OPPORTUNITIES IN USER SELF-MAINTENANCE

ABOUT INPUT

THE COMPANY

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

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OPPORTUNITIES IN USER SELF-MAINTENANCE

AUGUST 1980

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ABSTRACT

This report deals with user attitudes and activities relative to the four elements of self-maintenance of hardware: installation, diagnostics, depot maintenance and hardware. The data presented is based on telephone interviews and questionnaires from INPUT's User Panel.

The variation in user behavior by type of equipment and industry sector is treated. Recommendations are presented regarding vendor actions to capitalize on a growing user receptivity to self-maintenance.

F-URM
August 1980

INPUT

OPPORTUNITIES IN USER SELF-MAINTENANCE

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LIST OF EXHIBITS

1 INTRODUCTION

I INTRODUCTION

A. PURPOSE

- This report is part of the INPUT 1980 U.S. Field Service Planning Information Program.

- The topic "Opportunities in User Self-Maintenance" was selected because of uniform solid client interest. The purpose of this report is to:

  - Establish to what degree user involvement in maintenance is important to both the field service organization and the company as a whole.

  - Discuss the benefits and implications of using/not using user self-maintenance.

  - Analyze user opinions and capabilities relating to their participation in the maintenance process.

  - Present this analysis in terms of the overall industry status, and also in terms of differences by types of user.

  - Provide a set of conclusions and a methodology to assist clients in their planning and management functions.

- Describe what currently is being done to involve users in their own maintenance.

  . What users themselves are doing?

  . What are vendors doing to involve users?

- Create a base of information to update and expand on an annual basis.

B. SCOPE

- Research for this report was collected through both telephone and mailed questionnaires:

  - Direct telephone interviews were conducted with 30 users. All were participants in the 1980 Field Service Annual Report survey. The research sample is provided in Appendix B.

  - Questions pertinent to the topic were asked in INPUT's annual EDP User Panel Survey. These questionnaires, part of the Planning Information Program for Computer and Communications Users, were mailed to data processing executives throughout the U.S. There were over 900 responses in 1980. A profile of this return is also provided in Appendix B.

- Information on vendor activities was taken from the INPUT Field Service data base, supplemented by phone interviews with selected vendors.

- Other information used for this report was taken from related INPUT studies. INPUT research reports are presented in Appendix C.

C. REPORT ORGANIZATION

- This report is organized to provide a logical analysis to the topic of user self-maintenace. To enhance this:

  - Statistical and supporting information has been placed in a series of appendices for general reference purposes.

  - Raw information reduced into exhibits has been integrated directly into the text.

  - Key conclusions and recommendations are presented in the Executive Summary. This summary is also designed to also function as a separate document for those seeking only the highlights of the study.

- Your comments on this report and its organization are welcome.

II EXECUTIVE SUMMARY

II EXECUTIVE SUMMARY

A. USER SELF-MAINTENANCE - A POTENTIAL SOLUTION

- Vendors of field service surveyed by INPUT in early 1980 specified two problem areas as most important. These were:

  - The cost of the labor component in field service. This cost is increasing due to higher wages, transportation costs, benefits and levels of training required.

  - The effort required to continually recruit personnel. This recruiting effort is particularly severe in smaller companies that must recruit both to maintain high growth and to offset turnover.

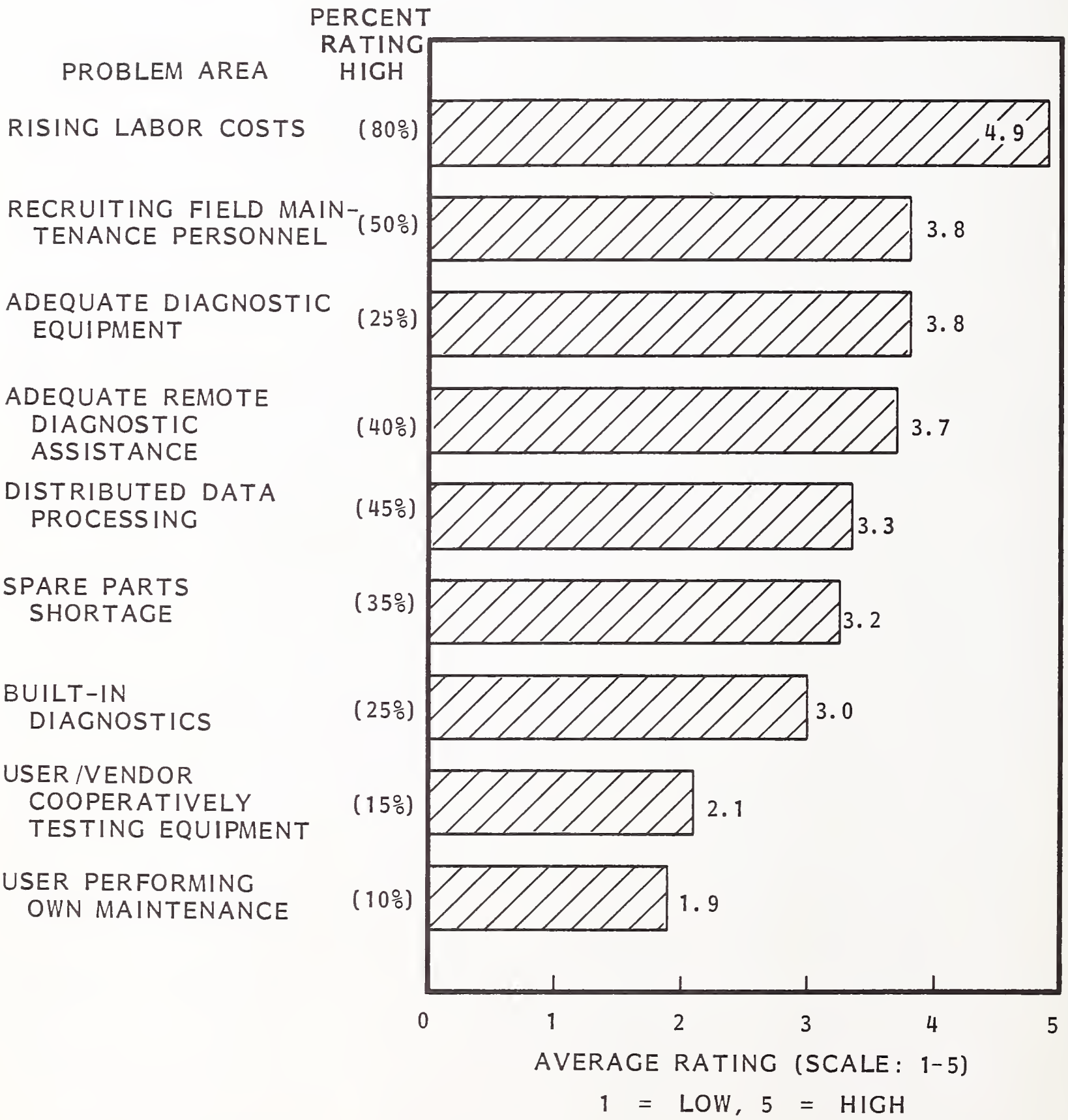
- Actual results of the vendor survey on issues related to this subject are shown on Exhibit II-1. It is significant that the labor-related issues are well recognized, while the specific topic of users performing their own maintenance is at the bottom of the list.

- User self-maintenance offers a partial solution to the labor cost and recruiting problems by shifting a portion of the labor requirement to the user. In carrying out this study, four functions were considered for user participation:

  - Equipment installation.

EXHIBIT II-1

VENDOR RATING OF PROBLEMS RELATED TO USER SELF-MAINTENANCE



NUMBER OF RESPONSES: 20

SOURCE: 1980 FIELD SERVICE ANNUAL REPORT.

- User performance of diagnostics.

- Actual performance of maintenance.

- Return of defective parts to a vendor depot.

- These functions have been incorporated in some recent vendor offerings, most notably the IBM 3101 display terminal and the IBM 3102 non-impact thermal printer.

  - As presented in more detail in the body of the report, user reaction to this concept is mixed. All vendors need to understand the variations in user reactions in order to determine an optimal design for current and future offerings.

  - According to survey results, users are responding more positively to the self-installation and diagnostic aspects of the offering, and less positively to the depot maintenance aspect.

- While user self-maintenance offers vendors some potential cost savings, users expect reductions in maintenance prices in exchange for their participation.

  - Over 900 responses to a recent INPUT mail survey indicate that users expect reductions of the following size:

    . Perform diagnostics - 15%.

    . Perform maintenance - 30%.

    . Deliver equipment to a depot - 20%.

  - However, if the self-maintenance features are made an integral part of a new product offering (as with the IBM 3101), the cost saving comparisons become a moot issue; the only price announced with this

product included the assumption that the user would participate in certain maintenance functions.

- Vendors must therefore carefully consider their strategy relative to user self-maintenance.

  - If hardware prices continue to decline, maintenance fees as a percent of hardware cost must increase if maintenance revenues are to avoid a similar decline.

  - The present trend toward more distributed data processing is leading to many small installations versus large central sites.

- INPUT estimates that by 1982, 30% of the total installed base of electronic data processing equipment will be operating in such a distributed environment.

- This equipment is particularly suited for user self-maintenance because it will have communications capability for diagnostics, will be relatively simpler than large central systems, and will be expensive to cover with on-site FEs.

- Further, the distributed nature of installations will make user involvement more helpful in determining the location of a problem in a network, and in developing a plan for spares distribution.

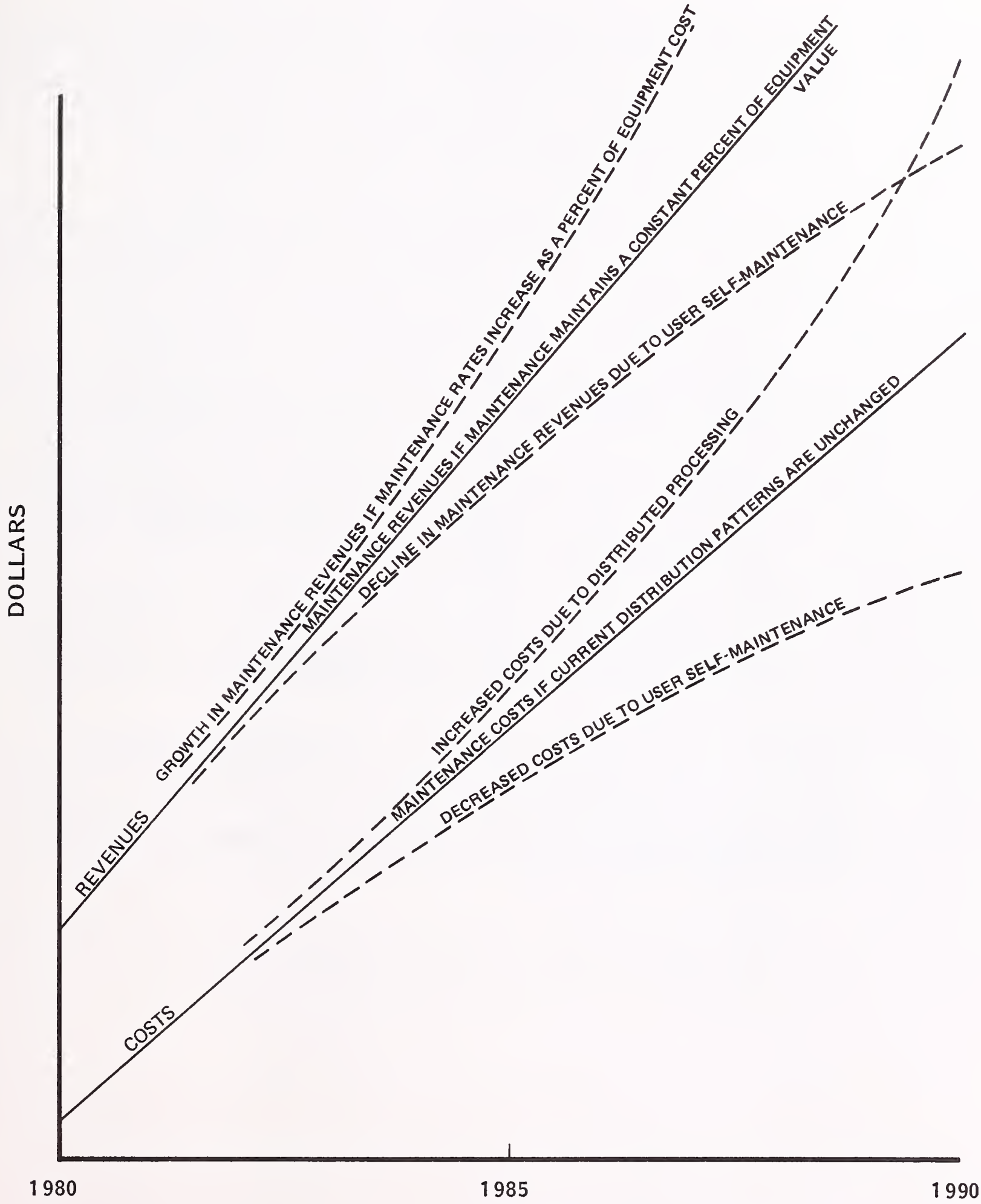
  - However, if too much user self-maintenance is built into product offerings, the overall impact on maintenance revenues can be adverse. Each vendor must balance costs, revenue growth and profit. Exhibit II-2 graphically presents the tradeoffs.

- INPUT estimates 1980 maintenance revenues for information processing equipment in the U.S. at $6 billion.

- Each 1% shift of revenues into user self-maintenance means a "loss" of $60 million in annual maintenance revenues.

EXHIBIT II-2

THE POTENTIAL IMPACT ON MAINTENANCE REVENUES OF DISTRIBUTED PROCESSING AND USER SELF-MAINTENANCE



B. CURRENT USER ATTITUDES

- Approximately half of respondent users are currently active in performing diagnostics, and a third are active or willing to consider installing equipment. However, participation in depot maintenance and hardware maintenance are resisted by the great majority of users, as shown in Exhibit II-3.

- When probed through in-depth telephone interviews, however, users were found to be more receptive to doing hardware maintenance of simpler equipment, particularly terminals.

  - None of the users interviewed were currently doing mainframe maintenance, and only 10% were doing maintenance on minicomputers.

  - However, 20-30% of the respondents felt they had the capability to maintain minis, small business computers or peripherals if they were given adequate tools and training.

  - For terminals, 13% of the respondents were already performing maintenance and 43% felt they had the capability.

- Willingness to maintain hardware also varied by user industry sector. The more technically advanced sectors in terms of EDP (education, manufacturing and banking) tended to have an above average willingness to participate, as seen in Exhibit II-4.

  - This indicates that, as technical competence increases, willingness to participate in hardware maintenance also increases.

EXHIBIT II-3

USER RECEPTIVITY TO SELF-MAINTENANCE

USER ACTIVITY	PERCENT OF RESPONDENTS	
	CURRENTLY ACTIVE	WILLING TO CONSIDER
INSTALL EQUIPMENT	21%	9%
PERFORM DIAGNOSTICS	42	20
DEPOT MAINTENANCE	11	15
PERFORM HARDWARE MAINTENANCE	7	7

SOURCE: 912 RESPONSES FROM INPUT'S 1980 USER PANEL SURVEY

EXHIBIT II-4

USER WILLINGNESS TO PERFORM SELF-MAINTENANCE
AS REPORTED BY INDUSTRY SECTOR

INDUSTRY SECTOR	PERCENT OF POSITIVE RESPONSES		
	PERFORM DIAGNOSTICS	HARDWARE MAINTENANCE	DEPOT MAINTENANCE
DISCRETE MANUFACTURING	65%	11%	19%
PROCESS MANUFACTURING	56	15	17
TRANSPORTATION	61	13	26
UTILITIES	70	14	23
WHOLESALE	69	12	49
RETAIL	54	12	22
BANKING AND FINANCE	64	15	32
INSURANCE	41	7	14
EDUCATION	75	26	53
GOVERNMENT	71	13	31
SERVICE - OTHER	55	12	20
OVERALL AVERAGE	62%	14%	28%

- A counter-force is also active in the survey sample. Larger companies tend to be less interested in doing hardware maintenance, preferring to concentrate their personnel on mainstream activities such as applications development.

- There was no significant difference in the survey between IBM and non-IBM users. All vendors have equal access to shaping the role of the user in maintenance.

- When compared to results obtained two years ago for INPUT's multiclient study "Maintenance Requirements In The Information Processing Industry, 1978-1983," the percentages of users doing self-maintenance or willing to consider it were approximately one-half what they are today. This growth exceeds the levels projected at that time, and is an indication that current user resistance will continue to diminish.

C. RECOMMENDATIONS

- Every vendor of information processing industry equipment must consider user self-maintenance as an element of long-term product development and pricing strategy.

  - Vendors can employ user self-maintenance as a way of reducing the labor content of their own maintenance effort.

  - Vendors must consider, however, the potential adverse effect on revenues, and balance the labor-saving and revenue-generating elements.

- The user self-maintenance issue must be considered, especially in the design of new products.

- Users are more receptive to maintaining equipment that can be shown to have design features conducive to self-maintenance.

- Some such features can add significantly to the cost of the equipment. Where this is the case, vendors must establish a balance in the design phase between higher-cost equipment and lower-cost maintenance.

- Vendors must consider the impact of user self-maintenance on the current workforce.

  - Early indications, particularly with regard to remote diagnostics, are that FEs support the concept.

  - Should user self-maintenance take on the image of a possible replacement for the FE, however, management can expect opposition from the FE force.

- The problem of managing a mix of FE-maintained equipment and user-maintained equipment in a given installation must be addressed.

  - The user may be confused if the rules are not clearly understood, particularly when a problem arises which may be in the self-maintained sector.

  - With distributed systems, the source of the problem may be even less clear and responsibilities must be spelled out.

  - There is a definite potential for the FE to be caught in the middle.

- User training and tools are key elements in successful user self-maintenance programs, particularly with more complex equipment.

  - Users interviewed stated a real concern with their potential liability should a piece of mainframe equipment be damaged.

- This fear can be reduced with better user training.

- Vendors marketing user self-maintenance must be sensitive to several problems paramount to most EDP managers.

  - EDP managers are under pressure to put new applications on stream. Any use of their key workforce to do maintenance will be resisted if it slows new application development.

  - The threat of reduced system availability due to inadequate maintenance will be a deterrant if the EDP manager feels that self-maintenance will mean lower-quality maintenance. On the other hand, if self-maintenance is viewed as increasing system availability, it will be handled positively.

- Vendors must evaluate their particular market sectors to determine if they are relatively receptive or resistant to self-maintenance. Marketing approaches that recognize industry differences (as the requirment for high up-time in banking and finance) will have an improved chance for success.

- Vendors implementing self-maintenance techniques must adequately budget for the cost of implementation.

  - New diagnostic routines are usually required.

  - Better documentation is essential.

  - User training programs will often be necessary.

  - Sales personnel must be trained to handle the user self-maintenance concept.

  - Product design must enhance the ease of user self-maintenance.

- The success of products now in the marketplace that demand user self-maintenance will have a major impact on the near-term acceptance of the concept. If user self-maintenance becomes identified with better overall maintenance, the concept will rapidly gain acceptance, and vice versa.

- Finally, vendors should view user self-maintenance as one of a series of elements in a complete maintenance strategy.

  - Other elements include use of system support centers, design of low-maintenance products, and use of third-party maintenance vendors as part of the maintenance delivery system.

  - User self-maintenance will have increased acceptance over time, but is currently the object of a great amount of user resistance, with some indication that this resistance is diminishing.

III RESULTS OF THE USER SURVEY

III RESULTS OF THE USER SURVEY

A. METHODOLOGY AND USER PROFILE

- While organizing, conducting and summarizing the user survey, INPUT focused on the three major points which limit the options available to vendors. These include:

  - Resources users currently have available to commit to servicing in-house equipment.

  - Duties users are willing to perform and why.

  - Concessions users expect in exchange for participation in the maintenance function.

- Users were asked to discuss their positions on each of these points in the areas of self-installation, self-diagnosis and self-repair. INPUT approached users in two ways:

  - Users were first asked to generalize their opinions on each point in the three major areas of interest. Questions were asked as clearly as possible concerning hypothetical circumstances and potential maintenance options .

- Users were then asked about a specific, currently available offering (the IBM 3101 terminal), which is user-maintained and with which users were acquainted. The general questions asked previously were then targeted specifically to this offering.

- Responses from the two sections were then reconciled to produce a summary of opinion.

- Of the 76 users surveyed for the 1980 Field Service Annual Report, 30 were selected as representative and were interviewed again on the above topics. A profile of the interview sample, provided in Appendix C, includes:

  - Users by size grouping.

  - Users by industry sectors.

- Questions regarding user self-maintenance were included in INPUT's 1980 User Panel survey. Analysis of 912 responses received is presented in Chapter IV.

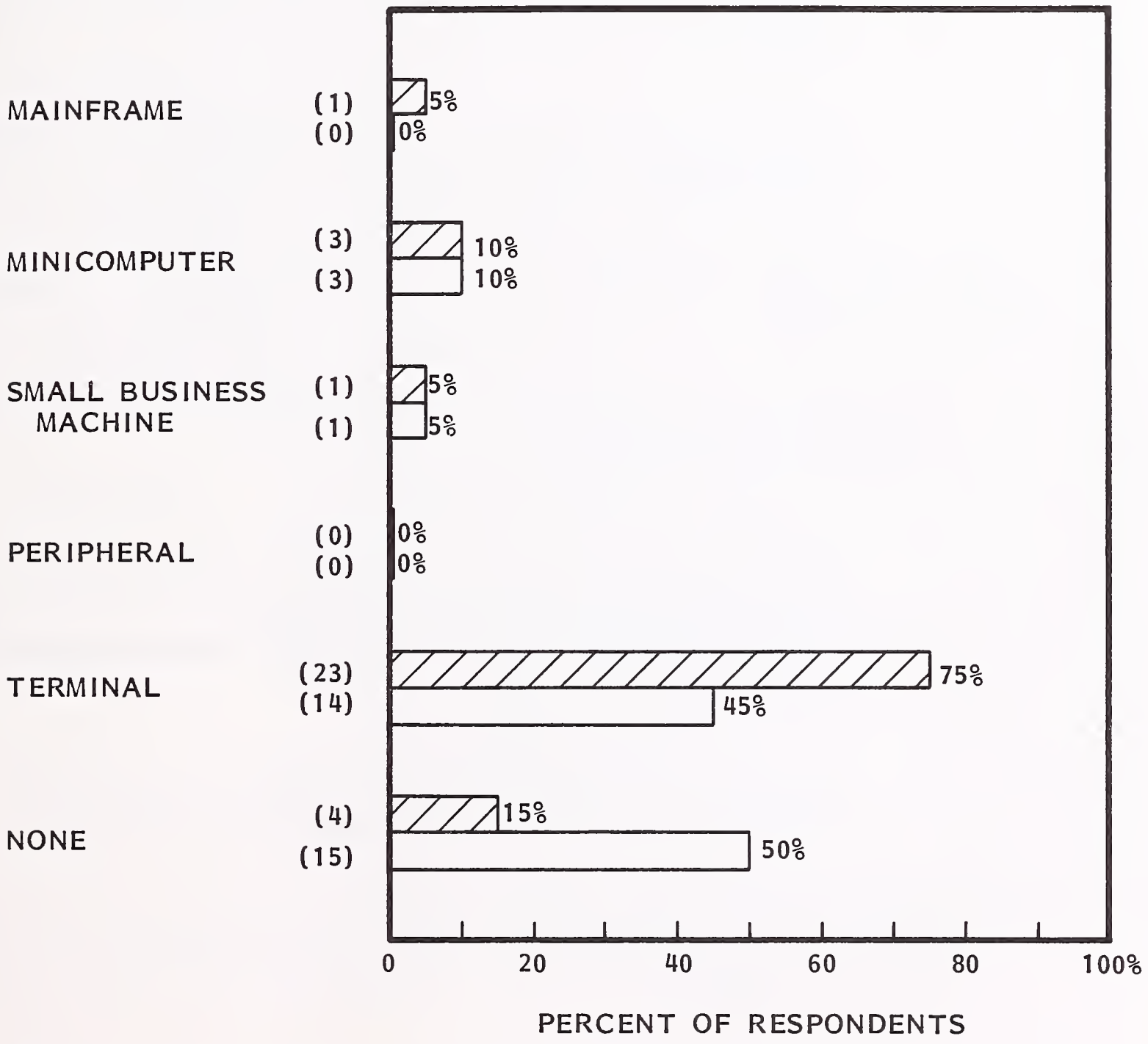
B. USER INSTALLATION

- User capability and willingness to install equipment varied greatly by machine type. While 67% of all respondent users currently performed some installation, 80% of these installed terminals only, as shown in Exhibit III-1. This exhibit also distinguishes installing activity between central and remote sites.

  - Of those not currently installing equipment, 20% indicated that they would consider doing so in the future. The sum of those currently and those potentially installing equipment indicates that 73% of the respondent users are willing to be involved.

EXHIBIT III-1

USERS CURRENTLY PERFORMING INSTALLATION, BY MACHINE TYPE



NUMBER OF RESPONSES = 30

- This is considerably greater than the number of responses given two years ago to the same questions for the report "Maintenance Requirements in the Information Processing Industry, 1978-1983."

  . At that time, only 26% of users surveyed were installing equipment. Virtually all of these were limited to terminals or modems.

  . Only 14% more indicated that they would be willing to do so in the future.

  . The number of users installing equipment in 1980 far exceeds the levels projected by users two years ago.

- Exhibit III-2 shows what respondent users feel they currently have the capability to install.

  - Terminals were the most prominently installable item. Users cited a number of reasons for this:

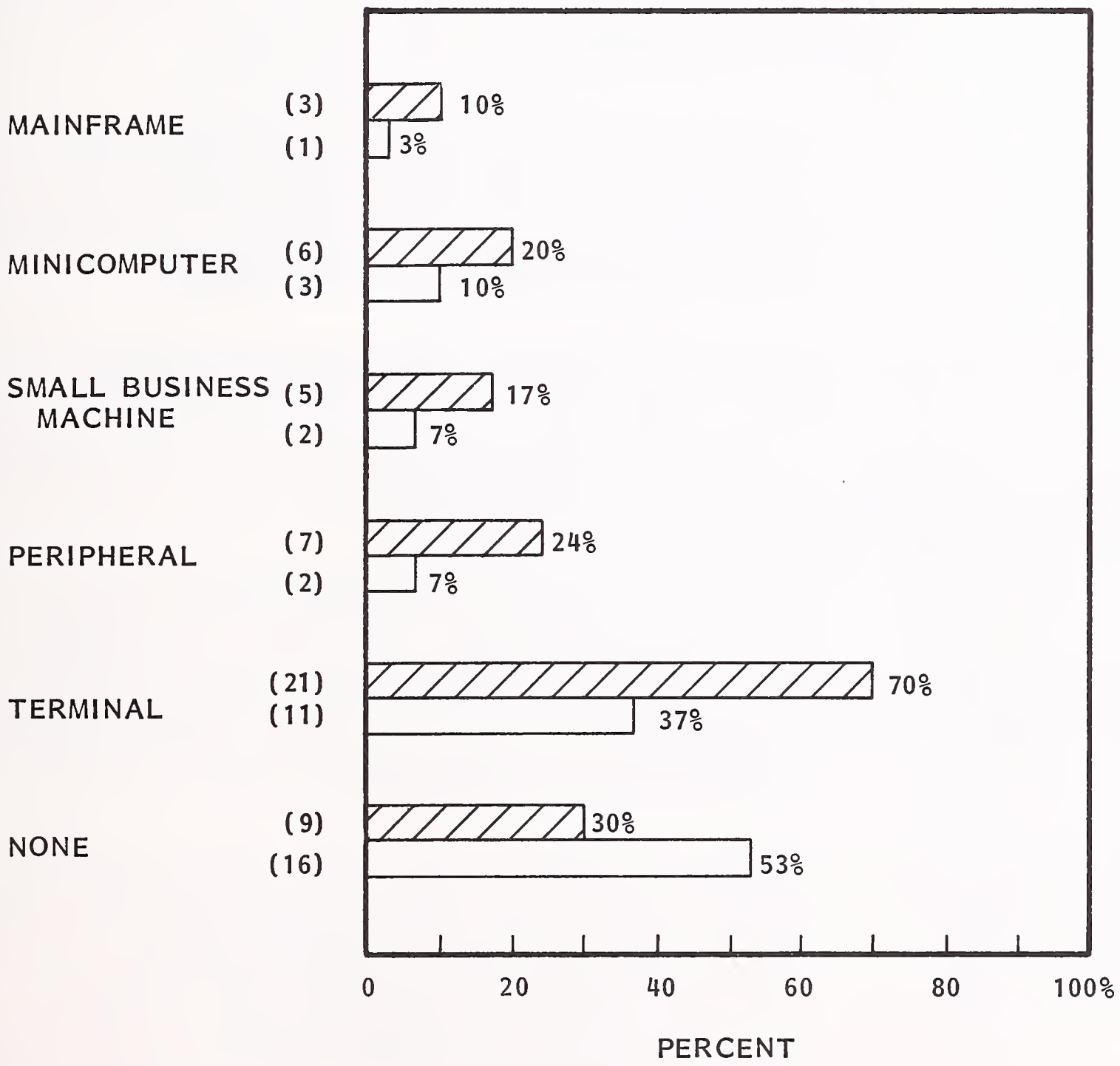
    . Terminals are the most common, simplest and most self-contained unit in the installation. When terminals are self-installed, the user can move them around at will instead of making appointments with the vendor.

    . Some terminals are designed and marketed for self-installation. Users stated that the self-install design was very important.

  - Users were much more willing to install machines designed for installation by a low-skills person than machines that were meant to be installed by the vendor.

EXHIBIT III-2

PERCEIVED USER INSTALLATION CAPABILITIES, BY MACHINE TYPE



▨ = CENTRAL SITE

□ = REMOTE SITE

NUMBER OF RESPONSES = 30

  - Users did not want to replace the vendor in a job meant for an FE, but were willing to install equipment meant to be user-installed.

- In all, 94% of terminals currently being user-installed were designed and marketed in this way.

- When asked about more complex machines, users felt that they had less capability to install them.

  - Exhibit III-2 shows user capabilities to install equipment currently available. Users stated, however, that should the next generation of new offerings be designed for self-installation, their perceived capability would be much higher.

  - Exhibit III-1 and III-2 are closely parallel in the response profile shown, leading again to the conclusion that users will install equipment only when they feel that they have the capability to do so.

  - Users felt they did not have personnel with skills equal to those of a vendor's field engineer. When equipment was designed for vendor installation, users assumed that it required skills equal to the vendor's. Users did not want to step in and perform what they perceived as a vendor activity.

