TURNKEY SYSTEMS AND VENDORS IN THE U.S.A.

INPUT

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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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TURNKEY SYSTEMS AND VENDORS

IN THE U.S.A.

Prepared For:

SCS SCIENTIFIC CONTROL SYSTEMS GmbH

Hamburg, Germany

May 1979

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IN THE U.S.A.

LIST OF EXHIBITS

1 INTRODUCTION

I INTRODUCTION

- As the major systems house in Germany, SCS decided to consider enhancing its market position further still by evaluating turnkey systems. The progressive U.S. market was chosen as a suitable background for this evaluation.

- Accordingly, INPUT proposed a survey of U.S. vendors of turnkey systems; at least 50 vendors were to be approached and these were to be of various types, including users, distributors, system integrators, hardware manufacturers and services companies.

- In a letter dated 20 February 1979, INPUT's proposal was authorized by Dr. Horst Schupferling, Marketing Director of SCS.

- The survey was carried out during the months of February and March 1979 by INPUT's staff in the U.S. Information obtained from each vendor was entered onto a formal questionnaire, a copy of which is included in Appendix C. Interviews were conducted mainly over the telephone, and, in one case, in person. An average duration for each interview was 60 minutes to cover 31 questions.

- Data obtained from this survey has been integrated with turnkey system data from three other recent INPUT projects in the U.S. to provide a very full and comprehensive data set for analysis. The resultant sample size used in quantitative analysis varies from 25 to 50; the total number of turnkey vendors in the U.S. is estimated at 1,000. In analysis of the data due reference has been made to SCS's interests in the following industries and application areas:

INDUSTRIES	APPLICATIONS
Manufacturing	Communications
Government/Defense	Warehouse Automation
Utilities	Shop Floor Data Collection
Banking	Production/Inventory Control
Insurance	Process Control
Oil	Energy Control
Medical	

- This report has been produced by INPUT EUROPE staff working with their U.S. colleagues in the Palo Alto, California head office. Thus, there has been a complete and faithful transfer of all data through analysis to the report.

- After analysis of the questionnaires for the report they were also assessed for any potential that may be offered to SCS for future cooperation. In cases where the turnkey vendors were successful with systems in the same industries and application areas they were re-approached. Approaches were made with a view to some form of technical or marketing cooperation with SCS; in the cases where interest was expressed in this principle meetings were arranged for Dr. Horst Schupferling. Meetings were arranged with:

  - American Business Computers, Inc.
  - Ball Computer Products Division
  - Binary Data Systems
  - HBO & Company

- A presentation and elaboration of the content of this report was given at INPUT's offices in Palo Alto, California on Monday, May 7th.

II EXECUTIVE SUMMARY

II EXECUTIVE SUMMARY

- The Turnkey Systems market in the U.S.A. is now a significant part of the overall computer services market. The number of vendors is estimated to be around 1000, including companies which include Turnkey Systems as part of a broader range of services and those companies which specialize in them.

- INPUT's estimate of the size of the U.S. domestic Turnkey Systems market in 1979 is $325M; it is also estimated that this market will grow at an average annual rate of 23% over the next five years.

- Assessments of market size and growth depend on a clear definition of Turnkey Systems, particularly since they are offered by several distinct types of vendors. The definition used during the study is the comprehensive version which describes an all inclusive service supplied by one vendor and including most or all of the following components:

  - Hardware supply and installation.

  - Hardware check out and commissioning.

  - Hardware maintenance.

  - Spare parts stock and supply.

  - Supply of system software.

- Supply of application software.
- Maintenance of software.
- Software development.
- User staff training and operating manuals.
- Rental or leasing facilities.
- Facilities management on site.

- All inclusive prices for Turnkey Systems generally range from $25K to $350K; a small number of exceptional cases in the $1M to $3M range were reported in the survey. The average price (discounting the exceptions) is $88K.

- Due to the small size of the majority of Turnkey Systems vendors they are generally unable to supply a comprehensive service without subcontracting.

- Hardware installation and support is the most commonly sub-contracted part of the Turnkey System package. It is probably the most crucial since in previous INPUT surveys, users are very consistent in stating maintenance and support to be one of their main selection criteria. A further disadvantage for the vendor is that the users loyalty may become divided between the hardware supplier and the Turnkey Systems vendor. INPUT considers the maintenance issue to be a fundamental factor in the future prospects for Turnkey System vendors. Two sections from a recent INPUT report on maintenance requirements in the U.S. are included in the Appendices; in so doing it is felt that this crucial issue is adequately addressed.

- The major sources of Turnkey Systems business are in the following industries:
  - Manufacturing.

- Retail/Wholesale.
- Medical.
- Transportation.
- Utilities.
- Communication.

- In terms of application areas the most popular for a Turnkey System solution are:
  - Accounting.
  - Inventory Control.

- The majority of vendors (or division of multi-service companies) are relatively small although large in number. Assuming that there are 1000 Turnkey System vendors in total, their average revenue in 1979 will be $325,000. This corresponds with the revenues reported by vendors in the survey sample which ranged from $250,000 to $22M.

- Staff numbers in Turnkey System operations fall in the range 2 to 120.

- Vendor revenues per head of staff increase in line with the size of the vendor's Turnkey System operation. For 1978 the survey revealed the following ratios:

OPERATION SIZE	1978 REVENUE	AV REV/HEAD
Small	< $1M	$62K
Medium	$1M - $10M	$132K
Large	> $10M	$166K

- U.S. vendors concentrate their products and marketing effort on a narrow selection of industries and applications.

- There is some variety in matching of hardware to application system requirements. The largest proportion of vendors base their systems on standard model ranges, supplied mainly by Data General. A significant proportion, however, manufacture and purchase components and then assemble; nearly half of the vendors customize hardware to meet particular application needs.

- All vendors produce their own applications software. Traditional programming methods are mostly used in preference to more advanced techniques; the primary languages used is BASIC for commercial applications and FORTRAN for technical languages.

- Systems are distributed mainly through direct sales forces with distributors being used to increase geographic coverage. Advertising is the main promotional aid used to assist sales.

III TURNKEY SYSTEMS DESCRIBED

III TURNKEY SYSTEMS DESCRIBED

A. DEFINITION

- Terms such as "Turnkey Systems" are frequently misunderstood and variously interpreted. Thus, it is important to provide each survey respondant with a standard definition. This ensures that all answers are provided on a common foundation enabling consistency to be achieved in subsequent analysis and conclusions.

- The standard definition of Turnkey Systems given by INPUT in the survey is:

  > "An end user and application oriented automatic data processing system; computer based including software with input and output terminals for operation by the end user. It is delivered, installed, placed into operation and maintained for the end user."

- Twenty-nine out of more than 50 companies approached are marketing systems which conform to this definition, and these are summarised later in this section. Generally, Turnkey Systems, as defined, have been marketed since 1971; the majority started in the period 1976 to 1977. Thus, Turnkey Systems are a relatively recent development as a form of packaging and installation of computer systems.

- Turnkey Systems are primarily intended to meet the needs of first time users, or, users which do not have an available complement of computer staff. To meet this need the vendor should provide the total hardware and software systems solution to the user requirement at minimum cost, with the solution available immediately upon installation.

- The user of a Turnkey System should not require any computer staff either for system development or installation. The operation of these systems should be reasonably transparent to the user.

- Turnkey Systems should normally be supplied under an all inclusive contract; this solves the conventional problem of a user being burdened and sometimes confused with separate suppliers of hardware, software and other services such as maintenance.

- Vendors of Turnkey Systems require adequate resources and good coverage of their chosen geographic markets in order to offer a comprehensive contract; such contracts can include all, or several, of the following products and services:

  - Hardware supply and installation
  - Hardware check-out and commissioning
  - Hardware maintenance
  - Spare parts stock and supply
  - Supply of system software
  - Supply of application software
  - Maintenance of software

- Software development

- User staff training and operating manuals

- Rental or leasing facilities

- Facilities management on site

- The majority of turnkey vendors are unable to supply more than a few of these items and need to subcontract in order to supply and maintain a comprehensive Turnkey Systems service. Turnkey systems are usually supplied for a fixed and pre-determined price; subcontracting reduces the vendor's control of quality and delivery time -- often in critical items of the contract such as maintenance.

- Until the Turnkey Systems vendors create a sufficiently large enough operation, they must continue to subcontract. This factor places much greater demands on the quality of documentation and control procedures; high standards need to be achieved in this area in order to:

  - Ensure profitability.

  - Provide thoroughly for the obviously more demanding needs of first time users.

  - Make subsequent modifications and expansion of systems easier and cheaper.

  - Enable reproduction of systems for new clients to be easier and cheaper.

  - To enhance the reputation for quality and dependability of the vendor.

- Turnkey Systems prices, as offered by the vendors interviewed, are generally in the range $25K to $350K, (See Exhibit IIIC); an average price being $88K. (Two exceptions priced at $1M and $2M, respectively, were left out of the reckoning as too extreme.)

- To summarize, Turnkey Systems represent an entirely different delivery channel for computer systems which shifts many responsibilities conventionally held by the user toward the vendor.

B. INDUSTRIES AND APPLICATIONS

- According to the sample of Turnkey Systems vendors interviewed, the major industry markets are Manufacturing, Retail/Wholesale, Medical, Transportation, Utilities and Communication. Between 21% and 61% of the vendors interviewed have supplied systems to these industries. (See Exhibit III-1.)

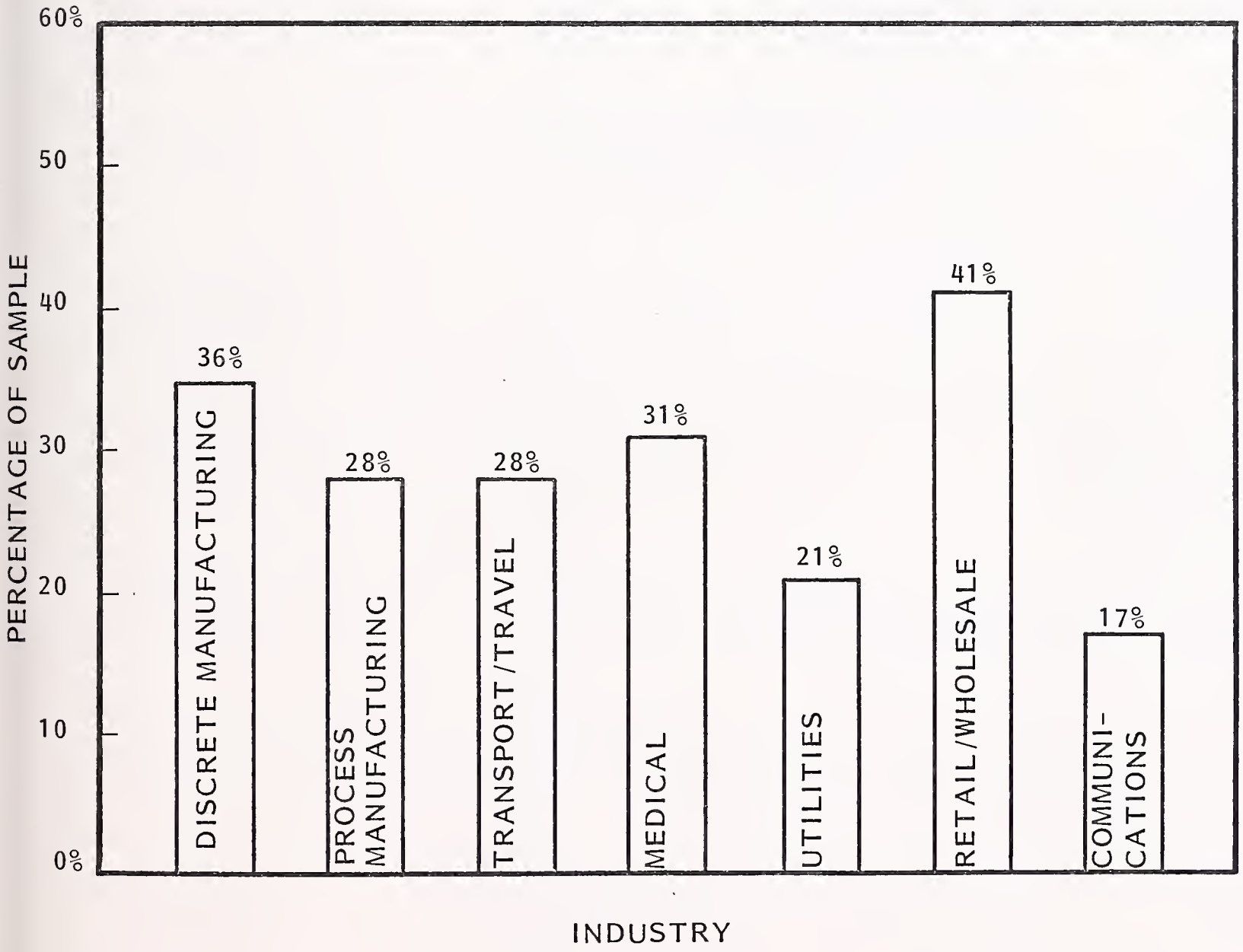
- A quarter of the vendors supplying to the Process Manufacturing industry named the Oil and Gas sector specifically. Forty percent of vendors supplying to the Communications industry named the Broadcasting sector specifically.

- Other industries have purchased Turnkey Systems at half the rate or less of the leading industries. Eleven percent of vendors have supplied to the Banking industry; Six percent have supplied to the Insurance, Central Government and Education sectors.

- Exceptionally large Turnkey Systems, that is in the range $1M to $2M, have been purchased by the Utilities, Banking and Communications industries. The applications concerned are remittance and cheque processing and satellite ground station operation.

EXHIBIT III-1

PERCENTAGE OF VENDORS SUPPLYING TURNKEY SYSTEMS - BY INDUSTRY



- The two most popular application areas for Turnkey System solution are Accounting (48% of vendors) and Inventory Control (31% of vendors). (See Exhibit III-2.)

- Industry specialized applications are the third most popular (27%); these include such application areas as:

  - Simulation
  - Scientific calculations
  - Cable TV records
  - Medical/hospital systems
  - Resource (i.e., oil and gas) control
  - Typesetting

- The remaining popular applications (supplied by 10% of vendors) have an accounting flavor, namely: Remittance/Cheque Processing, Order Entry and Costing.

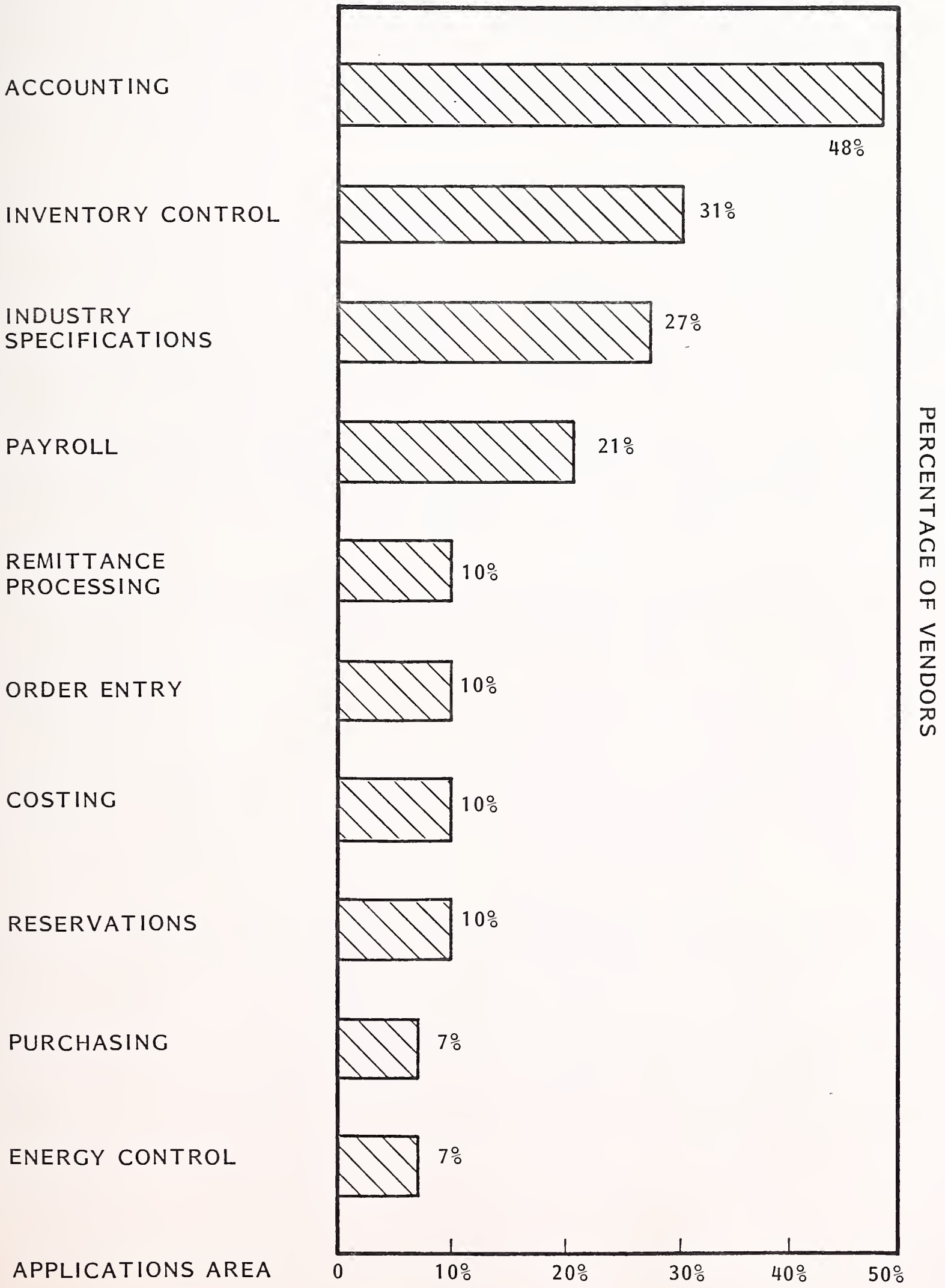
C. VENDOR CHARACTERISTICS

- Vendors included in the survey sample (and additional data from related INPUT projects) were of four basic types:

  - Systems houses (complete systems)
  - Software/services companies (partial systems)

EXHIBIT III-2

PERCENTAGE OF VENDORS SUPPLYING SYSTEMS - BY APPLICATION



- Subsidiaries of hardware manufacturers

- Spin offs from large users

- Turnkey system vendors in general appear to be small to medium size; typically, their staff and revenue numbers in 1978 were in the following ranges:

  - Staff 2 to 120

  - Revenue 0.25M to 22M

- Nearly all vendors (excepting by definition the software/services group) have all of their resources devoted to Turnkey System production and installation. Clearly, Turnkey Systems business is regarded by these companies as a sufficient goal. Annual revenue per head ranges (in 1978 figures) between $62K and $232K; the average is $140K.

- Revenues per head vary significantly when related to vendor size:

SIZE	1978 REV	AVERAGE REV/HD
Small	< $1M	$62K
Medium	$1M-$10M	$132K
Large	> $10M	$166K

- It is probably safe to assume from these figures that revenue per head (and profitability?) increase with the size of vendor. These figures indicate, however, that this is not a linear relationship and that the increase levels off (or becomes asymtotic) as it approaches some finite large size. Note that these figures have limited accuracy in time since revenue per head figures can be expected to increase with improvements in the "state of the art" as well as technology.

- Systems houses in the U.S. form the major component of the sample, and they are the major suppliers of Turnkey Systems. It should be noted that nearly all of these companies are completely dedicated to the production and installation of Turnkey Systems. Unlike some of their European counterparts, systems houses in the U.S. do provide complete systems and most of them have adequate hardware assembly, testing and, in some cases, maintenance, facilities to do this.

- The origin of systems houses appears to be an evolution from the traditional software house approach in only a minority of cases. As many as three quarters of the vendors started as hardware distributors and realized that good sales leverage would be obtained by supplying a complete solution. The remainder started with Turnkey Systems or the business objective.

- Subsidiaries of hardware companies offering Turnkey Systems include Itel, Data General and Perkin Elmer. Spin offs are owned by such parent companies as Reuters (British news agency) and Northrop (U.S. aerospace company).

- A noticeable feature in the market approach of Turnkey System vendors is that they specialize in a relatively small sub-set of industries and applications. (See Exhibit III-3.)

EXHIBIT III-3

SUMMARY OF TURNKEY VENDORS INTERVIEWED

VENDOR NAME	TURNKEY SYSTEMS			
	PRICE RANGE ($K)	INDUSTRY APPLICABILITY	APPLICATIONS	HARDWARE
AGENCY DATA SYSTEMS	34-300	TRAVEL	ACCOUNTING RESERVATIONS	DATA GENERAL DEC
AMERICAN BUSINESS COMPUTING	10-250	MANUFACTURING TRANSPORTATION MEDICAL RETAIL/WHOLES	INVENTORY CONTROL ACCOUNTING	OWN HAZELTINE
BALL COMPUTER	50-40	BANKING INSURANCE GOVERNMENT COMMUNICAT-IONS	CASH ACCOUNTING	
BINARY DATA SYSTEMS	110-350	MANUFACTURING MEDICAL RETAIL/WHOLES GOVERNMENT	MILITARY ACCOUNTING INVENTORY CONTROL	DATA GENERAL HAZELTINE
CABLE DATA	?	BROADCASTING	ACCOUNTING FCC RETURNS	HONEYWELL COMP-AUTO-MATION DATAPOINT CDC
CEDAR CREEK MANAGEMENT SYSTEMS	25-80	OIL/GAS TRANSPORTATION RETAIL EDUCATION	ACCOUNTING	HONEYWELL

EXHIBIT III-3 (CONTD)

SUMMARY OF TURNKEY VENDORS INTERVIEWED

VENDOR NAME	TURNKEY SYSTEMS			
	PRICE RANGE ($K)	INDUSTRY APPLICABILITY	APPLICATIONS	HARDWARE
COMPLETE COMPUTER SYSTEMS	50-150	BANKING	CASH TRANSACTIONS	DATA GENERAL WESTERN DYNAMIC TALLY
COMPOSITION SYSTEMS	250+	EDUCATION GOVERNMENT COMMUNI-CATIONS	TYPESETTING	HARRIS
CREATIVE DATA SYSTEMS	16-50	MEDICAL	ACCOUNTING INVENTORY, CONTROL	DEC CDC
DATA SYSTEMS ASSOCIATES	25-150	TRANSPORTATION UTILITIES COMMUNI-CATIONS	SPECIAL MIS	OWN CALCOMP HAZELTINE TALLY
DATA TERMS AND COMMUNI-CATIONS	12+	MANUFACTURING TRANSPORTATION MEDICAL UTILITIES RETAIL/WHOLES	ACCOUNTING WORD PROCESSING	OWN
DIGITAL COMPUTER CONTROLS	15-75	MANUFACTURING TRANSPORTATION	ACCOUNTING PAYROLL INVENTORY CONTROL	DATA GENERAL

EXHIBIT III-3 (CONTD)

SUMMARY OF TURNKEY VENDORS INTERVIEWED

VENDOR NAME	TURNKEY SYSTEMS			
	PRICE RANGE ($K)	INDUSTRY APPLICABILITY	APPLICATIONS	HARDWARE
DIVA	?	MEDICAL	REGISTRATION ACCOUNTING	DATA GENERAL CDC DEC LEAR TALLY
GENERAL INSTRUMENT	500-38	UTILITIES RETAIL BANKING INSURANCE GOVERNMENT	CASH	DEC DATA GENERAL SYSTEMATICS SYKES
HBO	80-135	MEDICAL	REGISTRATION ORDER ENTRY COMMUNICATION DATA COLLECTION ACCOUNTING	FOUR PHASE
INTERCOMB	3+	OIL/GAS GOVERNMENT	RESOURCE CONTROL DISTRIBUTION PROCESS CONTROL	HARRIS
IRD	1K-3	COMMUNICATION	GROUND STRUCTURE PROCESSING	DEC
ITEL	11-152	MANUFACTURING TRANSPORTATION MEDICAL RETAIL/WHOLES BANKING INS. - COMM.	INDUSTRY SPEC. INVENTORY CONTROL ACCOUNTING PAYROLL	

EXHIBIT III-3 (CONTD)

SUMMARY OF TURNKEY VENDORS INTERVIEWED

VENDOR NAME	TURNKEY SYSTEMS			
	PRICE RANGE ($K)	INDUSTRY APPLICABILITY	APPLICATIONS	HARDWARE
MARTIN-MARIETTA	?	MANUFACTURING	ACCOUNTING INVENTORY CONTROL	H-P IBM DEC DATA GENERAL
MICOR	150-1	MEDICAL BANKING HOTELS	ENERGY CONTROL EFTS BILLING	TI CALCOMP ELECTROHANE GE
MODULAR SYSTEM	20-30	MANUFACTURING TRANSPORTATION WHOLESALE	BOM ORDER ENTRY PURCHASING COSTING INVENTORY CTL	CROMENCI CENTRONICS TELETYPE
NEC	13-150	VARIOUS	ORDER ENTRY SALES ANALYSIS INVENTORY CTL ACCOUNTING PAYROLL	OWN
NORTHROP DATA SYSTEMS	20-230	MANUFACTURING	ORDER PROC. INVENTORY CTL. ACCOUNTING PRODUCTION CTL. PAYROLL	OWN REGISTRATION BILLING
PERKIN-ELMER	33.5+	MANUFACTURING TRANSPORTATION UTILITIES RETAIL/WHOLES GOVERNMENT	MILITARY AEROSPACE DATA COLLECTION SIMULATION COMMERCIAL	OWN

EXHIBIT III-3 (CONTD)

SUMMARY OF TURNKEY VENDORS INTERVIEWED

VENDOR NAME	TURNKEY SYSTEMS			
	PRICE RANGE ($K)	INDUSTRY APPLICABILITY	APPLICATIONS	HARDWARE
A O SMITH	55-100	MANUFACTURING TRANSPORTATION WHOLESALE	ACCOUNTING PAYROLL	DATA GENERAL
SUN INFORMATION SERVICES	20-80	OIL/GAS TRANSPORTATION UTILITIES WHOLESALE	DISTRIBUTION COSTING ACCOUNTING SCHEDULING	DATA GENERAL IBM
SYSTEMS ADI	200-300	COMMUNICATIONS	TELECOMMUNI-CATIONS	CDC
TESDATA	100-200	VARIOUS	H/W MONITOR	OWN
WESTINGHOUSE	12-500	MANUFACTURING UTILITIES	ENERGY MGMT. N.C. PROCESS CTL.	OWN

IV PRODUCTION

IV PRODUCTION

A. HARDWARE AND SOFTWARE SOURCES

1. HARDWARE

- The majority of Turnkey System vendors do not supply their own hardware to their clients. As shown in Exhibit IV-1, 23 firms (79%) of the 29 in the survey purchased their hardware from other manufacturers, while only six (21%) supplied their own hardware.

