MARKETS FOR SERVICE-RELATED PRODUCTS

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ABSTRACT

This feasibility study, conducted by INPUT for Digital Equipment Corporation (DEC), concerns automation needs for customer service/repair organizations in Fortune 1500 companies.

Primary research consisted of 39 telephone interviews. Secondary research identified market segments of interest: (1) medical equipment; (2) major home appliances; and (3) consumer durable electronics.

The study results indicated that market trends are encouraging, that technology is influencing market growth, that information requirements are outstripping existing systems capability, that a market potential for customer service/repair information systems is between $4 billion and $7 billion over five years from the selected industry segments, and that production potential ranges between 80,000 and 100,000 units sold over five years.

The report recommends that DEC consider strategic partnering for market entry, target additional market research for the selected markets, consider market research in at least three additional market segments, and evaluate advanced customer service/repair software packages.

This report contains 103 pages, including 48 exhibits.

MARKETS FOR SERVICE-RELATED PRODUCTS

CONTENTS

EXHIBITS

I INTRODUCTION

I INTRODUCTION

- This feasibility study, conducted by INPUT for Digital Equipment Corporation (DEC), concerns automation needs for customer/repair services organizations in Fortune 1500 companies.

- The research effort outlined in INPUT's proposal of April 9 was authorized by DEC on April 30, 1985.

- A detailed work statement was forwarded on May 2, 1985, and approved as amended on May 7, 1985.

- The preliminary questionnaire was forwarded on May 9, 1985, amended on May 13, 1985, and approved on May 16, 1985. A copy of the final questionnaire is included as the Appendix.

- The research consisted of first ten, then an additional 29 telephone interviews with national customer services/field services executives. The interviewed executives were chosen from: (1) articles in national customer/field services publications; (2) the Association of Field Service Managers (AFSM); and (3) International Customer Service Association (ICSA).

- Secondary research was used to identify market segments of interest. The major portion of the interview program was focused on the selected markets.

- Every attempt was made to interview the executive having primary responsibility for the customer services/repair organization. A summary of the respondents' interviews is shown in Exhibit I-1. Well over 70% of respondents interviewed were at the national level. Selected regional/district managers were interviewed to gain a sense for decentralized customer service/repair operations.

- Early in the study INPUT identified three market segments that appeared attractive for offering service-related information system products: (1) medical equipment; (2) major home appliances; and (3) consumer electronic durables.

- A summary of the companies interviewed by type is shown in Exhibit I-2. Over 40% of total interviews fell into market segments of interest. Interviews were conducted in other areas to gain some sense of product need and to highlight possible additional market segments of interest.

- The interview program began on May 8, 1985, and was completed on June 22, 1985.

- The study addressed within the limited budget the following issues:

  - What are the high value products?

  - What kinds of segment information are available for production and sales planning?

  - What constitutes a service market segment?

  - What is the potential size of a selected market segment?

  - What are the information needs of potential users?

EXHIBIT I-1

RESPONDENTS INTERVIEWED

TITLE	NUMBER INTERVIEWED
Manager/Director Customer Service	7
National Field Service Director/Manager	12
National Director/Manager Customer Service	6
National Service Director/Manager	10
Operations/EDP/MIS Director/Manager	2
Director/Manager Technical Services	2
Total	39

EXHIBIT I-2

COMPANIES INTERVIEWED BY TYPE

TYPE	NUMBER INTERVIEWED
Process Manufacturers	6
Major Home Appliances	5
Consumer Electronic Durables	4
Medical Equipment Companies	7
Third-Party Service Companies	2
Electrical Equipment Manufacturers	6
Information Systems	5
Others	4
Total	39

- How are these needs being currently addressed?

- What new products/services are wanted?

- Who is currently offering information products/services?

- What technology can be applied to more effectively automate the service function?

- What are the common characteristics that would constitute a horizontal market segment?

- What market players are potential candidates for OEM or other business relationships?

- What segments of the market warrant further detailed research?

- All forecasts in this report are based on current dollars. The forecasts include a 5% annual price increase due to inflation.

II EXECUTIVE SUMMARY

II EXECUTIVE SUMMARY

- This executive summary is designed in a presentation format in order to:
  - Help the busy reader quickly review key research findings.
  - Provide a ready-to-go executive presentation, complete with script, to facilitate group communication.
  - Key points of the report are summarized in Exhibits II-1 through II-7. On the left hand page facing each exhibit is narrative explaining the contents of the exhibit.

A. MARKET TRENDS ARE ENCOURAGING

- Respondents uniformly report that the ratio of product to service cost is falling. The net result is continued pressure on product vendors to increase services productivity through more efficient operations. In labor intensive service operations the substitution of capital (in the form of automation) is vital to achieving efficiency at the margin.

- Corporate management has found that offering services bundled with product price to increase revenues has resulted in rapidly declining profit margins. Management is recognizing both the revenue potential and profitability of separately pricing customer service/repair offerings. The result has been a shift from revenue/cost center to revenue/profit center responsibility for customer service/repair operations. The net effect is that service is increasingly viewed as a separate but complementary business by corporate management.

- The research clearly indicated the recognition by both corporate management and services managers that increased automation was essential to support and cope with the rapidly expanding services base. The data indicated that managers are willing to as much as double the portion of total budget allocated to automation in order to achieve improved productivity, improved customer services, reduced operating costs, improved management data, and increased product and services revenues.

- Respondents reported that service revenues were growing faster than product revenues and that service profit margins were consistently greater than product profit margins.

- The implications of the above market trends are that services management has the money to spend on customer service/repair information systems products and that corporate management by and large will approve cost-effective solutions.

MARKET TRENDS ARE ENCOURAGING

- Product/Service Cost Ratios Are Falling
- Shift to Profit Center Responsibility
- Willingness to Increase Automation Budgets
- Service Revenues Growing Faster Than Product Revenues

B. TELECOMMUNICATIONS IS INFLUENCING MARKET GROWTH

- The geographically dispersed nature of customer service/repair operations implies that telecommunications is key to productivity improvement in highly labor intensive services operations. Increasing use of and plans for emerging telecommunications technology by services organizations requires that information systems product vendors provide integrated telecommunications support for:

  - Automatic WATS routing of incoming calls to the responsible services operation.

  - Elimination of expensive separate voice and data lines through the implementation of digital voice/data as an option.

  - Interfacing with and providing computer initiated area and national paging.

  - Providing electronic mail capability through high speed data communication channels.

  - Providing for computer-initiated cellular radio communiction.

  - Providing for computer-initiated interaction with service engineers using hand-held terminals.

- Respondent data clearly indicates that call handling and dispatch is becoming centralized. Telecommunication and computer technology is available to permit what appears to be the optimum solution of centralized information control with decentralized field logistics and repair operations.

INPUT®

TELECOMMUNICATIONS IS INFLUENCING MARKET GROWTH

- Telecommunication Key
  - Automatic WATS Routing
  - Digital Voice/Data
  - National Paging
  - Cellular Radio
  - Hand-Held Terminals
  - Electronic Mail
- Dispatch Becoming Centralized

C. INFORMATION REQUIREMENTS OUTSTRIPPING EXISTING SYSTEMS CAPABILITY

- The research showed that customer service/repair operations are as much involved in offering information services as they are in accomplishing diagnosis and repair.

- Managers report that information is becoming more specialized in order to support products that use multi-disciplines.

- Transfer of information needed for on-site analysis is rising. The information transfer occurs through education, technical literature, and electronic data transfer, which is increasingly graphics and, more recently, video.

- Integration of products into increasingly sophisticated systems utilizing multiple technologies is increasing the complexity of the service/repair tasks at tech centers and company sites. Field engineers are required to become knowledgeable in vertical market applications.

- The major portion (62%) of respondents reported that products were more maintainable in the field. However, once failed, systems were more complex to repair. As hardware is replaced with firmware and software, services personnel must understand the complex system interaction to separate electronic failure from firmware and software error.

- The research found that services managers were implementing centers to assist users in self-repair through problem resolution, recalibration, software changes, etc. Services are designed to substitute less expensive depot repair for highly expensive on-site component diagnosis and repair.

- The above information requirements imply that the nature of the information flow within computer service/repair information systems is becoming wider based, more dynamic, and more on-line and interactive.

INPUT®

INFORMATION REQUIREMENTS OUTSTRIPPING EXISTING SYSTEMS CAPABILITY

- Information Becoming More Specialized
- Higher Information Needs On-Site
- Service/Repair Tasks More Complex
- Products More Maintainable But More Complex to Repair
- More Self-Repair and Module Exchange

D. MARKET POTENTIAL ATTRACTIVE

- The market potential for customer service/repair information systems is somewhere between $4 billion and $7 billion over the next five years for the selected industry segments: (1) medical equipment; (2) large home appliances; and (3) consumer durable electronics.

- The range of market potential results from selection of growth in the portion of services operations budget devoted to computer automation over that reported currently (1985) and that extrapolated to 1990.

- All three market segments are individually attractive.

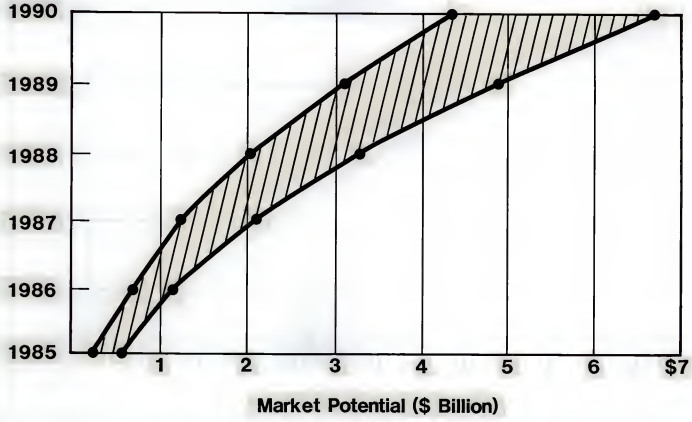
  - Market potential for the medical equipment market ranges between $750 million and $1 billion.

