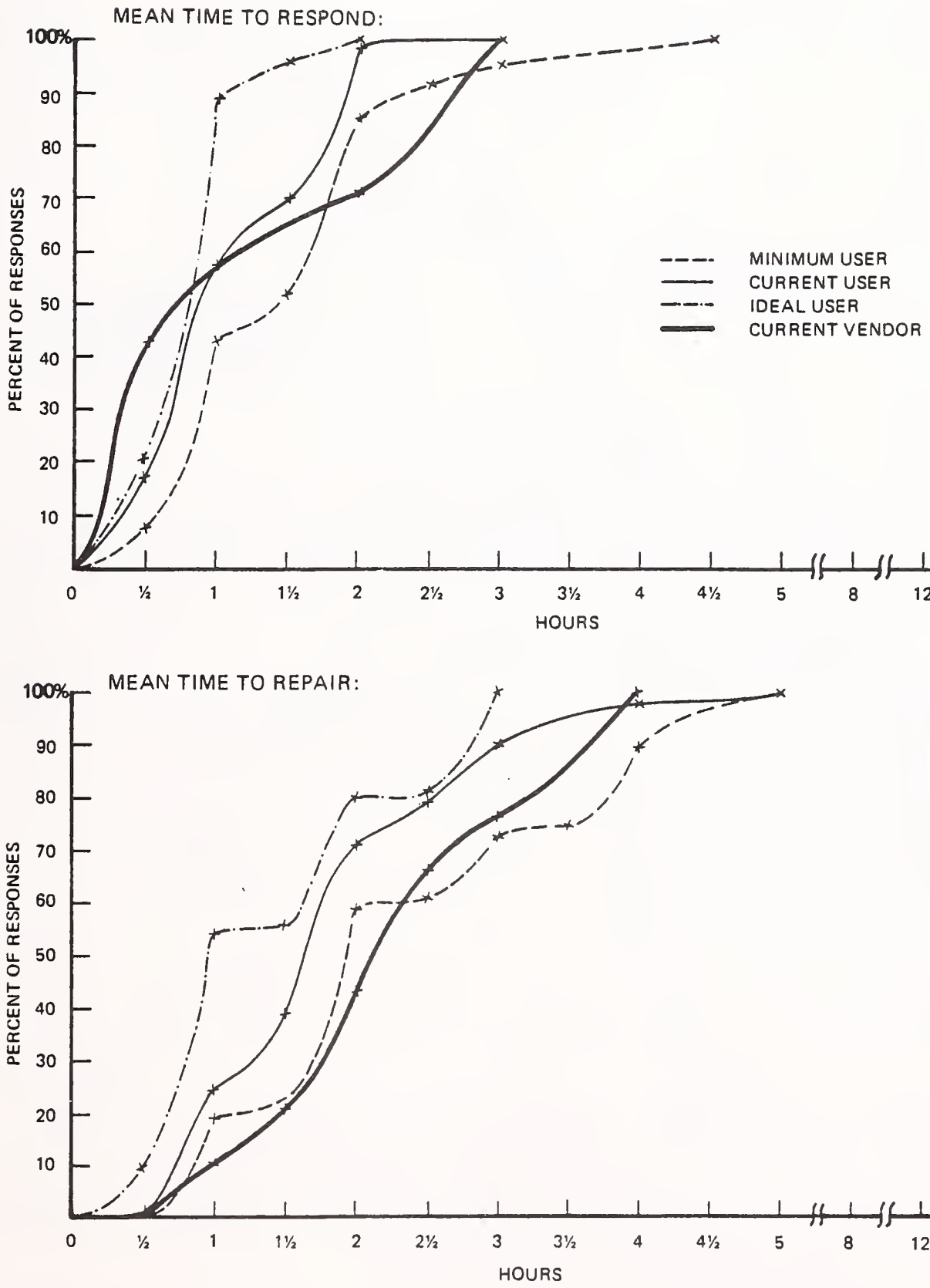
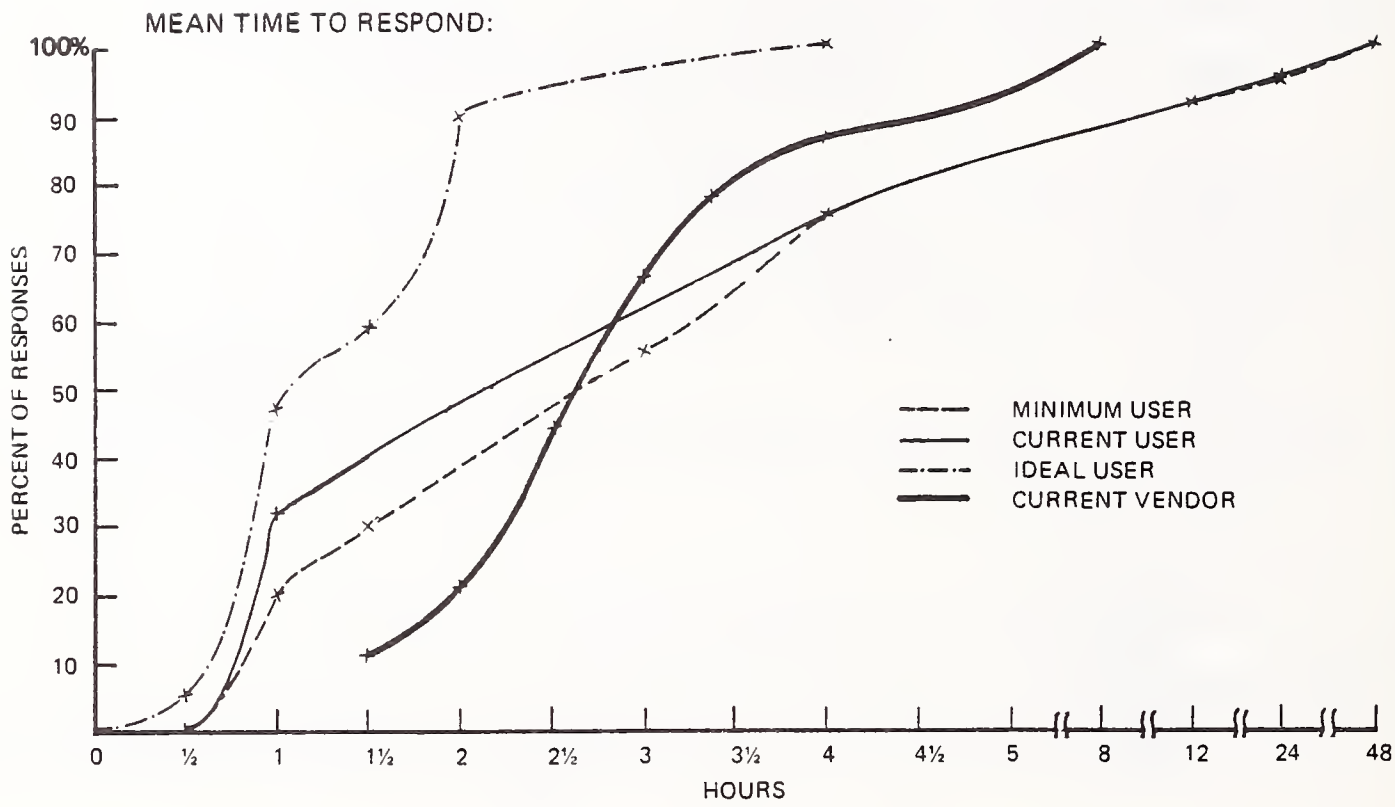


EXHIBIT V-14

SMALL BUSINESS MACHINE
MEAN TIME TO RESPOND AND REPAIR –
VENDOR VERSUS USER



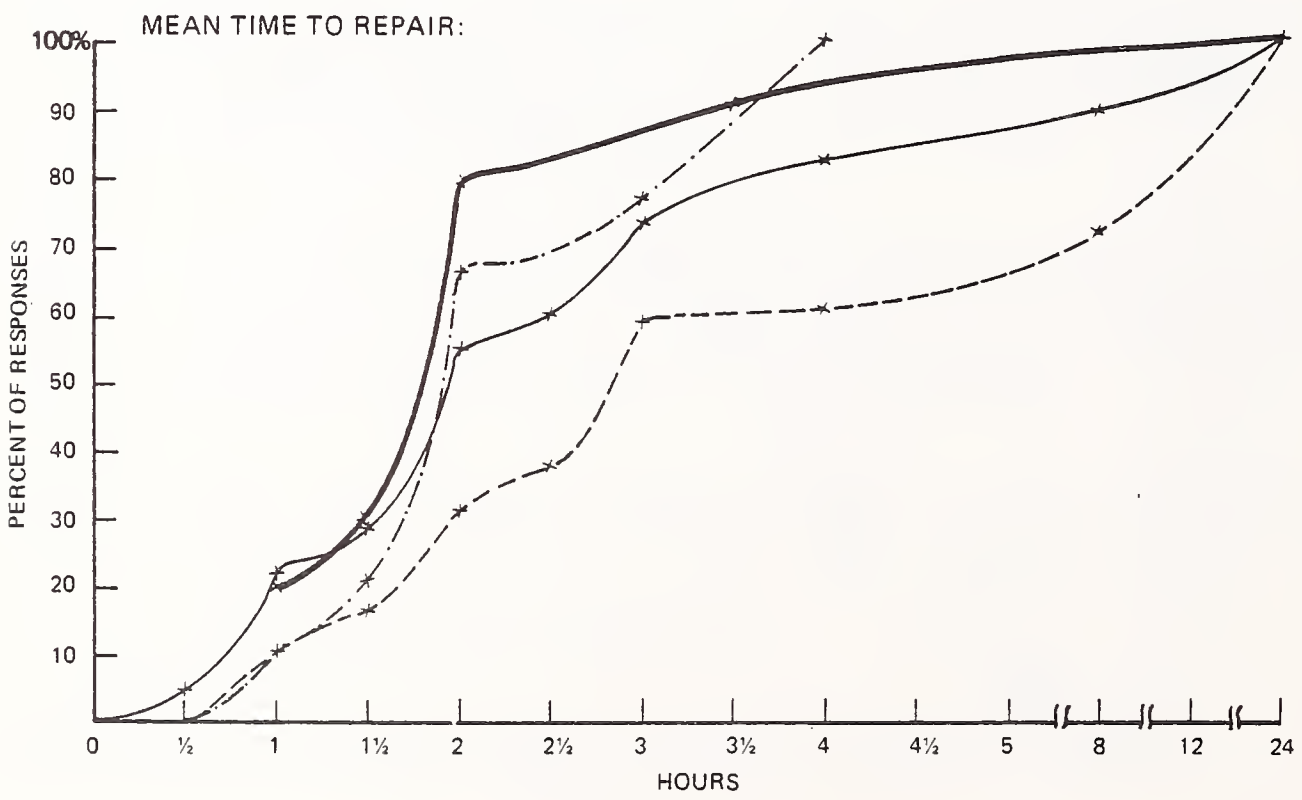


EXHIBIT V-15

MINICOMPUTER
MEAN TIME TO RESPOND AND REPAIR – VENDOR VERSUS USER

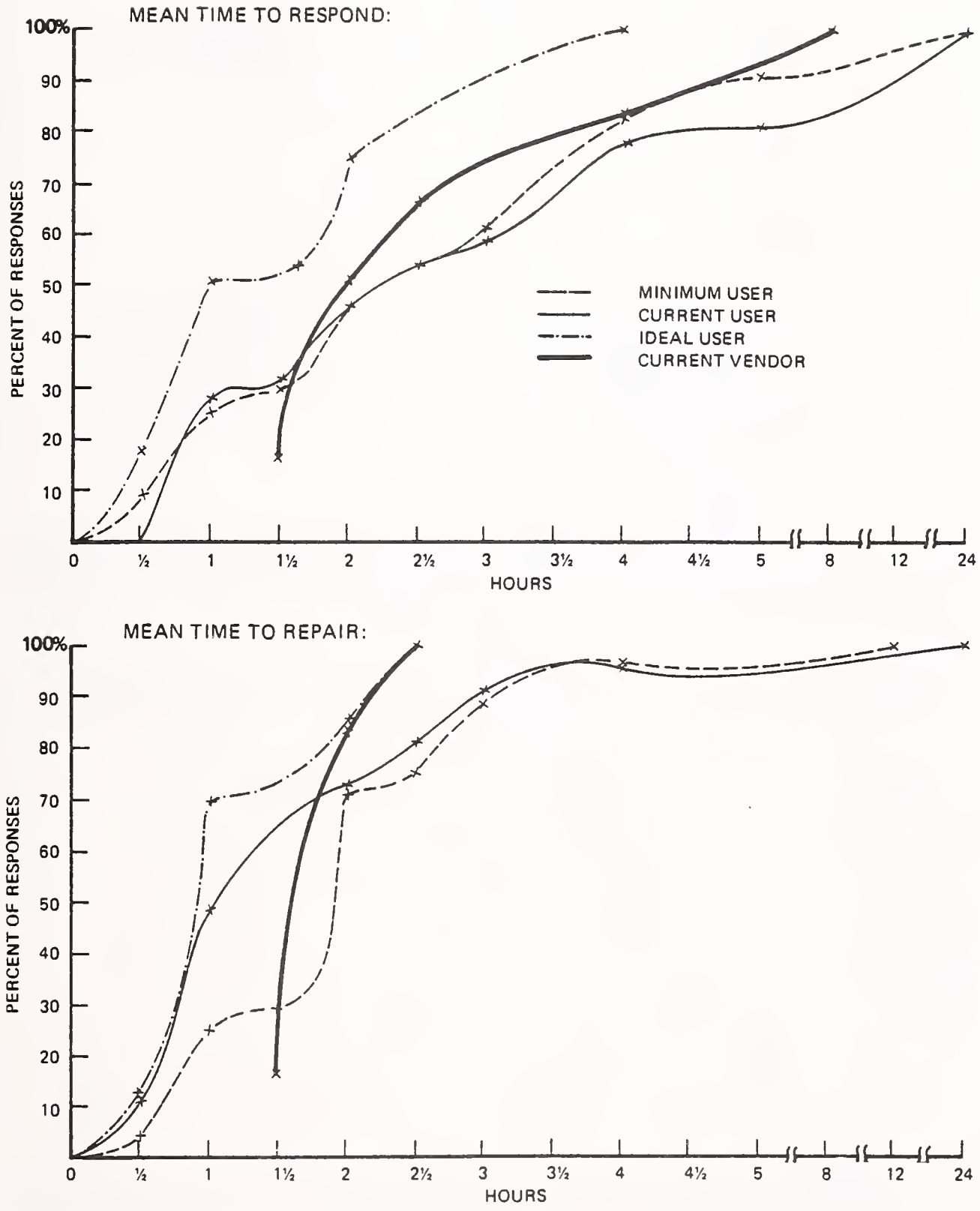
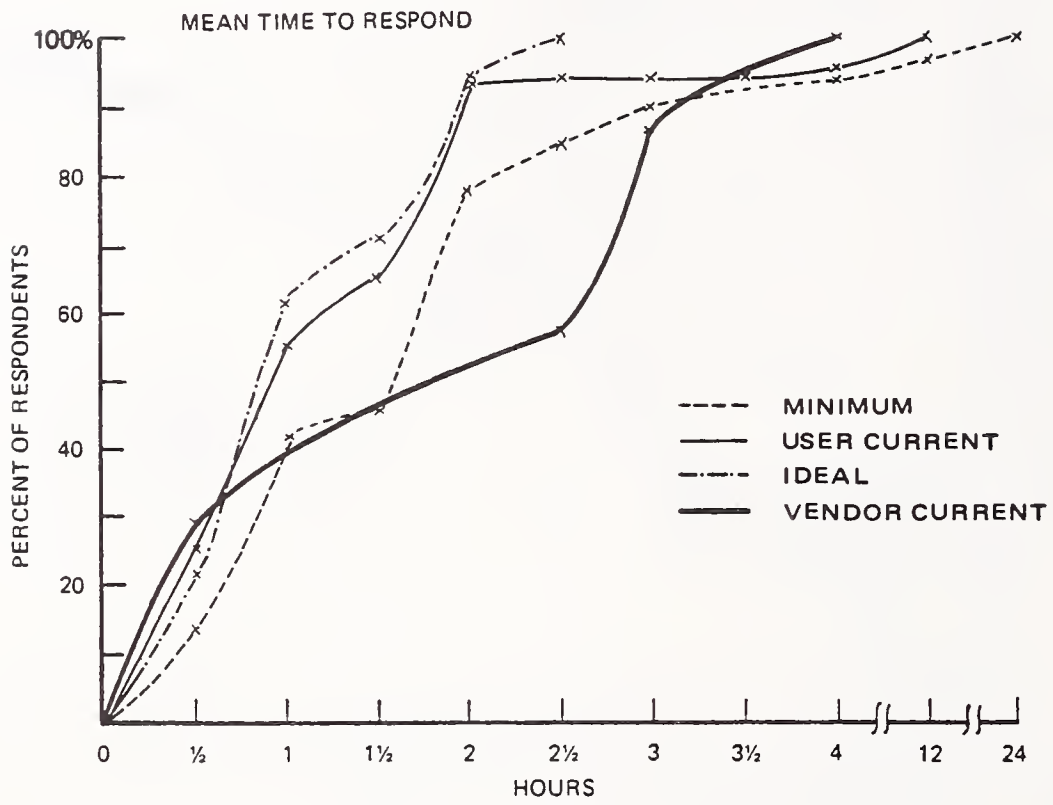