- Of those that purchased, a majority (45%) bought their systems as sub-assemblies and components, rather than as a complete package.

- Only a small minority of firms (6.9%) supplied their own CPU and added on peripherals.

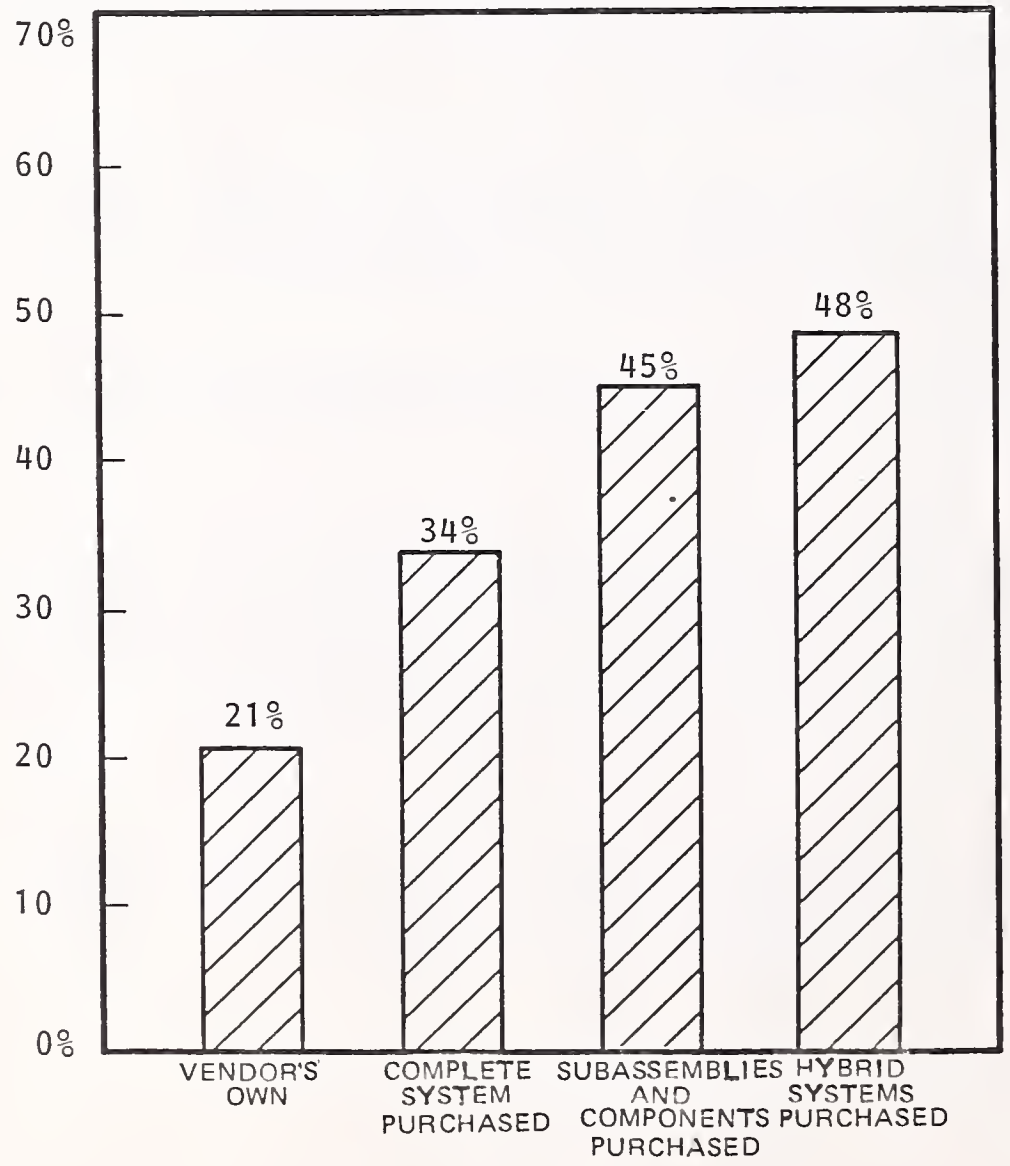
- Of the six firms that supplied their own hardware for their turnkey systems, all used proprietary equipment. One firm, however, stated that as far as its clients were concerned it was all proprietary equipment "no matter where we get it from!"

- About 48% of the hardware supplied for these turnkey systems was hybrid in that a variety of manufacturers was represented.

EXHIBIT IV-1

SOURCES OF HARDWARE

VENDOR'S OWN	PURCHASE		TOTAL
	COMPLETE SYSTEM	SUBASSEMBLIES AND COMPONENTS	
6	10	13	29



- As shown in Exhibit IV-2, the most popular suppliers of Turnkey Systems hardware, including both mainframe and peripherals, are Data General, Hewlett-Packard, DEC, and CDC.

- Although 50% of equipment choices are in the "OTHERS" column, no one firm predominates in this category, which includes equipment made by many manufacturers, such as Honeywell, Harris, Tesdata, etc.

- The firm that supplies more hardware than any other seems to be Data General (23.9%) of equipment choices.

- This breakdown holds true even when examining popular suppliers by unit. In CPUs, for example, the popular vendors are again Data General, DEC, and Hewlett-Packard.

- In the CPU category, however, it should be noted that two firms supplied their own unit and added on peripherals made by others.

2. PURCHASE ARRANGEMENTS

- Turnkey Systems vendors are fairly evenly divided between those who have a volume discount and guaranteed minimum arrangement with their hardware suppliers (42%) and those who have some other, usually OEM, arrangement (38%).

- As shown in Exhibit IV-3, none of the vendors interviewed had a guaranteed minimum arrangement alone. Rather, they either had a volume discount arrangement or they had a combined volume discount and guaranteed minimum plan.

3. SOFTWARE

- As shown in Exhibit IV-4, a slim majority (42%) of vendors supplied their own systems software with their turnkey systems.

EXHIBIT IV-2

POPULAR VENDOR HARDWARE
(NUMBER OF EQUIPMENT CHOICES)

DATA GENERAL	DEC	HEWLETT-PACKARD	CDC	OTHERS
17 (23.9%)	11 (15.5%)	3 (4.2%)	4 (5.6%)	36 (50%)

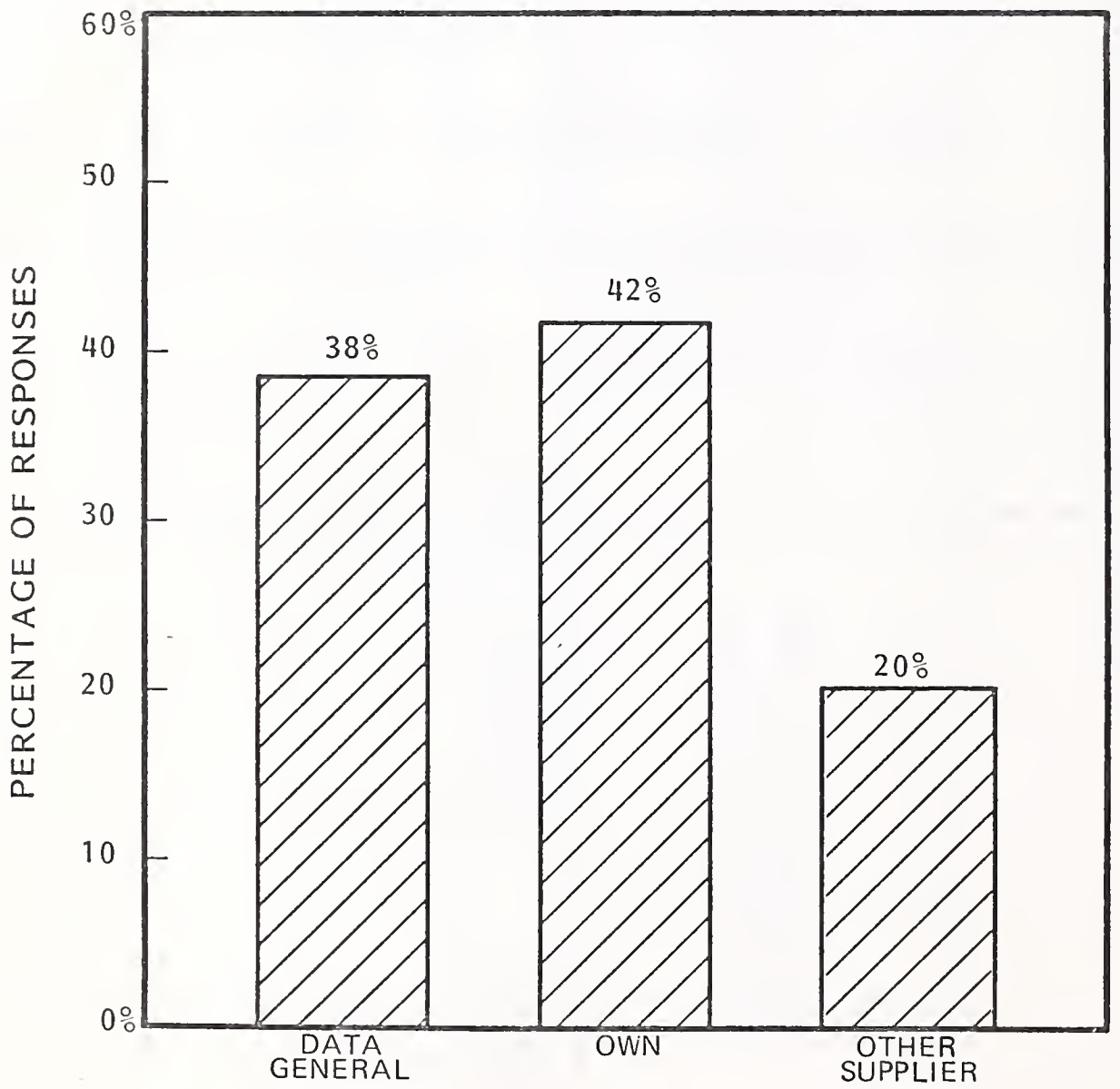
EXHIBIT IV-3

TYPES OF PURCHASE ARRANGEMENTS

VOLUME DISCOUNT AND GUARANTEED MINIMUM			OTHER STANDARD ARRANGE-MENT	NOT APPLICABLE	NO ANSWER	TOTAL
VOLUME DISCOUNT	GUARANTEED MINIMUM	BOTH				
6 (20.9%)	0	6 (20.9%)	11 (37.9%)	3 (10.3%)	3 (10.3%)	29

EXHIBIT IV-4

SYSTEMS SOFTWARE SUPPLIERS



NUMBER OF RESPONDENTS = 29

- Data General was again the leading supplier, providing systems software to 38% of the firms surveyed for this report. Other sources supplied 20%.

- Applications software was produced by the systems vendors in 100% of the cases.

- Exhibit IV-5 shows that BASIC was the primary language used to develop applications software.

- BASIC is the overall language of choice even when examining the industrial specialization of the turnkey vendor, as shown in Exhibit IV-6. As would be expected, FORTRAN was the primary language used for technical applications. However, even here, a surprising 33.3% of Turnkey Systems dedicated to technical applications used BASIC.

- BASIC appears to be the most practical language to use for software applications in the turnkey systems industry.

B. SOFTWARE PRODUCTION AND CUSTOMIZATION

1. LANGUAGES AND PROGRAMMING TECHNIQUES

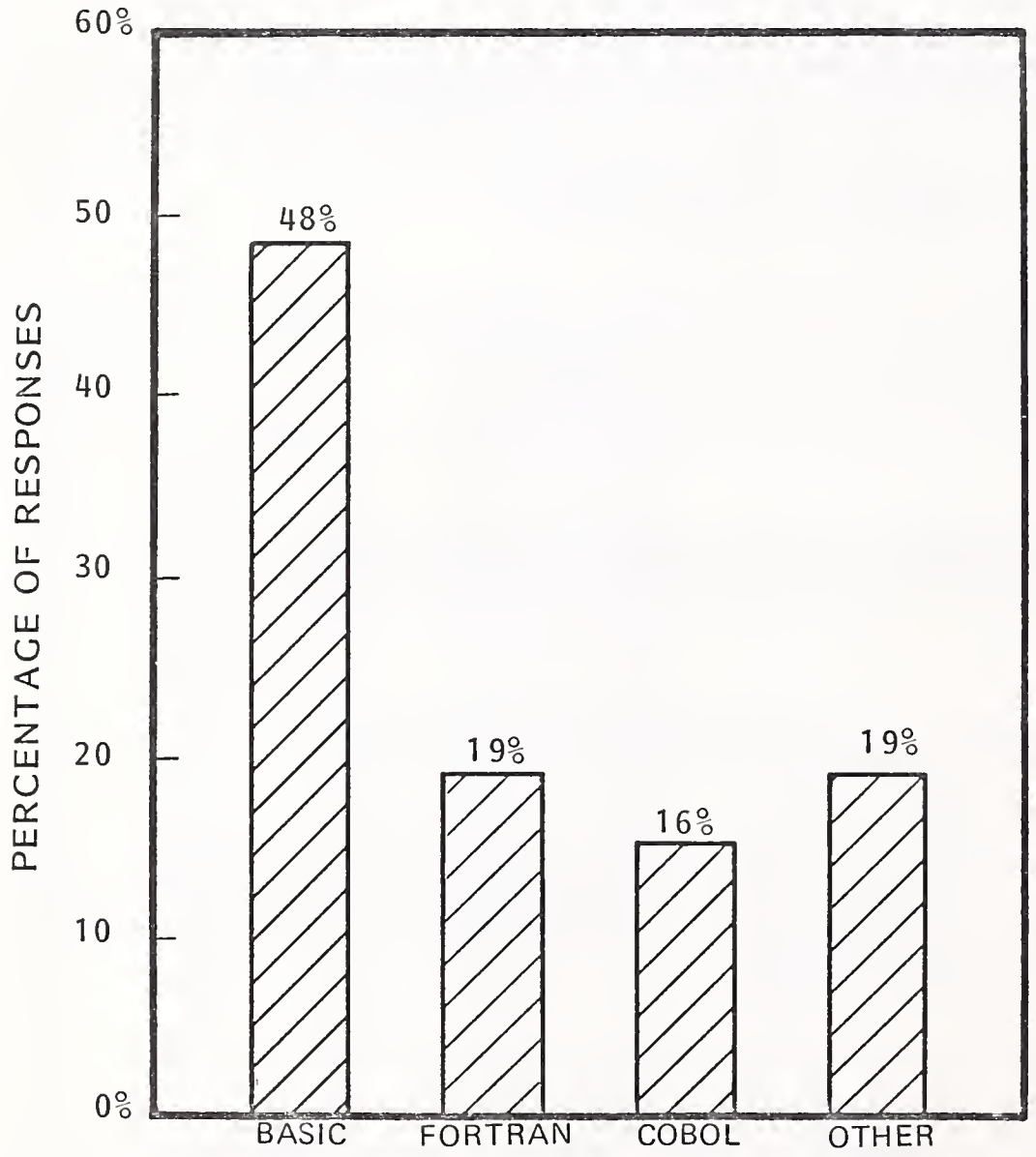
- The types of programming techniques employed by turnkey systems vendors are shown in Exhibit IV-7. Traditional and module subroutine methods received the most emphasis.

2. USER REQUIREMENTS SPECIFICATIONS

- Only in cases where the vendor has a specific knowledge of a particular clients' requirements or feels he has a specific expertise in a particular area are user's requirements for a Turnkey System defined in other than a management orientation.

EXHIBIT IV-5

PRIMARY LANGUAGES USED TO DEVELOP
APPLICATIONS SOFTWARE



NUMBER OF RESPONDENTS = 34

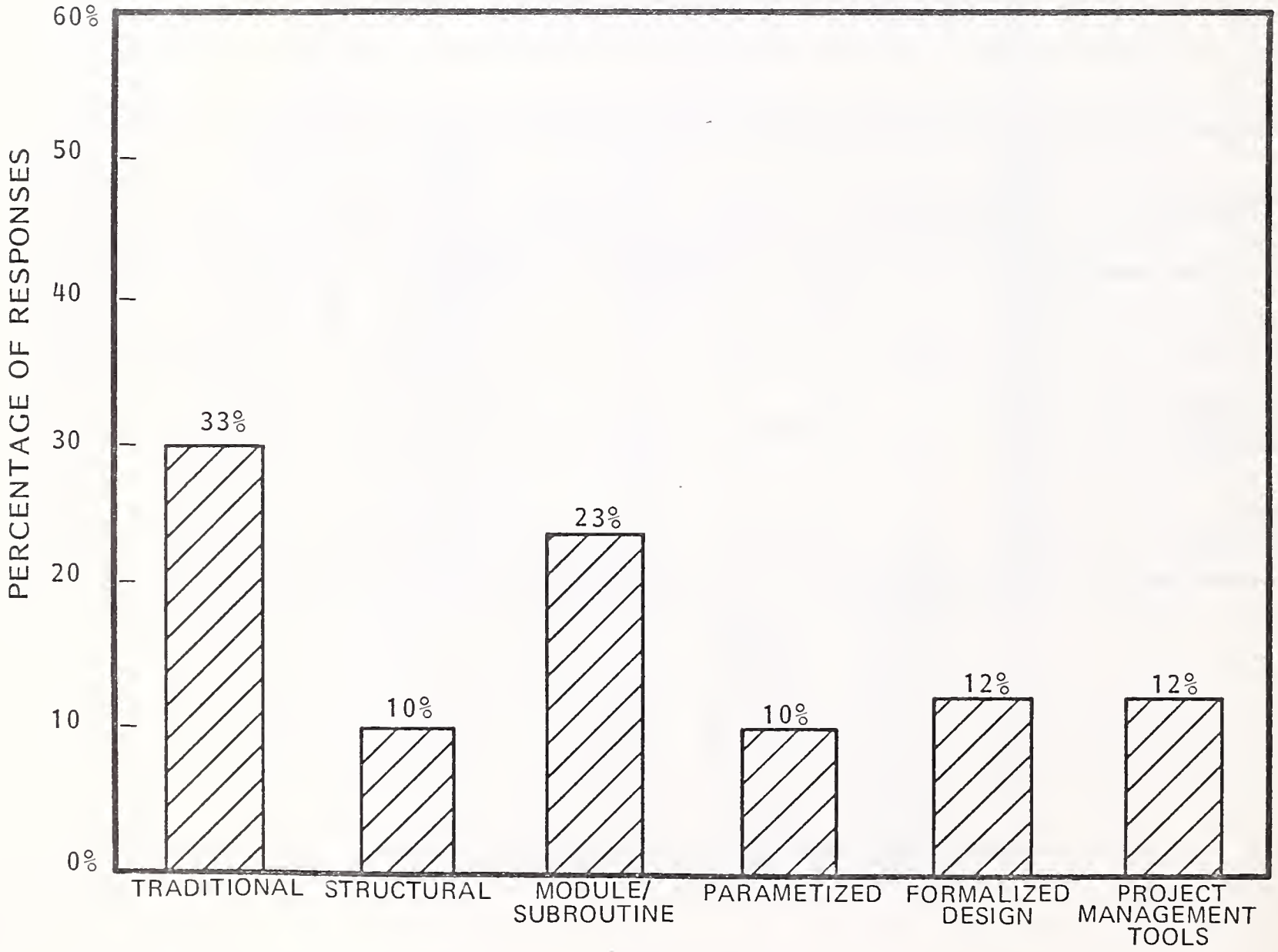
EXHIBIT IV-6

APPLICATION SOFTWARE BY INDUSTRY
(%)

INDUSTRY	FORTRAN	BASIC	COBOL	OTHER	TOTAL
TECHNICAL	55.6%	33.3	0	11.1	100%
SPECIALIZED COMMERICAL	7.6%	46.2	23.1	23.1	100%
GENERAL COMMERCIAL	9.1%	54.5	18.2	18.2	100%

EXHIBIT IV-7

PROGRAMMING TECHNIQUES EMPLOYED BY
TURNKEY SYSTEMS VENDORS



NUMBER OF RESPONDENTS = 58

- As shown in Exhibit IV-8, management needs account for 69% of the number of responses on user requirements specifications. "Management needs" is a category of user requirements that can be defined as a response on the part of the vendor to a potential client's requirements as specified by the client. The vendor will approach the client management with a package and will then respond to clients' particular applications and specifications. The vendor will give the potential client a choice of modules, for example.

- "Customer Needs" and "Expertise in Field" can be defined as follows:

  - "Customer Needs" implies that the vendor not only offers a potential client a wide variety of modules to meet the client's applications but will also customize software to meet any unique requirements that the client might have. The client might handle his cash flow in a unique manner, for example, or the client might be in a very specialized, one-of-a-kind industry.

  - "Expertise in Field" means that the vendor feels he has enough knowledge of an industry to go to a client and offer a package that will meet all of the client's needs, without customizing or modifying in any way. For example, a turnkey vendor may feel he has a thorough knowledge of the travel agency field. He will write his software to cover all applications that a travel agency might need and then market the product to that particular industry.

- "Expertise in the field" represents 13.8% of responses. In relating this category of response to technical, general commercial, or specialized commercial user requirements, the majority (37.5%) of the "Expertise" responses were found among vendors offering specialized commercial systems. Surprisingly, none of the surveyed firms considered their "Expertise" in the general commercial system area.

EXHIBIT IV-8

USER REQUIREMENTS SPECIFICATIONS
(NUMBER OF RESPONSES)

MANAGEMENT NEEDS	CHECK LISTS	CHOICE OF OPINION	DECISION TABLES	CUSTOMER NEEDS	EXPERTISE IN FIELD
20 (69%)	0	1 (3.4%)	0	4 (13.8%)	4 (13.8%)

3. PRODUCTION AND CUSTOMIZATION

- When questioned on customization, 13 firms (45%) replied that they do customize hardware; 15 (52%) do not customize; and 1 (3%) did not respond.

- In applications software, only five firms (13%) do not customize at all.

- As shown in Exhibit IV-9, of those providing software customization, 38% charge their clients at rate, 32% provide customization at no charge, and 30% have various ways of absorbing the cost, such as packaging it in the system or negotiating a separate fee.

- Exhibit IV-10 shows software customization charges in relation to the type of user requirement. It can be seen that vendors are fairly evenly divided between those who do not charge for customization and those who do.

- In relating this to Exhibit IV-6, we can see that the majority of vendor customization involves BASIC and it is for commercial rather than for technical users.

C. STAFF/FACILITIES USED IN PRODUCTION

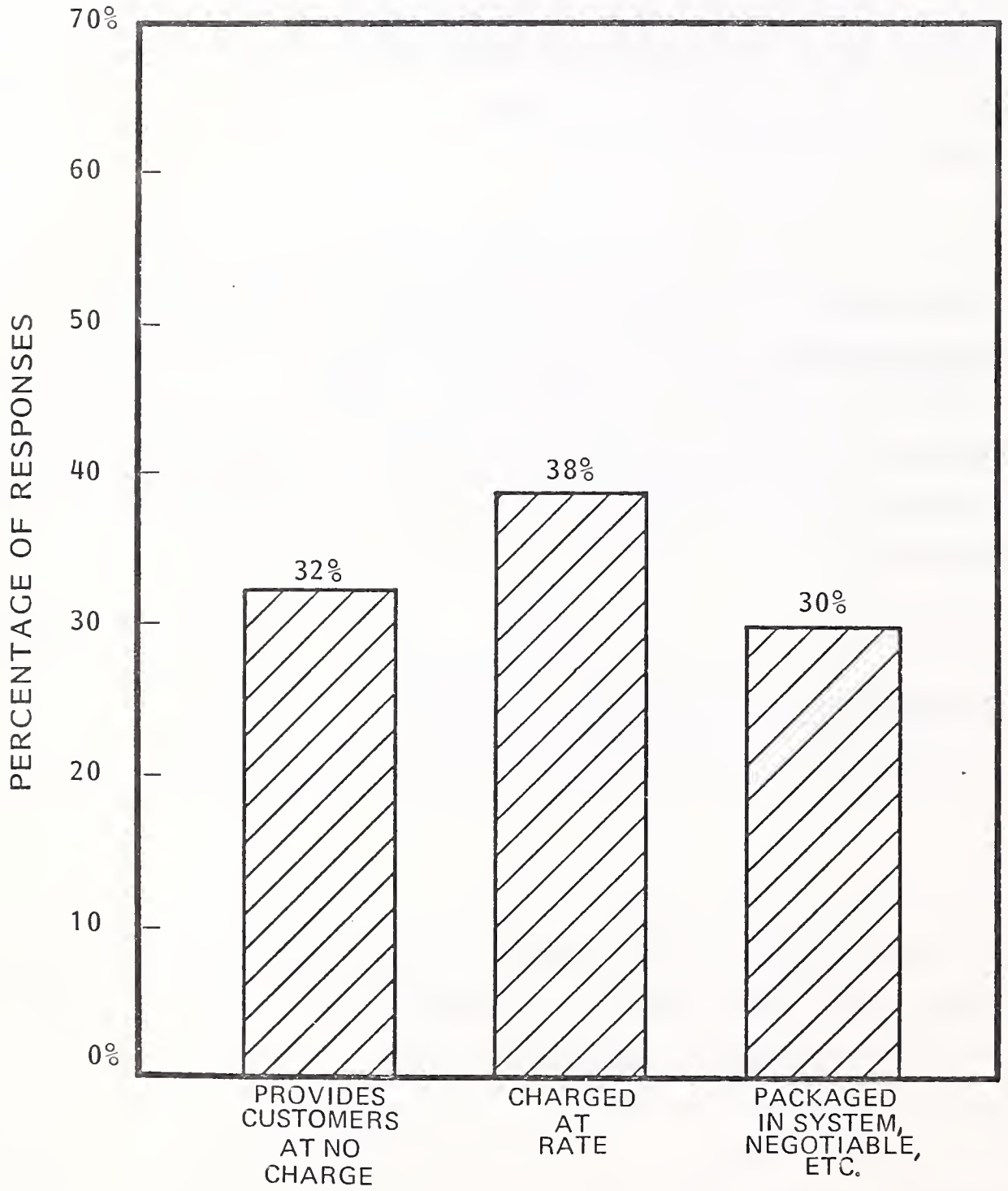
1. STAFF

- Exhibit IV-11 shows staff assignments by company size (in sales). The larger the company, the more people are assigned to system assembly/interfacing, system test/debugging, and applications testing.

- There is a noticeable drop in the number of people assigned to vendor and component selection and incoming test/inspection in companies with sales of $11 million to $50 million. A reason for this might be a greater investment in automated functions by companies of this size.

