F-TEUL
Letter
Original

January 14, 1987

NO ITEM TO INSERT

NO ITEM TO INSERT

Dear
NO ITEM TO INSERT
:

Enclosed is the Telecommunications User Service Requirements report, a deliverable in INPUT's 1986 Customer Service Program. This report should be filed in your Telecommunications Service binder in Section III. A table of contents and list of exhibits accompanies the report, to be filed in the Section A at the front of the binder.

Soon, INPUT will deliver the Telecommunications Service Vendor Profiles and Service Market Analysis reports, to be filed in Sections IV and V of the binder. In addition, an Executive Summary which summarizes the year's research in presentation format and Appendix information will be delivered, to be filed in the appropriate sections.

Sincerely,

Rick Brusuelas
Manager, Customer Service Program

RB:ml

Enclosure

Litton **Mellonics** Systems Development

P.O. BOX 3407
1001 W. MAUDE AVENUE
SUNNYVALE, CALIFORNIA 94088-3407
(408) 245-0795 X221,207,208

DATE 12-18-86

CHARGE NO. F-TELL

JOB DESCRIPTION TELECOMMUNICATIONS - SERVICE + SUPPORT

COMPANY _____ CONTACT _____ PHONE ( ) _____ EXT _____

PLATES OR MASTERS _____ NO. COPIES _____ BINDING _____

PAPER: SIZE _____ WEIGHT _____ TYPE _____ PUNCH _____

MISCELLANEOUS _____

Title / Copyright	Contents i / X	Exhibits ii → V	I 1 → 2	III 1 / X
A-1 → A-14	B-1 → B-14	C-1 → C-14	D-1 → D-14	E-1 → E-14
F-1 → F-14	G-1 → G-14	H-1 → H-14	I-1 → I-14	J-1 → J-16
~~VII-1~~ → ~~VII-4~~				

ANALYSIS OF TELECOMMUNICATIONS SERVICE AND SUPPORT

1986

Published by
INPUT
1943 Landings Drive
Mountain View, CA 94043
U.S.A.

Customer Service Program (CSP)

Analysis of Telecommunications Service and Support

ANALYSIS OF TELECOMMUNICATIONS
SERVICE AND SUPPORT

CONTENTS

ANALYSIS OF TELECOMMUNICATIONS
SERVICE AND SUPPORT

EXHIBITS

I INTRODUCTION

- This binder contains a series of reports covering the telecommunications service and support market produced by INPUT for clients of the telecommunications module of the 1986 Customer Service Program. INPUT has adopted the binder format to speed the delivery of research findings, thus facilitating the use of specific sections of the reports.

- After the Table of Contents, List of Exhibits, and this Introduction, the first report section to be delivered is the Telecommunications Service and Support User Requirements report, to be filed in Section III of this binder. This section contains vendor-specific information about telecom user service requirements versus actual vendor performance. Along with vital customer satisfaction information, this section provides a detailed analysis of current areas of opportunity for service vendors to improve user satisfaction and increase service revenue potential.

- The next deliverable is the Telecommunications Service Vendor Profiles report, to be filed in Section IV of this binder. In this section, INPUT will provide detailed analyses of the service operations of ten leading telecom vendors, including descriptions of service offerings and possible service directions for each company.

- The third deliverable is the Telecommunications Service Market Analysis, to be filed in Section V. In this section, INPUT provides market size and forecast information on the entire customer service market as well as a

detailed analysis of the telecom service market segment. In addition, INPUT will provide an analysis of key issues and trends affecting the telecom service market. Lastly, INPUT will provide strategic recommendations and conclusions for the telecom service executive.

- Along with the Service Market Analysis, INPUT will provide an Executive Summary for the Telecommunications binder to be filed in Section II. This popular summary of the key findings of the year's research is provided in standard presentation format, facilitating slide preparation.

- The binder also contains an Appendix section for information that may be sent at various times during the year. Summary exhibits, industry definitions, and questionnaires used during the year are examples of Appendix information that will be filed in this section.

III TELECOMMUNICATIONS SERVICE AND SUPPORT USER REQUIREMENTS

- This section is part of INPUT's 1986 Customer Service Program's telecommunications module. Users of nine major telecommunications vendors' equipment were contacted in the course of this research project, and their views of the service and support currently received was recorded. Support as provided by both the equipment vendors and third-party maintenance organizations is reviewed within the report.

- Nine separate sections of this report discuss users' levels of support both required and received as reported by each manufacturers' sample. A tenth section gives an overview of the data recorded across vendor lines.

- Issues presented include satisfaction with specific modes of service delivery, the popularity and importance of separate service offerings, and a look at traditional service measures such as percent uptime and number of system interruptions experienced. User needs are compared to the levels of support currently being delivered to telecomunications equipment users, and recommendations are made to support vendors based on the analysis of these user perceptions.

III A. IBM

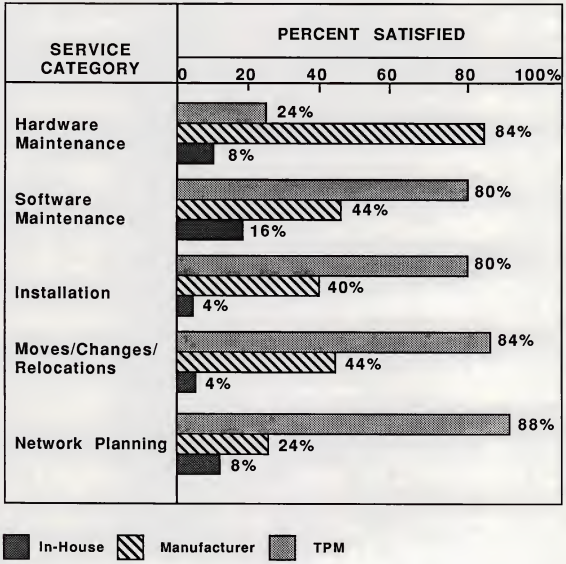
- In September of this year, 25 users of IBM telecommunications equipment, primarily modems (in the 37XX and 38XX series) and local area networks (including PC-Net and Token Ring), were interviewed. All interviews were conducted by telephone, each lasting between 15 and 20 minutes, with key telecommunications personnel at each site. Titles of respondents ranged from senior analyst (6%) and data processing or technical support/operations manager (26% and 24%, respectively) to telecommunications director or vice president (20% each). Nine distinct industry categories were covered by the sample, with the insurance industry representing 28%; distribution representing 24%; banking and finance at 12%; manufacturing, services, and transportation each at 8%; and medical, education, and "other industry specific" each representing 4%.

- IBM provided these users with support for their telecom equipment in the vast majority of the cases. Only 8% of the users contacted enlisted third-party support for their units. Exhibit III-A-1 shows the breakout of service source reported by the sample, with IBM supplying hardware maintenence to 84% of the users. Although TPM had a very low presence among the IBM user group, other aspects of support, such as any software support or installation and moves/changes, were often handled by the firm's in-house technical team. IBM still held firm ground within these categories, however, with 40-44% share in each service category. Network planning was also handled for the most part internally, with only 24% of users contracting IBM for assistance in this consultory capacity.

- In more traditional measures of equipment performance, IBM telecom equipment fared well, with uptimes reportedly averaging over 98% among respondents (see Exhibit III-A-2). System interruptions averaged an artificially high 3.1 problems per month. The majority of respondents (79.2%) experienced two or less interruptions within any given month, but a small

EXHIBIT III-A-1

TELECOM SUPPORT SOURCES
IBM



FTEU S

EXHIBIT III-A-2

TELECOM SERVICE PERFORMANCE
IBM

SERVICE COMPONENT	
Average System Availability (Percent)	98.1%
Average Number of System Interruptions	
Per Month (Number)	3.1
Hardware Caused (Percent)	53.0%
Software Caused (Percent)	56.0%
Average Response Time (Hours)	2.8 Hours
Average Repair Time (Hours)	6.0 Hours

percentage (12.7%) had from 10 to 15 failures, acting to inflate the overall average. The interruptions encountered were caused fairly equally by hardware versus software failures.

- Response times averaged 2.8 hours, but ranged between 15 minutes and one full day. Repair times showed an equally broad range, running from 45 minutes to 24 hours, with an average of 6 hours overall.

- IBM telecommunications equipment users' needs are being closely met within these traditional measures, as illustrated in Exhibit III-A-3. Response and repair times delivered are exactly meeting users' expectations on the average, and unit performance falls short of requirements by less than 1%.

- Supporting the strength shown in these measures is Exhibit III-A-4, showing high satisfaction ratings in the areas of response and repair times as well as overall support. This level of satisfaction is apparently not without its cost, reflected in the lower rating assigned to satisfaction with maintenance price.

- Satisfaction with specific areas of support is illustrated in Exhibit III-A-5, comparing users' requirements to the levels of service currently received from their support vendor in various service categories. IBM users seem to be well satisfied with areas of extended support, such as consulting and training, but other, more immediate areas of concern, including hardware and software maintenance performance as well as related issues of parts availability and engineer skill level, are falling slightly below users needs. These areas are of great concern to users, as reflected in their high (8.4 through 9.0) levels of requirement for the individual aspects of telecom support. Care should be taken by service vendors as to not allow the further erosion of these support levels in these key service categories.

- Exhibit III-A-6 provides further warning to maintenance vendors concerned with user satisfaction in these areas. The majority of IBM telecom users expressed dissatisfaction with the level of hardware and software support

EXHIBIT III-A-3

TELECOM USER EXPECTATIONS FOR SERVICE PERFORMANCE
IBM

SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE	
		Falls Short of Expectations	Exceeds Expectations
System Availability	98.8	-0.7	
Response Time	2.8	0	
Repair Time	6.0	0	

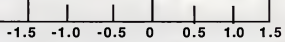
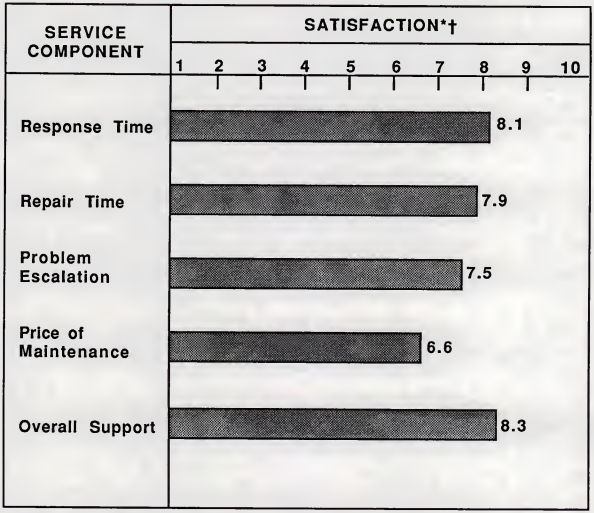


EXHIBIT III-A-4

TELECOM USER SATISFACTION WITH SERVICE DELIVERY
IBM



* Rating: 1 = Low, 10 = High
† Average Standard Error of the Mean: 0.3

EXHIBIT III-A-5

TELECOM USER SERVICE RATINGS
IBM

SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	REQUIRED†	RECEIVED†	
Hardware Maintenance	9.0	8.4	(0.6)
Software Maintenance	8.4	7.7	(0.7)
Training	6.5	7.3	0.8
Consulting	5.8	6.9	1.1
Parts Availability	8.8	8.6	(0.2)
Engineer Skill Level	9.0	8.3	(0.7)
Moves/Changes/ Relocation	6.3	8.0	1.7

User Expectations Exceed Vendor Performance

* Rating: 1 = Low, 10 = High

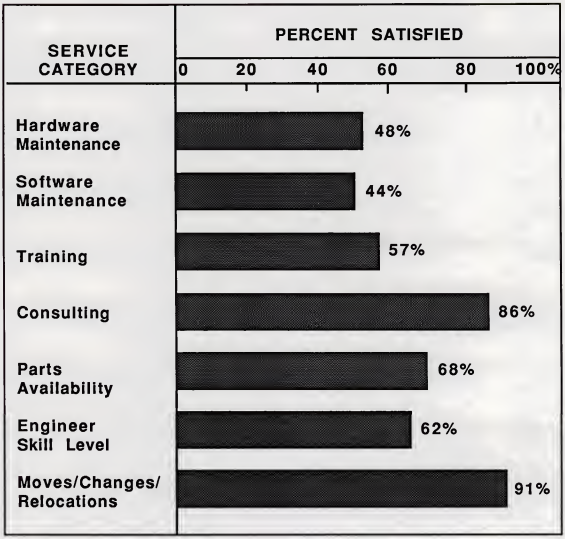
† Average Standard Error of the Mean: 0.3

** Insufficient Response

FTEU S

EXHIBIT III-A-6

TELECOM USER SATISFACTION
IBM



received, and, again, the only areas showing high percentages of satisfied users were in consulting and (exceeding requirements by 1.7 points, as shown in Exhibit III-A-5) the areas involving moves, changes, and relocations of telecom units. Again, key aspects of parts availability and engineer skill level were only ranked in the 60th percentile.