EXHIBIT V-16

PERIPHERAL MEAN TIME TO RESPOND AND REPAIR – VENDOR VERSUS USER



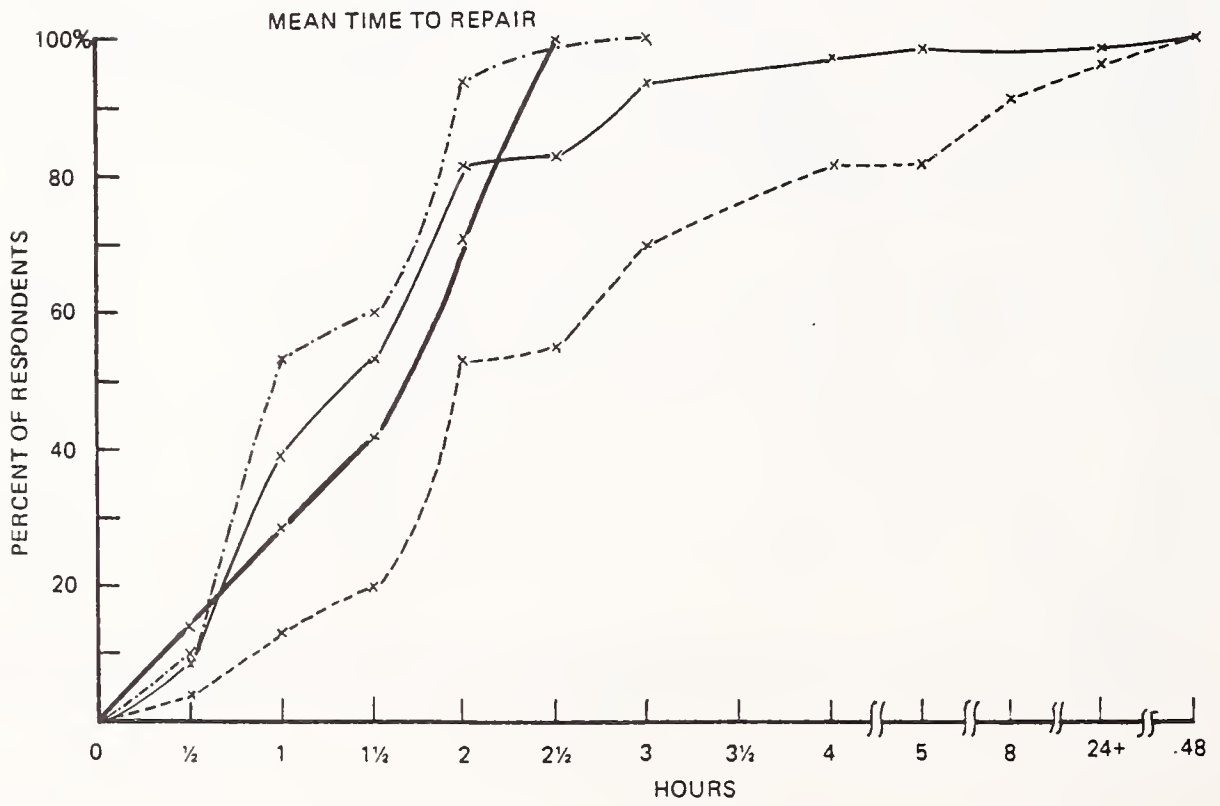
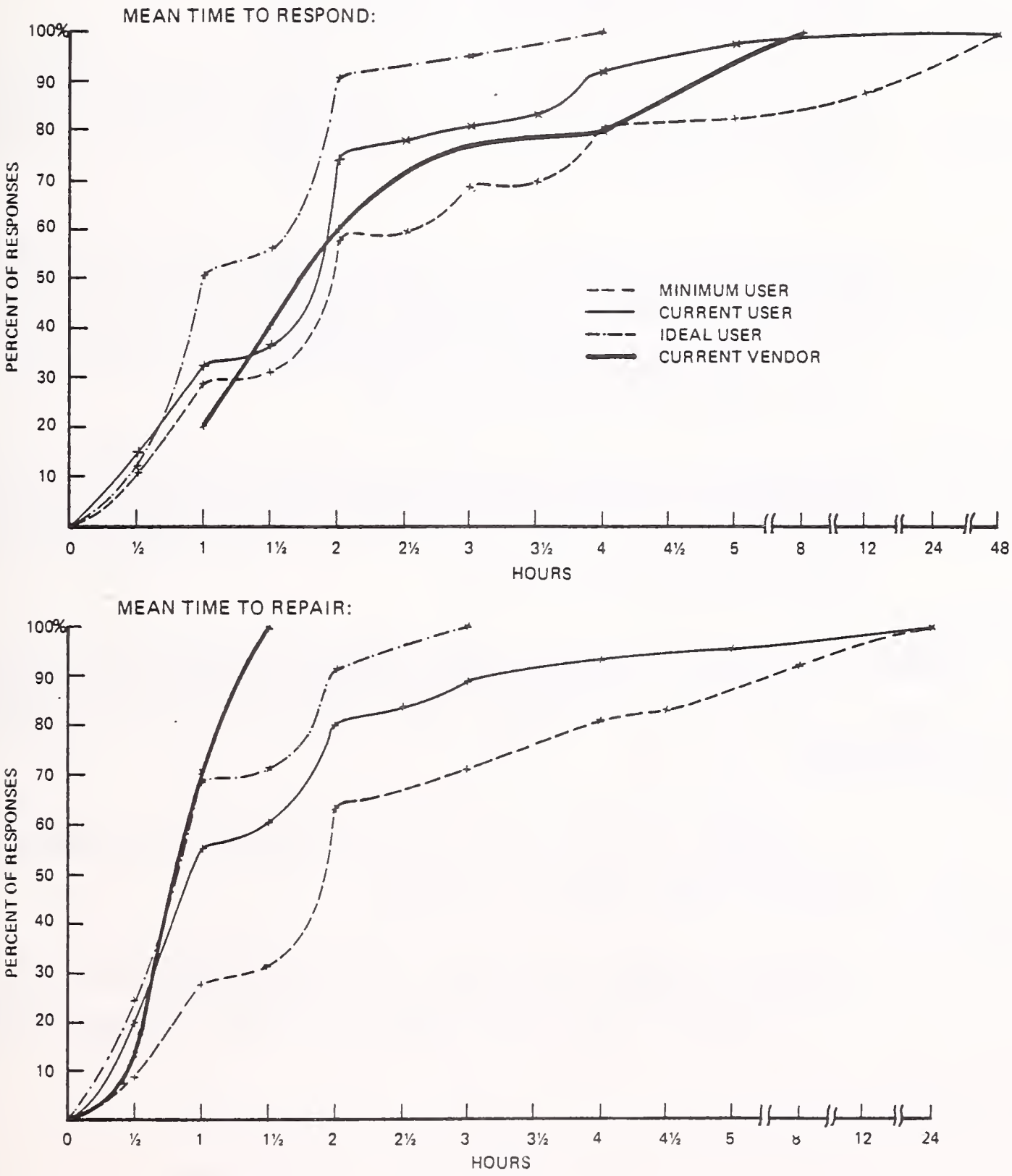


EXHIBIT V-17

TERMINAL
MEAN TIME TO RESPOND AND REPAIR – VENDOR VERSUS USER



- Over one-half of the mainframe users surveyed reported actual response times which were just slightly lower than "ideal." Half the respondent vendors reported actual response times to mainframe calls at better than user-reported ideals, as shown in Exhibit V-13.

  - All users reported better response times on mainframes than they specified as minimum acceptable performance.

  - Once the average response time on mainframes exceeds one hour and 45 minutes, vendors tend to respond more slowly than users find acceptable.

  - Because users are often in an "anxious" state until the field engineer arrives, he is likely to overstate the response time; the user "relates" when the engineer arrives and may understate the repair time. The survey results bear these tendencies out.

  - All respondent vendors reported average repair times of four hours or less on mainframes, while users reported that only 98% of all vendors made repairs in four hours or less.

- Exhibit V-14 shows that one-half of the respondent vendors reported response times to small business machines below the users' minimum acceptable peformance.

  - As reported in Chapter III, users reported response times almost exactly according to their minimum standards.

  - Respondent vendors tend to show more effort as calls grow older than do the universe of all vendors reported by users. Respondent vendors

become slightly more responsive to calls over 2.5 hours than users reported for all vendors.

- Respondent vendors are repairing small business machines more quickly than the users' ideals in 90% of the cases, and are generally better than most vendors as perceived by respondent users.

  . Eighty percent of respondent vendors reported average repair times of between one and two hours on small business machines.

  . Only 55% of the users reported that all vendors repaired their small business machines in two hours or less.

  . The responses are biased somewhat in that the users interviewed were larger sites which would typically demand a better response time than the small, often remote site.

- Thirty percent of the respondent minicomputer users reported better response times than 30% of respondent vendors average on minicomputers, as shown in Exhibit V-15.

  - As in other cases, respondent vendors become more responsive as the age of the calls exceeds two hours.

  - The higher level of responsiveness of respondent vendors to this survey suggests more intensive escalation procedures.

  - All vendors reported mean-time-to-repair figures for minicomputers between 1.5 and 2.5 hours, as shown in Exhibit V-15, while users reported average repair times of up to 24 hours.

  - Clearly, there is a basis for better communications in the minicomputer area. Vendors tend to speak in terms of actual repair time (labor) and bench time, while users think of unit turnaround time.

- Over one-half of the peripheral maintenance vendors whose responses are tabulated in Exhibit V-16 report significantly slower response times than users are accustomed to receiving or even expecting as minimum standards.

  - The caveat issued in Chapter III is repeated here for emphasis. Provide closer to ideal service as perceived by the users of peripheral devices, or be replaced by vendors who do provide the service!

  - Only 15% of respondent vendors are offsetting slow response times in peripherals by repairing devices in less than 2.5 hours on the average.

  - The warning is worth repeating in peripherals. Users measure outage, not actual repair times!

- The general tendency of respondent terminal vendors responding to trouble calls is roughly the same as reported by users in Exhibit V-17.

  - The dichotomy of measuring outage as perceived by users and bench repair times as perceived by vendors is no more evident than in the case of perceived terminal repair times.

  - One-half of the vendors and one-half of the users agree that repair times are close to ideal as they require up to an hour. Beyond one hour, as field engineers wait for parts or remove terminals to a bench area for repair, users see greater turnaround times.

- Overall, users feel response time is poorer than vendors report, and that repair time is better; evidently the user is less critical of elapsed time after the field engineer arrives. For vendors this means that an investment in better response times will often buy more in terms of improved customer relations, than will improved repair time.

F. VENDORS' RESPONSES ON AVAILABILITY, MTBF, RESPONSE AND REPAIR TIMES

- All vendors averaged equipment availability from 95% to 96.4%, as shown in Exhibit V-18.

- It was necessary to exclude one responding vendor from mainframe averages because of the unique measurements of "system" reliability versus unit reliability factors.

  - System reliability, in this case, is distorted for maintenance purposes because the system is totally redundant.

  - The highest non-redundant mainframe MTBF reported was 2,500 hours, the lowest was 144 hours. The average MTBF for all mainframe vendors came to 1,187 hours, as seen in Exhibit V-18.

- Terminals have the greatest unit reliability as reported by vendors (5,187 hours mean time between failure), but the longest repair time.

- Reliability of peripherals is distorted somewhat by two vendors' reporting over 6,000 hours MTBF. The norm is running 1,500 to 2,500 MTBF on peripherals.