EXHIBIT IV-9

CUSTOMIZATION



NUMBER OF RESPONDENTS = 34

INPU

EXHIBIT IV-10

SOFTWARE CUSTOMIZATION CHARGES IN
RELATION TO COMMERCIAL VS. TECHNICAL
USER REQUIREMENTS (%)

CUSTOMIZATION CHARGE	SPECIALIZED COMMERCIAL	GENERAL COMMERCIAL	TECHNICAL
NO CHARGE	16.1	9.7	3.2
CHARGED AT VENDOR RATE	16.1	6.5	6.5
PACKAGED IN SYSTEM	3.2	3.2	9.7
NEGOTIABLE	3.2	9.7	0
NO CUSTOMIZATION	9.7	0	3.2

EXHIBIT IV-11

STAFF FUNCTIONS BY COMPANY SIZE
(AVERAGE NUMBER OF PEOPLE)

SALES ($)	VENDOR AND COMPONENT SELECTION	INCOMING TEST/ INSPECTION	SYSTEM ASSEMBLY INTERFACING	SYSTEM TEST/ DEBUGGING	APPLI-CATIONS TESTING
250K-999K	2.5	2.5	5.5	4.5	2.0
1M-10M	5.3	4.5	24.5	22.3	11.8
11M-50M	4.0	3.0	42.5	27.5	25.0

- To better evaluate these figures in context, it is useful to describe the usual sequence of functions in producing a turnkey system:

  - The majority of turnkey system vendors have a "value added system" in which they:

    . Sign an agreement with a hardware manufacturer for a quantity discount.

    . Write the software for the specific market to which they are targeting their sales efforts.

  - At the opposite end of the scale is the turnkey vendor who:

    . Designs a system.

    . Determines the specifications for the design.

    . Obtains components to meet the specifications.

    . Performs tests on the components.

    . Assembles a prototype system.

    . Performs system testing.

    . Purchases components in large quantities.

    . Goes into production.

    . Writes software.

  - There are many combinations between these two extremes. Some turnkey vendors, for example, will buy a CPU -- or use their own --and

combine various peripherals from different manufacturers with it. This involved requirements for interfacing units and other methods of obtaining a compatible system.

2. FACILITIES

- The in-house capabilities and use of facilities are shown in Exhibit IV-12. Regardless of the price of the system offered, the Turnkey Systems vendor has a fairly even distribution of resources. This is particularly true in the lower price systems.

- Companies with overall sales in the $250,000 to $1 million range concentrate their facilities use on interfacing. Those with higher sales figures tend to have a wider distribution.

D. SYSTEM DEFINITION AND INSTALLATION

1. METHODS OF SPECIFICATION

- The methods of specifying the system and determining the user's requirements are shown in Exhibit IV-8.

2. LEVEL OF CUSTOMER INVOLVEMENT

- Dealing with top management constitutes the majority of Turnkey Systems customer involvement (73.1% of responses) as shown in Exhibit IV-13.

- DP personnel and marketing/operations personnel are also involved in many cases, but this often depends upon the size of the user.

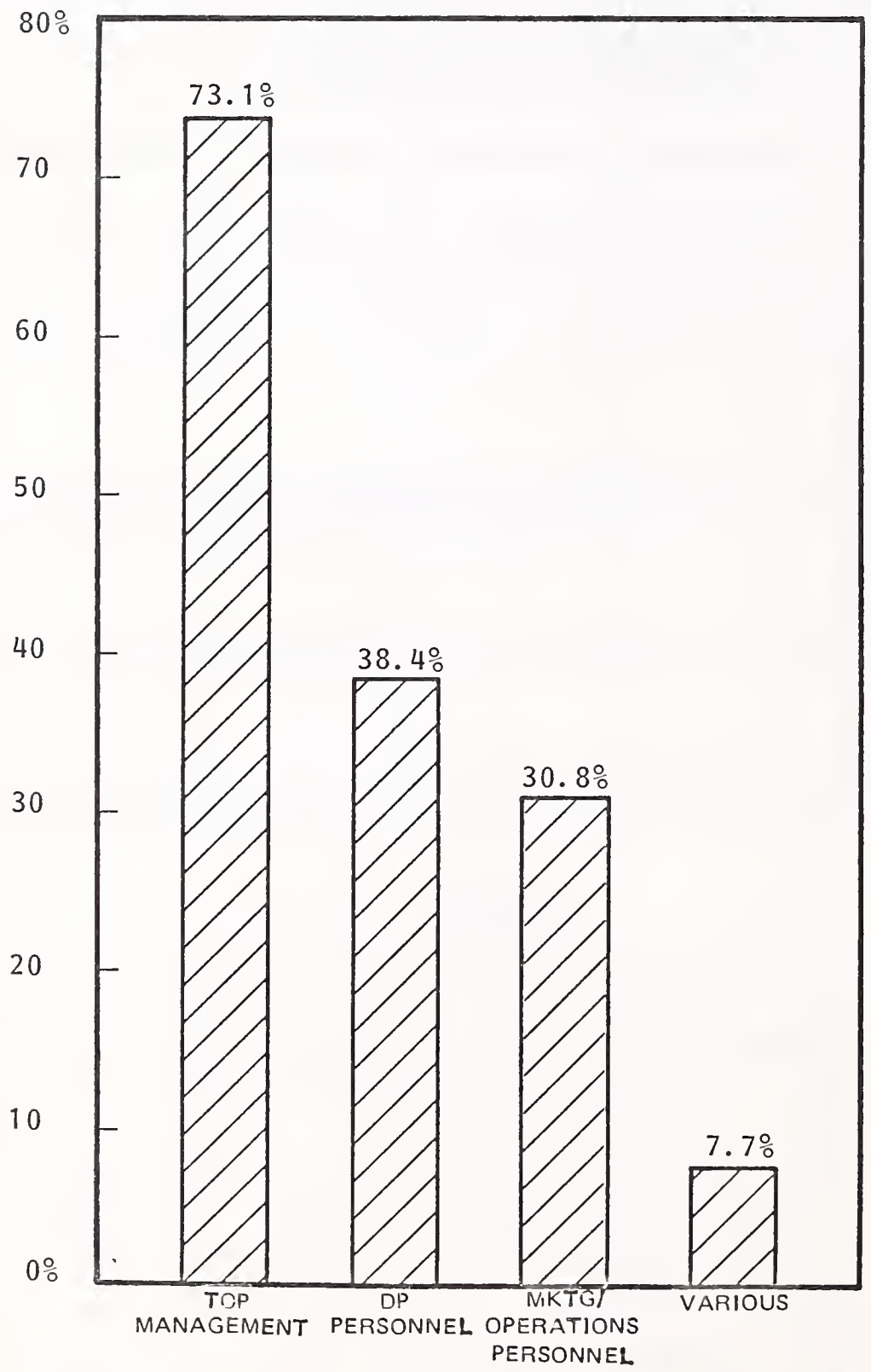
- DP personnel in larger firms requiring Turnkey Systems apparently act as technical consultants.

EXHIBIT IV-12
USE OF FACILITIES
(PERCENT OF FIRMS)

FIRMS	HARDWARE ENGINEERING	PRODUCTION (MANPOWER)	FACILITIES FOR INTERFACING	FACILITIES FOR ASSEMBLY FROM COMPONENTS	FACILITIES FOR DEVELOPMENT OF SPECIAL PURPOSE HARDWARE
AVERAGE SYSTEM PRICE					
25K-50K	37%	37%	42%	37%	16%
51K-300K	21	11	26	16	16
301K-1M	11	5	11	11	5
>1M	5	5	11	11	5
SALES					
250K-1M	0	0	12	0	0
1M-10M	63	50	63	50	38
>10M	12%	12%	25%	25%	12%

EXHIBIT IV-13

LEVEL OF CUSTOMER INVOLVEMENT



NUMBER OF RESPONDENTS = 39

INPU

3. PRODUCTION LEAD TIMES

- Production lead times have a direct relationship to the complexity, size, and cost of the turnkey system.

- As shown in Exhibit IV-14, 25% of those firms requiring less than three months from initial order to delivery sold systems priced at $25,000 to $50,000. Those firms selling systems priced at over $250,000 required 10 months to two years for delivery from date of order.

- The lead time, nevertheless, is longer for the alternative way of implementing a turnkey system, which usually involves a series of steps such as:

  - Feasibility study.
  - Establishment of system specifications.
  - Choice of hardware and standard software.
  - Placement of order.
  - Program specifications.
  - Programming and testing.
  - File creation/conversion.
  - System testing.
  - User training.

EXHIBIT IV-14

PRODUCTION LEAD TIMES AND
AVERAGE SYSTEM COST
(%)

AVERAGE COST OF SYSTEM ($)	PRODUCTION LEAD TIME		
	<3 MONTHS	3-9 MONTHS	10 MONTHS -2 YEARS
25K - 50K	25.0	33.3	0
51K-150K	12.5	4.1	4.1
151K-250K	0	4.1	4.1
>250K	0	0	16.6

INP

- In comparison, a turnkey system involves the straight purchase, lease, or rental of a system that can be tailormade for the user's applications. This can be at a considerable saving according to the complexity and size of the applications involved.

V MARKETING AND SUPPORT

V MARKETING AND SUPPORT

A. DISTRIBUTION CHANNELS

- The main method of distribution is through a direct sales force; 85% of vendors (see Exhibit V-1) market their Turnkey Systems through this channel. 44% of vendors market through distributors and 7% through manufacturer leads.

- Clearly, some vendors use more than one distribution channel. Typically, this occurs where a vendor markets his products directly in his home market and gains extra geographic coverage through distributors; 30% of vendors use both channels.

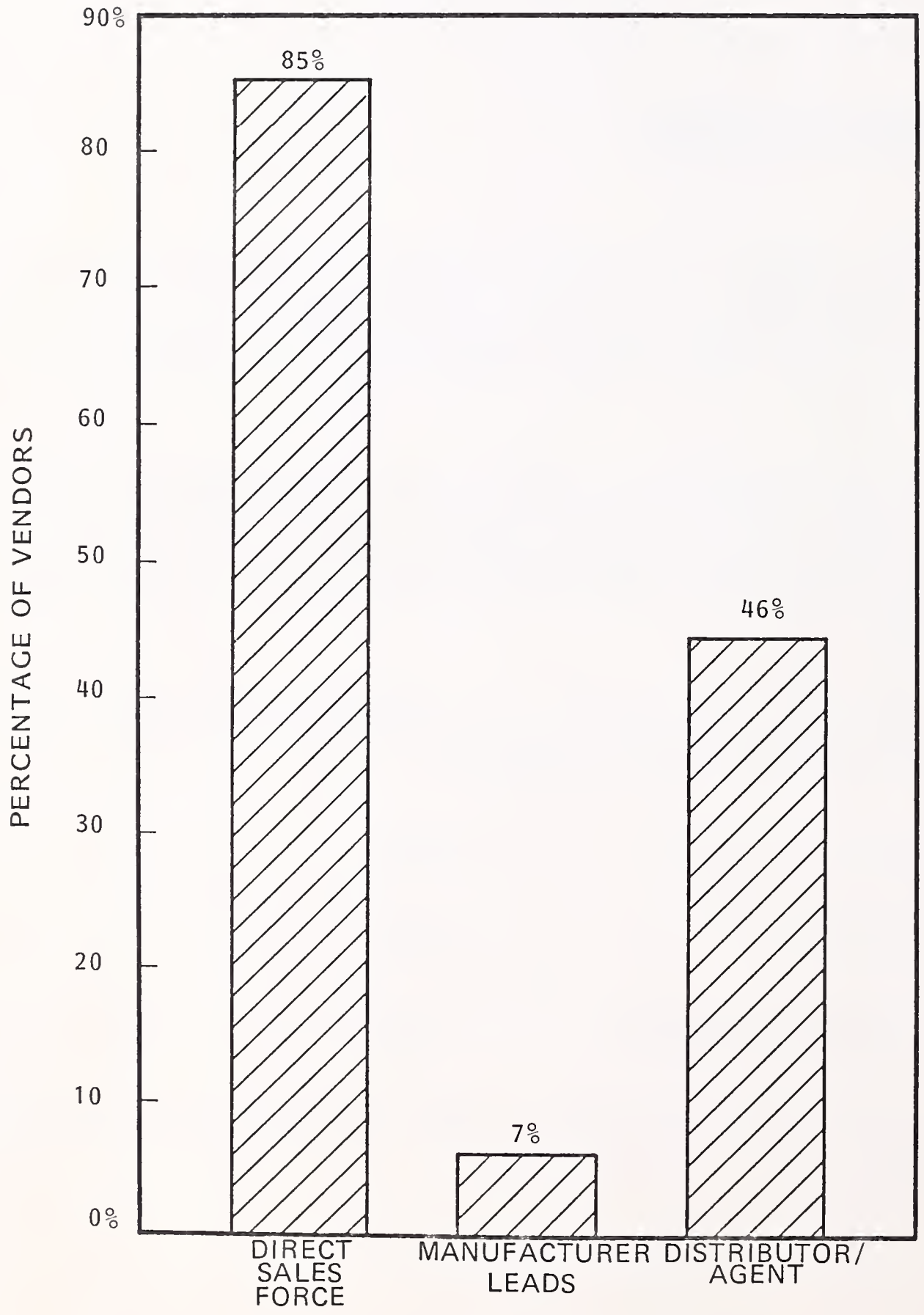
- The majority of vendors (70%) use one distribution channel only; these are chosen from the three options as follows:

  - Direct sales force - 52%
  - Distributor - 15%
  - Manufacturer's leads - 3%

- No vendors declared that they use more than three types of distribution channels.

EXHIBIT V-1

VENDOR USAGE OF DISTRIBUTION CHANNELS



- After the domestic U.S. market the next most popular markets are first Canada then Europe. (See Exhibit V-2.) This is so in terms of both the percentage of vendors selling directly and the overall level of interest (obtained by adding the percentage for "direct sales force," "distributor(s)" and "would consider").

- Understandably, the level of interest in direct selling diminishes as the distance of the market from the U.S. increases. Conversely, the level of interest in selling through distributors increases as a function of distance from the home market.

- The Middle East is only the fifth most popular market -- in spite of the attraction of huge development plans and lavish spending of vast oil revenues.

- Canada, South America and Europe are the most attractive as new market areas. It should be noted that at least one vendor, which had stated "no interest" in Europe during the survey, changed its mind when re-approached with a real opportunity for cooperation.

- The Far East is the least attractive market, with no vendors selling directly there and the highest number stating "no interest."

B. PRICING

- Overall system prices average $88K and fall in the range of $25K to $350K.

- Sixty-seven percent of all turnkey systems prices are "bundled," that is, the prices would not normally be broken down into hardware, software and other components. Eighteen percent are offered "unbundled," and the remaining 15% are offered with either approach. Some examples of bundled and unbundled prices are as follows:

EXHIBIT V-2

LEVELS OF DISTRIBUTION INTEREST BY GEOGRAPHIC REGION

REGION	EXISTING DIRECT SALES FORCE	ESTABLISHED THROUGH DISTRIBUTOR(S)	WOULD CONSIDER	NO INTEREST
U.S.A.	85%	15%	-	-
CANADA	33	8	26	33
SOUTH AMERICA	12	8	26	56
EUROPE	21	16	19	46
MIDDLE EAST	4	15	26	55
FAR EAST	-	19%	19%	62%

-	Bundled	HP 3000 or 1000 based system with MANMAN software	$135K to $300K
-	Unbundled	a) BOM and Inventory Control DEC based software	$15K
		b) Order Processing, Inventory Control and Invoicing DEC or S/I based software	$15K

- All vendors offer their systems for outright purchase and 27% of these offer purchase as the only option. (See Exhibit V-3.)

- Seventy-three percent of all vendors offer leasing as an acquisition option and only 45% offer rental.

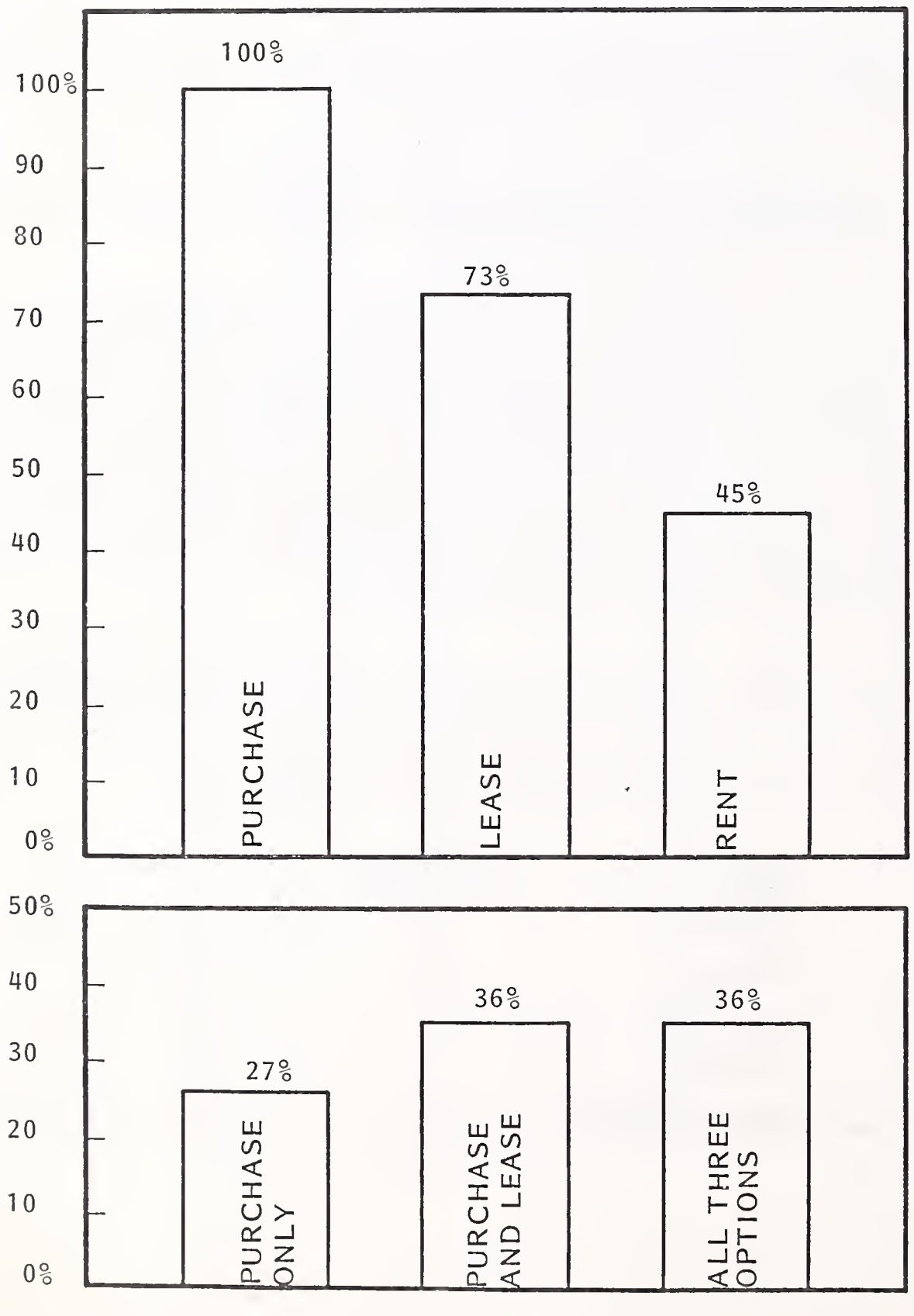
- Although the question was not asked specifically in the survey, it may be safely assumed that a major factor in the selection of user acquisition options offered by vendors is the vendor's cash flow. Purchase provides "immediate" cash at today's value, whereas leasing involves some delay (if offered through a third party leasing company) and probably incurs a discount; from a cash flow point of view, rental is the least attractive.

- Nearly all vendors interviewed described their pricing policy as "cost plus related to the market and competitive conditions." Only one vendor was prepared to give a breakdown of his system pricing; this is:

ITEM	Percentage
Hardware	30
Software	30
Installation	10
Training	5
Sales/marketing	25
	100%

EXHIBIT V-3

OPTIONS AVAILABLE FOR SYSTEM ACQUISITION



INPU

- Maintenance is priced separately by the majority of vendors; as a percentage of the total system price the maintenance charges vary as follows:

Monthly	0.34% to 1%
Annually	1.6% to 6%

- Some exceptions to this pattern were:

  a. Maintenance subcontracted to DEC at their rates.

  b. Software only maintenance charged at 8% per annum.

  c. Maintenance charge (for unspecified period) included in purchase price.

- Some additional but isolated comments on pricing terms included:

  a. "Europe (distributor) produces own software."

  b. System invoiced 2/3 on delivery and 1/3 on acceptance.

- The sample size specified for this survey is insufficient to allow statistically reliable subdivision of the data by industry and application. Therefore, only range values found are given in Exhibit V-4 for broad indications of pricing.

- Five industries generate demand for high-priced systems. Sales of $2M or over have been made by vendors in the sample to the following industries:

  - Oil/Gas.

  - Utilities.

  - Retail/Wholesale.

  - Banking/Insurance.

EXHIBIT V-4a

SYSTEM AVERAGE PRICE RANGE BY INDUSTRY

INDUSTRY	TYPICAL PRICE RANGE
DISCRETE MANUFACTURING	$25K-$300K
PROCESS MANUFACTURING (LESS OIL)	50K-90K
OIL/GAS	30K-3M
TRANSPORT/TRAVEL	42K-60K
MEDICAL	35K-100K
UTILITIES	50K-2M
RETAIL/WHOLESALE (LESS RESTAURANTS/HOTELS)	40K-2M
RESTAURANTS/HOTELS	22K-350K
BANKING/INSURANCE	1M-2M
GOVERNMENT (FEDERAL)	90K-200K
COMMUNICATIONS	$65K-$2M

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EXHIBIT V-4b

SYSTEM AVERAGE PRICE RANGE BY APPLICATION

APPLICATION	TYPICAL PRICE RANGE
COMMERCIAL	
ACCOUNTING	$40K-$165K
PAYROLL	24K+
CASH/CHECK PROCESSING	1M-2M
ORDER ENTRY	43K
INVENTORY CONTROL	24K-165K
SALES ANALYSIS	43K
SCHEDULING /BOM	24K-50K
PURCHASING	43K
COSTING	50K
DISTRIBUTION	24K+
RESERVATIONS	350K
TECHNICAL	
DATA COMMUNICATIONS	65K-250K
SATELLITE GROUND STATION PROC.	2M
ENERGY CONTROL	125K-350K
HARDWARE PERFORMANCE MEAS.	150K
NUMERICAL CONTROL	25K
RESOURCE DEVELOPMENT	$3M+

NOTE: SINGLE FIGURE RANGES INDICATE RANGE SIZE OF ONE. THE FIGURES IN THIS EXHIBIT ARE GIVEN FOR EXAMPLE ONLY AND ARE NOT STATISTICALLY SIGNIFICANT.

- Communications.

- Two vendors specialize in the high-priced cash/cheque processing systems in the $1M to $2M average price range; one vendor claims that the upper price limit for his systems is $40M. (See Exhibit V-4.)

- Other high-priced systems include:

  a. One oil/gas vendor which has sold 15 resource development systems at $3M+.

  b. A news agency vendor which has sold nine ground interface systems for satellite data processing at $1M to $3M.

- Apart from these exceptionally highly priced systems, the majority in the survey were priced between $25K and $350K. Application areas which appear to be in the upper end of this range are:

  - Accounting.

  - Inventory control.

  - Data communications.

  - Energy control.

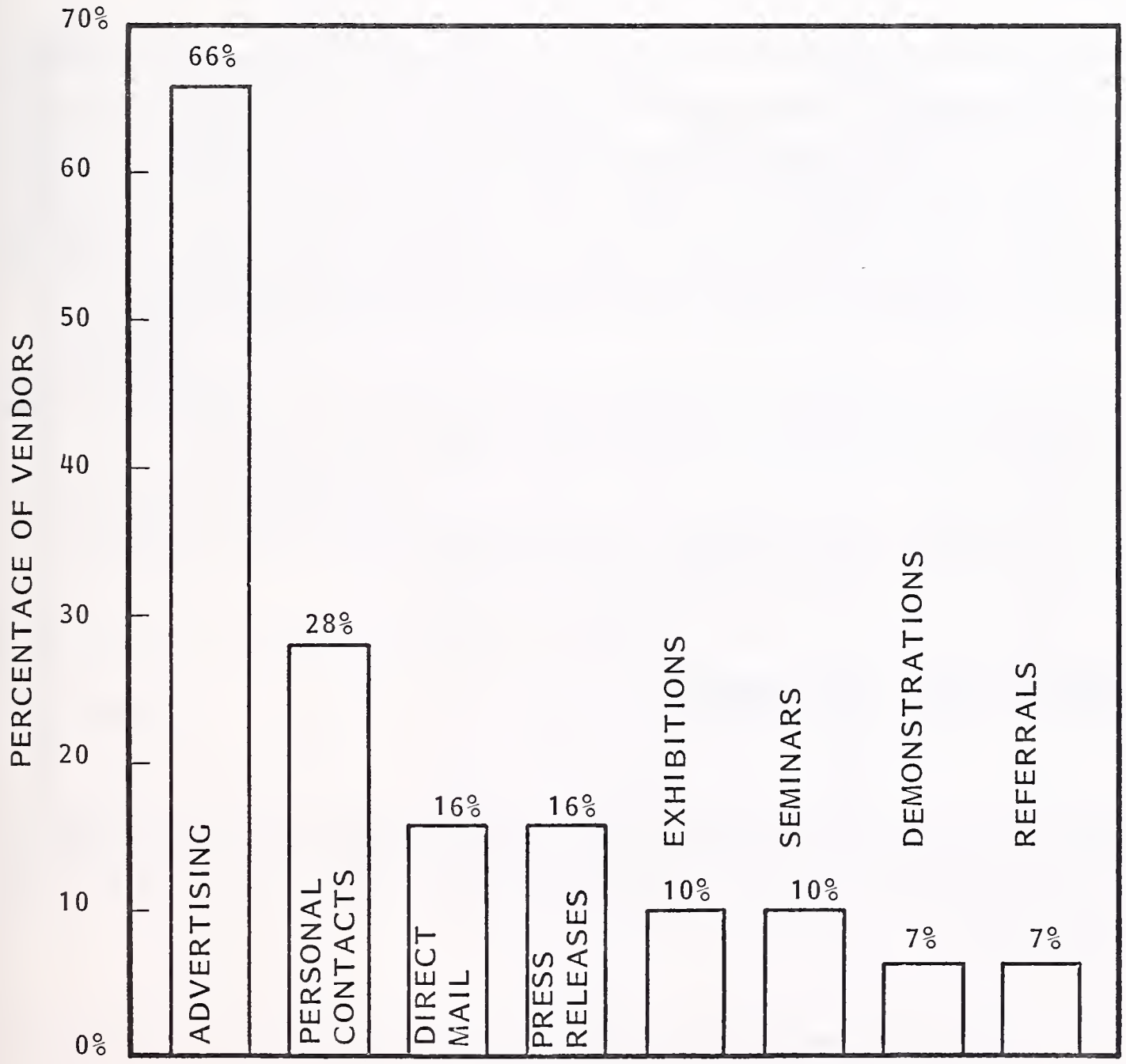
  - Hardware performance measurement.