- Vendors must be sensitive to the requirements of users if they are to retain their market share, and must show special concern to areas which users rank high in individual importance. Exhibit III-A-7 graphically presents the needs expressed by users versus the corresponding perception of support received in these specific categories of telecom service.

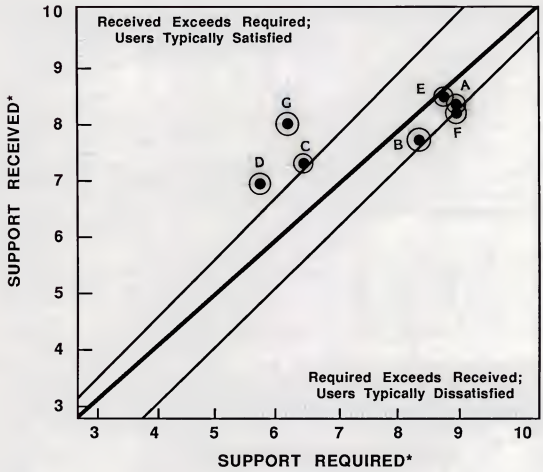
- Of the IBM users contacted, 84% received their telecom support at their installation site, and 100% purchased that support via a contractual agreement. With so few users reportedly using depot maintenance, comparisons of depot support delivery cannot be included in the survey.

- Exhibit III-A-8 presents user ratings of the pertinent delivery modes (showing correspondingly low requirements for depot support, as could be expected). Telephone support delivery was rated highest as compared to user requirements, but both on-site and remote support, considering statistical error applicable, are within an acceptable range of the required levels. It is important to note, however, that on-site support is of considerably higher importance to users, with requirements for this mode of delivery at 8.8 points.

- The range of responses in regard to these areas of service delivery were wide, however, as reflected by the relativly low percentages of satisfied users among the sample shown in Exhibit III-A-9. On-site and telephone support users expressed satisfaction with these services in 56% of the cases, and only half of the sample were satisfied with remote support as received. Considering the users' requirement of 8.8 associated with on-site support delivery, significant attention should be placed on improvement of this service.

EXHIBIT III-A-7

TELECOM SERVICES REQUIRED VERSUS RECEIVED
IBM



A: Hardware Maintenance
B: Software Maintenance
C: Training
D: Consulting
E: Parts Availability
F: Engineer Skill Level
G: Moves/Changes/Relocation

* Rating: 1 = Low, 10 = High

EXHIBIT III-A-8

TELECOM SERVICE DELIVERY RATINGS
IBM

SERVICE DELIVERY MODE	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	REQUIRED†	RECEIVED†	
On-Site Support	8.8	8.6	(0.2)
Carry-In Depot	2.0	**	-
Mail-In Depot	1.6	**	-
Telephone Support	7.0	7.6	0.6
Remote Diagnostics/ Support	6.7	6.5	(0.2)

User Expectations Exceed Vendor Performance

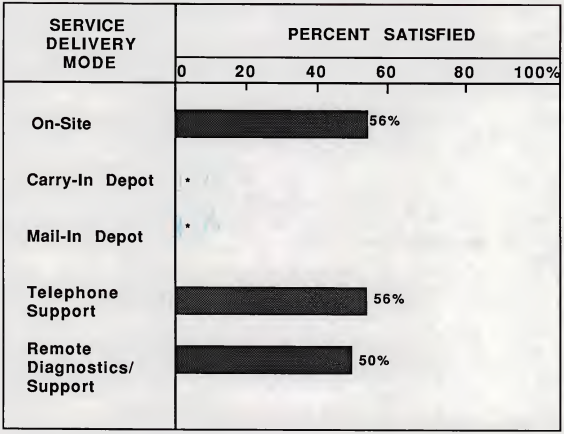
* Rating: 1 = Low, 10 = High

† Average Standard Error of the Mean: 0.4

** Insufficient Response

EXHIBIT III-A-9

TELECOM USER SATISFACTION WITH SERVICE DELIVERY
IBM



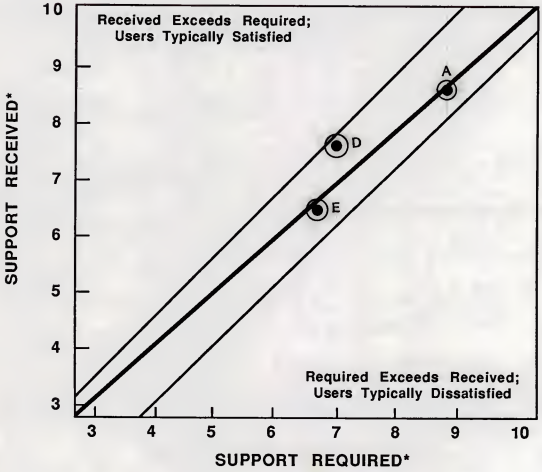
* Insufficient Response

- Exhibit III-A-10 illustrates the discrepancies between user needs and vendor support provision in these areas. Although nearly approaching the target area in each delivery mode, on the average the lower levels of user satisfaction as a percentage of the sample must be kept in mind to keep these ratings in proper perspective.

- Users sampled were also asked to rate the importance of a single source of support for their telecom equipment. Of the IBM users contacted, this aspect of support was relatively important, averaging 8.3 points of 10. Also posed was a related question of willingness to use a third-party maintenance vendor in the support of their telecom systems, which users rated at a much lower average of 4.6. Considering the importance which users placed on a single source of service for their systems, it would initially be surmised that a TPM vendor with multi-vendor coverage may be a viable alternative satisfying this desire. The broad range of telecom products offered by IBM, coupled with the stable, quality reputation IBM support enjoys, explains the seeming contradiction of these two ratings.

EXHIBIT III-A-10

TELECOM DELIVERY REQUIRED VERSUS RECEIVED
IBM



A: On-Site

D: Telephone Support

E: Remote Diagnostics/Support

* Rating: 1 = Low, 10 = High

FTEU S

III B. CODEX

- Twenty users of Codex telecommunications equipment were contacted in September of this year in regard to the support they were currently receiving from their service vendor. Of the 20 users of Codex modems and multiplexers, 10% opted for support from a third-party vendor.

- INPUT targeted high ranking data processing and communications managers for response to our survey. Titles of respondents ranged from communications coordinator, manager of network systems, and director of corporate telecommunications to data coordinator and technical support supervisor. Each interview was conducted by phone and lasted approximately 15 to 20 minutes.

- The sample was distributed over nine separate standardly accepted industry categories, with 20% of the responding firms involved in the insurance industry; 15% each among manufacturing, banking and finance, and services industries; distribution and telecommunications each represented by 10% of the sample; and federal government, transportation, and utilities comprising 5% each.

- Codex held a very strong share in many categories of maintenance, as demonstrated in Exhibit III-B-1. Ninety-five percent of users relied on their manufacturer for hardware maintenance, and of the 30% of users reportedly receiving any software support, two-thirds received this support from Codex. Installation tasks were handled by the vendor on 70% of the cases, while internal staff more often handled moves and changes and planning tasks. Third-party involvement was limited to 5% of hardware maintenance work and another 5% of network consulting services.

- Service vendors' performance as measured by traditional factors is presented in Exhibit III-B-2. System availability, a factor of great importance, was reported to average 97.5%, with a mean number of system interruptions of 1.3

EXHIBIT III-B-1

TELECOM SUPPORT SOURCES
CODEX

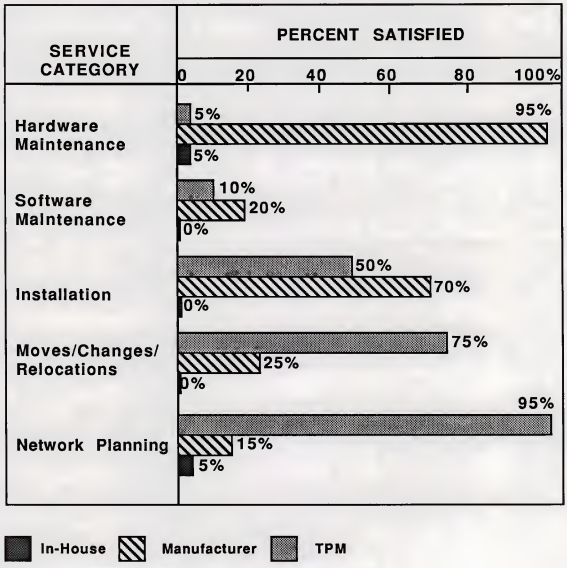


EXHIBIT III-B-2

TELECOM SERVICE PERFORMANCE
CODEX

SERVICE COMPONENT	
Average System Availability (Percent)	97.5%
Average Number of System Interruptions	
Per Month (Number)	1.3
Hardware Caused (Percent)	99.8%
Software Caused (Percent)	0.2%
Average Response Time (Hours)	4.7 Hours
Average Repair Time (Hours)	11.5 Hours

per month. Response times experienced by Codex users ranged from 1 hour to 1 day, with an average response of 4.7 hours overall. Repair times reported by users, ranging from 1 hour up to 30 hours, averaged 11.5 hours.

- Comparing these measures to the levels of performance expected by users, Exhibit III-B-3 shows Codex service vendors as performing well below user requirements. Extremely high system availability is expected by Codex users, and equipment performance falls 2.1% below users' needs. Response to service calls is only slightly below that expected by users, but repair times are exceeding user requirements by over four hours on average.

- User satisfaction with this performance is graphed in Exhibit III-B-4. General satisfaction with support overall is relatively high, rating an 8 on a scale to 10, with escalation procedures and response ratings even higher. Repair time again receives the lowest rating among these performance categories, rating a 7.8. Even this level of satisfaction may seem relatively high, considering the actual repair times reported by users, but may reflect localized problems with repair performance as opposed to a general dissatisfaction among Codex users. Of the various service components rated, the price of maintenance was by far the least satisfactory to users, rating at 6.4.

- Specific categories of telecommunications service were rated by users, as shown in Exhibit in III-B-5. The two areas in which the levels of support received surpassed users' requirements by the greatest amounts were, not coincidentally, those services provided in-house by the majority of users. Software maintenance also received satisfactory ratings among those users experienced with software support.

- More importantly, however, are the discrepancies seen between user requirements and vendor delivery of hardware support and the related measures of parts availability and engineer skill level. As reflected by the high requirements users reported in each of these categories (all ranking between 9 and 10 points), these are areas in which service vendors must be sensitive to user needs if they wish to retain control of the account.