- Small business machines are experiencing the same reliability as their forebearers, the minicomputers, with the average MTBF reported as 2,164 hours. Average availability is pushed down to 95% in small business machines due to the slower turnaround of over six hours.

- The "average uptime" column in Exhibit V-18 is an average of averages which will not reconcile against average MTBF and average outages. Response times plus repair times do not add up to outage, which must be used to calculate availability.

EXHIBIT V-18

VENDOR RESPONSES TO EQUIPMENT AVAILABILITY

EQUIPMENT TYPE	AVERAGE UPTIME		MTBF		MTTR		AVERAGE RESPONSE TIME	
	RESPON-DENTS	PERCENT	RESPON-DENTS	HOURS	RESPON-DENTS	HOURS	RESPON-DENTS	HOURS
MAINFRAMES	8	95.3%	6	1,187	8	2.56	7	1.26
SMALL BUSINESS MACHINES	10	95%	7	2,164	10	3.08	9	3.17
MINI-COMPUTERS	6	96.4%	5	2,204	6	2.00	6	3.18
PERIPHERALS	6	95.9%	5	3,548	6	1.78	6	1.78
TERMINALS	8	95.6%	6	5,187	8	0.98	8	3.48

G. VENDORS' RESPONSES ON FIELD REPAIRS AND ENGINEERING CHANGE ACTIVITIES

- The average field engineer working for respondent maintenance vendors spends 5% of his time installing engineering changes.

  - Three companies reported no field activity installing engineering changes.

    . One of the three explained: "ECN upgrades are installed automatically by our manufacturing equipment return and repair department when failed assemblies are returned from the field."

    . The other two vendors without ECN activity offered no comments.

  - Other comments on ECN activity included:

    . "ECN are done on a next-service-call basis to reduce travel."

    . "Product line is very stable, less than 5% of direct labor spent on changes."

- Sixteen of the respondent vendors reported that 10,151 field engineers are covering 298,111 trouble calls each month, an average of 29.4 calls per month per person.

  - The average number of calls per vendor exceeded 18,000 per month.

  - Trouble call volume per field engineer varied from less than one per month per person, to 46 per person. A reasonable degree of correlation appears to exist between the number of trouble calls per field engineer and whether an effective remote diagnostic and support center is indicated.

- Variable product mixes reported by vendors allowed no meaningful analysis of data as to average calls per field engineer on different product types.

- Vendors reported averages of repeat calls within two weeks ranging from 5% to 25% of volume.

  - One-half reported repeat-call volume in excess of 10%.

  - The nominal average repeat-call volume was 12.5%.

- The volume of "no-fault-found" calls ranged from 1% to 30% as reported by 15 respondent vendors.

  - One-half of the respondents reported the volume of "no-fault-found" calls equal to or greater than 10%.

  - "No-fault-found" calls averaged 11.7% among respondent vendors.

- With the reported ranges and averages of non-productive hours spent in repeat calls and "no-fault-found" calls, an opportunity exists for significant improvements in utilization with commensurate improvements in profit margins.

  - For example, sixteen of the respondent vendors reducing non-productive calls by roughly 25% would save 6% of 298,000 calls, or 17,880 calls per month.

  - As will be discussed later in more detail, the cost of the average trouble call is running around $170. This suggests a potential savings, transferrable to the bottom line of sixteen respondent vendors, of over $3 million per month!

- All 20 vendors report that field engineers replace boards on-site to effect repairs and that they will continue this practice in 1984.

- A greater number of respondents (11 of 20) indicated that their field engineers will be replacing units on-site in 1984.

- Only four of 20 respondents have their field engineers replace components on-site, but six vendors expect field technicians to replace components on-site by 1984.

- Ninety percent of respondent vendors return most boards and units to a factory for repairs.

  - One-half of the vendors surveyed repair some boards and units at a regional depot.

  - Only 10% of the respondents repaired boards and subassemblies on-site.

  - A secondary source of revenue has been created in some companies through repairing circuit boards for other vendors at repair depots.

H. VENDORS' RESPONSES ON SYSTEM SUPPORT CENTERS

- Most system support centers are transparent to customers as reported by vendors, with only two vendors giving direct assistance to users from the support centers.

  - Although 11 vendors (55%) reported system support centers in existence for up to 11 years, as shown in Exhibit V-19, the concept of direct user access is relatively new.

  - Seven of the eleven system support centers are set up to provide software support to the field. This presents an opportunity to create more direct lines of communication with users as resistance to the concept recedes.

EXHIBIT V-19

SYSTEM SUPPORT CENTER CHARACTERISTICS OF RESPONDING VENDORS

COMPANY NUMBER	SIZE FIELD ORGANIZATION	PERCENT OF FORCE AT SYSTEM SUP. CENTER	NO. OF YEARS OFFERED	FOR HARDWARE	FOR SOFTWARE
1	10	33%	2.0		X
2	70	35%	8.0	X	X
3	220	N.D.	0.1	X	X
4	230	5%	1.3	X	X
5	280	1%	3.0	X	
6	350	1%	1.4	X	
7	390	2%	4.5	X	X
8	700	1%	11.0	X	X
9	910	3%	5.0	X	
10	1100	3%	1.0	X	X
11	4200	4%	4.0		

N.D. = NO DATA

- Vendors and users alike seem to feel that more selling and proving of the benefits of direct user interface with system support centers is in order.

  . Users have indicated their strong feelings about losing the "personal touch" and about the fact that they are paying for maintenance to be performed for them.

  . Vendors feel a level of user resentment and continue where possible to interface through a local maintenance person when providing assistance.

- For vendors with field forces greater than 200, system support centers use from 1% to 5% of available personnel, as shown in Exhibit V-19. The two smallest vendors interviewed placed approximately one-third of their force in the centers, most likely reflecting a desire to get greater client coverage from a limited number of people.

- None of the vendors reported an increase in personnel due to the implementation of system support centers.

  - Eighty-five percent of respondents indicated that there was no discernable effect on total personnel requirements resulting from system suport centers.

  - Except for one vendor who reported a personnel savings of 84%, decreases in total personnel ran at 5%.

- No vendors reported increased expenses associated with the implementation of system support centers. Twenty-five percent of the maintenance vendors surveyed responded with net savings of 5% on expenses.

  - The one centralized vendor reported an equivalent expense ratio before and after centralization of 5 to 1; i.e., decentralization cost 500% of costs under current centralized organization.

- Some comments from vendors on system support centers:
  - "Reduced our field tech support staff."
  - "Customer is not aware of system, interfaces primarily with (company) customer representative."
  - "Not sold to customers yet."
  - "Implemented (1968) for complex systems requiring high-level capability to restore 5% of failures."
  - "Center used only by FEs."
  - "Customer is not aware of support center except when alert procedure is used."
  - "Very difficult to implement. Customers feel they have a valid service contract. Field engineers should respond."

- Four of the nine respondent maintenance vendors without system support centers plan to implement the concept between now and 1985.
  - Two of the four expect to save 15% in personnel requirements as a result of implementation.
  - Five vendors (25%) have no current plans to implement system support centers.
    - "No funds."
    - "No current plans, but consideration still open."

I. VENDORS' RESPONSES ON REMOTE DIAGNOSTICS

- "Remote diagnostics" might be described as a term in search of a definition.

  - Users and vendors alike vary in their interpretations of the meaning of "remote diagnostics."

  - Some respondents stick to a very narrow definition for remote diagnostics, limiting the term to describe integrated diagnostic hardware or firmware which may be exercised and analyzed at a remote diagnostic terminal.

  - Other respondents expand the term to include verbal interface with users and/or field service personnel who then transmit program "dumps," "log recs" and other data to a diagnostic center for analysis.

  - Definitions are ultimately expanded by some users and vendors to include any remote diagnostic assistance for any problem. In this sense the definition merges with system support center definitions.

  - It is not one of the objectives of this report to define remote diagnostics completely, but rather to report on vendor and user attitudes.

  - Remote diagnostics will be the subject of a Field Service Brief from INPUT in late 1980 or early 1981.

- Remote diagnostics, subject to broad definitions, are offered by eight (40%) of the respondent vendors shown in Exhibit V-20.

  - All eight remote diagnostic centers provide diagnostic assistance for hardware, with roughly one-half supporting software as well.

  - Only one vendor reported an increase in maintenance costs, but added that it was too early to measure the trade-offs.

EXHIBIT V-20

REMOTE DIAGNOSTIC CHARACTERISTICS OF RESPONDING VENDORS

COMPANY NUMBER	SIZE FIELD ORGANIZATION	NO. OF YEARS OFFERED	FOR HARDWARE	FOR SOFTWARE
1	70	8.0	X	X
2	190	0.1	X	
3	220	0.1	X	X
4	230	1.0	X	X
5	350	1.0	X	
6	900	2.0	X	X
7	3450	1.0	X	
8	4200	4.0	X	X

- Six of the eight remote diagnostic services are expected to yield an average of 5% savings in total maintenance costs.

- Ten of the remaining 12 vendors plan to implement remote diagnostic capabilities, eight of them before 1982. Two vendors with no current plans to incorporate remote diagnostics expressed the feeling that they are not yet cost-justified in their case.

J. FORMAL ESCALATION PROCEDURES

- Every maintenance vendor surveyed has a formal escalation procedure in place. With epithets ranging from "Alert" procedures to "Early Warning" procedures, all have common objectives.

  - Some procedures assure, as tradition demands, that the account sales representatives are alerted to down machines and potential image problems before they or their managers are called by irate customers. This fundamental objective dates back to earlier times when field service managers were less confident in personally defusing potentially explosive situations.

  - The current need for involving sales personnel is a mutual need - the preservation of joint revenues.

  - Some of the procedures are oriented toward direct access to technical assistance. Field engineers are required to discuss problems with branch or regional specialists after a checkpoint in elapsed time. The intermediate specialist is then required to involve a national or plant technical support specialist after a certain elapsed-time checkpoint.

  - Other vendors structure escalation procedures along management lines following time and circumstance checkpoints, at which points increasing levels of management make judgements regarding the delegation of technical, hierarchial responsibilities and communications with the user's hierarchy.

- The more advanced escalation procedures involve checks and balances.

  . Technical hierarchy, field engineering management hierarchy and sales hierarchy all escalate through their own functional lines of communication. Cross talk at each level assures that escalation occurs.

  . Daily "status reports" are wired or called into headquarters through the hierarchy with negative or "no situations" forced to assure that escalation channels are open each work day.

- Ostensibly, the major objective is to give customers a warm feeling that the entire vendor organization is concentrating on their problem until it is resolved.

- As reported in Chapter III, users are often unaware of escalation procedures, indicating that they are not adequately publicized by the FE force.

• Some vendor comments on escalation:

  - "We call it escalation management, two hours at FE level, three hours at district or region tech support - then to home office tech support."

  - "After two hours the FE must notify the branch manager ... 4 hours to district manager ... 8 hours to region manager ... etc."

  - "Just formalized, but frankly operating at 'threshold-of-pain' levels of judgement."

  - "It is a very strong sales tool."

  - "Major concern of most customers."

• Surprisingly, three of 20 vendors (15%) responded that a formal escalation procedure was not an important factor in selling their products.

K. VENDORS' RESPONSES ON SPARES INVENTORIES

- With rising interest rates, vendors have become much more concerned with the cost of carrying spares inventories, which may go as high as 40% of the basic cost of spares on an annual basis.

  - Maintenance vendors who transfer field spares from manufacturing to the field service division books at a standard cost rate, which includes some of the carrying costs, have seen the book value of their inventories go up. Usage costs charged to field income statements are further inflated.

  - Third-party vendors and autonomous field service divisions who must expense their own carrying costs have become much more aware of the expensive habit of carrying spares in excess of the "threshold of pain."

  - Rapidly changing technology and shorter product life cycles compound the interest problem by increasing the risk of obsolescence in carrying excess spares.

  - Some relief may be in sight for vendors as more users express a willingness to pay for on-site spares to mitigate outages.

- The two largest spare parts inventory locations for the average respondent are at headquarters and the branch office, as shown in Exhibit V-21.

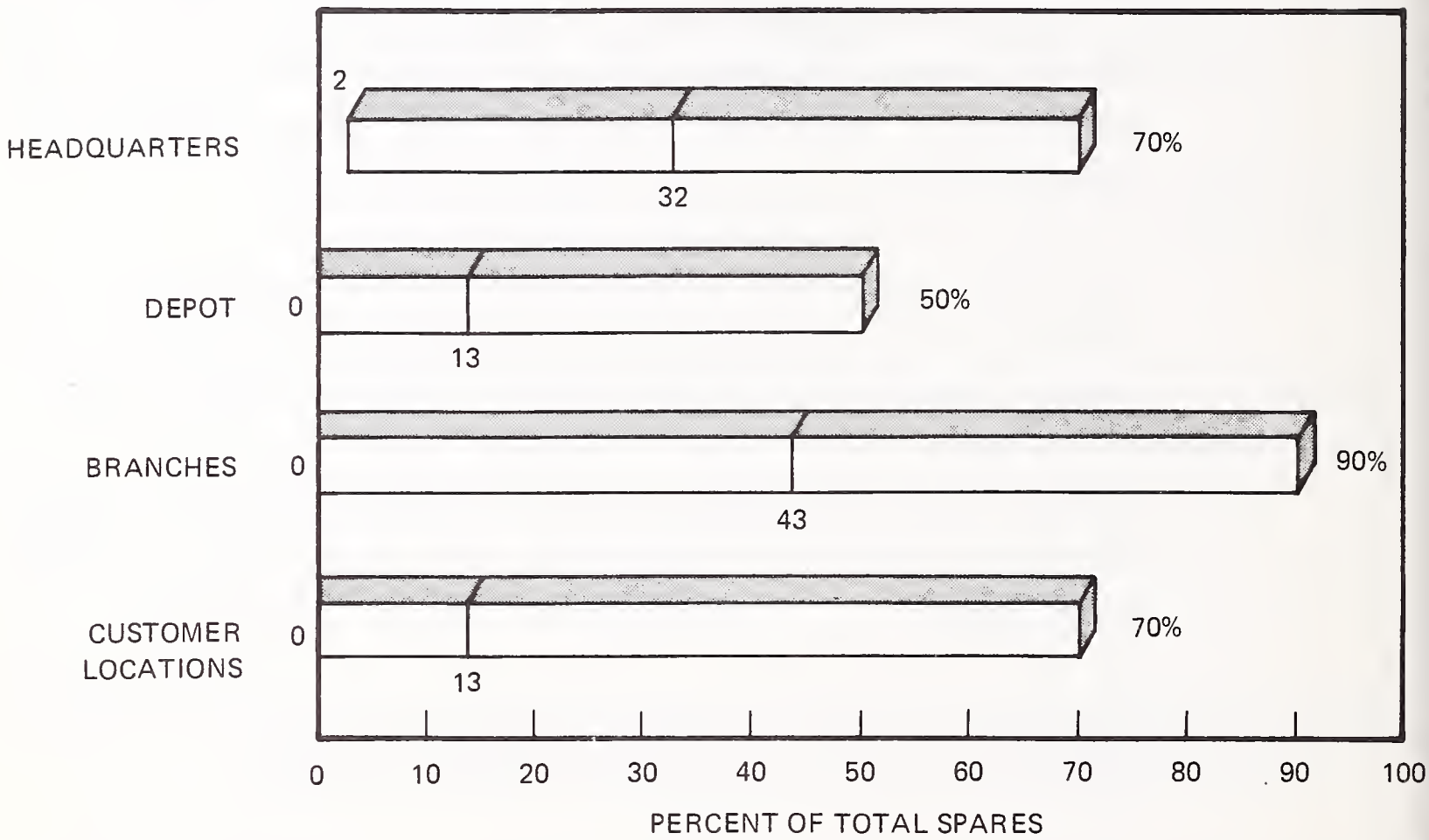
  - A wide variation exists in the distribution of spares inventories as of the date of this survey.