C. PROMOTION METHODS

- The type of promotion most used by vendors is advertising. Sixty-six percent of all vendors interviewed stated that they use advertising (see Exhibit V-5)

EXHIBIT V-5

PROPORTIONS OF VENDORS USING VARIOUS PROMOTIONAL METHODS



and most put this at the top of their list. At least two thirds of advertising is placed with computer trade and industry journals; 10% of interviewees stated that they use national and local newspapers. Appendix E gives some examples of the advertising in recent months by Turnkey System vendors.

- Personal contacts are the second most used promotional method. Such contacts originate through word-of-mouth and through personal friends of the key people in the vendor company. This is the method used more by small vendors which cannot afford more sophisticated marketing activities.

- More than half (51%) of the interviewees approach the President or Owner (in the case of small companies) first. A further 28% approach first at Executive VP/Controller level; this applies probably to the medium to larger size targets. In cases where the system is of a highly technical nature, the functional manager would be approached first; for example, hardware performance monitoring equipment would be offered to the data processing manager.

- Some vendors described a sequenced approach whereby they approached at the top level first followed by one or two lower levels. For example:

  President - VP/Controller - Functional Manager

D. INSTALLATION AND SUPPORT

- Nearly half (49%) of Turnkey System vendors provide their own installation and maintenance services. (See Exhibit V-6.) This is only practical and effecive if:

  a. The vendor restricts geographic coverage within his resource capability -- many confine their activities to relatively small regions of the U.S.

EXHIBIT V-6

SOURCES OF INSTALLATION/MAINTENANCE SUPPORT

SOURCE	TURNKEY VENDOR	ORIGINAL MANU-FACTURER	THIRD PARTY	TOTAL
SINGLE HARDWARE SOURCE	28%	34%	10%	72%
MULTIPLE HARDWARE SOURCE (HYBRID)	21%	0%	7%	28%
TOTAL	49%	36%	17%	100%

b. The vendor is part of a large organization with an established network of engineering capabilities.

- All of the vendors providing their own installations and maintenance services also customize the hardware to meet specific user system requirements. Under these circumstances, it is most unlikely that the original hardware manufacturer would be willing to take responsibility for installation and maintenance. Sixty-six percent of vendors providing their own service obtain supplies of hardware from external original hardware manufacturers.

- About one third (36%) of vendors use the original hardware manufacturer to supply installation and maintenance services; in all cases, their systems are built up from a single hardware manufacturer range. In none of these cases is the hardware customized.

- Third party installation and maintenance organizations are used by 17% of Turnkey vendors. In 60% of these cases, the hardware is customized.

- The use of an external installation and maintenance organization (either original equipment manufacturers or third party organizations) has both advantages and disadvantages:

  - Advantages
    a) Wider geographic coverage thereby giving increased sales potential.
    b) Allows vendor to devote management effort more in the area of product development and sales.
  - Disadvantages
    a) Breaks the one supplier advantage of the Turnkey System.
    b) Provides an introduction to competition.

- At least one vendor uses their own organization to give local area installation support and an external organization for distant customer sites.

- All applications software is supported by Turnkey System vendors who in all cases develop and produce this with their own resources. This applies also to vendor-developed systems software.

- Nearly three quarters (73%) of those vendors providing a service run their installation and maintenance operations as a profit generating department.

- In July 1977, INPUT conducted a multiclient study on IBM's Series/1 minicomputer system. In this study, 40 of the first 120 Series/1 users were interviewed; 58% believed that IBM's maintenance and support to be the greatest product strength of the Series/1, providing the ability to service and maintain the equipment in remote locations. It may be safely assumed, in line with this finding, that the quality and coverage of installation and maintenance services have a highly significant affect on Turnkey Systems market potential.

- Almost all (93%) of vendors operating their own maintenance service have local offices for fault reporting and service requests. Twenty-one percent of vendors have both central and local reporting; 29% have central or one location reporting.

- After a fault has been reported, first aid is provided by telephone by 86% of vendors. Fourteen percent of vendors can either provide now, or are planning to provide, a computerized automatic diagnostic system. All vendors providing a maintenance service will send a field engineer, usually after exhausting all the telephone/automatic diagnostics possibilities.

- All but two vendors interviewed were very reluctant to provide information about the size of the inventories. The two cooperative vendors revealed that their production inventory falls in the range 33% to 16% compared to sales revenue. The larger of these two percentages applies to the smaller vendor ($2M revenue) and the higher percentage to the larger vendor ($7M revenue).

- Just over half of Turnkey System vendors provide additional services (see Exhibit V-7). The majority of these provide Professional Services which include:

  - Custom software.

  - Software development.

  - Consulting.

- The zero rating for Facilities Management is consistent with the user orientation intention behind Turnkey Systems. If professional computer staff are required from an external vendor to operate such systems, then the implementation of the concept has failed in some way.

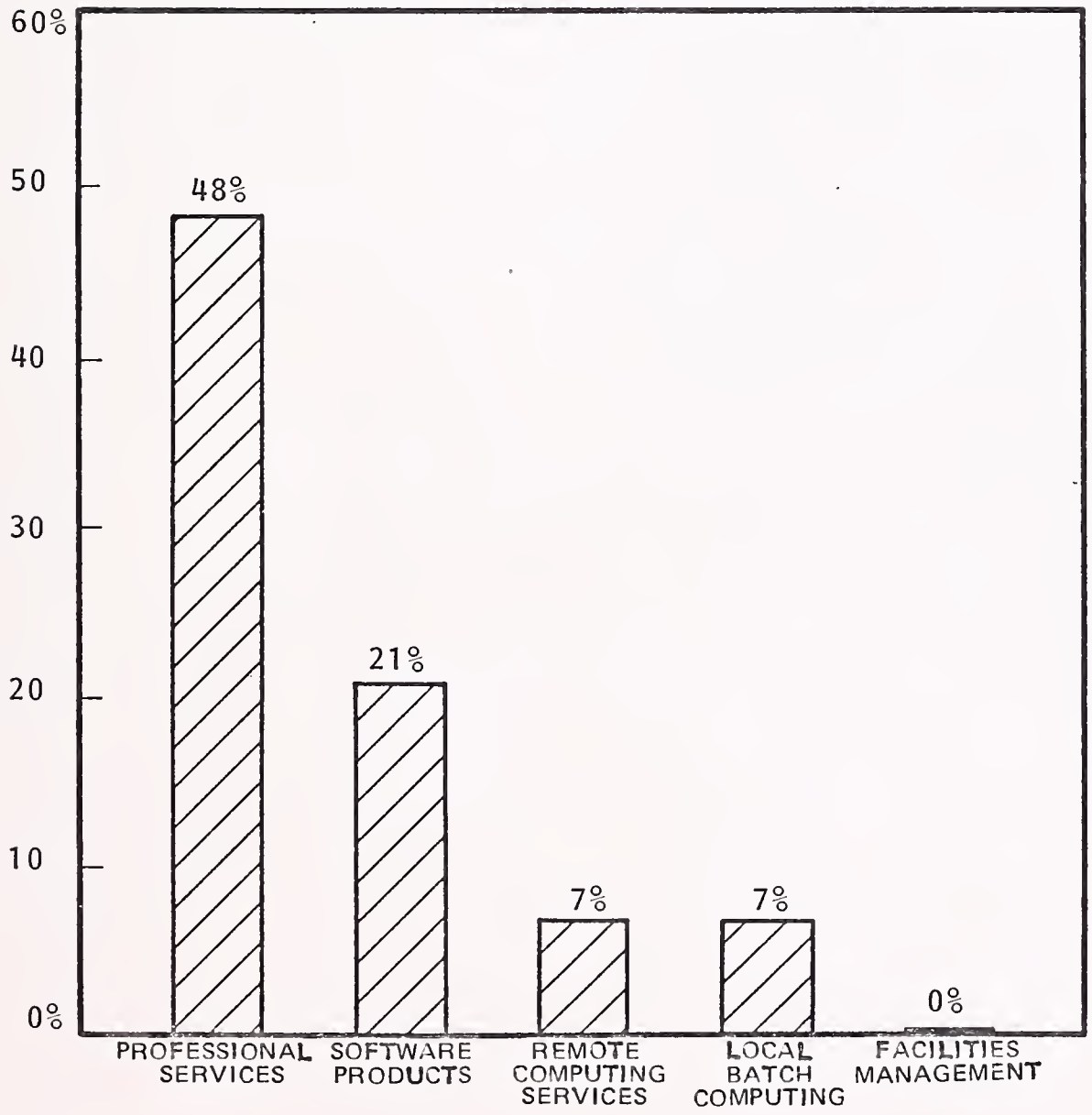
- In December 1978, INPUT completed a study in the U.S. entitled "Maintenance Requirements for the Information Processing Industry, 1978-1983." Two sections from this report are included in Appendix A since they contribute further to the subject discussed in this section. The two sections are:

  a. Executive Summary.

  b. Background and Present Status of the Information Processing Equipment Maintenance Function.

EXHIBIT V-7

PERCENTAGE OF VENDORS PROVIDING
ADDITIONAL SERVICES



VI MARKET AND PRODUCT TRENDS

VI MARKET AND PRODUCT TRENDS

A. MARKET SIZE AND GROWTH

- There is a severe lack of knowledge among Turnkey Systems vendors about market size. Only one third responded to the questions on this subject in the questionnaire.

- The responses provided, however, were consistently in the range $100M to "several $100M;" the highest quantified value was $300M. (All figures relate to 1979 and to the U.S. domestic market.)

- A separate approximation was conducted, using alternative INPUT sources, and this is given in Exhibit VI-1. Overall market values for categories of service, which include Turnkey Systems activity, have been factored with a turnkey market percentage; this percentage is an INPUT estimate. The result gives $232M for turnkey systems without hardware. On average, it is estimated that hardware adds a further 40%; thus the estimate for the turnkey market becomes $325M. Since this figure corresponds with the vendor estimates it stands as INPUT's estimate; thus:

  MARKET SIZE (1979) = $325M

- Vendor responses on the question of growth were lacking to an even greater extent than for market size. Only two quantified responses were given (+10%

EXHIBIT VI-1

APPROXIMATION OF TURNKEY MARKET SIZE

	TOTAL U.S. MARKET		PERCENTAGE FOR TURNKEY	TURNKEY MARKET	GROWTH*
	1977*	1979			
APPLICATION S/W PACKAGES	$365M	$617M	15%	$93M	30%
SYSTEMS S/W PACKAGES	$214M	$250M	5%	$13M	8%
CUSTOM PROGRAMMING	$897M	$1,228M	10%	$123M	17%
CONSULTING/ EDUCATION	$ 69M	94M	3%	$ 3M	16%
			TOTAL	$232M**	21%

*SOURCE: INPUT'S 1978 REPORT ON THE U.S. "COMPUTER SERVICES INDUSTRY"
** WITHOUT HARDWARE

and +20% annual growth rate); all were consistent in forecasting positive growth.

- Applying a weighted average calculation to the growth rates in Exhibit VI-1 provides a general software services growth rate of 21%. However, the Turnkey System component may well be growing faster than the general rate; INPUT's growth estimate is therefore:

  GROWTH (1979) = 23%

- As a further reference point, the widely circulated U.S. journal "Mini-Micro Systems" contained statements by DEC in June 1978 concerning the size and growth rate of the Turnkey Systems market, these were:

  a. In 1977, the first time user Turnkey Systems market was valued at $297.5M.

  b. This sector of the Turnkey Systems market will grow at an annual rate of 20%.

B. IMPACT OF NEW TECHNOLOGY

- Lower cost hardware (e.g., bubble memory) and micro computers were mentioned much more frequently than any other aspect of new technology. Both are cost factors and together they represent an overwhelming expectation by vendors that new technology will reduce their costs. (See Exhibit VI-2.)

- Micros will have several impacts in relation to cost; some of these suggested by vendors are:

EXHIBIT VI-2

INCIDENCE OF NEW TECHNOLOGY IMPACT

TECHNOLOGY ASPECT	NUMBER OF RESPONDENTS
BETTER SOFTWARE DEVELOPMENT METHODS	42
INCREASED HARDWARE RELIABILITY/ SIMPLICITY	3
LOWER COST HARDWARE	9
MICRO-COMPUTERS	7
BETTER COMMUNICATIONS AND DDP	2
APPLICATION-SPECIFIC TERMINALS	3
FIBRE OPTICS	1

- As an alternative to mini-computers, micros are cheaper building blocks.

- Micros with PROM can be substituted for the more expensive structure of mini-computers plus conventional programs.

- Attached micros for on-site automatic system monitoring and diagnostics to decrease maintenance requirements.

- As indicated in the previous section, maintenance is a very significant factor in determining the market potential of Turnkey Systems. Some perception of this factor exists in the minds of at least three vendors contacted in the survey: they expect new technology to have an impact on the reliability of hardware. Attached micro-based diagnostic and monitoring equipment could contribute significantly to maintenance. The effect of both developments may reduce the present high demands made by users of maintenance coverage and response time.

- Application specialization and fibre optics are elements which will make turnkey systems more attractive and convenient to operate. As developments in the improvement of the interface between the user and the machine, they are certainly consistent with the Turnkey System concept.

- It is surprising that development of new software technology was not considered by more than two respondants to be worthy of mention. One explanation may be that after two decades of only minor advances compared with hardware no new technology is expected to emerge which will have an impact. Suffice it to say that INPUT considers the development of low labor intensive forms of software production vital to enable the computer industry to continue satisfying the demands of high growth.

- New technology associated with communications and DDP (Distributed Data Processing) have been encouraged in their development by the presence of micro and mini-computers. They are also both driving forces behind user

migration away from centralized computing to local or departmental computing. Users can increasingly contemplate cost effective distributed computing in large organizations and viable computing in first time user and small organizations. Due to the increasing communications capability of minicomputers large organizations need not fear disintegration of control.

C. WHY BUY A TURNKEY SYSTEM?

- The major conceptual selling point for Turnkey Systems is that most often given by vendors for users choosing this type of solution. This is (see Exhibit VI-3) the dependability of achieving an operational computer system with low risk and no technical involvement. This is clearly a powerful selling point for first time users and non-technical departmented users of centralized computer systems.

- Reduced cost is usually a good reason, providing that a good system is implemented. The alternative produced by the traditional approach -- expensive managment involvement; no limit to cost, difficulties and expense of assembling a computer staff; and the high cost of trial and error -- is easy for Turnkey Systems salesmen to knock.

- Price/performance is believed by most vendors (see Exhibit VI-4) to be the reason for acquiring their system.

- As already stated in an earlier section, the quality and coverage of maintenance and support is an important factor in the user's mind. This seems to be underestimated by vendors, since only five stated this as a reason for buying their system.

- The reason that a vendor Turnkey Systems offers the best solution to a specific application needs is probably truer of the small organization -- and most turnkey vendors fall into this category. As one vendor explained,

EXHIBIT VI-3

VENDOR-STATED REASONS FOR SELECTION
OF TURNKEY SYSTEMS

REASON FOR SELECTION OF TURNKEY SYSTEMS	NUMBER OF RESPONDENTS
DEPENDABILITY OF ACHIEVING A COMPUTER SYSTEM WITH LESS RISK AND NO TECHNICAL INVOLVEMENT.	8
REDUCED COST COMPARED WITH TRADITIONAL DO-IT-YOURSELF APPROACH.	5
CONVENIENCE OF ONE SUPPLIER.	4
PRICE/PERFORMANCE COMPARED WITH OTHER ALTERNATIVES.	3
REDUCTION OF IMPLEMENTATION TIME.	2
EASIER FOR USER TO UNDERSTAND.	1

EXHIBIT VI-4

VENDOR REASONS FOR POPULARITY OF
THEIR OWN TURNKEY SYSTEMS

REASON FOR POPULARITY	NUMBER OF RESPONDENTS
PRICE/PERFORMANCE	9
RELIABILITY AND SERVICE	5
BEST SOLUTION TO SPECIFIC APPLICATION NEEDS	4
OWN REPUTATION	3
REPUTATION OF PARENT COMPANY	2
FIRST TO OFFER A TURNKEY SOLUTION TO A PARTICULAR PROBLEM	2
DELIVERY, REDUCED IMPLEMENTATION TIME	1
MODULARITY/FLEXIBILITY	1
PROVEN PRODUCT	1

"smaller vendors can respond more closely to the application needs of their client."

D. COMPETITION

- Hardware manufacturers are the most feared competition by turnkey vendors. (See Exhibit VI-5.) On average, every vendor named two. The company most feared is IBM which was mentioned 15 times (i.e., by one in every two respondants). Two reasons exist for this:

  a. IBM does not make any significant price concession to turnkey vendors.

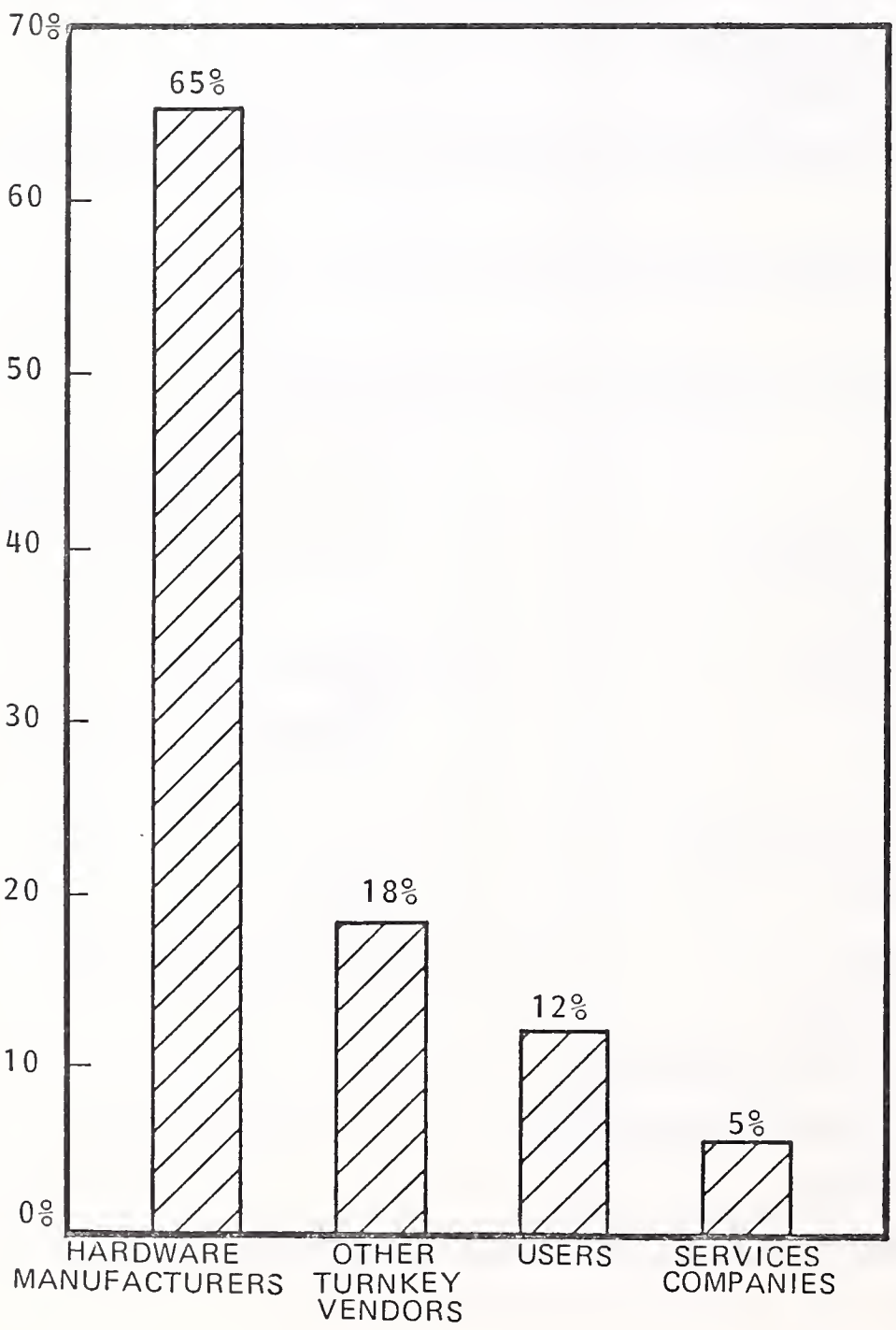
  b. IBM influences a vast portion of the market.

- Other hardware manufacturers mentioned were:

-	DEC	6	(PDP II, VAX, 320, 350)
-	Data General	3	(CS 20, 40, 60)
-	Basic IV	5	
-	Burroughs	3	(B80)
-	Wang	7	(2200)
-	NCR	3	
-	Hewlett-Packard	2	
-	Univac	2	(BC7)
-	Quantel	2	
-	Honeywell	1	
-	Data Terminal Systems	1	
-	Addressograph-Multigraph	1	
-	Microdata	1	
-	Prime	1	(450, 550, 650)
-	SEL	1	

EXHIBIT VI-5

TYPE OF COMPETITOR MOST MENTIONED



INP

- Although companies like DEC, Data General and Hewlett-Packard are very substantial in the mini-computer market, they are mentioned much less because of their relationship with services companies.

- Other turnkey vendors are feared usually when the competition is direct in terms of industry or application. Big users which are capitalizing on their own internally developed systems are feared for the same reason.

- Four of the Turnkey Systems vendors included in the survey sample were referred to by other vendors as rivals; these were:

  - General Instrument
  - ITEL
  - A.O. Smith (Geosource)
  - Northrop

- Clearly services companies are not considered as serious competitors.

APPENDIX A: SUCCESSFUL VENDOR PROFILES

AMERICAN BUSINESS COMPUTERS, INC.
3600 Standish Avenue
Santa Rosa, CA 95401
(707) 525-9850

President: Edmund DeChant
Ownership: Private
Revenues Fiscal Year End 1978:
$1 million (INPUT estimate)
Employees: 54

COMPANY BACKGROUND

- American Business Computers (ABC) is a turnkey system vendor marketing on-line, real-time, mini-computer systems to the newspaper and automotive parts industries.

- ABC uses a 16-bit general purpose mini-computer to support up to 255 devices, 114 program instructions, plus a wide variety of off-the-shelf options that allow clients to tailor the system.

- ABC sales are handled by 40 representatives in four Pacific states.

- Employees
  - 54 (including 40 sales representatives)
- Geographic Concentration
  - Throughout the United States except the Northeast.
- Data Center Locations
  - N/A
- Computer Hardware
  - One 16 bit ABC mini-computer with peripherals.

- Major Clients

  - Scripps League of Newspapers, Napa, CA
  - Aerospeed Warehouse, Kansas City, MO
  - Nichols Performance Warehouse, Shreveport, TN

- Major Competitors

  - Wang
  - NCR
  - IBM
  - Burroughs

- Sales Offices

  - Various cities on Pacific coast

TURNKEY SERVICES OFFERED

- American Business Computers manufactures an on-line turnkey system for the newspaper, automotive parts and other industries.

- The processor is a 16-bit parallel micro-programmed unit with standard inclusions of 16 general purpose registers. The unit is task-oriented and has all core locations directly addressable.

- The system covers the following applications:

  - Order Entry
  - Payroll
  - Customer Data
  - Accounts Payable

- Accounts Receivable
- General Ledger
- Sales Analysis
- Inventory Data

- ABC sells its systems in the range of $10,00 to $250,000, with $50,000 being the typical average price.

SYSTEM DESCRIPTION

- ABC uses its own CPU and various peripherals purchased from such firms as Hazeltine.

- ABC's system will accept most cash register input.

- Compatable operating systems are:

  - Disk operating system
  - Multi-tasking operating systems
  - Real-time operating systems
  - Basic operating systems.

- Compatable and interchangeable languages are FORTRAN, COBOL and BASIC.

- ABC's software comes in interactive forms and with all necessary documentation.

- Software maintenance/support is done remote from ABC headquarters and is done via modem connection to computer.

- ABC will sell custom software on a full cost basis and offer a rebate if the software is sold to another client.

- ABC charges $40 per hour for customization.

- ABC claims a time period of 30 days from initial order to system delivery.

- ABC sees the turnkey market in the U.S. at 1 million new installations per year for the next 5 years. The company feels the main market area will be small manufacturers and wholesalers.

- ABC believes that its clients buy ABC systems because of cost effectiveness and customization that can solve specific problems.

BALL COMPUTER PRODUCTS DIVISION
860 East Arques Avenue
Sunnyvale, CA 94086
(408) 733-6700

President: Richard M. Ringoen
Ownership: Public
Revenues Fiscal Year End 1978:
$7 million
Employees: 85

COMPANY BACKGROUND

- Ball Computer Products Division is a division of Ball Corporation of Muncie, Indiana, a public firm.

- Ball Corporation had 1978 sales of $515 million and is comprised of a number of divisions producing such diverse products as glass containers, food preservation products, plastics, satellite systems, and computer-related equipment.

- Employees

  - 85.

- Geographic Concentration

  - Midwest and Pacific states, Northern Ireland and Singapore.

- Data Center Locations

  - N/A

- Computer Hardware

  - Data General Nova

- Major Clients

  - AT&T

- Sears Roebuck
- PG&E

- Major Competitors

  - IBM
  - General Instrument
  - Bell & Howell
  - Cummins-Allison
  - Burroughs

- Sales Offices

  - Sunnyvale, CA.

TURNKEY SYSTEMS OFFERED

- Ball Computer manufactures ReaDoc, an automated remittance processing system.

- ReaDoc automatically MICR encodes, endorses, date stamps and imprints account numbers on checks.

- It also edits, validates and balances payments, comparing check to remittance document.

- ReaDoc can be customized according to the clients' requirements.

- Ball has sold about 48 systems at prices ranging from $500,000 to $40 million for those installed in retail, insurance and utility industries and $50,000 to $250,000 for those sold to broadcasting companies. Typical average system prices are $2 million for the former and $100,000 for the latter.

- Ball Computer anticipates a 10% per year growth in sales.

SYSTEM DESCRIPTION

- This system is written in BASIC, and the company has standard building blocks to assemble and modify the software to meet each customer's specifications.

- Ball's turnkey system is in operation in nine months to two years (or more) from initial order.

- Ball Computer has 45-50 employees exclusively involved in turnkey operations. About seven employees are in vendor and component selection, three to five are in incoming test and inspection, 15 are in system assembly and interfacing, 10 are in system test and debugging, and 10 are in applications testing.