  - Market potential for major home applicances ranges between $900 million and $1.4 billion.

  - Market potential for consumer durable electronics ranges between $2.7 billion and $4.4 billion over five years.

- No attempt was made to determine existing market base or the potential penetration by vendor.

MARKET POTENTIAL ATTRACTIVE - BETWEEN FOUR AND SEVEN BILLION DOLLARS



E. PRODUCTION POTENTIAL IS SOLID

- Market potential in terms of units ranges between 80,000 and 300,000 units produced and sold over the five-year period.

- The range results from the reported range of the current (1985) portion of services budgets devoted to automation and extrapolated from respondent growth data to 1990.

- The production potential is considerable for each of the selected markets individually.

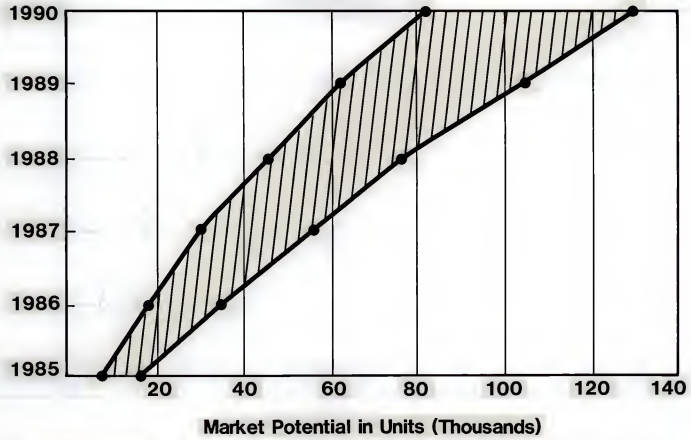
  - Production potential for medical electronics ranges between 14,000 and 19,000 units.

  - Production potential for the major home appliance industry ranges between 17,000 and 27,000 units.

  - Production potential for consumer durable electronics ranges between 50,000 and 84,000 units.

- No attempt was made to determine the existing installed base or vendor penetration during the forecast period.

PRODUCTION POTENTIAL IS SOLID - BETWEEN 80 AND 130 THOUSAND UNITS



F. CONSIDER STRATEGIC OPTIONS

- A number of strategic options are available for market entry. All options should be considered with the goal of establishing a national presence to address the geographic characteristics of customer service/repair operations.

- Market entry in the major home appliance market may best be accomplished through strategic partnering with a major home appliance company, with product development carried from successful implementation through common parts distributors and independent services companies into the marketplace.

- There are a number of powerful national trade associations in the applicance and consumer durable electronic market segments which through partnering could spearhead development and promotion of customizable information systems in the selected sectors.

- Only one vendor, ASK Computers, has national market presence. Their products are equally identified with Hewlett-Packard and DEC computers. Consideration should be given to selecting and including a software product vendor in the teaming arrangement through licensing a yet-to-be-determined promising customer service/repair software product.

- The degree of customization and hardware/communications system integration raises the option of teaming with professional services vendors capable of systems implementation and integration services. Candidates are Computer Sciences Corporation (CSC), Electronic Data Systems (EDS), and Computer Task Group (CTG). These vendors have national presence, DBMS systems implementation, and telecommunications expertise.

- National presence, implementation capability, and telecommunications expertise can alternatively be attained through strategic partnering with selected RCS vendors. Candidates are Boeing Computer Services (BCS), McDonnell Douglas Information Services, and General Electric Information Services Company (GEISCO).

INPUT®

CONSIDER STRATEGIC OPTIONS

- Partner with Major Home Appliance Company
- Develop through National Trade Association
- License Software Product
- Team with Professional Services Vendor
- Team with RCS Vendor

G. TARGET ADDITIONAL MARKET RESEARCH

- The initial study established the feasibility of offering a customer service/repair information systems product line to selected markets. The findings indicated that the market trends, emerging technology, and information requirements all point toward an attractive market.

- The research also indicated that no single product is likely to satisfy the information system requirements of the selected vertical market sectors. INPUT recommends additional market research to more clearly define the information system requirements for the medical equipment, major home appliances, and consumer electronic durable marketplaces.

- The feasibility study excluded consumer maintenance for computer or computer-related products. While computer maintenance to mainframe and minicomputer vendors may be overcrowded, INPUT feels microcomputer and peripheral equipment vendors, as well as third-party computer maintenance vendors, are likely candidates for customer service/repair information systems products.

- There are over 300,000 new car dealers, automotive accessory (including tire) dealers, and mass merchandisers with 1985 revenues exceeding $95 billion, growing at a rate of 11% annually.

- INPUT believes that market research is warranted in these additional markets at least.

- There are a number of advanced customer service/repair software packages which require further research and evaluation with regard to both technology and functionality. Detailed evaluation could determine that one of these packages is attractive enough to form the base line for customer service/repair information system product line development.

INPUT®

TARGET ADDITIONAL MARKET RESEARCH

- Conduct Detailed Analysis of Selected Markets
- Research Additional Markets
- Evaluate Advanced Software Packages

III MARKET DEFINITION AND STRUCTURE

III MARKET DEFINITION AND STRUCTURE

A. ANALYSIS

- The principal domain of potential markets for customer service/repair information system products is very large. Customer service/repair functions, whether industrial, consumer, or company internal, can be found in virtually every market segment in the public and private sectors. The limited nature of this feasibility study required an almost immediate focus on selected market sectors.

- Utilizing the preliminary results of the initial telephone interviews and secondary research, three market segments were identified for preliminary analysis with respect to market size and structure.

B. MEDICAL EQUIPMENT MARKET

- Nearly 400 companies, as shown in Exhibit III-1, currently generate in excess of $13 billion in revenues through selling medical equipment to hospitals, medical centers, group medical practices, and, at times, individual physicians.

- Utilizing microelectronics capability to provide increasing levels of complex medical data analysis, monitoring, and control, the medical marketplace has recently increased and is expected to continue annual growth in excess of 20% over the next five years.

EXHIBIT III-1

STRUCTURE OF THE MEDICAL EQUIPMENT MARKETPLACE, 1985-1990

ITEM	UNITS	1985	1990	AAGR 1985-1990 (Percent)
Revenues	$ Billions	$13.2	$37.2	23%
Companies	1	380	420	2%
Revenue per Company	$ Millions	$35	$89	21%

Source: The Medical and Health Care Guide; International Biomedical Information Service.

- Although some medical equipment vendors are divisions and subsidiaries of Fortune 500 companies, most fall below the Fortune 1000 class. The average-size company, currently approaching $40 million, will still be less than $100 million by 1990.

- Although some medical equipment vendors utilize third-party maintenance organizations, the technical complexity together with the high level of customer interaction results in most companies supporting and servicing what they sell.

- The medical equipment marketplace appears an attractive market segment for offering customer service/repair information system products.

C. MAJOR HOME APPLIANCE MARKET

- Nearly 200 companies, as shown in Exhibit III-2, currently receive revenues in excess of $30 billion annually by supplying refrigerators, washers, ranges, dishwashers, and other major home appliances to U.S. consumers. The revenues represent non-captive U.S. revenues for both U.S. and foreign companies.

- Revenue growth in current dollars will exceed $50 billion by 1990, a moderate 11% annual growth.

- Many of the companies fall into the Fortune 1000 class. The high average revenue per company, exceeding $150 million and approaching $250 million by 1990, indicates both large organizations and a mature industry segment.

- The companies support sold appliances through a network of parts distributors (less than 2,000) and independent authorized repair companies (in excess of

EXHIBIT III-2

STRUCTURE OF THE MAJOR HOME APPLIANCE MARKETPLACE, 1985-1990

ITEM	UNITS	1985	1990	AAGR 1985-1990 (Percent)
Revenues	$ Billions	$30.3	$51.1	11%
Companies	1	190	210	2%
Revenue per Company	$ Millions	$159	$243	9%

Source: Appliance; Dana Publications.

50,000). Companies maintain a minimum number of their own service centers (less than 500) in large metropolitan areas, primarily to handle appliances in warranty.

- Although order entry and part distribution is widely automated, little automation exists between the companies and the authorized dealers, and between the distributors and the authorized dealers.

- Two important trade associations operate in this market segment: (1) Appliance Dealers Association (ADA), and (2) National Appliance Parts Dealers Association (NAPDA).

- INPUT believes that the major home appliance marketplace can be viewed as similar to the casualty insurance marketplace, where some 200 life/casualty companies supply insurance products to well over 50,000 independent agents/brokers. Whereas significant efforts between insurance companies, trade associations, and information services vendors (notably IBM) are introducing automation, including networking, into the insurance marketplace, it appears little is being done yet in the major home appliance marketplace.

D. CONSUMER DURABLE ELECTRONICS MARKET

- Well over 1,000 companies, as shown in Exhibit III-3, supply televisions, VCRs, stereos, and other electronics to the consumer marketplace. Current revenues exceeding $90 billion will grow to over $200 billion annually by 1990.

- Revenues are non-captive and stated in current dollars, resulting in a growth of 17% annually over the forecast period.