  - Users responding that they could install more complex equipment generally had personnel in-house already involved in maintenance. These were typically large, multivendor installations requiring a pseudo-field engineer in-house to determine the faulty unit and select which vendor to call. Such users indicated that they were glad to save some money and keep these people busy.

- Users were concerned with technical and legal problems associated with self-installation.

  - Users were very worried about what would happen if they should damage the equipment during installation. A vendor's policy on liability was very important. As one user stated, "What if I drop the damn thing and break it, who is responsible?"

  - Users were wary of assuming any responsibility that might become more trouble to them than it was worth. As one user put it, "If it is designed for user-install and we have the people available, then it is great to save the money." The implication was that if installation was a problem, or if the people were not available, or the net savings was not enough, involvement was simply not worth it.

- Users not interested in installing any type of equipment cited a number of factors:

  - Many felt that the cost savings was not great enough to warrant getting involved. These felt that they did not need any other duties to keep themselves busy.

  - Often users did not have the in-house personnel capable or available to do this. Users as well as vendors have tried to keep costs down by minimizing the number of persons required.

  - Users with unions in their data processing facility felt that the potential problems were not worth the risk. Such respondents indicated that there was little flexibility within the union and anticipated added costs if new duties were added to a job description. Two users in the sample (7%) currently had unions to deal with.

  - Some typical negative comments were:

- "We do not want to hire people that have these capabilities."

- "If there were problems during installation, I am afraid finger-pointing would be a problem."

- "We would not install leased or rented equipment. If the vendor still owns the equipment, we would not accept the liability for installation."

- "I do not have the people with the sophistication and technical skill on my staff to do this. The cost to train them would be too much."

- "I could not trust my people to do this right."

- Users could not consistently quantify what cost savings were currently received from self-maintenance. Responses such as "significant" and "enough to justify the time" were common.

- Users felt some free installation support should be provided by the vendor.

  - Of those currently installing equipment, 75% receive some free support when they have problems.

    - Of those getting free support, 73% receive help on-site while 27% receive it on the phone only.

  - The remaining 25% of users now installing equipment had to get support at the current time-and-materials rate charged by the vendor.

  - Users felt that the vendor should, at minimum, provide free phone support. Since users were receiving a price discount for self-installation, they did not generally demand free on-site support; however, when vendors were willing to give it, users were pleased to use it.

C. USER FAULT DIAGNOSIS

1. LOCAL IN-HOUSE DIAGNOSTICS

- A large number of users were running or were willing to run some local diagnostic routines before calling the vendor for on-site support.

  - Fifty-seven percent of respondent users claimed that they ran some sort of diagnostic routines on their equipment prior to calling the vendor.

    . This compares to only 24% doing so two years ago, as reported in the study "Maintenance Requirements for the Information Processing Industry, 1978-1983."

  - An additional 30% of respondents felt that they were capable of and willing to run simple diagnostic routines on their equipment in the future.

    . This compares with 64% of respondents capable and willing two years ago.

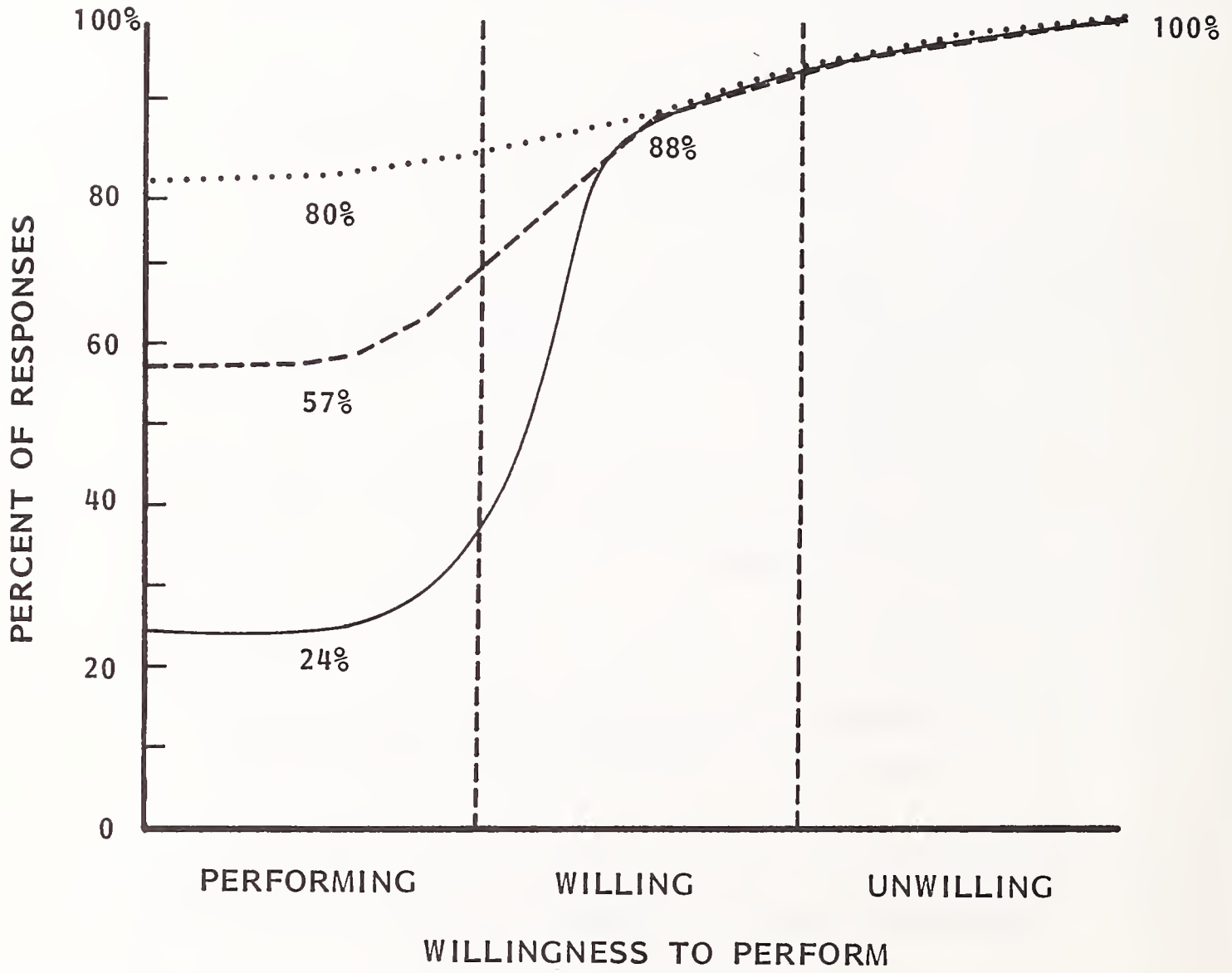
  - Exhibit III-3 compares the number of users performing, willing and unwilling to run precall diagnostics over the period 1978-1980, and those stating that they would be willing by 1982.

- The number of users opposed to running diagnostics has not changed significantly over the period. Twelve percent of users remain inflexibly opposed to this.

- The rising number of users involved in precall diagnosis comes from those surveyed as willing in the previous year. Thus the number actuallly performing continues to rise, but the total of current plus willing remains fixed.

EXHIBIT III-3

USER WILLINGNESS TO PERFORM PRECALL-ISOLATION DIAGNOSTICS BEFORE CALLING VENDOR, 1978-1982



——— = 1978
– – – = 1980
····· = 1982

- These in-house diagnostic routines, though useful in general fault isolation, were not the same or equivalent to diagnostics run by an on-site field engineer. Routines could typically isolate the faulty unit and the general type of problem only.

  - Such diagnostics did not replace the on-site FE for specific fault identification.

  - Diagnostics were typically run through mainframes or minicomputers only.

  - Such routines were functionally precall-isolation diagnostics only.

- Respondent users generally did not have skilled maintenance personnel available to run these diagnostics. As seen in Exhibit III-4, only two users had engineers dedicated to installing and diagnosing equipment.

  - By far the largest number of users had the console operator running the diagnostic routines.

  - Users indicated that training provided to those executing the local diagnostics was minimal. Exhibit III-5 shows what methods vendors employed to educate the user.

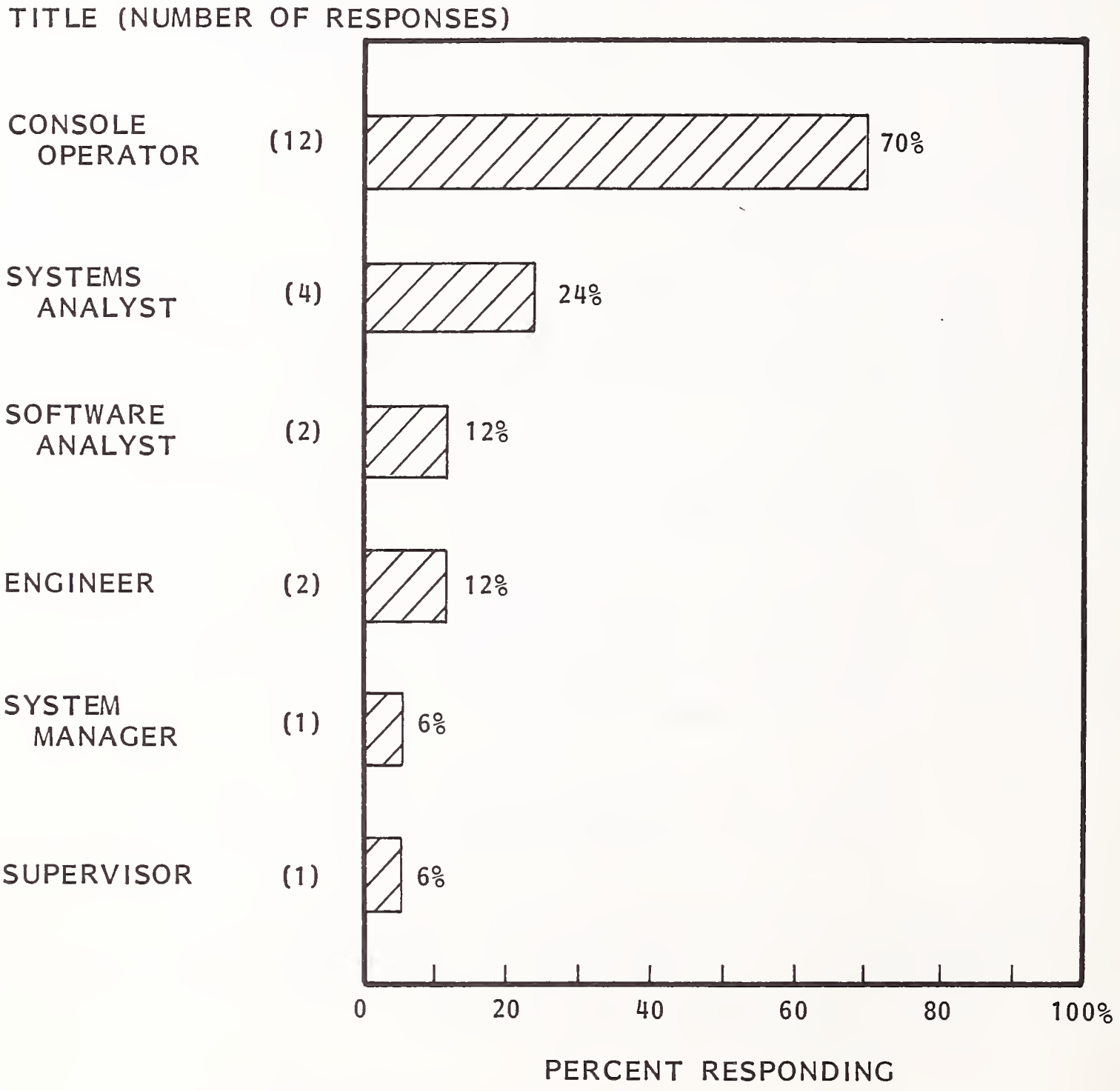
  - Though vendors provided minimal training, 100% of respondent users stated that it was satisfactory to run the local diagnostics successfully.

- Though users were generally willing and able to run precall-isolation diagnostics, they did not feel that they had the capability to run and understand these fault isolation routines.

  - Lack of skilled, trained personnel was the key factor. Users felt that their operators and systems analysts were not sophisticated enough to replace on-site FEs.

EXHIBIT III-4

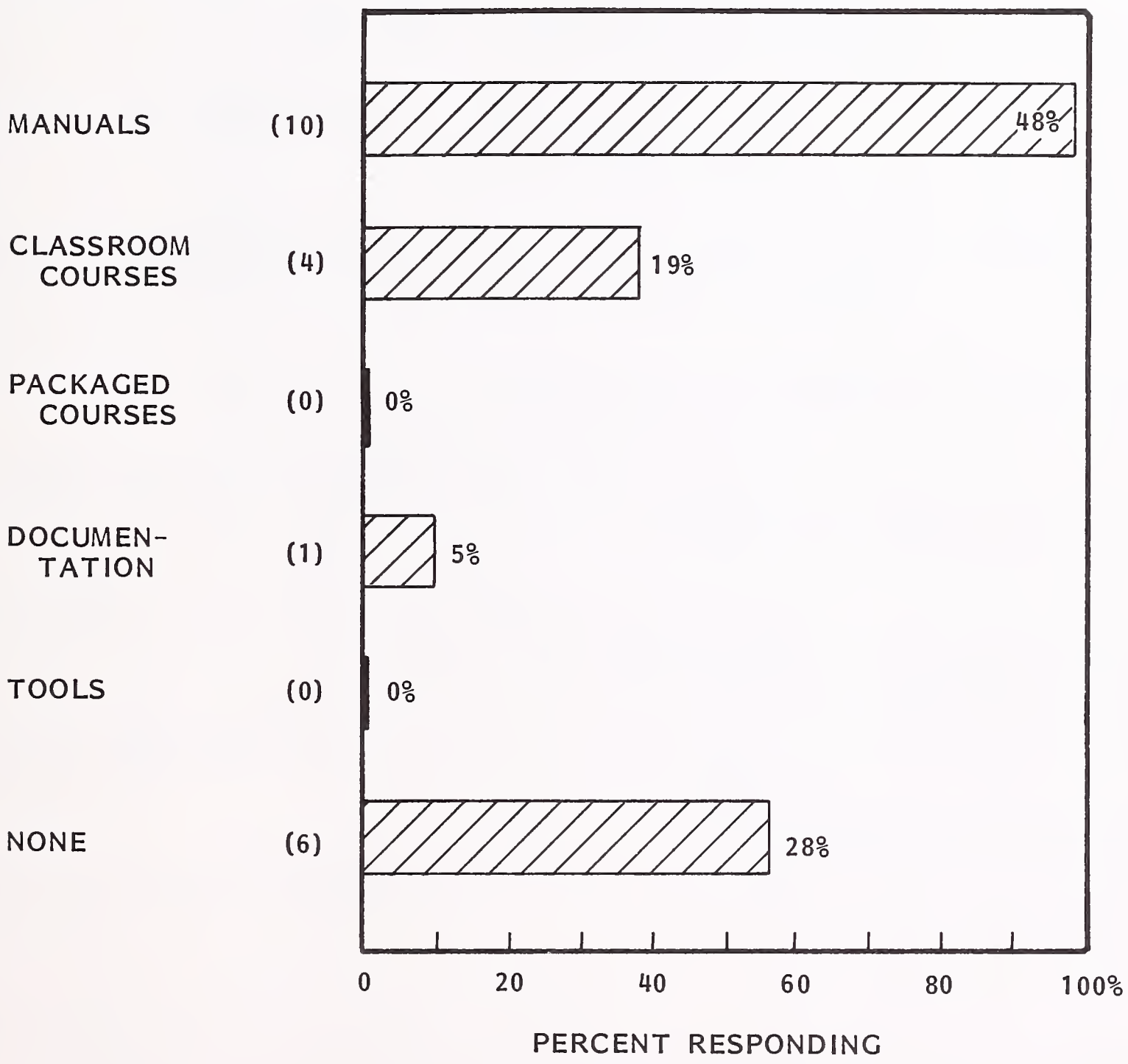
INDIVIDUALS RUNNING IN-HOUSE DIAGNOSTICS, BY TITLE



NUMBER OF RESPONSES = 17

EXHIBIT III-5

TRAINING PROVIDED TO USERS FOR PERFORMANCE
OF LOCAL DIAGNOSTICS



TOTAL RESPONSES = 21

- Users anticipated problems running the diagnostics properly and understanding what they meant.

- Users had little confidence that they would relay information gathered from a local diagnostic to a remote FE in a usable form.

- Users did not feel that training by the vendor would overcome these problems. They felt that the skill level of those available to run diagnostic routines was too low to begin with.

  . Users felt that turnover in people trained to run diagnostics would endanger their operation.

- Users had little confidence in the quality or dependability of software diagnostics currently available to them.

- Some user comments included:

  . "We don't have the people who could trouble-shoot problems such as these."

  . "We could use them (diagnostics) only if they were very straightforward and simple to operate."

  . "I would rather leave such tasks in the hands of the professionals [vendors]."

  . "Diagnostics are not reliable enough to determine problems specifically."

  . "Diagnostics available to users now are of poor quality. If we were to use them, they would have to be much better."

2. REMOTE DIAGNOSTICS

- Users were generally familiar with remote diagnostics. Sixty-seven percent of respondent users stated that they had such capability from some vendor.

  - Exhibit III-6 shows on what types of equipment users currently have remote diagnostics available.

  - Users indicated that though vendors had remote diagnostic capabilities, they did not always use them. Twenty-seven percent of users stated vendors never used this capability.

  - Users were in agreement that remote diagnostics were a positive factor in improving maintenance quality. Only 10% of users disagreed with this.

  - Eighty-five percent of respondents stated that remote diagnostics were operated only after an FE had arrived on-site.

  - Only 20% of users felt there was any security problem with remote access to their equipment.

- Both users with remote diagnostic capability and those without were asked if they thought remote diagnostics could replace an on-site FE for fault isolation.

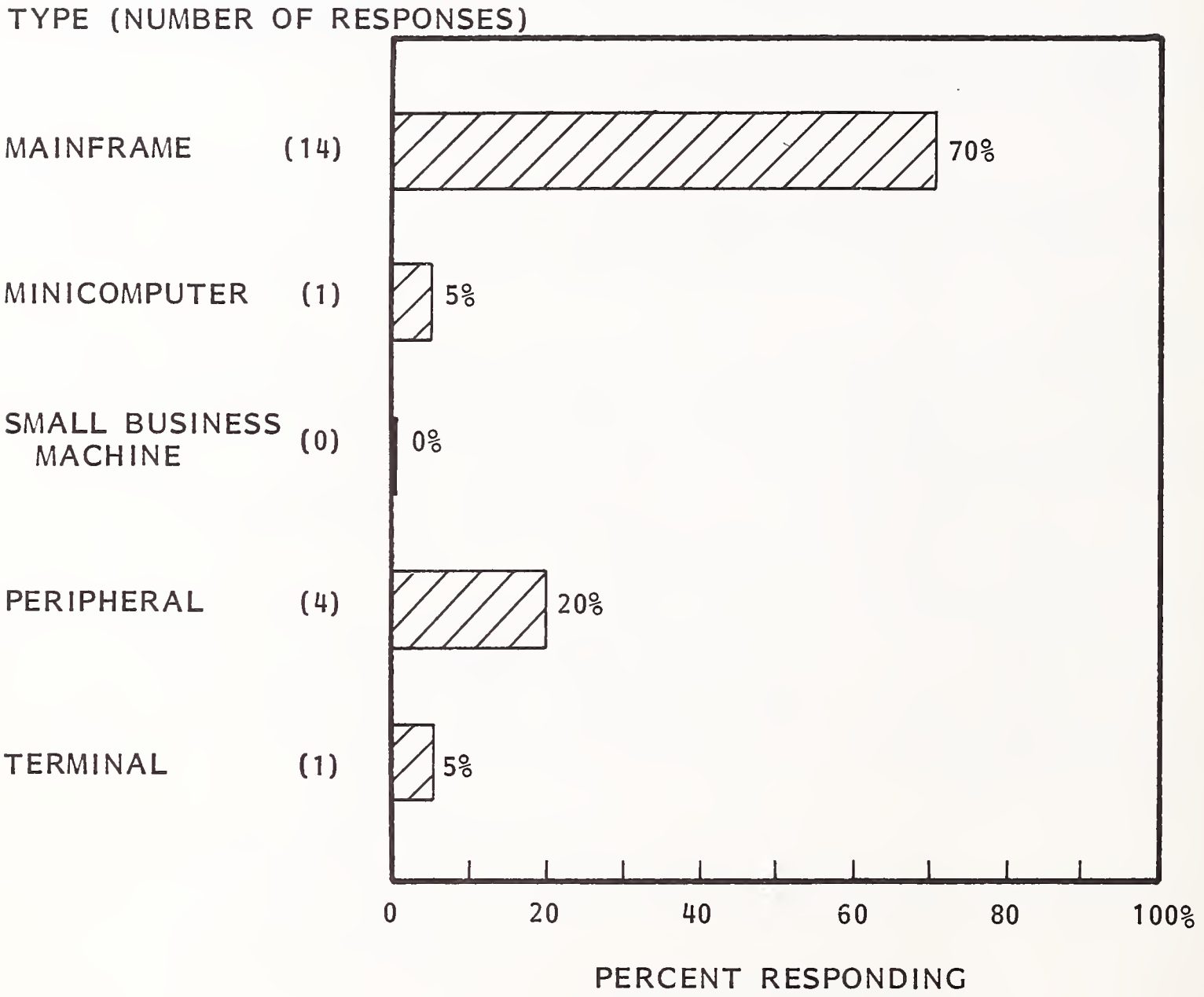
  - Twenty-nine percent of users felt that remote diagnostics could replace an on-site FE.

  - Twenty-eight percent were unsure.

  - Forty-three percent felt remote diagnostics could not currently replace an on-site FE.

EXHIBIT III-6

REMOTE DIAGNOSTIC USAGE BY USERS INTERVIEWED



TOTAL RESPONSES = 20

- User uncertainty with relying on remote diagnostics for fault isolation lay in a number of factors.

  - Many users had bad experiences with past attempts to isolate problems remotely.

  - As with local diagnostics, users did not think the routines were dependable enough to rely upon them fully.

  - Users were unclear exactly what a remote diagnostic could potentially do. Though the vendor might promise great things, the user wants it to be shown to be as good as an on-site FE first.

  - Users wanted to see the diagnostics in action under noncritical conditions before they would endorse them. Users were wary of vendors trying out a new technique on their installations.

- However, users also saw advantages to remote isolation identification.

  - Users felt that they would get a faster repair if the remote diagnostic was effective. They felt that someone would get to work immediately, not two hours after placing the call.

  - Users felt that they were less at the mercy of a slow or untrained FE with remote diagnostics. They felt that the margin for incompetence was minimized if the exact problem had been identified before the FE was summoned.

  - Respondents felt that with remote diagnostics, the vendor was still repairing the machine, not the user. They did not perceive working diagnostic routines and executing instructions as taking over maintenance.

- Some user comments included:

- "If the remote diagnostics get that good, then we would substitute them for an on-site FE."

- "Remote diagnostics don't seem to me to be that good."

- "With our 4331, we call the system support center, which can usually diagnose the problem remotely. This speeds repair when the FE knows what problem to fix."

- "I feel more comfortable with an FE on-site."

- "We have a very sophisticated DDP system. Identifying what part of the system is faulty is hard enough, isolating the fault is even harder. Any remote diagnostics would only help."

D. USER MAINTENANCE

1. UNIT REPAIR

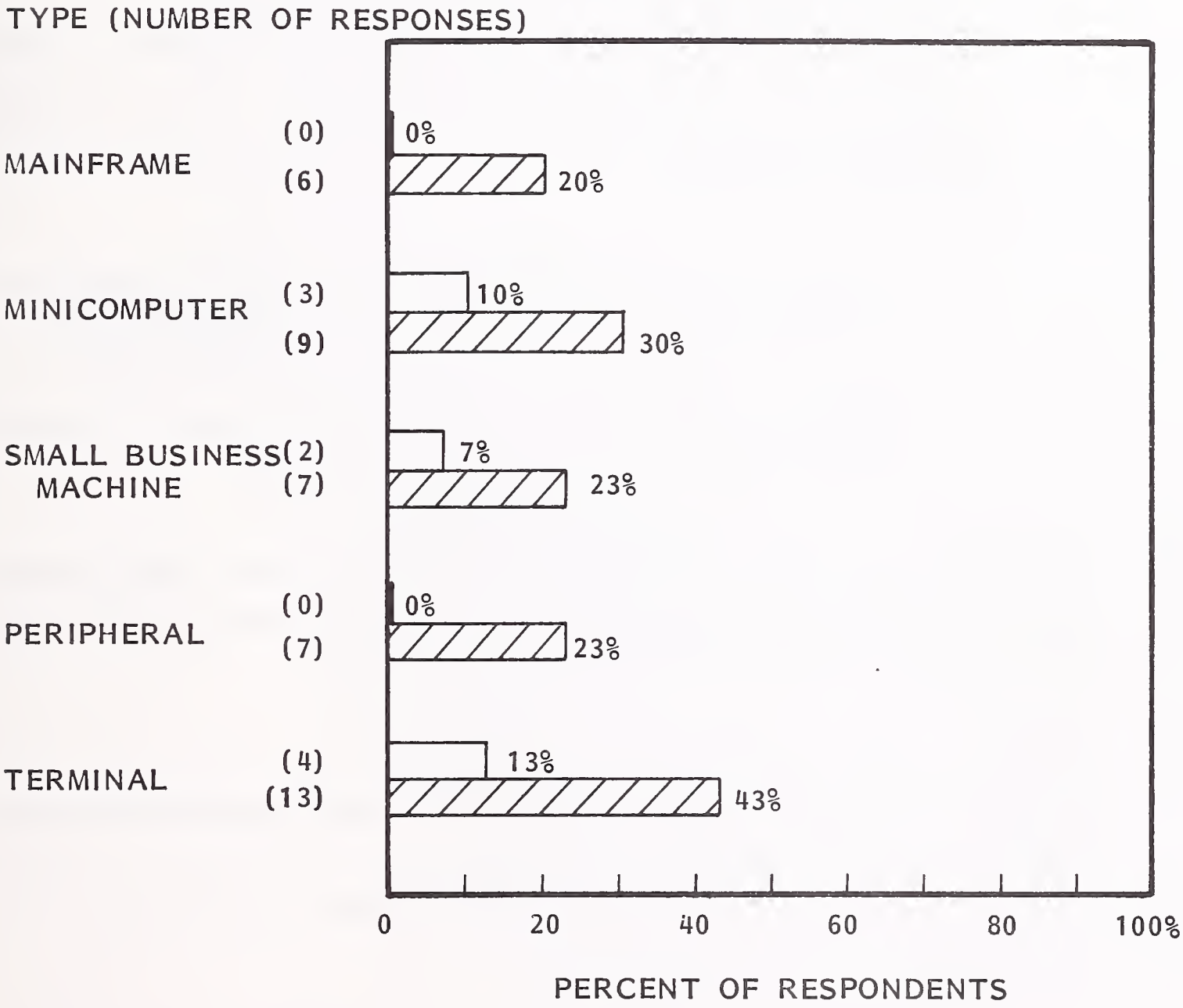
- Users were not currently heavily involved in maintaining any of their own equipment.

  - Twenty percent of respondent users were currently involved in actual machine maintenance. Types of machines serviced by this twenty percent are shown in Exhibit III-7.

    . This compares with only 9% maintaining some equipment two years ago, as documented in the report "Maintenance Requirements for the Information Processing Industry, 1978-1983."

EXHIBIT III-7

EQUIPMENT TYPES BEING MAINTAINED BY RESPONDING USERS AND PERCEIVED CAPABILITY TO MAINTAIN IN THE FUTURE



□ = CURRENT

▨ = FUTURE CAPABILITY

NUMBER OF RESPONSES = 30

- An additional 35% of users were willing to consider becoming involved in maintenance. The types of machines considered are also shown in Exhibit III-7.

  . This compares with only 20% willing to consider maintaining some equipment two years ago.

- Those currently performing maintenance plus those willing to consider it accounted for 46% of all user respondents. This is far above expectations expressed two years ago, in which a total of only 29% expressed any interest.

  . Users unsure of their willingness and capability generally answered negatively to the questions rather than positively.

  . With more effort, vendors could certainly convince more users to become involved by building their confidence.

- Users currently involved in maintenance were highly skilled. They stated that they could perform most functions of an on-site FE, as shown in Exhibit III-8. Users willing to become involved showed similar skills.

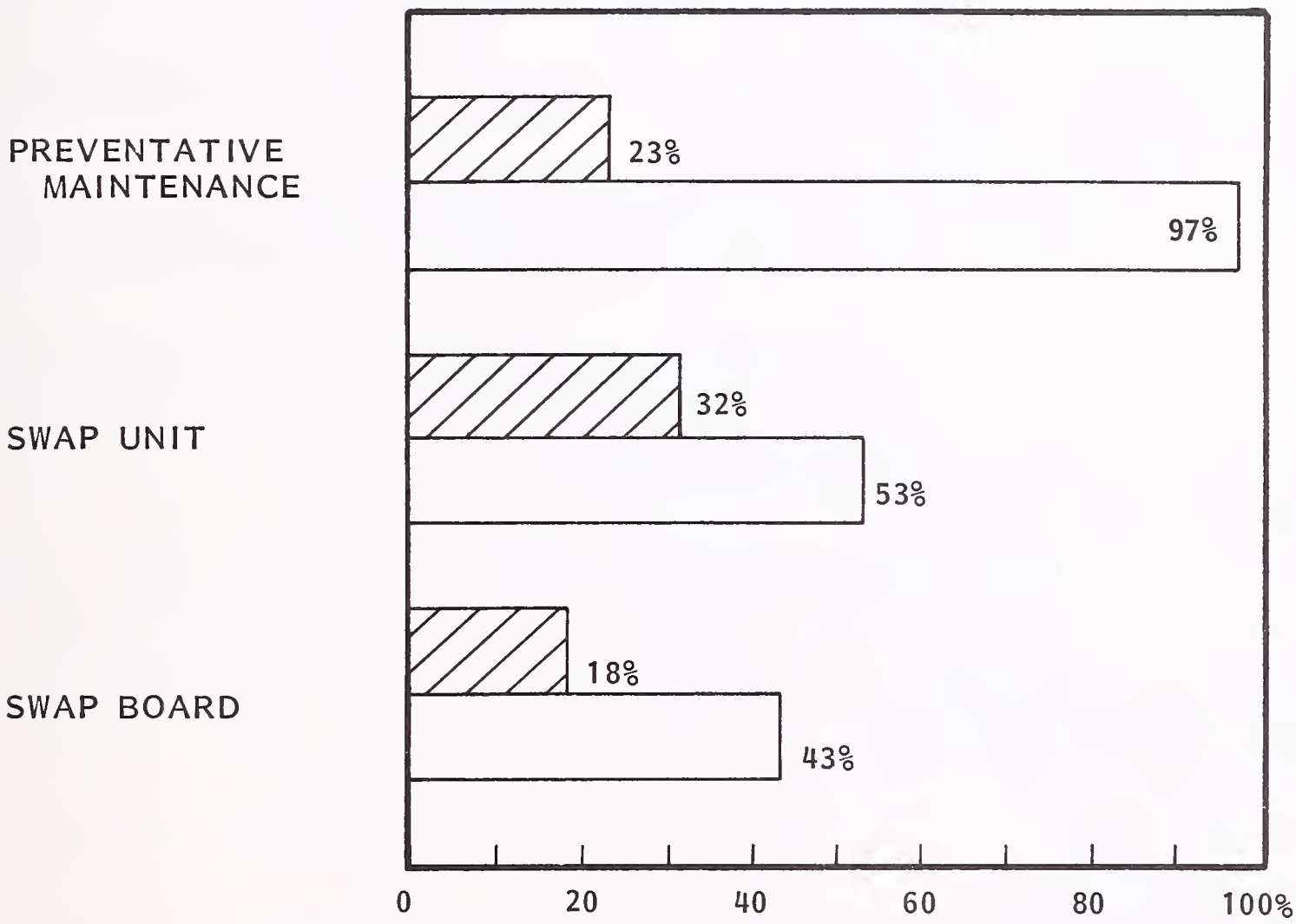
- Users were asked specifically how willing they would be to swap a faulty CPU board if the vendor could identify it remotely. Overall response was generally positive, with 48% being highly willing, 32% somewhat willing, and only 20% completely unwilling. Users perceived both advantages and problems.