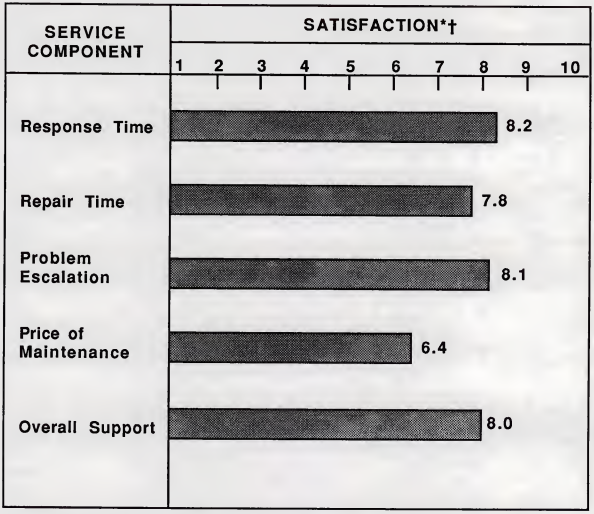
EXHIBIT III-B-3

TELECOM USER EXPECTATIONS FOR SERVICE PERFORMANCE CODEX

SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE	
		Falls Short of Expectations	Exceeds Expectations
System Availability (Percent)	99.6%	-2.1	
Response Time (Hours)	4.1 Hours	-0.6	
Repair Time (Hours)	7.4 Hours	-4.1	

EXHIBIT III-B-4

TELECOM USER SATISFACTION WITH SERVICE DELIVERY CODEX



* Rating: 1 = Low, 10 = High
† Average Standard Error of the Mean: 0.3

EXHIBIT III-B-5

TELECOM USER SERVICE RATINGS CODEX

SERVICE CATEGORY	LEVEL OF SERVICE		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	REQUIRED†	RECEIVED†	
Hardware Maintenance	9.8	8.2	(1.6)
Software Maintenance	3.0	3.1	0.1
Training	9.0	4.6	(4.4)
Consulting	4.4	8.6	4.2
Parts Availability	9.4	8.3	(1.1)
Engineer Skill Level	10.0	8.0	(2.0)
Moves/Changes/ Relocation	2.9	8.2	5.3

User Expectations Exceed Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error of the Mean: 0.5

** Insufficient Response

FTEU S

- Exhibit III-B-6 reflects this user dissatisfaction in these areas, with only 37-47% percent of users receiving hardware maintenance, engineer skill, or parts support to the degree they require. Another area of potential improvement (and high requirement, as shown in Exhibit III-B-5) is that of training support, an area in which only 43% of users are expressing satisfaction.

- Exhibit III-B-7 reveals Codex support vendors' weak positioning in regard to these various service categories. In consideration of the low percentages of satisfied users shown in the previous exhibit, these service vendors must act to better align their support with user needs if they wish to retain their Codex customer base.

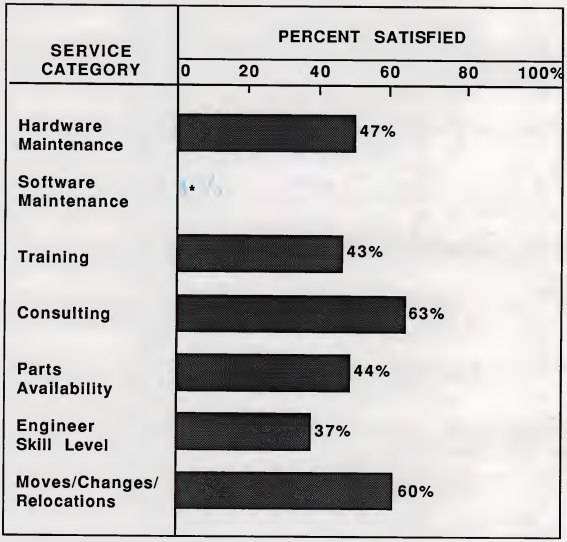
- Among our sample, 84% of Codex users were contract customers, 75% opting for support on-site and 30% (showing that at least 5% of users relied on both types of support) receiving service via depot delivery. Exhibit III-B-8 reports users' ratings of these various forms of service. Carry- and mail-in depot support received was rated very high against users' relatively low requirements, as was the case with remote diagnostics and fixes.

- Of greater importance to users, however, was on-site maintenance performance and telephone hotline support. Although on the average these ratings exceeded users' reported levels of requirement, Exhibit III-B-9 provides a clearer picture of user satisfaction as a group. The low percentage of users reporting satisfaction with on-site service delivery points again to a situation of inconsistency in service performance, as was indicated with repair times experienced by users.

- Exhibit III-B-10 shows Codex support vendors far exceeding user requirements in depot support delivery, as well as in remote support measures. In consideration of the lower importance assigned to these forms of service, these vendors could provide support much closer in line with user needs by reallocating resources spent on depot and remote service to the higher priority areas of on-site and telephone support.

EXHIBIT III-B-6

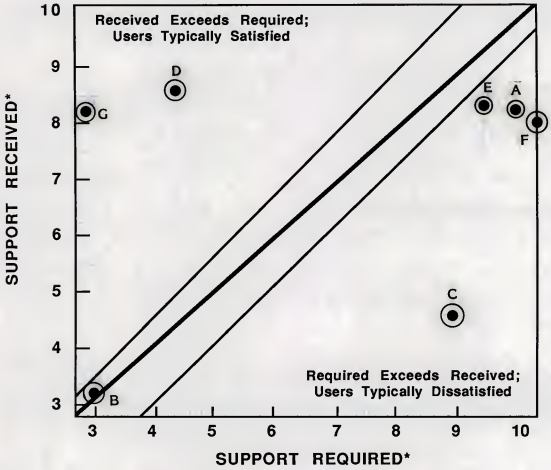
TELECOM USER SATISFACTION CODEX



* Insufficient Response

EXHIBIT III-B-7

TELECOM SERVICES REQUIRED VERSUS RECEIVED CODEX



A: Hardware Maintenance
B: Software Maintenance
C: Training
D: Consulting
E: Parts Availability
F: Engineer Skill Level
G: Moves/Changes/Relocation

* Rating: 1 = Low, 10 = High

EXHIBIT III-B-8

TELECOM SERVICE DELIVERY RATINGS CODEX

SERVICE DELIVERY MODE	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	REQUIRED†	RECEIVED†	
On-Site Support	7.5	8.5	1.0
Carry-In Depot	2.2	6.3	4.1
Mail-In Depot	4.4	9.3	4.9
Telephone Support	7.6	8.9	1.3
Remote Diagnostics/ Support	4.6	9.2	4.6

▒ User Expectations Exceed Vendor Performance

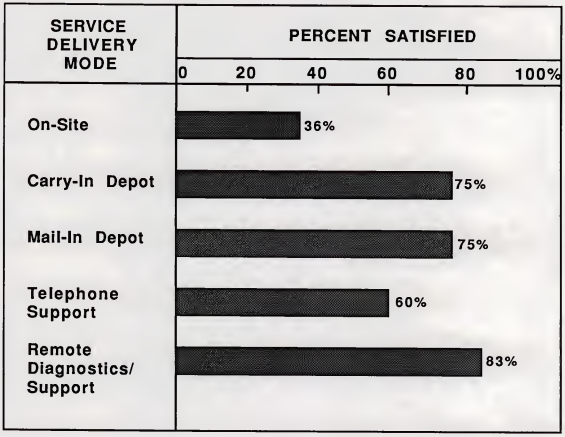
* Rating: 1 = Low, 10 = High

† Average Standard Error of the Mean: 0.7

** Insufficient Response

EXHIBIT III-B-9

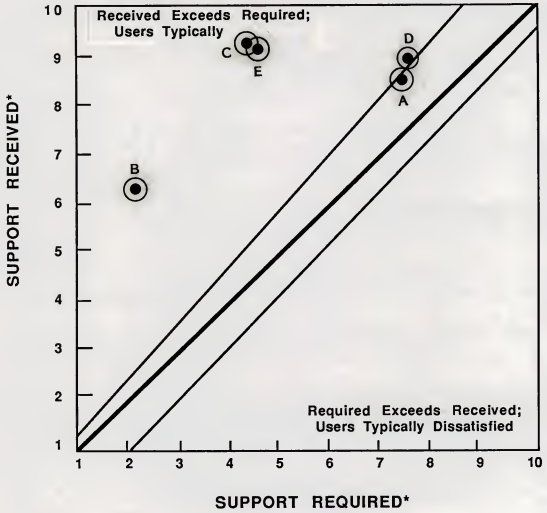
TELECOM USER SATISFACTION WITH SERVICE DELIVERY CODEX



FTEU S

EXHIBIT III-B-10

TELECOM DELIVERY REQUIRED VERSUS RECEIVED CODEX



A: On-Site
B: Carry-In Depot
C: Mail-In Depot
D: Telephone Support
E: Remote Diagnostics/Support

* Rating: 1 = Low, 10 = High

FTEUS

- When asked about the importance of a single source of service, Codex users indicated a interest level of 6.7--not extremely high as compared to other telecom user samples. In line with this low interest, Codex users' willingness to enlist third-party service for their telecom system was a low 4.3, many users expressing concern over parts availability and the remote capabilities of TPM vendors. As more TPM companies venture into telecom service and prove third-party legitimacy in the market, however, these concerns may take a back seat to other criteria for selection. The most commonly quoted reason for willingness to accept third-party support was that of price.

III C. AT&T

- In October of this year, 25 users of AT&T telecommunications equipment were contacted, and the levels of support they were receiving from their vendor were discussed. Of this sample, 100% of the users relied on AT&T for support of their various modems and PBX products, which included Dimension, Dataphone, and 20XX models.

- Ranking telecommunications and data processing directors were targeted for response to our survey, and among AT&T users, respondents' titles ranged from operations supervisor and facilities manager to teleprocessing director, network communications specialist, and information systems vice president. Fifty percent of the respondents were managers of telecommunications/network services, with DP/MIS officers and operations/technical support managers equally comprising the remaining 50%.

- The sample was distributed across nine standard industry groups, with the highest concentration among the insurance industry with a 24% representation. Manufacturing and distribution each represented 20% of the users; the banking and finance industry, 16%; services represented 8%; and transportation, utilities, and state/local government categories each comprised 4% of the sample.

- AT&T had captured 100% of the user sample in the category of hardware maintenance, as illustrated in Exhibit III-C-1. A strong share was held by AT&T in all areas addressed except that of network planning. The high percentage of users who participated in network planning indicates an important potential market for AT&T support vendors who had shown penetration of only 20% within our sample.

- Traditional measures of service performance are presented in Exhibit III-C-2. A mean system availability of 97.9% was reported by the users,

EXHIBIT III-C-1

TELECOM SUPPORT SOURCES
AT&T

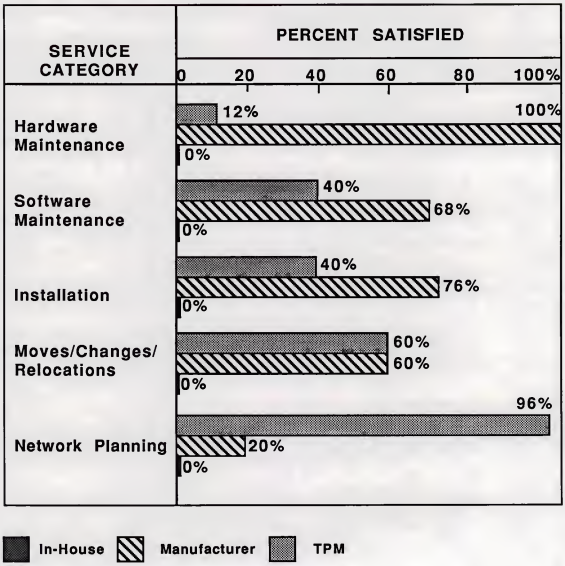


EXHIBIT III-C-2

TELECOM SERVICE PERFORMANCE
AT&T

SERVICE COMPONENT	
Average System Availability (Percent)	97.9%
Average Number of System Interruptions Per Month (Number)	2.0
Hardware Caused (Percent)	77.1%
Software Caused (Percent)	22.3%
Average Response Time (Hours)	8.6 Hours
Average Repair Time (Hours)	15.4 Hours

experiencing an average of two interruptions per month. These interruptions were most often seen as the fault of hardware failures, with only 22.3% of problems reported requiring software support.