- Some of the companies are Fortune 500 size. A significant portion of these companies are foreign (particularly Japanese) subsidiaries. Most of these subsidiaries are small, with less than $200 million in annual sales.

EXHIBIT III-3

STRUCTURE OF THE CONSUMER ELECTRONICS MARKETPLACE, 1985-1990

ITEM	UNITS	1985	1990	AAGR 1985-1990 (Percent)
Revenues	$ Billions	$92.8	$203.5	17%
Companies	1	1,250	1,500	4%
Revenue per Company	$ Millions	$74	$136	13%

Source: Appliance; Dana Publications.

- The companies provide a significant degree of consumer service centrally. Products are supported through distributors for parts, and through in excess of 50,000 authorized service companies for repairs.

- Companies maintain some (less than 1,500) service centers in large metropolitan areas, primarily to support warranty service/repair.

- Little automation exists between the companies and the independent authorized repair companies, and between the distributors and the independent service/repair companies. Automation within corporate organization for order entry and price distribution is significant, but uneven, between the companies and the distributors.

- The declining ratio in the product price versus cost to repair is forcing the market to consider increased automation to increase productivity and better disseminate service/repair information.

- The market appears attractive for a microcomputer-based customer service/repair information system product for independent service organizations with networking as required to both distributors and producers of consumer electronic products.

E. OTHER POTENTIAL MARKETS

- The feasibility study excluded computer maintenance. Although INPUT agrees that DEC is not likely to sell a customer service/repair DEC-based information systems product to IBM, Burroughs, Prime, Wang, etc., there are a great many other companies involved in the computer maintenance marketplace, currently estimated to exceed $13 billion with growth forecast at 17% annually over the next five years. Third-party maintenance vendors,

peripheral vendors, communication vendors, and systems integrators all offer computer maintenance services. INPUT believes that the computer maintenance market should be given detailed consideration in a future study.

- There are over 300,000 auto repair facilities in the U.S. The total service parts marketplace in 1985 is estimated to exceed $95 billion. Franchised new car dealerships, accessory dealers, and mass merchandisers, comprising just under 25% of the total number, receive over 60% of total market segment revenues. INPUT believes that this market subsegment represents another area ripe for improved customer service/repair information systems.

IV MARKET POTENTIAL

IV MARKET POTENTIAL

A. METHODOLOGY

- The forecast for the market potential of medical equipment, major home appliances, and consumer electronics markets presented below is based on the following assumptions:

  - Amounts are presented in current dollars.

  - Growth rates include a 5% annual price increase due to inflation.

  - Customer service/repair budgets are estimated to be 4% of company revenues, a rule of thumb quoted for at least the consumer durable electronics and personal care products marketplaces.

  - Current customer service/repair information processing budgets are assumed to vary between 5% and 15% of total customer service/repair budgets. This range appears consistent with the respondent data presented in Chapter V, User Analysis.

  - Future customer service/repair information processing budgets are assumed to grow to between 15 and 20% of the total customer service/repair budgets. This range is not unreasonable when extrapolated from the respondent data presented in Chapter V, User Analysis.

- Average customer service/repair information processing system unit cost is assumed to be $35,000 per unit. An information processing system includes a micro/minicomputer, intelligent terminals, auxiliary storage (magnetic or optical disk), printer, and voice/data communications.

- The unit information system cost will rise to $70,000 by 1990 as additional functionality and increased processing capability are incorporated in the information system product(s).

- Revenue and company growth rates for the 1985-1990 timeframe are a linear projection of those industry rates reported for the 1981/1982-1985 timeframe.

- The forecast presented below represents total market potential. No consideration is given to the currently installed base or to vendor (DEC or other) penetration.

- The forecast of market potential for each of the market subsegments is determined on an annualized basis, and then summed to determine total market potential in dollars and in units delivered for the five-year forecast period.

B. MEDICAL EQUIPMENT MARKET

- Company revenues will, as shown in Exhibit IV-1, increase from just over $13 billion in 1985 to in excess of $37 billion in 1990 in a hot market forecast to grow at 23% annually.

EXHIBIT IV-1

FORECAST OF MARKET POTENTIAL FOR CUSTOMER SERVICE/REPAIR INFORMATION SYSTEMS FOR THE MEDICAL EQUIPMENT MARKETPLACE, 1985-1990

ITEM	UNITS	1985	1986	1987	1988	1989	1990	AAGR 1985-1990 (Percent)
Company Revenues	$ Billions	$13.2	$16.2	$20.0	$24.6	$30.3	$37.2	23%
Customer Service/ Repair Budgets (4%)	$ Millions	$530	$652	$805	$1,000	$1,220	$1,500	23%
Information Processing Budgets								
(A) 10% - 15%	$ Millions	$53	$68	$97	$130	$171	$225	34%
(B) 15% - 20%	$ Millions	$80	$104	$137	$180	$232	$300	30%
Information System Unit Cost	$ Thousands	$35	$40	$46	$53	$61	$70	15%
Units								
(A)	1	1,515	1,700	2,110	2,455	2,805	3,210	16%
(B)	1	2,290	2,600	2,980	3,400	3,800	4,290	13%
Number of Companies	1	380	388	396	404	412	420	2%
Average Units per Company								
(A)	1	4	4	5	6	7	8	15%
(B)	1	6	7	8	8	9	10	11%

- Customer service/repair operational budgets, assumed to remain constant at 4% of revenues, will rise from over $530 million to $1.5 billion during the forecast period.

- Two ranges of information processing budgets have been assumed:

  - Ten percent of total customer service/repair operational budgets, rising to 15% by 1990.

  - Fifteen percent of current budgets, rising to 20% through increased automation during the forecast period.

- Information processing budgets range from just over $50 million to $80 million in 1985, and will rise to $225-300 million annually by 1990, for average annual growth rates ranging between 30 and 34%.

- Information system unit costs are assumed to rise from $35,000 to $70,000 for a 15% annual growth in current dollars over the forecast period.

- Annualized information system unit market potential, currently ranging from just over 1,500 to nearly 2,300 in 1985, will increase to between 3,200 and 4,300 units by 1990.

- The number of companies will slowly increase from 380 to 420, or 2% annually over the forecast period.

- The average unit sale per company will range between 4 and 6 units in 1985 to between 8 and 10 by 1990.

- The total market potential for customer service/repair information systems in terms of current dollars will range between $750 million and $1 billion during the five-year forecast period.

- The total market potential in terms of units sold will range from 14,000 to a high exceeding 19,000 for the five years under consideration.

C. MAJOR HOME APPLIANCE MARKET

- Total company revenues, as shown in Exhibit IV-2, will rise from in excess of $30 billion in 1985 to over $50 billion by 1990, a moderate growth of 11% annually over the forecast period.

- Customer service/repair budgets, assumed at a constant 4% of company revenues, will increase from just over $1.2 billion in 1985 to over $2 billion by 1990.

- Information processing budgets have been assumed for two scenarios:

  - Currently 5% of total customer service/repair budgets, rising to 15% by 1990.

  - Currently 10% of customer service/repair budgets, rising as high as 20% by 1990.

- Information processing budgets will increase from between $60 million and $100 million in 1985 to between $300 million and $400 million by 1990, for an average annual growth rate between 27% and 38% over the forecast period.

- Information unit cost is assumed to start at $35,000, rising to $70,000 by 1990, a 15% annual growth in current dollars.

- The market potential in terms of units on an annualized basis will rise from between 1,700 and 3,400 in 1985 to between 4,300 and 5,700 by 1990.

EXHIBIT IV-2

FORECAST OF MARKET POTENTIAL FOR CUSTOMER SERVICE/REPAIR
INFORMATION SYSTEMS FOR THE MAJOR HOME APPLIANCES MARKETPLACE, 1985-1990

ITEM	UNITS	1985	1986	1987	1988	1989	1990	AAGR 1985-1990 (Percent)
Company Revenues	$ Billions	$30.3	$33.6	$37.3	$41.4	$46.0	$51.1	11%
Customer Service/ Repair Budgets (4%)	$ Millions	$1,210	$1,345	$1,495	$1,660	$1,845	$2,040	11%
Information Processing Budgets								
(A) 5% - 15%	$ Millions	$60	$83	$115	$159	$220	$300	38%
(B) 10% - 20%	$ Millions	$120	$152	$193	$245	$312	$400	27%
Information System Unit Cost	$ Thousands	$35	$40	$46	$53	$61	$70	15%
Units								
(A)	1	$1,710	$2,075	$2,500	$3,000	$3,605	$4,290	20%
(B)	1	$3,430	$3,800	$4,195	$4,625	$5,115	$5,710	14%
Number of Companies	1	190	194	198	202	206	210	2%
Average Units per Company								
(A)	1	9	11	13	15	18	20	17%
(B)	1	18	20	21	23	25	27	8%

- With the number of companies rising slowly from 190 to over 200 during the forecast period, the market potential for the average number of units sold per company will rise from between 9 and 18 in 1985 to between 20 and 27 by 1990.

- The market structure of the major home applicance marketplace is such that the major portion of units will be sold either directly to authorized service repair companies or through programs sponsored by major home appliance vendors.

- The market potential for customer service/repair information systems for the major home appliance marketplace in terms of current dollars will range from over $900 million to as high as $1.4 billion over five years.

- The market potential in terms of information system units will range from 17,000 to as high as 27,000 over five years.

D. CONSUMER DURABLE ELECTRONICS MARKET

- Total company revenues, as shown in Exhibit IV-3, will rise from nearly $93 billion in 1985 to over $203 billion by 1990 for a solid growth rate of 17% annually in current dollars.