  - Problems were not unique or new. They centered around claims of inadequate workforce,fear of liability for damage to the machine, lack of training and need for quick on-site support when needed. Comments included:

    . "Even the vendor's FE sometimes damages the CPU when repairing it; what would happen if we did also?"

EXHIBIT III-8

DUTIES PERFORMED BY RESPONDENT USERS IN EQUIPMENT MAINTENANCE



▨ = CURRENTLY PERFORMING

□ = TOTAL CAPABILITY, CURRENT AND WILLING

- "It would be fine as long as we are not liable if something goes wrong."

- "Getting personnel qualified to do this would be a problem. Our shop is unionized and working it out with the union would be a pain."

- "We prefer to maintain equipment ourselves, except we need more training."

- "It would be difficult piggybacking new jobs on the operators because of the union. The union would call it out of the operator's area and probably force us to hire someone else."

- "We would do it as long as on-site support was readily available should we have problems. We have the people who can do it."

- "I would swap boards with the understanding that if the machine was not up in a given time (one-half to one hour), then I would get free on-site support."

- Users also perceived some important advantages. Speed of response and repair were key factors. Potential cost savings was cited as an advantage but not a reason in itself to become involved. Some comments:

  - "If it would get the machine up faster, I certainly would do it."

  - "When it becomes simpler, I will be calling to participate. It would increase our uptime."

  - "It would be especially desirable during off-hours."

  - "We would do anything to get the system up faster."

- Users currently performing some of their own maintenance received widely varying amounts of training from the vendor, as shown in Exhibit III-9.

  - One hundred percent of current participants felt that the amount of training received was adequate.

  - Most users would like to have as much training as possible. Users showed a preference for in-person training and careful documentation.

  - Users indicated that they would use as much training as the vendor provided. Though all current participants stated that training had been adequate, most indicated that they would use more it if were offered.

- Users indicating willingness to repair did not want to start with the mainframe. Users wanted to work their way up in machine complexity as their experience grew. Users preferred not to take risks with the mainframe immediately.

2. USER ON-SITE SPARE PARTS

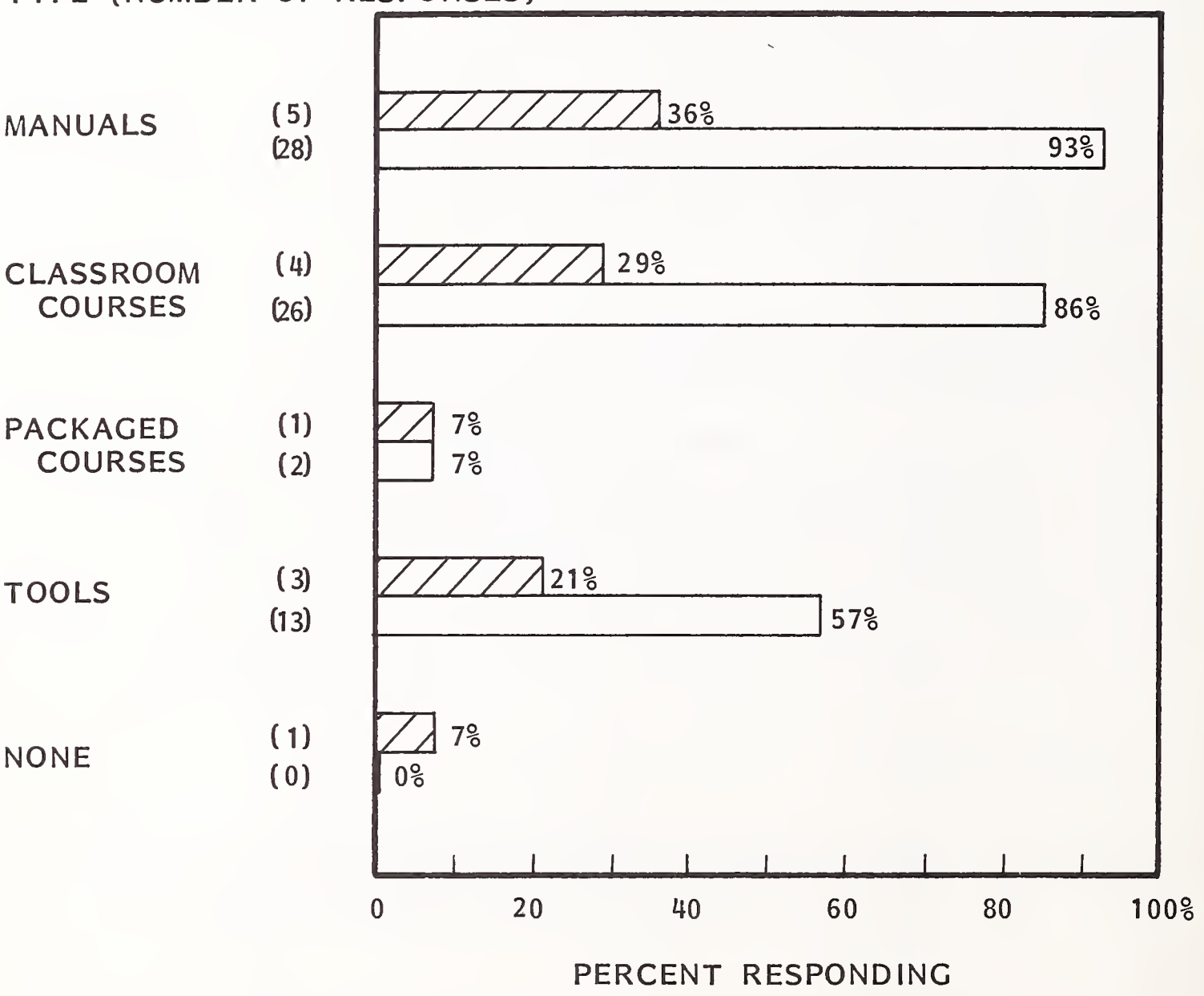
- Respondent users showed only moderate interest in paying for on-site spare parts. When asked to rate their willingness to store spares, 17% indicated high willingness, 33% medium willingness and 50% low willingness.

  - Users indicated that they were willing to stock spares worth 5-25% of initial equipment costs. The average amount was 9% and the mean was 7.5%.

  - Users with very old machines (IBM 1401, Xerox Sigma VII) felt that they had to store parts to ensure availability. These usually had already done so.

EXHIBIT III-9

USER TRAINING REQUIREMENTS TO REPAIR EQUIPMENT



▨ = TRAINING CURRENTLY RECEIVED (14 RESPONSES)

□ = TRAINING DESIRED (30 RESPONSES)

- Users whose downtime was critical felt parts storage was justified when vendor performance was inadequate. This was particularly true of on-line systems.

- Users recognized the cost implications of parts storage. Most users looked upon such a move as strictly a business decision.

  - Users would prefer that the vendor store parts on-site without charge. Users showed great willingness to assume liability for these parts if the vendor would store them: 71% indicated that they would accept liability, 21% that they would consider it, while only 8% outright refused.

  - The second best option from a user viewpoint was having the vendor bring spares on-site as needed. Users indicated that they would consider storing and paying for some critical parts in addition to this arrangement.

  - Though moderately willing to store parts, users had some reservations.

    . Overall cost was of paramount concern.

      - "We are too small a shop to justify much in parts investment."

      - "Storing equipment in all of the remote locations would cost too much money."

      - "We could afford spares if we saved enough on our maintenance contract."

    . Budgetary matters were also of concern. As one user put it, "Maintenance is pure operational cost in the current budget, but parts would be capital expenditure. It is relatively easy to get

increases to cover operational expenses, but hard to get increases in the capital expenditure budget. Convincing management that parts are an operational expense would be difficult."

- Users of leased or rented equipment were not enthusiastic about storing parts.

  - These felt that they paid more in a lease arrangement and the vendor should at least supply the parts.

  - Users did not feel that they should have to buy parts for a machine that they did not own.

3. DEPOT REPAIR

- Users were not pleased with the prospect of using depots to repair parts, especially large modules or units.

  - Only 12% of respondent users indicated a high willingness to use a depot, while 36% were moderately willing and 52% were unwilling.

  - Users felt that if they paid for spare parts, depot maintenance was too slow and required too large an investment.

    . "We currently find that to cover the three- to four-week delay in depot repair, we need one full terminal extra for each ten installed."

    . "We have a 10% parts investment sitting around waiting for a breakdown. It seems like a waste."

- Depot repair was fine for certain parts but not for all. Users felt that for critical or very expensive parts they must have some option with a faster turnaround than the depot.

- Users wanted a choice in how they had their parts repaired. They wanted to decide criticality and cost justifications themselves, not have the vendor dictate. Users felt a series of repair options should be available offering different turnaround times at different prices.

E. THE IBM MODEL 3101 TERMINAL

- Introduced in mid-1979, the 3101 terminal was IBM's first venture into a user-installed, diagnosed and depot-repaired product.

  - IBM used innovative selling techniques, including:

    . Newspaper advertising that suggested that the buyer call a national marketing center.

    . Fifteen-day free trial on the first IBM 3101 display terminal and 3102 thermal printer.

    . Quantity discounts for 25 or more units.

    . Purchase prices of from $1295 to $1520 for the 3101 and $1295 for the printer.

  - With the 3101, the customer is responsible for:

    . Adequate site preparation.

    . Obtaining cable.

    . Receiving, unpacking and placing the unit.

    . Setup and checkout.

. Fuse replacement.

. Determination of the required number of spares (with a recommendation from IBM).

. Performing problem analysis and resolution.

. Returning the failing workstation element to the repair center with a completed repair authorization form.

- Users were asked their general opinion of such an offering.

  - Some were positive:

    . "Our experience with user-installed terminals has been good - no complaints."

    . "Purchase price is the key. At this price, it is a very good buy. The promised reliability makes the self-maintenance factor less important."

    . "Price is the main factor. I would prefer this purchase plan with on-site support. At least I know quick on-site support is available if I need it."

    . "Desirability of this offering depends completely on equipment reliability."

  - Others were negative:

    . "This is fine for central site, but remotes don't have the people."

    . "We would have to hire someone to repair these - everyone is too busy."

- "Fixing equipment is a skilled job, I wouldn't trust my staff to do it."

- "I really don't care for it. I don't pay my people to repair equipment - to use them as such would be expensive."

- "We don't have the people or time to do this. IBM has conned management with the low purchase price, but concealed the hidden costs of self-maintenance. These costs appear in my budget."

- "Nausea - I'd rather buy cheap terminals at half the price and throw them out when they break."

- Exhibit III-10 indicates the acceptance of the self-maintenance characteristics involved with the 3101.

  - Self-ordering by phone was not highly touted. Users very much like the personal touch (and time) of a salesperson.

    - "We like dealing with the salesmen."

    - "Salesmen can be very beneficial in selecting equipment."

    - "This is fine for small equipment as long as there is adequate documentation available."

    - "I want one person in charge of my account so I have someone to go to with problems."

    - "I'd rather buy cheap terminals and throw them away as they break. At least the salesman would buy me a cup of coffee for my efforts."

EXHIBIT III-10

USER RATINGS OF SELF-MAINTENANCE CHARACTERISTICS OF THE IBM 3101 TERMINAL

CHARACTERISTIC	USER RATING		
	HIGH	MEDIUM	LOW
SELF-ORDERING BY PHONE	27%	31%	42%
SELF-INSTALLATION	52	28	20
SELF-DIAGNOSTICS	46	38	16
DEPOT REPAIR	12	36	52
PRICE/PERFORMANCE	70	30	0
OVERALL	41%	32%	27%

NUMBER OF RESPONSES = 30

- Self-installation received high acceptability ratings. Users generally had both the skills and time to install this type of unit.

  . "If we have the people available, great."

  . "We have the people, so it's great to save the money."

  . "If it's as easy as they say, great."

  . "We can use equipment much more flexibly if we can install and de-install ourselves."

  . "My only concern is if we break it, who is responsible?"

- Self-diagnostics also received high acceptability. Users in general saw little difficulty running the diagnostics as designed for this machine.

  . "As long as it is very simple, it would be fine."

  . "It would depend on the availability of trained personnel."

  . "If we have the people available, it would speed repair. I would expect to get better equipment to begin with anyway."

  . "As long as parts are available, I don't mind at all."

- Depot repair was strongly disliked by respondents. Users had a whole host of complaints.

  . "It is very inconvenient; I hate the hassle."

  . "Two to four weeks is too long to get parts back."

  . "It depends on what spares cost."

- "Fine, as long as the vendor supplies the spares."

- "If they would issue us spares, it would be much more attractive."

- "We have had terrible problems with units being damaged in transit. I would avoid this when possible."

- "Bad idea - it means that you need spares and spares cost money. I can't afford to have a spare in every branch office, we have too many."

- "Hate it. You have to store cartons, coordinate with shipping, paperwork to track it, etc. I want someone to pick it up, this is a buying factor."

- Price-performance was undoubtedly the key driving force behind the product. Users felt that they had to look carefully at such pricing. There were some concerns, however.

  - "We are concerned about the long-term parts' cost. Would it ruin the great initial purchase price?

  - "The purchase price is great, but the manpower is not figured in."

  - "The price makes depot repair and self-maintenance worth it. We would have to pay three times more for on-site support than we pay for depot only."

- Overall acceptance of the 3101 was very high. As a package, the positive factors significantly outweighed the problems in the user's mind. All users had reservations about certain aspects, but overall attractiveness overcame them. The fact that it was user-installed and diagnosed did not spook users.

- Forty-four percent of respondent users saw the concept of self-maintenance and price/performance spreading to more complex equipment.

  - Equipment complexity was the foremost reason for discouragement among users. A four-module terminal was easily sent for repair, but not a mainframe.

    . "We will go full self-maintenance when the equipment becomes cheap enough to store the parts. When the CPU is down to ten to 14 modules, then it will make sense. Right now, the things are just too complex."

  - Users did not feel that they had the skill or training to get involved with complex equipment. Users did not want to be pushed into something that they were not ready for.

    . "Vendors want to push users up to CPU repair right now. I want some experience on terminals and other non-critical equipment first. CPUs are not yet simple or reliable enough for user repair. Potentially, this is a very attractive idea."

    . "The use of microprocessors will make diagnosing any problem simple. By the time they are used for diagnostics in more complex equipment, I will be ready."

    . "Diagnostics are not yet good enough and spares are too expensive to expand this idea to other equipment at present."

- The main user's complaint, however, was with the currently available equipment itself. On the basis of current experience with MTBF, repair problems, and general complexity, users stated in effect that they could not repair them because they did not have an in-house FE. As demonstrated with the 3101 terminal, users are more willing to be involved with simpler, more reliable equipment.

  . "We would have to add the equivalent of an in-house FE if we were to service more complex equipment."

  . "We would have to employ highly technical people and this costs too much."

  . "Costs of training people to the level required would be too great."

  . "With the repair problems FEs currently have on our equipment, I can't see us going to self-maintenance.

F. GENERAL USER COMMENTS

- Users indicated that they could not be sold on self-maintenance just because of vendors' problems.

  - Sixty-eight percent of respondent users stated that they were not sympathetic to the vendor's labor problems. Users were not willing to assume responsibilities on current equipment to help aid the vendor.

    . "More reliable equipment would solve their staff shortages."

    . "Better diagnostics would relieve the burden on existing staff."

  - . "We know the vendor's problem, but it is unfair to penalize the user."

  - . "Vendors are just using staff problems as an excuse to get out of the headache of maintenance. I don't buy it."

  - . "I will accept user maintenance to get better MTTR and efficiency, but I will not be pushed into it simply because the vendor can't get enough people to service me on-site."

  - . "It is a blatent attempt by the vendor to cut their costs at the user's expense. I don't like it at all."

- Seventy-two percent of respondent users stated that they were not sympathetic to the vendor's problem of rising costs. Users were familiar with problems of inflation.

  - . "We all pass along rising costs, why should I be sympathetic to the vendor?"

  - . "I am not sympathetic to shifting the cost burden to the user."

  - . "There are other ways to handle this - more reliable equipment would help."

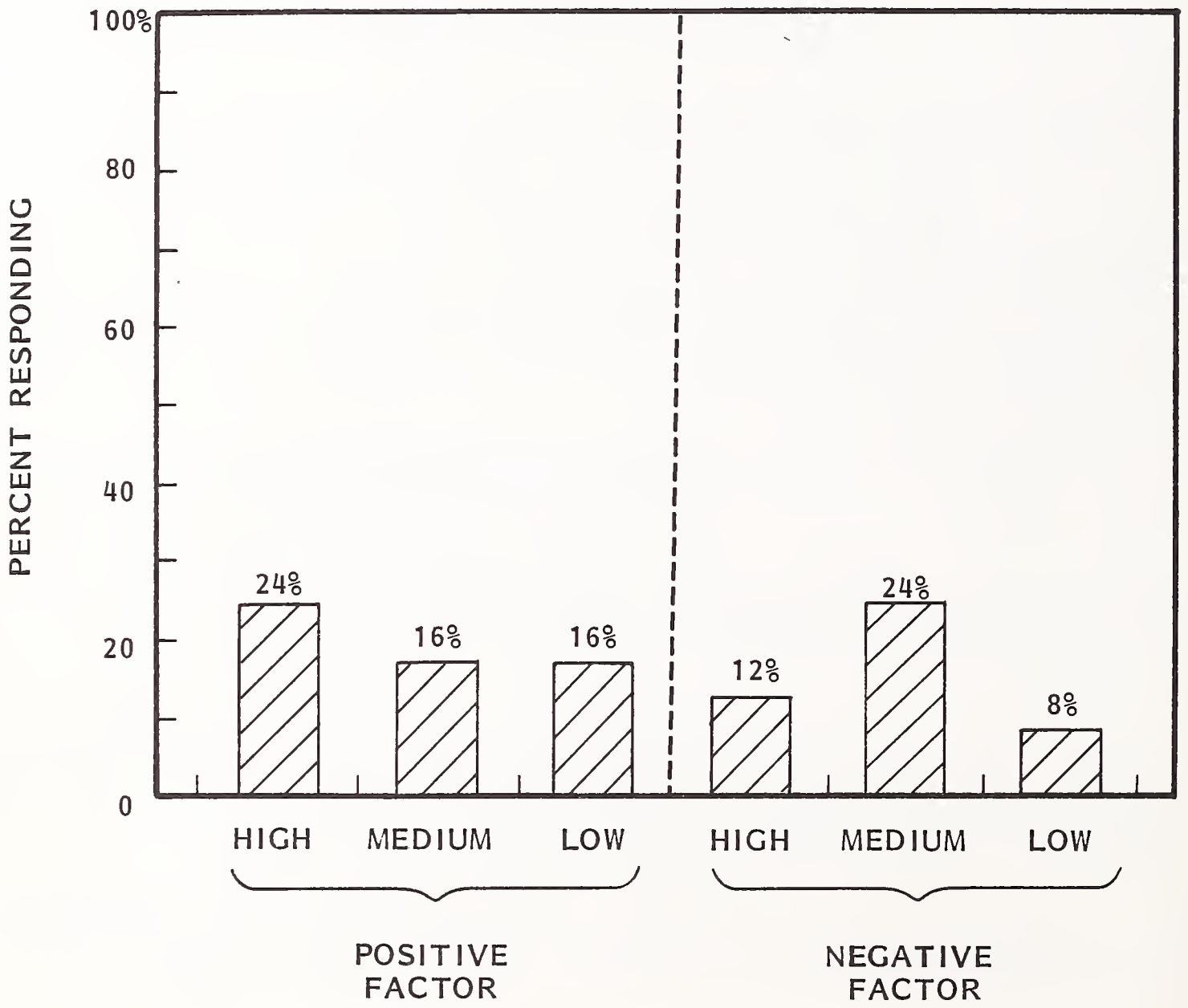
  - . "Everyone has increased costs. I am not convinced that the vendor would pass along dollar for dollar any cost savings realized from user involvement."

- General user ratings of the "do-it-yourself" concept are shown in Exhibits III-11 and III-12.

  - Over half the sample (56%) had an overall positive reaction to the idea itself.

EXHIBIT III-11

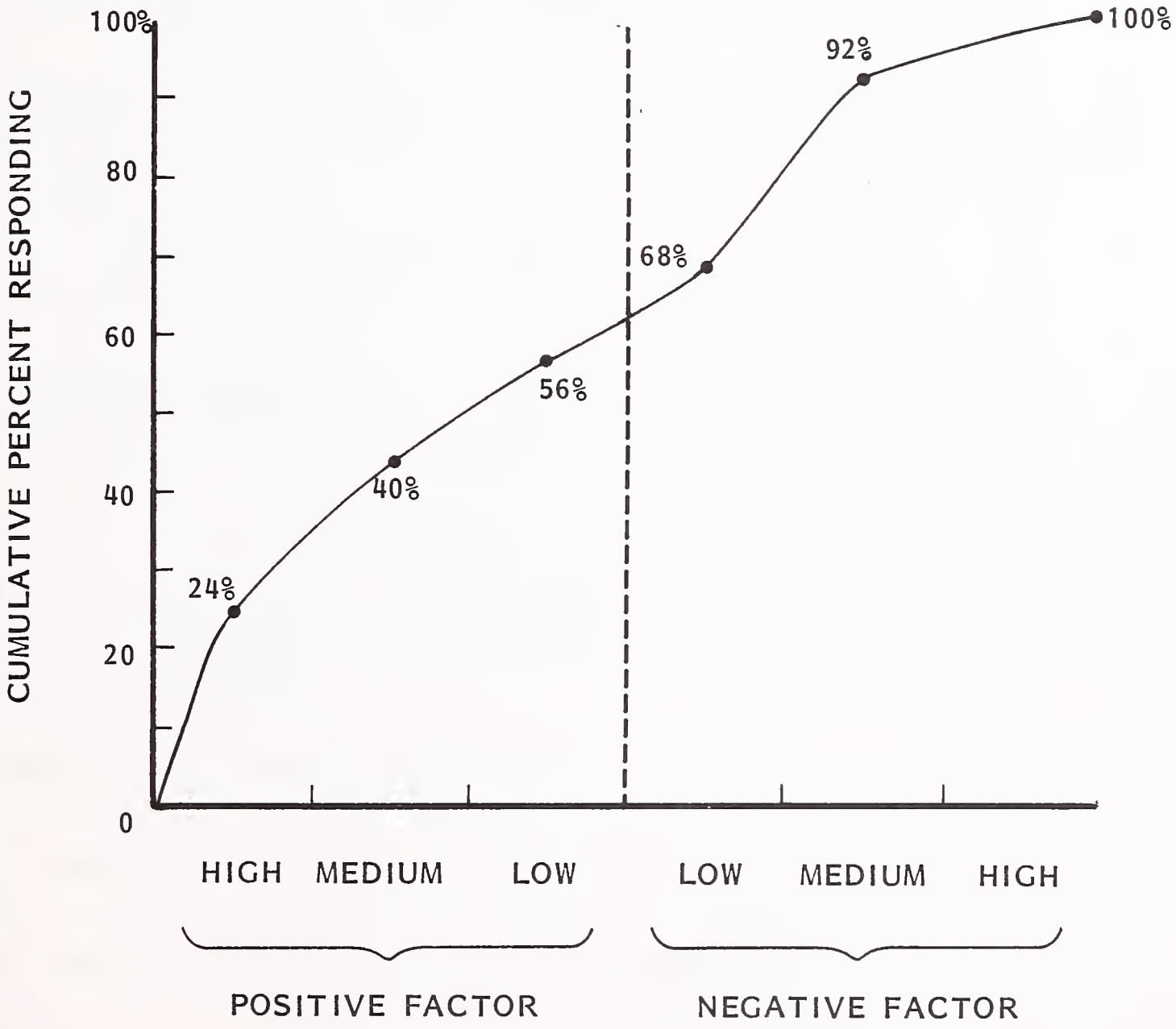
RESPONDING USER RATINGS OF THE DO-IT-YOURSELF CONCEPT



NUMBER OF RESPONSES = 30

EXHIBIT III-12

RESPONDING USER RATINGS OF THE DO-IT-YOURSELF CONCEPT -
CUMULATIVE PERCENTAGES



NUMBER OF RESPONSES = 30

NOTE: THE CUMULATIVE PERCENT SHOWN REPRESENTS THE PERCENTAGE OF RESPONDENTS WHO RATED THE DO-IT-YOURSELF CONCEPT AT THE INDICATED LEVEL OR BETTER.

- A small group (8%) remains strongly against user involvement.

- Eighty percent of respondent users felt that self-maintenance would require more reliable equipment.

- Most users indicated neither highly positive nor highly negative opinions concerning do-it-yourself service.

- Exhibit III-12 shows the above statistics graphically. Sixty-eight percent of respondent users found this idea only a low negative factor or better, and 92% found it a medium negative factor or better.

- Respondent users were asked a series of questions about their general opinion of what self-maintenance implied. Exhibit III-13 shows the overall results.

  . "If I were to maintain anything, it would have to be a better, more modular machine."

  . "We would only consider a proven machine. Mean time between failures would have to be very good."

- Two-thirds of responding users (67%) felt that user self-maintenance would mean faster overall repair of their equipment. Comments included:

  . "For remote locations, this could speed repair significantly."

  . "Quality of the diagnostics should make repair faster."

  . "Fault location will be faster, but I'm not convinced repair will be proportionally as good."

- Users were undecided if overall quality would improve. Half thought it would improve above current levels and half did not.

EXHIBIT III-13

USER EXPECTATIONS SURROUNDING SELF-MAINTENANCE

SELF-MAINTENANCE CHARACTERISTIC	USER EXPECTATION	
	YES	NO
MORE RELIABLE EQUIPMENT	80%	20%
FASTER REPAIR	67	33
POORER OVERALL MAINTENANCE	50	50
LOWER MAINTENANCE PRICE	71	29

NUMBER OF RESPONSES = 28

- "I am afraid preventive maintenance would be skipped more often."

- "Until the people get fully trained, it will be poorer."

- "Training will be the key."

- "Hell, I've got clerks who can solve problems quicker than some of the FEs I've seen. How the hell could maintenance get any poorer?"

- Most users (71%) associate some price savings with participation in self-maintenance, though general agreement on an amount was not forthcoming.

  - "We would expect a 25% savings on terminals, and more as equipment increases in complexity."

  - "I would expect the overall unit cost would be more since it is more reliable, redundant, etc., but maintenance would be less."

  - "In the long run, training, parts, etc. would not make it a bargain."

  - "Maintenance, not savings, would be offset by the inefficient use of my people."

- Users indicated that they did not expect their overall satisfaction with maintenance to change in the next two years, regardless of how equipment or maintenance techniques changed.

  - Only 22% of users felt that their satisfaction would improve, while 59% expected it to remain the same, and 18% believed it would get worse.

- Comments included:

  . "They will have to keep us happy to keep our business since we are growing so fast."

  . "There are too few FEs to cover the installed equipment and new ones just don't have the training."

  . "I will stay with the big vendors and pay the price for good maintenance. Money problems and personnel shortages will hit the small vendors much harder."

  . "Key operators would be a problem with the unions. They would probably have to be management and they are usually not technically trained. It could be a problem."

G. OVERALL IMPRESSIONS OF USER REACTION

- The following comments are based on impressions gained through carrying out the interviews and analysis upon which this study is based.

1. INSTALLATION

- General interest in self-installation suffered from the fact that users found few advantages in it for themselves. Users were not greatly unhappy with their current vendor's installation of equipment. Vendors will have to convince users that self-installation is desirable and simple.

- Cost is and will continue to be the key factor in selling self-installation to users. By increasing installation fees for vendor-installed equipment, a larger price differential between vendor- and user-installed machines would be created. This would enhance user interest in the potential cost savings.

- Equipment must be designed for user installation. Users contacted in phone interviews strongly indicated that they were unwilling to attempt the installation of equipment intended to be installed by a vendor's field engineer.

  . Respondent users have had an overall positive experience with self-installed terminals. They indicated that they would be willing to attempt to install other types of equipment if they, too, were so designed.

  . Apart from those with the equivalent of an in-house FE, users did not feel that they could install any currently available equipment other than terminals. Capacity and willingness to install will increase above the levels given in Exhibits III-1 and III-2 should newly introduced equipment be designed for user installation.

  . The exact definition of "designed for user-install" was unclear to users. Users described them as "simple to install," "modular," "well-documented" and "with adequate instructions." Ultimately, the definition was left to the vendor. By marketing and packaging a product for user self-installation, the vendor will set the standard.

- Convenience is the other advantage perceived by the user. Assuming other factors were right, users felt it an added bonus to be able to move and install equipment at will without needing an appointment with the vendor.

- The potential for getting the user immediately involved in installing currently available equipment other than terminals is low since most do not meet the minimum criteria of being designed for user installation.

- However, the potential for user self-maintentance is much better with the next generation of equipment on the assumption that it will be designed for user installation, and that it will be more reliable. Acceptance will hinge on marketing and packaging by the vendor.

2. DIAGNOSIS

- Potential benefits for user involvement in fault diagnosis are greater than for installation for both vendors and users. The isolation of a specific faulty component is what requires the highest skill level of the vendor's FE and causes the longest downtime for the user.

- Users are currently running extensive precall-isolation diagnositcs. Though surely a help to the vendor and a start in user involvement, these must not be equated with true fault diagnostic routines run by an on-site FE.