- Ball uses a Data General Nova 3 with a 32K-128K word capacity as the CPU.

- Peripherals are BCP, Wang, Hazeltine, and Honeywell.

- Systems software is supplied by Ball and Data General. The operating system is DDOS and RDOS.

- Ball has regular OEM agreements to obtain system hardware.

- Ball employs a direct sales force and directs its marketing efforts at companies in the several billion dollar range.

- Ball feels that its systems are purchased because of its established reputation and its system flexibility.

BINARY DATA SYSTEMS
88 Sunnyside Blvd.
Plainview, NY 11803

President: Gerald November
Ownership: Public
Revenues Fiscal Year End 1978:
$4 million
Employees:

COMPANY BACKGROUND

- Binary Data Systems (BDS) markets turnkey systems to the medical, discrete manufacturing, retail and wholesale industries.

- BDS also sells military software and other government applications.

- BDS has facilities in Washington, D.C., Ft. Lauderdale, and Denver, but regards New York City as its primary sales office and facility.

- Employees

  - 75

- Geographic Concentration

  - East Coast

- Data Center Locations

  - N/A

- Computer Hardware

  - Four Data General Novas and Eclipses.

- Major Clients

  - Diversified range in the wholesale and manufacturing areas.

- Major Competitors

  - ITEL
  - STC
  - All other turnkey systems vendors.

- Sales Offices

  - New York City.

TURNKEY SERVICES OFFERED

- Binary Data Systems manufactures a modular turnkey system and aims its marketing efforts primarily at retailers of health and beauty aids, blood banks, and wholesale and retail druggists.

- BDS's sales in 1978 were divided between $400,000 for military and over $3 million for commercial.

- BDS sells its systems at prices ranging from $110,000 to $250,000, with most sales in the $250,000 area.

- BDS has its own in-house capabilities for hardware engineering, facilities for interfacing, and facilities for assembly from components.

SYSTEM DESCRIPTION

- The BDS turnkey system uses a Data General Nova or Eclipse CPU, DG peripherals, Hazeltine 2290 CRT's and Teletype printers.

- Systems sosftware is DG-provided with a BASIC language computer (FORTRAN for military sales).

- Applications software is also in BASIC and can be customized. Software is bundled.

- BDS claims a delivery time of three months from initial order with an additional 30-day acceptance period.

- BDS also offers a 35-40% volume discount and may offer a 10-20% discount to other OEM's provided there is a contract.

- Binary Data Systems feels that its clients purchase from BDS because of the firms "inedible" size, its reputation, and because it does not "low ball" systems.

HBO & Company
Suite 208
2700 River Road
Des Plains, IL 60018

President:
Ownership: Private
Revenues Fiscal Year End 1978:
$17 million
Employees: 120

COMPANY BACKGROUND

- HBO was founded in 1974 and offers on-line computer services to the health care industry through its Medical Services Division.

- Employees

  - 120

- Geographic Concentration

  - Mid-western, Southern and Pacific states.

- Major Competitors

  - SMS
  - MCAUTO

- Sales Offices

  - Atlanta, GA
  - Boston, MA
  - Chicago, IL
  - Los Angeles, CA
  - Peoria, IL
  - St. Louis, MO
  - San Francisco, CA

TURNKEY SERVICES OFFERED

- HBO's system is named MEDPRO. It is a Four Phase 470-490 mini-based system that provides in-patient admissions and census, nursing and departmental order entry, outpatient registration and billing and serves as a data communication and collection system.

- It is also possible to add other custom applications to the system for pharmacy, nursing service, central services, and dietary planning.

- The system does not include any business management applications but is capable of interfacing with these systems.

- MEDPRO systems have been linked with remote service vendors such as MCAUTO, SMA and TYMSHARE and IBM, Honeywell, and NCR hospital-based computer systems.

- HBO provides its system to Humana Inc., and, until recently, it was marketed by SMS under a licensing agreement to HBO.

- HBO claims its system can be custom designed and fully operational in less than six months.

- HBO's turnkey systems range in price from $80,000 to $135,000 with $100,000 being the typical average cost.

SYSTEM DESCRIPTION

- System hardware consists of one or more Four Phase 470/490s. HBO is the largest OEM purchaser of Four Phase units.

- Peripherals can be added on, such as video display terminals, printers, selected magnetic tape units and disk storage units.

- Systems software is written in COBOL, and the MEDPRO system utilizes HBO's proprietary software, Network Operating System (NOS), and custom applications programs written in HBO's proprietary MACRO programming language.

- HBO charges its clients a fixed price for customizing, although the company states that its clients usually adapt to HBO software.

- HBO feels that its systems are purchased because HBO's products are proven and the company has no direct competition.

NORTHROP DATA SYSTEMS, INC.
1160 Sandhill Avenue
Carson, CA 90746
(213) 637-1533

President: Tom Jones
Ownership: Public
Revenues Fiscal Year End 1978:
$2 million + (INPUT estimate)
Employees: 150

COMPANY BACKGROUND

- Northrop Data Systems, Inc. (NDSI), was incorporated in 1972 as a wholly owned subsidiary of Northrop Corporation. NDSI manufactures and sells on-line, real-time minicomputer business systems for specific industries such as health care and manufacturing.

- Northrop Corporation, a multi-billion dollar "Fortune 150" company, is comprised of a number of advanced technology divisions and susidiaries with operations throughout the world. As a result, Northrop Data Systems claims it is able to provide its customers the financial stability of a well-established major corporation.

- Professional services are provided by the company to turnkey system clients. Consulting is not viewed as a separate service.

- Headquartered in suburban Los Angeles, NDSI states that turnkey system sales are handled by a cross-section of highly trained technical personnel at all sales offices.

- Employees

-	Marketing and sales	50 (estimate)
-	Software services	35 (estimate)
-	Customer support	25 (estimate)
-	Operations	20 (estimate)
-	General and administrative	20 (estimate)
		150

- Geographic Concentration

  - Pacific (mainly California), South Atlantic, and Northeast states.

- Data Center Locations

  - N/A

- Computer Hardware

  - One Microdata Reality system at home office.
  - Eight to ten Microdata Reality systems at branch offices.

- Major Clients

  - The company claims 100 systems have been installed but would not provide specific client names.

- Major Competitors

  - IBM (competing for one-half of Northrop's market).
  - Small software companies specializing in manufacturing and medical applications.

- Sales Offices

  - Birmingham, AL.
  - Boston, MA.
  - Charlotte, NC.
  - Chicago, IL.
  - Cincinnati, OH.
  - Dallas, TX.
  - Los Angeles, CA.
  - Milwaukee, WI.

- Orlando, FL.
- Philadelphia, PA.
- San Francisco, CA
- San Mateo, CA.

TURNKEY SERVICES OFFERED

- Northrop Data Systems manufacturers a series of turnkey business minicomputer systems, all modular in design, that allow firms to computerize in stages based on business needs and growth. Each system includes a customized software package designed to meet the specalized requirements of each vertical market.

- Northrop's turnkey system package also features installation, operator training, documentation and service from nationwide sales/services offices.

- Northrop's minicomputer systems provide the customer with multiple, concurrent operations, one-time data entry, and on-line, real-time file updating and inquiry. Comprehensive software programs offer operational simplicity, built-in data security controls; automatic statistical/information; on-demand inquiry and on-demand reports. The systems feature low initial cost and economical building block growth capability.

- NDSI's on-line turnkey systems have the following applications:

  - Medical Groups/Clinics/Labs
    - Patient Billing
    - Appointment Scheduling
    - Insurance Form Processing
    - Management Reports
    - Patient Record Keeping
    - Payroll

  - Diagnostic Reporting
  - Accounts Payable/General Ledger

- Manufacturers
  - Sales Order Processing
  - Production Management
  - Inventory Management
  - Cost Accounting
  - Billing/Accounts Receivable
  - Accounts Payable/General Ledger
  - Purchasing/Receiving
  - Payroll

- Northrop reports an estimated 200 installations have been sold for prices ranging from $20,000 to $230,000, depending on peripherals. The typical average price is $35,000. The system can also be leased or rented.

- Northrop's maintenance fees are 6% of the purchase price per month.

- Northrop anticipates a 40% growth in sales in 1979.

SYSTEM DESCRIPTION

- The system uses a wide range of vendor hardware, including Microdata equipment.

- All hardware is sold under the Northrop logo. The firm has standard OEM aggreements with its suppliers.

- This system is written in BASIC and can accommodate up to 32 users, with each user's files protected.

- NDSI supplies its own systems software. The company's applications software is designed to meet the majority of the needs of its clients.

- NDSI does not customize its software in 95% of the cases but customization charges are included in the system price it if is required.

- Northrop feels that its clients buy Northrop systems because the firm is "one of the few truly turnkey suppliers." In addition, NDSI feels that its clients know that Northrop will be in business after the product is delivered.

INF

APPENDIX B: MAINTENANCE REQUIREMENTS FOR THE INFORMATION PROCESSING INDUSTRY

II EXECUTIVE SUMMARY

A. MAINTENANCE REQUIREMENTS, 1978-1983

- Vendor revenues derived from information processing maintenance services will increase at an average annual growth rate (AAGR) of 15% over the forecast period--from a 1978 base of $4.8 billion to $10 billion in 1983, as shown in Exhibit II-1.

  - This forecast, in current dollars, includes only the United States and excludes maintenance revenues for common carrier-supplied communications equipment and office equipment.

- During the same period, the dollar value of the installed base of information processing equipment will increase at an AAGR of 11-12% per year.

- In order to meet these increased demands, vendors would have to double the number of field service personnel over the forecast period, assuming that traditional maintenance methods and techniques continue to be used (see Exhibit II-1).

  - Vendors interviewed for this study claimed they would do exactly that.

EXHIBIT II-1

FORECASTED MAINTENANCE REVENUE AND PERSONNEL
1978 - 1983 (U.S. ONLY)

YEAR	MAINTENANCE REVENUE ($ BILLIONS)	MAINTENANCE PERSONNEL (THOUSANDS)		ANTICIPATED MANPOWER (THOUSANDS) SHORTAGE (DIFFERENCE)
		INPUT FORECAST	VENDOR PROJECTION	
1978	$4.8	90	90	-
1979	5.5	99	103	4
1980	6.4	110	119	9
1981	7.3	123	137	14
1982	8.4	136	157	21
1983	10.0	151	180	29
AAGR	15%	11%	15%	-

- However, INPUT believes that the industry will not be able to sustain that level of hiring and training and, in fact, that personnel growth will not exceed an 11% AAGR over the forecast period.

- This shortfall in people, illustrated in Exhibit II-2, will have major consequences for maintenance operations:

  - Many users will be forced to accept degraded performance.

  - Spares inventories and stocking locations will have to be increased.

  - R&D efforts for development of more efficient diagnostic and repair techniques will have to be intensified.

  - Companies who have difficulty attracting and holding people will find it even more difficult to compete with those firms (such as IBM and Hewlett-Packard) who have been traditionally able to staff and maintain a quality field service force.

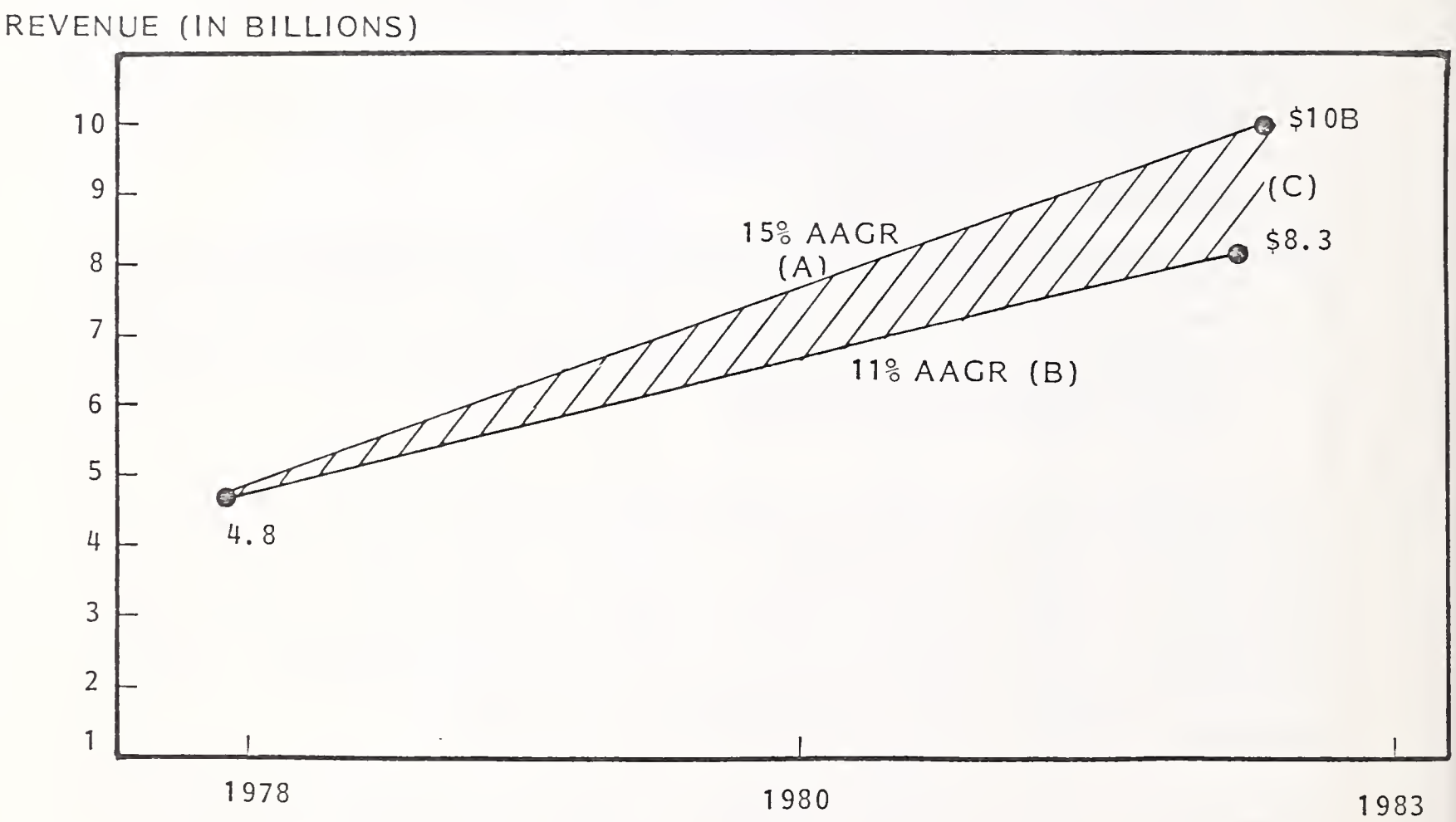
- In general, users today rank perceived reliability above all other factors as the key criteria of equipment selection. Thus, the maintenance function is a gating item to sales growth. Vendors who fail to recognize the importance of maintenance (and related activities such as spares stocking and quality assurance) will be at a distinct competitive disadvantage.

- Users do not expect maintenance charges to increase significantly as a percent of their overall EDP budgets, although they recognize that costs will go up along with everything else. However, INPUT found that users are not prepared for the degree of increase:

  - There is a "mental block" in the minds of most users that have established the figure of 15% of purchase price as an upper bound on annual maintenance costs.

EXHIBIT II-2

FORECASTED REVENUE VS. AVAILABLE FIELD ENGINEERS



A = MAINTENANCE REVENUE DEMANDED BY INSTALLED BASE.
B = MAINTENANCE REVENUE DERIVED FROM AVAILABLE FIELD ENGINEERS.
C = UNCOVERED MAINTENANCE REVENUE TO BE DERIVED IN NON-TRADITIONAL MANNER.

- As shown in Exhibit II-3, annual maintenance costs are expected to double in relation to hardware costs in five years. Depending on type of equipment, the 15% "barrier" will be encountered as early as 1979.

- The best way to deal with the problem is to shift a larger share of the maintenance responsibility onto the shoulders of the users themselves. This action implies that vendors must invest in the development of new programs designed to train and assist users in "self-help" efforts.

• Beyond the 1983 time frame (not scrutinized in this study), the latest generation of equipment will markedly impact the character of the installed base. Average mean time between failure (MTBF) will be much larger than on today's systems, and the maintenance demands of an average installation will be significantly less than they are today and over the next few years.

- Board and unit level replacement will be the most common fix-it methods. The user will take a major share of the responsibility for this type of maintenance. In cases where on-site repairs by vendor personnel are still required, relatively unskilled people will be able to handle the job.

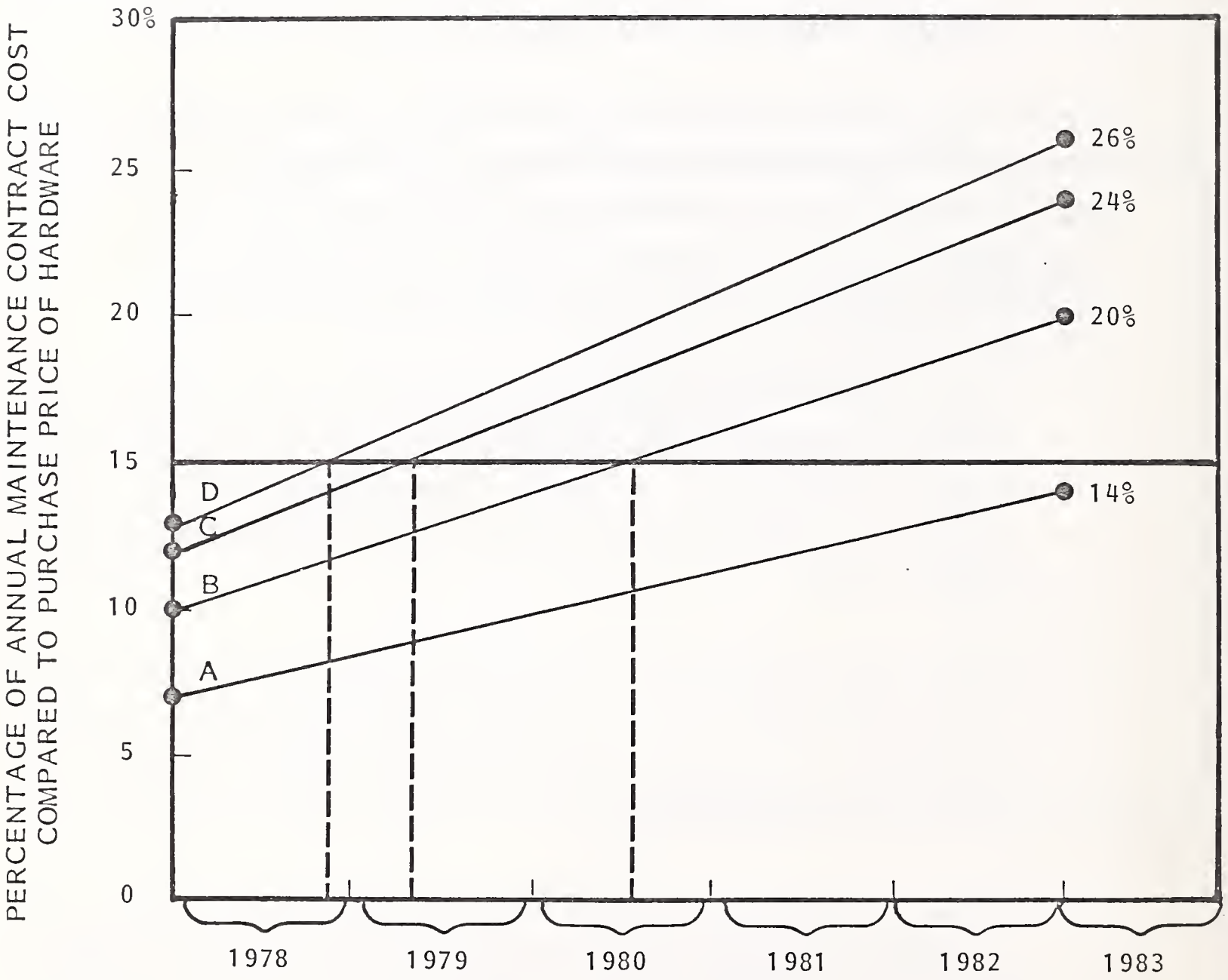
- Diagnostics will be performed by the users or on a remote basis. Faults will be isolated to one of a small number of hardware modules. Component level repairs will be carried out only at the factory or centralized repair facilities.

- Hiring, training, and skill requirements for field service personnel will be radically different than they are today. In fact, many companies will be faced with the problem of phasing out some of the people they currently employ.

• Exhibit II-4 is a schematic representation of the way in which requirements for field service will vary over the next decade. The chart shows that the most severe shortage of field service people will occur in the 1980-1981 period.

EXHIBIT II-3

FORECASTED GROWTH OF ANNUAL MAINTENANCE
CHARGES FROM VENDOR PROJECTIONS

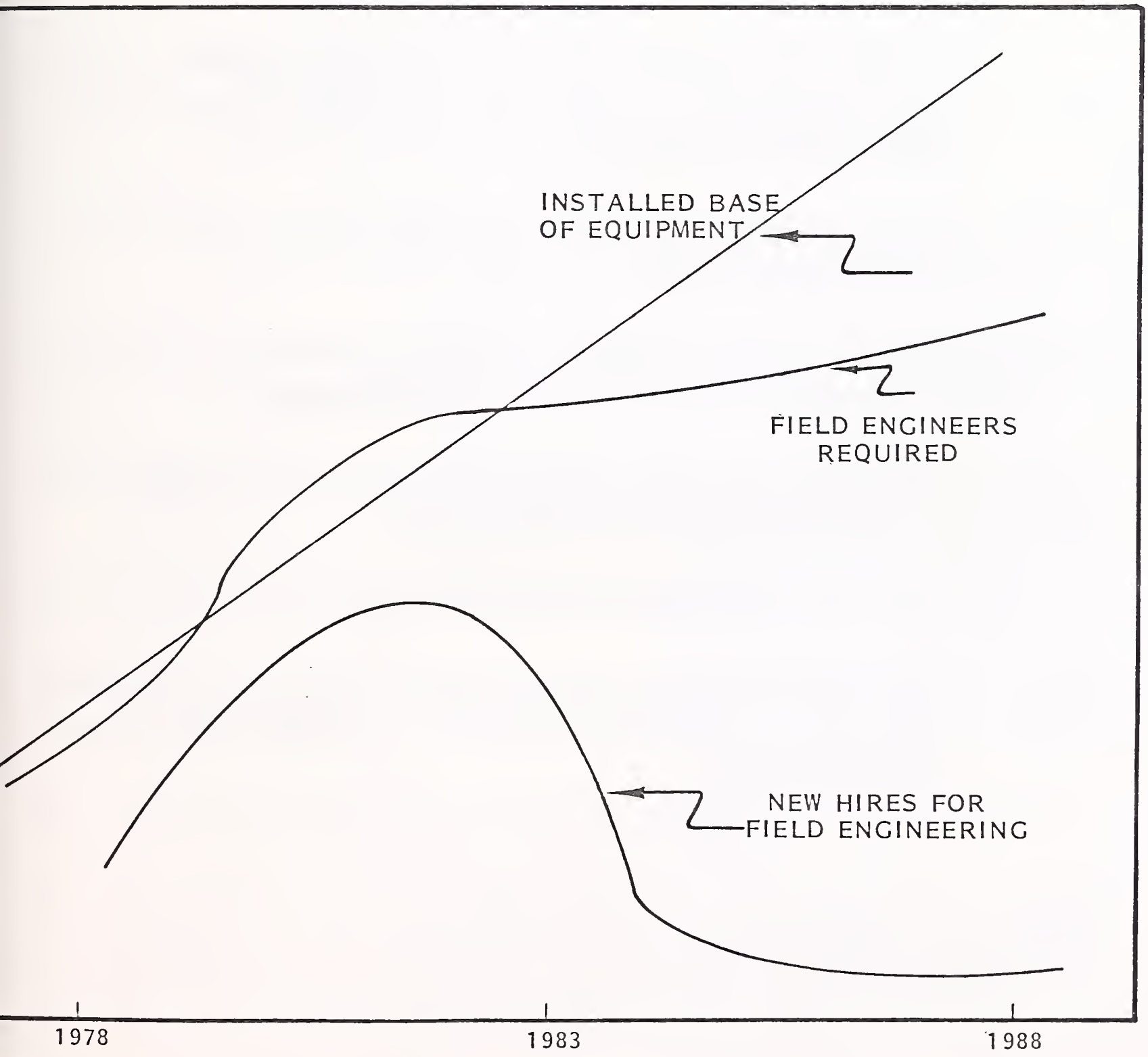


A = LARGE MAINFRAME SYSTEMS
B = MINICOMPUTERS, TERMINALS, AND OTHER
C = SMALL BUSINESS EQUIPMENT
D = PERIPHERALS

15% AAGR

EXHIBIT II-4

PROJECTED GROWTH OF FIELD ENGINEERS
VS. INSTALLED BASE



Vendors must establish a plan to deal with this critical phase and, perhaps just as importantly, establish a plan to "back off" once the critical phase has passed.

- One of the key driving forces facing maintenance organizations is the move to broader geographic dispersion of equipment with the advent of distributed data processing (DDP). INPUT's DDP forecasts indicate that by 1982, 30% of the total installed base of equipment will be operated in a DDP environment.

  - In 1982, 225,000 small business and minicomputer systems will be shipped domestically. Of these units, at least 50,000 will be utilized in a dedicated DDP environment.

  - In the same year, at least one-half million terminals of all types will be shipped in the U.S. alone.

- The substantial increase in dispersed facilities is creating a number of problems and opportunities for vendor maintenance operations.

  - Third party maintenance is often the only economically viable means of supplying maintenance to remote locations.

  - Spare parts stocking and distribution are critical.

  - Foresighted vendors can capitalize on the problem by providing spares distribution and maintenance services on a third party basis for non-competing vendors.

B. USER ATTITUDES TOWARD MAINTENANCE

1. USER INVOLVEMENT WITH MAINTENANCE

- The majority of users interviewed for the study were willing to participate in traditional vendor-supported maintenance functions providing they could see a pay-off in increased system availability.

  - Several large users maintain some of their own equipment today (e.g., Federal Express, SLAC). Usually the equipment for which they take responsibility is "simple"; for example, terminals and modems.

  - All sizes of users said they were willing to run vendor-supplied diagnostics and to participate in the execution of remote diagnostics.

  - Users of some equipment are doing board swaps from "high mortality" kits supplied by the vendor.

- Users said they were willing to install their own equipment if the procedure was not too complex. With the encouragement provided by IBM with the 8100 announcement, this will likely become an established trend with most new generation equipment.

- Users are, in general, willing to return devices to a local branch or repair depot for repair.