- Customer service/repair budgets, assumed at a constant 4% of company revenues, will rise from the current level of $3.7 billion to over $8 billion by 1990.

- Two information processing budget scenarios are assumed:

  - Currently 5% of customer service/repair budgets, rising to 10% by 1990.

EXHIBIT IV-3

FORECAST OF MARKET POTENTIAL FOR CUSTOMER SERVICE/REPAIR INFORMATION SYSTEMS FOR THE CONSUMER ELECTRONICS MARKETPLACE, 1985-1990

ITEM	UNITS	1985	1986	1987	1988	1989	1990	AAGR 1985-1990 (Percent)
Company Revenues	$ Billions	$92.8	$108.6	$127.1	$148.7	$174.0	$203.5	17%
Customer Service/ Repair Budgets (4%)	$ Millions	$3,700	$4,330	$5,065	$5,925	$6,930	$8,100	17%
Information Processing Budgets								
(A) 5% - 10%	$ Millions	$185	$260	$355	$474	$624	$810	34%
(B) 10% - 15%	$ Millions	$370	$476	$608	$770	$970	$1,215	27%
Information System Unit Cost	$ Thousands	$35	$40	$46	$53	$61	$70	15%
Units								
(A)	1	$5,298	$6,500	$7,720	$8,940	$10,230	$11,570	17%
(B)	1	$10,570	$11,900	$13,220	$14,530	$15,900	$17,360	10%
Number of Companies	1	1,250	1,300	1,350	1,400	1,450	1,500	4%
Average Units per Company								
(A)	1	4	5	6	7	7	8	15%
(B)	1	8	9	10	10	11	12	8%

- Currently 10%, rising to 15% resulting from increased automation during the forecast period.

- Information system unit costs are assumed currently at $35,000, rising through increased utilization and functionality to $70,000 by 1990, or 15% annually in current dollars.

- The market potential in terms of unit on an annualized basis ranges from 5,000 to 10,000 in 1985 to between 11,000 and 17,000 by 1990.

- The number of companies involved in selling consumer electronic products will increase at a 4% annual rate, reaching 1,500 at the end of the forecast period and resulting in the average units sold per company, currently between 4 and 8, increasing to between 8 and 12 by 1990.

- The major portion of the units will be sold primarily to authorized distributors and repair service companies, either directly or through programs sponsored by consumer electronics companies.

- The market potential for customer service/repair information systems for consumer durable electronics in terms of dollars ranges between $2.7 billion and $4.4 billion over five years.

- The market potential in terms of units sold ranges from 50,000 to a high of 84,000 over five years.

V USER ANALYSIS

V USER ANALYSIS

A. CUSTOMER SERVICES

1. FUNCTIONS PROVIDED

- The organizations interviewed were correctly targeted. The functions provided are shown in Exhibit V-1.

- Those organizations providing customer service were most heavily involved in handling customer inquiries and providing product information.

- For those organizations interviewed, automated dispatching was about equally divided between centralized and field, although there was a significant trend toward shifting to centralized dispatch.

- A rather low portion of respondents were making effective use of management information and reports. As will be shown below, this area is of major importance in justifying additional automation.

- Other customer service/repair functions as reported by respondents are shown in Exhibit V-2. Service organizations are heavily involved in order entry and in providing sales information. Repair organizations cited training as an important additional function.

EXHIBIT V-1

MAIN CUSTOMER SERVICE/REPAIR FUNCTIONS
AS REPORTED BY RESPONDENTS

FUNCTION	PERCENT OF RESPONDENTS
Service	
• Customer Inquiries	82%
• Product Information	67
• Warranties	51
• Service Referral	36
Repair	
• Dispatching	
• Customer/Equipment Records	59
• Parts	59
• Labor/Billing	59
• Field	38
• Reports	38
• Centralized	36%

EXHIBIT V-2

OTHER CUSTOMER SERVICE/REPAIR FUNCTIONS
AS REPORTED BY RESPONDENTS

OTHER FUNCTIONS
Service • Order Entry • Adjustments • Returns • Sales Information • Telemarketing • Inventory Control Repair • Quality Control • Contract Services • Warranty • Exchange Service • Training

- Typical comments by respondents about their customer service/repair responsibilities are shown in Exhibit V-3. It is evident that the customer service/repair organization is becoming a separate and well-defined function within the corporate infrastructure.

2. USERS SERVED

- The distribution channels for customer service/repair are not, as shown in Exhibit V-4, directly to consumers. The primary distribution channels are through company service centers. Alternate channels are directly to companies and through authorized dealers and distributors.

- Typical comments on distribution channels for customer service/repair are shown in Exhibit V-5. There is a trend toward looking at the service center as a business or profit center, with responsibility for increasing sales as well as support.

3. COMMUNICATION CHANNELS

- The predominant method of establishing communication between users and the customer service/repair organization is through WATS telephone communication, as shown in Exhibit V-6.

- Nearly half of the respondent organizations utilize written correspondence, including product notices and training materials. This data indicates an area of opportunity for future automation.

- The low level of data communication between users and service/repair organizations indicates further opportunities for information systems automation.

- Typical comments on communication channels between users and customer service/repair organizations are shown in Exhibit V-7. Comments are indicative of the range of communication capabilities necessary for a cost/effective computer-aided customer service/repair information system.

EXHIBIT V-3

TYPICAL COMMENTS BY RESPONDENTS ABOUT
THEIR CUSTOMER SERVICE/REPAIR RESPONSIBILITIES

COMMENTS	MULTIPLE RESPONDENTS
Responsible for all other sales and service.	X
Provide field services through national field service organization.	X
National field service organization for medical systems.	X
Provide parts and service for major home appliances.	X
Provide product support and field service on national basis.	
Provide parts and services through distributors.	
Provide customer support to consumers.	X
Provide liaison between headquarters and district offices.	
Provide product services to process manufacturers.	
Provide support to appliance service companies.	X

EXHIBIT V-4

HOW CUSTOMER SERVICE/REPAIR SERVICES ARE DELIVERED
AS REPORTED BY RESPONDENTS

HOW SERVICES ARE PROVIDED	PERCENT OF RESPONDENTS
Directly to Consumers	18%
Directly to Companies	62
Through Company Service Centers	85
Through Authorized Dealers	36
Through Retail Account	10
Through Distributors	21
Through Repair Depots	10
Through District Offices	10

EXHIBIT V-5

TYPICAL COMMENTS ON METHOD OF CUSTOMER/REPAIR DELIVERY
AS REPORTED BY RESPONDENTS

TYPICAL COMMENTS
Regional centers interconnected to home office.
Provide customer services through authorized service centers.
Have service centers in large cities for warranty work.
Service centers are set up to sell what they service.
District offices handle all customer services.
Provide service to over 60,000 units for 25 vendors and large users.
Have 600 people in field repair all on-site.
Industrial distribution centers for spares and repairs.
Each service center is its own profit center.
Service centers support both warranty work and authorized service companies.

EXHIBIT V-6

PRIMARY METHOD OF COMMUNICATION
BETWEEN USERS AND CUSTOMER SERVICE/REPAIR ORGANIZATION

METHOD	PERCENT OF RESPONDENTS
Written Correspondence	49%
Voice Communication	
WATS	72
Direct Dial	28
Data Communications	
Leased Line	15
Telex	10
VAN	10
Dial Up	8
Electronic Mail	5
FAX	5

EXHIBIT V-7

TYPICAL COMMENTS ON PRIMARY METHOD OF COMMUNICATION BETWEEN USERS AND CUSTOMER SERVICE/REPAIR ORGANIZATION

TYPICAL COMMENTS
Poll dealers weekly by phone. They call directly for exceptions.
Distributors/authorized dealers polled nightly for orders, etc.
Users contact service centers locally.
Use national WATS automatic call routing system.
Use VAN to interconnect field offices.
Use mail for literature, training, orders, newsletters, etc.
Use dial-up terminals for large distributors and dealers.
Use our national corporate 800 network.
Over 95% of service requests come over WATS lines.

4. ORGANIZATION

- Any effective computer-aided information system for customer service/repair operations must consider both centralized control and widely decentralized operations. As shown in Exhibit V-8, the average number of people in field/district operations exceeds that of the home or centralized operations by nearly a factor of seven. The field organizations are generally national in scope with many locations, indicating that telecommunications is a key to effective operations.

- Typical comments concerning customer/repair service organizations are shown in Exhibit V-9. The comments indicate an attempt to establish centralized control of the information system while decentralizing service and repair operations.

5. MANAGEMENT VIEW

- Respondent corporate management is, as shown in Exhibit V-10, about equally divided between considering customer service/repair operations as a profit center and considering them a cost/revenue center. However, nearly 40% of cost/revenue center respondents indicated that they would be shifting to profit center responsibility in the current or next year.

- Typical comments on the corporate viewpoint of customer service/repair operations are shown in Exhibit V-11. The trend is evidence of management recognition that customer service/repair operations are vital to corporate viability and that a shift to profit center responsibility is occurring.

EXHIBIT V-8

DISTRIBUTION OF PEOPLE IN CUSTOMER SERVICE/REPAIR GROUP
AS REPORTED BY RESPONDENTS

LOCATION	SAMPLE SIZE	AVERAGE NUMBER OF OFFICES	RANGE	AVERAGE NUMBER OF PEOPLE	RANGE
Home	37	1	_	52	3 - 305
Field/District	33	69	1 - 1,500	341	5 - 5,000

EXHIBIT V-9

TYPICAL COMMENTS BY RESPONDENTS ON CUSTOMER/REPAIR GROUP HOME/FIELD OFFICE ORGANIZATION

TYPICAL COMMENTS
Have small home office staff. Most people are at service centers.
Retail outlets offer full range of customer services.
Home office heavily involved in education and training.
Technical support center solves over 60% of service requests by phone.
Home office handles training, publications, referrals, and warranties.
Home office for coordination, dispatch, and technical support.
Customer service handles order entry, returns, and adjustments.
Home office handles dispatch, parts, inventory, billing, data entry, and customer files.