- The skill level of personnel currently committed by users to running these routines is very low. Users do not and will not have anyone available with nearly the capability of a vendor's FE to run diagnostics.

  - Vendors must design local diagnostics to be executed and understoood by console operators with no more than a high school education.

  - Vendors must be prepared to train and retrain large numbers of user personnel. An adequate number must be trained to accomodate large personnel turnover.

- Users do not have a great willingness to assume responsibility for isolating problems in their equipment.

- Resistance was roughly proportional to unit complexity.

- Users were willing to cooperate with and help the vendor in maintenance, as in running precall-isolation diagnostics. Users were resistant to situations where they were diagnosing themselves with help from the vendor.

- Some users were sold currently installed equipment and told it was to be serviced by an FE only. They were critical of vendors who changed the rules in midcourse.

  - Vendors should not attempt drastic changes in the method of servicing currently installed equipment, or their credibility with users will suffer.

  - If users plan for new equipment to be user-supported, it must be carefully marketed as such.

  - Vendors must emphasize and demonstrate that future diagnostics are significantly better than those currently available.

- Vendors take certain risks relying on the user to run the diagnostics.

  - No matter what the arrangement, the user will always hold the vendor responsible for the time that the machine is down.

  - If the diagnostic does not work properly, even if due to user error, the vendor will be blamed.

  - Should the diagnostic not function, the risk of a long down period is high unless the vendor has quick backup available. This partially defeats the purpose of user involvement.

- Remote diagnostic support was much more desirable to respondent users than local diagnostics.

- Remote diagnosis was still clearly defined as the vendor isolating problems with the user's cooperation, not vice-versa.

- The vendor remained in control of the problems at all times. The user did not feel neglected.

- Minimal skills were required of user personnel. Extensive training was not required.

- Remote diagnosis was perceived as a refinement of existing maintenance procedures rather than a renovation in the service process.

- Vendors will better be able to sell users on the benefits of remote diagnostics than on local diagnostics.

  - Skills required for local diagnostics are not readily available, while skills to help with remote diagnostics are available.

  - Willingness to accept remote diagnostics is much greater than that for local diagnostics.

  - Users perceive potential benefits from remote diagnostics, but mainly potential risks for local diagnostics.

- Users can be sold the "new and improved" quality of diagnostics on new equipment, though it must be carefully done.

3. REPAIR

- Interest in user self-repair was buoyed by the potential advantages to the user. Benefits perceived were:

  - Faster repair times translating into greater uptime and equipment availability.

- Lower maintenance costs.

- As with installation and diagnosis, user concerns centered on training, personnel and reliability.

  - Respondent users felt that they did not have the personnel trained to perform this maintenance.

  - They felt that the machines currently available were not reliable enough and too complex to be repaired in-house.

  - They also felt that they had not been prepared by the vendor, and thus are unqualified to repair equipment.

- Users generally do not have the capability to service the more complex equipment as currently designed.

  - Users rightly perceive that equipment has not been designed for user repair. They are wary of taking on the risks implied with such responsibility.

  - Users' general negative reaction is based on the idea of servicing currently available equipment. Capability and willingness to repair modular, less complex equipment would be much higher.

  - Users want to ease into the repair function. They are willing to experiment on terminals and other noncritical equipment, but reserve judgement on complex machines.

  - Users now have the capability to swap units with design improvements. Repairs at the level of training boards are clearly obtainable.

- Users are generally reluctant to store and pay for spare parts.

- They perceive this as an addition, not an alternative, to high maintenance and contract costs.

- Users will be able to convert some savings on maintenance contracts to parts storage. This would be a general benefit to the vendor.

- Users look on spare purchase as a business decision. If overall benefits are more than costs, users can be persuaded.

- Users are resistant to a depot-only repair option, especially on expensive and critical parts.

  - Users prefer a choice of spare repair methods, with costs tied to service and value received.

  - Users want to decide for themselves. They don't want the vendor to decide for them.

- Vendors must design new equipment for user repair and market it as such. Users will balk at repairing equipment designed for the vendor service.

  - Users have the capability to swap boards. Convincing them it is beneficial to do so will be the problem.

  - Vendors must provide adequate training for the user. Users will probably ask for more training than they really need.

  - Vendors must stress that on-site support is quickly available should there be problems. Users will, at least initially, demand such assurance.

  - Vendors must introduce the self-repair idea on conventional equipment. Forcing users to service complex equipment prematurely will sour the user on the whole idea.

- Users are not overly sensitive to pricing. They indicate no firm cost demands in this area.

H. STATUS OF SELECTED VENDORS RELATIVE TO USER SELF-MAINTENANCE OFFERINGS

- Throughout this study the focus is on user reaction to the issue of self-maintenance. To provide a balanced view, the following section contains examples of vendor offerings to which users are responding.

- This section is based on information collected by INPUT in the course of vendor research. It is not intended as a compendium of all vendor activities but rather as a sampling of what is currently available.

- Answers to specific questions about vendor activities not covered in this summary may be obtained through INPUT'S "Hotline" support facility available to all clients.

- Expansion of this section on vendor activities will be provided in upcoming INPUT Field Service Program materials.

1. AMDAHL

- Amdahl has remote diagnostic capabilities to its machines. Due to system size, most installations have an available on-site field engineer. Currently, only the on-site FE can execute by remote diagnostics. This service is called AMDEC. Diagnostic centers are maintained in Sunnyvale (CA), Columbia (MD) and London (UK).

2. BTI COMPUTERS

- BTI markets small timesharing computer systems. When users have a problem, they telephone central support in Sunnyvale (CA).

  - BTI runs a full remote diagnostic routine on the faulty machine. When the defective board is identified, the user swaps it. Parts are then sent to the repair center.

  - If the routine does not identify the problem, an FE is dispatched from Sunnyvale, California. Diagnostics are accurate enough to allow all FEs to operate out of the corporate office.

  - Remote diagnostics are performed from Sunnyvale, California. The repair center is in Minneapolis, Minnesota. There is a parts distribution center in Memphis, Tennessee. Maintenance for foreign operators is handled from Birmingham, England.

  - Periodic check-ups of equipment can be performed without interrupting normal user operations.

3. COMPUTER AUTOMATION

- Computer Automation has a 16-bit naked minicomputer unit designated "Scout." Each of the four to 16 boards contains a read-only memory (ROM) facility and a light-emitting diode (LED) indicator light:

  - The unit can operate the diagnostics (called "Isolite") in three modes:

    . Automatic testing upon power-on.

    . Continuous testing during operation.

    . Confidence testing under software control.

- Boards with a failure are indicated by a lit LED. The user or field engineer simply removes the board and replaces it. All boards are color-coded to assure accurate identification.

- Results of the ROM diagnostics can be displayed in remote locations.

- Computer Automation charges a flat fee to fix boards returned to the depot. Users must buy and store their own replacement boards.

4. DIGITAL EQUIPMENT CORPORATION (DEC)

- DEC has moved to a centrally dispatched field service organization.

  - Users call the Service Response Group (SRG) directly via a 24-hour, seven-day, toll-free number. SRG logs the call and determines whether a remote diagnostic routine is possible and advantageous. SRG notifies the local branch office and, when appropriate, the Digital Diagnosis Center (DDC).

- DDC operates all remote diagnostics from its Colorado Springs, Colorado location. Service is available 24 hours a day, seven days a week, regardless of length of coverage paid for under the contract. DDC sends the results of its diagnostics and its recommendation to SRG for action.

- DEC also has available oral software support 24 hours a day, seven days a week.

  - Based in Colorado Springs, Colorado, the telephone support center (TSC) is available to users of VAX/VMS, RSTS/E, CTS/500, RSX-UM and RT-11 operating systems on PDP-11 and VAX-11/780 systems.

  - Users must be under software warranty or subscribe to DEC's post-warranty software products service.

- A series of depot and product repair centers are maintained around the country. Services are post-warranty and include:

  - Module Mailer Contract: for high-volume repairs for users identifying problems to the module level. Users pay a specific monthly fee and ship modules directly to the customer returns area depot. The module is repaired and returned within a set time period.

  - Loose Piece Module Repair Contract: for odd, as-needed repairs. Any piece sent to the customer returns area will be repaired and returned for a set monthly fee.

  - Off-site Per Call Repair: users can have modules repaired on a fixed quote or time-and-materials basis.

  - DEC currently operates six Product Repair Centers, with one each in: Sunnyvale and Costa Mesa (CA), Chicago (IL), Princeton (NJ), Lowell (MA) and Canada.

  - DEC also has a component exchange program available through its Lowell office. DEC will swap a faulty component for a refurbished one for a fraction of the normal list price. This service is on a per-unit basis only.

5. HONEYWELL

- Honeywell has remote diagnostic capabilities on its new small- and medium-sized systems.

  - Remote diagnostics on these systems are indicated by the user. After experiencing a hardware or software problem, the user telephones toll-free to the Atlanta-based National Response Center (NRC).

- The NRC has records of all problems previously encountered with the specific installation. The NRC identifies which machine is faulty. If the CPU has remote diagnostic capability, the user's call is transferred to the National Technical Center assigned to that product. There are currently two centers: small systems are handled at the Boston (MA) facility, while the Phoenix (AZ) facility handles medium-sized systems.

- Once the National Technical Center has done its best, the call is sent back to the NRC. NRC documents the call, and can dispatch an FE if necessary.

6. IBM

- IBM has initiated user involvement in maintenance on its 3101 terminals, 4300 Series machines and 8100 offerings. System Support Center service for software is also available to certain System/370 and 303X users.

- The IBM 3101 Display Terminal was introduced in October of 1979. As discussed earlier, it is fully user-installed and diagnosed and depot repaired. No on-site maintenance contract is available; time-and-materials rates are charged when an FE is called. There are four components to the terminal: CRT screen, logic element, keyboard and printer. The user identifies the faulty component and sends it to the local depot (Paramus (NJ), Chicago (IL) and Los Angeles (CA)). Depot repair requires approximately one week. IBM recommends the following minimum spares coverage:

3101s installed	Spare 3101s
15	1
30	1
50	1
75	2
100	2
200	3
300	3
500	5
700	6
1000	7

- The IBM 4300 Series processors have a dedicated diagnostic processor that monitors hardware performance. This subsystem generates an eight-digit code which, when there are problems, identifies the failing unit. The code is logged onto a diskette and is displayed on the system console.

  - The 4300 Series systems include a remote support facility that connects the diagnostics to an IBM Field Technical Support Center. Diagnostic routines can then be executed remotely.

  - At present, only on-site field engineers may connect a system to the Field Technical Support Center.

- The IBM 8100 Information System is a minicomputer used for controlling a distributed data processing network.

  - The system is completely user-installed. Users must do their own site preparation, including physical layout, power and cable requirements.

  - Diagnostics have been designed into the machine. These include power-on and IPL tests, hardware error detection facilities, off-line diagnostics and remote diagnostic capability.

- Diagnostics that can be run from a host processor include error logging and display, on-line diagnostics and maintenance analysis procedures.

- IBM System Support Centers in Chicago, Illinois and Tampa, Florida are the first point of contact for software problems on 8100 and 4300 machines, as well as System/370 and 303X processors using DOS/VS, DOS/VSE, VS-1 or VM.

  - Users must come to this center for fault isolation. On-site FEs will be dispatched only from the System Support Center.

  - At these centers, IBM has a data base of all problems and fixes executed. Since January 1980, IBM has released Program Update Tapes (PUTs) to users as a form of preventive software maintenance. These tapes are implemented by the user.

IV ANALYSIS BASED ON A BROAD USER SAMPLING

IV ANALYSIS BASED ON A BROAD USER SAMPLING

A. THE USER PANEL - OVERALL ATTITUDES

To add a perspective beyond the telephone interviews that provided the basic data for this study, questions regarding self-maintenance were added to INPUT's 1980 mail survey of large users.

- This survey allows the issue of self-maintenance to be taken into account within the user's overall perspective. Though maintenance is the focus of all attention in the field service organization, users do not rate maintenance as their major problem. The following analyses will provide field service management with an insight into the attitudes of a wide range of EDP managers.

- The 912 respondents to the 1980 EDP User Panel were asked to rank their top five EDP problems. Only 15% of users put maintenance in the top five, and only 1% rated it the chief problem, as shown in Exhibit IV-1. The actual questionnaires used are included in Appendix B.

- Personnel problems were rated as the highest problem, with 69% rating personnel recruiting and 65% rating personnel training among the top five EDP problems.

EXHIBIT IV-1

USER PANEL RATING OF EDP PROBLEMS

EDP PROBLEM	RATING					
	FIRST PRIORITY	SECOND PRIORITY	THIRD PRIORITY	FOURTH PRIORITY	FIFTH PRIORITY	TOTAL
PERSONNEL RECRUITING	28%	13%	12%	10%	6%	69%
BETTER PLANNING AND CONTROL	12	11	18	12	14	67
PERSONNEL TRAINING	8	17	14	14	12	65
LACK OF USER INVOLVEMENT IN DEVELOPMENT	7	13	10	10	11	51
LACK OF MANAGEMENT UNDERSTANDING	12	10	10	9	10	51
NEED IMPROVED OPERATIONS	7	8	9	13	9	46
NEED IMPROVED DATA COMMUNICATIONS	6	11	8	10	11	46
NEED EXCLUSIVE APPLICATIONS DEVELOPMENT TIME	8	7	8	9	8	40
INADEQUATE EDP BUDGET	5	6	5	6	11	33
OTHER	6	2	3	4	3	18
UNSATISFACTORY MAINTENANCE	1	2	3	4	5	15

NUMBER OF RESPONSES = 912

- Budgetary problems were not overly acute for the user. Only 33% rated inadequate EDP budget among the top five problems, and only 5% as the primary problem.

- It follows that the opportunity to save on maintenance costs by doing self-maintenance will not be a major motivation for EDP managers.

- As seen in Exhibit IV-2, maintenance comprises a very small portion of the user's total EDP budget.

  - Maintenance represented only 2% of the average budget. This was not dependent on size of company or type of installation, but was reasonably constant across installations. It was relatively more important in small installations.

  - Personnel costs approached 50% of the average budget. This item is paramount in the EDP manager's thinking.

- The overall impact of equivalent increases in maintenance and personnel costs differs greatly due to the difference in size of these budget items.

  - Exhibit IV-3 shows that the projected increase in maintenance costs for 1981 will be 6%. This will add an average of $6,000 to the average EDP budget of $4.5 million, representing an overall budget increase of 0.1%.

  - The same 6% increase projected in personnel costs for 1981 will add an average of $126,000 to the EDP budget. This represents an overall budget increase of 2.8%.

  - Users are sensitive to any maintenance activity that will increase their personnel costs even by small amounts.

EXHIBIT IV-2

EDP USER PANEL BUDGETS BY CATEGORY OF EXPENDITURES

CATEGORY OF EXPENDITURE	OVERALL	IBM	NON-IBM	SIZE OF USER		
				SMALL	MEDIUM	LARGE
PERSONNEL	48%	48%	47%	47%	48%	47%
HARDWARE	32	32	31	32	33	31
SUPPLIES AND OTHER	10	10	10	9	9	11
COMMUNICATIONS (HARDWARE AND SOFTWARE)	4	4	4	3	2	5
MAINTENANCE	2	2	2	5	3	1
SOFTWARE	2	2	2	3	3	2
PROCESSING SERVICES	2	2	2	2	2	2

OVERALL: 912 CASES
IBM: 519 CASES
NON-IBM: 473 CASES
SMALL ($0-100 MILLION): 317 CASES
MEDIUM ($100-1 BILLION): 334 CASES
LARGE ($1 BILLION +): 92 CASES

EXHIBIT IV-3

EDP USER PANEL BUDGET AND EXPECTED CHANGES, 1980-1981

CATEGORY OF EXPENDITURE	AVERAGE PERCENT OF BUDGET	OVERALL CHANGE 1980-1981	EXPECTED CHANGE				
			IBM	NON-IBM	SMALL USER	MEDIUM USER	LARGE USER
PERSONNEL	48%	6%	6%	5%	7%	11%	4%
HARDWARE	32	5	5	3	6	8	4
SUPPLIES AND OTHER	10	3	3	2	5	8	1
COMMUNICATIONS (HARDWARE AND SOFTWARE)	4	5	4	4	11	7	4
MAINTENANCE	2	6	6	7	5	8	7
SOFTWARE	2	6	5	5	6	6	2
PROCESSING SERVICES	2	0	1	2	5	(4)	1

OVERALL: 912 CASES
IBM: 519 CASES
NON-IBM: 473 CASES
SMALL ($0-100 MILLION): 317 CASES
MEDIUM ($100-1 BILLION): 334 CASES
LARGE ($1 BILLION +): 92 CASES

- Users must perceive user self-maintenance as a more efficient use of existing personnel, not requiring new hires, if they are to accept the self-maintenance concept easily.

B. USER PANEL RESPONSES TO MAINTENANCE ISSUES

1. TOTAL RESPONSES

- Panel members were asked to rate their impressions of the quality of the traditional field service people who were supporting them.

  - When compared to quality in previous years, 50% of the 912 respondents felt that first-line FE managers had remained the same, 21% felt quality had declined and 19% felt quality had improved.

  - For field engineers, 52% felt quality had remained the same, 25% felt it was poorer and 23% felt it had improved.

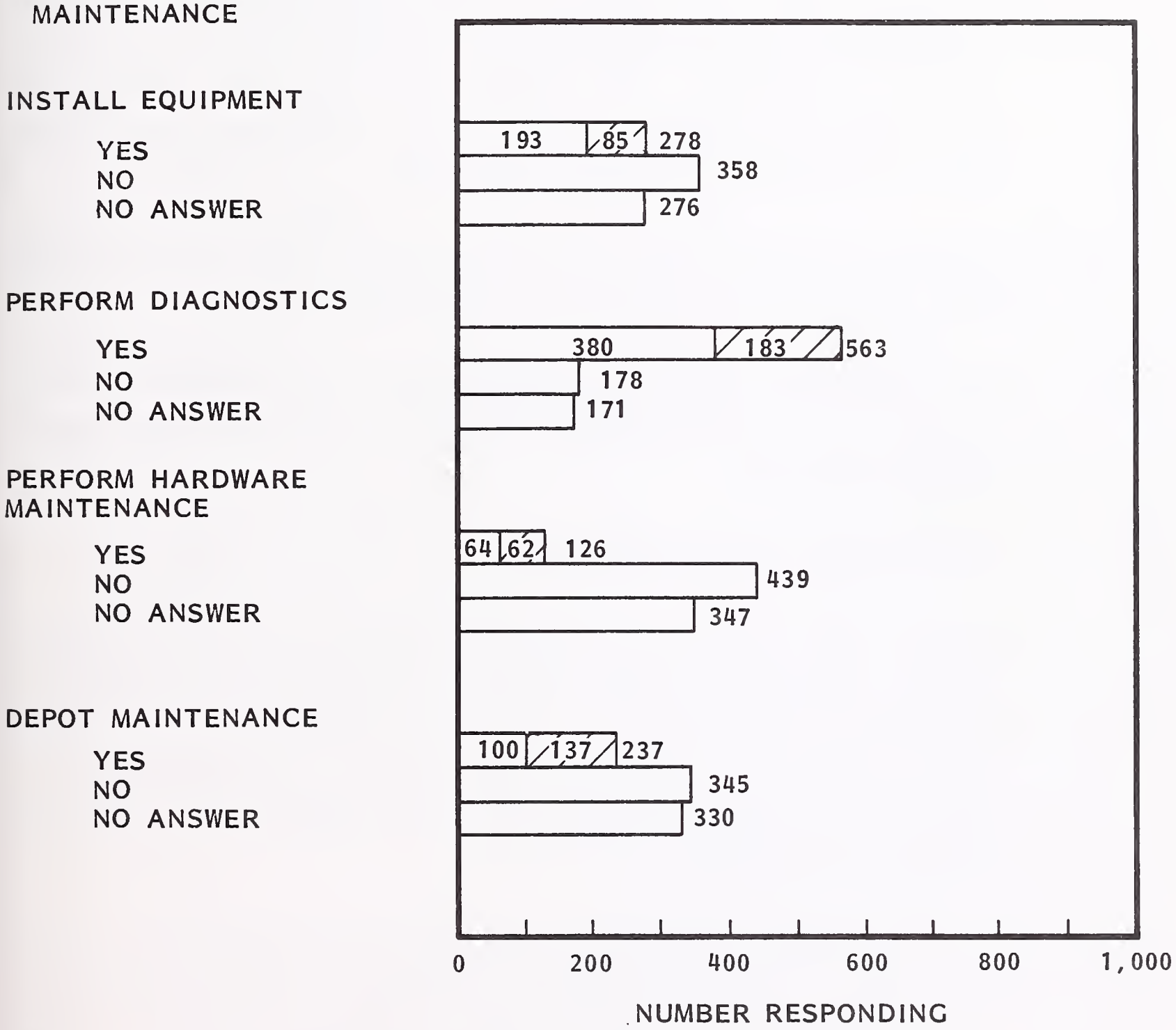
  - These results agree with the telephone survey of 76 users which INPUT carried out as part of the 1980 Field Service Annual Report.

  - Clearly users perceive that the quality of field service personnel is remaining constant. By maintaining the current quality level - and the 1980 Field Service Annual Report concludes that users are generally satisfied with current maintenance - field service organizations are not providing a "push" to users to do more self-maintenance. Users can live with the status quo.

- As shown in Exhibit IV-4, users' responses are mixed on the issue of self-maintenance, depending on the element of user maintenance being considered.

EXHIBIT IV-4

USER PANEL RESPONSES TO SELF-MAINTENANCE ISSUES



NUMBER OF RESPONSES = 912

- Approximately one-third of respondents are doing, or would consider, self-installation and depot maintenance.

- Two-thirds are doing or would consider doing diagnostics.

- Only 14% are performing or would consider performing hardware maintenance. This compares to 20% who are performing hardware maintenance according to the phone survey. The difference in response levels is largely due to an interpretation by user panel respondents of the questions referring primarily to mainframe maintenance. The telephone interviews, which probed more deeply, found that though users resist mainframe maintenance almost totally, they are more receptive to terminal maintenance.

- In general, users are receptive to less labor-intensive tasks (diagnostics) rather than more labor-intensive tasks (hardware maintenance).

- On Exhibit IV-5, the user responses are calculated as percentages of the total. This chart can be used for comparisons with the individual industry sector responses that follow.

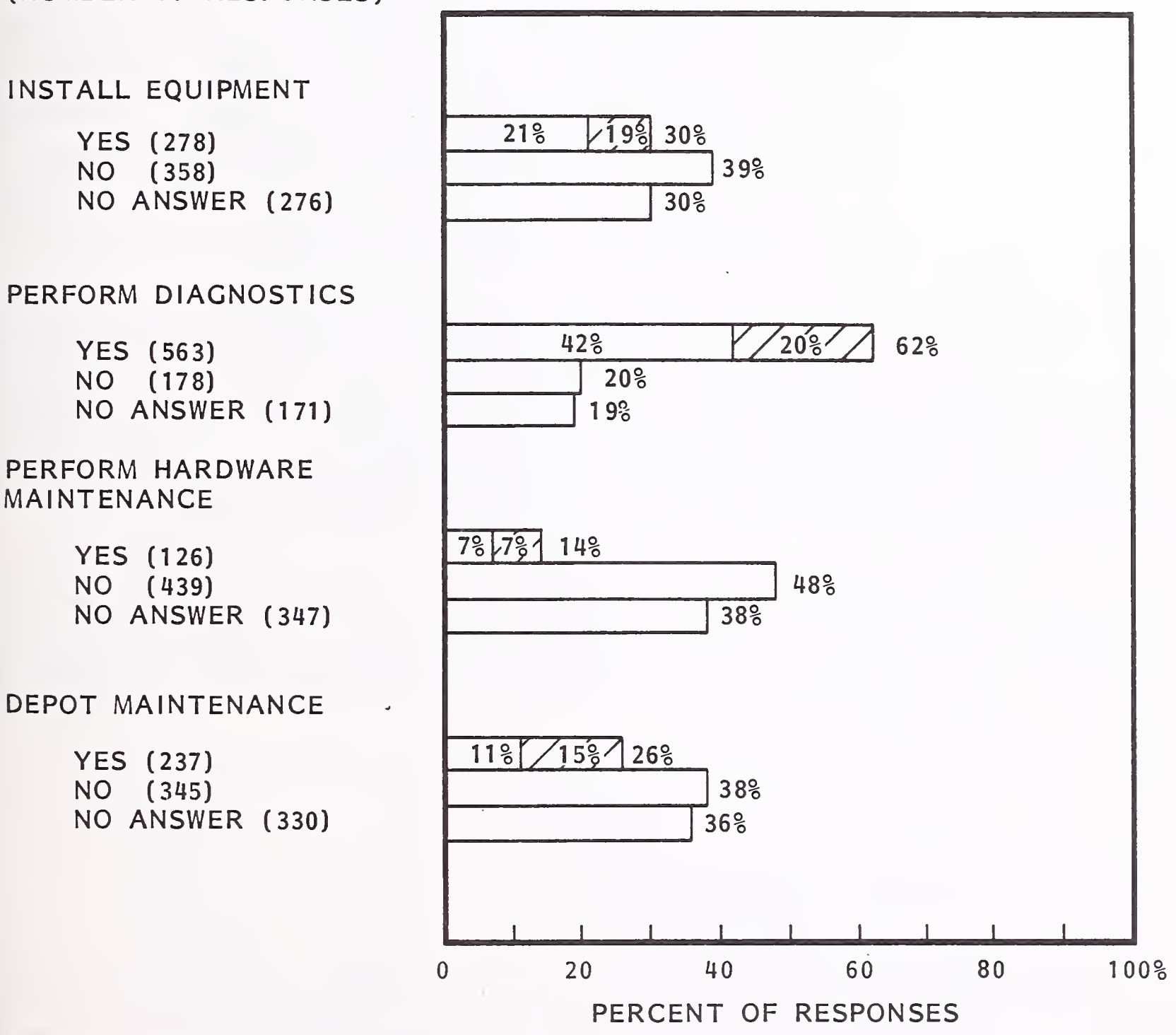
2. RESPONSES BY INDUSTRY SECTOR

- Industry sector analysis has been used extensively by companies marketing hardware and computer services (timesharing, etc.) since the late 1960s. It has not been used to any great extent in the area of field service. As field service becomes a larger part of total revenues and more important in developing the overall client relationship industry sector analysis will become of increasing importance.

  - Differences in applications and hardware mix between industry sectors can have a profound effect on the maintenance required. For example, an electronic funds transfer system in the banking sector has a higher up-time requirement than does an inventory control application in a distribution company.

EXHIBIT IV-5

USER PANEL RESPONSES TO SELF-MAINTENANCE ISSUES IN ALL INDUSTRY SECTORS SURVEYED



NUMBER OF RESPONSES = 912

- Attitudes toward EDP differ between industry sectors. For example, the utilities sector makes heavy use of in-house EDP and little use of outside computer services. Hospitals, on the other hand, have been successfully courted by computer services companies due to both the high degree of standardization among hospitals and their relatively smaller size.

- The level of distributed versus nondistributed processing differs greatly between sectors. Manufacturing and banking and finance tend to lead in the commercial sectors. Insurance, with its heavy dependence on large central EDP installations, tends to be lagging in distributed systems. Since user self-maintenance tends to be more attractive in areas where on-site FE maintenance is less available, this factor directly relates to the issue of user maintenance.

- In the exhibits which follow, the user panel data has been segregated by industry sector. Some differences do emerge. However, there is also a great deal of similarity between sectors. The relevance of this data to individual clients will depend largely on how industry specialized their individual business is and which sectors comprise their current and planned market(s).

- The industry sectors used are standard in all INPUT programs and reflect the market segmentation currently used by a majority of equipment and services vendors. Demographics describing the sectors in detail are contained in Appendix E.

a. Discrete Manufacturing Sector

(1) Sector Overview

- The discrete manufacturing sector spans a group of industries that are the backbone of U.S. production, from the smallest specialty manufacturers to the heavy machinery, aerospace and automotive giants.

- Together, the discrete manufacturing subsectors contributed approximately 16.1% of the GNP in 1976. Machinery accounted for 3%, while metal, metal products, motor vehicles and electrical equipment each contributed about 2%.

- Growth rates for these industries are expected to average 10% through 1979, but some components such as aerospace, electronics, and computers will far exceed these rates.

- Real growth rates in the discrete manufacturing categories are expected to achieve 3.5% to 4% per year for the period 1978-1983, plus whatever growth is attributable to inflation.

- However, the effects of international economics, both positive and negative, may affect individual subsectors to a greater degree than for the sector as a whole.

- EDP in the discrete manufacturing sector is generally mature for the larger companies, and among the most advanced for aerospace and automotive companies. Applications in these industries are highly developed and the current effort is to integrate them fully.

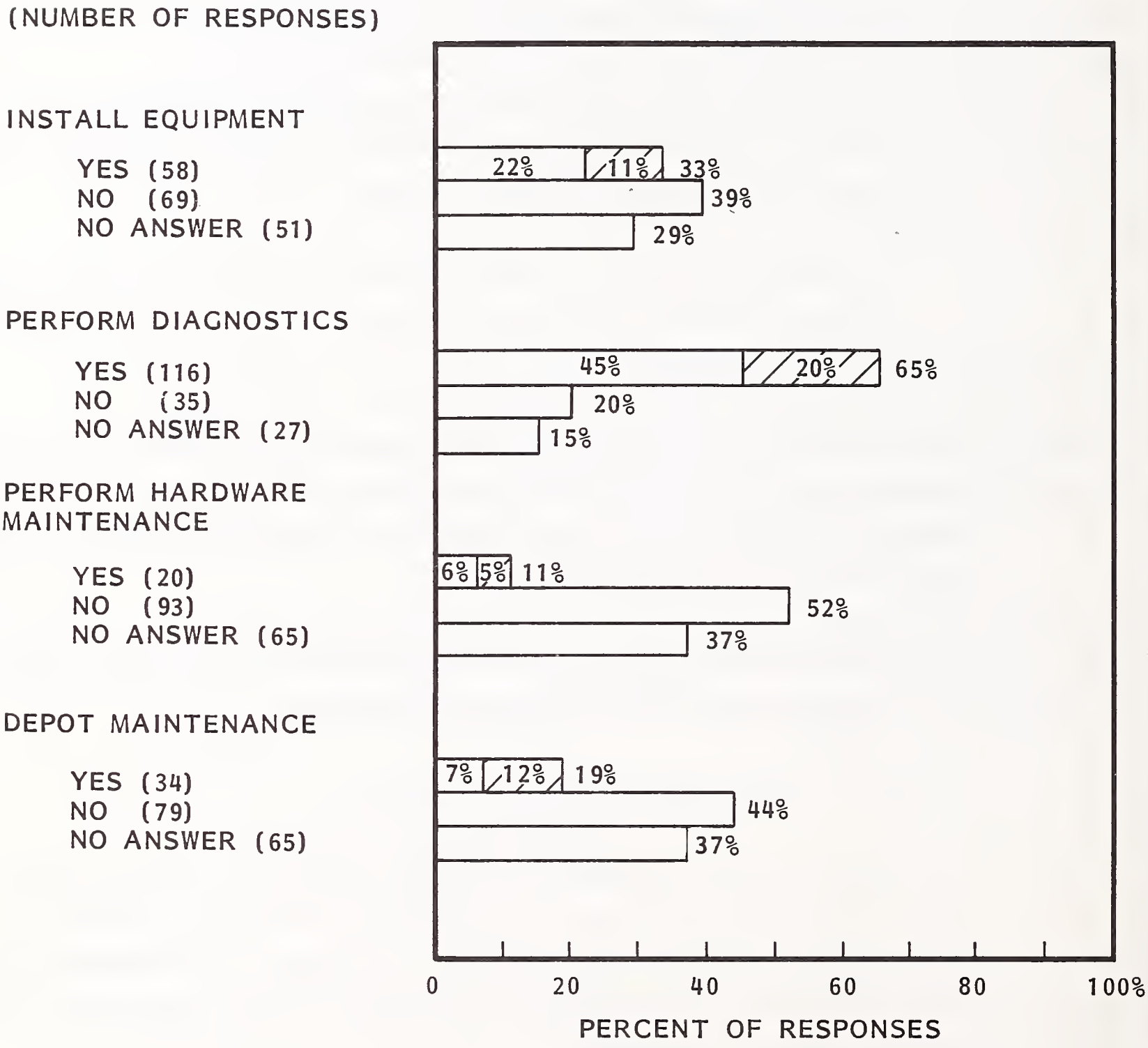
  - But the sheer size and number of applications and data bases involved has made this a difficult, lengthy goal to achieve.