- Response and repair times reported by AT&T users ranged from one hour to two full days, resulting in an average response time of a high 8.6 hours, and even higher repair times of 15.4 hours; neither allow for solution to a system problem within the same day reported.

- Exhibit III-C-3 compares performance in these areas to the levels of expectations users hold. System availability is slightly below user needs of over 98% uptime, and response and repair times fall well below expectations by nearly three to four hours.

- User satisfaction with these and related components of service are charted in Exhibit III-C-4, showing lowest among the ratings user satisfaction with response to service calls and problem escalation. Ratings of overall support are hurt by this performance, averaging 7.2 out of 10, and even greater dissatisfaction was reported regarding the costs associated with this service.

- Specific categories of support were rated by users, as are recorded in Exhibit III-C-5. Users expressed very high requirements across the areas of hardware maintenance, parts availability, and engineer skill level, and although among the highest ratings of service received across these categories, performance still fell below user needs in all of these high-priority areas.

- In the areas of software support and the extended services of user training and network consulting, however, AT&T rated well among users sampled, significantly exceeding user requirements (statistically) in software maintenance and training services.

- Exhibit III-C-6 provides another view of user satisfaction, graphing the percentages of satisfied users within in each category of service. As could be

EXHIBIT III-C-3

TELECOM USER EXPECTATIONS FOR SERVICE PERFORMANCE AT&T

SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE	
		Falls Short of Expectations	Exceeds Expectations
System Availability (Percent)	98.2%	-0.3	
Response Time (Hours)	5.8 Hours	-2.8	
Repair Time (Hours)	11.6 Hours	-3.8	

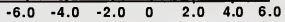
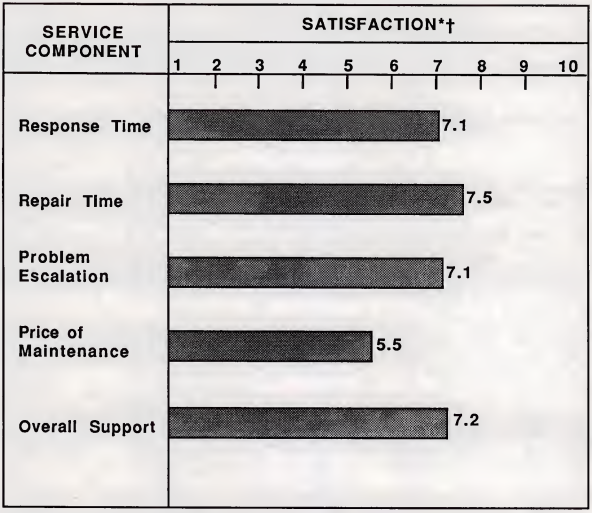


EXHIBIT III-C-4

TELECOM USER SATISFACTION WITH SERVICE DELIVERY AT&T



* Rating: 1 = Low, 10 = High
† Average Standard Error of the Mean: 0.3

EXHIBIT III-C-5

TELECOM USER SERVICE RATINGS
AT&T

SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	REQUIRED†	RECEIVED†	
Hardware Maintenance	9.4	7.5	(1.9)
Software Maintenance	7.0	7.6	0.6
Training	5.7	6.3	0.6
Consulting	5.9	6.1	0.2
Parts Availability	9.0	6.5	(2.5)
Engineer Skill Level	8.8	7.0	(1.8)
Moves/Changes/ Relocation	6.7	6.4	(0.3)

User Expectations Exceed Vendor Performance

* Rating: 1 = Low, 10 = High

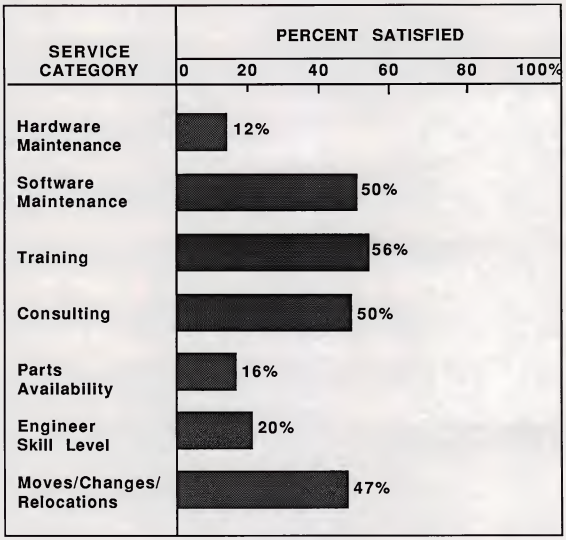
† Average Standard Error of the Mean: 0.3

** Insufficient Response

FTEU S

EXHIBIT III-C-6

TELECOM USER SATISFACTION
AT&T



expected, the lowest proportions of satisfied users are in the problem areas of hardware support, spare parts, and FE skill level. Proportionate increases are seen among users of software support, training, and consulting, as well as in the category of moves/changes/relocations.

- Exhibit III-C-7 provides an illustration of AT&T service vendor positioning for each of these service areas. Clearly demonstrated is the need for improvement in these areas of high importance to users, namely hardware service, parts support, and engineer skill.

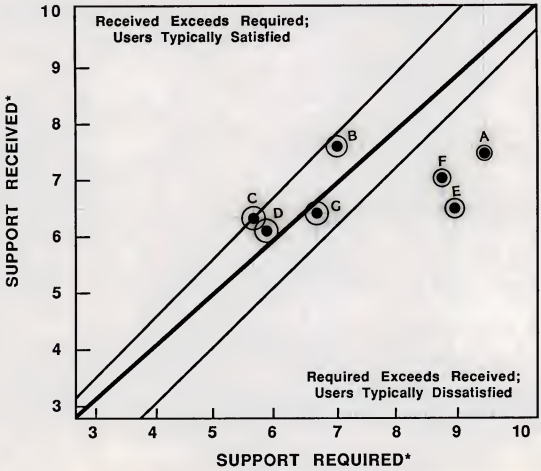
- Of AT&T users sampled, 100% invested contractually for their telecom system support, with 86% opting for support at their installed site. Exhibit III-C-8 provides evaluation of the level of support provided in these categories as compared to user requirements.

- Carry-in and mail-in depot requirements, as could be expected from the low percentage (4%) of users participating in these forms of support, were very low, with vendor performance far exceeding users needs in this area. On-site service, the more popular form of delivery, as well as remote support came close to user requirements on the average. Telephone support fell somewhat below user standards.

- Viewing this data with results recorded in Exhibit III-C-9 in mind, however, presents a slightly different picture of AT&T support delivery. On-site service, in particular, showed extremely low levels of user satisfaction within the sample, highlighting the broad range of support received by these users. Comments addressing the inconsistencies in service across geographic areas as well as at particular sites were commonly recorded by interviewers.

- Support performed remotely appears to be handled in a more consistent manner, with 61% of the sample receiving satisfactory remote service. But telephone support, an area of higher priority to users, however, is another area in need of improvement.

TELECOM SERVICES REQUIRED VERSUS RECEIVED
AT&T



A: Hardware Maintenance
B: Software Maintenance
C: Training
D: Consulting
E: Parts Availability
F: Engineer Skill Level
G: Moves/Changes/Relocation

* Rating: 1 = Low, 10 = High

EXHIBIT III-C-8

TELECOM SERVICE DELIVERY RATINGS
AT&T

SERVICE DELIVERY MODE	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	REQUIRED†	RECEIVED†	
On-Site Support	7.6	7.3	(0.3)
Carry-In Depot	1.6	6.0	4.4
Mail-In Depot	1.6	6.0	4.4
Telephone Support	8.1	6.9	(1.2)
Remote Diagnostics/ Support	7.5	7.2	(0.3)

▨ User Expectations Exceed Vendor Performance

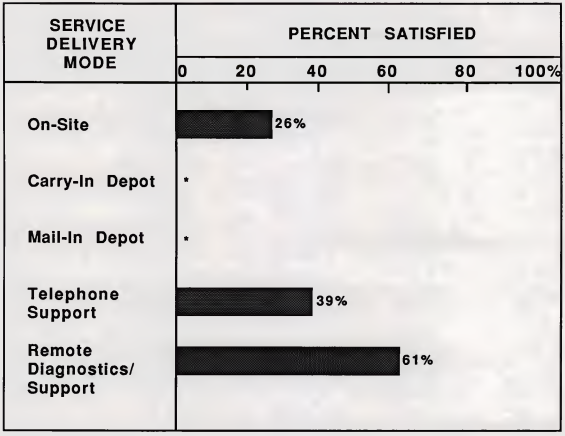
* Rating: 1 = Low, 10 = High

† Average Standard Error of the Mean: 0.5

** Insufficient Response

EXHIBIT III-C-9

TELECOM USER SATISFACTION WITH SERVICE DELIVERY AT&T



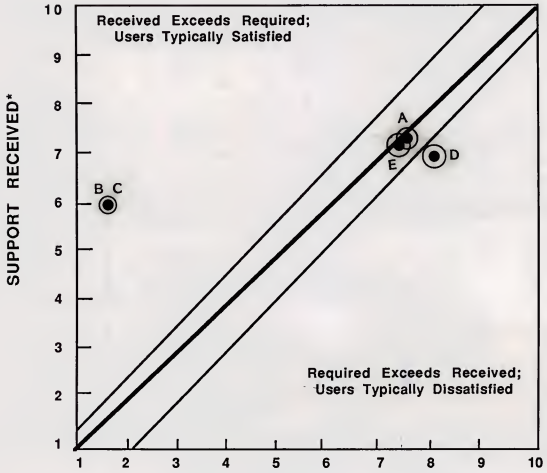
* Insufficient Response

- In viewing Exhibit III-C-10, the discrepancies between user requirements and vendor performance are easily visualized. Reconsideration of the services and delivery modes which users value more highly will be an important factor in determining future customer satisfaction.

- When questioned regarding willingness to switch over to third-party support for their telecom system, AT&T users showed relatively little motivation, rating willingness at 5.4. Although many users commented on the significance of single-source support (rating it at 7 in importance), AT&T's willingness to support foreign equipment within a system, as well as the variety of equipment they offer to the telecommunications marketplace, tends to satisfy this need in users, and not, as with other telecom vendors, indicate a reason to turn to TPM. Equally common comments, however, addressed many of the performance problems discussed in this report, and without proper recognition and action to avoid further erosion of user satisfaction, AT&T user consideration of alternative maintenance will undoubtedly increase.

EXHIBIT III-C-10

TELECOM DELIVERY REQUIRED VERSUS RECEIVED
AT&T



A: On-Site
B: Carry-In Depot
C: Mail-In Depot
D: Telephone Support
E: Remote Diagnostics/Support

* Rating: 1 = Low, 10 = High

FTEU S

III D. NORTHERN TELECOM

- INPUT interviewed 20 users of Northern Telecom equipment in October of this year regarding the service and support they received on their equipment (most often SL or XN series PBX systems). Each interview was conducted by phone with personnel at each site closely involved with the maintenance of their telecommunications systems, the range of titles including director of telecommunications, communications coordinator, EDP manager, and telephone systems analyst.

- The sample was distributed across six standard industry categories, with a slight concentration in the fields of distribution and insurance (30% and 25%, respectively). Manufacturing and services each comprised 15% of the sample, and banking and finance and the utilities industry each were 5%. Five percent of respondents were classified as "other industry specific."

- Of all user groups sampled, the Northern Telecom group had, by far, experienced the greatest penetration of third-party maintenance, with 60% of the users sampled enlisting a TPM vendor as their service source. Exhibit III-D-1 demonstrates this fact, showing TPM leading in all categories of support except network planning; this activity was performed in-house by 80% of the respondents. In fact, software maintenance and equipment installation were the only two categories of service in which the use of Northern Telecom support surpassed the use of internal resources (following the consideration of TPM).