EXHIBIT V-10

HOW CORPORATE MANAGEMENT VIEWS CUSTOMER SERVICE/REPAIR OPERATIONS
AS REPORTED BY RESPONDENTS

OPERATIONAL STATUS	PERCENT OF RESPONDENTS
Profit Center	54%
Cost Center	41
Revenue Center	5
Total	100%

EXHIBIT V-11

TYPICAL COMMENTS ON CORPORATE VIEWPOINT OF
CUSTOMER SERVICE/REPAIR OPERATIONS
AS REPORTED BY RESPONDENTS

TYPICAL COMMENTS
Both service revenues and profits are rising more rapidly than for products.
We are in the process of shifting to profit center this year.
Our costs are targeted at 2% of sales..
Our revenues and costs are targeted for break even.
Management has recognized that customer services is a product line.
A profit center for the last two years. We are growing like gang busters!
We are responsible for 1/3 of corporate revenue and almost all of its profit.
Very important. Head of customer services is a vice president.
Management recognizes that our margins are higher than for products.

B. BUDGETS AND AUTOMATION

1. OPERATING BUDGETS

- The distribution of annual budgets for the research sample is shown in Exhibit V-12.

- Over 50% of the research sample have annual budgets in excess of $5 million. Organizations of this size represent a well-defined target for computer-aided automation.

- Another 30% of the respondents having operating budgets of at least $1 million are still a target of interest for offering microcomputer-based information systems.

- Typical respondent comments on customer service/repair budgets are shown in Exhibit V-13. Management rule-of-thumb of allocating between 3% and 4% of revenues to customer service/repair, at least in selected industries, is useful in estimating market potential.

- Again, management recognition of the importance of customer service/repair operations to corporate operations and the shift to profit center responsibility are evident.

2. CURRENT AUTOMATION BUDGETS

- How automation budgets relate to customer service/repair budgets are shown in Exhibit V-14.

- Some 77% of respondent computer automation budgets are less than 15% of operating budgets. This data was used to calculate the market potential shown in Chapter IV, Market Potential.

EXHIBIT V-12

DISTRIBUTION OF ANNUAL BUDGETS FOR CUSTOMER/REPAIR
AS REPORTED BY RESPONDENTS

BUDGET LEVEL ($ Millions)	PERCENT OF RESPONDENTS
$1 Million	17%
$1 - $5 Million	32
$6 - $10 Million	20
$11 - $25 Million	20
$26 - $100 Million	11
Total	100%

EXHIBIT V-13

TYPICAL COMMENTS ON CUSTOMER SERVICE/REPAIR BUDGETS
AS REPORTED BY RESPONDENTS

TYPICAL COMMENTS
Our budget runs 3% of sales as a cost of service.
Our budget is currently not related to computer costs which are borne by corporate overhead.
Our budget runs 3 - 4% of revenue on a full cost basis.
We are a profit center. Our margins exceed 20%.
We are growing very rapidly.
We are becoming a profit center.
We expect to shift to profit center in a year or two.
Our profit center margins are greater than for the products themselves.

EXHIBIT V-14

DISTRIBUTION OF PORTION OF CUSTOMER SERVICE/REPAIR BUDGETS
DEVOTED TO COMPUTER AUTOMATION
AS REPORTED BY RESPONDENTS

COMPUTER AUTOMATION PORTION (Percent)	PERCENT OF RESPONDENTS
< 1%	12%
1 - 5%	38
6 - 10%	15
11 - 15%	12
16 - 20%	12
21 - 25%	8
> 25%	3
Total	100%

3. CURRENT REVENUES

- The distribution of respondent annual revenues for customer repair/service is shown in Exhibit V-15.

- Nearly 70% of respondents reporting revenues had annual revenues greater than $5 million. This group represents a prime target for offering computer-aided information services.

- An additional 30% reported revenues of at least $1 million. This group represents a potential target for offering microprocessor-driven information systems.

4. FUTURE AUTOMATION BUDGETS

- The respondents' willingness to allocate budget for increased automation of customer service/repair operations is shown in Exhibit V-16.

- The marked shift between the relative portions of operating budgets devoted to computer automation, as shown in the data of Exhibit V-16 versus data on current computer automation as shown in Exhibit V-14, is highly significant. For example:

  - The level of future spending for automation of up to 5% of operating budget drops to half of that being spent under current conditions. This indicates a willingness by at least half of the respondents to increase computer automation budgets significantly.

  - The future level of automation expenditures in the 6%-10% category is over double that in the corresponding category under current operations.

EXHIBIT V-15

DISTRIBUTION OF ANNUAL REVENUE FOR CUSTOMER/REPAIR SERVICES
AS REPORTED BY RESPONDENTS

REVENUE DISTRIBUTION	PERCENT OF RESPONDENTS
< $1 Million	4%
$1 - $5 Million	29
$6 - $10 Million	13
$11 - $25 Million	29
$26 - $100 Million	25
Total	100%

EXHIBIT V-16

WILLINGNESS TO ALLOCATE BUDGET TO INCREASE AUTOMATION OF CUSTOMER SERVICE/REPAIR OPERATIONS AS REPORTED BY RESPONDENTS

PORTION OF OPERATING BUDGET (Percent)	PERCENT OF RESPONDENTS
< 1%	0%
1 - 5%	21
6 - 10%	37
11 - 15%	13
16 - 20%	8
21 - 25%	4
> 25%	17
Total	100%

- The portion of respondents willing to spend more than 25% of future operating budgets on automation indicates that these respondents are in a "buy" status.

- The potential shift in the portion of operating budgets used for computer automation was used to calculate the market potential in Chapter IV, Market Potential.

- Typical respondent comments on plans to increase customer service/repair automation are shown in Exhibit V-17. The comments are favorable for utilizing computer-aided automation as a prime method for increasing productivity and profitability of customer service/repair operations.

C. CUSTOMER SERVICE/REPAIR AUTOMATION

1. CURRENT STATUS

- The current status of customer service/repair automation for the interview sample is shown in Exhibit V-18.

- Well over 90% of the respondents were automated to some degree.

- The software was primarily homegrown. Users who had purchased software products indicated significant modifications were required on up to 30% of the program functions.

- There is a trend toward substituting personal computers for CRTs, particularly in the field offices, to gain added flexibility.

- The interaction with mainframes, particularly for order entry and inventory control, indicates that an effective product offering must consider IBM compatibility, at least for data structure and communications.

EXHIBIT V-17

TYPICAL COMMENTS OF PLANS TO INCREASE AUTOMATION OF
CUSTOMER SERVICE/REPAIR OPERATIONS
AS REPORTED BY RESPONDENTS

TYPICAL COMMENTS
Initial investment might be as high 20% of annual budget.
Whatever is needed that ROI can justify.
Most of current system is manual, so 50% of our budget would not be out of line.
Whatever we need. We are operating as a profit center.
We need to raise the portion we spend on automation to bring us up to par and to be competitive.
Would spend more than $500K annually for the right system.
We will soon be sharing costs with the marketing department.
Have planned to double the amount we spend for automation in 1986.
Most of the new system will come out of capital costs and not our regular operating budget.

EXHIBIT V-18

CURRENT STATUS OF CUSTOMER SERVICE/REPAIR AUTOMATION
AS REPORTED BY RESPONDENTS

TYPE	PERCENT OF RESPONDENTS	AVERAGE NUMBER	RANGE
CRTs	90%	23	3 - 150
Mini/Microcomputers	45	8	1 - 51
Mainframes	65	1	_
Telecommunications			
• 800 WATS	69	16	1 - 150
• Voice	10	13	5 - 24
• Voice/Message	20	29	1 - 84
• Other	10	2	1 - 5
Data Communications			
• Leased/Dialup	36	44	1 - 500
• VAN	8	1	_
• Other	10	1	_
Software			
• In-House	65	_	_
• Software Product	20	_	_
None	5%	_	_

- WATS is the most significant telecommunications vehicle for service departments. There is a trend toward national WATS incoming call automated distribution.

- Voice response/synthesis was viewed with caution, particularly in customer service operations involving consumers.

- Other telecommunications included National Paging and Cellular Radio.

- Other data communications included satellite links and advanced digital voice/data communications.

- Respondent comments on the current status of customer service/repair automation is shown in Exhibit V-19. The comments highlight the substitution of PCs for CRTs, the inability to find adequate software, and the importance of order entry and parts distribution to the customer service/repair operations.

2. INCREASED AUTOMATION

   a. Importance

- Respondent data, as shown in Exhibit V-20, indicates that introducing automation in customer service/repair operations is of great importance to them.

- Nearly 70% of respondents rated introducing further automation as very important (8-10). The data further supports the viability of offering computer-aided products/services to this marketplace.

- Respondents' comments on how their corporations view automation of customer service/repair operations is shown in Exhibit V-21.