(2) User Responses To Self-Maintenance

- User maintenance respondents in the discrete manufacturing sector generally follow the overall pattern shown in Exhibit IV-5. As shown in Exhibit IV-6, respondents are somewhat more resistant to hardware self-maintenance and depot maintenance. With regard to hardware self-maintenance, only the insurance sector is more resistant.

EXHIBIT IV-6

USER PANEL RESPONSES TO SELF-MAINTENANCE ISSUES IN THE DISCRETE MANUFACTURING SECTOR



NUMBER OF RESPONSES = 178

b. Process Manufacturing Sector

(1) Sector Overview

- The process manufacturing sector contributes over 10% of the gross national product, and has been the most rapidly growing industry sector in the U.S. in recent years. It is comprised of chemicals and allied products; petroleum refining; rubber and plastic products; pharmaceuticals; textiles; foods, beverages, and tobacco; and miscellaneous other process industries.

  - Chemicals and petroleum refining will continue through 1980 to grow at 11.5%, faster than the national average growth rate, although not as fast as in the preceding five years.

  - Shortages or excessively high costs of energy and feedstocks could have an unfavorable impact upon these industries, but this likelihood is discounted by most of the current respondents.

  - High capital investment requirements and continuing strong government regulations also mitigate against much higher growth rates over the next five years.

  - Plastics and resins, paints, soaps and detergents will each average between 6% and 10% growth, but drugs and cosmetics should exceed 13%.

  - Rubber will show the smallest increase among producer goods at 4%.

  - The major consumer goods process industries (food, beverages) will see growth rates around 10%, but tobacco will be far behind at only 1% or so.

- Large companies in the process manufacturing sector are fairly advanced in their use of EDP, especially in the chemicals and petroleum refining subsec-

tors, but cost control and consolidation/standardization of EDP are current needs and emphases.

- If a serious recession occurs, EDP budgets in the process industries will be hit hard. Consequently, very few new applications are planned compared to other industries.

(2) User Responses To Self-Maintenance

- Responses from users in this sector parallel those in discrete manufacturing, with a lower receptivity to depot maintenance for process manufacturing being the main difference. As will be shown in a later section of this chapter, the lower receptivity to depot maintenance is a characteristic of large companies, and large companies characterize the process manufacturing sector. Responses are shown in Exhibit IV-7.

c. Transportation Sector

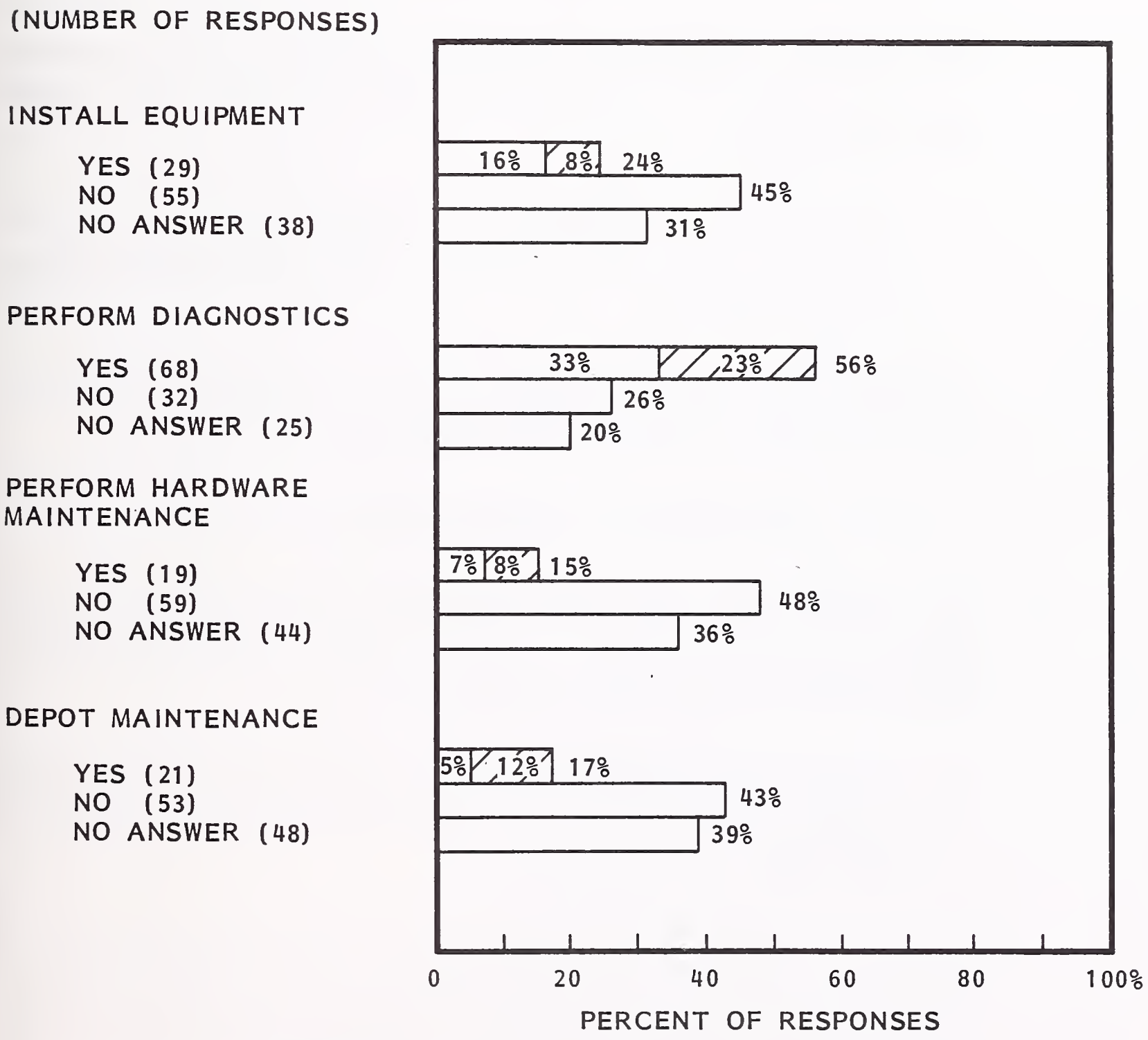
(1) Sector Overview

- The transportation sector is very diverse in its business and operating characteristics, as well as its use of EDP. The sector comprises railroads; bus, taxi, and limousine companies; motor freight; water transportation; pipeline companies; and airlines.

- Together, these subsectors contributed approximately 3.6% of the GNP in 1976, with motor freight accounting for 1.5%, and airlines and railroads each contributing 0.8%.

EXHIBIT IV-7

USER PANEL RESPONSES TO SELF-MAINTENANCE ISSUES IN THE PROCESS MANUFACTURING SECTOR



NUMBER OF RESPONSES = 122

- Airlines grew 10% in ton-miles carried in 1978, while trucking grew 7%. These growth rates are each expected to grow 6% through 1979, and post an AAGR of 5% for airlines and 4% for trucking for the period 1978-1983.

- However, increasing costs of fuel and labor are expected to have adverse effects on profitability for 1979.

- EDP has been a critical function for airlines since the beginning of computing; but trucking companies have only recently begun to put freight bills - the key application - on-line.

  - Railroads and water transportation companies are between these two extremes in their EDP development, with wide variations existing between companies.

- Companies in the transportation sector comprise 3% of the total responses to this survey, similar to the contribution of transportation to the GNP.

(2) User Responses To Self-Maintenance

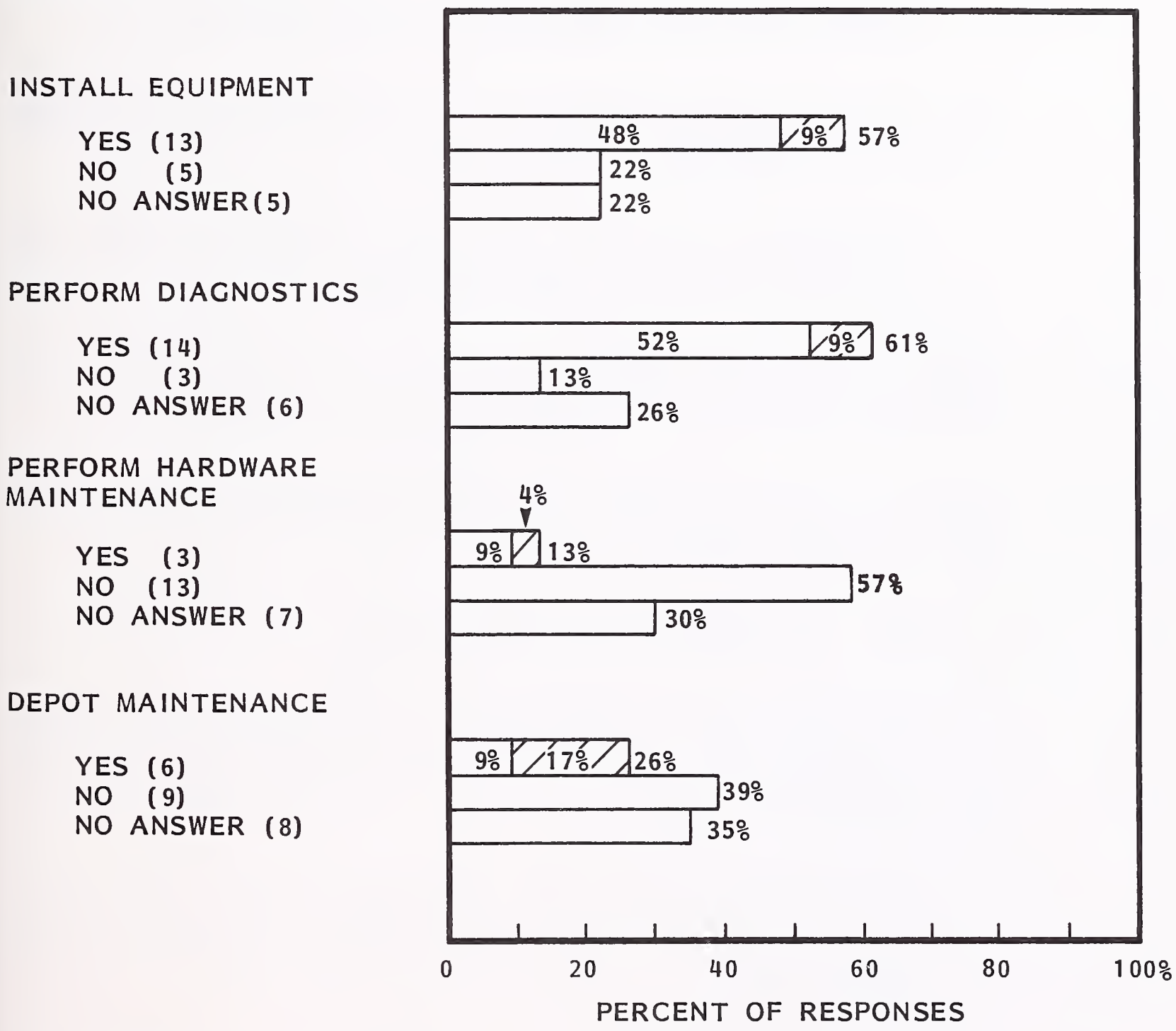
- The 23 respondents in the transportation sector differ markedly from the manufacturing sectors already discussed in that the former are heavily involved (48%) in the installation of equipment.

  - Although the survey did not identify the type of equipment being installed, other INPUT data show a high rate of terminal installations in this sector.

- Related to a willingness to do installations is a fairly high willingness to participate in depot maintenance. These factors combine to make this sector a relatively positive market for a product such as the IBM 3101 terminal. User panel responses are tabulated in Exhibit IV-8.

EXHIBIT IV-8

USER PANEL RESPONSES TO SELF-MAINTENANCE ISSUES IN THE TRANSPORTATION SECTOR



NUMBER OF RESPONSES = 23

d. Utilities Sector

(1) Sector Overview

- The utility sector is comprised of telephone communications companies, which employ more than 50% of the industry's personnel, and gas and electric suppliers, with an additional one-third of the employees.

  - Together the subsectors contribute 4% of the nation's GNP.

- Utility sector revenue is anticipated to grow by at least the national average growth rate, in line with the historical pattern.

  - Technological improvements will provide better than average real growth (after inflationary effects are discounted).

- Utilities are large-scale users of EDP both for operations (switching and transmission control) and for customer billing and recordkeeping.

- Utilities are regional by nature. Also, they are regulated and not active in openly competitive markets.

(2) User Responses To Self-Maintenance

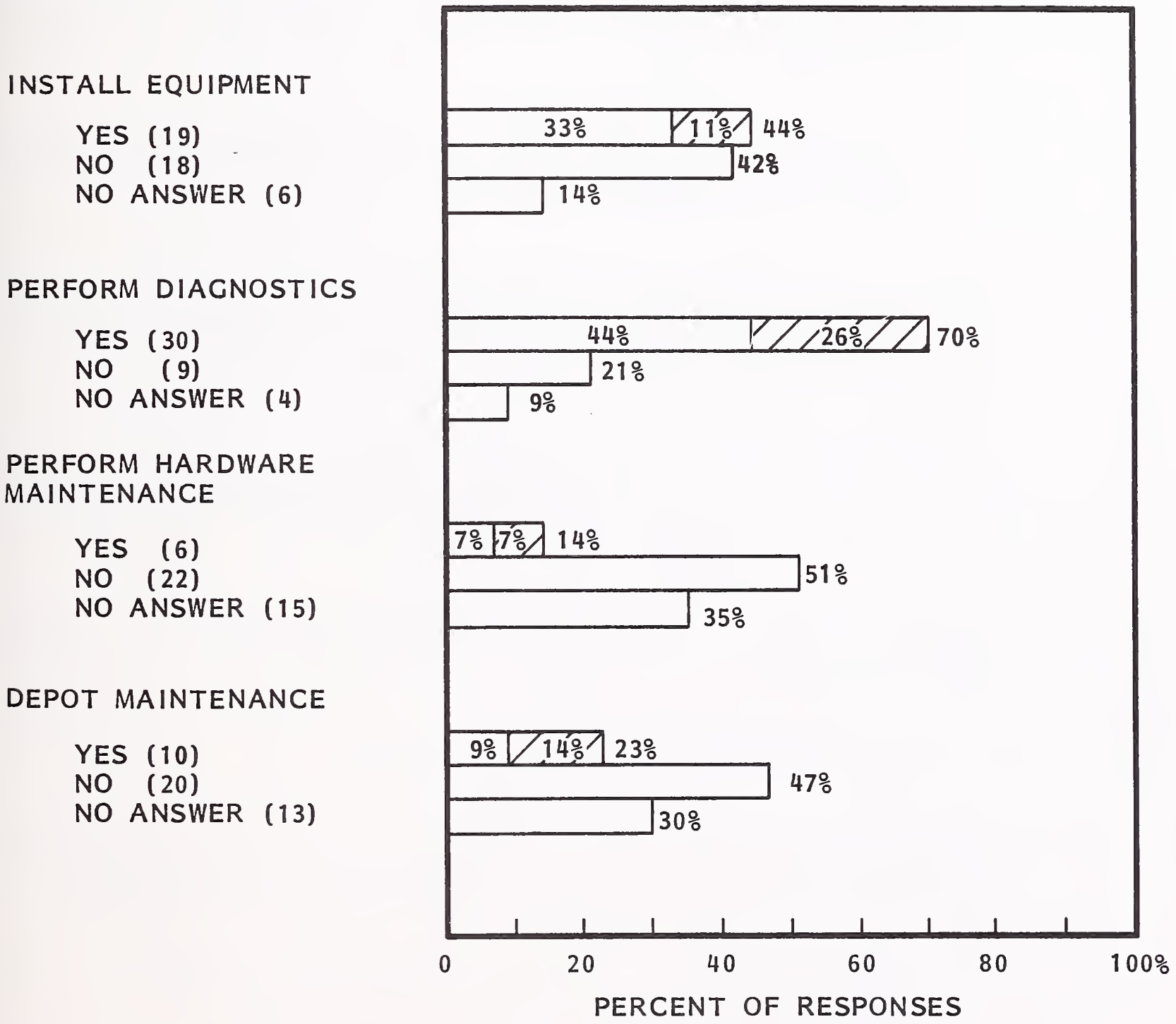
- This sector tends to be dominated by large mainframe; terminals are not being installed at the rate typical of transportation and other sectors.

- The net result is a fairly stable environment with the response profile, as shown in Exhibit IV-9, showing little difference from the total profile in Exhibit IV-5.

EXHIBIT IV-9

USER PANEL RESPONSES TO SELF-MAINTENANCE ISSUES IN THE UTILITIES SECTOR

(NUMBER OF RESPONSES)



CURRENTLY PERFORMING

WILLING TO CONSIDER

NUMBER OF RESPONSES = 43

e. Wholesale Sector

(1) Sector Overview

- The wholesale distribution industry sector, comprised of merchant wholesalers of durable and non-durable goods, contributes 6.5% of the U.S. GNP.

- 1979 sales of merchant wholesalers are expected to exceed 1978 sales by 11%, of which non-durable goods will contribute the larger dollar amount, but a lower percentage of growth.

  - In general, wholesaling tracks the national economic trends, both as to growth and to the effect of inflation.

- Computers and computerized systems are considered a key to productivity in this sector and are increasingly employed to step up efficiency in both the receipt and placement of orders with manufacturers.

  - A growing shift in the way wholesalers do business has broadened the number and kinds of goods wholesalers must carry, and has created new systems requirements.

- The wholesale sector is characterized by thousands of small- and medium-sized companies.

(2) User Responses To Self-Maintenance

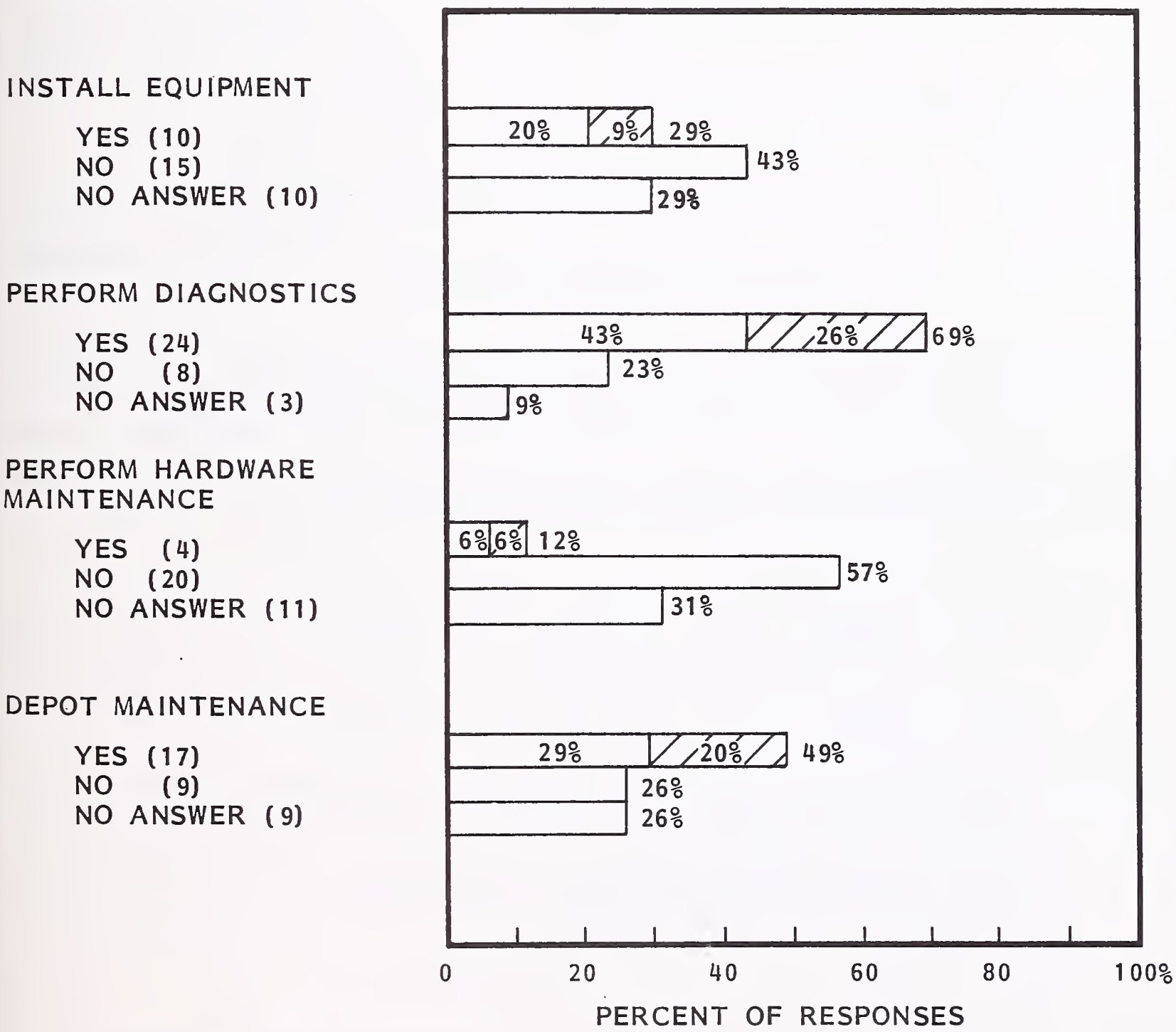
- The level of EDP sophistication and confidence in this sector lags behind the sectors discussed above. The responses shown in Exhibit IV-10 reflect this.

  - Resistance to installing and maintaining equipment is higher.

EXHIBIT IV-10

USER PANEL RESPONSES TO SELF-MAINTENANCE ISSUES IN THE WHOLESALE SECTOR

(NUMBER OF RESPONSES)



CURRENTLY PERFORMING

WILLING TO CONSIDER

NUMBER OF RESPONSES = 35

- The fact that people in this sector are comfortable with shipping materials is reflected in the very high willingness (half of the respondents) to participate in depot maintenance.

f. Retail Sector

(1) Sector Overview

- Retail trade is one of the largest economic sectors in terms of the number of its establishments and employees, and its contribution to the GNP. In 1977, this contribution was 9.3%.

  - The retail trade sector includes hardware stores, department stores, food stores, auto dealers, clothing stores, furniture stores, restaurants and all other retail establishments.

- As in other sectors, it is the "giants" of the sector that have done most with EDP, often out of necessity rather than desire. The magnitude of daily transactions in the large regional and national food and clothing chains has offered many opportunities for computerization.

  - Many of these opportunities, such as computer-driven checkout scanners, on-line credit verification, and electronic banking, have taken years to implement, largely because of consumer and labor resistance.

- The reported 1979 growth of 20% in EDP expenditures for the retail sector exceeds the expected 10% growth in retail sales. This growth is due largely to inflation rather than real gains in productivity. The level of installed investment in POS and EFTS systems that have not yet been brought on-line is very high.

- The retail sector will continue to grow at about a 10% annual rate for the near future, with a growth trend favoring the national and regional chains rather than local stores.

- The importance of EDP in the retail industry will also continue to grow, and interindustry applications will become the primary growth area involving the banking, transportation and manufacturing functions as well as retailing.

- CATV and other television-based, consumer-oriented advertising, ordering, and purchasing systems are an experimental reality in several locations, but their widespread adoption is still five or more years away.

- Increased varieties of merchandise sold by nontraditional outlets, such as auto supplies in food stores, will provide an active area of need in software development for the next two to four years.

(2) User Responses To Self-Maintenance

- The most significant characteristic of this sector relative to willingness to participate in self-maintenance is shown in Exhibit IV-11.

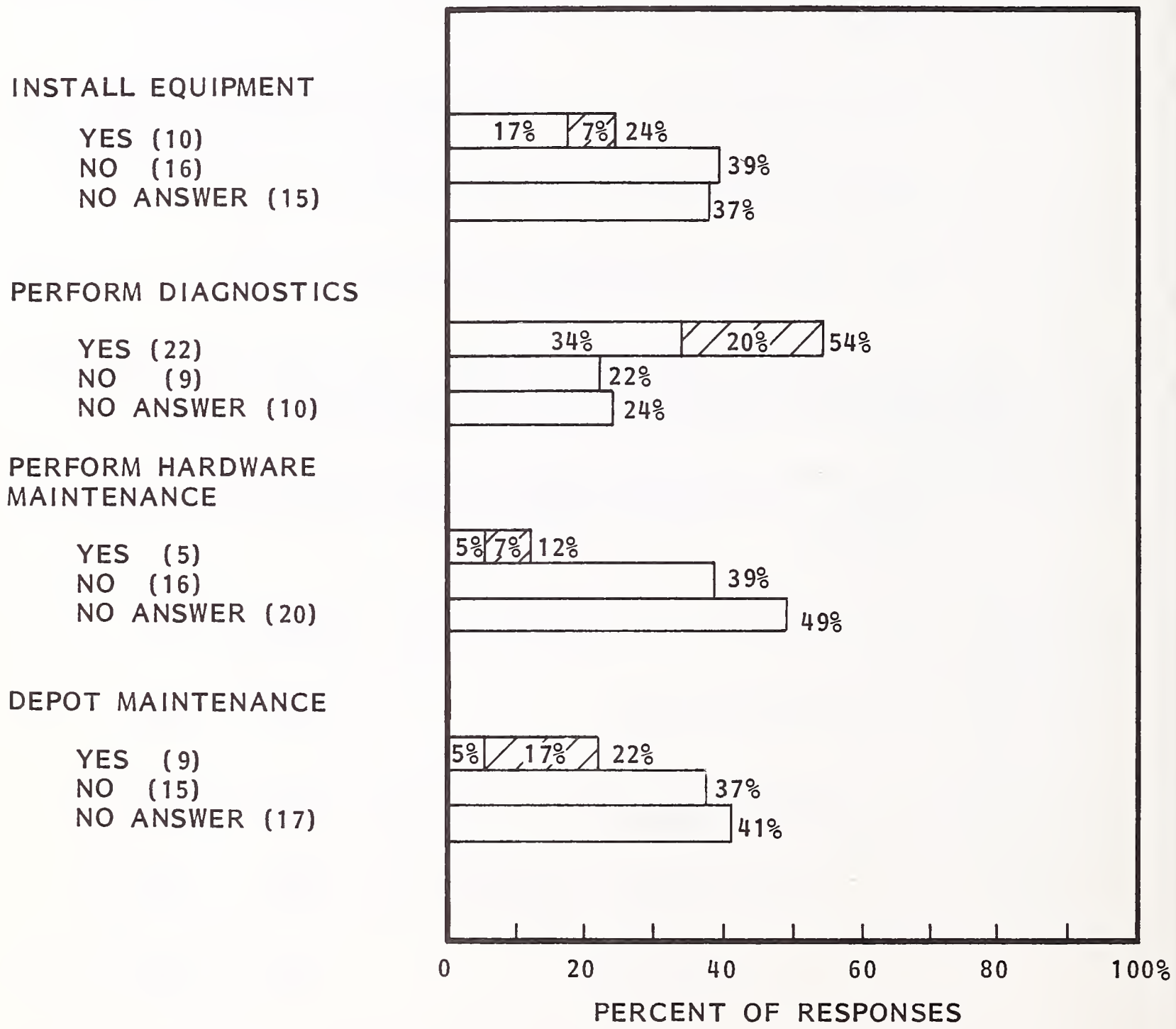
  - Positive responses were lower than the average of all sectors in all categories:

	Retail	All
. Install equipment	24%	30%
. Perform diagnostics	54%	62%
. Perform hardware maintenance	12%	14%
. Depot maintenance	22%	26%

EXHIBIT IV-11

USER PANEL RESPONSES TO SELF-MAINTENANCE ISSUES IN THE RETAIL SECTOR

(NUMBER OF RESPONSES)



CURRENTLY PERFORMING

WILLING TO CONSIDER

NUMBER OF RESPONSES = 41

- This resistance to nontraditional central EDP methods is consistent with this sector's resistance to other options, such as use of computer services.

- The retailing sector can be expected to be one of the more resistant sectors to user self-maintenance techniques, at least within the EDP establishment.

g. Banking and Finance Sector

(1) Sector Overview

- The banking and financial industry is composed of full-service and savings banks, credit and thrift institutions, security and commodity brokers, mortgage banking, and other holding and investment companies, which together make up not quite 2% of the GNP.

  - Commercial banking is the most heavily represented group in this sample, and is also the most diversified and advanced in its EDP usage and requirements.

- Despite vigorous competition, the financial and banking industries expect growth rates of 10-12%, as high or higher than other industry sectors surveyed for this study.

  - Final performance will be dependent upon economic conditions, particularly the level of interest rates that are set by the government, and also upon changes in federal and state regulations affecting checking accounts, loans and savings account interest rates.

  - These effects will be long-term, and may eventually alter the structure of the entire industry.

- EDP plays a significant role in achieving company growth in this sector. EDP and communications are key to an electronic funds transfer system (EFTS), which is the most widespread goal in banking today.