- Exhibit III-D-2 presents user reports of the performance of their service vendor, as measured in the traditional terms of uptime and response and repair times. Northern Telecom users experienced very high system availability, reporting over 99% uptime on average.

EXHIBIT III-D-1

TELECOM SUPPORT SOURCES
NORTHERN TELECOM

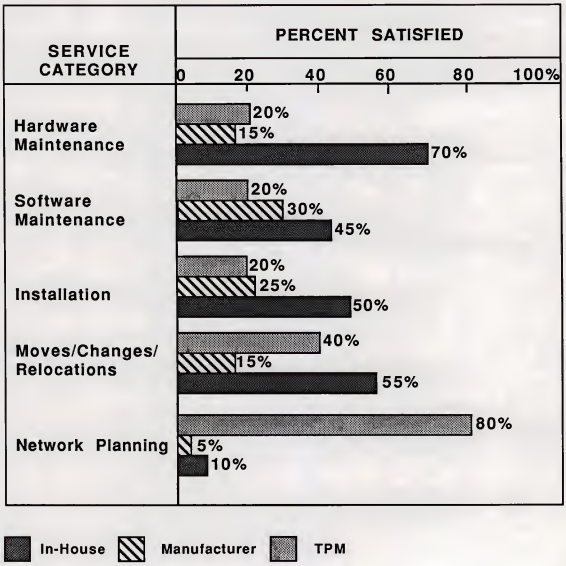


EXHIBIT III-D-2

TELECOM SERVICE PERFORMANCE
NORTHERN TELECOM

SERVICE COMPONENT	
Average System Availability (Percent)	99.1%
Average Number of System Interruptions Per Month (Number)	2.8
Hardware Caused (Percent)	57.4%
Software Caused (Percent)	40.8%
Average Response Time (Hours)	2.1 Hours
Average Repair Time (Hours)	2.3 Hours

- The number of system interruptions reported ranged from 0 to 14 per month, the mean value centering at 2.8. This average may appear artificially high, considering that 35% of the sample experienced no problems over the past six months. The slight majority of the problems occurring were hardware malfunctions, only 40.8% of interruptions calling for software support activities.

- Average response to service calls as well as repair times reported were extremely high, both well under three hours. Obviously, users sampled received their support on-site (versus the slower turnaround times associated with depot repair). One hundred percent of users were serviced at their installed site, and 5% of these also had experimented with depot repair from their vendor.

- Despite these exemplary availability and performance measures, the users of Northern Telecom equipment report even higher expectations from their support vendor, as shown in Exhibit III-D-3. Northern Telecom systems are expected to perform at 99.6% availability, and with these high uptime demands, users expect slightly more expedient repair times. Overall, however, these differences are negligible, and Northern Telecom support vendor performance closely meets these high user expectations.

- Exhibit III-D-4 illustrates user recognition of this performance, presenting user ratings of their satisfaction with the service they receive in these areas. The quick response delivered to users is most highly appreciated, rated at a very high 9 of 10, with repair times and problem escalation following closely behind. Overall, support centers between these measures, with a satisfaction rating of 8.6. Northern Telecom users also reported among the highest satisfaction with the price of the service they received.

- The extremely high requirements placed on Northern Telecom service vendors carry over into specific categories of support, as reported in Exhibit III-D-5. The areas of hardware maintenance and software support are rated 9.5 and

EXHIBIT III-D-3

TELECOM USER EXPECTATIONS FOR SERVICE PERFORMANCE
NORTHERN TELECOM

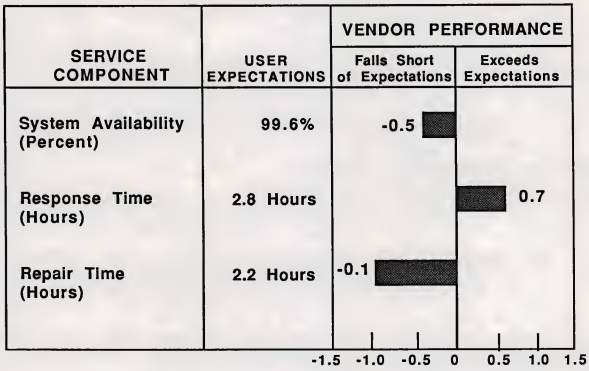
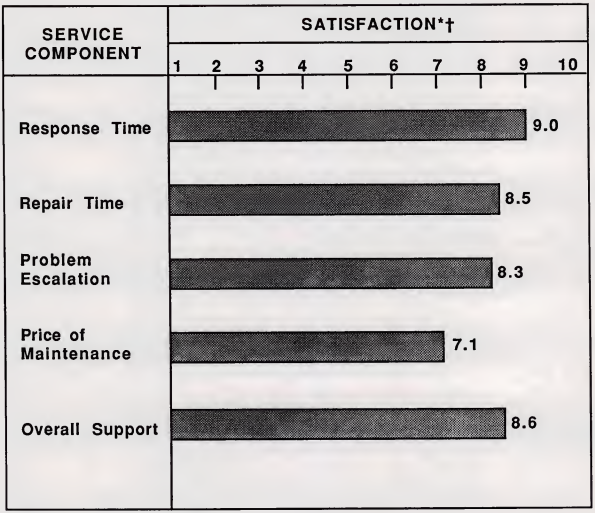


EXHIBIT III-D-4

TELECOM USER SATISFACTION WITH SERVICE DELIVERY
NORTHERN TELECOM



* Rating: 1 = Low, 10 = High
† Average Standard Error of the Mean: 0.3

EXHIBIT III-D-5

TELECOM USER SERVICE RATINGS
NORTHERN TELECOM

SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	REQUIRED†	RECEIVED†	
Hardware Maintenance	9.5	8.2	(1.3)
Software Maintenance	9.4	8.2	(1.2)
Training	7.6	7.6	0.0
Consulting	6.7	6.7	0.0
Parts Availability	9.1	8.8	(0.3)
Engineer Skill Level	9.1	8.5	(0.6)
Moves/Changes/ Relocation	8.3	8.1	(0.2)

User Expectations Exceed Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error of the Mean: 0.4

** Insufficient Response

FTEU S

9.4, respectively, among the highest requirements reported by any of the user groups considered. These high requirement areas are being served with support rated at 8.2--relatively high ratings which would have resulted in satisfaction in many of the other user groups but fall below the extreme expectations of Northern Telecom users. The related category of engineer expertise is another problem area, even though the users are receiving very high (8.5) levels of support in terms of industry-wide ratings.

- Exhibit III-D-6 graphs the percentage of satisfied users among the sample. These three problem areas of hardware and software maintenance and engineer skill show the lowest proportion of satisfied users, an especially troubling 30% of the sample among hardware support users.

- The relative positioning of Northern Telecom maintenance vendor support is presented in Exhibit III-D-7. Again, hardware and software maintenance as well as FE skill level lie furthest from the target area. Training and consulting, on the other hand, are positioned perfectly with respect to user requirements.

- Users also rated their levels of requirement and support received in different modes of service delivery, as shown in Exhibit III-D-8. On-site support, which was purchased via contract in 83% of user cases, fell slightly below user requirements (when considering the standard error factor). Depot support, which was also used by only 5% of users, in conjunction with on-site service (received by 100% of the sample), was primarily delivered through carry-in means and met user needs well on the average.

- Exhibit III-D-9 presents the percentages of users reporting satisfation with these categories of support delivery. Receiving the highest accounts of satisfaction were remote support and diagnostics, with 83% of the sample satisfied. On-site support delivered satisfied only 60% of the sample, not surprising considering the high requirements (9.2, as shown in Exhibit III-D-8) users were placing on their vendors.

EXHIBIT III-D-6

TELECOM USER SATISFACTION
NORTHERN TELECOM

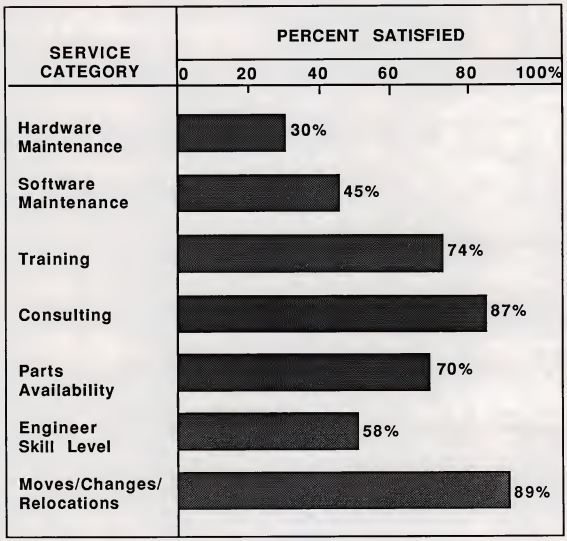
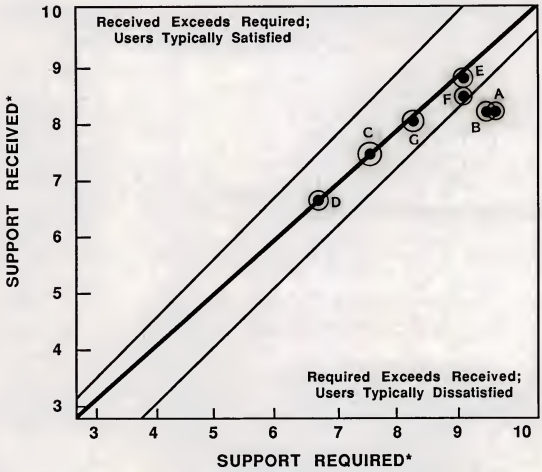


EXHIBIT III-D-7

TELECOM SERVICES REQUIRED VERSUS RECEIVED
NORTHERN TELECOM



A: Hardware Maintenance
B: Software Maintenance
C: Training
D: Consulting
E: Parts Availability
F: Engineer Skill Level
G: Moves/Changes/Relocation

* Rating: 1 = Low, 10 = High

EXHIBIT III-D-8

TELECOM SERVICE DELIVERY RATINGS
NORTHERN TELECOM

SERVICE DELIVERY MODE	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	REQUIRED†	RECEIVED†	
On-Site Support	9.2	8.5	(0.7)
Carry-In Depot	5.1	5.6	0.5
Mail-In Depot	**	**	--
Telephone Support	7.7	7.7	0.0
Remote Diagnostics/ Support	8.9	8.6	(0.3)

User Expectations Exceed Vendor Performance

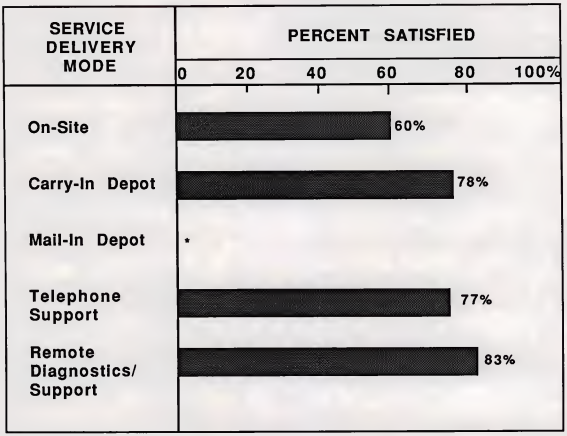
* Rating: 1 = Low, 10 = High

† Average Standard Error of the Mean: 0.5

** Insufficient Response

EXHIBIT III-D-9

TELECOM USER SATISFACTION WITH SERVICE DELIVERY NORTHERN TELECOM



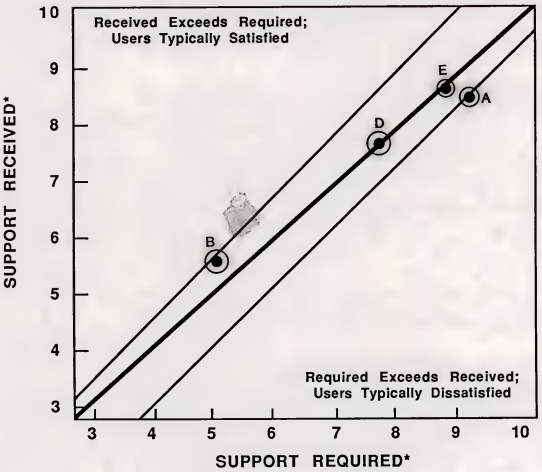
* Insufficient Response

- Exhibit III-D-10 graphically compares user requirements with vendor delivery in each of these areas. Closer attention should be paid by Northern Telecom support vendors in the categories of service rated as more important by users, in particular on-site delivery, if high levels of user satisfaction are to be gained. Although carry-in depot and telephone support are within or exceeding the target area, the importance of these services to users must be kept in mind when weighing the resources put toward the delivery of these services. The improvement of on-site support will have greater impact on customer satisfaction than will maintaining high levels of support in these other areas.