EXHIBIT V-19

TYPICAL COMMENTS ON CURRENT STATUS OF
CUSTOMER SERVICE/REPAIR AUTOMATION
AS REPORTED BY RESPONDENTS

TYPICAL COMMENTS	MULTIPLE RESPONDENTS
Experts replace CRTs with PCs to get more flexibility.	X
CRTs for order entry, warranty, and technical support.	X
A home-grown system. Could use new, more up-to-date system with automated dispatch, etc.	
We are in the process of integrating all telecommunications into a national network with WATS 800 auto distribution.	
We looked at software but did it in-house. Our next go-around will see if we can modify an existing package.	X
Are shifting to centralized dispatch with national paging.	X
Depots and field offices are connected to home office/ mainframe for parts availability and order entry.	X
Are installing IBM PCs at field offices connected to home office mainframe.	X

EXHIBIT V-20

IMPORTANCE OF INTRODUCING FURTHER AUTOMATION INTO
CUSTOMER SERVICE/REPAIR OPERATIONS
AS REPORTED BY RESPONDENTS

IMPORTANCE	PERCENT OF RESPONDENTS
1 - Unimportant	
2	3%
3	8
4	0
5	5
6	5
7	10
8	18
9	23
10 - Very Important	28
Total	100%

EXHIBIT V-21

TYPICAL COMMENTS ON HOW CORPORATE EXECUTIVES VIEW AUTOMATION OF CUSTOMER SERVICE/REPAIR OPERATIONS AS REPORTED BY RESPONDENTS

TYPICAL COMMENTS
Corporate believes automation is the only way to provide service.
The information from customer service is vital to company operations.
Needed to reduce time/cost to service customers.
Expanding sales requires us to have key information on service/repair.
We are now an almost paperless operation.
We need to keep customer service on a more personal basis.
Automation the only way to survive and be competitive.
Couldn't run our operation without computer and telecommunications automation.
Automation essential to operate customer service as profit center.

- The comments support the growing importance of customer service/repair operations in corporate strategy. Respondents believe that the corporate executives will support automation of customer service/repair operations.

b. Justification

- The most important factors used to justify computer automation capital expenditures for customer service/repair operations are shown in Exhibit V-22.

- Improved customer service was the most important of the pre-selected criteria, averaging 7.6 on the scale of 1-10 with a significant differential as compared to the factors of reduced operating costs and increased productivity.

- Better data for failure analysis, maintainability, and field operation effectiveness as well as management financial reports was cited by a significant portion (over 30%) of the respondents.

- Other factors included providing capacity for rapid growth and remaining competitive.

- Respondents' comments on justifying computer automation capital expenditure for customer service/repair operations are shown in Exhibit V-23. The comments support management realization that computer-aided automation comes through to the bottom line of corporate operating statements.

c. Vendor Selection/Approval

(i). One-Stop Shopping

- The concept of one-stop shopping for computer-aided customer service/repair information systems is important but not critical to the interview sample.

EXHIBIT V-22

MOST IMPORTANT FACTORS USED TO JUSTIFY CAPITAL EXPENDITURE FOR COMPUTER AUTOMATION OF CUSTOMER SERVICE/REPAIR OPERATIONS AS REPORTED BY RESPONDENTS

FACTOR	SAMPLE SIZE	IMPORTANCE SCALE (1 - 10)	
		AVERAGE	RANGE
Improved Customer Service	39	7.6	3 - 10
Reduced Operating Costs	39	7.4	2 - 10
Increased Productivity	39	7.0	1 - 10
Better Data/Reports	12	8.3	7 - 10
Increased Sales	4	8.3	8 - 9
Return on Investment	2	10.0	-
Other	4	8.5	8 - 9

EXHIBIT V-23

TYPICAL COMMENTS ON JUSTIFYING CAPITAL EXPENDITURE FOR COMPUTER AUTOMATION OF CUSTOMER SERVICE/REPAIR OPERATIONS AS REPORTED BY RESPONDENTS

TYPICAL COMMENTS
We justified it as part of new billing system.
We justified the system on the elimination of paper work.
Payback was the most important criteria for management.
Difficult to justify if can't increase revenues/profits.
To provide capacity for rapid growth.
Service response time is critical for our industry.
Improved customer response time/service critical.
Looked at as a business. Keep a high level of service and make a buck.
We have the same number of people with over twice the sales volume.

- As shown in Exhibit V-24, it is somewhat more important that the information system be maintained rather than supplied by a single vendor. Many of the respondents have a degree of self-maintenance capability for all but minicomputers and mainframes.

- The respondents look on the use of third-party maintenance vendors to support computer-aided information systems (including PCs) in the field as an effective way of obtaining maintenance at the local level.

- Respondent comments on one-stop shopping for customer service/repair information systems is shown in Exhibit V-25. The comments support the findings that one-stop shopping is not critical to the successful marketing of computer-aided customer service/repair information systems.

(ii). Who Selects/Approves?

- The respondents (primarily managers/directors of national customer service/field service operations) have, as shown in Exhibit V-26, considerable responsibility in the selection of customer service/repair information systems. This responsibility is either direct (primarily those having profit center responsibility) or held jointly with the MIS department.

- It is evident that a successful sales strategy will include both customer service/repair managers and the corporate MIS department. The interface between customer/repair services and corporate information data bases, particularly for order entry and parts distribution, requires MIS involvement.

- Even with profit center responsibility, few respondents had the ability to approve capital expenditures (usually above $100,000) for information system products. For the Fortune 1500 companies in the interview sample, corporate involvement with either a corporate financial/administrative officer or a chief operating executive is required.

EXHIBIT V-24

IMPORTANCE OF INFORMATION SYSTEMS FOR CUSTOMER SERVICE/ REPAIR OPERATION BEING SUPPLIED/MAINTAINED BY ONE VENDOR AS REPORTED BY RESPONDENTS

FACTOR	IMPORTANCE (1 - 10)	
	AVERAGE	RANGE
Supplied (one-stop shopping)	6.0	2 - 10
Maintained (one place to call)	6.5	2 - 10

EXHIBIT V-25

TYPICAL COMMENTS ON IMPORTANCE OF INFORMATION SYSTEMS FOR CUSTOMER SERVICE/REPAIR OPERATIONS BEING SUPPLIED/MAINTAINED BY ONE VENDOR, AS REPORTED BY RESPONDENTS

TYPICAL COMMENTS	MULTIPLE RESPONDENTS
Nice to have all supplied by one vendor, but not essential.	X
A must for a first-time user. Learn self-maintenance after awhile.	X
Not really a big deal.	
We sell concept so we want it too.	X
Don't care who supplies hardware/software as long as it works and one organization is responsible for maintenance.	
Am not involved. Handled by corporate MIS/DP.	
The problem is compatibility. We have no problem with third-party maintenance.	X
Not really too important. We can service in the field locally.	X
We can maintain all but the mainframe ourselves.	X

EXHIBIT V-26

RESPONSIBILITY FOR SELECTION/APPROVAL OF INFORMATION SYSTEMS FOR CUSTOMER SERVICE/REPAIR OPERATIONS AS REPORTED BY RESPONDENTS

RESPONSIBILITY	PERCENT OF RESPONDENTS
Selection	
• Respondent	33%
• Joint Effort With MIS Department	33
• Director Department/Division	18
• MIS Director	16
Total	100%
Approval	
• Respondent	14%
• Group Vice President/Director	17
• Corporate Financial/Administrative Officer	36
• Company President/Board	21
• Corporate Vice President MIS	12
Total	100%

- An effective sales strategy must include an effective corporate presentation of the proposed system, including demonstrated success stories. Awareness of the corporate process and timing for capital expenditures is also important.

d. Needed Products/Services

- Products/services needed by respondents to improve customer service/repair operations are shown in Exhibit V-27.

- Adding microcomputer (PC) capability in both home and field offices is consistent with the current wave of utilizing PCs at the local level in corporate organizations.

- The next two important categories, adding/replacing software and adding/upgrading mini/mainframe capability, indicate that current customer service/repair information systems have reached capacity and are inadequate to handle the services required in an expanding economy. This data further supports the viability of offering computer-aided information systems into this marketplace.

D. CUSTOMER SERVICE/REPAIR MARKET TRENDS

- Trends in the customer service/repair marketplace are shown in Exhibit V-28.

- Over 60% of the respondents felt the information to effectively run customer/field service operations was becoming more specialized.

- The major portion (75%) of respondents felt that the job tasks, particularly in the field, were becoming more complex.

EXHIBIT V-27

PRODUCTS/SERVICES NEEDED BY RESPONDENTS
TO IMPROVE CUSTOMER SERVICES/REPAIR OPERATIONS

PRODUCT/SERVICE	NUMBER OF RESPONDENTS
Add Personal Computers	16
Add/Upgrade Mini/Mainframe	14
Add/Replace Software	13
Field Engineer Hand-Held Terminals	8
National Paging/Cellular Radio	7
National/District WATS Network	7
Upgrade Telecommunications	6
Automated Parts Order/Distrubution	5
Add Electronic Mail	4
Tech Support, Diagnostic System	4

EXHIBIT V-28

TRENDS IN THE CUSTOMER SERVICE/REPAIR MARKETPLACE
AS REPORTED BY RESPONDENTS

MARKET TREND	PORTION OF RESPONDENTS (Percent)			
	Higher or More	Lower or Less	About The Same	Do Not Know/ Not Applicable
Complexity of Job Tasks	75	10	10	5
Specialization of Information	64%	8%	28%	0%
Information Needs On-Site	62	5	15	18
Maintainability of Products	62	10	8	20
Module Exchange vs. On-Site Repair	56	5	13	26

- Well over 75% of respondents having an opinion indicated that the customer/field engineer needed more information on-site to diagnose/service the installed base.

- Nearly 80% of respondents having an opinion believe that products were more maintainable, primarily through design and more recently through feedback information.