- EDP has moved to a position of major importance in banking and finance, especially when compared to the retailing sector (where EDP is still relatively unimportant) in terms of EDP employees per 100 total employees:

Company Size Annual Sales/Revenues	Retail	Banking and Finance
- $100 million or less	2.2	3.5
- $101-999 million	0.7	4.6
- $1 billion or more	0.9	6.1

- It is significant that the relative importance of EDP increases as the size of the banking and finance institution increases. This is a reflection of the strong trend to electronic banking (EFTS, automated teller machines, etc.) among the larger banks.

(2) User Responses To Self-Maintenance

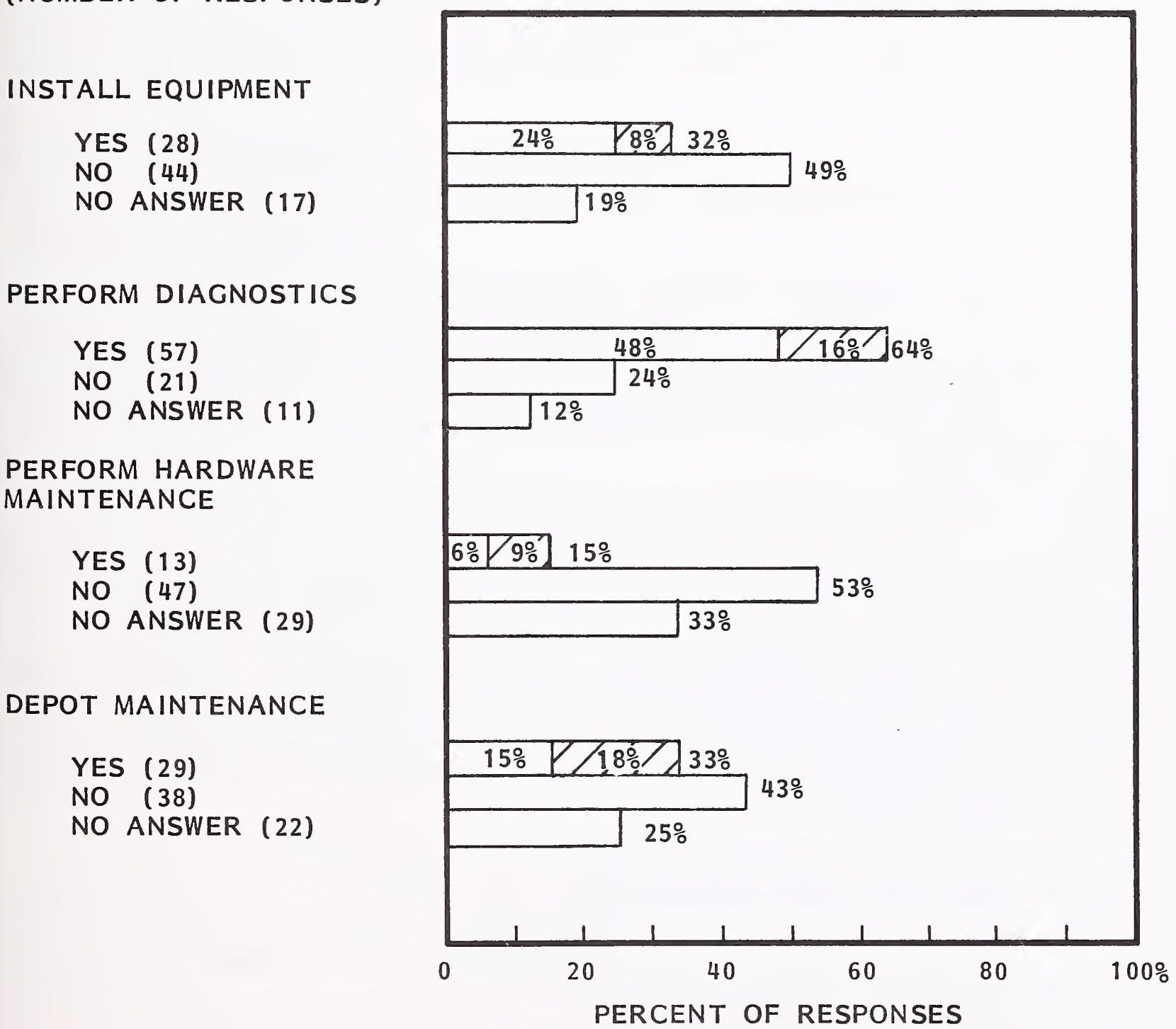
- The receptivity of the banking and finance sector to user maintenance issues is presented in Exhibit IV-12. Compared to the overall user profile:

  - Banking and finance respondents are slightly more receptive in all categories as far as the percentage of positive answers.

EXHIBIT IV-12

USER PANEL RESPONSES TO SELF-MAINTENANCE ISSUES IN THE BANKING AND FINANCE SECTOR

(NUMBER OF RESPONSES)



CURRENTLY PERFORMING

WILLING TO CONSIDER

NUMBER OF RESPONSES = 89

- The higher level of sophistication in this category is evident in the lower ratio of "no answers" in all categories. The users tend to be aware of the user maintenance options and have an answer. Therefore, the respondents also give a higher-than-average percentage of negative answers.

- The vendors marketing user self-maintenance in the banking and finance sector must keep these characteristics in mind.

  - Most users have formed opinions relative to user maintenance.

  - Users, particularly large ones, have built staffs to a size where they are a significant part of the total force.

  - The level of technical competence in EDP in this sector is high.

  - Because of these factors, at least one large bank is considering training and installing its own field engineering force.

h. Insurance Sector

(1) Sector Overview

- The insurance industry comprises property and liability, life and health insurance carriers, plus brokers, agents and services. Although they are all aggregated into two SIC codes (63 and 64), their operating characteristics are very diverse.

- The life insurance business, with nearly 1,800 firms, generates about 20% of the total premiums written, while property and liability companies account for twice that much. All together, the insurance business produces about 1.6% of the GNP.

- Inflation, a particular concern to the insurance industry, is putting pressure on operating costs, causing companies to intensify efforts to control expenses and increase productivity. Hence, the industry continues to stress automation to handle the rising transaction volume. The resulting introduction of new product lines and the necessity to maximize investment income both generate new EDP requirements.

- EDP is highly centralized in insurance companies. Exposure to EDP and communications by executives in this sector is likely to be second only to banking executives, if at all.

- The life insurance industry grew about 10% in 1978 in dollar value of premiums written, and the same level of growth is indicated for 1979 as well as the next five years after that.

- EDP is considered very important for meeting growth objectives, with computer/communication systems providing a competitive advantage as well as an essential basis for service reliability.

(2) User Responses To Self-Maintenance

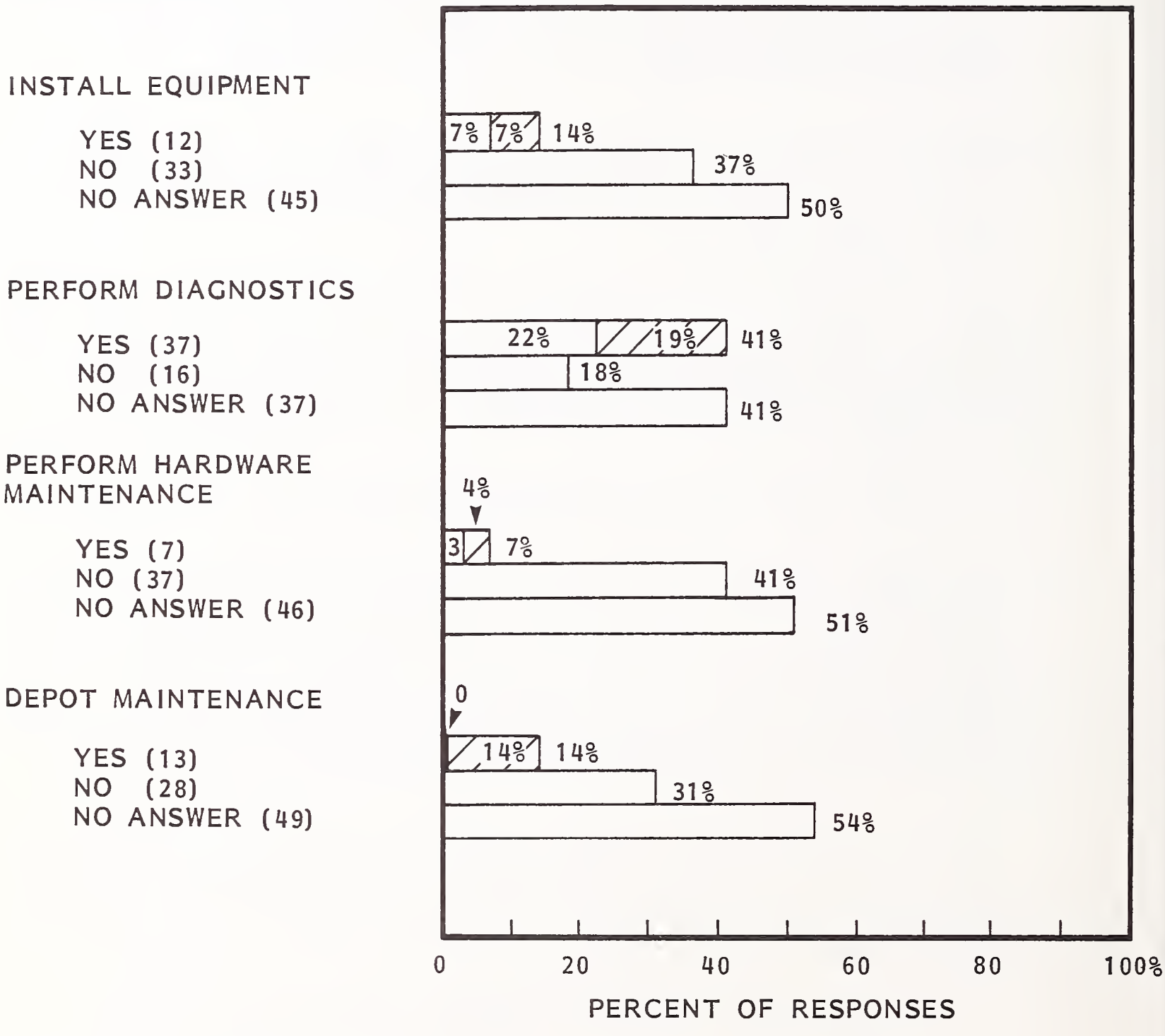
- The highly centralized EDP structure in the insurance sector has created a certain rigidity in the acceptance of new approaches. This is evidenced by a slower acceptance of the use of computer services in this sector, and the lagging position of the sector relative to the installation of distributed data processing. The sector is also resistant to involvement in user maintenance.

- As shown in Exhibit IV-13, insurance industry respondents are significantly less involved in user maintenance, with only half as many positive responses as the survey average across sectors.

  - No respondents are currently using depot maintenance.

EXHIBIT IV-13

USER PANEL RESPONSES TO SELF-MAINTENANCE ISSUES IN THE INSURANCE SECTOR



NUMBER OF RESPONSES = 90

- Negative responses closely paralleled the survey average, while the highest percentages fell into the "no answer" category - further evidence of the respondents' resistance to involvement.

- With correct marketing techniques, vendors may be able to turn many of the "no answer" respondents into "yes." At this time, the best techniques would include appeals to the sector's interest in cost control and increased productivity.

i. Service and Other Industries Sector

(1) Sector Overview

- The information contained in this section is intended to summarize findings for companies not included in the previously defined eight industry sectors.

- It should not be assumed that these findings typify any industry group within this category.

- Respondents included in this section are representatives from education, construction, real estate, business and personal services of all types, together with a few companies that did not fall unequivocally into any other category.

(2) User Responses To Self-Maintenance

- The education sector, as shown in Exhibit IV-14, is the single most receptive sector to user maintenance.

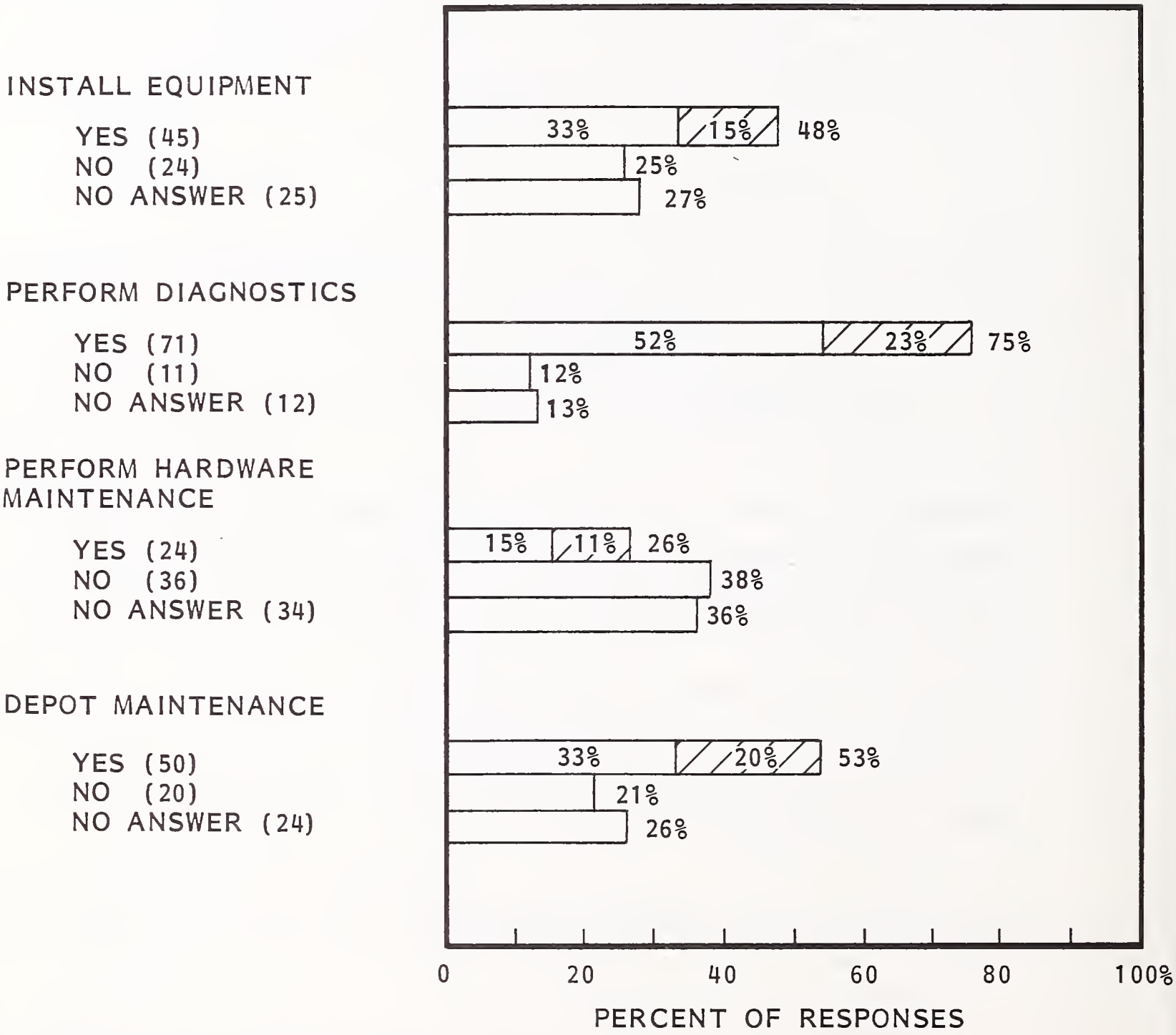
- Those currently involved in user maintenance exceed even those who would consider it in the insurance sector.

- The education sector, with its current pressures due to reduced budgets, is an excellent area for promotion of user maintenance.

EXHIBIT IV-14

USER PANEL RESPONSES TO SELF-MAINTENANCE ISSUES IN THE EDUCATION SECTOR

(NUMBER OF RESPONSES)



CURRENTLY PERFORMING

WILLING TO CONSIDER

NUMBER OF RESPONSES = 94

- Government sectors, which include responses from federal, state and local EDP managers, closely parallel the average attitudes of the total survey respondents, as shown in Exhibit IV-15.

  - Due to government regulations, GSA activities and the like, the government sectors must often be viewed as a special case.

  - Vendors must consider the unique characteristics of the government sectors in formulating user maintenance programs.

- The services and other industry sector includes a range of activities including agriculture, real estate, recreation and the like. It does not lend itself to vertical industry analysis.

  - As shown in Exhibit IV-16, the conglomeration of responses results in a profile very close to the average for the whole survey.

  - Vendors approaching individual subsectors would do well to consider their characteristics relative to their degree of EDP sophistication and commitment as an indication of their receptivity to user maintenance. Those sectors that are more advanced, such as banking and finance and education, tend to be more receptive.

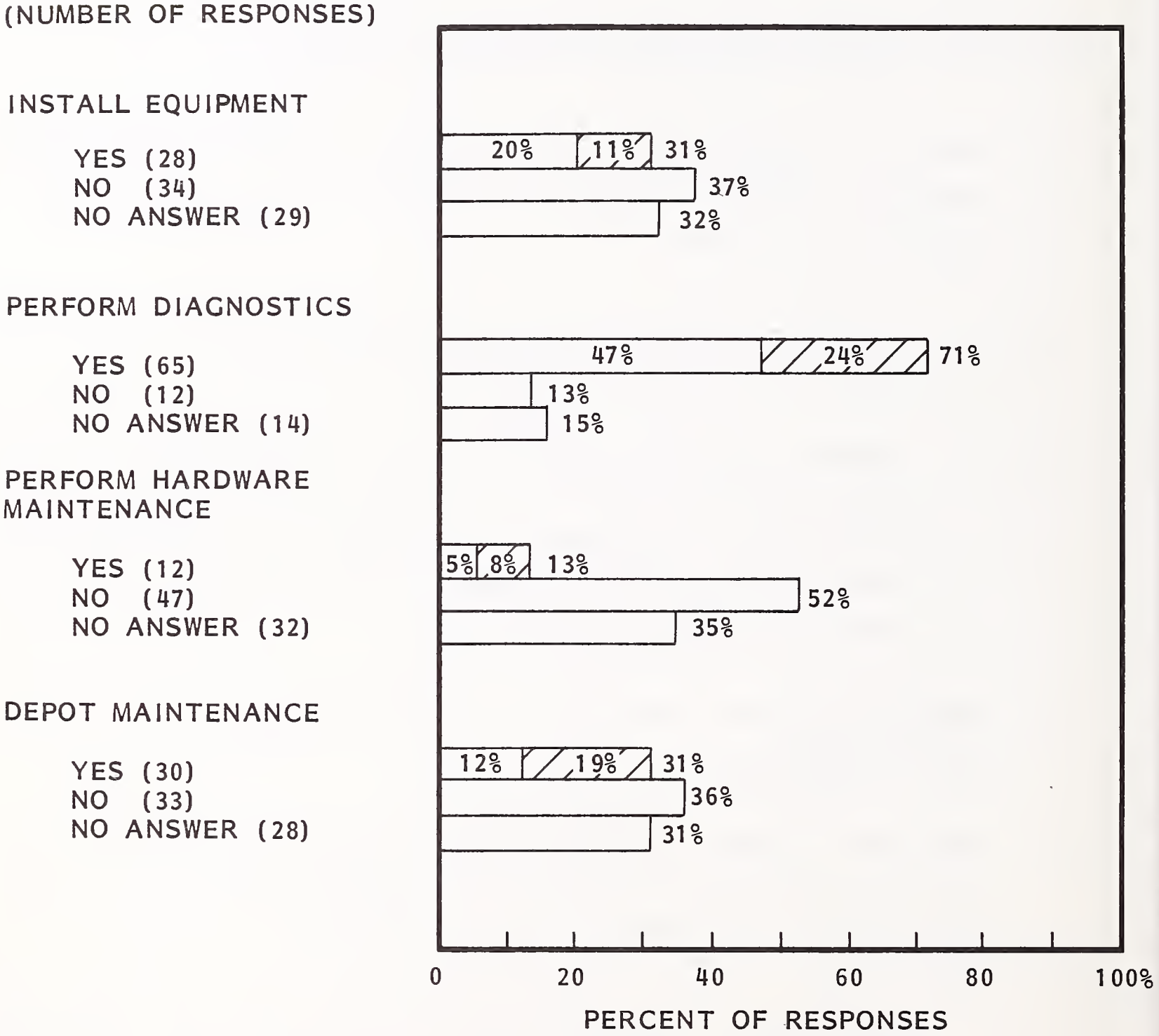
3. IBM INSTALLATIONS COMPARED TO MIXED OR NON-IBM INSTALLATIONS

- User panel responses were also analyzed to determine, in IBM-dominated installations, whether they were more or less likely to take on user maintenance. Results are tabulated in Exhibits IV-17 and IV-18.

  - IBM shops tend to be slightly more receptive. This can be due largely to IBM's recent product introductions (4300 Series, 8100, 3101 terminals), which include user maintenance aspects.

EXHIBIT IV-15

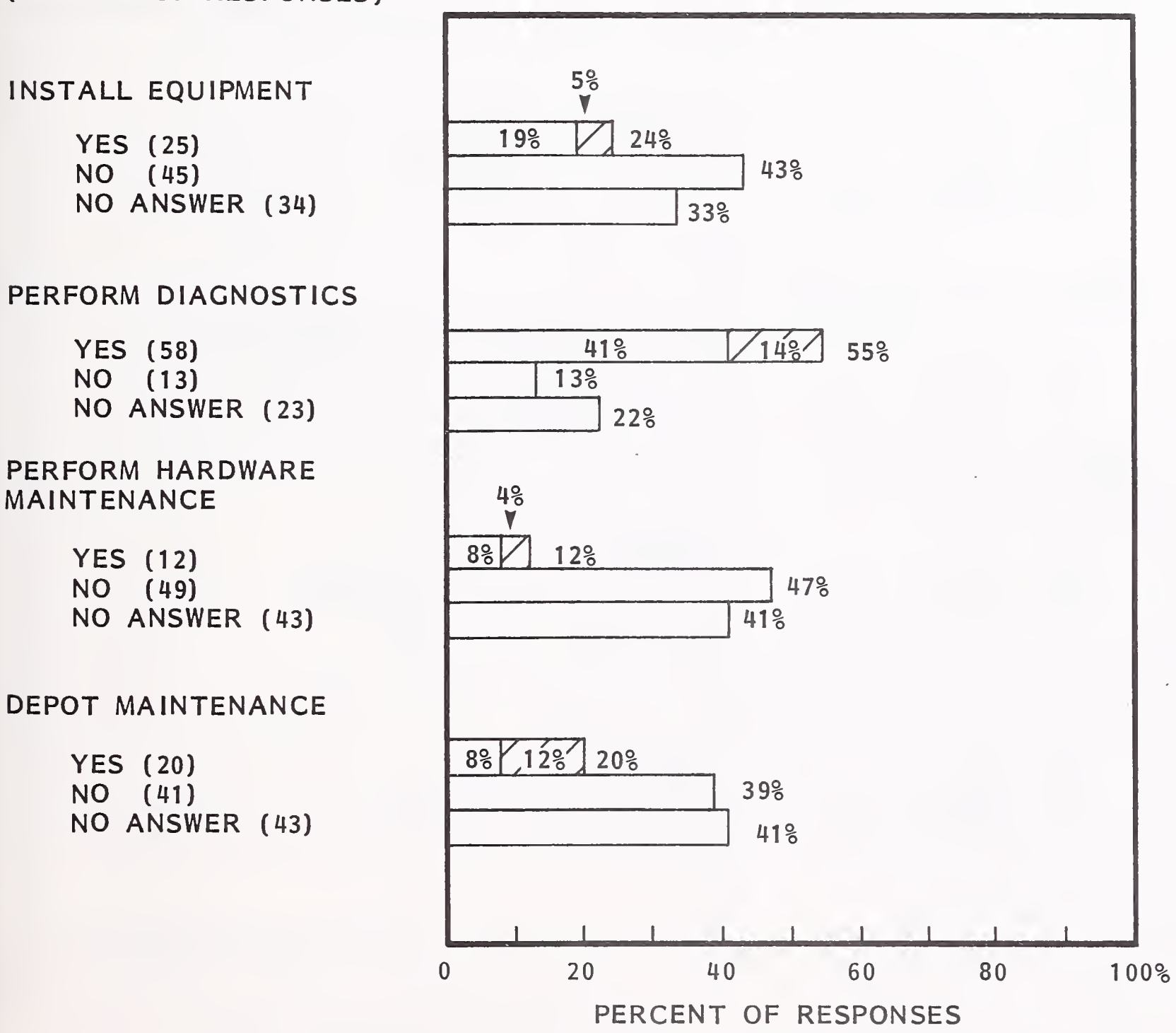
USER PANEL RESPONSES TO SELF-MAINTENANCE ISSUES IN THE GOVERNMENT SECTOR



NUMBER OF RESPONSES = 91

EXHIBIT IV-16

USER PANEL RESPONSES TO SELF-MAINTENANCE ISSUES IN THE SERVICE/OTHER SECTOR

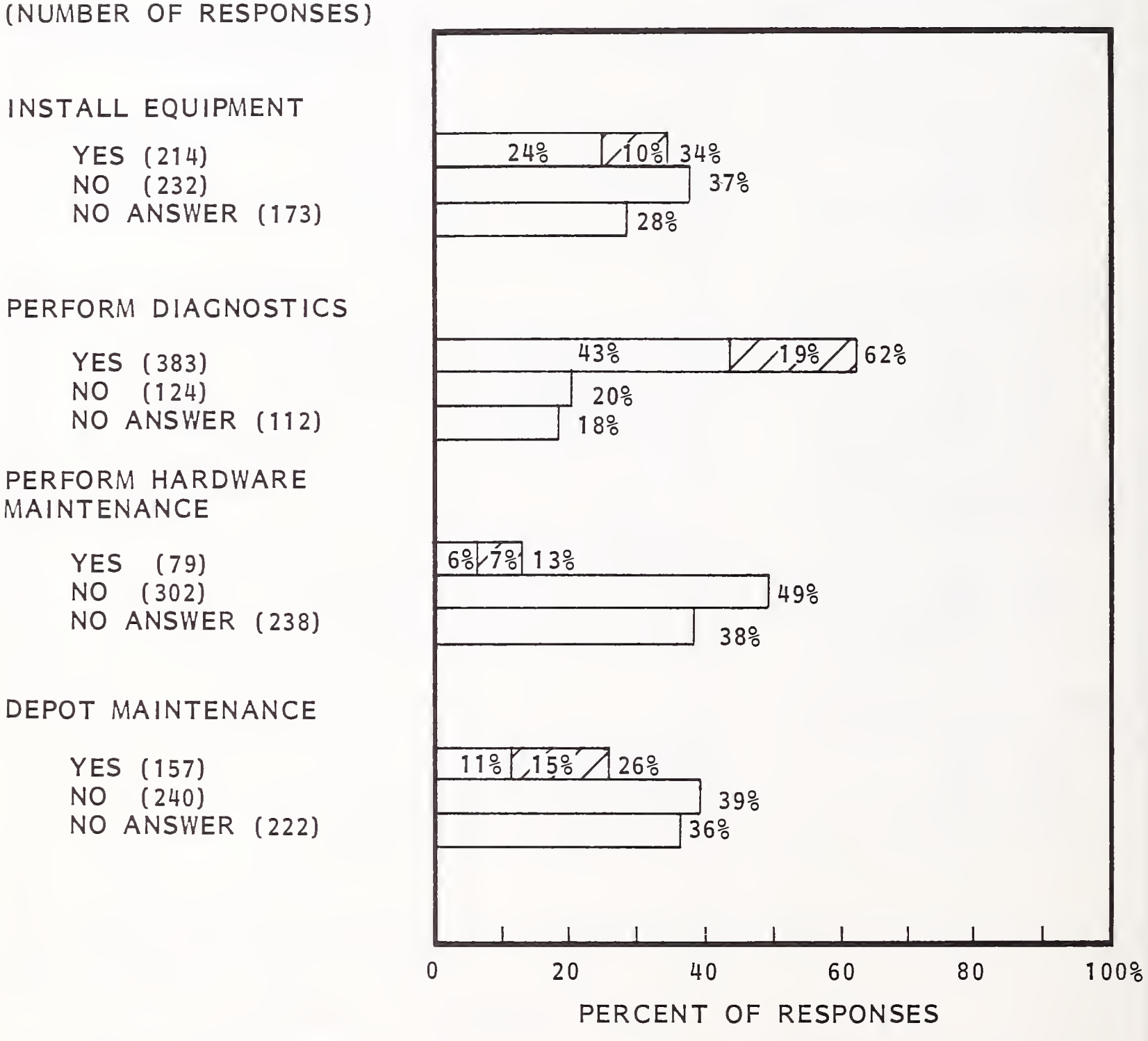


NUMBER OF RESPONSES = 104

EXHIBIT IV-17

USER PANEL RESPONSES TO SELF-MAINTENANCE ISSUES IN IBM INSTALLATIONS

(NUMBER OF RESPONSES)



CURRENTLY PERFORMING

WILLING TO CONSIDER

NUMBER OF RESPONSES = 619

EXHIBIT IV-18

USER PANEL RESPONSES TO SELF-MAINTENANCE ISSUES IN MIXED AND NON-IBM INSTALLATIONS

(NUMBER OF RESPONSES)

INSTALL EQUIPMENT

YES (139)
NO (204)
NO ANSWER (130)

PERFORM DIAGNOSTICS

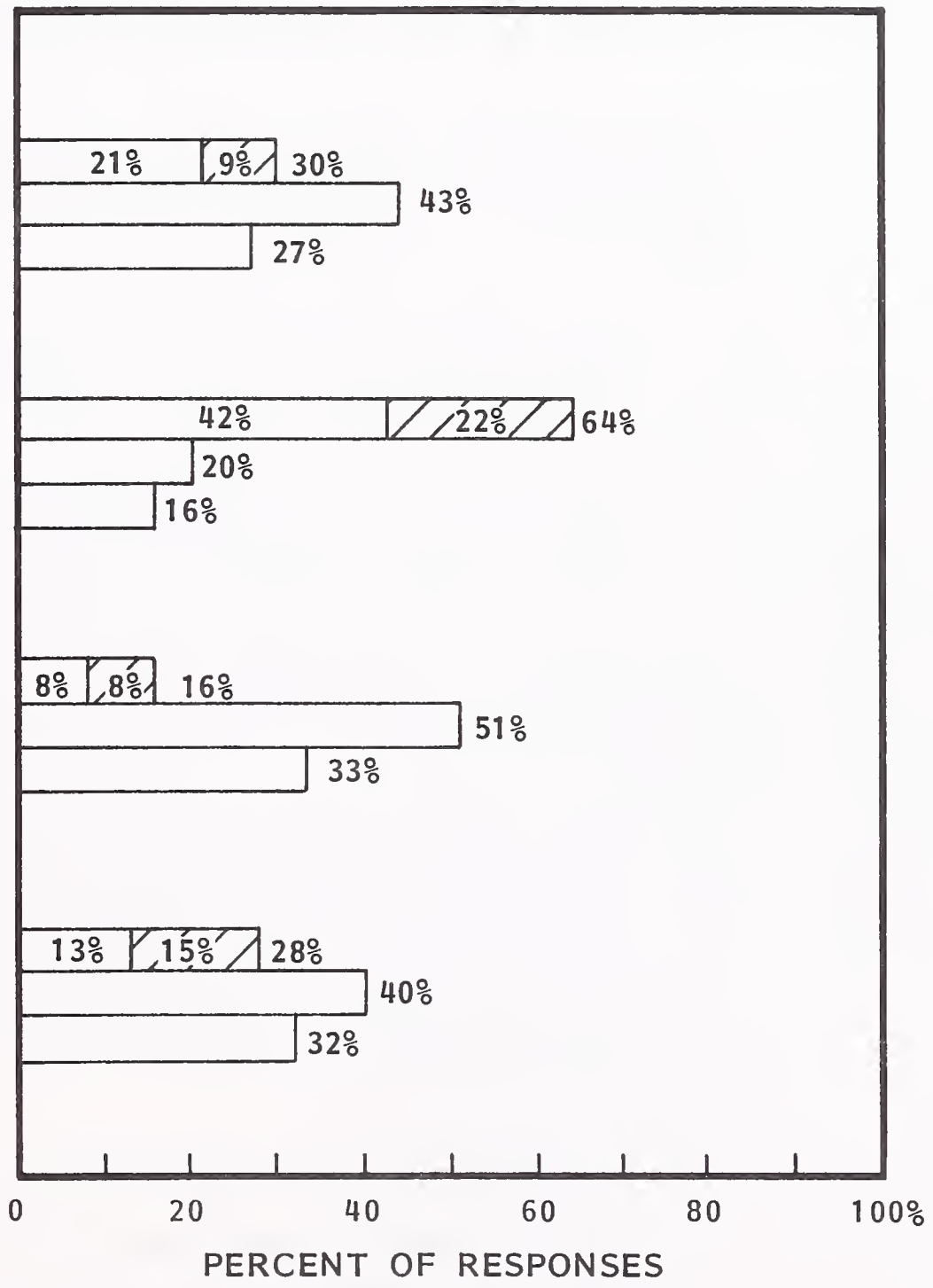
YES (303)
NO (95)
NO ANSWER (75)

PERFORM HARDWARE MAINTENANCE

YES (75)
NO (242)
NO ANSWER (156)

DEPOT MAINTENANCE

YES (133)
NO (190)
NO ANSWER (150)



CURRENTLY PERFORMING

WILLING TO CONSIDER

NUMBER OF RESPONSES = 473

- The close parallel between IBM and non-IBM shops shows that user attitudes are formed by issues inherent at the user level (personnel costs, demand for up-time, backlog of applications development) and not by a particular vendor's product line.