  - Not shown in these results are the parts in the possession of individual field engineers.

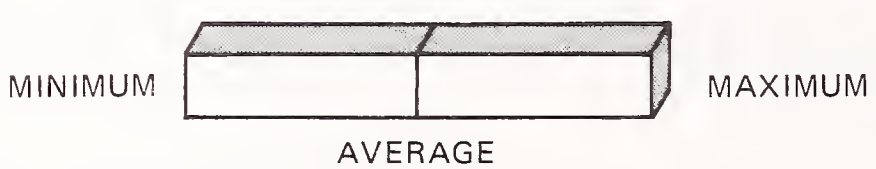
  - A follow-up survey would probably indicate a movement of spares to depots and/or headquarters for control purposes.

EXHIBIT V-21

RANGE AND AVERAGE OF VENDORS' SPARE PARTS DISTRIBUTION



NUMBER OF RESPONSES: 20



- Four respondent vendors indicated an average increase of 10% in the number of customers who maintain spares on-site.

  - "Increase in mini-system customers electing to perform their own maintenance."

  - "Some customers exercised their option to purchase extra spares to hold down mean time to repair."

- Leasing spare parts to concerned users is presented as an opportunity for vendors to transfer risks.

L. THE IMPACT OF MAJOR FACTORS RELATING TO MAINTENANCE TECHNIQUES

- Rising labor costs are believed to have the greatest impact on the changing scene, according to 80% of respondent vendors shown in Exhibit V-22.

  - The novelty, or pull, toward more exotic solutions to rising labor costs (such as dial-up remote diagnostics) is now being heavily reinforced by the push of increasingly expensive personnel.

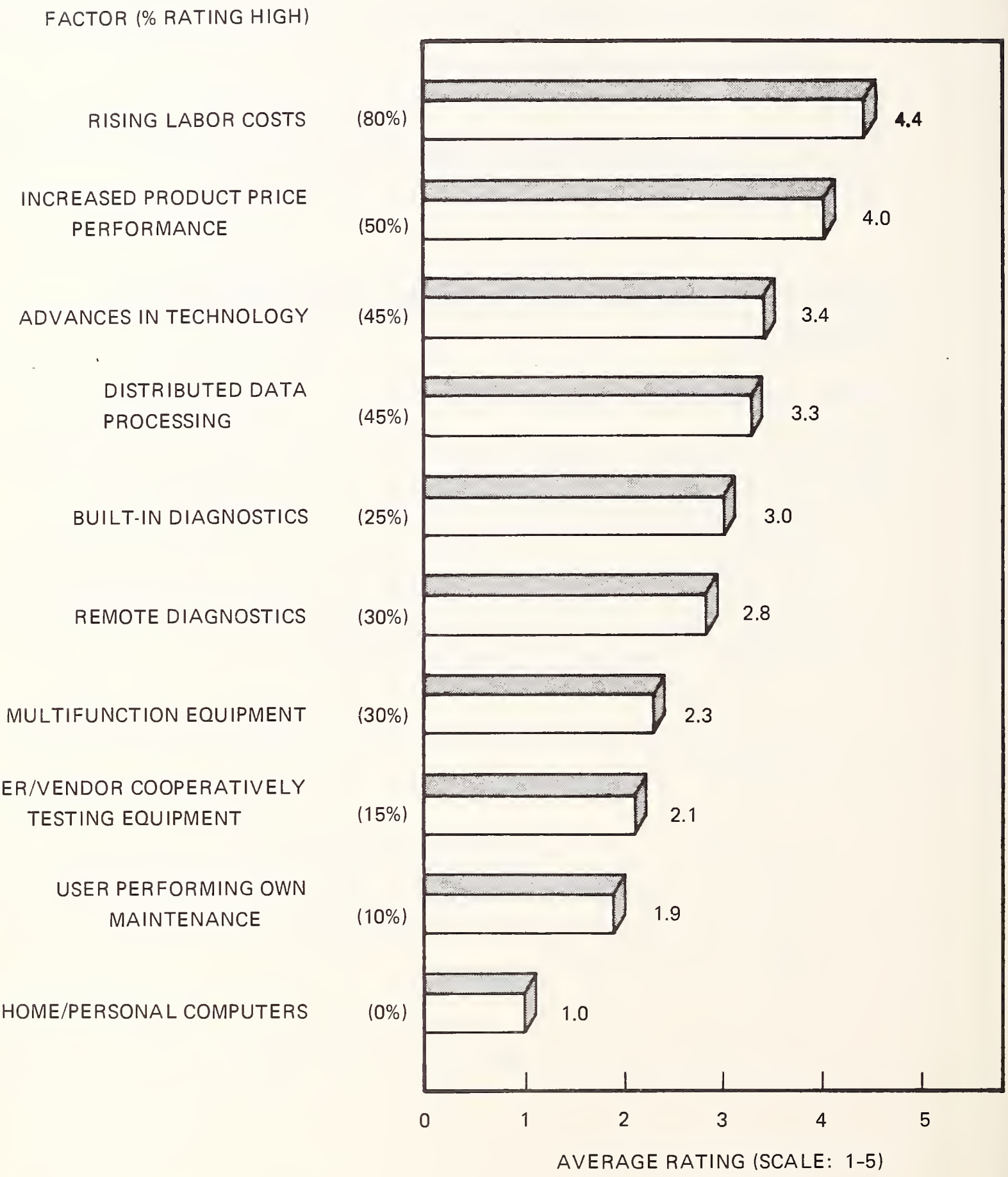
  - The key variable in the equation to improve utilization is the bottleneck of response time to random calls.

  - Traditionally field service vendors have been able to manage the problem of the queue or pipeline by overkill. Vendors maintained excess personnel at relatively low labor costs and found various ways to affect or justify high idle times.

    . Lower labor costs were more easily passed through the contract price to the user.

EXHIBIT V-22

VENDOR RESPONSES ON IMPACT OF FACTORS RELEVANT TO MAINTENANCE TECHNIQUES



NUMBER RESPONSES: 20

- Large amounts of idle time could be written off as valuable PR through time spent in customer relations.

- Productive uses of idle time, which also tended to alleviate the bottlenecks caused by random trouble calls included preventive maintenance, engineering changes, and on-the-job training of younger recruits.

- Progressive strategies have been employed over the years, all essentially attacking the weak link, the queuing problem.

  - Spare parts logistics tend to compound the pipeline problem by introducing a second random variable in a high number of calls. Roving parts vans were put into effect in the early sixties as experiments in large metropolitan areas.

  - The "man-in-a-van" concept is being used by more than one company to avoid compounding bottlenecks through lack of correct tools or parts.

- High reliability technology at more reasonable rates is beginning to have some effect on the volume of equipment that may be handled per field engineer, but the ratios of utilization are not impacted.

  - Frequency of failure determines the volume of equipment that is considered workload.

  - Randomness of failure combined with response time constraints and repair time distributions determines utilization of personnel.

- User involvement in diagnosing and solving problems offers some potentially dramatic relief at the bottleneck, but draws little attention from vendors, as shown in Exhibit V-22. INPUT forecasts an increase in the level of user involvement in maintenance as IBM and other vendors promote the concept.

- Very few innovations have been reported by vendors which address the corollary, creating business opportunities for field engineering idle time.

  . Most business opportunities mentioned have generally related to "more of the same"; e.g., take trouble calls for another vendor in remote areas.

  . Examining the corollary of the fundamental problem yields a suggestion to seek outside business with manageable turnaround priorities. For example, set up a remote field engineering location with excessive idle time to calibrate and repair test equipment used by the vendor and sell the service to others.

- Half the vendor respondents consider improvements in product price/performance ratios to have significant impact on maintenance techniques, as shown in Exhibit V-22.

  - Maintenance costs become much more visible to the user as price/performance improves.

  - A selling point suggestion is to relate maintenance prices to performance (throughput) instead of units or unit prices.

- Vendors perceive technological advances to have medium to high levels of impact on maintenance.

  - Upgraded training requirements become more frequent with new technologies.

  - Higher reliability with less frequent failures means slower learning curves and longer mean times to repair.

  - Better price/performance creates higher visibility to users of increased maintenance ratios.

- One vendor sums up the general reluctance to have users become too involved in maintenance, by giving a "high" rating to the impact of an "other" category in the questionnaire.

  - Customer involvement in maintenance and diagnostics will elevate the importance of remote technical support techniques as customer personnel are expected to interface and implement solutions suggested by computer vendors.

  - The inevitable evolution of user involvement will place a new burden on the training department to provide the field with well-documented training aids for users.

- Distributed Data Processing was rated highly as an impact on maintenance techniques by 45% of respondent vendors, as shown in Exhibit V-22.

  - The dispersed characteristic of DDP is causing some concern about the focal points of service.

  - Innovations like remote diagnostics will most likely be pushed to the foreground by DDP maintenance vendors over the next few years.

- Personal computers are not considered to have an impact on respondent vendors' maintenance techniques, as shown in Exhibit V-22.

  - Field engineers with high idle time could repair personal computers at discounted rates on a low-priority basis.

  - One Computerland store surveyed charges $40 per hour to repair personal computers.

  - Public schools are using more personal computers to teach computer science fundamentals, creating a potential source of additional revenues.

M. RESEARCH AND DEVELOPMENT

- Half the respondent vendors reported spending from 0.5-15% of their operating budget on improvements to maintenance techniques.

  - "Impossible to tell (percentage of operating budget). Improving techniques is part of the charter of technical support and training groups."

  - "New organization (R&D) in 1980."

- Fifteen of the 20 respondent vendors reported varying levels of involvement in the development of new products.

  - "Final sign off to insure serviceability as per our corporate style."

  - "Definition of 'RAS' (Reliability, Availability and Service) requirements/specifications, design and engineering reviews (hardware and software)."

  - "Low profile."

  - "Very little."

  - "Participate in product reviews throughout development cycle."

  - "Provide maintenance requirements and approve maintenance section of product specifications."

  - "Tech Ops review of development steps. Corporate system is new and controlled by Product Management. Manufacturing, Field Engineering, Q.A., and Product Marketing have a sequence of specific, measured stages."

- "Minimum (involvement) at this time but growing rapidly."

- "Conduct maintenance cost analysis."

N. CUSTOMER DOCUMENTATION PROVIDED BY VENDORS

- Six (30%) of the respondent vendors replied that they had made some major changes in documentation supplied to customers.

  - "A software performance monitoring program supplied at no cost to any SVS or MVS customer that desires it. It provides both the customer and (vendor) a common vehicle for measuring performance so that any slow degredation of performance can be rectified ASAP and both can more easily set and measure performance goals."

  - "Hardware notification service for some products . . . better support for self-service customers."

  - "Involving the customer in providing proper environment and installing cable that runs through walls, ceilings, and conduits...(because of) high cost of installations."

  - "We normally do not provide customers with special documentation beyond the operator's manual."

- Seven vendors (35%) plan to provide customers with even more documentation during the next two years.

  - "Current documentation is admittedly inadequate."

  - "Improve relations, reduce problems."

- "Improve self-support."

- "Better educated customers make our job easier."

O. MAINTENANCE PRICING

1. PRICE CHANGES

- Eighteen of 20 vendors (90%) reported maintenance price increases ranging from 1-20%. The average increase per vendor was 8.5%.

  - One vendor decreased maintenance prices by 20% without explanation.

  - The majority of vendors blame labor costs as the major reason for increasing prices.

  - General inflation runs a close second as the culprit behind maintenance price increases.

  - Only four vendors mentioned competitors' pricing as a factor in allowing their prices to rise also.

- During the next year, 85% of respondent vendors expect to increase maintenance fees from 1-13% at an average rate of 8.1%.

  - Labor costs and general inflation are tagged as the major reasons for increasing prices.

  - Four vendors plan to go along with competition and raise prices as appropriate.

- None of the vendors plan a decrease in maintenance prices during the next year.

2. COST BREAKDOWN OF TYPICAL SERVICE CALLS

- The average cost of service calls as reported by vendors is $170. A standard deviation of $112 suggests a wide variance in which approximately two-thirds of service calls will cost between $58 and $282.

  - The highest per-call maintenance cost ($450) was reported by a vendor who averages approximately 25 calls per month per field engineer; suggesting a fully burdened cost per field engineer between $12,000 and $15,000 per month, which would be among the highest in the industry.

  - The average rate of $170 per call for 30 calls per month as reported by all vendors suggests a fully burdened average field engineer to carry over $5,100 in costs per month. This seems high for the industry.

  - By removing the influence of the one-vendor estimate of $450 per call, the average is lowered to $150, which translates into a $4,500 total burden per field engineer per month.

  - From the above analysis, it is clear that all quoted labor costs are fully burdened rates; that is, burdened for costs plus profit margin per hour.