- Although the majority of respondents believe that trend was toward modular exchange versus on-site repair, those respondents involved in consumer durables and electronic home care products as well as other selected vendors felt that either the trend did not apply to them (throwaway) or that on-site repair was a primary requirement for doing business.

- Respondent comments on the five specified trends in the customer service/repair marketplace are contained in Exhibits V-29 through V-33.

- The analysis indicates that successful computer-aided customer service/repair information systems product offerings must provide for data bases of specialized information and adequate telecommunication interfaces to provide computer-assisted information at the home office, field offices, service centers, and increasingly on-site to the customer/service representative.

EXHIBIT V-29

TYPICAL COMMENTS ON THE TRENDS OF SPECIALIZATION OF INFORMATION IN THE CUSTOMER SERVICE/REPAIR MARKETPLACE AS REPORTED BY RESPONDENTS

TYPICAL COMMENTS
Have more and varied products to service.
Specialization for training on specific equipment.
Need more information to do diagnosis.
Amount of information continues to become more detailed.
Information needs becoming more complex for automated diagnosis.
Specialization of information much higher for training.
Information specialization becomes higher as service centers take a total product responsibility including sales.
We are moving more into a throwaway consumer electronics market.
Products becoming more computerized. Need more specialized information to service them.

EXHIBIT V-30

TYPICAL COMMENTS ON THE TREND OF COMPLEXITY OF JOB TASKS IN THE CUSTOMER SERVICE/REPAIR MARKETPLACE AS REPORTED BY RESPONDENTS

TYPICAL COMMENTS
More complex because systems needs are multi-discipline: chemistry, electronics, mechanics, etc.
Increased software/firmware control adds another dimension.
Remains about the same. Customer service skills are becoming more related to handling the customer, being a company man.
Systems are now too complex to work from schematics.
Software makes system interaction complex.
Medical electronics becoming increasingly more complex analog/digital.
Same people handle more products, have more complex training needs.
On-site tasks simple because swaps module. Off-site repair at depots much more complex.

EXHIBIT V-31

TYPICAL COMMENTS ON THE TREND OF PRODUCT MAINTAINABILITY
IN THE CUSTOMER SERVICE/REPAIR MARKETPLACE
AS REPORTED BY RESPONDENTS

TYPICAL COMMENTS
Products must be more maintainable. Are servicing a greater installed base with same FE staff.
The cost of service/unit is rising. To sell product profitability it must be more reliable.
Home appliances are stable product line so we learn to build them for better reliability and maintainability. Electrical home care products are basically throwaway.
A design criteria. Over time we learn how to design ease of maintenance into the product.
More maintainable but more maintenance because products more complex.
Management recognizes that to be profitable, products must be supportable economically.
The maintainability problem is not with our product per se, but with the medical system components supplied by other vendors.

EXHIBIT V-32

TYPICAL COMMENTS ON THE TREND OF MODULE EXCHANGE VERSUS ON-SITE REPAIR IN THE CUSTOMER SERVICE/REPAIR MARKETPLACE AS REPORTED BY RESPONDENTS

TYPICAL COMMENTS
We have shifted to a strategy of field module replacement and depot repair.
The trend is toward board and module swap and depot repair later.
Depends on product. The FDA frowning on on-site repair of medical systems.
The customer stocks a level of board and modules. We replenish. When he can't do self maintenance we take over. Ship module for depot repair.
About the same. We are oriented to repair major home appliances on site.
More module replacement because of sophistication of systems, electronics, mechanisms, printers, A/D connections, etc.
It is more cost-effective to use expensive field engineers to do module replacement, than to do depot repair with low-cost but low-skilled labor.

EXHIBIT V-33

TYPICAL COMMENTS ON THE TREND OF INFORMATION NEEDS ON-SITE
IN THE CUSTOMER SERVICE/REPAIR MARKETPLACE
AS REPORTED BY RESPONDENTS

TYPICAL COMMENTS
Level of service higher, time critical, more software interaction.
FE's are becoming more than repairmen; they are becoming customer consultants with ever greater information needs.
About the same. We have always provided extensive documentation to the field coupled with extensive training.
Are constantly upgrading. We will have a new data base service available through TYMNET for data available to FEs.
About the same. Industry is swapping component information for system information. No longer repair at component level.
Systems are more integrated. More system information of components needed to solve the problem.

VI COMPETITION

VI COMPETITION

A. COMPETITIVE ENVIRONMENT

- No more than 20 vendors supply software products and turnkey systems for computer-aided customer service/repair operations.
- Major competition comes from in-house systems. The major portion (65%) of user respondents reported utilizing in-house developed software applications.
- ASK Computer and The Data Group Corporation are probably the leading vendors.
- The existing market is widely held, with the leading vendors holding less than 5% of the available market.
- ASK Computer, a specialist in supplying software and turnkey systems to the manufacturing sector, is the only vendor with national presence.
- Most respondents felt that existing products were at best useful to first time users. All reported a significant degree (25-30%) of customization was required to meet their specific company needs.
- Successful market entry will require a strategic partnering arrangement between DEC, a software product vendor, and a professional services vendor

with national presence to customize the software as necessary and to integrate the computer hardware, software, and communications systems to end-user specifications.

- Potential software product vendors are those using advanced DBMS techniques. They include Combined Computer Resources, Pacific Decisions Sciences, and Alert Computer Systems.

- A more detailed analysis of vendor products is recommended as part of the follow on effort.

- Potential professional services vendors with national presence, capable of integration and implementation services, are Computer Sciences Corporation (CSC), Electronic Data Systems (EDS), and Computer Task Group (CTG).

- Strategic partnering with large RCS companies such as Boeing Computer Services (BCS) and General Electric Information Services Company (GEISCO) is another source for obtaining professional implementation services, network services, and national presence.

- Development of computer-aided customer service/repair systems for the major home appliance and consumer durable electronics marketplaces could be accomplished through partnering arrangements with an appropriate Fortune 500 manufacturer or an appropriate national trade association.

B. EXISTING PRODUCTS

1. PRODUCTS USED BY RESPONDENTS

- Three vendor products were reported as being used by the respondents: (1) Field Watch by The Data Group Corporation; (2) Serviceman by ASK Computer; (3) The SAFE System by Alert Computer Systems.

- All of the vendor products were extensively modified, particularly on the front end, by the users to meet their individual operational requirements.

- Most of the respondents utilizing vendor software packages were not initially responsible for their procurement. The consensus was that the software packages were useful for first time users, but lack the flexibility to support new communications technology and rapidly expanding field service operations.

- The Alert Computer Systems' SAFE System is comprised of five system modules. The system utilizes a relational data base system with an active data dictionary. The system is available on both mini and microcomputers. The source programming language, hence portability, was not indicated.

- The Serviceman program consists of three submodules which are part of ASK Computer's integrated manufacturing package. The Serviceman module handles the dispatch and logistics functions. Inventory, billing and reporting functions are handled in other modules of the integrated manufacturing information system. The current system is in Fortran and uses extensive file management functions. A new version may be implemented utilizing a DBMS system.

- The Data Group Corporation's Field Watch is an integrated service management system including Dispatch* Plus, Logistics Plus, Billing Plus, Scheduling Plus, and Forecasting Plus modules. The system is written in COBOL and Databus and is available for a wide variety of operating systems. Some modules are available on microcomputers with operating systems including MS-DOS. The Field Watch system currently utilizes a ISAM-type file structure. New systems under development may be data base oriented.

2. OTHER PRODUCTS

- There are a number of newer products appearing in the marketplace which are DBMS-based. Some of these products are oriented toward decentralized field service operations and are implemented on personal microcomputers.

- Combined Computer Resources offers Service-Traxx, an integrated field service management software product which utilizes high level programming techniques including screen handling software to permit customization to meet specific customer requirements. The system is DBMS-oriented.

- Pacific Decision Sciences offers Super Dispatch and Field Service Management System (FSMS), software packages developed utilizing relational DBMS systems. The software is offered for direct installation on microcomputers and IBM mainframes as well as on an RCS basis by Tymshare.

- Decision Sciences Corporation offers Microcomputer Service Management Systems (MSMS), oriented to support small field service organizations. The software product is designed to operate on many personal computers including the IBM PC/XT.

- There are a number of other software packages available. Some are more directly related to large equipment maintenance, inventory control, and logistics. All appear to have been written in COBOL, FORTRAN, or other second generation programming languages and lack a DBMS orientation.

- Computer-aided customer service/repair information services are also offered by computer services vendors, including Boeing Computer Services (BCS), McDonnell Douglas Information Services (through Tymshare), and General Electric Information Services Company (GEISCO).

  - Boeing Computer Services (BCS) offers Maintenance and Materials Management system (MMS), an on-line real time integrated system for

plant and equipment maintenance operations. The turnkey system operates on an HP-3000 interfacing with the IMAGE DBMS.

- Tymshare offers services using Pacific Decision Sciences products.

- GEISCO offers REMAIN, a comprehensive manufacturing repair and maintenance service. Used in conjunction with the MIMS system, Remain is available on the IBM-compatible Mark 3000 service.

VII TECHNICAL PRODUCT REQUIREMENTS

VII TECHNICAL PRODUCT REQUIREMENTS

- The strong trend toward profit center responsibility in customer service/repair operations requires consideration of an information system that will manage the entire service business. The information system must not only handle the field personnel and logistic functions, but must also handle data management and reporting, billing, financial control, and P/L analysis.