2. USER ATTITUDES TOWARD MAINTENANCE FEES

- The average user is not today particularly concerned with the cost of maintenance. His concerns are directed at system availability (i.e., uptime) and, in general, he is willing to pay more to achieve improved availability.

- Many users perceive (after the fact) that they have been oversold on preventive maintenance. Once this perception sets in, time and materials contracts are likely to displace fixed fee contracts.

- Most users feel that the level of service personnel is deteriorating. Where this perception is acute, the typical user believes he is being overcharged for what he is receiving.

3. USER ATTITUDES TOWARD MAINTENANCE ORGANIZATIONS

- Most users stated that they preferred the vendor's maintenance organization to report to marketing. This preference derives from a belief that pressure placed on marketing is more likely to bring results than the same pressure applied to other parts of a vendor organization.

  - IBM field engineering is in a separate division equal to marketing.

  - It doesn't really matter (to the user) where field service reports as long as both marketing and field service appear as a team with coincident objectives.

- Users tend to think in terms of the "levers" they can pull or pressure points they can push in order to get what they consider to be proper attention to their service problems.

  - Vendor-supplied maintenance on rented equipment provides maximum leverage.

  - Third party-supplied maintenance on purchased equipment provides the least leverage.

  - Vendor-supplied maintenance provides a definite competitive advantage over third party maintenance.

4. USER PERCEPTIONS OF THE FUTURE

- Users were not, in general, aware that maintenance problems were likely to become much more acute in the future or that maintenance costs would likely increase beyond what they consider to be acceptable bounds.

- Users tend to think that new equipment will be more reliable (true) while existing equipment will continue to run as it always has (unlikely). Vendors should plan to deal with the likelihood of increased customer dissatisfaction on a broad scale, especially in the 1980-1981 period.

C. MARKETING AND COMPETITIVE ISSUES

- Very few vendors recognize the utility of maintenance as a competitive tool. As noted earlier, users ranked reliability as the single most important criteria used in the evaluation process for equipment selection. IBM, of course, has set the standard and has proved that it can overcome large price gaps in competitive situations (where the competition has a clear cut price/performance advantage) by selling its maintenance/service capability.

- In particular, the specifications of the maintenance contract are frequently mishandled by salespeople and are often an item of confusion to the customer.

  - If the salesman senses that the prospect perceives that preventive maintenance (PM) is important, he will oversell its benefits and commit field service to more PM than necessary. This results in more expense to the customer and less available system time.

  - If the salesman senses that the prospect perceives little value to PM, he will undersell it with the result that the user will encounter more frequent unscheduled downtime than necessary.

- Selling inappropriate maintenance contracts usually costs the vendor money and, eventually, alienates the customer.

- Maintenance service has the potential to be a major contributor to vendor profits, at least in the short term. In the research for this study, INPUT found that few vendors pay proper attention to pricing nor do they carry out even rudimentary ROI analyses when it comes to maintenance.

  - Most vendors total their costs, add a profit/overhead factor, then ignore their own analysis and price within pennies of the competition (and 20-30% under IBM).

- As noted earlier, users are willing to pay for equipment availability. Premium pricing of maintenance services will be accepted if performance standards can be met.

- Although most vendors collect pricing data on competitors, very few track their competitor's actual performance. Thus, in addressing reliability as a competitive issue, vendors are poorly informed and are not able to use reliability/maintenance as an effective competitive issue.

- In this atmosphere, there are several actions vendors can take to use maintenance more effectively as a competitive tool and increase the profitability of the maintenance function.

  - Positive sales involvement by maintenance managers in the presale phase will help dispel prospect doubts regarding level and quality of maintenance services.

    - Managers involved in presales activity should receive sales training.

  - Field service should understand the availability needs of the customer and propose tailored maintenance programs to meet those needs.

Performance on each account should be monitored and adjusted as user needs change. Frequently, an opportunity to enlarge the scope of the maintenance contract or to save money on the performance side results.

- Competitive analysis departments should be chartered to include maintenance/reliability as an important subject to study.

- Vendors should establish better ground rules for the sale of maintenance services. In particular, marketing/sales should not be the "tail that wags the dog."

- Pricing schemes for maintenance service should ensure a reasonable profit. Maintenance should be viewed as a profit center by corporate management.

- Where a choice between using in-house and third party maintenance exists (within reasonable economic boundaries), go in-house.

- Most field service departments use several tools that should be more heavily promoted as sales aids because they can be equated to the prospect's perception of availabiltiy. These include such items as:

  . Central dispatch.

  . "Creative" stocking, distribution systems, and on-line locator files for spares.

  . Local branch office repair of returned boards.

  . Systems support/diagnostic centers.

  . Customer-operated diagnostic programs.

. "Fault-fix" data bases.

. Remote diagnostics.

D. SPARE PARTS

- All respondent vendors were concerned about the shortage of spare parts.

  - Users are experiencing lengthy mean time to repair cycles due to the lack of spare parts. Some of the user concerns can be attributed to inept field engineers who use this as an excuse.

  - Inventories represent a significant dollar investment yet are filled with older parts or costly seldom used items and are not balanced to usage.

  - The supply pipeline to repair and restock spares is usually too long to be really effective. Paperwork to handle the ins and outs of spares and their repair is expensive and slow.

  - Due to the use of "shotgun" diagnostics the supply pipeline typically contains up to 40% "no fault found" boards returned for repair.

- INPUT recommends that vendors:

  - Consider using on-site "high mortality kits" with possible user purchase involvement.

  - Review the present accounting method for spares inventory and establish realistic depreciation programs for seldom used and high dollar value items.

- Establish repair facilities for spare boards in local branch offices or create more regional repair centers as a means to shorten the spares pipeline.

- Establish an easy to use identification method and follow-up system to determine responsibility for "no fault found" boards returned for repair.

E. THIRD PARTY MAINTENANCE

- After several difficult years, third party maintenance firms have found a niche in the marketplace.

- Most users will not convert from vendor-supplied maintenance just to save money. Users will switch to get better service.

- As stated earlier, users prefer the hardware vendor to supply maintenance.

- Primary marketing opportunities exist for third party maintenance firms in:

  - Both vendor and end user markets for maintenance of electro-mechanical devices.

  - The end user market for distributed data processing.

  - The end user market by tailoring maintenance contracts and services to fit the user's needs.

  - Maintenance of older hardware where the vendor support commitment has been reduced or terminated.

- Third party maintenance firms will continue to grow through 1985 but will experience problems in attracting users of new generation hardware.

- Third party firms will not have access to the "fault and fix" files established by the vendors.

- Some hardware vendors have expressed a willingness to enter the third party maintenance business. INPUT believes that hardware vendors should not enter the third party maintenance business unless they have a surplus of field engineers or are opening new territories and would use maintenance of other equipment as a method of covering under-utilized personnel costs.

- Computer service companies that are providing on-site hardware and building a maintenance service function should consider maintaining equipment other than products currently sold by their organizations. This is recommended as an aid to more fully utilize field engineers during the early staffing phase and produce revenues to offset start up costs.

F. PERSONNEL ISSUES

- The most pressing problem facing most field service organizations today is finding, hiring, training, and retaining qualified field engineers:

  - Field service personnel are in short supply today. This situation will intensify, reaching a peak in the 1980/1981 time frame.

  - The industry is churning the same people and not training a sufficient number of new people to fill the supply-demand gap.

  - In the long term (post 1983), the personnel shortage situation will improve dramatically because technology will take up the slack.

- Traditional sources for trained technicians (i.e., the military) have virtually dried up and have not been replaced. Thus, vendors are competing for a limited number of qualified people.

- One vendor commented, "There are really only 500 good FEs in the country. At any one time they all work for the guy paying the most and he has the image of having a maintenance force."

- All field service organizations are virtually identical:

  - Most are run by ex-IBM people or are patterned after IBM.

  - Career paths are very much the same among vendors.

  - With few exceptions, FEs are looked upon as second-class citizens when compared with programmers and engineers.

- INPUT found that the average attrition rate of new hires in field engineering is 50%; i.e., companies must hire two people to net one.

  - Companies such as IBM and Hewlett-Packard, who have managed to create a professional image and environment for field service, have the lowest rate of attrition.

  - Much of the blame for high attrition rates can be placed on inept first line management.

- Most vendor's training programs are inadequate in the following areas:

  - They tend to rely on traditional training methods and are not state-of-the-art.

  - Training is not geared to the needs of the (relatively) less qualified people being hired today.

  - Older employees are not kept updated in the rapidly changing electronics field resulting in a tendency to obsolete people.

- Training is run by hardware-oriented technicians not qualified to integrate software training with hardware training.

- Some vendors are experimenting with incentive programs.

  - Most incentive programs look like marketing commission schemes. However, they don't appear to work well because it is difficult to establish and apply easily measurable standards, and the "judgement" factor plays too big a role in determining the amount of incentive compensation.

  - The incentive awards given to field service personnel are too small to have much impact.

- Most vendors have failed to set performance standards for field engineers. Goals, if established at all, are poorly monitored and only infrequently fed back to the individual. This is largely attributed to weak first line management.

- Vendors reported that 20% of field engineering time is spent on repeat and "no fault found" service calls. Very few vendors have formal programs that are designed to help minimize this unnecessary activity.

- INPUT believes that companies can do much to improve the personnel situation in general, improve productivity, and lower the attrition rate. Some recommendations:

  - Field engineering should manage its own recruiting and hiring functions. In many companies, the personnel department takes so long to get an offer out that many hiring opportunities are missed. Furthermore, the personnel department staff does not usually convey the initial professional/technical image sought by the candidate. First impressions are crucial.

- Vendors should consider establishing close ties with technical schools; e.g., funding courses geared to their needs, contributing instructors (who have a good image), arranging plant tours with graduating classes, etc.

- Programs should be instituted to improve the professional image of field service:

  . FEs should have visibility to senior management, both in and out of their department.

  . The field service organization should be equal to that of marketing and engineering.

  . Alternative career paths should be available permitting people to move not only within the field service organization, but also across organizational lines.

  . Senior corporate management should ensure that the importance of field service is conveyed to the entire corporation.

- A program for early identification of potential management talent should be instituted and followed by special handling and training of individuals so identified. People who are now "Peter-principled" into management must be given career alternatives.

- Although incentive compensation schemes have not worked well, vendors should continue to experiment. However, programs must have "teeth" and provide real incentives in order to motivate people.

- Management should institute more programs and systems aimed at improving utilization; i.e., establishing goals, monitoring progress against goals, and reporting results.

G. THE SOFTWARE MAINTENANCE ISSUE

- The issue of combining hardware and software maintenance is increasing in importance to all vendors providing systems to end users. Based on the research for this study, INPUT believes that by 1982, maintenance of vendor-supplied systems software by field service will be the rule rather than the exception.

  - The growth of distributed data processing is the principal driving force. As stated in a recent INPUT study, "Distributed Data Processing Systems: Applications, Performance, and Architecture," "...There is a close correlation between geographically dispersed organization structures and a predilection to adopt DDP methods..."

- It is not clear at this time, in a general sense, where the responsiblity for applications software maintenance will be placed.

- In the interviews for this study, INPUT found that most field service executives are reluctant to assume any responsibility for software maintenance.

  - They believe that software trained people will find greater opportunities as programmers - often outside their own companies.

  - They believe that they will have to pay programmer salaries which are higher today than those paid to FEs.

  - They feel that their present operations are taxed to the limit just dealing with hardware maintenance, and they cannot handle the added responsibility for software.

- Although the issue of software maintenance did not receive extensive treatment in this study (by design), INPUT believes that surviving successful

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vendors, especially those involved with DDP, will offer integrated hardware/software maintenance. Therefore, INPUT strongly recommends that vendors immediately institute plans to obtain people, establish training programs, and develop supporting corporate policies aimed at creating an integrated capability. The plan should be implemented no later than the end of 1979.

III BACKGROUND AND PRESENT STATUS OF THE INFORMATION PROCESSING EQUIPMENT MAINTENANCE FUNCTION

III BACKGROUND AND PRESENT STATUS OF THE INFORMATION PROCESSING EQUIPMENT MAINTENANCE FUNCTION

A. THE EVOLUTION OF MAINTENANCE IN THE INFORMATION PROCESSING INDUSTRY

- Traditionally, a buyer expects his purchase of a product to include service warrantees, repairs, or guarantees. The information processing industry conforms to these practices. In fact, this industry is one of the most demanding and competitive in relation to customer satisfaction and product maintenance and service.

- Initially, product maintenance in the information processing industry was provided as a service intended to be no more than an extension of the product sale.

- When leasing a system or product, the maintenance cost was included in the monthly rental price of the equipment. Since it was never separated as a price item, the user became used to considering maintenance as part of the sale.

- In 1956, IBM entered into a consent decree with the Federal Government and became obligated to sell as well as rent equipment. IBM was forced to publish individual prices for spares, training of personnel, and maintenance required to repair equipment.

- This resulted in major changes in the packaging and delivery of maintenance services; however, at the time it appeared to be of minor impact.

- The installed equipment base in the late fifties consisted primarily of unit record equipment. Few new competitors were attracted to the industry due to the substantial investment required for tooling, manpower and inventory.

- Extended commitment and pay-out periods made the purchase of information processing equipment unattractive to the majority of potential users.

- In the mid-1960s, IBM, to meet the customer and product demands of S/360, reorganized field engineering and formed a separate division with profit and loss responsibilities.

- The industry viewed this IBM reorganization as merely a rearrangement of "a mass" represented by the huge group of personnel operating within marketing and field engineering as one division. At that time this was a reasonable analysis; however, it became apparent during the recession of the early 1970s that a separate field engineering division permitted not only improved cost control, but the means for creating a profit center. With the decline in sale and lease revenues, field maintenance cost control became a matter of survival for many companies in the industry.

- During the past five years, many vendors have reorganized field engineering function:

  - As a cost center within marketing and operations.

  - As a separate division with profit responsibility.

- As a separate group reporting to a manager having responsibility for production, marketing, and engineering.

- Field engineering's status as a division with profit and loss responsibility has evolved because:

  - Of an increasingly competitive marketplace with maintenance becoming a key factor in vendor selection.

  - With increasing competition in the industry, improved cost control is required with all operations and functions contributing to corporate profit.

  - Revenue derived from product maintenance is increasing as a proportion of total corporate sales, thus, providing a greater impact on profits.

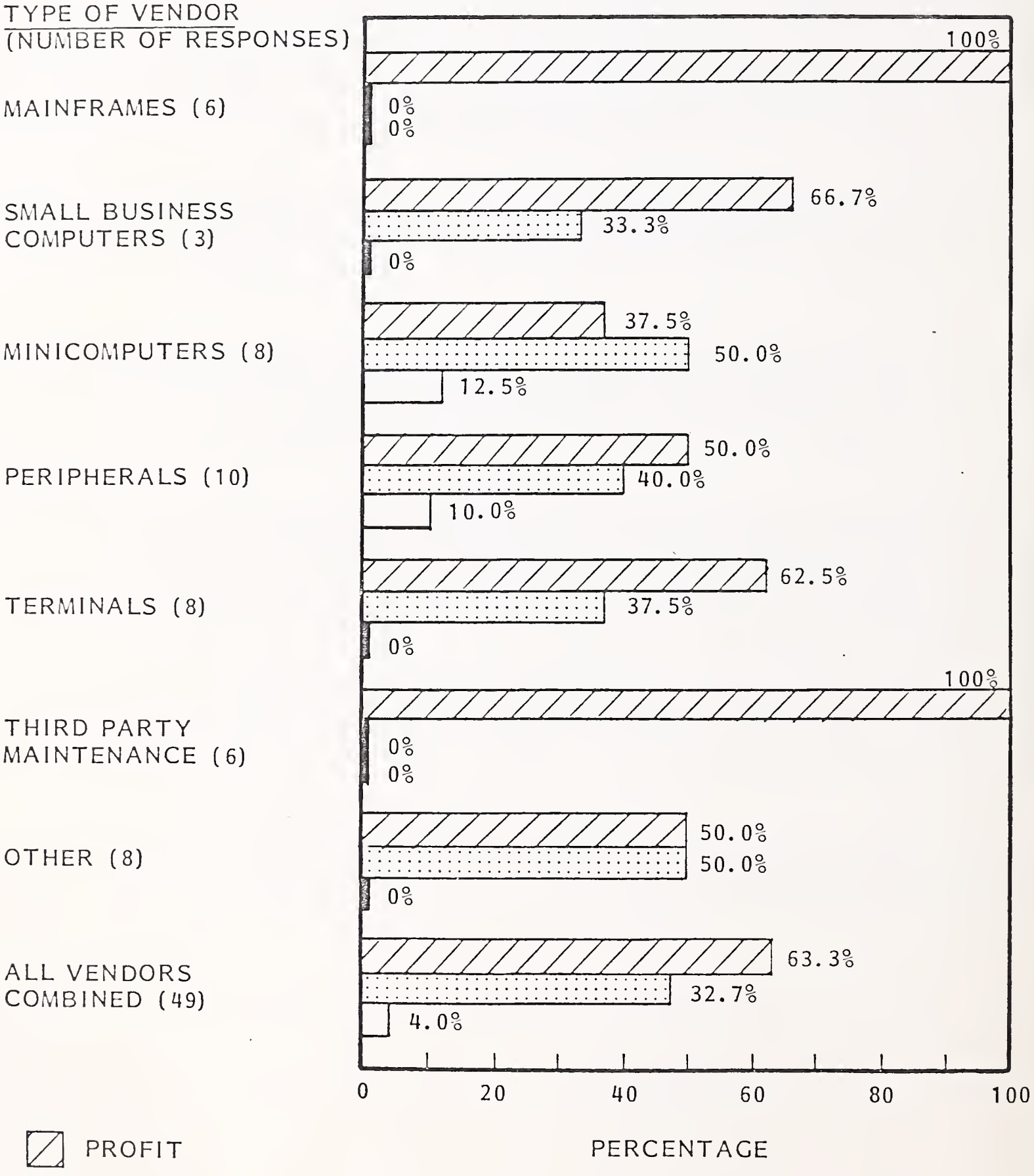
  - Field engineering is labor intensive and these hourly rates are rising more rapidly than other costs, increasing the requirement to focus management attention and action in the area of maintenance.

  - As performed by other functions within the corporation, maintenance represents an investment of capital and should be measured by a return on this investment.

- The growing frequency of corporations organizing maintenance as a profit center is shown in Exhibit III-1.

EXHIBIT III-1

CLASSIFICATION OF MAINTENANCE OPERATIONS AS PROFIT GENERATORS OR COST CENTERS BY RESPONDENT VENDORS



B. MAINTENANCE IS A KEY FACTOR IN THE EVALUATION AND SELECTION OF AN EQUIPMENT VENDOR

- In conducting numerous studies involving minicomputers, large mainframe systems, communications networks, and other equipment and services markets, INPUT determined that user establishments, both large and small, overwhelmingly considered product reliability and vendor maintenance capability to be of prime importance. These two factors consistently were more highly rated by user respondents than other considerations such as price/performance, product design, financial arrangements, training, vendor image/reputation, and product delivery. Following are five examples of recently conducted research studies which emphasize the importance of the maintenance function as viewed by the user.

1. SERIES/1 MINICOMPUTER SYSTEM

- In July 1977, INPUT conducted a multiclient study on IBM's Series/1 minicomputer system. Approximately 40 of the first 120 Series/1 users were interviewed to determine the product's strengths and weaknesses.

- As shown in Exhibit III-2, respondent users reported they believed IBM maintenance and support to be the greatest product strength of the Series/1 (58%), providing the ability to service and maintain this equipment in remote locations.

2. SMALL ESTABLISHMENT MANUFACTURERS

- In conducting a survey of small establishment metalworking manufacturers, INPUT determined that when evaluating a product for purchase, an overwhelmingly large percentage of those being interviewed believed that product reliability and field maintenance were the factors of highest importance (Exhibit III-3), compared to product delivery or user training.

EXHIBIT III-2

RESPONDENT ATTITUDES TOWARDS
SERIES/1 PRODUCT STRENGTHS

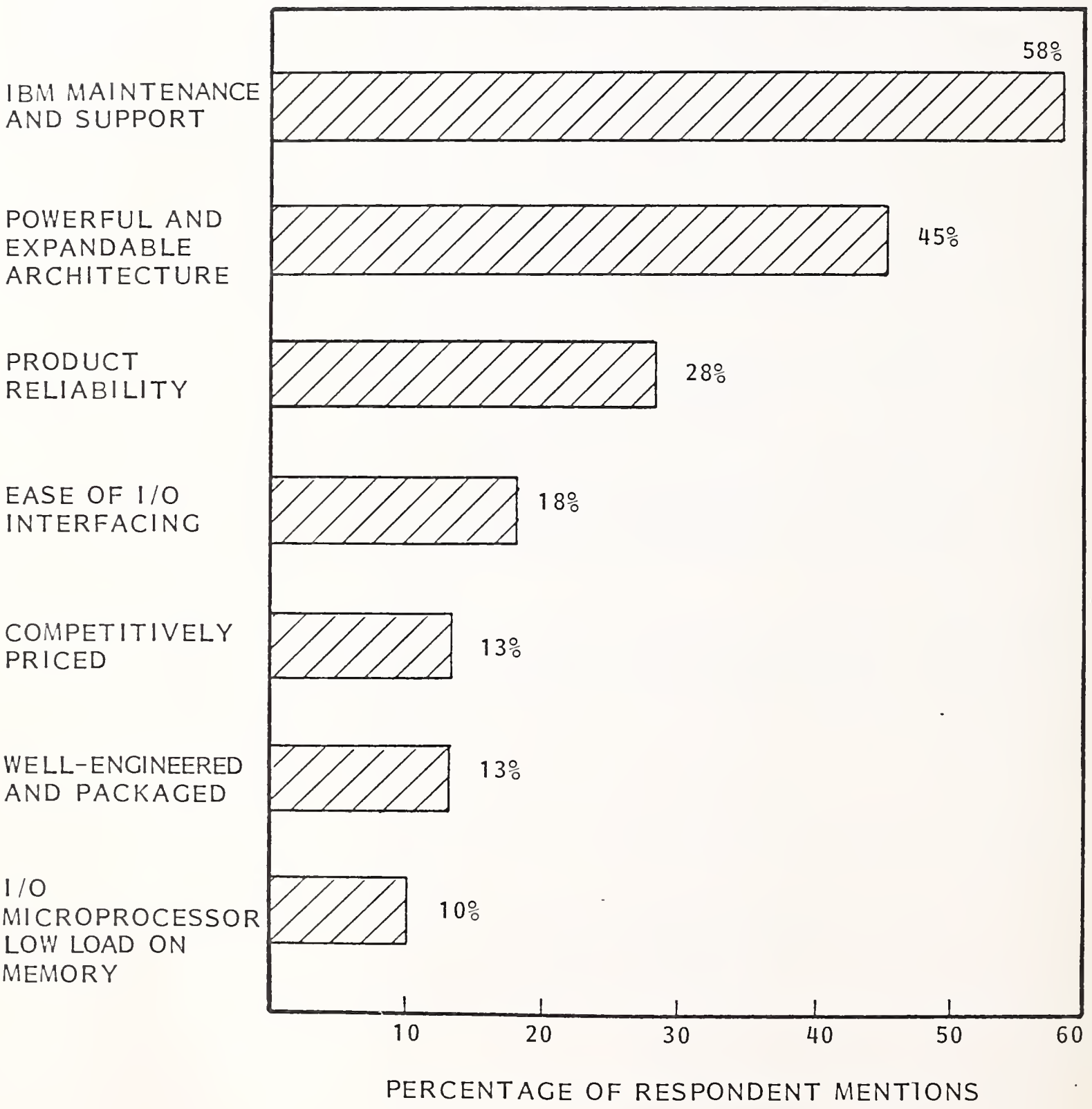
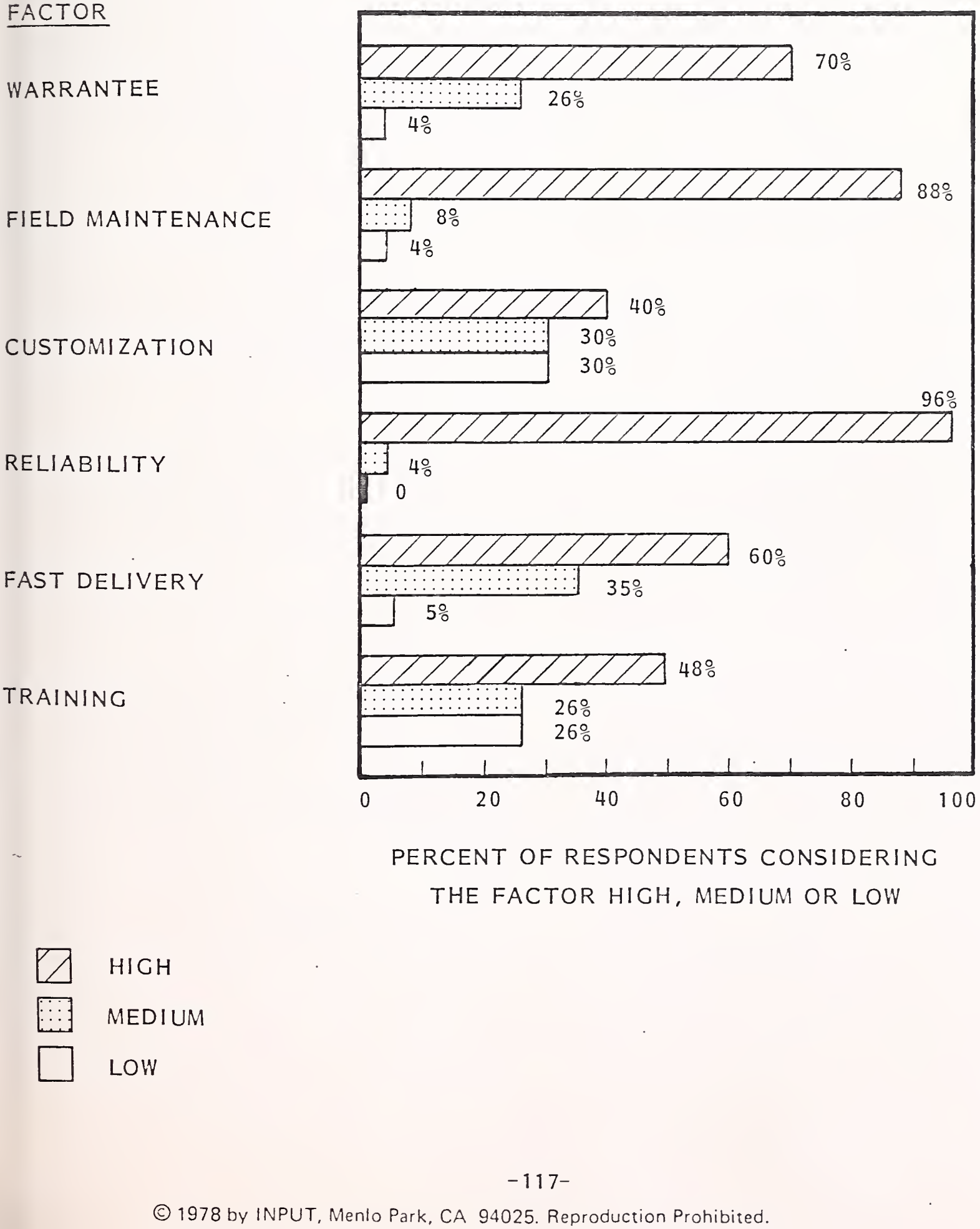


EXHIBIT III-3

SMALL ESTABLISHMENT MANUFACTURERS
(METALWORKING): RESPONDENT
ATTITUDES TOWARDS IMPORTANCE
OF FACTORS IN PURCHASING DECISIONS



3. IBM PLUG COMPATIBLE MAINFRAMES

- Over 100 interviews were conducted by INPUT to determine ratings of factors considered by respondents in the selection of a plug compatible mainframe vendor.