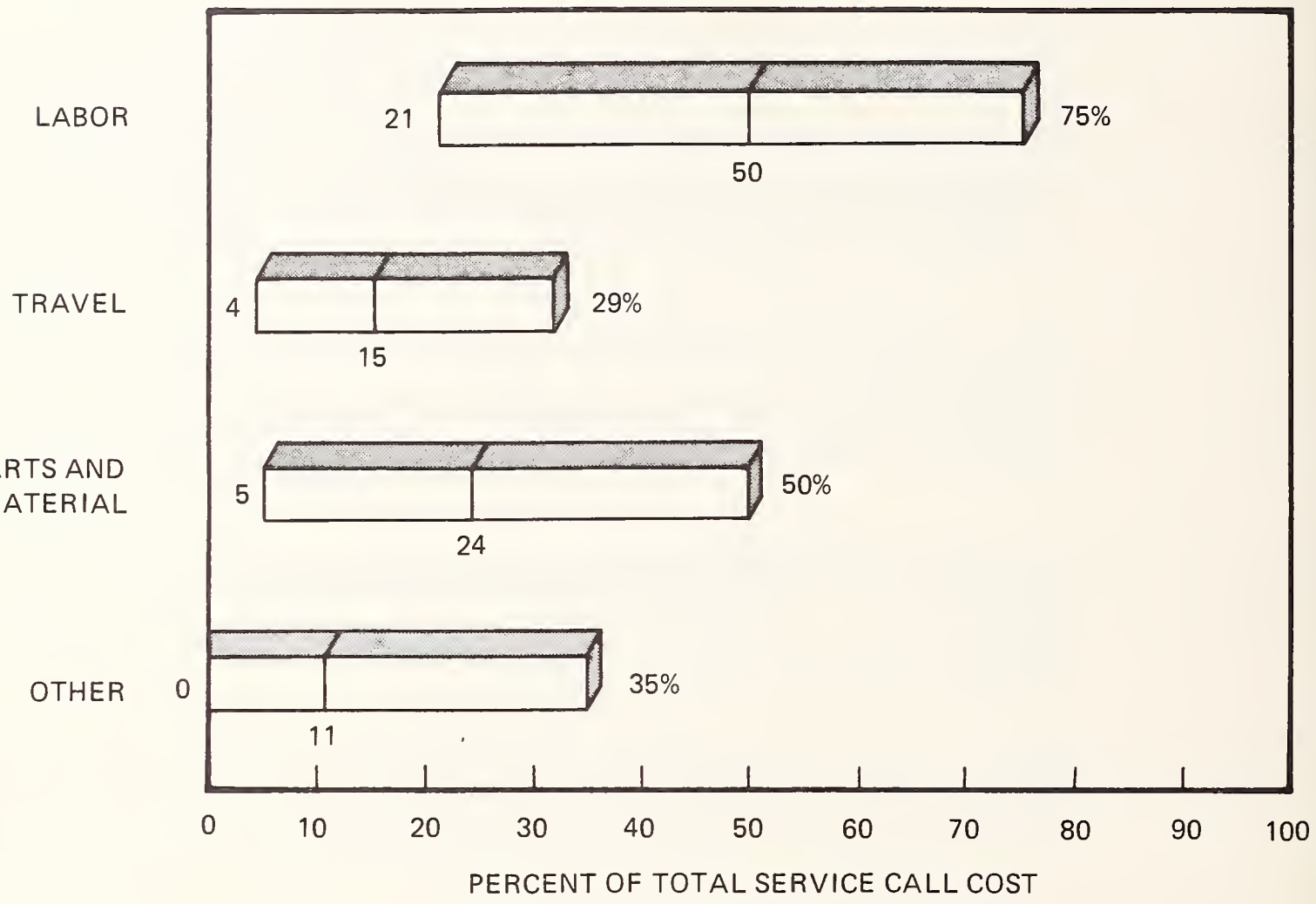
  - The analysis also suggests that parts expenses per call are inclusive of all standard costs associated with inventories: risk, distribution, taxes, storage, interest and return on invested capital.

- Exhibit V-23 offers a graphic display of service call cost breakdowns.

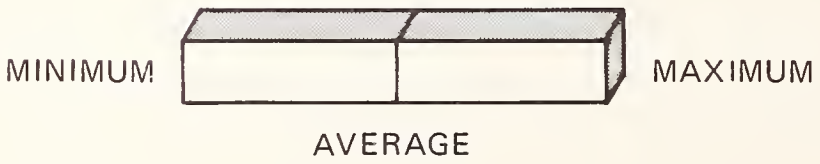
  - On the average, 74% of the typical service call is allocable to labor and parts, with the remainder going to travel expenses and other.

EXHIBIT V-23

RANGE AND AVERAGE COST DIVISIONS OF A TYPICAL SERVICE CALL



NUMBER RESPONSES: 17



- Some vendors are much more labor intensive than others (75% to 21%). Some of the variation is undoubtedly due to the handling of labor in individual responses. For example, some respondents may have included labor to repair parts in "parts and material."

3. MAINTENANCE PRICING BY EQUIPMENT TYPE

- Questions regarding pricing were included in the survey to provide some general guidelines. INPUT recognizes that a more detailed analysis of pricing is required; for example, a definition of exactly what is included in a given price. (This more detailed analysis is now underway, and will be published in an issue report in September.)

- Mainframe vendors are charging from 3.6-10% of the purchase price for annual contract rates. The average annual maintenance contract is priced at 6.6% of the purchase price for mainframes.

  - The average time and material rate charged for hardware calls on mainframes is $75, and the hourly rate ranges from $60-110.

  - The hourly rate for software averages a slightly lower $72, but covers the same range as hardware calls on mainframes.

  - Only one mainframe vendor reported a bundled lease arrangement, with 12.5% of the lease being allocated to maintenance.

- Annual maintenance contract prices as a percentage of purchase price averaged a higher 8.5% for small business machines.

  - Maintenance contracts ranged from 6-12% of small business machine purchase prices.

  - Hourly rates to repair small business systems ranged from $35-110, and averaged $67 per hour.

- Software billing rates for small business machines averaged $63 per hour with the same range.

- Three small business machine vendors reported an average of 24.7% of lease revenues allocated to maintenance.

- Annual maintenance contracts for minicomputers average 11.4% of the purchase price.

  - Contract prices for maintenance range from 7-20% of the purchase price of minicomputers.

  - Hourly rates to repair minicomputers range from $47-150 and average $76 per hour.

  - Software calls on minis are billed out from $51-71 per hour and average $60.

  - Two vendors reported bundled maintenance on minis with 23% of lease revenues allocated to maintenance.

- Peripheral maintenance vendors reported that 9.8% of the purchase price is the average annual price of maintenance.

  - Contract prices for peripheral maintenance ranged from 4.4-16.2%

  - Hourly rates charged by peripheral vendors ranged from $45-90 on hardware, with an average of $71.

  - Two peripheral vendors offer software maintenance at $65 and $68 per hour.

  - Three peripheral vendors have bundled leases, with 23% allocated to maintenance.

- Terminal maintenance contracts average 10.6% of purchase price among respondent vendors.

  - Annual contracts on terminals ranged from 6-15% of the purchase price.

  - Hourly rates on terminals averaged $69 and ranged from $55 to $100 per hour.

  - Three terminal vendors offer software maintenance at hourly rates averaging $60 per hour.

P. GENERAL RESPONSES FROM VENDORS

- Comments from vendors on measuring field engineering productivity.

  - "Number of repeat calls."

  - "Correct diagnosis resulting in correct parts being sent."

  - "Subjectively . . . noise levels of customers . . . utilization factors."

  - "Poorly."

  - "Real time MIS system including dispatch and spare parts tracking."

  - "Number of calls taken per F.E."

  - "Average calls per day and hours billed/hours paid."

  - "Attitude of field engineer as observed by customer."

  - "Systems per man and response time."

- "Revenue per man and expense per man."
- "Profit margins."

- Some programs needed or being intitiated by vendors are:
  - "Remote diagnostics."
  - "Centralized dispatch."
  - "Microfiche."
  - "MIS for parts."
  - "Restructuring organization."
  - "Increased involvement in product design."
  - "Product specialization."
  - "Employee recognition program."
  - "Management incentive program."
  - "Failure analysis program."
  - "Management-by-objectives program."
  - "Expand system support center."
  - "Management development."

VI SIGNIFICANT VENDOR ACTIVITIES, 1979-1980

VI SIGNIFICANT VENDOR ACTIVITIES, 1979-1980

- Over the last year, vendors have begun to implement many of the techniques and policies discussed in the vendor and user sections of this report.

- The following summary is intended not as a chronology of all announcements but as an indication of industry trends.

- This summary presents a survey of types of vendor activities, rather than a listing of all significant activities. Clients wishing additional information are encouraged to use the "hot line" telephone inquiry service, to get information on topics of specific interest.

A. EXAMPLES OF 1980 MAINTENANCE PRICE INCREASES

- IBM began a series of industry-wide purchase, lease, and maintenance price increases with its January 14, 1980, announcement.

  - Price increases came as a sharp reversal of IBM's earlier price reduction policies and its 4300 and 8100 introductions.

    . IBM gave little explanation for such a turnaround beyond the higher cost of doing business.

. IBM had previously experienced an 18% drop in earnings in the third quarter of 1979 compared with the same quarter, 1978.

- Hourly systems engineering rates rose 10% effective immediately.

- Beginning April 1, 1980, maintenance fees for both the data processing and general systems divisions were increased 5-15%, depending on the system. Not all systems were affected.

- Field installation rates were hiked 15%.

- The office products division raised monthly maintenance contracts on some systems up to 20%.

• Other mainframe manufacturers followed with similar price increases.

- Honeywell announced new purchase, lease, and maintenance fee schedules on January 21, 1980.

. Monthly maintenance contracts on Level 62, Level 64, Level 66, and DPS 8 family machines increased 5-10%.

. Maintenance for such older systems as the Honeywell Series 600 and Series 2000, and the Xerox computer products, rose 7-10%.

. Hourly and monthly charges for systems engineers increased 18%.

. Time and materials rates for field engineers were hiked 16-17%.

. Price increases were effective January 21, 1980, for new customers and April 21 for present users.

- Univac announced corresponding price hikes on March 3, 1980.

  - . Maintenance fees increased 9% for all products except the 1100/60 mainframe.

  - . Hourly rates for on-call maintenance were boosted 15-36%, depending on time of day.

  - . Univac cited inflation and the competitive environment as the causes for these increases.

  - . New rates were effective May 1, 1980.

- Storage Technology initiated price increases by non-mainframe vendors.

  - STC announced purchase, rental, and maintenance price hikes for all data storage equipment on February 4, 1980.

    - . Maintenance fees were raised 10% for high-density tape storage equipment and some disk controllers. Low-density tape drives received a 15% increase.

    - . Rates became effective April 1, 1980, for all direct user clients. OEM prices remained unchanged.

  - Memorex announced price increases on February 11, 1980, for its large storage and communications equipment.

    - . Maintenance on disk drives were hiked 15%.

    - . Large-scale tape drive units increased by 20-24% for maintenance.

    - . Terminals and printers had maintenance charges raised 25-33%.

- Monthly maintenance fees were increased a maximum of 14% on cluster controllers.

- Price changes were effective January 28, 1980, for new users and would be phased into existing users' contracts depending on maintenance contract length.

- Digital Equipmment Corporation announced its increases March 14, 1980.

  - Maintenance monthly fees were increased 5-15%, depending on the system. Not all systems were affected.

  - Other service functions such as add-on installation, per-call time and materials fees, and factory repair services rose an average of 20%.

  - Price increases were applicable to all contracts written or renewed after April 1, 1980.

- Datapoint announced similar price changes on March 21, 1980.

  - All systems except Infoswitch and ARC workstations received a price increase ranging from 4-10%. Maintenance on individual products climbed 5-15%.

  - Prices were effective immediately for new clients, and the latter of either May 1 or the renewal date for existing users.

- Data General price hikes were also announced around March 21, 1980.

  - Maintenance contracts, on-call agreements, and preventative maintenance all increased in price approximately 6%. All systems except the Commercial Systems family were affected.

. Maintenance price increases went into effect March 29, 1980.

- Prime Computer followed closely with similar increases.

. Monthly service contract fees were raised an average of 8% effective March 24, 1980. Stiffer hikes of 12% were given to Model 300, 400, and 500 users.

. The recently announced Models 150 and 250 were not affected.

B. NEW MAINTENANCE TECHNIQUES

- Vendors announced an assortment of new service capabilities over the last year, including remote diagnostics, system support centers, and automated dispatching.

- IBM introduced its 3101 display terminal on October 2, 1979, with a depot-only maintenance contract.

. The terminal is completely portable. Its four components (CRT screen, logic element, keyboard, printer) are separable for easier shipment.

. The unit is strictly user-installed.

. There are currently three 3101 depots: one each in the Mid-western, Eastern, and Western regions.

- Hewlett-Packard equipped its HP 3000 Series 33 system with a remotely accessable system console. Diagnostic routines can be run remotely to identify faulty components.

- Datapoint announced that its new Remote Disk Operating System (REMDOS) will include a remote diagnostic capability. The system is free to users after a $50 installation fee.

- Honeywell announced an unbundling of its remote software maintenance services pricing.

  . Each element of the operating system will carry its own separate maintenance fee.

  . Users wanting on-site support will have to pay time and materials fees or sign for an expanded contract.

- DEC introduced a toll-free line to answer software usage and performance questions. The service is currently available eight hours per day, Monday through Friday, but eventually will be expanded to 24 hours, seven days.

- IBM began installing 50 computer-aided dispatch systems for its field service organization, the number rising to 96 in 1980. The Series/1 computers will help dispatchers match the proper FE with a user's problem.

- NCR announced that it will offer central software support at no charge beginning August 1, 1980, for its system software products.

  . Products eligible for remote servicing will be unbundled to allow greater user flexibility.

  . Depending on the product, software will be maintained from five centers spread across the country.

  . By mid-1980, five additional centers to service application software products are planned.

- On-site support on a time and materials basis will cost $40 per hour for terminal products and $57 per hour for computer systems.

- On-site maintenance contracts for these products will cost from 15-20% of the monthly software license fee.

C. VENDORS ACTING AS A THIRD PARTY FOR MAINTENANCE

- Some vendors with existing field organizations have contracted to service equipment of other vendors with little or no such capability.

  - General Electric's Apparatus Service Division contracted with Televideo, Inc., to maintain all its terminal products. Both monthly and hourly rates will be available.

  - Pertec Computer signed a two-year agreement with Alpha Professional Systems to service its System 7 minicomputers. Maintenance is for both hardware and software.