- Other vendors confront the same mix of opportunities and user resistance relative to user maintenance as does IBM.

4. ATTITUDES BY SIZE OF RESPONDING COMPANY

- A final parameter which vendors can use in developing a strategy for user maintenance is to evaluate their client base from the standpoint of company size.

  - Some products, such as small business computers, are targeted at smaller companies.

  - Other products, such as high-speed, high-capacity peripherals are targeted at larger companies.

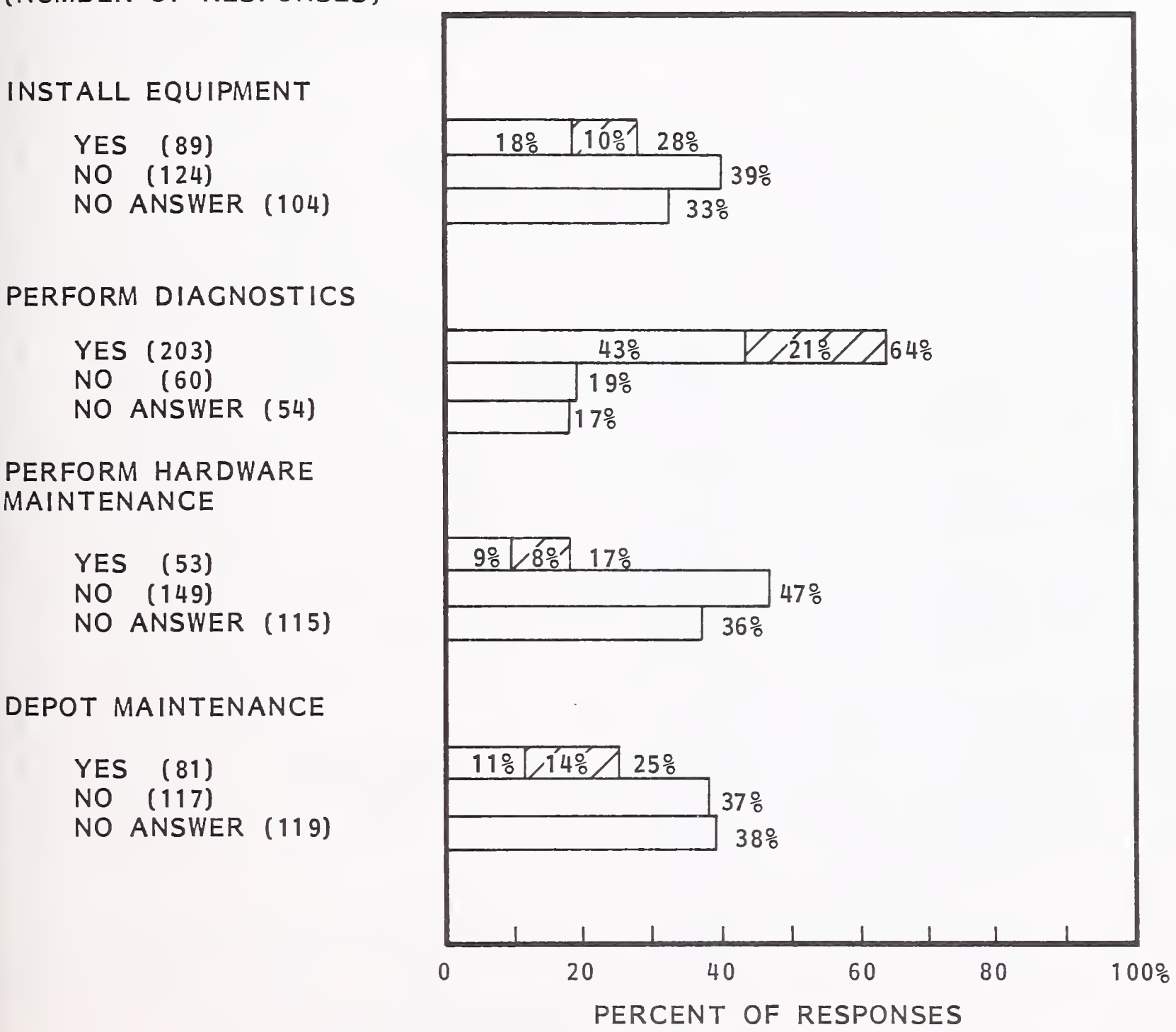
- A comparison of Exhibits IV-19, IV-20 and IV-21 shows a shift in attitude among the companies with sales of over $1 billion per year.

  - Companies with annual sales of up to $100 million, shown in Exhibit IV-19, are similar to those with $100 million to $1 billion, shown in Exhibit IV-20, and closely parallel the results of the total survey; although the smaller companies are somewhat more receptive to performing hardware maintenance.

  - Companies with annual sales over $1 billion are very resistant to doing their own hardware maintenance, with only 1% currently involved. In some other aspects, particularly installation, the large companies are actually more receptive than the smaller ones.

EXHIBIT IV-19

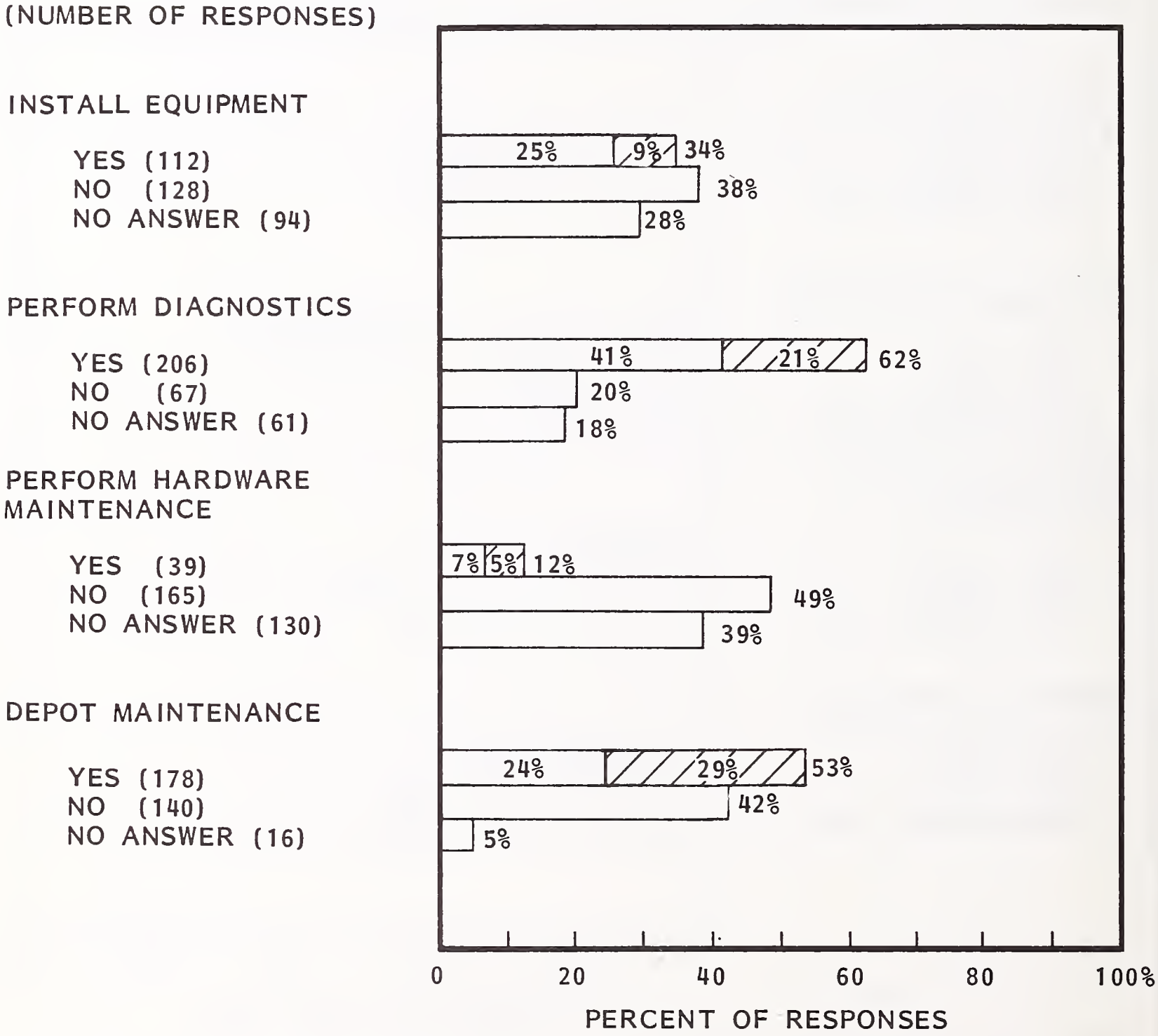
USER PANEL RESPONSES TO SELF-MAINTENANCE ISSUES IN COMPANIES WITH ANNUAL REVENUES OF $0-100 MILLION



NUMBER OF RESPONSES = 317

EXHIBIT IV-20

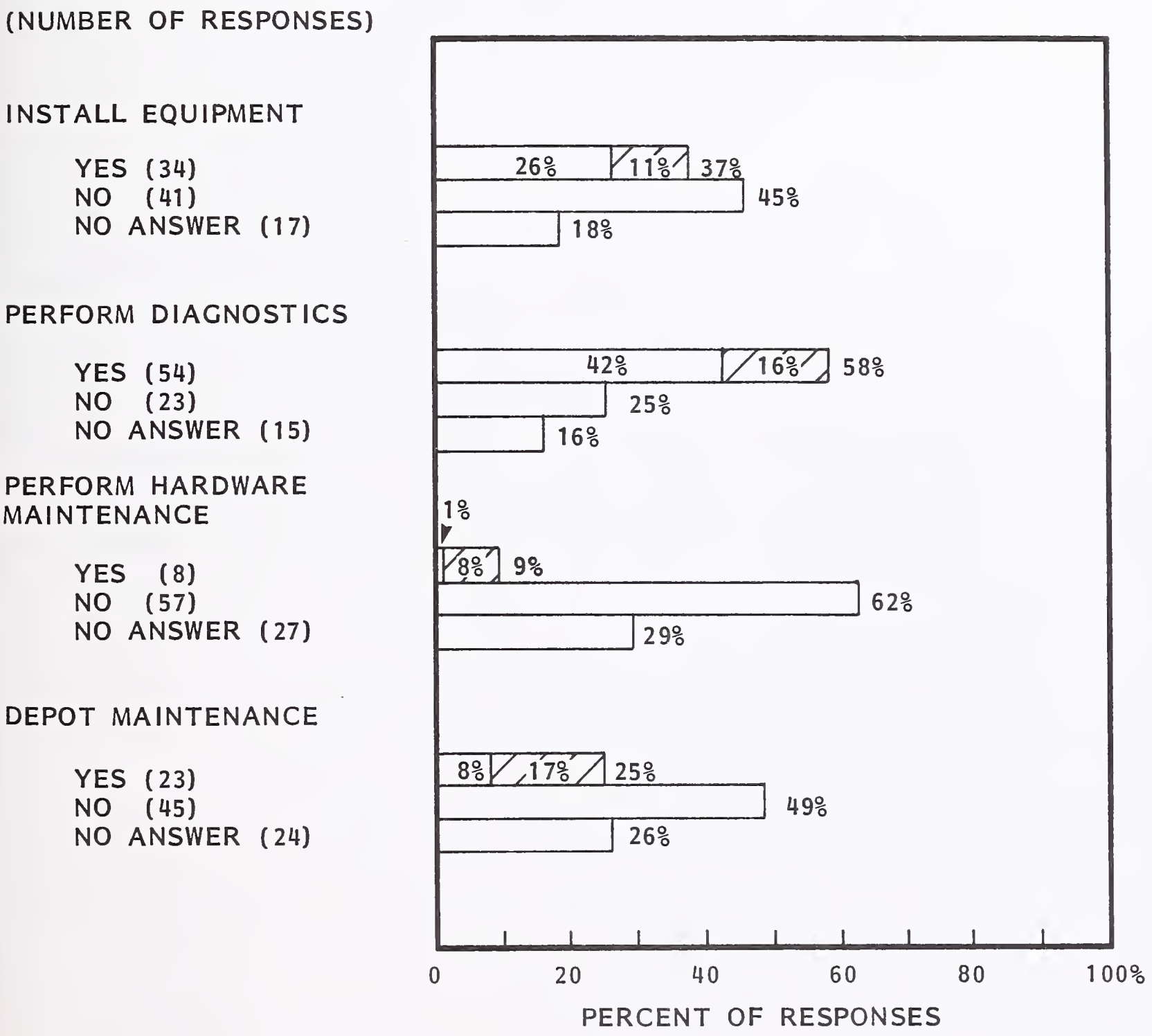
USER PANEL RESPONSES TO SELF-MAINTENANCE ISSUES IN COMPANIES WITH ANNUAL REVENUES OF $100 MILLION TO $1 BILLION



NUMBER OF RESPONSES = 334

EXHIBIT IV-21

USER PANEL RESPONSES TO SELF-MAINTENANCE ISSUES IN COMPANIES WITH ANNUAL REVENUES OF $1 BILLION AND OVER



NUMBER OF RESPONSES = 92

- The attitude of the large companies comes primarily from EDP managers' needs to optimize the use of their personnel on the major problem of installing the applications in their growing backlog of new applications under development.

5. SUMMARY

- The great quantity of data collected from 912 respondents on INPUT's user panel provides a current look at user attitudes toward self-maintenance as of mid-1980.

- User attitudes are not formed by the maintenance issue itself, because maintenance is not a major issue in the minds of users. Rather, user attitudes are formed by the personnel and management issues that EDP managers perceive to be key to their survival and growth.

- User attitudes tend to be fairly uniform across industry sectors, vendor-installed bases and company sizes. However, in developing strategies for implementing user maintenance on current and new products, vendors must consider those differences that could be significant on certain products and strategies.

  - Some sectors (e.g., education) are much more receptive to user maintenance than others (e.g., insurance).

  - Small companies are more receptive than very large ones.

  - Many users are still undecided and can be swayed by an approach which considers their prime needs.

APPENDIX A: DEFINITIONS

APPENDIX A: DEFINITIONS

- DISTRIBUTED DATA PROCESSING: the deployment of programmable intelligence to the site where the particular data processing function is performed. Computers and terminals are interconnected through a telecommunications network adapted to individual user needs.

- ENGINEERING CHANGE NOTICE: notice of improvements or corrections in a product after it has been released to production or has been installed at the user's site.

- ENGINEERING CHANGE ORDER (ECO): instructions including bill of material and parts required to effect the engineering change.

- FIELD ENGINEER (FE): individual who responds to a user's call for service and repairs a device or system. FE is used interchangeably with customer engineer, serviceperson, maintenance person, etc.

- FIRST-LINE MANAGER (FLM): individual at the first or lowest level of management in the field organization, usually at the branch level.

- MEAN TIME TO RESPOND: the elapsed time between a user's service call and a field engineer's arrival at the user's location.

- MEAN TIME TO REPAIR: the elapsed time between a field engineer's arrival at the user's site and the repaired device's return to full operation.

- MEAN TIME BETWEEN FAILURES (MTBF): the elapsed time between reported failures on a device or system.

- REMOTE DIAGNOSTICS (RD): diagnostics run by the vendor from a remote location without the intervention of the user's operator, diagnostics run by an on-site field engineer tied to a central support center, or by a user tied to a central support center. It can usually isolate a fault to the lowest exchangeable unit.

- SYSTEM SUPPORT CENTER (SSC): a central technical support facility staffed by highly skilled field engineers and accessed over a national "hotline" number. A system support center is available to both users and field engineers for the analysis of problems in hardware, software or a combination of the two.

- USER SELF-MAINTENANCE (USM): some involvement by individual users in the installation, diagnosis and repair of their own installed equipment.

APPENDIX B: QUESTIONNAIRES

USER SELF MAINTENANCE

USER QUESTIONNAIRE

CONFIDENTIAL

I. INSTALLATION

1. Do you currently install any of your own equipment?

☐ Yes

☐ No (see I.b.)

a. If yes:

1) What type of equipment:

☐ Mainframe

☐ Minicomputer

☐ Small Business Machine

☐ Peripheral

☐ Terminal

2) Is this equipment located at:

☐ Central Data Processing Facility

☐ Remote Location

3) Is it designed for user installation?

☐ Yes

☐ No

4) What cost savings did you receive for installing yourself?

_____ %

5) Did the vendor prepare your people by providing:

- ☐ Manuals
- ☐ Classroom Courses
- ☐ Packaged Courses
- ☐ Documentation
- ☐ Tools
- ☐ None

6) If you have problems installing a machine, what help does the vendor supply?

_____

_____

At what cost?

$ _____

What should the vendor supply?

_____

_____

At what cost?

$ _____

7) Do you have personnel capable of installing other equipment at the central DP facility?

- ☐ No
- ☐ Mainframe
- ☐ Minicomputer
- ☐ Small Business Machine
- ☐ Peripheral
- ☐ Terminal

8) How about at remote locations?

- ☐ No
- ☐ Mainframe
- ☐ Minicomputer
- ☐ Small Business Machine
- ☐ Peripheral
- ☐ Terminal

9) Would you be willing to install any of these other types of machines?

- ☐ Yes
- ☐ No

What savings would you expect to receive for doing so?

_____ %

b. If no:

1) Would you consider installing some of your own equipment?

- ☐ Yes
- ☐ No

If no, why?

_____

_____

_____

If yes, why?

_____

_____

_____

2) For what types of equipment do you currently have personnel capable of performing installation?

- ☐ None
- ☐ Mainframe
- ☐ Minicomputer
- ☐ Small Business Machine
- ☐ Peripheral
- ☐ Terminal

3) How about at remote locations?

- ☐ None
- ☐ Mainframe
- ☐ Minicomputer
- ☐ Small Business Machine
- ☐ Peripheral
- ☐ Terminal

4) For which equipment types would you actually install the equipment?

Central	Remote	
☐	☐	None
☐	☐	Mainframe
☐	☐	Minicomputer
☐	☐	Small Business Machine
☐	☐	Peripheral
☐	☐	Terminal

5) What cost savings would you expect?

_____ %

6) What preparation would you require to be able to do your own installation?

- ☐ Manuals
- ☐ Classroom Courses
- ☐ Packaged Courses
- ☐ Documentation
- ☐ Tools
- ☐ None

7) If you had problems installing a machine, what help would you expect from the vendor?

_____

_____

At what cost?

$ _____

II. DIAGNOSTICS

1. Do you currently run diagnostic routines before calling the field engineer for support?

- ☐ Yes
- ☐ No (see II.b.)

a) If yes:

1) What is the skill level of the operator?

_____

_____

_____

2) What training was provided by the vendor?

- ☐ Manuals
- ☐ Classroom Courses
- ☐ Packaged Courses
- ☐ Documentation
- ☐ Tools
- ☐ None

3) Was this training adequate?

- ☐ Yes
- ☐ No

4) Are the diagnostic routines accurate in determining failures?

- ☐ Yes
- ☐ No
- ☐ Don't Know

b) If no:

1) Does the field engineer run diagnostic routines when he arrives?

- ☐ Yes
- ☐ No
- ☐ Don't Know

2) Could you perform this function yourself?

- ☐ Yes
- ☐ No
- ☐ Don't Know

If no, why?

_____

_____

_____

3) Do you foresee doing your own diagnostics in the future?

☐ Yes

☐ No

If yes, on what type of equipment would you perform diagnostics?

☐ Mainframe

☐ Minicomputer

☐ Small Business Machine

☐ Peripheral

☐ Terminal

If no, why?

_____

_____

_____

III. REMOTE DIAGNOSTICS

1. Does any vendor have remote diagnostic capability on your equipment?

☐ Yes

☐ No

Does he use it?

☐ Yes

☐ No

a) If yes:

1) On what equipment are the remote diagnostics performed?

- ☐ Mainframe
- ☐ Minicomputer
- ☐ Small Business Machine
- ☐ Peripheral
- ☐ Terminal

2) Are the remote diagnostic routines accurate in determining failures?

- ☐ Yes
- ☐ No

3) Does the use of remote diagnostics improve the quality of maintenance?

- ☐ Yes
- ☐ No

4) When a problem occurs, does the vendor run the remote diagnostics:

- ☐ Before Sending an FE
- ☐ After an FE Arrives On-Site

5) Could remote diagnostics replace an on-site FE for fault diagnosis?

- ☐ Yes
- ☐ No
- ☐ Don't Know

Comments: _____

_____

_____

6) Is data security a concern when a vendor performs diagnostics?

☐ Yes

☐ No

If yes, why?

_____

_____

_____

b) If no:

1) Would you be willing to pay for remote diagnostic capability on new equipment?

☐ Yes

☐ No

How much?

_____ % Increase to Present Cost

2. Do you currently have machines that run standalone diagnostics?

☐ Yes

☐ No

a) If yes:

1) What types of equipment?

☐ Mainframe

☐ Minicomputer

☐ Small Business Machine

☐ Peripheral

☐ Terminal

2) What vendors provide this service on their equipment?

- _____
- _____
- _____
- _____

3) Were standalone diagnostics the reason for selecting this equipment?

☐ Yes
☐ No

4) Are the standalone diagnostics accurate in determining failures?

☐ Yes
☐ No
☐ Don't Know

b) If no:

1) Would standalone diagnostics be a factor in selecting equipment to be installed in the future?

☐ Yes
☐ No

If yes, what equipment types?

☐ Mainframe
☐ Minicomputer
☐ Small Business Machine
☐ Peripheral
☐ Terminal

How much extra would you be willing to pay for these features?

_____ %

IV. REPAIR INVOLVING THE USER

1. Do you currently participate in the maintenance of your own equipment?

- ☐ Yes
- ☐ No

a) If yes:

1) What types of equipment?

- ☐ Mainframe
- ☐ Minicomputer
- ☐ Small Business Machine
- ☐ Peripheral
- ☐ Terminal

2) Is it located at:

- ☐ Central DP Facility
- ☐ Remote Site

3) What functions do you perform?

- ☐ Perform preventative maintenance
- ☐ Identify which piece is faulty
- ☐ Swap units and send to depot
- ☐ Swap units and repair yourself
- ☐ Swap boards and send to depot

4) What training was provided by the vendor?

- ☐ Manuals
- ☐ Classroom Courses
- ☐ Packaged Courses
- ☐ Tools
- ☐ None

5) Was this training adequate?

☐ Yes

☐ No

6) How could it be improved?

_____

_____

_____

7) Do you have the capability to participate in other equipment service?

☐ Yes

☐ No

☐ Mainframe

☐ Minicomputer

☐ Small Business Machine

☐ Peripheral

☐ Terminal

b) If no:

1) Do you have the capability to:

☐ Perform Preventative Maintenance

☐ Swap Units

☐ Swap Boards

☐ Swap Components

2) Would you be willing to do so for any of your equipment?

- ☐ Yes
- ☐ No
  - ☐ Mainframe
  - ☐ Minicomputer
  - ☐ Small Business Machine
  - ☐ Peripheral
  - ☐ Terminal

3) What cost savings would you expect?

_____ %

4) What training would you require from the vendor?

- ☐ Manuals
- ☐ Classroom Courses
- ☐ Packaged Courses
- ☐ Tools
- ☐ None

5) Is the incentive to participate:

- ☐ Monetary
- ☐ Speed of Repair
- ☐ Other _____
- ☐ _____

Comments: _____

_____

_____

_____

_____

USER SELF-MAINTENANCE - PART 2

1. Do you know of the IBM announcement regarding the do-it-yourself aspects of the 3101 display terminal?

   If no, give brief outline of announcement. (outline attached)

   If yes:

   a. What is your general reaction?

   _____

   _____

   _____

   _____

   b. Rate your acceptance on a scale of 0-5 (0 = total rejection, 3 = I'll live with it, 5 = great idea, right way to go) for the following:

	Rating
1) Self-ordering by phone	0 1 2 3 4 5
2) Self-installation	0 1 2 3 4 5
3) Self-maintenance/diagnostics	0 1 2 3 4 5
4) Return to depot for repair	0 1 2 3 4 5

Comments: _____

_____

_____

_____

_____

c. Do you see this concept spreading to more complex equipment?

☐ Yes ☐ No

Give examples: _____

_____

or

Why not: _____

_____

d. Provided price and performance were competitive, would you rate the "do-it-yourself" concept as high, medium, or low influence?

☐ High ☐ Medium ☐ Low

As negative or positive factor?

☐ - ☐ +

e. How sympathetic are you of the need for vendors to reduce the labor content in maintenance because of:

1) Shortage of trained staff

_____

_____

_____

2) Rising costs

_____

_____

_____

2. a. If by remote diagnostics a vendor could identify a failing module in your mainframe, please rate your willingness to swap that module (assuming a spare is on-site) on a scale of 0-5 (0 = would not consider, 3 = not really willing, but I will, 5 = quite willing):

What are your reasons? _____

_____

_____

(If "0", skip question b.)

b. Now rate your willingness to return the failed module to the vendor as high, medium, or low.

☐ High ☐ Medium ☐ Low

If "low", why not? _____

_____

_____

c. Rate your willingness to buy and hold spare parts as high, medium, or low.

☐ High ☐ Medium ☐ Low

1) If a rating of "3" or over, what percentage of initial equipment cost would you invest in parts inventory?

_____ %

Reasons: _____

_____

_____

d. Rate your willingness to store and accept liability for vendor-owned spares at your location as high, medium, or low.

☐ High ☐ Medium ☐ Low

Reasons: _____

_____

_____

e. Do you associate more self-maintenance with:

	Yes	D/K*	No
1) More reliable equipment	☐	☐	☐
2) Less reliable equipment	☐	☐	☐
3) Faster repair	☐	☐	☐
4) Poorer maintenance	☐	☐	☐
5) Lower maintenance price	☐	☐	☐

Comments: _____

_____

_____

_____

_____

*Don't Know

f. Rate your willingness to accept the "Xerox Copier Key Operator" concept on a scale of 0-5 (0 = never, 3 = accept under protest, 5 = OK) to your equipment:

Mainframe:

Other: (identify)

Reasons: _____

_____

_____

3. Do you expect your satisfaction with field service maintenance to improve, stay the same, or decline over the next two years?

☐ Improve ☐ Same ☐ Decline

Comments: _____

_____

_____

_____

_____

CATALOG NO. U P 8 0 | | | | (1)

EDP USER QUESTIONNAIRE

A. GENERAL INFORMATION

1. Primary business _____
2. SIC (If known) _____ (2)
3. Total number of employees _____ (3)
4. Number of EDP employees _____ (4) Company size ($ million): _____ (5)
5. Annual sales ($ million) _____ (6) or 6. Assets ($ million): _____ (7)
7. If size is measured by some other scale, please indicate _____ (8)

   Are the above statistics for: 8. ☐ Division/subsidiary? or 9. ☐ Total corporation? (9)

10. If division/subsidiary, what is corporate size? ($ million): $_____ (10)

B. EDP PLANS

11. What are your primary objectives and priorities for the next three years? (Rank the top five in order of priority: 1 through 5, 1 being most important, 2 second, etc., for each of the three years.)

CATEGORY (11-37)	PRIORITY RANKING 1980	1981	1982	CATEGORY (CONT.) (38-61)	PRIORITY RANKING 1980	1981	1982
Convert applications	(11)	(12)	(13)	Centralize EDP control	(38)	(39)	(40)
Develop new batch applications	(14)	(15)	(16)	Decentralize EDP control	(41)	(42)	(43)
Install on-line applications	(17)	(18)	(19)	Develop long range EDP plan	(44)	(45)	(46)
Design/install DBMS	(20)	(21)	(22)	Meet development/conversion schedules	(47)	(48)	(49)
Design/install DDP Network	(23)	(24)	(25)	Improve EDP personnel productivity	(50)	(51)	(52)
Install new mainframe	(26)	(27)	(28)	Integrate office automation with EDP	(53)	(54)	(55)
Install minicomputers	(29)	(30)	(31)	Other (Please specify and indicate priority) _____	(56)	(57)	(58)
Install new peripherals	(32)	(33)	(34)				
Change operating systems	(35)	(36)	(37)	_____	(59)	(60)	(61)

12. Has your budget been impacted by the possibilities of recession? (1) Yes _____ (2) No _____ (62)
13. If yes, by what percent _____% (63) and in what areas? _____ (64)

C. EDP PROBLEMS

14. What are the most significant EDP problems you face in 1980. (Rank the top five in order of priority: 1 through 5, 1 being most important, 2 second, etc., and indicate whether you have a plan in place to address the problem.)