- The highest scores (93 of a possible 100) were attributed to product reliability and maintenance capability, which ranked higher than other factors usually considered to be of great importance such as sales contacts and financial arrangements, each of which rated a score of less than 50 (see Exhibit III-4) by comparison.

4. DISTRIBUTED DATA PROCESSING

- INPUT conducted over 100 in-depth interviews of major U.S. corporations during 1978 to determine user attitudes concerning the installation of distributed data processing.

- Exhibit III-5 shows that product reliability and maintenance capability were rated "critically important" by 95% and 82% of the respondents, respectively. These were the only factors reporting no ratings of "unimportant."

5. VALUE ADDED NETWORKS (VAN)

- Over 150 major U.S. corporations either using or considering the use of VAN services were interviewed by INPUT in 1977 as part of a multiclient study on network services. Respondents reported highest interest in the factors of maintainability (77.8%), and fault diagnosis (67.3%) when compared with other key factors such as network design or training (Exhibiti III-6).

EXHIBIT III-4

RESPONDENTS' RATINGS OF FACTORS WHEN EVALUATING AN IBM PLUG COMPATIBLE MAINFRAME (100 MAXIMUM)

FACTOR	TOTAL RATINGS
PRODUCT RELIABILITY	93
MAINTENANCE CAPABILITY	93
SOFTWARE SUPPORT	85
PRICE/ PERFORMANCE	75
FIELD UPGRADABILITY	75
VENDOR IMAGE/ REPUTATION	68
VENDOR SALESMAN CONTACTS	50
SINGLE VENDOR FOR ALL PURCHASES	48
FINANCIAL ARRANGEMENTS	48

EXHIBIT III-5

RESPONDENTS' RATING OF FACTORS WHEN CONSIDERING INSTALLING DISTRIBUTED DATA PROCESSING

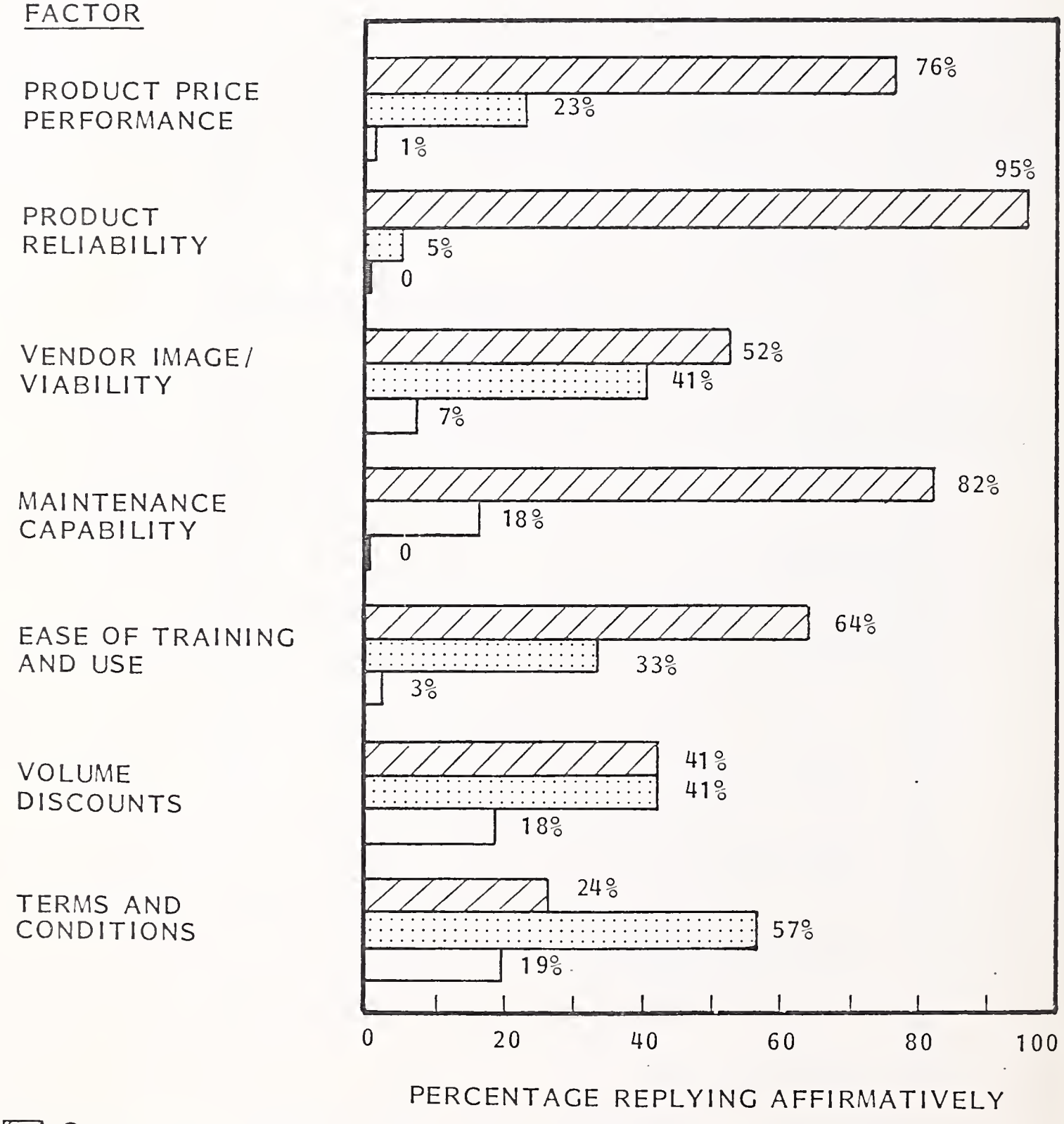
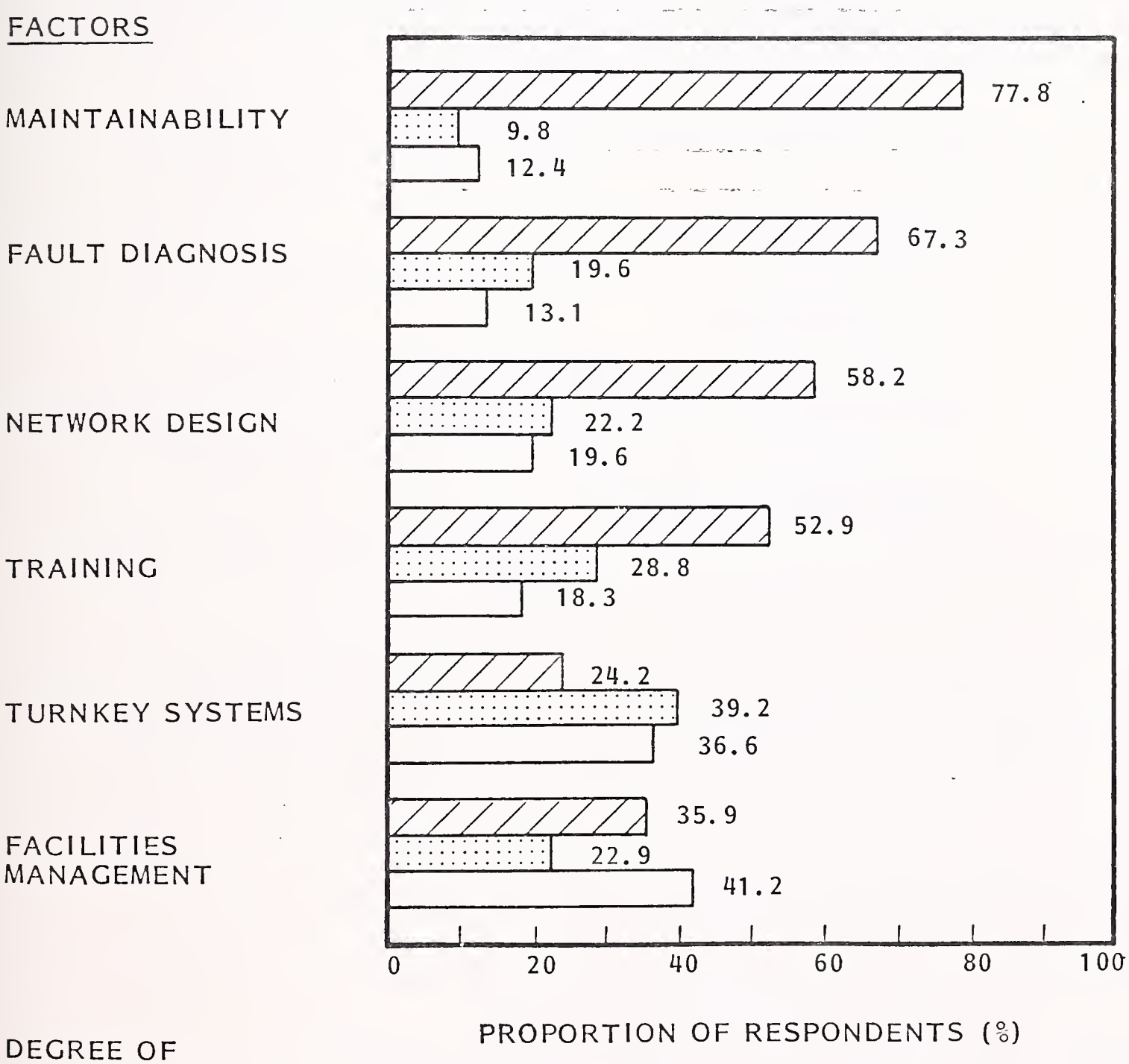


EXHIBIT III-6

VALUE ADDED NETWORK SUPPORT SERVICES
WANTED BY ALL COMPANIES



C. THE ORGANIZATIONAL STRUCTURE OF MAINTENANCE

- As the importance of maintenance has increased in ranking by the end user, so has the internal company structure of maintenance been elevated.

- The senior maintenance executive's position is now Vice President (or equal) in nearly all of the respondent vendors' corporate organizations. Titles include:

  - Vice President of Field Engineering (or Customer Service).
  - Vice President.
  - Senior Vice President.
  - Director of Field Engineering (or Customer Service).
  - President of the Field Engineering Division.
  - Vice President and General Manager.

- Functions usually reporting to the senior corporate maintenance executive include:

  - Line field service.
  - Logistics.
  - Maintenance training.
  - Plant field engineering.
  - Maintainability and planning function.

- Spare part repair depots.

- Dispatch.

- Technical support groups.

- Functions occasionally reporting to the senior maintenance executive include:

  - Systems software maintenance.

  - Sales order entry.

  - Plant scheduling.

  - Manufacturing quality assurance.

  - Application software system engineers.

  - Field engineering recruiters.

  - Maintenance and supplies marketing.

- The above organizational changes are occurring as maintenance evolves in the corporate environment. Other restructuring of responsibilities include:

  - Systems software maintenance is projected to become a part of field engineering by 1982 by most respondent vendors who supply this service.

    - Both systems software maintenance and hardware maintenance are labor intensive.

  - The delineation between the product's requirements for software and hardware maintenance is increasingly difficult to establish due to complex systems configurations.

  - Field engineering has assumed some software maintenance responsibility when responding to service calls and performing checks proving that the hardware is properly operating.

- Sales order entry will more often involve field engineering as order scheduling and customers' installations must coincide with field engineering availability within a geographic location. A personnel shortage for maintaining equipment could restrict product installations and company growth in the 1980 and 1981 time frame.

- Manufacturing scheduling requires field engineering input for establishing the mix of new build for customer orders and spare parts for repair. Every vendor interviewed expressed a need for more spares and many users stated that a larger spares inventory was required to improve service and reduce mean time to repair.

- Manufacturing quality assurance impacts field engineering labor expenditures. Units shipped from the factory should perform to specification in the customer's location. Marginal units should be repaired at the factory where the required material and personnel are available as opposed to "patching" on the customer site by personnel who frequently lack parts and testing equipment.

- Maintenance of application programs and the required system engineering force should become part of the field engineering function. The slogan "one problem, one call, one man, one fix" will become an increasingly stronger requirement in the industry, especially with the advent of distributed data processing (DDP).

  - DDP places powerful and inexpensive computers in the hands of relatively untrained user personnel and will create a strain for even the largest and most efficient field engineering force.

  - Other problems may influence the maintenance of applications programs by field engineering, such as one vendor comment: "If it worked yesterday and doesn't today, is it a field engineering problem or a marketing problem?"

- As the supply of qualified maintenance personnel decreases as the demand increases, field engineering must play a more active role in the hiring procedure (e.g., the addition of field engineering recruiters to augment local office and personnel department efforts).

- Field engineering, as a profit center, should add personnel to fulfill the marketing requirements involving maintenance services and supplies.

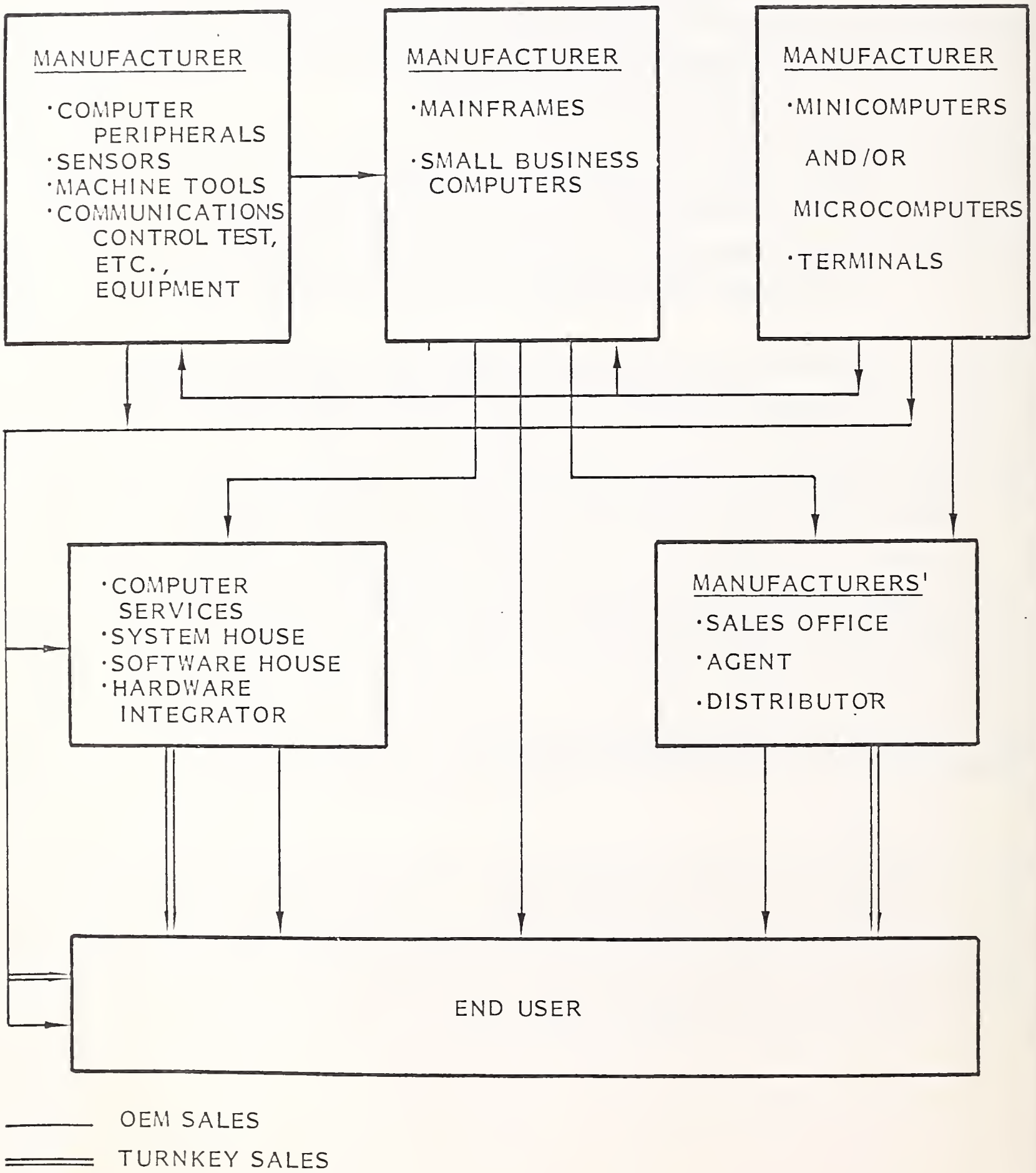
- The maintenance function has evolved from being "a necessary evil" to becoming an integral part of the corporate team. Also, the importance of service is increasing as it is becoming the criterion upon which the user selection process is often focused and has therefore become a key element in the vendors' marketing plans and strategies.

D. VENDORS OF MAINTENANCE SERVICES

- Exhibit III-7 illustrates the complexity of the product distribution function within the information processing industry. One of the primary considerations of a company when expanding or evaluating the change from being an OEM supplier to an end user orientation is the factor of providing a responsive maintenance service to the equipment user.

EXHIBIT III-7

METHODS OF PRODUCT DISTRIBUTION



- The end user maintenance responsibility is substantially more demanding than providing OEM support. This function is often subcontracted to distribution or third party organizations by the manufacturing company.

- Maintenance services for the end user are provided by one of the following:

1. EQUIPMENT MANUFACTURERS

- All large mainframe, small business computer, minicomputer, peripheral, and terminal manufacturers provide maintenance services to users purchasing the product directly.

- Manufacturers do not in all cases offer maintenance coverage to users purchasing equipment through a distributor, systems integrator, software house, etc.

2. OTHER DISTRIBUTORS OF SYSTEMS

- A distributor of systems must usually be prepared to maintain the product he sells to his customer for the following reasons:

  - The manufacturer may not offer adequate maintenance services in his required geographic area.

  - By his establishing an increasingly greater product installation density, the distributor can create a growing source of recurring revenue.

  - Good local product maintenance provides visibility to the user of a capable product vendor.

3. COMPUTER SERVICES COMPANIES

- Computer services companies have entered the turnkey systems marketplace by supplying applications or systems software and telecommunications capability as an added value to a hardware system purchased from the manufacturer.

- As with the system distributors, the computer services company can develop a new growth source of revenue by offering product maintenance to its customers.

4. THIRD PARTY MAINTENANCE ORGANIZATIONS

- End users may select a third party organization to perform system maintenance on their purchased equipment for one of the following reasons:

  - Dissatisfaction with the service offered by the system distributor or manufacturer.

  - The third party organization's capability of providing the strongest maintenance support in a particular geographic area.

  - The third party organization is often able to provide the user a savings in maintenance cost compared to the system distributor or manufacturer.

  - Third party can provide a one vendor maintenance service for a multivendor installation.

5. RETAILERS

- The retail store has recently developed as an outlet for computer goods and maintenance services.

- These outlets are currently selling at a rate of about 200,000 home or hobby computers annually with 20% entering the small business market.

- Established computer manufacturers are cautious in their consideration of entering the retail business market.

  - Retail stores may be the key that unlocks the burgeoning small business market.

  - The cost of merchandising through retail outlets is substantially less than through the traditional direct salesman approach.

- Most retailers are offering maintenance service for the products they vend.

  - Since retailing in the computer industry is in its infancy and the user base is small, considerable experimentation can be expected before a "standard" method of delivering maintenance services evolves.

E. TECHNIQUES PRESENTLY USED FOR PROVIDING MAINTENANCE SERVICE

- Field service for information processing equipment is currently being provided in much the same manner as in the past several years.

  - Trouble calls are placed with a local dispatch telephone number and passed to the field engineer for response. The field engineer maintains his inventory "call queue" and ranks the servicing sequence.

  - Large accounts are serviced by on-site field engineers who report to the customer location for designated shifts.

- Due to increasing labor costs, techniques for providing maintenance service are slowly being modified. Some recent incorporated changes and new techniques include:

  - Central dispatch: User problem calls are answered by a nationwide or regional dispatch center. "Call queues" are maintained on a computer system.

  - System support centers: Provides technical support for hardware and software and responds to either end user or field engineer inquiries.

  - Radio dispatch: Maintains radio communications with field engineers. Field engineers may spend up to 50% of their working time in auto travel and are unreachable during this period.

  - Remote diagnostics: With the utilization of communications facilities and on-line computers it is possible to perform fault isolation tests remotely. If a service call is required, the field engineer is dispatched to the machine site.

  - Customer operated diagnostics: Vendors are providing software programs that will allow the user to test the system for accuracy. Although such test programs may not isolate faults, they will determine if the problem is in the hardware or the application program.

  - End users performing board swap: Utilization of local and remote diagnostics and training can create an environment whereby the end user replaces faulty boards with an on-site spare.

  - For smaller devices having quantity installations at a single location (e.g., POS, modems, hand held wands, terminals, etc.), a variety of programs are in effect to eliminate service calls. Some examples are:

1) Mailing the defective unit to a repair depot or plant.

2) Delivering the product to the local branch or repair depot.

3) Accumulating a number of faulty devices for scheduled periodic on-site service calls.

- Field engineers are instructing end users on the performance of preventive maintenance for certain simple electro-mechanical devices. Although operator care of equipment is customary, the complexity of user involvement is increasing.

- End users are encouraged to install their equipment. A large vendor who formerly tagged the shipping carton with "Do not open. Warranty will be voided," in a recent announcement of a new computer stated "...the user is encouraged to install this equipment. It is as easy as hooking up a stereo sound system."

- In the future, end users are expected to be more involved with maintenance by:

  - Cooperating on testing and running diagnostics prior to placing a service call.

  - Assisting in peforming remote diagnostics.

  - Self-installation of smaller devices and systems.

  - Purchasing and stocking needed on-site spares and board swapping.

  - Performing a higher level of preventive maintenance.

F. DRIVING FORCES

- INPUT forecasts a variety of factors that will impact the maintenance function for the information processing equipment industry over the next five years, and also offer a number of new business opportunities. These driving forces run the gamut from product price/peformance improvements to inflationary factors forcing labor costs to increase.

- Increasing labor costs and the shortage of qualified personnel are causing serious problems for management in the labor intensive service business.

  - Salaries within the information processing industry as a whole are rising; e.g., 12.4% average in the last year.

  - Salaries for field engineers are increasing even more rapidly: 16-18% annual rate.

- End users are buying new equipment at an accelerated rate, and the availability of personnel to repair this hardware is not increasing as rapidly as the shipment rate.

- Demand for equipment to be utilized in an expanded geographic area, through the use of distributed data processing, will require faster growth of the field engineering force.

- In maintaining products within an expanded geographic area, organizations will be competing for the same finite supply of available field engineering talent.

- Technical innovations, such as the microprocessor, value added networks and multi-function equipment will create additional demands for new hardware and increased maintenance service.

- Few vendors interviewed for this survey are staffed with a balanced mix of required personnel skills.

  - One vendor employs an over-abundance of electro-mechanical skills who are being retrained for electronics, while another firm is seeking electro-mechanical personnel to support its installed base.

  - Some vendors are in short supply of personnel to maintain equipment while others with a field engineering force lack an installed base to utilize this asset.

  - All vendors require software support personnel and have open job requisitions to be filled.

- New business opportunities exist in:

  - Providing a responsive and effective single source for maintenance service for multi-vendor installations.

  - Establishing trade schools for technical hardware and software training.

  - Establishing a third party service company for electro-mechanical products.

  - Utilizing excess field engineering manpower in maintaining equipment manufactured by others.

  - Providing service for computer stores to utilize excess field engineering manpower.

  - Small software firms maintaining user and vendor supplied software under contract to the vendor, particularly in remote areas.

APPENDIX C: SURVEY QUESTIONNAIRE

CATALOG NO. YERS[ ][ ][ ]

TURNKEY SYSTEMS

I. QUALIFYING INTERVIEW

1. INPUT defines Turnkey Systems as: "An end user, application oriented, automatic data processing system; computer based including software with input and output terminals for operation by the end user. It is delivered, installed, placed into operation and maintained for the end user."

2. Would you categorize your firm as a:

   ☐ Systems Integrator

   ☐ User Company

   ☐ Distributor

   ☐ Equipment Manufacturer

   ☐ Other _____
   (Specify)

3. a) Does your company sell turnkey systems?

   ☐ Yes ☐ No

   Comments

   b) If yes, go to question 4a.

   c) If no, have you considered offering turnkey systems? Why?

IF NO TO QUESTION 3C, TERMINATE INTERVIEW

4. a) If yes to question 3, please describe your turnkey system and indicate number sold to date and price per system.

DESCRIPTION OF FUNCTIONAL AREA	NUMBER SOLD	SYSTEM PRICE RANGE	TYPICAL AVERAGE PRICE

b) In what year was the first system sold? _____

c) How many systems were sold the first year? _____

5. a) In what industries have your systems been installed?

- ☐ Discrete Manufacturing
- ☐ Process Manufacturing
- ☐ Transportation
- ☐ Medical
- ☐ Services
- ☐ Utilities
- ☐ Retail
- ☐ Banking
- ☐ Wholesale
- ☐ Education
- ☐ Insurance
- ☐ Government - Federal
- ☐ Government - State & Local
- ☐ Communications
- ☐ Other

b) What applications are these systems used for?

CATALOG NO. ☐☐☐☐☐☐

INTERVIEWER NOTE:

- If QUALIFIED RESPONDENT (markets a medium-high priced turnkey system, typically greater than $50,000, and if a systems house or user organization), go to question II-A-1.
- If NOT QUALIFIED (markets a turnkey system priced less than $50,000, or if a "hardware" supplier), continue to question 6a.

6. a) As part of your turnkey system, you provide standard applications software. What percent of your customers are able to use that software and require no modifications?_____ %

b) How is your turnkey system adapted (or customized) to special user requirements?

7. a) In your opinion, approximately how large is the total market for turnkey systems?

$_____Value

b) Who do you view as the major competitors in this field, currently?

c) Who do you expect will be the major competitors in the 1980s?