  - Centronics contracted to service all peripherals owned by Technical Services Group of New Jersey and leased to New York's Office of Mental Hygiene. The three-year agreement (worth $500,000) covers 180 Hazeltine CRTs, 80 Centronics serial impact printers, and 40 Centronics band printers.

D. ADDITIONAL MAINTENANCE ACTIVITIES

- Vendors made other additions and changes pertinent to their maintenance activities.

- Along with the 4300 introduction, IBM announced that rental and lease agreements for new machines will no longer automatically receive the traditional 24-hour, seven-day maintenance service.

  . Under the new plan, users will pay only for the coverage used. One shift, five days will be minimum coverage; all service above that will be additional.

  . Cost schedules will vary by the difficulty of machine maintenance. Four machine groups were identified, A to D.

  . Machines in Group A will require a 47% surcharge over the base maintenance fee to get full, three-shift, seven-day coverage. Group B would require 59%; Group C, 79%; and Group D, 47%. Less coverage for all groups will be available.

- Raytheon Service Company announced plans to form a network of maintenance franchises.

  . Each franchise will pay a flat fee plus a percentage of sales. Raytheon will guarantee backup support for all types of equipment currently serviced.

  . Raytheon set up its Toronto subsidiary as the first location and named it Rayserv Computer Services. Other franchises are planned for 1980.

  . Raytheon plans eventually to cover the top 100 U.S. cities with either their own or franchised maintenance locations.

- Hewlett-Packard took a full-page ad in the Wall Street Journal to advertise its maintenance capabilities as a key factor in a computer purchase, emphasing the importance of reliable service over product price or performance.

APPENDIX A: DEFINITIONS

APPENDIX A: DEFINITIONS

- DISTRIBUTED DATA PROCESSING - Distributed processing is the deployment of programmable intelligence in order to perform data processing functions where they can be accomplished most effectively, through the electronic interconnection of computers and terminals, arranged in a telecommunications network adapted to the user's characteristics.

- DISTRIBUTOR - Purchases the small business computer on an OEM basis from the manufacturer and markets it to the end user. It may or may not provide a turnkey system.

- END USER - May buy a system from the hardware supplier(s) and do his own programming, interfacing, and installation. Alternatively, he may buy a turnkey system from a systems house or hardware integrator.

- ENGINEERING CHANGE NOTICE (ECN) - Product changes to improve the product after it has been released to production.

- ENGINEERING CHANGE ORDER (ECO) - The follow-up to ECNs which include parts and a bill of material to affect the change in hardware.

- FIELD ENGINEER (FE) - For the purpose of this study, field engineer, customer engineer, serviceperson, and maintenance person were used interchangeably and refer to the individual who responds to a user's service call to repair a device or system.

- HARDWARE INTEGRATOR - Develops system interface electronics and controllers for the CPU, sensors, peripherals and all other ancillary hardware components. He may also develop control system software in addition to installing the entire system at the end user site.

- MEAN TIME BETWEEN FAILURE (MTBF) - The elapsed time between hardware failures on a device or a system.

- MEAN TIME TO REPAIR - The elapsed time from the arrival of the field engineer on the user's site until the device is repaired and returned to the user for his utilization.

- MEAN TIME TO RESPOND - The elapsed time between the user placement of a service call and the arrival at the user's location of a field engineer.

- PERIPHERALS - Include all input, output, and storage devices, other than main memory, which are locally connected to the main processor and are not generally included in other categories, such as terminals.

- SMALL BUSINESS COMPUTER - For the purpose of this study, is a system which is built around a Central Processing Unit (CPU), has the ability to utilize at least 20M bytes of disk capacity, provides multiple CRT work stations and offers business-oriented system software support.

- SOFTWARE PRODUCTS - Systems and applications packages, which are sold to computer users by equipment manufacturers, independent vendors and others. Also included are fees for work performed by the vendor to implement a package at the user's site.

- SYSTEMS HOUSE - Integrates hardware and software into a total turnkey system to satisfy the data processing requirements of the end user. He may also develop system software products for license to end users.

- TURNKEY SYSTEM - Composed of hardware and software integrated into a total system designed to completely fulfill the processing requirements of a single application.

APPENDIX B: RESEARCH METHODOLOGY

APPENDIX B: RESEARCH METHODOLOGY

- The research for this study was predicated upon two sets of questionnaires, one for users and one for vendors. The questionnaires were developed by INPUT based on the 1978 multiclient study "Maintenance Requirements for the Information Processing Industry, 1978-1983." Because of interest shown by clients, three new subjects were added:

  - Systems support centers.

  - Remote diagnostics.

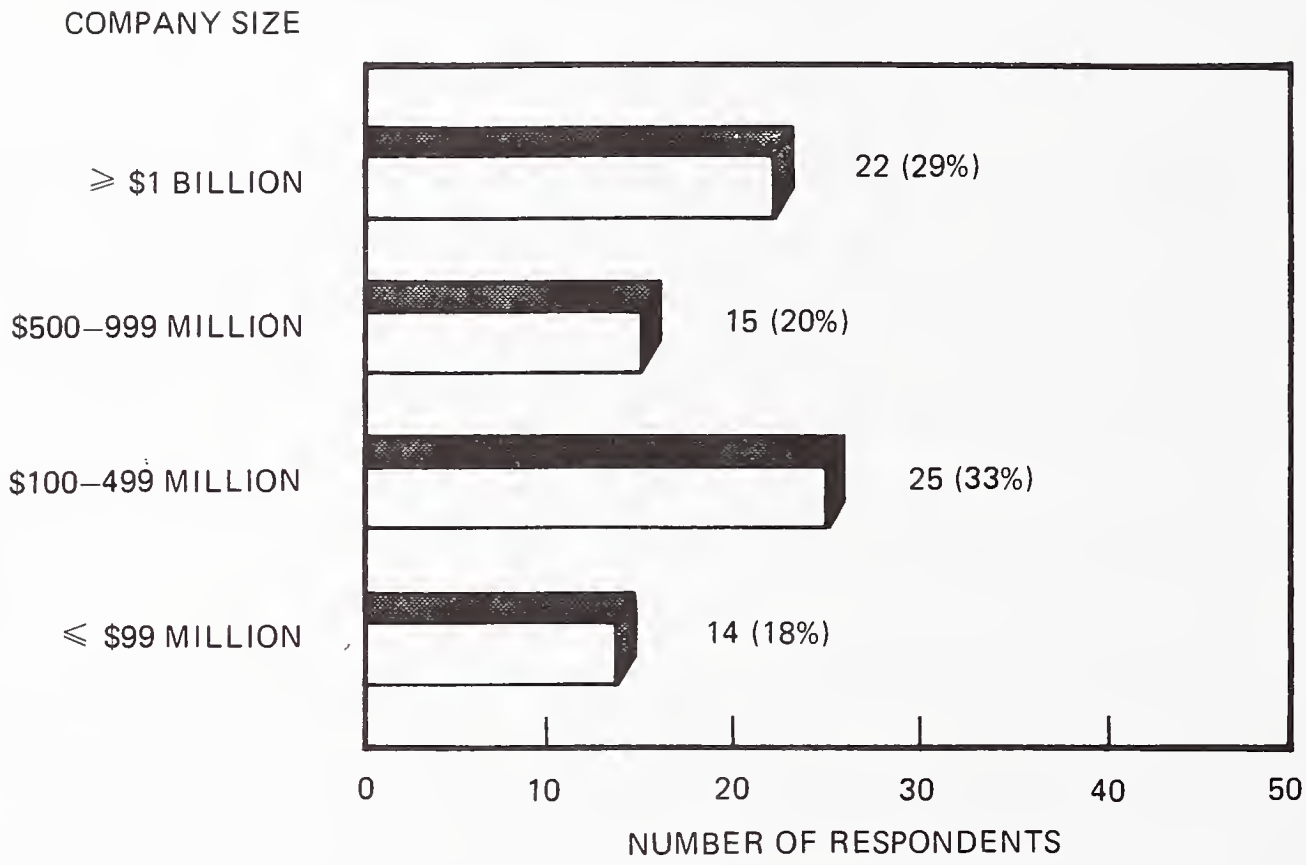
  - Software maintenance.

- Seventy-six user interviews were conducted by telephone with each interview lasting from one-half to one and one-half hours. The interviews were selected from among the 145 users interviewed in the 1978 multiclient study effort.

  - As in 1978, approximately one-half the users interviewed were corporations with sales between $100 million and $1 billion, as shown in Exhibit B-1. Emphasis shifted slightly, however, from the smaller companies towards the over-$1 billion group. (Note that on exhibits in Chapter III, the number of responses are shown, thereby allowing the reader to relate the exhibit to the total of 76 user interviews.)

EXHIBIT B-1

USERS INTERVIEWED, BY COMPANY SIZE



NUMBER OF RESPONSES: 76

- The user profile by industry, shown in Exhibit B-2, indicates a slight bias toward discrete manufacturing. This is the effect of a decision to get more information this year from users of distributed data processing; other INPUT studies have shown a concentration of DDP in the manufacturing sector.

- Twenty vendors were interviewed; a profile of size of the vendor interviews is presented on Exhibit B-3.

  - The interview form was mailed to participating vendors.

  - Telephone follow-up was done where necessary to complete questions and clear up ambiguities.

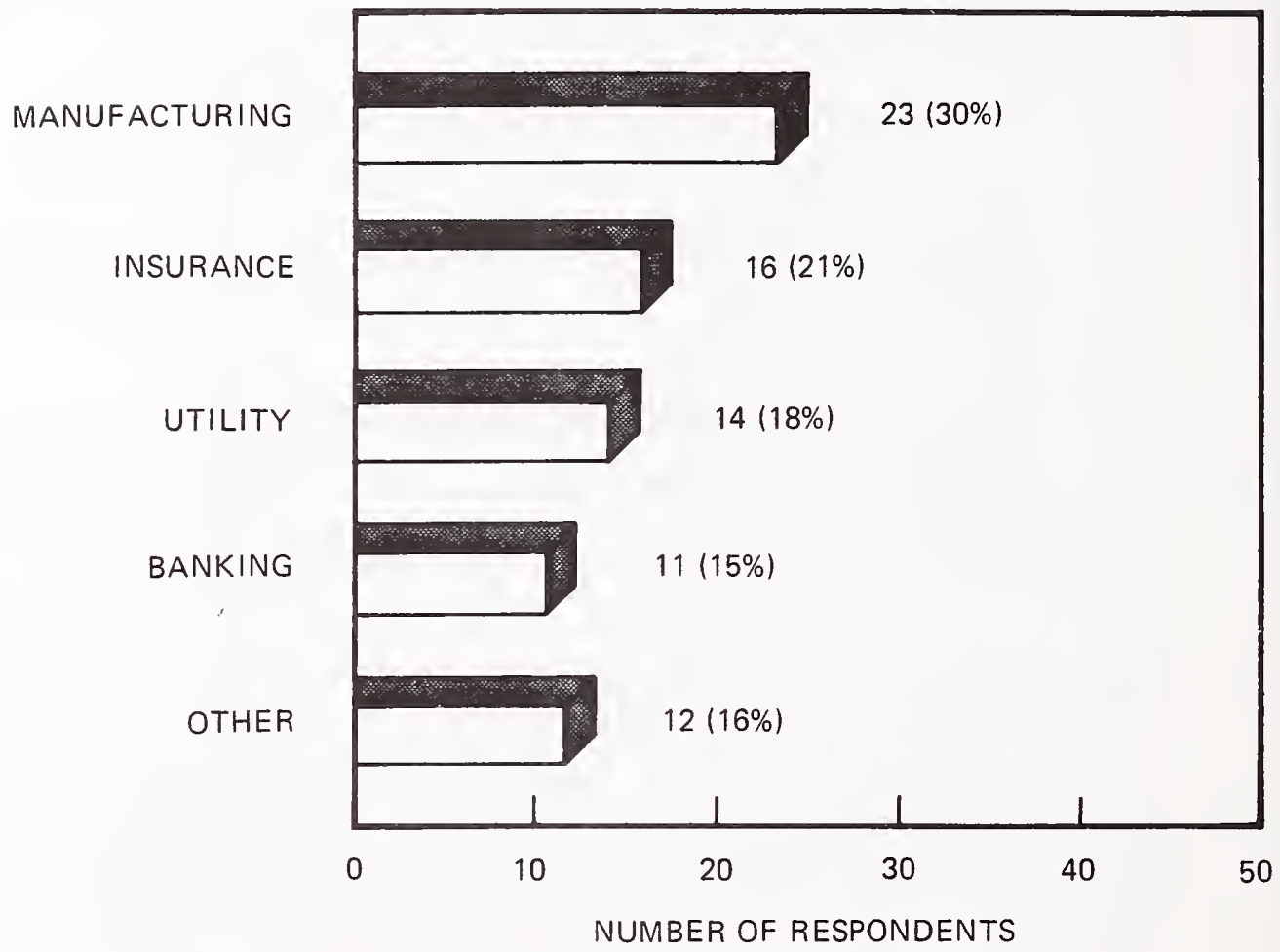
  - Vendors were selected based upon size and major product types to develop a representative mix of mainframes, small business computers, minicomputers, peripherals, terminals and software.

- The objective of the interviews was to determine a wide range of representative user and vendor attitudes and data, rather than to construct a statistically valid sample of a narrow range of information. Accordingly, where necessary to construct market estimates and forecasts or to draw conclusions beyond the base of data gathered, other information developed by INPUT was used.

- Client inquiries and suggestions are welcome.

EXHIBIT B-2

USERS INTERVIEWED, BY INDUSTRY SECTOR



NUMBER RESPONSES: 76

EXHIBIT B-3

VENDOR INTERVIEW POPULATION

COMPANY NUMBER	SIZE OF FIELD SERVICE ORGANIZATION	
1	7	
2	60	
3	117	
4	121	
5	131	AVERAGE = 128
6	120	
7	221	
8	249	
9	301	
10	320	
	*	AVERAGE = 852
11	450	
12	490	
13	623	AVERAGE = 552
14	568	
15	801	
16	517	
17	900	
18	2,519	
19	2,856	AVERAGE = 3,682
20	5,672	

*MEDIAN = 400

APPENDIX C: SUPPORTING CHARTS

APPENDIX C: SUPPORTING CHARTS

Exhibits C-1 through C-5 show in numeric terms the same data which is shown in graphic form in Chapters III, IV and V. The percentages represent those user respondents who reported the indicated time or less to either respond or repair. As in the graphs, the data is presented by type of equipment.