- Northern Telecom users' propensity toward TPM usage (recall that 60% of the sample were TPM customers) was explained in part by the importance users placed on a single source of service, rated 9.1 out of 10. Of those users not enlisting third-party maintenance, however, comments often reflected their high system availability needs and concern over TPM competency. The overall rating of willingness to use a TPM vendor for support on their telecom system averaged an artificially low 4.9, as those clients of manufacturer service reported very low willingness, as compared to the 60% of the sample currently relying on TPM.

EXHIBIT III-D-10

TELECOM DELIVERY REQUIRED VERSUS RECEIVED
NORTHERN TELECOM



A: On-Site
B: Carry-In Depot
D: Telephone Support
E: Remote Diagnostics/Support

* Rating: 1 = Low, 10 = High

III E. PARADYNE

- Twenty users of Paradyne Challenger and MPX modems were contacted regarding the service and support their vendor provided for their telecom equipment. One hundred percent of users sampled relied on support from Paradyne. All interviews were conducted by phone with ranking data processing and telecommunications managers. Sample titles ranged from vice president of information services and assistant vice president of telecommunications to network analyst, teleprocessing specialist, and data communications manager.

- The sample consisted of companies spanning nine industry categories: 25% involved in manufacturing; 15% involved in either the insurance or distribution industries; 10% each in utilities, services, or "other industry spectific" categories; and education, banking and finance, and state and local government each comprising 5% of the sampled users.

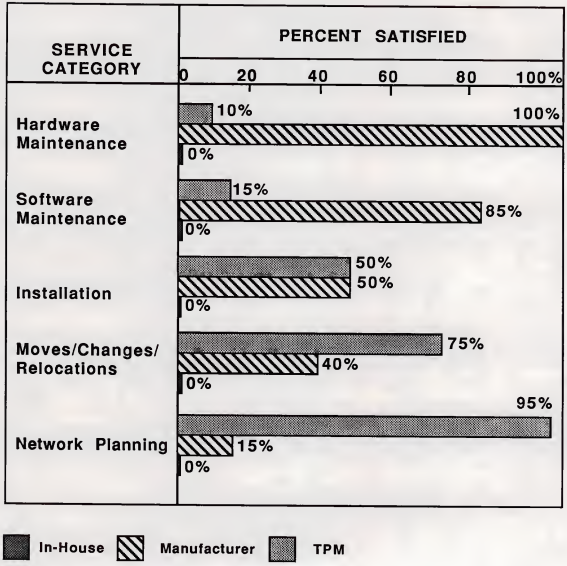
- Paradyne hardware support was enlisted by 100% of users sampled (shown in Exhibit III-E-1) and Paradyne software support in 85% of the cases. Other areas of service, such as installation, moves/changes, and network planning, saw less involvement by the manufacturer, with percentages ranging from 15-50%.

- All of these categories of support, however, were required by at least 50% of Paradyne users (up to a 95% involvement in planning activities) and represent areas of significant potential revenue should the manufacturer or other Paradyne support vendors increase penetration in these areas. In-house staff performed at least part of each of these service tasks, and internal involvement was especially heavy in these final three categories.

- Traditional measures of service performance were recorded and average responses are shown in Exhibit III-E-2. System availability reported was

EXHIBIT III-E-1

TELECOM SUPPORT SOURCES
PARADYNE



FTEU S

TELECOM SERVICE PERFORMANCE
PARADYNE

SERVICE COMPONENT	
Average System Availability (Percent)	94.7%
Average Number of System Interruptions	
Per Month (Number)	3.3
Hardware Caused (Percent)	73.2%
Software Caused (Percent)	26.8%
Average Response Time (Hours)	7.7 Hours
Average Repair Time (Hours)	10.3 Hours

relatively low, at 94.7% uptime, with users experiencing an average of 3.3 interruptions per month. The number of interruptions recorded ranged from 1 up to a high of 12 per month; the majority of the problems were in hardware.

- Response to these interrupts averaged near eight hours, which interprets into next-day service on the average service call. Repair times experienced were even longer, averaging 10.3 hours for Paradyne users.

- Comparing this performance with user expectations for support, Exhibit III-E-3 show Paradyne service falling below user needs in all of these categories. Especially lacking is system/modem availability, with users expecting 98.8% uptimes on the average. Response times fall somewhat below user expectations, but more serious is the 2.6 hour discrepancy between expected and received repair times.

- In the face of these shortcomings, user satisfaction in these areas does not exceed a 7.5 rating, as shown in Exhibit III-E-4. Problem escalation surfaces as another factor affecting satisfaction with response and repair times, rated at a low 6.8 of 10. Overall satisfaction with support stands at 7.3, and satisfaction with the cost of services falls at a 6.7 rating.

- Satisfaction with specific categories of support was explored with users, and results are recorded in Exhibit III-E-5. The related areas of hardware manintenance, parts availability, and engineer skill level are all major problem areas, falling from 1.9 to 2.4 points below user requirements recorded. User requirements in these specific areas are, however, extremely high, all rating well above 9 of 10 and all requiring levels of support well above other areas considered, such as software support or extended services of consulting or training.

- Exhibit III-E-6 gives another view of user satisfaction within these service categories, graphing percentages of users experiencing satisfaction in each area. As could be predicted, the areas with the lowest proportions of satisfied

EXHIBIT III-E-3

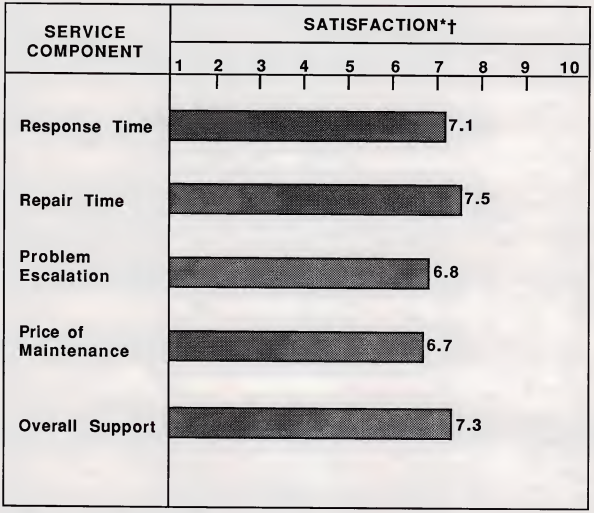
TELECOM USER EXPECTATIONS FOR SERVICE PERFORMANCE
PARADYNE

SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE	
		Falls Short of Expectations	Exceeds Expectations
System Availability (Percent)	98.8%	-4.1	
Response Time (Hours)	7.1 Hours	-0.6	
Repair Time (Hours)	7.7 Hours	-2.6	

-6.0 -4.0 -2.0 0 2.0 4.0 6.0

EXHIBIT III-E-4

TELECOM USER SATISFACTION WITH SERVICE DELIVERY
PARADYNE



* Rating: 1 = Low, 10 = High
† Average Standard Error of the Mean: 0.5

EXHIBIT III-E-5

TELECOM USER SERVICE RATINGS
PARADYNE

SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	REQUIRED†	RECEIVED†	
Hardware Maintenance	9.7	7.3	(2.4)
Software Maintenance	4.7	**	-
Training	4.8	7.4	2.6
Consulting	6.0	7.3	1.3
Parts Availability	9.6	7.7	(1.9)
Engineer Skill Level	9.4	7.2	(2.2)
Moves/Changes/ Relocation	5.4	8.0	2.6

User Expectations Exceed Vendor Performance

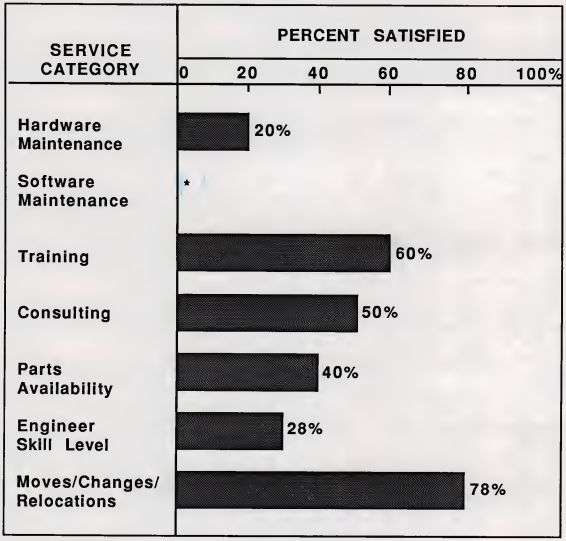
* Rating: 1 = Low, 10 = High

† Average Standard Error of the Mean: 0.4

** Insufficient Response

EXHIBIT III-E-6

TELECOM USER SATISFACTION
PARADYNE



* Insufficient Response

users are the problem areas of hardware support, parts sparing, and engineer skill--80% of users reported receiving hardware service at unsatisfactory levels.

- Paradyne's support delivery relative to user requirements in these areas is clearly shown in Exhibit III-E-7. Overcompensation in areas of lower importance, such as software maintenance, training, and moves/changes, should be adjusted and resources concentrated on the improvement of services deemed more critical by users (i.e., hardware service, parts availability, engineer expertise).

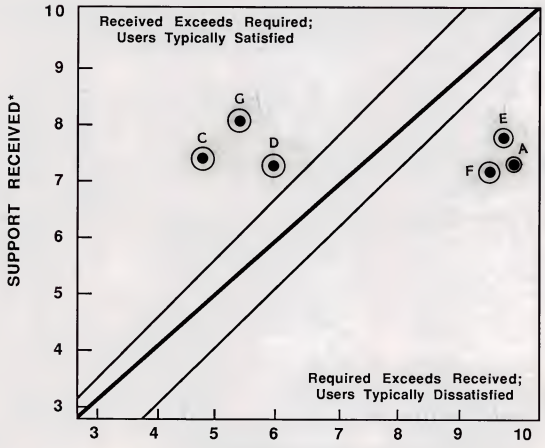
- Of users sampled, 81% received their telecom support on-site and 83% purchased their support contractually via term agreements. Exhibit III-E-8 presents user ratings of the levels of support, both required of and received from their vendor, in various modes of service delivery. The low percentage of respondents experienced with depot support made it impossible to accurately determine the level of service received in these areas. Considering the standard error factor, all requirements were satisfied on average measure.

- In viewing Exhibit III-E-9, however, these satisfactory average ratings are exposed as the percentage of users satisfied is considered. Only 40% of users are reporting satisfactory on-site service, and even lower percentages are satisfied with telephone support, revealing the wide range of responses recorded within these two categories.

- These two comparative measures are indicative of inconsistent service delivery across the sample base, as well as the wide range of requirements expressed by individual users. Paradyne must address both of these problems if high levels of user satisfaction are to be achieved. Consistency in service delivery is key in user perception of service vendors, and Paradyne must be sensitive to users' needs in the servicing of specific accounts.