8. Please send product literature, company information, and an annual report if available.

THANK YOU FOR YOUR TIME

TURNKEY SYSTEMS

II. DETAILED INTERVIEW OF QUALIFIED TURNKEY SYSTEMS VENDORS

A. HARDWARE

1. What does a typical system configuration consist of?

DEVICE	VENDOR	MODEL	QUANTITY	CAPACITY/SPEED
• CPU(s)				
• MEMORY				
DISK PACK/ CARTRIDGE				
MAGNETIC TAPE				
FLOPPY DISK				
CASSETTE				
OTHER _____ SPECIFY				
• TERMINALS				
CRT				
KEYBOARD				
• PRINTERS				
• OTHER _____ _____				

2. a) Do you have your own, in-house capability for:

- ☐ Hardware Engineering
- ☐ Production (Manpower)
- ☐ Facilities for Interfacing
- ☐ Facilities for Assembly from Components
- ☐ Facilities for Development of Special Purpose Hardware

b) Please list specific types of equipment used (i.e., oscilloscopes, etc.).

3. Do you customize the hardware for use in your turnkey systems? ☐ Yes ☐ No

B. SYSTEMS SOFTWARE

4. a) Which systems software products do you use, and who supplies them?

SUPPLIER	OPERATING SYSTEM	TELE-PROCESSING	COMPILER	OTHER* MAJOR SOFTWARE

*i.e., DBMS, data dictionary, test aids, diagnostic packages, etc.

b) If any of the above system software is developed by your company, is it available for distribution in Europe?

☐ Yes ☐ No _____

(Specify Software Product)

C. APPLICATIONS SOFTWARE

5. a) What are the primary languages used in writing your application software?

_____

_____

_____

b) What programming techniques or tools are used?

- ☐ Traditional
- ☐ Structural
- ☐ Module/Subroutine Library
- ☐ High Level Generator
- ☐ Parameterized
- ☐ Formalized Design Methods and Design Tools
- ☐ Project Management Tools
- ☐ Other _____ (Specify)

6. How do you determine to what degree you can standardize a product? What process takes place in that determination?

7. How do you handle the customization of standard products to special user requirements?

- ☐ Provide as a Customer Service at No Charge
- ☐ Charged at Rate _____ (Specify)
- ☐ Other _____ (Specify)

8. How are user requirements defined?

- ☐ Management Needs
- ☐ Check Lists
- ☐ Choice of Opinions
- ☐ Decision Tables
- ☐ Parameters
- ☐ Other _____
  (Specify)

9. Who is involved in this process? (Titles)

_____ _____

_____ _____

_____ _____

10. What is the average elapsed time between original turnkey system order and user acceptance?

11. What types of purchase agreements do you have with your hardware vendors?

- ☐ Volume Discount
- ☐ Guaranteed Minimum
- ☐ _____
- ☐ _____

D. SYSTEM PRODUCTION

12. a) How many employees are involved in turnkey system operations? _____

b) How many of the employees identified above are involved in:

	Percent of Total	or	Number
• Vendor and Component Selection	_____		_____
• Incoming Test/Inspection	_____		_____
• System Assembly/Interfacing	_____		_____
• Systems Test/Debugging	_____		_____
• Application Testing	_____		_____

13. Please describe your production facilities.

FACILITY	DESCRIPTION (QUANTIFY WHERE APPROPRIATE)
FLOOR SPACE	
BUILDING AND ASSEMBLY EQUIPMENT	
TESTING EQUIPMENT	
ON-SITE EQUIPMENT	

E. FIELD SUPPORT

14. How do you handle field installation and maintenance of your turnkey systems?

- ☐ Your Own Maintenance Organization
- ☐ Original Manufacturer
- ☐ Third Party Maintenance Organization _____ (Specify)
- ☐ Individual Contracts
- ☐ Other _____ (Specify)

15. Is your in-house maintenance organization considered to be a profit center?

- ☐ Yes, Profitable
- ☐ Yes, But Not Profitable
- ☐ No, Not Expected to be Profitable

16. How do customers report problems to you?

- ☐ Call Central Maintenance Dispatch
- ☐ Call Their Local Service Office
- ☐ Other _____ (Specify)

17. How are their problems analyzed?

- ☐ Remote Diagnostic Assistance
- ☐ Telephone Support
- ☐ Send Field Service Person Out to Determine Problem
- ☐ Other _____ (Specify)

18. How much inventory must you carry for:

Production $_____ Value

Spares $_____ Value

F. MARKETING DISTRIBUTION

19. a) How is the selling price for your turnkey system developed?

- ☐ Hardware $_____
- ☐ Software $_____
- ☐ Installation Costs $_____
- ☐ Training Costs $_____
- ☐ Other _____ $_____
- _____ $_____

b) Are costs:

☐ Bundled ☐ Unbundled

20. How do you promote/sell your turnkey systems?

21. In marketing your turnkey systems, do you use:

- ☐ A Direct Sales Force
- ☐ Manufacturer's Representatives
- ☐ Dealers/Distributors
- ☐ Other _____
  (Specify)

22. At what levels of management do you direct your selling efforts? (Specify any variations by industry)

Title_____

Title_____

Title_____

23. What size companies do you market to? $_____
(Minimum/Maximum Revenue)

24. What services do you offer to your customers in addition to turnkey systems?

- ☐ Facilities Management
- ☐ Batch Services
- ☐ Interactive Remote Computing
- ☐ Software Products
- ☐ Remote Batch
- ☐ Professional Services
- ☐ Other _____
(Specify)

25. In your opinion, how large is the total U.S. market for turnkey systems?

$_____(Total or per Year)

- ☐ Level
- ☐ Growing, at what rate_____ Percent per Year
- ☐ Declining, at what rate_____ Percent per Year

Why?

26. What technology changes do you foresee that may impact future sales? Why?

27. Where not represented directly, would you consider engaging/or have you established distributorships?

(CHECK ONE) DISTRIBUTORSHIPS

LOCATION	REPRE-SENTED DIRECTLY	CONSIDER	ESTAB-LISHED	NO
UNITED STATES				
CANADA				
SOUTH AMERICA				
EUROPE				
MIDDLE EAST				
FAR EAST				
OTHER _____				

28. Who do you consider to be your competitors in this market?

_____

_____

_____

_____

29. In your opinion, why do users buy turnkey systems?

Why do they buy yours, particularly?

30. There are companies which are good candidates for turnkey systems, yet they are not buying them. Can you identify any common barriers which inhibit companies from purchasing these systems?

31. Please send product literature, company information and an annual report if available.

THANK YOU VERY MUCH FOR YOUR TIME

APPENDIX D: DEFINITIONS

APPENDIX A: DEFINITIONS

- COMPUTER SERVICES

  These are services provided by vendors which perform data processing functions using vendor computers, or assist users to perform such functions on their own computers.

- The following are definitions of the modes of service used in this report.

- REMOTE COMPUTING SERVICES (RCS)

  Provision of data processing to a user by means of terminals at the user's site/s connected by a data communications network to the vendor's central computer. The three sub-modes of RCS are:

  1. INTERACTIVE (timesharing) is characterized by interaction of the user with the system, primarily for problem solving timesharing, but also for data entry and transaction processing; the user is "on-line" to the program/files.

  2. REMOTE BATCH is where the user hands over control of a job to the vendor's computer which schedules job execution according to priorities and resource requirements.

3. DATA BASE is characterized by the retrieval of information from a vendor-maintained data base. This may be owned by the vendor or a third party.

- BATCH SERVICES

This includes data processing performed at vendors' sites of user programs and/or data which are physically transported (as opposed to electronically by telecommunications media) to and/or from those sites. Data entry and data output services, such as keypunching and COM processing, are also included. Batch services include those expenditures by users which take their data to a vendor site which has a terminal connected to a remote computer used for the actual processing.

- FACILITIES MANAGEMENT (FM)

- (Also referred to as "Resource Management" of "Systems Management.") The management of all or part of a user's data processing functions under a long-term contract (not less than one year). To qualify as FM, the contractor must directly plan and control as well as operate the facility provided to the user on-site, through communications lines, or mixed mode. Simply providing resources, even though under a long-term contract and/or for all of a users' processing needs, does not necessarily qualify as FM.

- PROFESSIONAL SERVICES

Management consulting related to EDP, systems consulting, systems design and programming, and other professional services are included in this category. Services can be provided on a basis of: "Time and Materials," whereby the user pays for the time used of an individual on a daily or other fixed rate, or "Fixed Price," where the user pays a fixed fee for a specific task or series of tasks.

SOFTWARE PRODUCTS

This category is for users' purchases of systems and applications packages for use on in-house computer systems. The figures quoted include lease and purchase expenditures, as well as fees for work performed by the vendor to implement and maintain the package at the users' sites. Fees for work performed by organizations other than the package vendor are counted in professional services. The two sub-categories are:

1. SYSTEMS PACKAGES are operating systems, utilities, and language routines that enable the computer/communications system to perform basic functions. This software is provided by the mainframe manufacturers with their hardware; other vendors provide improved versions of this and special-purpose routines. This classification includes compilers, data base management software, communications packages, simulators, performance measurement software, diagnostic software, and sorts.

2. APPLICATIONS PACKAGES are software which perform processing to serve user functions. They consist of general purpose packages, such as for accounting and inventory control, and special purpose packages, such as personal trust, airline scheduling, and demand deposit accounting.

PROCESSING SERVICES

Processing services encompass FM, RCS, and batch services: they are categorized by type of service, as distinguished from mode of service, bought by users as follows:

- GENERAL BUSINESS services are processing services for applications which are common to users across industry categories. Software is provided by the vendor; this can be a complete package, such as a payroll package, or an application "tool," such as a budgeting model,

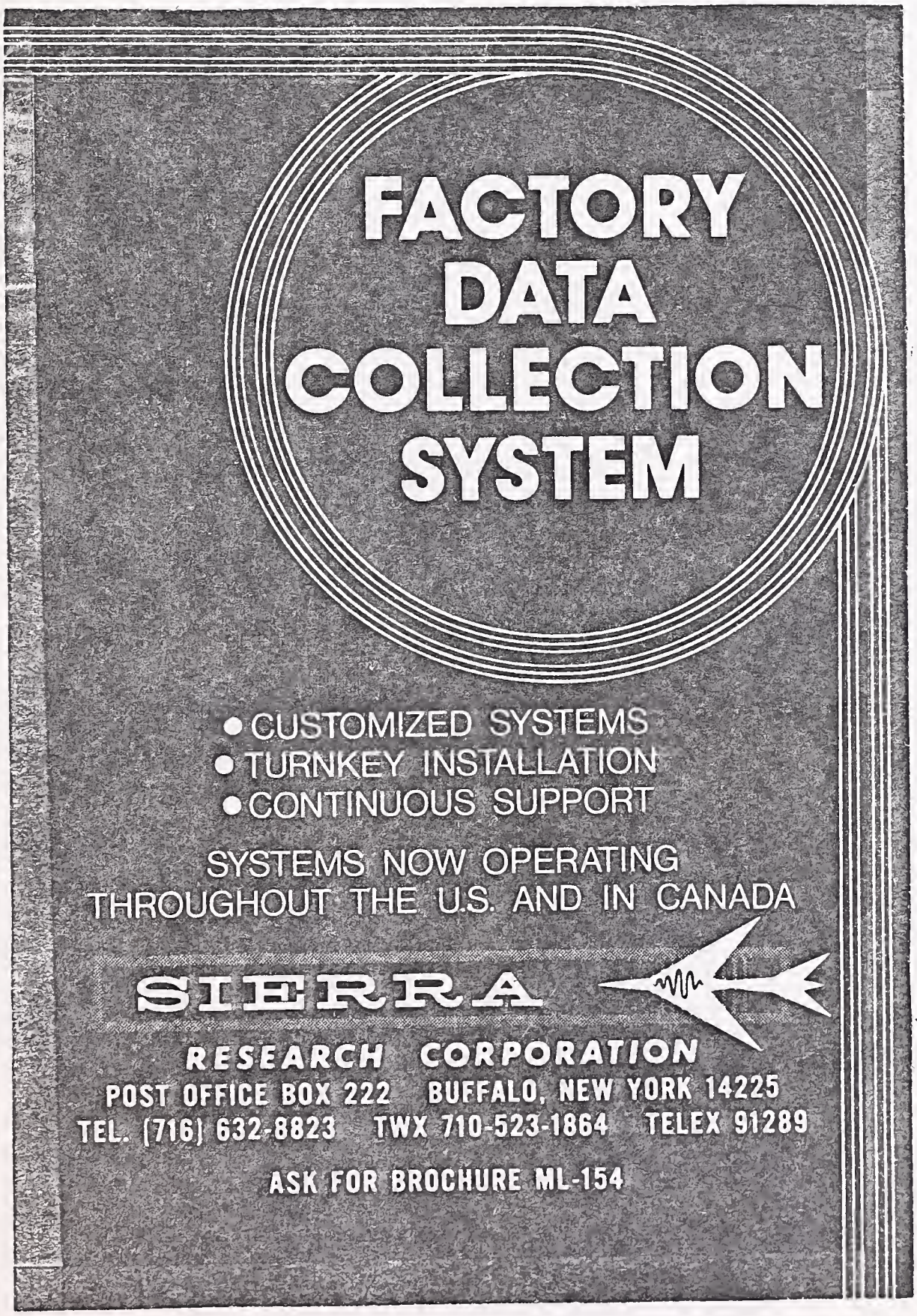
where a user provides much of the customizing of the finished product it uses. General business processing is often repetitive and transaction oriented.

- SCIENTIFIC AND ENGINEERING services are the processing of scientific and engineering problems for users across industries. The problems usually involve the solution of mathematical equations. Processing is generally problem solving and is non-repetitive, except in the sense that the same packages or "tools" are used to address different, but similar, problems.

- INDUSTRY SPECIALTY services provide processing for particular functions or problems unique to an industry or industry group. The software is provided by the vendor either as a complete package or as an application "tool" which the user employs to produce its unique solution. Specialty applications can be either business or scientific in orientation; data base services where the vendor supplies the data base and controls access to it (although it may be owned by a third party) are also included under this category. Examples of industry specialty applications are: seismic data processing, numerically-controlled machine tool software development, and demand deposit accounting.

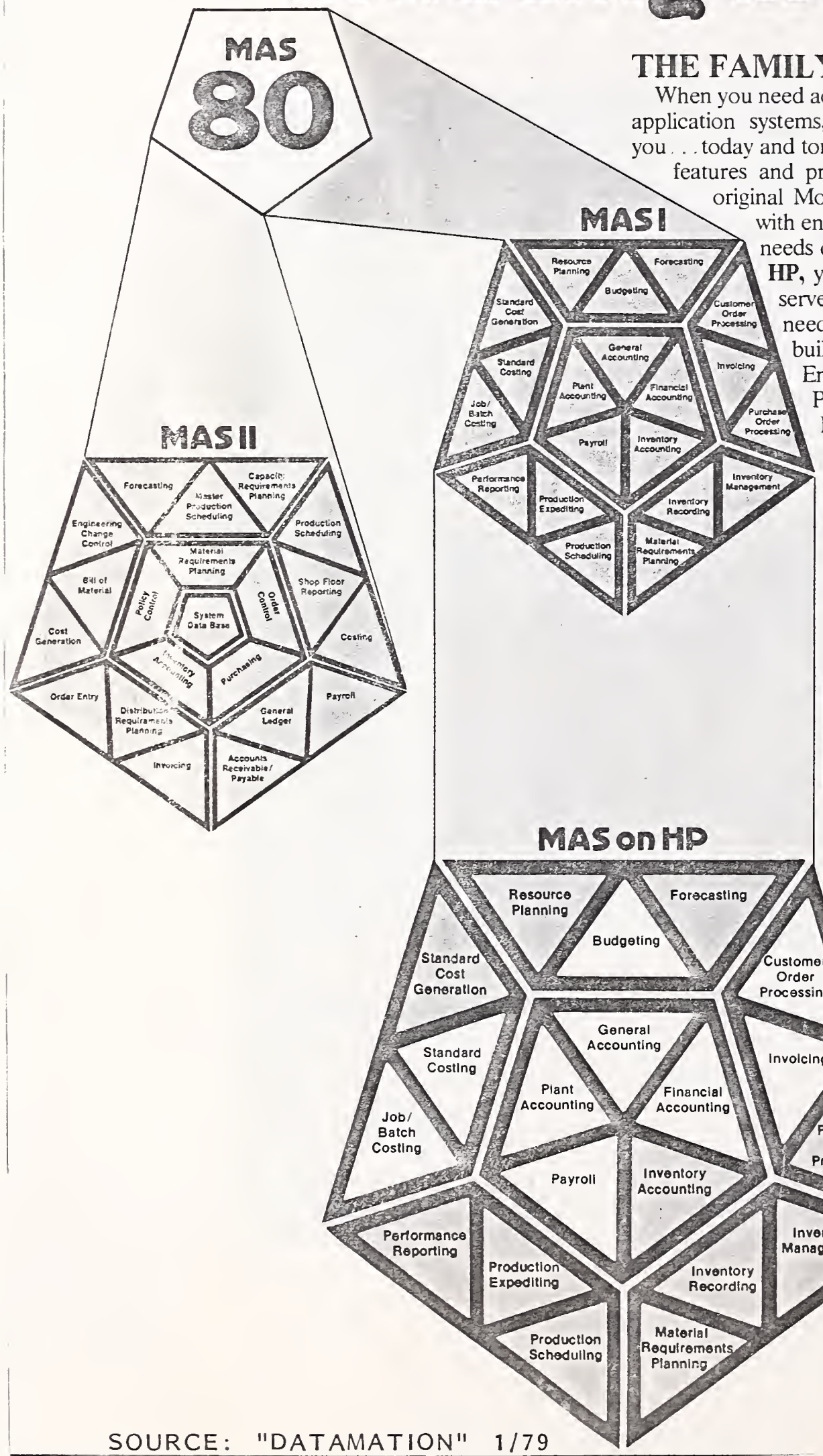
- UTILITY services are those where the vendor provides access to a computer and/or communications network with basic software that enables any user to develop its own problem solution or processing system. These basic tools include terminal handling software, sorts, language compilers, data base management systems, information retrieval software, scientific library routines, and other systems software.

APPENDIX E: SAMPLE TURNKEY ADVERTISEMENTS



SOURCE: "COMPUTERWORLD" PAGE S/12 1/26/76

Manufacturing Systems including the newest



THE FAMILY

When you need advanced software for manufacturing application systems, our MAS-80 Family can cover you . . . today and tomorrow. MAS-80 combines the best features and proven experience gained from our original Modular Application Systems (MAS), with entirely new capabilities. Whether your needs call for **MAS I, MAS II,** or **MAS on HP,** you can be certain your system will serve all of your company's operating needs. MAS-80's functional capability is built around these six business areas: Engineering Control, Financial Control, Production Control, Inventory Control, Distribution Order Entry, and Business Planning. These systems are not only individually purchasable, but you also get . . .

- Functional and technical configuration flexibility to fit both your manufacturing and data processing environment.

MAS on HP

MAS on HP is an on-line, interactive Materials Management System specifically for the Hewlett Packard 3000.

SOURCE: "DATAMATION" 1/79

from the MAS-80 Family family member...

- A cost-effective way of achieving proven, viable manufacturing systems.
- Comprehensive and integrated systems covering your primary business areas. They are independent, yet still automatically interfaceable.

But, while MAS-80 family members share certain functional aspects, each offers a unique set of benefits you can utilize, depending on the needs of your manufacturing environment.

MAS on HP PROVIDES . . .

- **Individually purchasable systems modules for Inventory Control, Manufacturing Control and Purchase Order Processing.**
- **On-line, interactive inquiry and update capability.**
- **Fully integrated Data Base using IMAGE as the Data Base manager.**
- **Complete transaction recording for all systems activities and functions whether batch or on-line.**
- **Data Entry Language invoked for CRT screen processing to readily change screen formats.**
- **Increased system throughput performance tuning to optimize vital storage processing, e.g.:**
  - **—minimize stack size**
  - **—consistent code segmentation**
- **Use of QUERY for specialized inquiries or special reporting to enhance your on-line capability.**
- **Data Base security assuring privacy and integrity of your data.**

MAS-I PROVIDES . . .

- Batch processing capability to run on mainframes such as IBM, Honeywell, Univac.
- 20 individually purchasable elements.
- Functional compatability with MAS II.

MAS II PROVIDES . . .

- Individually purchasable elements, constituting a complete Materials Management Closed Loop System, including necessary Data Base control and maintenance functions.
- Full Data Base capability with the independence to utilize the DBMS of your choice: IMS, TOTAL, ADABAS, IDMS and others.
- A totally transaction driven and oriented system that provides the ability to grow your system in a centralized or distributed processing mode, including on-line functions.

WRITE ON . . .

MAS-80 has already proven its worth as the manufacturing application system for the future. It's the world leader in **comprehensive,** proprietary manufacturing systems software. In fact, in our more than 10 years of experience, more than 900 manufacturing system modules have been selected.

To learn more about the MAS-80 Family, and how **MAS I, MAS II,** and **MAS on HP** can assist you in your Materials Management needs, just fill in and return the coupon below for our **free** brochures. If it's easier, call Marketing Services at MMDS headquarters . . .

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NAME _____

COMPANY _____

TITLE _____

ADDRESS _____

CITY _____

STATE _____ ZIP _____

PHONE _____

SOURCE: "DATAMATION" 1/79

System for city governments

Complete Computer Systems has announced a turnkey computer system for municipal governments. The system handles tax billing and follow-up, licensing, vehicle and street maintenance, parking violations, purchasing, payroll and general ledger. The product is designed for use by personnel with no computer background or experience, the company claims. A minicomputer, disk drive, printer(s), CRT terminals and all software are included, as is a built-in security system. **Circle 103**

SOURCE: "INFOSYSTEMS" PAGE 100 3/79

SOURCE: "COMPUTERWORLD" PAGE S/7 1/26/76

DTC's TaskMaster with multi-user capability delivers more. For less. A lot less.

Since you're heading up a small business today, you're aware of the real-world benefits of the computer: speed, flexibility and accuracy. DTC's TaskMaster offers the small business owner all this and more: a *small business* price.

Our TaskMaster is the first small business computer delivered with *multi-user capability*. The TaskMaster can handle the work done on up to four separate terminals simultaneously. Which means that one person on the TaskMaster and up to three people on different terminals can do their jobs at the same time — even if they're in separate work areas. They no longer have to wait to "get into the system." So, you can use the TaskMaster while your manufacturing, accounting, and marketing people are hard at work, too.

TaskMaster is an extension of your business.

We found that one of the primary concerns of small business owners is that they'll have to restructure their business around the computer. But the TaskMaster computer doesn't change what you've established. Instead, it fits easily into any work environment, ranging from office to scientific and industrial areas. We designed the TaskMaster to be expandable, too, so it can grow as your business grows. Just add more applications packages when your company expands. That way, you won't need to buy new equipment or hire new people to do the work.

Proven hardware and software.

Our TaskMaster includes the most modern hardware: a flexible disk system or an optional hard disk for maximum data storage, plus a full-screen CRT and printer. (You can choose between two printers: a medium-speed, letter-quality printer or a high-speed matrix printer. What about applications? We provide a standard package we call the Accountmaster. This package contains *more than eighty* general business functions. And it's easy to learn. We thoroughly train your people, then check back to see that everything is running smoothly. And we'll be around when you need us.

DTC wants all your business, not all your money.

We've priced TaskMaster within easy reach of the small business owner. Even with multi-user capability and specialized functions, the price tag is under $20K — the most cost-effective price around.

When you buy a TaskMaster, you get DTC.

With a TaskMaster computer, you also get our strong service organization, our strong dealer network, and our ten-year, ten-thousand terminal history of dependability. We're proud of our credentials. But the thing we're proudest of is our customers. Add *your* name to our list. Arrange to visit one of our dealers' offices for a demo. Write or call Data Terminals and Communications, 590 Division Street, Campbell, CA 95008. (408) 378-1112. TWX (910) 590-2436 to find the dealer nearest you. Or send in the coupon below.

Accounting

Marketing

Stockroom

DTC

Data Terminals and Communications
590 Division St., Campbell, CA 95008

MORE! MORE!
Sounds like TaskMaster is the way to go!
Send me all the details!

My name is _____

Company _____

Address _____

City _____ State _____ Zip _____

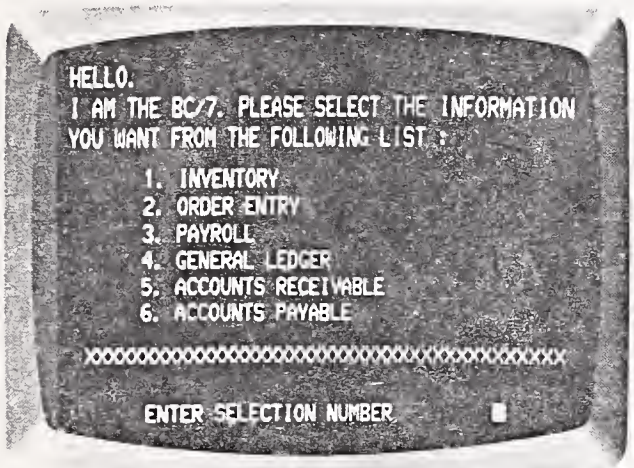
Want quick results? Give us your phone number!

(_____) _____

SBC 1/79

SOURCE: "SMALL BUSINESS COMPUTERS" PAGE 6 - 1/79

NOW, FOR AS LITTLE AS $700 A MONTH, YOU CAN MANAGE YOUR ORDERS, SALES, INVENTORY, RECEIVABLES, PAYABLES, PAYROLL, OVERHEAD, PRODUCTIVITY. EVERY DAY.



THE SPERRY UNIVAC® BC/7 BUSINESS COMPUTER TALKS TO YOU IN ENGLISH.

It's a competitive business you're in. To be more successful than the other guy, you've got to do a better job. You have to make a lot of good decisions. And make them fast.

For that, you need information. Up-to-date information. Easy-to-understand information. For that, you need the SPERRY UNIVAC BC/7 business computer.

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Whatever you want to know, you simply ask it a question, in English, and the correct information appears in English on the screen.

The Sperry Univac BC/7 can go to work for you and your business in a short time after you contact us. The BC/7 can be equipped with business applications to satisfy your requirements. And with a couple of days of simple instruction, you or anyone on your staff can operate it easily.

Less than $700 a month including maintenance. It's a small price to pay for the information you need to manage your business.

SPERRY UNIVAC

SPERRY UNIVAC IS A DIVISION OF SPERRY RAND CORPORATION

SPERRY UNIVAC BC/7

The small computers for small business.

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Name _____

Company _____

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State _____ Zip _____ Phone _____

SBC-5

SOURCE: "SMALL BUSINESS COMPUTERS" PAGE 13-1/79