Exhibits C-6 and C-7 identify the vendors, by equipment type, who were identified by users as supplying maintenance.

Exhibit C-8 is a presentation of maintenance coverage requirements and compares the 1978 and 1980 surveys.

EXHIBIT C-1

MAINFRAME
MEAN TIME TO RESPOND AND REPAIR: CUMULATIVE PERCENTAGES, USER SURVEY

MEAN TIME TO RESPOND:

HOURS	CURRENT	MINIMUM	IDEAL
½	17%	7%	21%
1	57%	43%	88%
1½	70%	52%	96%
2	99%	88%	100%
2½		92%	
3	100%	95%	
3½			
4		100%	
4½			
5+			

MEAN TIME TO REPAIR:

HOURS	CURRENT	MINIMUM	IDEAL
½	1%	0%	10%
1	25%	18%	54%
1½	39%	23%	56%
2	71%	59%	80%
2½	79%	61%	82%
3	90%	73%	100%
3½		75%	
4	97%	90%	
4½			
5	100%	100%	

EXHIBIT C-2

SMALL BUSINESS MACHINE
MEAN TIME TO RESPOND AND REPAIR: CUMULATIVE PERCENTAGES, USER SURVEY

MEAN TIME TO RESPOND:

HOURS	CURRENT	MINIMUM	IDEAL
½	0%	0%	5%
1	32%	20%	47%
1½		30%	58%
2	43%	50%	90%
2½			
3	59%	55%	
3½			
4	75%	75%	100%
12	91%		
24	96%	95%	
48+	100%	100%	

MEAN TIME TO REPAIR:

HOURS	CURRENT	MINIMUM	IDEAL
½	5%	0%	0%
1	23%	11%	11%
1½	28%	16%	22%
2	55%	32%	66%
2½	60%	37%	
3	74%	58%	77%
3½			
4	84%	61%	100%
8	89%	72%	
24+	100%	100%	

EXHIBIT C-3

MINICOMPUTER
MEAN TIME TO RESPOND AND REPAIR: CUMULATIVE PERCENTAGES, USER SURVEY

MEAN TIME TO RESPOND:

HOURS	CURRENT	MINIMUM	IDEAL
½	0%	8%	17%
1	27%	25%	50%
1½	31%	29%	54%
2	46%	46%	75%
2½	54%	54%	75%
3	58%	62%	75%
3½			75%
4	77%	83%	100%
6	81%	91%	
24	100%	100%	

MEAN TIME TO REPAIR:

HOURS	CURRENT	MINIMUM	IDEAL
½	11%	4%	13%
1	48%	25%	70%
1½		29%	74%
2	74%	71%	86%
2½	81%	75%	100%
3	92%	88%	
3½			
4	96%	97%	
12		100%	
24	100%		

EXHIBIT C-4

PERIPHERAL
MEAN TIME TO RESPOND AND REPAIR: CUMULATIVE PERCENTAGES, USER SURVEY

MEAN TIME TO RESPOND:

HOURS	CURRENT	MINIMUM	IDEAL
½	25%	14%	22%
1	55%	42%	62%
1½	65%	46%	71%
2	94%	78%	95%
2½	94%	84%	100%
3	94%	90%	
3½	94%		
4	95%	94%	
12	100%	97%	
24		100%	

MEAN TIME TO REPAIR:

HOURS	CURRENT	MINIMUM	IDEAL
½	9%	3%	10%
1	39%	13%	53%
1½	53%	20%	60%
2	82%	53%	94%
2½	84%	55%	94%
3	94%	70%	100%
3½	94%	70%	
4	99%	82%	
5	99%	84%	
8	99%	91%	
24	99%	96%	
48	100%	100%	

EXHIBIT C-5

TERMINAL
MEAN TIME TO RESPOND AND REPAIR: CUMULATIVE PERCENTAGES, USER SURVEY

MEAN TIME TO RESPOND:

HOURS	CURRENT	MINIMUM	IDEAL
½	15%	11%	12%
1	33%	28%	52%
1½	36%	31%	56%
2	75%	58%	91%
2½	77%	60%	91%
3	82%	68%	95%
3½	84%	70%	95%
4	92%	81%	100%
6	94%	83%	
10	97%	87%	
36	100%	100%	

MEAN TIME TO REPAIR:

HOURS	CURRENT	MINIMUM	IDEAL
½	20%	8%	25%
1	56%	27%	68%
1½	61%	32%	72%
2	81%	64%	92%
2½	84%	64%	92%
3	89%	72%	100%
3½	89%	72%	
4	94%	82%	
6	96%	84%	
10	96%	93%	
36	100%	100%	

EXHIBIT C-6

USER HARDWARE MAINTENANCE VENDOR COMPOSITION

MAINTENANCE VENDOR	MACHINE TYPES INSTALLED				
	MAINFRAME	SMALL BUSINESS MACHINE	MINICOMPUTER	PERIPHERAL	TERMINAL
ATT					√
AMDAHL	√				
BRIGGAN					√
BURROUGHS	√	√		√	√
COMPUTER OPTICS					√
COM/TEN			√		
CONTROL DATA	√	√	√	√	√
COURIER					√
DATA GENERAL		√	√		
DATA-100			√		
DATAPOINT		√	√		√
DEC		√	√		
DOCUMATION				√	
ENTREX			√		
FOUR-PHASE			√		√
GE					√
GTE					√
GENYSIS			√		√
HARRIS			√		√
HEWLETT-PACKARD	√	√	√	√	√
HONEYWELL	√	√	√	√	√
IBM	√	√	√	√	√
INCOTERM					√
INTERCOMM				√	
MEMOREX				√	√
MOHAWK			√		√
NCR		√	√		
NSC	√			√	
NIXDORF			√		√
ONTEL					√
PACIFIC TEL					√
PERKIN ELMER		√			
PERTEC			√		
PRIME		√			
RAYTHEON					√
STC				√	
SANDERS					√
SORBUS	√			√	√
TCI					√
TANDEM			√		
TEKTRONIX					√
TELEX					√
TEXAS INSTRUMENTS		√			
TRIVEX					√
UNIVAC	√		√	√	√
WANG		√	√		
XEROX					√

EXHIBIT C-7

USER SOFTWARE MAINTENANCE VENDOR COMPOSITION

MAINTENANCE VENDOR	SOFTWARE TYPES INSTALLED	
	SYSTEM SOFTWARE	APPLICATION SOFTWARE
ADR	√	√
AMDAHL	√	
ALLEN SERVICES	√	
BURROUGHS	√	
CDC	√	
EQUIMATICS		√
FLORIDA SOFTWARE		√
HEWLETT-PACKARD	√	
HONEYWELL	√	
IBM	√	√
INFORMATICS		√
INTERCOMM	√	
MRI		√
MSA		√
McCORMICK-DODGE		√
PANSOPHIC	√	√
SOFTWARE A G	√	
SOFTWARE INTERNATIONAL		√
TRES		√
UCC		√
UNIVAC	√	
WESTINGHOUSE		√

EXHIBIT C-8

ACTUAL MAINTENANCE COVERAGE REQUIREMENTS 1978 AND 1980

COVERAGE		PORTION OF TOTAL SAMPLE				CHANGE 1978-1980
		1978*		1980		
		NUMBER	PERCENT	NUMBER	PERCENT	
5 DAYS	1 SHIFT	133	100%	76	100%	SAME
	2 SHIFTS	74	56	43	57	+1%
	3 SHIFTS	63	47	36	47	SAME
6 DAYS	1 SHIFT	66	50	34	45	-5%
	2 SHIFTS	53	40	31	41	+1%
	3 SHIFTS	50	38	28	37	-1%
7 DAYS	1 SHIFT	43	32	22	29	-3%
	2 SHIFTS	40	30	21	28	-2%
	3 SHIFTS	39	29	21	28	-1%

*FROM MAINTENANCE REQUIREMENTS FOR THE INFORMATION PROCESSING INDUSTRY 1978-1983.

APPENDIX D: USER QUESTIONNAIRE

1. a) For your _____, who is the predominant vendor?

   b) Do you have a maintenance contract with them or do you use a time and materials arrangement?

   c) Please rate the quality of the vendor's overall maintenance using a 5-1 scale; 5 being excellent and 1 being poor.

Equipment Classification	Predominant Vendor	Maintenance Vendor	Maintenance Contract or Time and Materials	Rating of Vendor's Maintenance Service
a) Medium and Large Mainframes				
b) Small Business Computers				
c) Other Minicomputers				
d) Peripherals (plug compatible)				
e) Terminals				
f) Software: Systems				
g) Software: Applications				

2. a) For how many shifts per day have you presently contracted maintenance?

_____

b) For how many days a week do you have coverage?

_____

c) Will this coverage change in the future?

☐ Yes ☐ No

Comment: _____

_____

d) Does this coverage vary depending on type of equipment?

☐ Yes ☐ No

If yes, please comment:

_____

_____

_____

_____

3. MINIMUM/CURRENT/DESIRED MEAN TIME TO RESPOND/REPAIR

a) For your _____, what is the minimum acceptable mean time to respond, mean time to repair?

b) What is the current mean time to respond you are receiving? Repair?

c) What would you like to have as the mean time to respond? Repair?

d) What additional amount would you be willing to pay to receive this ideal mean time to respond? Repair?

Equipment Classification	Minimum Respond/Repair	Current Respond/Repair	Ideal Respond/Repair	Percent Willing to Pay
a) Medium and Large Main-frames				
b) Small Business Computers				
c) Other Mini-computers				
d) Peripherals (plug com-patible)				
e) Terminals				
f) Software: Systems				
g) Software: Applica-tions				

4. Rate the importance to you of the following field maintenance characteristics: (5 = highest, 1 = lowest)

Factor	Rating
a) Mean Time to Respond (in person)	
b) Mean Time to Repair (of equipment) (Not include response time)	
c) Regularly Scheduled Preventive Maintenance	
d) Other (specify)	

5. During the past two years have you or are you currently replacing any hardware due to poor maintenance?

a) Yes _____

b) No _____

c) If yes:

- Vendor _____
- Type Machine _____
- Maintenance Vendor _____

6. Over the same period have you or are you replacing any software due to poor maintenance?

   a) Yes _____

   b) No _____

   c) If yes:

   - Vendor _____
   - Type of Software _____
   - Maintenance Vendor _____

7. During the past year how would you rate the quality of the field service engineers that service your installation compared to earlier years?

   _____ Same Quality
   _____ Poorer Quality
   _____ Improved Quality

   Please comment: _____

8. During the past year how would you rate the quality of the field service management that is responsible for your installation compared to earlier years?

   _____ Same Quality
   _____ Poorer Quality
   _____ Improved Quality

   Please comment: _____

9. As a result do you currently perform any of the following maintenance activities?

		Perform		Cost Saving Percent	Consider		Expected Cost Saving
a)	Install equipment	Y	N	_____	Y	N	_____
b)	Perform diagnostics before calling for vendor maintenance	Y	N	_____	Y	N	_____
c)	Perform maintenance on your hardware system	Y	N	_____	Y	N	_____
d)	Perform maintenance on vendor supplied software	Y	N	_____	Y	N	_____
e)	Deliver equipment to vendor maintenance depot for repair or replacement	Y	N	_____	Y	N	_____

10. Do any of your vendors provide a remote diagnostic capability?

☐ Yes ☐ No

a) If yes, which vendor provides this service? _____

If yes, for which equipment type? _____

b) How long has it been provided? _____ months

c) How would you rate the quality of your maintenance service with this remote diagnostic capability?

_____ Same Quality
_____ Improved Service
_____ Poorer Service

Please comment: _____

_____

_____

11. Has this remote diagnostic capability reduced your maintenance costs?

☐ Yes ☐ No

a) If yes, by what percent has your maintenance costs decreased? _____ % decrease

12. Do any of your vendors provide a system support center capability?

☐ Yes ☐ No

a) If yes, which vendor provides this service? _____

b) How long has it been provided? _____ months

c) How would you rate the quality of this system support center capability?

_____ Same Quality
_____ Improved Service
_____ Poorer Service

Please comment: _____

_____

_____

13. Do any of your vendors provide a formal escalation procedure as part of their maintenance activities?

☐ Yes ☐ No

Vendor _____

Equipment _____

a) If yes, what effect has this had on the maintenance support that has been provided to you?

_____

_____

_____

b) If no, do you believe that a formal escalation procedure would provide improvements over the present level of maintenance support you are receiving?

☐ Yes ☐ No

How would it help? _____

_____

_____

_____

14. Would you prefer to buy products from a vendor who provides a formal escalation procedure as a part of their maintenance activities?

☐ Yes ☐ No

15. What other new maintenance techniques have your vendors introduced in the past year?

_____

_____

_____

_____

a) How effective have they been?

_____

_____

_____

16. What is your current budget for EDP? $ _____

What portion of this is spent on: ($ or %)

	1980	1982	1985
a) Hardware			
b) Software			
c) Personnel			
d) Hardware Maintenance			
e) Software Maintenance			

17. How have your maintenance costs changed in the last 12 months compared to earlier years?

	More (%)	Less (%)	Same
In absolute $			
Relative to value of Equipment			

18. What do you plan to do about rising maintenance costs?

19. At what point does this become a problem?

There have been some recent changes in the manner vendors charge for maintenance services. These changes have been primarily in providing incremental pricing structure where individual maintenance activities are billed separately.

20. For which types of equipment would you prefer maintenance to be billed as a:

a) Fixed monthly maintenance charge? _____

_____

_____
(equipment type)

b) Incremental maintenance charge based on service provided? _____

_____

_____
(equipment type)

Why? _____

_____

_____

21. Would you be willing to pay for on-site spares for your installation?

☐ Yes ☐ No

a) If yes, what advantages?

_____

_____

_____

b) If no, why not?

_____

_____

_____

22. For what percentage of cost saving in your maintenance contract would you eliminate preventive maintenance (PM)? (encircle)

a) Would not consider elimination of PM

b) <5% of contract cost

c) 5-10% of contract cost

d) 11-20% of contract cost

e) 21-30% of contract cost

f) >30%

23. If currently using a third party for maintenance, please rate the following reasons for having used a third party for maintenance. (Use a scale of 5-1, 5 being the most important reason, and 1 being the least)

	Hardware	Rating	Software	Rating
a) Thought it would be less expensive Percentage expected savings Percentage actually saved	_____ % _____ %		_____ % _____ %	
b) Manufacturer does not provide adequate maintenance at your location Maximum acceptable response time	_____ Hrs		_____ Hrs	
c) Have a multivendor installation				
d) Other (specify)	_____ _____		_____ _____	

24. If you are not currently using a third party for maintenance, would you consider it?

a) Yes _____

b) No _____

If no, why?