EXHIBIT III-E-7

TELECOM SERVICES REQUIRED VERSUS RECEIVED
PARADYNE



A: Hardware Maintenance
B: Software Maintenance
C: Training
D: Consulting
E: Parts Availability
F: Engineer Skill Level
G: Moves/Changes/Relocation

* Rating: 1 = Low, 10 = High

FTEU S

EXHIBIT III-E-8

TELECOM SERVICE DELIVERY RATINGS
PARADYNE

SERVICE DELIVERY MODE	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	REQUIRED†	RECEIVED†	
On-Site Support	7.7	7.6	(0.1)
Carry-In Depot	3.1	**	-
Mail-In Depot	7.0	**	--
Telephone Support	6.9	7.2	0.3
Remote Diagnostics/ Support	4.6	7.3	2.7

User Expectations Exceed Vendor Performance

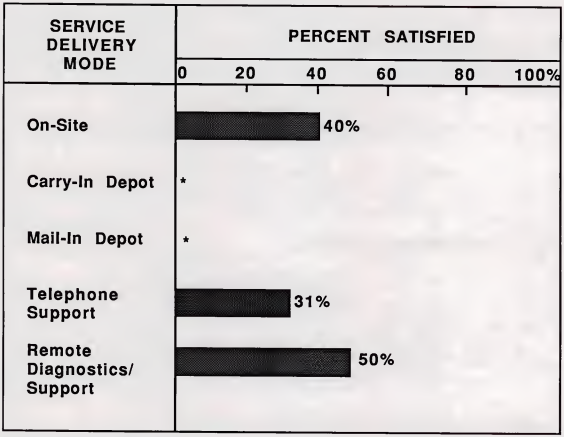
* Rating: 1 = Low, 10 = High

† Average Standard Error of the Mean: 0.6

** Insufficient Response

EXHIBIT III-E-9

TELECOM USER SATISFACTION WITH SERVICE DELIVERY PARADYNE



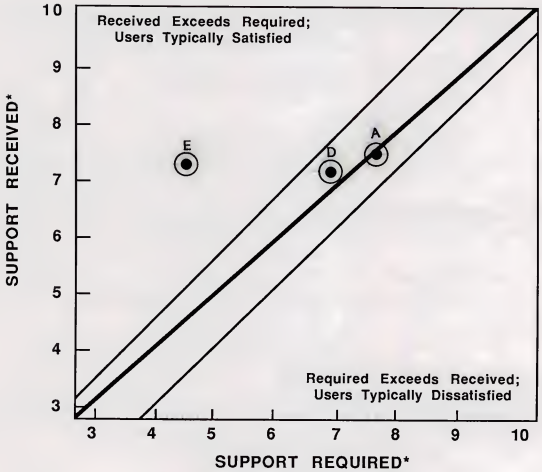
* Insufficient Response

- Exhibit III-E-10 graphically represents Paradyne's support positioning in these areas of service across the user sample. Again, the insight gained from the measure of the inconsistent percentages of satisfied users must be applied when considering these positions on a more practical level.

- Paradyne users' willingness to access a third-party source of telecom service was, as could be predicted, low among the sample, rated at only 3.7. Users most often cited concern over multiple party's involvement in the acquisition and maintenance of their system as their reluctance. The importance of a single source of support for their entire telecommunications system, however, rated at 7.1, should be kept in mind by Paradyne as third-party vendors gain the confidence of the market with increased experience.

EXHIBIT III-E-10

TELECOM DELIVERY REQUIRED VERSUS RECEIVED
PARADYNE



A: On-Site

D: Telephone Support

E: Remote Diagnostics/Support

* Rating: 1 = Low, 10 = High

III F. GENERAL DATACOM

- In October of this year, INPUT contacted 20 users of General Datacom modems and multiplexers regarding the service they were receiving from their support vendor. Eighty percent of users within the sample received support from the manufacturer, the remaining 20% from various TPM vendors.

- Each interview was conducted by phone with the ranking support manager, with such titles as director of data products, manager of systems, data support manager, senior network planner, and teleprocessing director, to name a few.

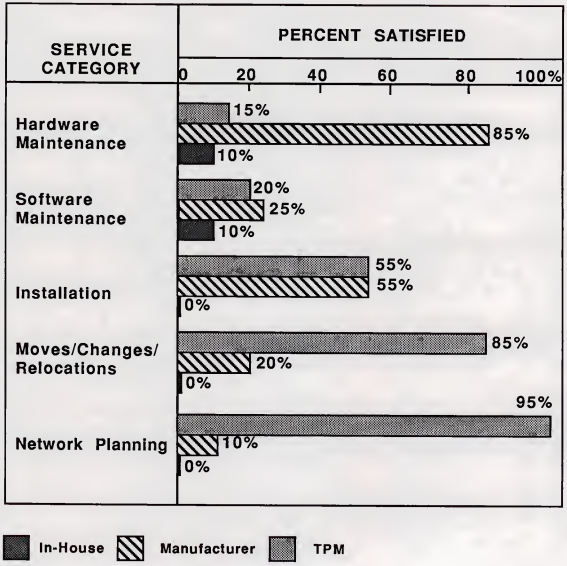
- Eight specific industry categories were represented in the sample. Twenty-five percent of the users were involved in banking and finance; 20% in manufacturing; 15% in the insurance industry; medical, services, and telecommunications industries each totalled 10% of the sample; and education and state/local government equally comprised the last 10%.

- Exhibit III-F-1 demonstrates a breakdown of the General Datacom sample by the source of their support in various categories. General Datacom held an 85% share of hardware maintenance and 25% of software support, leading in both categories of service. Installation was handled equally between General Datacom and in-house staff, with no TPM intervention mentioned. Moves/changes and network planning services were also devoid of third-party assistance among our sample, and both activities were primarily carried out internally. Third-party maintenance overall held a very limited share in General Datacom support, with only 10% of users enlisting TPM in either hardware or software service.

- As shown in Exhibit III-F-2, General Datacom users experienced 98.4% system availability on the average, reporting an average of 1.5 system interruptions per month. Responses ranged from 0 to 12 problems reported monthly, and

EXHIBIT III-F-1

TELECOM SUPPORT SOURCES
GENERAL DATACOM



FTEU S

EXHIBIT III-F-2

TELECOM SERVICE PERFORMANCE
GENERAL DATACOM

SERVICE COMPONENT	
Average System Availability (Percent)	98.4%
Average Number of System Interruptions	
Per Month (Number)	1.5
Hardware Caused (Percent)	63.6%
Software Caused (Percent)	26.4%
Average Response Time (Hours)	6.2 Hours
Average Repair Time (Hours)	7.8 Hours

56% of the sample had experienced no interruptions within the past six months. The majority of problems reported were hardware related.

- Response times were also spread over a broad range, from one hour to one day, with the mean value lying at 6.2 hours. Repair times varied even more greatly, ranging from 1 hour to up to 60 hours for full problem resolution.

- Exhibit III-F-3 compares these averages to users' expectations for each component of service. General Datacom users held high requirements for response times and system availability, with vendor support falling below user expectations in both categories. Users were somewhat less demanding in the area of repair times, reporting low expectations of 8.9 hours for problem resolution.

- Satisfaction with these aspects of service is recorded in Exhibit III-F-4, with highest ratings received in overall support and repair times. Problem escalation is apparently seen as a fault affecting repair and response, with the lower satisfaction rating of 7.6. The price of maintenance is cause for least satisfaction among General Datacom users, with a rating of 6.2.

- Exhibit III-F-5 presents user ratings within specific service categories regarding levels of support received as well as required. Software maintenance, among the least important services to General Datacom users (with a requirement of 4.3), is being supplied at levels rivaling that received in the high requirement category of hardware service. The related areas of parts availability and engineer skill level lag well behind user needs, also sharing the high levels of user requirements expressed for hardware support in general. Overall, Exhibit III-F-5 shows users receiving service beyond their needs in areas of low priority and support lacking in areas of high requirement.

- Percentages of users expressing satisfaction with the levels of support they are receiving in these areas are recorded in Exhibit III-F-6. As could be expected, hardware maintenance satisfaction is low (56% of users), problems

EXHIBIT III-F-3

TELECOM USER EXPECTATIONS FOR SERVICE PERFORMANCE
GENERAL DATACOM

SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE: Falls Short of Expectations	VENDOR PERFORMANCE: Exceeds Expectations
System Availability (Percent)	99.7%	-1.3	
Response Time (Hours)	5.0 Hours	-1.2	
Repair Time (Hours)	8.9 Hours		1.1

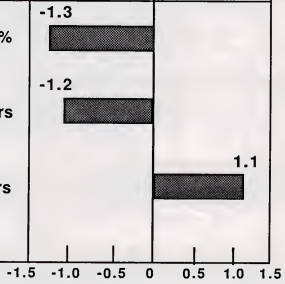
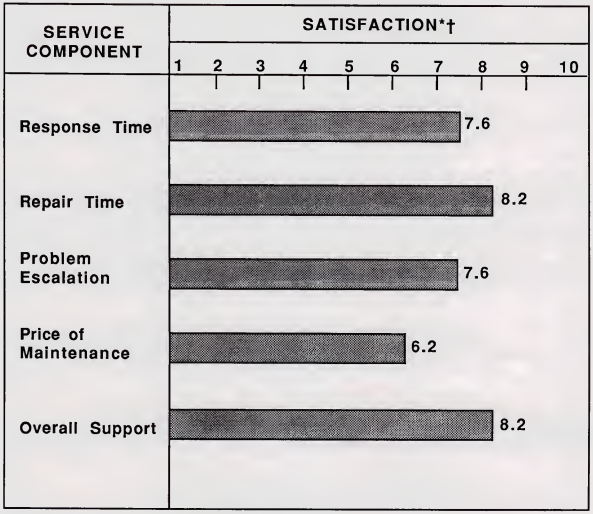


EXHIBIT III-F-4

TELECOM USER SATISFACTION WITH SERVICE DELIVERY
GENERAL DATACOM



* Rating: 1 = Low, 10 = High
† Average Standard Error of the Mean: 0.6

EXHIBIT III-F-5

TELECOM USER SERVICE RATINGS
GENERAL DATACOM

SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	REQUIRED†	RECEIVED†	
Hardware Maintenance	9.2	8.7	(0.5)
Software Maintenance	4.3	8.7	4.4
Training	5.0	7.6	2.6
Consulting	4.3	6.6	2.3
Parts Availability	8.9	7.7	(1.2)
Engineer Skill Level	9.3	7.9	(1.4)
Moves/Changes/ Relocation	4.1	7.4	3.3

User Expectations Exceed Vendor Performance

* Rating: 1 = Low, 10 = High

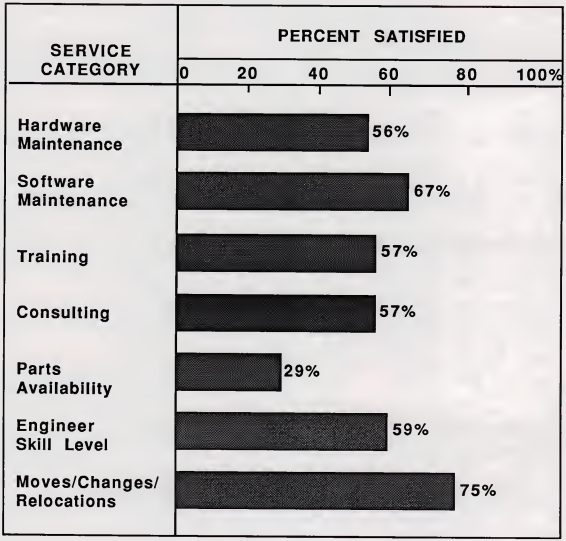
† Average Standard Error of the Mean: 0.5

** Insufficient Response

FTEU S

EXHIBIT III-F-6

TELECOM USER SATISFACTION
GENERAL DATACOM



associated with parts availability surfacing as a key cause of the low ratings with only 29% of the users satisfied in this category. Engineer skill is rated slightly higher among these problem areas, but still only satisfying 59% of users sampled.