CATEGORY (65-78)	Priority Ranking 1980	PLAN IN PLACE YES	NO	CATEGORY (CONT.) (79-90)	Priority Ranking 1980	PLAN IN PLACE YES	NO
Personnel recruiting	(65)		(66)	Exclusive applications development time	(79)		(80)
Personnel training	(67)		(68)	Inadequate EDP funding (budgets)	(81)		(82)
Lack of general management understanding	(69)		(70)	Need to improve data communications facilities	(83)		(84)
Lack of user involvement in system/application development	(71)		(72)	Unsatisfactory hardware maintenance	(85)		(86)
Inadequate systems software	(73)		(74)	Other (please specify and indicate priority) _____	(87)		(88)
Need for improvement in operations	(75)		(76)				
Need for better planning and control	(77)		(78)	_____	(89)		(90)

D. EDP APPLICATIONS

15. What new applications will you be developing (or purchasing) during 1980? What is their mode of operation and relative importance in your total development effort? (Rank new applications in order of importance: 1 being most important, 2 second, etc.)

APPLICATIONS (91-120)	Priority Ranking	Primary Mode of Operation (check one)		Source (check one)	
		Central Site (1)	Remote Site (2)	In-house (1) Development	Outside Purchase (2)
Accounting/finance	_____ (91)	_____	_____ (92)	_____	_____ (93)
Inventory control	_____ (94)	_____	_____ (95)	_____	_____ (96)
Order entry/billing	_____ (97)	_____	_____ (98)	_____	_____ (99)
Personnel	_____ (100)	_____	_____ (101)	_____	_____ (102)
Purchasing	_____ (103)	_____	_____ (104)	_____	_____ (105)
Marketing/sales	_____ (106)	_____	_____ (107)	_____	_____ (108)
Modeling/forecasting	_____ (109)	_____	_____ (110)	_____	_____ (111)
Performance measurement and control	_____ (112)	_____	_____ (113)	_____	_____ (114)
Other (please specify, indicate interest level and ranking)					
_____	_____ (115)	_____	_____ (116)	_____	_____ (117)
_____	_____ (118)	_____	_____ (119)	_____	_____ (120)

16. What is the most significant industry event which affected applications development during the last 12 months?

_____

_____ (121)

17. What is your major concern about applications development in 1980?

_____

_____ (122)

18. What is your single most important development objective during 1980?

_____

_____ (123)

19. What research or information would be most helpful to your development efforts?

_____

_____ (124)

E. EDP BUDGET

20. What is your total EDP budget for 1980? ($000) _____ (125) 21. Does your budget include data communications, software products, training, supplies, etc? (1) Yes _____ (2) No _____ (126) 22. If no, what item(s) are not included in your budget?

_____

23. What is the annual amount of those items not included? $ _____ (127). 24. Did your budget increase or decrease from 1979 to 1980? Increase _____ % Decrease _____ % (128) 25. Will your budget increase or decrease from 1980 to 1981? Increase _____ % Decrease _____ % (129)

26. Please categorize how your 1980 EDP budget will be spent and how this breaks down between central and remote sites. Also indicate how much you expect specific categories to increase or decrease in 1981.

BUDGET CATEGORIES (130-169)	1980 Total Budget			Anticipated Percent of Change in 1981	
	($000)	Percent Central	Percent Remote	Increase (1)	Decrease (2)
Personnel (including recruitment, training, etc.)	$ _____ (130)	_____ %(131)	_____ %(132)	_____ %	_____ %(133)
Mainframe Processors	$ _____ (134)	_____ %(135)	_____ %(136)	_____ %	_____ %(137)
Peripherals	$ _____ (138)	_____ %(139)	_____ %(140)	_____ %	_____ %(141)
Minicomputers	$ _____ (142)	_____ %(143)	_____ %(144)	_____ %	_____ %(145)
Terminals	$ _____ (146)	_____ %(147)	_____ %(148)	_____ %	_____ %(149)
Communications Hardware and Software	$ _____ (150)	_____ %(151)	_____ %(152)	_____ %	_____ %(153)
Software (Purchase or lease)	$ _____ (154)	_____ %(155)	_____ %(156)	_____ %	_____ %(157)
Vendor Maintenance Services (Hardware and Software)	$ _____ (158)	_____ %(159)	_____ %(160)	_____ %	_____ %(161)
Processing Services (outside)	$ _____ (162)	_____ %(163)	_____ %(164)	_____ %	_____ %(165)
Supplies and Other _____	$ _____ (166)	_____ %(167)	_____ %(168)	_____ %	_____ %(169)

27. Are any of the expenditures in your budget for turnkey systems which combine hardware and applications software on a "ready-to-use" basis? (1) Yes _____ (2) No _____ (170) If yes, how much was spent for such systems? $ _____ (171)

F. EDP HARDWARE

28. Please indicate the number of systems installed and on order for central site and remote sites.

IBM CLASS AND/OR MORE (172-183)	INSTALLED	ON ORDER	IBM CLASS AND/OR MORE (184-195)	INSTALLED	ON ORDER
3033	(172)	(173)	4341	(184)	(185)
3033N	(174)	(175)	8100	(186)	(187)
3032	(176)	(177)	Other 370	(188)	(189)
3031	(178)	(179)	Other 360	(190)	(191)
370/158-168	(180)	(181)	System 1, 3, 32, 34	(192)	(193)
4331	(182)	(183)	System 38	(194)	(195)

If other than IBM, please indicate:

VENDOR	MODEL	NO. INSTALLED	NO. ON ORDER	NO. LOCATED: AT HQ.	NO. LOCATED: AT REMOTE SITES
(196)	(197)	(198)	(199)	(200)	(201)
(202)	(203)	(204)	(205)	(206)	(207)
(208)	(209)	(210)	(211)	(212)	(213)

29. Please indicate the number of devices installed or planned.

HAVE YOU INSTALLED:	NO PLANS	NONE, BUT PLANNED	NUMBER INSTALLED	PROJECTED GROWTH 1980-1981
A) Minicomputers or small business computers	(214)	(215)	(216)	% (217)
B) Microcomputers or personal computers	(218)	(219)	(220)	% (221)
C) Intelligent terminals	(222)	(223)	(224)	% (225)
D) Non-intelligent terminals	(226)	(227)	(228)	% (229)

How does the EDP group plan/control the acquisition and use of categories 29. A and 29. B?

(230)

(231)

G. OUTSIDE COMPUTER SERVICES AND SOFTWARE EXPENDITURES

30. Does your company purchase outside computer services that are not under the control of the EDP organization?
(1) Yes (2) No (232) 31. If yes, what were the approximate annual expenditures for these services in 1979? $ (233) 32. What percent increase or decrease do you expect between 1979-1980? % (234) 1980-1981 %. (235)

33. Who purchases these outside services?

Finance	% (236)	Operations/Manufacturing	% (240)
Corporate	% (237)	Market/Sales	% (241)
Personnel	% (238)	Other	% (242)
R&D Engineering	% (239)		

H. UTILIZATION ISSUES

34. What percent of your computer resources are used for:

Production Runs	% (243)
New applications development	% (244)
Maintenance of Existing Programs	% (245)
Other (specify)	% (246)

35. What percent of your application programmers are assigned to:

Development of new programs	% (247)
Maintenance of existing programs	% (248)
Enhancement of existing programs	% (249)

36. What measures are you taking to reduce the time and costs associated with program development?

(250)

(251)

37. What level of improvement are you seeking?
(1) 1-10%, (2) 11-20%, (3) 21-50%, (4) 51-100%, (5) Greater than 100% (252)

I. TRAINING ISSUES

38. Please indicate how much you spent on training in 1979.

TYPE COURSE	IN-HOUSE EXPENDITURES	OUTSIDE TRAINING EXPENDITURES	PERCENT OF STAFF ATTENDING
Technical	$ _____ (253)	$ _____ (254)	_____ % (255)
Management	$ _____ (256)	$ _____ (257)	_____ % (258)

39. What percent change (increase/decrease) do you expect in your training budget?

1980-1981 _____ % (259) 1980-1984 _____ % (260)

J. OFFICE OF THE FUTURE ISSUES

40. Please check which of the office automation and communications services are being used or planned and indicate whether the EDP department has management responsibility for them.

CATEGORY	STATUS/PLANS					EDP RESPONSIBILITY/PLANS				
	USING IT NOW	IN 1980-1982	IN 1983-1985	NO PLANS	DON'T KNOW	EDP RESPONSIBILITY	IN 1980-1982	IN 1983-1985	NO PLANS	DON'T KNOW
ELECTRONIC MAIL					(261)					(262)
WORD PROCESSING					(263)					(264)
IMAGE PROCESSING					(265)					(266)
TELECOPIER/FACSIMILE					(267)					(268)
CRT GRAPHICS					(269)					(270)
DATA COMMUNICATIONS										
• DIAL UP					(271)					(272)
• WATS					(273)					(274)
• DEDICATED					(275)					(276)
• TELEX/TWX					(277)					(278)
LONG DISTANCE VOICE LINES										
• DIAL UP					(279)					(280)
• WATS					(281)					(282)
• DEDICATED					(283)					(284)
• MCI, SPC					(285)					(286)
• OTHER					(287)					(288)

K. MAINTENANCE ISSUES

41. 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
First Line Managers (289)	(1) _____	(2) _____	(3) _____
Field Engineers (290)	(1) _____	(2) _____	(3) _____

42. Do you currently perform any of the following maintenance activities?

MAINTENANCE ACTIVITY	PERFORM	COST SAVINGS PERCENT	WOULD CONSIDER	EXPECTED COST SAVINGS
Install equipment	1) YES (291) 2) NO	_____ % (292)	1) YES (293) 2) NO	$ _____ (294)
Perform diagnostics before calling for vendor maintenance	1) YES (295) 2) NO	_____ % (296)	1) YES (297) 2) NO	$ _____ (298)
Perform maintenance on your hardware system	1) YES (299) 2) NO	_____ % (300)	1) YES (301) 2) NO	$ _____ (302)
Perform maintenance on vendor supplied software	1) YES (303) 2) NO	_____ % (304)	1) YES (305) 2) NO	$ _____ (306)
Deliver equipment to vendor maintenance depot for repair or replacement	1) YES (307) 2) NO	_____ % (308)	1) YES (309) 2) NO	$ _____ (310)

FOR OFFICE USE ONLY ☐ (311)

APPENDIX C: USER SAMPLE

EXHIBIT C-1

USERS RESPONDING TO TELEPHONE SURVEY, BY COMPANY SIZE

COMPANY SIZE	NUMBER	PERCENT
<$100 MILLION	6	20%
100-$500 MILLION	11	37
500-$1 BILLION	9	30
>$1 BILLION	4	13
TOTAL	30	100%

EXHIBIT C-2

USERS RESPONDING TO TELEPHONE SURVEY,
BY INDUSTRY SECTOR

INDUSTRY SECTOR	NUMBER	PERCENT
MANUFACTURING	8	27%
BANKING	8	27
UTILITIES	8	27
INSURANCE	2	6
OTHER	4	13
TOTAL	30	100%

EXHIBIT C-3

EDP USER PANEL, BY COMPANY SIZE

COMPANY SIZE	NUMBER	PERCENT
0-$100 MILLION	316	35%
100-$1 BILLION	334	37
>$1 BILLION	92	10
NOT SPECIFIED	170	18
TOTAL	912	100%

EXHIBIT C-4

EDP USER PANEL, BY INDUSTRY SECTOR

INDUSTRY SECTOR	NUMBER	PERCENT
MANUFACTURING	300	33%
TRANSPORTATION	23	3
UTILITIES	43	5
WHOLESALE	35	4
RETAIL	41	5
BANKING	89	10
INSURANCE	90	10
MEDICAL	2	1
EDUCATION	94	10
GOVERNMENT	91	10
OTHER	104	11
TOTAL	912	102*

*DISCREPANCY DUE TO ROUNDING

APPENDIX D: RELATED INPUT REPORTS

APPENDIX D: RELATED INPUT REPORTS

Title	Publication Date
Maintenance Requirements in the Information Processing Industry, 1978-1983	January 1979
1980 Field Service Annual Report	August 1980
1980 Communications and Computer Users Annual Report	August 1980
Strategies for Competing in the IBM Compatible Marketplace	January 1980
First Line Managers	December 1979

Contact: Walter P. Smith, Director, Field Service Program, at (415) 493-1600.

APPENDIX E: INDUSTRY SECTOR DEMOGRAPHIC DATA

EXHIBIT E-1

DISCRETE MANUFACTURING INDUSTRY SECTOR -
DEMOGRAPHIC DATA

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
ALL	ALL	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS (1975) NUMBER OF EMPLOYEES (1978)	$538.1 BILLION 184,642 85,760,000
23	APPAREL	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1978)	$34.8 BILLION 22,311 1,316,000
25	FURNITURE	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1978)	$14.2 BILLION 8,630 486,000
27	PRINTING	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1978)	$42.8 BILLION 41,877 1,181,000
31	LEATHER	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1978)	$7.1 BILLION 2,827 251,000
34	FABRICATED METAL PRODUCTS	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1978)	$77.5 BILLION 29,349 1,653,000
35	MACHINERY	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1978)	$105.5 BILLION 41,506 2,337,000
36	ELECTRONICS	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1978)	$73.9 BILLION 12,574 1,966,000
37	TRANS-PORTATION EQUIPMENT	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1978)	$141.0 BILLION 8,536 4,858,000

EXHIBIT E-1 (CONTD)

DISCRETE MANUFACTURING INDUSTRY SECTOR -
DEMOGRAPHIC DATA

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
38	SCIENTIFIC AND CONTROL INSTRUMENTS	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1978)	$25.0 BILLION 6,288 654,000
39	MISCEL-LANEOUS MANU-FACTURERS	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1978)	$16.3 BILLION 14,674 454,000

EXHIBIT E-2

PROCESS MANUFACTURING INDUSTRY SECTOR -
DEMOGRAPHIC DATA

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
ALL	ALL	VALUE OF SHIPMENTS NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES	$882.7 BILLION 154,036 8.5 MILLION
10	METAL MINING	VALUE OF SHIPMENTS (1975) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$5.2 BILLION 819 87,509
11	ANTHRACITE MINING	VALUE OF SHIPMENTS (1975) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$198.5 MILLION 182 4,595
12	COAL MINING	VALUE OF SHIPMENTS (1975) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$12.5 BILLION 3,850 211,318
13	OIL AND GAS EXTRACTION	VALUE OF SHIPMENTS (1975) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$34.8 BILLION 14,069 279,458
20	FOOD PRODUCTS	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1978)	$180.9 BILLION 24,113 1.7 MILLION
21	TOBACCO	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1978)	$8.7 BILLION 262 73,000
22	TEXTILE PRODUCTS	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1978)	$36.4 BILLION 6,580 911,000
24	LUMBER AND WOOD PRODUCTS	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1978)	$31.2 BILLION 30,487 751,000

EXHIBIT E-2 (CONTD)

PROCESS MANUFACTURING INDUSTRY SECTOR -
DEMOGRAPHIC DATA

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
26	PAPER PRODUCTS	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$48.2 BILLION 5,891 615,208
28	CHEMICALS	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1978)	$104.1 BILLION 11,032 1.1 MILLION
29	PETROLEUM	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$82.3 BILLION 1,982 143,829
30	RUBBER AND PLASTICS	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$31.8 BILLION 9,707 648,595
32	STONE, GLASS CLAY	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$30.6 BILLION 15,713 580,512
33	PRIMARY METALS	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$77.5 BILLION 29,349 1.4 MILLION

EXHIBIT E-3

TRANSPORTATION INDUSTRY SECTOR -
DEMOGRAPHIC DATA

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
ALL	ALL	OPERATING REVENUES NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$39.5 BILLION 115,859 2.1 MILLION
41	LOCAL AND SUBURBAN TRANSIT	OPERATING REVENUES (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$5.7 BILLION 13,328 303,919
42	MOTOR FREIGHT	OPERATING REVENUES (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$9.7 BILLION 74,636 1.1 MILLION
44	WATER TRANS-PORTATION	OPERATING REVENUES (1975) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$946.0 MILLION 6,048 186,129
45	AIR TRANS-PORTATION	OPERATING REVENUES (1977) NUMBER OF AIR CARRIERS (1976) NUMBER OF EMPLOYEES (1976)	$19.9 BILLION 5,055 339,979
46	PIPELINES	OPERATING REVENUES (1975) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$1.9 BILLION 434 14,134
47	TRANS-PORTATION SERVICES	OPERATING REVENUES (1972) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$1.4 BILLION 16,358 144,081

EXHIBIT E-4

UTILITIES INDUSTRY SECTOR -
DEMOGRAPHIC DATA

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
ALL	ALL	OPERATING REVENUES NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	- 37,137 1.8 MILLION
481	TELEPHONE COMMUNI-CATIONS	OPERATING REVENUES (1977) NUMBER OF COMPANIES (1976) NUMBER OF EMPLOYEES (1976)	$40.8 BILLION 13,753 930,000
482	TELEGRAPH COMPANIES	OPERATING REVENUES (1977) NUMBER OF COMPANIES (1976) NUMBER OF EMPLOYEES (1976)	$951.7 MILLION 1,225 13,324
483	RADIO AND TV BROAD-CASTING	OPERATING REVENUES (1976) NUMBER OF STATIONS (1976) NUMBER OF EMPLOYEES (1976)	$6.8 BILLION 5,743 147,577
489	COMMUNI-CATIONS SERVICES (N.E.C.)	OPERATING REVENUES (1974) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$1.0 BILLION 2,555 37,326
491	ELECTRIC SERVICES	OPERATING REVENUES (1978) NUMBER OF PLANTS (1976) NUMBER OF EMPLOYEES (1976)	$69.9 BILLION 4,082 330,743
492	GAS PRODUCTS AND SERVICES	OPERATING REVENUES (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$32.0 BILLION 2,414 123,793
493	COMBINED GAS AND ELECTRIC	OPERATING REVENUES (1974) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$1.9 BILLION 939 143,565
494	WATER SUPPLY	OPERATING REVENUES NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	- 2,963 19,649

EXHIBIT E-4 (CONTD)

UTILITIES INDUSTRY SECTOR -
DEMOGRAPHIC DATA

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
495	SANITARY SERVICES	OPERATING REVENUES NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	- 3,054 33,667
496	STEAM SUPPLY	OPERATING REVENUES NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	- 60 2,929
497	IRRIGATION SYSTEMS	OPERATING REVENUES NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	- 349 1,831

EXHIBIT E-5
WHOLESALE INDUSTRY SECTOR -
DEMOGRAPHIC DATA

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
ALL	ALL	TOTAL SALES (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$211.0 BILLION 208,096 2.4 MILLION
501	MOTOR VEHICLES AND AUTOMOTIVE	TOTAL SALES (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$38.8 MILLION 36,041 408,010
502	FURNITURE	TOTAL SALES (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$7.7 MILLION 9,228 95,445
503	LUMBER AND CONSTRUCTION	TOTAL SALES (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$20.1 MILLION 15,098 171,893
504	SPORTING GOODS AND TOYS	TOTAL SALES NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	- 5,626 75,201
505	METALS AND MINERALS	TOTAL SALES (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$26.8 MILLION 8,332 128,632
506	ELECTRICAL GOODS	TOTAL SALES (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$28.9 MILLION 22,550 260,324
507	HARDWARE, PLUMBING AND HEATING	TOTAL SALES (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES 1976)	$19.3 MILLION 16,875 185,386
508	MACHINERY AND EQUIPMENT	TOTAL SALES NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$56.4 MILLION 76,311 938,763

EXHIBIT E-5 (CONTD)

WHOLESALE INDUSTRY SECTOR-
DEMOGRAPHIC DATA

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
509	MISCELLANEOUS DURABLES	TOTAL SALES NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$3.3 MILLION 15,924 162,202
51	WHOLESALE - NONDURABLE GOODS	TOTAL SALES (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$271.7 BILLION 145,046 1.8 MILLION
511	PAPER AND PAPER PRODUCTS	TOTAL SALES (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$13.1 MILLION 10,528 138,624
512	DRUGS AND SUNDRIES	TOTAL SALES NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	- 3,472 85,288
513	APPAREL, PIECE GOODS AND NOTIONS	TOTAL SALES (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$17.3 MILLION 11,585 128,593
514	GROCERIES AND RELATED PRODUCTS	TOTAL SALES (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$93.9 MILLION 34,893 579,817
515	FARM PRODUCTS	TOTAL SALES (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$45.2 MILLION 13,243 127,690
516	CHEMICALS AND ALLIED PRODUCTS	TOTAL SALES NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	- 6,760 85,030
517	PETROLEUM AND PETROLEUM PRODUCTS	TOTAL SALES NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	- 20,468 186,907

EXHIBIT E-5 (CONTD)
WHOLESALE INDUSTRY SECTOR -
DEMOGRAPHIC DATA

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
518	BEER, WINE AND DISTILLED BEVERAGES	TOTAL SALES (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$21.6 MILLION 6,380 117,820
519	MISCELLANEOUS NON-DURABLES	TOTAL SALES (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$55.1 MILLION 37,231 355,271

EXHIBIT E-6

RETAIL INDUSTRY SECTOR -

DEMOGRAPHIC DATA

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
ALL	ALL	SALES (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1978)	$651.9 BILLION 1.2 MILLION 14.5 MILLION
52	BUILDING MATERIALS, HARDWARE	SALES (1978) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$44.0 BILLION 61,681 441,837
53	GENERAL MERCHANDISE	SALES (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$104.2 BILLION 41,219 1.9 MILLION
54	FOOD STORES	SALES (1978) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$174.5 BILLION 162,010 1.9 MILLION
55	AUTOMOTIVE DEALERS & GASOLINE SERVICE STATIONS	SALES (1978) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$163.7 BILLION 229,257 1.7 MILLION
56	APPAREL & ACCESSORIES	SALES (1978) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$37.8 BILLION 112,089 834,315
57	FURNITURE, HOME FURNISHINGS & EQUIPMENT	SALES (1978) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$37.0 BILLION 81,119 492,301
58	EATING & DRINKING	SALES (1978) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$70.1 BILLION 272,633 3.2 MILLION
59	MISCELLANEOUS RETAIL	SALES (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$46.0 BILLION 246,595 1.6 MILLION

EXHIBIT E-6 (CONTD)

RETAIL ORGANIZATIONS -
DISTRIBUTION BY SIZE, 1976

INDUSTRY SIC	INDUSTRY NAME	NUMBER OF ESTABLISHMENTS (SALES RANGES) BY NUMBER OF EMPLOYEES			
		1-99	100-249	250-999	1,000 & OVER
52	BUILDING MATERIALS, HARDWARE	61,579	95	7	-
53	GENERAL MERCHANDISE	36,272	3,319	1,535	93
54	FOOD STORES	160,801	1,154	55	-
55	AUTO DEALERS AND GASOLINE SERVICE STATIONS	228,534	705	17	1
56	APPAREL AND ACCESSORIES	111,714	309	66	-
57	FURNITURE, HOME FURNISHINGS AND EQUIPMENT	80,996	105	18	-
58	EATING AND DRINKING	270,954	1,502	175	2
59	MISCELLANEOUS RETAIL	246,119	394	61	21

EXHIBIT E-7

BANKING AND FINANCE INDUSTRY SECTOR -
DEMOGRAPHIC DATA

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
ALL	ALL	NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	211,747 3.7 MILLION
60	BANKS	NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	40,943 1.2 MILLION
601	FEDERAL RESERVE BANKS	ASSETS (1978) NUMBER OF BANKS (1976) NUMBER OF EMPLOYEES (1976)	$153.2 BILLION 54 26,238
602	COMMERCIAL BANKS	ASSETS (1976) DEPOSITS (1976) NUMBER OF BANKS (1976) NUMBER OF EMPLOYEES (1976)	$1,040.1 BILLION $845.1 BILLION 37,224 1.2 MILLION
603	MUTUAL SAVINGS BANKS	ASSETS (1976) DEPOSITS (1976) NUMBER OF BANKS (1976) NUMBER OF EMPLOYEES (1976)	$134.8 BILLION $123.7 BILLION 1,815 44,440
604/605	TRUST COMPANIES AND OTHER FUNCTIONS	ASSETS NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	- 1,582 24,706
61	CREDIT AGENCIES	ASSETS NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	- 54,750 459,433
611	REDISCOUNT AND FINANCING INSTITUTIONS	ASSETS NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	- 68 1,659
612	SAVINGS AND LOAN ASSOCIATIONS	ASSETS (1976) NUMBER OF ASSOCIATIONS (1976) NUMBER OF EMPLOYEES (1976)	$392.0 BILLION 11,556 171,187

EXHIBIT E-7 (CONTD)

BANKING AND FINANCE INDUSTRY SECTOR -
DEMOGRAPHIC DATA

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
613	AGRICULTURAL CREDIT INSTITUTIONS	ASSETS NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	- 1,269 12,398
614	CREDIT UNIONS	ASSETS (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$44.8 BILLION 36,348 191,541
615	BUSINESS CREDIT INSTITUTIONS	ASSETS NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	- 1,750 33,999
616	MORTGAGE BANKERS AND BROKERS	ASSETS NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	- 3,402 46,523
62	SECURITY AND COMMODITY BROKERS	ASSETS NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	- 8,927 173,548
67	HOLDING AND OTHER INVESTMENT COMPANIES	ASSETS NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	- 12,059 153,862

EXHIBIT E-8

INSURANCE INDUSTRY SECTOR -
DEMOGRAPHIC DATA

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
ALL	ALL	PREMIUMS WRITTEN NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	- 29,814 1.1 MILLION
631	LIFE INSURANCE	PREMIUM RECEIPTS (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$31.4 BILLION 15,732 510,482
632	MEDICAL AND HEALTH INSURANCE	PREMIUM RECEIPTS (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$21.1 BILLION 1,426 99,424
633	FIRE, MARINE AND CASUALTY INSURANCE	PREMIUMS WRITTEN NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	- 6,860 361,459
635	SURETY INSURANCE	PREMIUMS WRITTEN NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	- 426 5,813
636	TITLE INSURANCE	PREMIUMS WRITTEN NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	- 1,726 32,491
637	PENSION, HEALTH AND WELFARE FUNDS	AMOUNT IN FORCE NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	- 3,323 64,308
639	INSURANCE CARRIERS (N.E.C.)	PREMIUMS WRITTEN NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	- 161 5,683
64	INSURANCE AGENTS, BROKERS AND SERVICES	OPERATING REVENUES NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	- 71,588 360,994

EXHIBIT E-9

EDUCATION INDUSTRY SECTOR-
DEMOGRAPHIC DATA

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
ALL	ALL	EXPENDITURES NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES	- 146,885 4,487,000
821	ELEMENTARY AND SECONDARY	EXPENDITURES (1977) NUMBER OF SCHOOLS (1976) NUMBER OF EMPLOYEES 1975)	$78.6 BILLION 106,200 3,435,000
822	HIGHER EDUCATION	EXPENDITURES (1977) NUMBER OF COLLEGES (1976) NUMBER OF EMPLOYEES (1976)	$40.3 BILLION 2,765 793,000
823	LIBRARIES AND SIMILAR	EXPENDITURES (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1977)	- 29,345 208,000
824	CORRES-PONDENCE AND VOCATIONAL	EXPENDITURES NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	- 1,324 16,000
829	SCHOOLS AND EDUCATIONAL SERVICES (N.E.C.)	EXPENDITURES NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	- 7,251 35,000

EXHIBIT E-10

SERVICES INDUSTRY SECTOR -
DEMOGRAPHIC DATA

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
ALL	ALL	ESTIMATED REVENUES NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	- 286,957 3.1 MILLION
73	BUSINESS SERVICES	ESTIMATED REVENUES (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$14.0 BILLION 133.804 2.1 MILLION
81	LEGAL SERVICES	ESTIMATED REVENUES (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$15.0 BILLION 85,758 363,088
891	ENGINEERING AND ARCHI-TECTURAL SERVICES	ESTIMATED REVENUES (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$18.0 BILLION 29,468 345,003
893	NON-COMMERCIAL RESEARCH ORGANIZATIONS	ESTIMATED REVENUES (1976) NUMBER OF ESTABLISHMENTS 1976) NUMBER OF EMPLOYEES (1976)	$19.0 BILLION 2,349 60,357
893	ACCOUNTING, AUDITING AND BOOKKEEPiNG	ESTIMATED REVENUES NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$9.0 BILLION 32,657 218,534
899	SERVICES (N.E.C.)	ESTIMATED REVENUES NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	- 2,921 14,924

EXHIBIT E-11

OTHER INDUSTRIES SECTOR - DEMOGRAPHIC DATA

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
ALL	ALL	SALES NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$421.9 BILLION 1.3 MILLION 9.6 MILLION
01-09	AGRICULTURE, FORESTRY, FISHING	SALES (1975) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$101.0 BILLION 42,699 227,505
15-17	CONSTRUCTION	SALES (1975) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$161.1 BILLION 394,963 3.4 MILLION
65	REAL ESTATE	SALES (1975) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$88.6 BILLION 166,275 819,474
66	REAL ESTATE, INSURANCE	SALES (1975) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$247 MILLION 7,326 29,317
70	HOTELS, ETC.	SALES (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$12.2 BILLION 46,122 890,512
72	PERSONAL SERVICES	SALES (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$16.7 BILLION 159,719 880,718
75	AUTO REPAIR	SALES (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$19.0 BILLION 91,653 444,165
76	MISCELLANEOUS REPAIR	SALES (1975) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$6.0 MILLION 47,874 242,767

EXHIBIT E-11 (CONTD)

OTHER INDUSTRIES SECTOR - DEMOGRAPHIC DATA

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
78	MOTION PICTURES	SALES (1976) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$3.0 BILLION 14,748 184,607
79	RECREATION	SALES (1975) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$8.7 MILLION 44,903 563,380
83	SOCIAL SERVICES	SALES (1975) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$2.9 BILLION 43,036 723,119
84	MUSEUMS, ETC.	SALES (1975) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$150 MILLION 871 23,398
86	MEMBERSHIP ORGANIZATIONS	SALES (1975) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$12.2 BILLION 135,628 1.1 MILLION
99	NON-CLASSIFIABLE	SALES (1975) NUMBER OF ESTABLISHMENTS (1976) NUMBER OF EMPLOYEES (1976)	$4.8 BILLION 82,951 112,621