_____

_____

_____

_____

c) If yes, please rate the following reasons for using a third party for maintenance. (Use a scale of 5-1, 5 being the most important and 1 being the least)

	Hardware	Rating	Software	Rating
1) Would expect it to be less expensive Percentage savings expected	_____ %		_____ %	
2) Manufacturer does not provide adequate maintenance at your location Maximum acceptable response time	____ Hrs		____ Hrs	
3) Have a multivendor installation				
4) Other (specify)	_____ _____		_____ _____	

25. What, in your opinion, would improve your maintenance service? How important are these?

	H	M	L
_____			
_____			
_____			
_____			
_____			

26. What maintenance needs or service requirements do you have which are not now being met?

APPENDIX E: VENDOR QUESTIONNAIRE

Please complete this questionnaire based on U.S. field service operations only.

I. FIELD SERVICE ORGANIZATION

1. What is the title of your senior corporate executive for field service?

   _____

   a) To whom does he report? _____

2. In your company is the field service organization treated as a:

   ☐ Profit center

   ☐ Cost center

   a) If it is currently a cost center, do you see this changing to a profit center?

      ☐ Yes ☐ No

      If yes, when will this occur? _____

3. During the past year have you made any major changes in the structure of your field service organization?

   ☐ Yes ☐ No

   If yes, what were these changes?

   a) _____

   b) _____

   c) _____

4. What is the current size of your field service organization?

   _____

   a) How many of these are field engineers? _____

   b) How many are field management? _____

   c) How many are administrative? _____

5. During the past year did the size of your field service organization?

☐ Increase _____ %

☐ Decrease _____ %

☐ Remain Same

a) What were the primary reasons for these changes?

1) _____

2) _____

3) _____

6. How many field engineering locations do you presently have? _____

a) Has this changed during the last year?

☐ Yes ☐ No

b) By what percentage has this changed?

Increased _____ %

Decreased _____ %

7. What percentage of the total maintenance organization is located at divisional (regional) and headquarters locations?

_____ %

8. a) How many field engineers did you hire last year? _____

b) How many field engineers did you lose? _____

9. What were the three most important reasons for losing field engineering personnel?

a) _____

b) _____

c) _____

10. Will the number of field engineers required increase:

			Percent Increase
a)	In 1980? ☐ Yes	☐ No	_____
b)	In 1982? ☐ Yes	☐ No	_____
c)	In 1984? ☐ Yes	☐ No	_____

d) Please comment on the causes of these changes.

_____

_____

_____

_____

11. When you add or replace field service personnel what are the primary sources? Please rate the following sources either high (H), medium (M), or low (L).

Factor	Rating (1980)	Rating (1985)
a) Hire and train yourself (No technical pretraining)		
b) Recruit from competition		
c) Recruit from other industries		
d) Trained discharged Armed Forces personnel		
e) Recruit from other functions within your company (e.g.: manufacturing, engineering)		
f) Trade schools		
g) Other (describe)		

12. The following are potential problems associated with field service organizations. Please rate them either high (H), medium (M), or low (L) as they pertain to your company.

Factor	Rating
a) Morale of maintenance force	
b) Recruiting field maintenance personnel	
c) Training field maintenance personnel	
d) Reducing labor turnover	
e) Product quality	
f) Adequate diagnostic equipment	
g) Adequate remote diagnostic assistance	
h) Marketing demands	
i) Customer demands	
j) Budget limitations	
k) Salary administration	
l) Spare parts shortage	

II. FIELD SERVICE SALARIES

1. For the following general categories of field service personnel, what is the average salary and salary range? How has and how will these change?

	Average Salary	Range		% Increase '78 to '79	% Increase '79 to '80
Trainee	_____	_____	to _____	_____ %	_____ %
Qualified field engineer	_____	_____	to _____	_____ %	_____ %
Senior field engineer	_____	_____	to _____	_____ %	_____ %

2. What are the primary reasons for salary increases?

a) _____

b) _____

c) _____

3. Do you currently have an incentive program for your field engineers?

☐ Yes ☐ No

Please describe:

_____

_____

_____

_____

_____

III. AFFIRMATIVE ACTION/EEO

1. What percent of new hires are required to meet affirmative action guidelines?

   _____ %

2. Has this requirement had any impact in the following areas?

   a) Recruiting costs ☐ Yes ☐ No _____ % increase

   b) Training costs ☐ Yes ☐ No _____ % increase

   c) Size of field service organization ☐ Yes ☐ No _____ % increase

3. What other problems, if any, has it caused your field service organization?

   _____

   _____

   _____

IV. LEVEL OF SUPPORT

1. What percentage of total field engineering manhours was spent in installing engineering change notices (ECN) during 1979?

   _____ %

   Comments:

   _____

   _____

   _____

   _____

   _____

   _____

2. What is the average number of "trouble calls" in a month? _____

   a) What percentage of these are "repeat calls," a second call within two weeks about the same problem?

   _____ %

   b) What percentage of total calls had no faults found? _____ %

3. Do field engineers currently replace components, boards, or units at the user's site?

   ☐ Components ☐ Boards ☐ Units

   a) Are these parts then repaired on-site, at a depot, or at the factory?

   ☐ On-Site ☐ Depot ☐ Factory

   b) In 1984 will field engineers replace components, boards, or units on-site?

   ☐ Components ☐ Boards ☐ Units

4. For each type of product offered by your company, what is the:

Equipment Classification	Average Percentage Uptime (Percent)	Average Meantime Between Failure (Hours)	Average Meantime to Repair (Hours)	Average Meantime to Respond (Hours)
a) Medium and Large Mainframes				
b) Small Business Computers				
c) Other Minicomputers				
d) Peripherals (plug compatible)				
e) Terminals				

5. How important do you feel are the following field maintenance characteristics to your users? Please rate them either high (H), medium (M), or low (L).

Factor	Rating
a) Mean Time to Respond (in person)	
b) Mean Time to Repair (of equipment)	
c) Regularly Scheduled Preventive Maintenance	
d) Other	

V. SYSTEM SUPPORT CENTERS

1. Do you provide a system support center as part of your field service support?

☐ Yes ☐ No If no, go to page 10(b).

a) If yes, when did you begin offering this capability? _____

1) What were the primary reasons for implementing this?

_____

_____

_____

2) Is this system support center for:

☐ Hardware
☐ Software
☐ Both

3) How many people are located there? _____

4) How has the establishment of a system support center affected the number of engineers required in the field?

☐ Increased _____ %

☐ Decreased _____ %

☐ No Affect

Comment:

_____

_____

_____

_____

5) How has this system support center affected your maintenance costs?

☐ Increased _____ %

☐ Decreased _____ %

☐ Remain Same

Comment:

_____

_____

_____

_____

6) What has been your customer's reaction to this system support center?

_____

_____

_____

_____

b) If you do not currently have a system support center, do you have any plans to implement one?

☐ Yes ☐ No

1) If yes, when will such a capability be available to your customers?

_____

How would you expect it to affect the number of engineers required in the field?

☐ Increase _____ %

☐ Decrease _____ %

☐ No Affect

2) If you do not plan to implement a system support center, please comment.

_____

_____

_____

VI. REMOTE DIAGNOSTICS

1. Do you provide a remote diagnostic capability as part of your field service support?

☐ Yes ☐ No

a) If yes, when did you begin offering this capability? _____

1) What were the primary reasons for implementing it?

_____

_____

_____

2) Is this remote diagnostic capability for:

☐ Hardware
☐ Software
☐ Both

3) How has this remote diagnostic capability affected your maintenance costs?

☐ Increased _____ %
☐ Decreased _____ %
☐ Remain Same

4) What has been your customers reaction to this remote diagnostic capability?

_____

_____

_____

_____

b) If you do not currently have a remote diagnostic capability, do you have any plans to implement one?

☐ Yes ☐ No

1) If yes, when will such a capability be available to your customers?

_____

2) If no, why not?

_____

_____

_____

_____

_____

VII. FORMAL ESCALATION PROCEDURES

1. Within your field service organization do you have a formal escalation procedure for handling maintenance calls?

☐ Yes ☐ No

a) If yes, what are the general parameters of this escalation procedure?

_____

_____

_____

_____

b) If no, how are trouble situations that cannot be solved by the local field engineer handled in your organization?

_____

_____

_____

_____

2. Do you believe that a formal escalation procedure is an important factor in the marketing and sales of your company's products?

☐ Yes ☐ No

Comment: _____

_____

_____

_____

VIII. FIELD SERVICE DOCUMENTATION

1. During the last year have you made any major changes in the types of field service documentation provided to your customers?

☐ Yes ☐ No

a) If yes, what were the types of changes made to the documentation, and its distribution to customers?

b) Why were these changes implemented?

2. During the next two years will you be providing your customers with:

☐ More Documentation

☐ Less Documentation

☐ Same as Present

a) Why will these changes be made?

IX. SPARES INVENTORY

1. What is the percentage distribution of spares among the following locations?

Headquarters	_____ %
Depots	_____ %
Branch Offices	_____ %
Customer Locations	_____ %
	100%

2. During the past year has there been an increase in the number of customers who maintain spares at their location?

☐ Yes ☐ No _____ % Increase

Why? _____

_____

_____

_____

X. MAINTENANCE TECHNIQUES

1. Please rate the impact of the following factors on your current maintenance techniques either high (H), medium (M), or low (L).

Factor	Rating (H,M,L)
a) Rising labor costs	
b) Increasing product price performance	
c) User performing own maintenance	
d) User and vendor cooperatively testing transmission or computing equipment	
e) Home or personal computers	
f) Multi-function equipment	
g) Built-in diagnostics	
h) Remote diagnostics (via telecommunications)	
i) Distributed data processing	
j) Advances in technology	
k) Other (describe)	

XI. RESEARCH AND DEVELOPMENT

1. As a part of your operating budget do you have an allocation for R&D expenditures for improving maintenance techniques?

☐ Yes ☐ No

a) If yes, what is the approximate percent of this allocation?

_____ %

2. In the development of new products in your company, what is the involvement of the field service organization?

_____

_____

_____

_____

XII. MAINTENANCE PRICING

1. During the past year what changes have you made in maintenance prices?

☐ Increased _____ %

☐ Decreased _____ %

☐ Remained Same

a) Which of the following reasons was most important in causing maintenance fees to rise?

1) Inflation ☐

2) Labor Cost ☐

3) Parts Cost ☐

4) Competitor's Pricing ☐

5) Other _____ ☐

_____

2. During the next year what types of price changes are you planning?

☐ Increase _____ %

☐ Decrease _____ %

☐ Remain Same

a) Which of the following reasons will be most important in causing maintenance fees to rise?

1) Inflation ☐

2) Labor Cost ☐

3) Parts Cost ☐

4) Competitor's Pricing ☐

5) Other _____ ☐

_____

3. What is the cost of a typical service call? $ _____

a) What percentage of this is for labor? _____ %

b) What percentage is for travel? _____ %

c) What percentage is for parts and material? _____ %

d) What percentage is for other? _____ %

100%

4. For the following products offered by your company, what is the:

a)	Mainframes	Average Purchase Price	$ _____
		Annual Maintenance Contract	$ _____
		Average Monthly Rental/Lease Price	$ _____
		Percent of Rental/Lease Allocated to Maintenance	_____ %
		Average Time and Materials Hourly Charge for Hardware Maintenance	$ _____
		Average Time and Materials Hourly Charge for Software Maintenance	$ _____
b)	Small Business Computers	Average Purchase Price	$ _____
		Annual Maintenance Contract	$ _____
		Average Monthly Rental/Lease Price	$ _____
		Percent of Rental/Lease Allocated to Maintenance	_____ %
		Average Time and Materials Hourly Charge for Hardware Maintenance	$ _____
		Average Time and Materials Hourly Charge for Software Maintenance	$ _____
c)	Minicomputers	Average Purchase Price	$ _____
		Annual Maintenance Contract	$ _____
		Average Monthly Rental/Lease Price	$ _____
		Percent of Rental/Lease Allocated to Maintenance	_____ %
		Average Time and Materials Hourly Charge for Hardware Maintenance	$ _____
		Average Time and Materials Hourly Charge for Software Maintenance	$ _____

d) Peripherals

Average Purchase Price $ _____

Annual Maintenance Contract $ _____

Average Monthly Rental/Lease Price $ _____

Percent of Rental/Lease Allocated to Maintenance _____ %

Average Time and Materials Hourly Charge for Hardware Maintenance $ _____

Average Time and Materials Hourly Charge for Software Maintenance $ _____

e) Terminals

Average Purchase Price $ _____

Annual Maintenance Contract $ _____

Average Monthly Rental/Lease Price $ _____

Percent of Rental/Lease Allocated to Maintenance _____ %

Average Time and Materials Hourly Charge for Hardware Maintenance $ _____

Average Time and Materials Hourly Charge for Software Maintenance $ _____

XIII. GENERAL

1. Do you presently use a third party to maintain any of your products?

☐ Yes ☐ No

a) If no, under what conditions would you consider doing so?

_____

_____

_____

_____

2. Would you consider acting as a third party to maintain other vendors' products?

☐ Yes

☐ No

☐ Currently Do So

3. Have you offered your customers any of the following to increase their participation in maintenance? Were they successful?

		Offered		Successful	
a)	Better Documentation	Y	N	Y	N
b)	Price Reduction	Y	N	Y	N
c)	Faster Response Time	Y	N	Y	N
d)	Promised Higher Up Time	Y	N	Y	N
e)	Remote Diagnostics	Y	N	Y	N
f)	Easier to Run Diagnostic Routines	Y	N	Y	N
g)	Specialized Instrumentation	Y	N	Y	N
h)	Improved Diagnostic Displays	Y	N	Y	N
i)	Other _____	Y	N	Y	N
	_____	Y	N	Y	N
	_____	Y	N	Y	N
	_____	Y	N	Y	N
	_____	Y	N	Y	N

4. How do you measure field engineer productivity?

_____

_____

_____

_____

5. What changes would cause the greatest improvement in the maintenance you provide to your users?

6. What programs do you have now or will initiate in 1980 to improve productivity? (describe)

We would appreciate receiving in addition to this questionnaire a copy of your standard maintenance contract and a field service organizational chart.

THANK YOU VERY MUCH!