- Information systems for computer-aided customer service/repair operations must operate at multiple levels, including field service operations, regional service centers, distribution centers, district and regional field center offices, and company customer service/repair operation centers.

- The different distribution channels for supplying customer service/repair services among market segments must be satisfied by a product line in contrast to a single product offering.

A. INFORMATION SYSTEM REQUIREMENTS

- The system concept that is emerging for managing the entire customer service/repair business is that of decentralized operation supported by centralized information control.

- Two types of computers are required, a micro or personal computer and a mini or perhaps supermicrocomputer system.

- The computers must have multi-terminal capability, supporting at the micro level up to six, and at the mini level possibly 40 terminals. Remote terminal capability for the mini should include interfacing with the micro.

- Communications is key to successful operation of the repair/logistics functions of the information system.

  - The micro must have both dial-up and dedicated communication capability. The micro must have emulation capability to support major network protocols. Combined voice/data, including digital voice, should be an option.

  - The mini must be able to interface with IBM mainframes and networks. It must have the ability to handle advanced communication techniques including digital voice, electronic mail, cellular radio, and hand-held FE terminals.

- Upward compatibility between the micro and mini is essential. A common operating system such as UNIX would insure software portability.

- Significant data disk storage is required, from 20 to 100 megabytes for the micro and from 100 to several million megabytes for the mini.

- Video disk storage display capability should be provided as an option for technical center customer and field service engineer on-line support services.

- The microcomputer must be a personal computer; that is, a micro having a standard operating system capability, such as UNIX. This will allow the micro to be used by service managers at the local level for other functions, including word processing, data analysis, report preparation, etc.

B. SOFTWARE FUNCTIONALITY

- It is evident that no one software package will satisfy user requirements for computer-aided customer service/repair operations. Keys to successful software product offerings appear to be: (1) modularity, and (2) the ability to customize, perhaps as much as 25% of the total application(s).

- The system should be developed utilizing a data base management system (DBMS). The system must have an active data dictionary, excellent query capability, and an effective screen system to aid in customization of the product to support individual company service/repair requirements.

- The ability to utilize expert systems, particularly for tech center support in the area of diagnostics, should be offered as an option.

- The modularized software system should accomplish the following functions:

1. CALL HANDLING AND DISPATCH

- The module screens incoming calls, records the customer placing the call, the person taking the call, and the time of the call; checks the data base on installed equipment; and records the problem.

- The next step, call analysis, first attempts problem resolution by telephone (in effect self-repair). The call may be routed to a technical systems group which accesses data bases of like problems and fixes, etc.

- The client is called back, and either self-repair effected or notification given that FE assistance will occur within a stated time frame.

- The next process is dispatching, which first identifies the field engineer(s), skill levels, availability, and ETA.

- The next process contacts the field engineer utilizing telephone, computer paging, electronic mail, or hand-held computer terminals.

- The next procedure is call tracking and escalation as problems occur in field engineering (meeting promised ETA).

- The last procedure is call closeout, which records the FE's data. This includes time, parts and material, failure codes, and expenses.

2. FILE MAINTENANCE

- The file maintenance function includes maintaining a data base of all equipment and equipment configuration; warranty status; maintenance contract status; FE skills, location, and availability; and parts to equipment relationships.

- The function allows interaction between dispatch center, field management personnel, and the data base. It permits query of inventory data, personnel, call status, and management data necessary to run the entire service business from the operation center(s), field engineering offices, and parts distribution centers.

3. LOGISTICS MANAGEMENT

- The function includes inventory tracking of the field engineering pipeline from warehouse to the service engineer's truck (trunk) inventory.

- The function can include customer spare parts order processing and the tracking of failed modules to repair service centers.

- Inventory control is provided as either an option or by passing FE pipeline inventory data to existing or separately offered inventory control programs.

- The FE inventory control function should include automatic replenishment of the FE pipeline. The function should set cost/effective parts level at the FE truck (trunk) related to the type and number of equipment serviced.

4. BILLING AND INVOICING

- The function includes preparing billing data based on time and materials, warranty, and maintenance contract billing.

- The function produces data for billing through an existing or separately offered accounting package.

5. FINANCIAL AND ADMINISTRATIVE MANAGEMENT

- The function includes cost analysis, P&L analysis, and financial control, as well as operational analysis such as MTBF, MTTR, failure analysis, and other management control data.

- An accounting package including invoicing, A/R, A/P, and G/L can be provided as an option. Alternatively data can be passed to existing corporate system.

6. REPORTS

- The programming system must provide a flexible report writer for creating standard management reports customized to the individual company.

- The function must include the ability to create "ad hoc" reports utilizing a query capability.

7. TECHNICAL/DIAGNOSTIC SUPPORT

- The function tracks equipment history, equipment problems, failures, corrective actions, etc.

- The function utilizes large data bases of past history to determine probable cause and to recommend corrective action for both customer self-help and FE support.

- Expert systems for diagnostic analysis and computer-aided corrective action can be offered as an option.

APPENDIX: QUESTIONNAIRE

APPENDIX

MARKETS FOR SERVICE RELATED PRODUCTS
USER QUESTIONNAIRE

1. What are your main customer service/repair functions?

☐ REPAIR	☐ SERVICE
☐ Dispatching	☐ Customer Inquiries
☐ Customer/Equipment Records	☐ Product Information
☐ Parts	☐ Service Referral
☐ Labor/Billing	☐ Warranties
☐ Reports	☐ Other
☐ Other	☐ Other
☐ Other	

Comments: (Who they are - what they do) _____

_____

_____

2. To whom do you provide service?

☐ Consumers _____ (number)

Comments: _____

_____

☐ Company Service Centers _____ (number)

Comments: _____

_____

☐ Authorized Dealers _____ (number)

Comments: _____

_____

☐ Other _____

3. How are you interconnected to your users?

☐ Letters, etc.

Comments: _____

_____

☐ Voice Communications

Comments: _____

_____

☐ Data Communications

Comments: _____

_____

4. How many people are in the Customer Service/Repair Group?

☐ Home Office _____ (number)

Comments: _____

_____

☐ Field Offices _____ (number) _____ (number of people)

Comments: _____

_____

5. What is your annual budget for customer/repair services?

☐ <1M ☐ 1-5M ☐ 5-10M ☐ 10-25M ☐ 25-100M ☐ >100M

Comments: _____

_____

6. What portion of that budget is devoted to computer automation?

_____ % ☐ Do Not Know

Comments: _____

_____

7. How does corporate management look at the Customer Service/Repair Operation? (How understood within Corporation)

☐ Profit Center

Comments: _____

_____

☐ Cost Center

Comments: _____

_____

☐ Revenue Center

Comments: _____

_____

8. Do you charge for your Customer/Repair Services?

☐ No

☐ Estimated Annual Revenues $ _____ (Millions)

☐ Do Not Know

Comments: _____

_____

9. To what extent is your Customer Service/Repair Operation automated?

☐ None

☐ _____ CRTs (number)

Comments: _____

_____

☐ _____ (number) Mini/Micro Computers _____(vendor)

Comments: _____

_____

☐ Connected to mainframe _____ (vendor)

Comments: _____

_____

☐ Telecommunications

_____ (number) 800 WATS Lines
_____ (number) Voice
_____ (number) Voice/Message
_____ (number) Other _____ (name)

Comments: _____

_____

☐ Data Communications:

_____ (number) Leased/Dial-up Lines
_____ (number) VAN Vendor _____ (name)
_____ (number) Other _____ (name)

Comments: _____

_____

10. How important is it to introduce automation into the Customer/Repair Service Operation?

_____ (1 = Unimportant, 10 = Very Important)

Comments: (How corporate views it) _____

_____

_____

11. Which are the most important factors used to justify capital expenditures for computer automation? (1 = Unimportant, 10 = Very Important)

_____ Increased Productivity

_____ Improved Customer Services

_____ Reduced Operating Costs

_____ Other _____

Commments: _____

_____

12. What products/services do you need to improve Customer/Repair Services?

Computers: ☐ Personal ☐ Mini ☐ Mainframe ☐ Turnkey

Comments: _____

_____

Communications: ☐ Voice/Data ☐ LAN ☐ VAN

Comments: (What they need) _____

_____

Other: ☐ _____ ☐ _____ ☐ _____

Comments: (What they need) _____

_____

13. How important is it for you to have Customer/Repair Service Information Systems Supplied/Supported by one vendor?
(Scale 1-10, 1 = Unimportant, 10 = Very Important)

_____ Supplied (integrated) by one vendor (one-stop shopping)

_____ Support by one vendor (one place to call for problems)

Comments: _____

_____

14. What portion of your budget would you be willing to spend on automating Customer/Repair Service? _____%

Comments: _____

_____

15. Who selects/approves Customer/Repair Services Information Systems Products/Services?

☐ Selects

☐ Respondent

☐ _____ (function title)

Comments: _____

_____

☐ Approves

☐ Respondent

☐ _____ (function title)

Comments: _____

_____

16. What trends do you see in the Customer/Repair Service marketplace, with respect to. . . .

☐ Specialization of Information?

☐ Higher ☐ Lower ☐ Do Not Know

Comments: _____

_____

☐ Complex Job Tasks?

☐ Simpler ☐ More Complex ☐ Do Not Know

Comments: _____

_____

☐ Information Needs On-Site?

☐ Higher ☐ Lower ☐ Do Not Know

Comments: _____

_____

Maintainable Products?

☐ More ☐ Less ☐ Do Not Know

Comments: _____

_____

Module Exchange Versus On-Site Repair?

☐ More ☐ Less ☐ Do Not Know

Comments: _____

_____

THANK YOU!