- Exhibit III-F-7 illustrates General Datacom support vendors' position in each of these categories of service in context of user requirements. The areas seen as highest in importance to users are most often neglected (i.e., hardware support, engineer skill level, parts acquisition), while users are receiving service in excees of needs in other areas deemed less important. General Datacom service vendors must consider user priorities when positioning their support offerings and allocating their service resources.

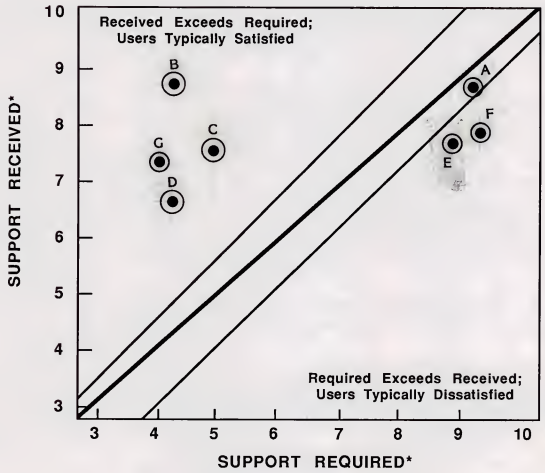
- User ratings of support within the various modes of delivery are presented in Exhibit III-F-8. Telephone support, representing the highest requirement among users, is delivered at levels falling farthest below user needs. The two modes of depot support, with only 21% of users receiving support via carry-in or mail-in service, were required at relatively low levels, and too few users were actually experienced with depot support to substantiate measures of support received.

- Although on-site support was reportedly received at high levels on the average, Exhibit III-F-9 shows low percentages of users reporting satisfaction with their on-site service. The sample reported a wide range in ratings of support received, partially the cause of a relatively high percentage of General Datacom users utilizing "per-call" support on-site (28%). Similarly low proportions of users received satisfactory remote and telephone support among the sample.

- Exhibit III-F-10 illustrates the discrepancies between users' needs and support received by users sampled. Again, due to the broad differences reported between users in the levels of support delivered, the percentages of users expressing satisfaction with the support received must be kept in mind when evaluating each components' respective position.

EXHIBIT III-F-7

TELECOM SERVICES REQUIRED VERSUS RECEIVED
GENERAL DATACOM



A: Hardware Maintenance
B: Software Maintenance
C: Training
D: Consulting
E: Parts Availability
F: Engineer Skill Level
G: Moves/Changes/Relocation

* Rating: 1 = Low, 10 = High

EXHIBIT III-F-8

TELECOM SERVICE DELIVERY RATINGS
GENERAL DATACOM

SERVICE DELIVERY MODE	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	REQUIRED†	RECEIVED†	
On-Site Support	6.4	8.0	1.6
Carry-In Depot	3.4	**	--
Mail-In Depot	4.1	**	--
Telephone Support	7.4	6.9	(0.5)
Remote Diagnostics/ Support	6.1	6.8	0.7

▨ User Expectations Exceed Vendor Performance

* Rating: 1 = Low, 10 = High

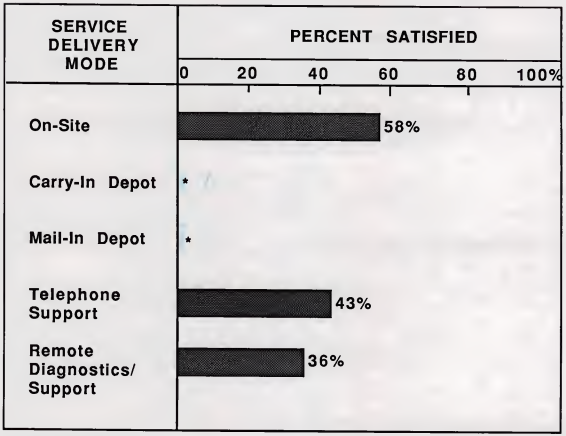
† Average Standard Error of the Mean: 0.7

** Insufficient Response

FTEU S

EXHIBIT III-F-9

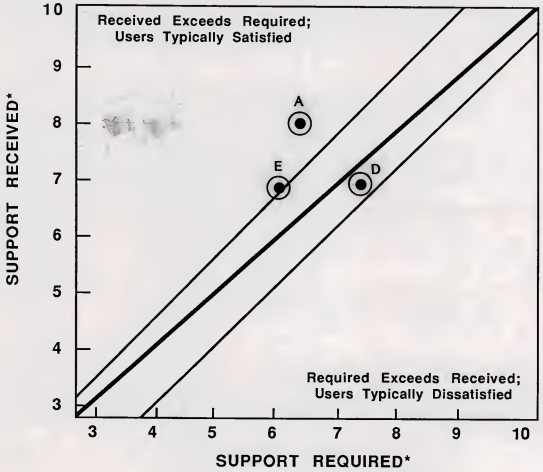
TELECOM USER SATISFACTION WITH SERVICE DELIVERY
GENERAL DATACOM



* Insufficient Response

EXHIBIT III-F-10

TELECOM DELIVERY REQUIRED VERSUS RECEIVED
GENERAL DATACOM



A: On-Site

D: Telephone Support

E: Remote Diagnostics/Support

* Rating: 1 = Low, 10 = High

FTEU S

- General Datacom users rated their willingness to use third-party support at 4.6--considerably lower than their rating of the importance of a single source of service at 7.6. A relatively low percentage of General Datacom users were currently experienced with TPM (20%, as mentioned previously), citing concerns over parts availability and skill level as the cause. Users of manufacturer support, however, reported similar concerns with engineer skill and availability and turnaround of FE staff as key concerns with the support they were currently receiving--problems which General Datacom must address to avoid any further erosion of their support base by alternative service sources.

- In October of this year, 20 users of Racal-Vadic equipment were contacted regarding the service they were receiving on their modems. Ten percent of users received support from third-party vendors, the remaining 90% from the manufacturer. Each interview lasted approximately 15 to 20 minutes and was conducted with the ranking telecommunications or data processing manager. Actual titles of contacts ranged from data communications specialist and manager of network control to DP/MIS supervisor and operations manager.

- Ten industry categories were covered by the sample, with a 20% concentration in federal government; insurance and manufacturing each comprising 15% of the sample; services, banking and finance, and distribution 10% each; and state/local government, utilities, medical, and education industries 5% each.

- Exhibit III-G-1 presents a breakout of the sample by service source. Racal-Vadic held the greatest service penetration in the category of hardware support with an 85% share. Not surprisingly, hardware maintenance was also the strongest area for TPM support with its highest percentage at 15%. Software support was also led by Racal-Vadic but with the much lower percentage of 25%. TPM was used in 5% of the cases within all remaining categories.

- In-house staff performed the majority of many of the services addressed, especially in the areas of moves/changes and network planning. Concurrently, Racal-Vadic's share was extremely low in both of these categories.

- Traditional measures of service performance are recorded in Exhibit III-G-2. Racal-Vadic users experienced an average of 1.3 interruptions per month, resulting in uptime percentages above 99%. Of these interruptions, the majority were the fault of hardware problems.

EXHIBIT III-G-1

TELECOM SUPPORT SOURCES
RACAL-VADIC

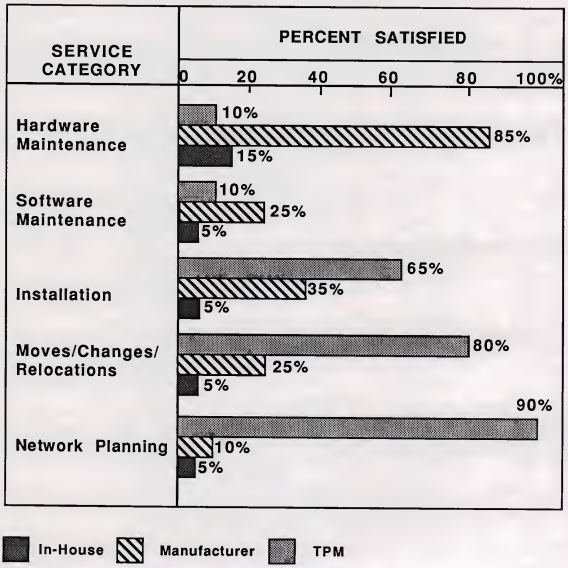


EXHIBIT III-G-2

TELECOM SERVICE PERFORMANCE
RACAL-VADIC

SERVICE COMPONENT	
Average System Availability (Percent)	99.5%
Average Number of System Interruptions Per Month (Number)	1.3
Hardware Caused (Percent)	62.5%
Software Caused (Percent)	25.0%
Average Response Time (Hours)	6.1* Hours
Average Repair Time (Hours)	113.3* Hours

* High Response and Repair times reflect the high percentage of depot service users among the sample.

- Racal-Vadic users within our sample were by far the heaviest users of depot maintenance among all user groups sampled, with only 45% opting for maintenance work to be performed on-site. The remaining 55% using depot service weigh heavily on the measures of response and repair times reported for Racal-Vadic, and this situation should be considered when comparing these measures between vendors.

- Response times varied greatly within the user group, ranging from 15 minutes to 24 hours, reflecting the differing responses expected between on-site versus depot support. Of the high proportion of depot support users bearing on the mean value, Racal-Vadic users reported an average response time of 6.1 hours. The median response was a more realistic value of two hours.

- Repair time measures were similarly affected by the number of depot support users within the sample, with responses ranging from one day up to three full weeks. (This dispersion also reflects the differences in repair times experienced by contract versus "per-call" customers. The Racal-Vadic group sampled also included a proportionately high percentage of "per-call" users, with only 61% of the sample contracting for their support.) Average repair time reported was 113.3 hours, or nearly five full working days. Again, the median value was more realistic, at a 24-hour repair time.

- Exhibit III-G-3 evaluates these measures in context with users' expectations for support in these areas. System availability ran only slightly below user needs, at 99.5% uptime, and user expectations for response and repair times were well exceeded by Racal-Vadic support vendor performance. Response times averaged nearly one hour faster, and repair was effected nearly six days faster than users expected.

- This level of response to user problems does not go unrecognized, as is demonstrated in Exhibit III-G-4. Satisfaction with response time was extremely consistent among the users sampled, rated at 8.9 out of 10. Satisfaction with escalation procedures was also high, with an average of

EXHIBIT III-G-3

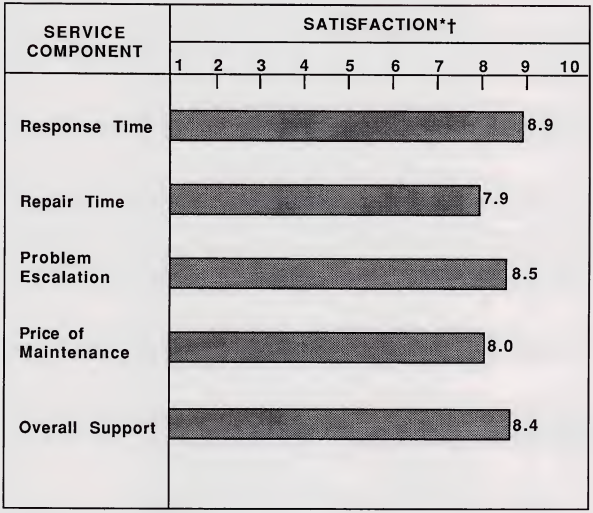
TELECOM USER EXPECTATIONS FOR SERVICE PERFORMANCE RACAL-VADIC

SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE: Falls Short of Expectations	VENDOR PERFORMANCE: Exceeds Expectations
System Availability (Percent)	99.8%	-0.3	
Response Time (Hours)	6.9* Hours		0.8
Repair Time (Hours)	127.4* Hours		14.1

* High Response and Repair times reflect the high percentage of depot service users among the sample

EXHIBIT III-G-4

TELECOM USER SATISFACTION WITH SERVICE DELIVERY
RACAL-VADIC



* Rating: 1 = Low, 10 = High
† Average Standard Error of the Mean: 0.4

8.5. Users did express less satisfaction with repair times, with a mean rating of 7.9 of 10. Overall satisfaction was quite high (8.4), as was user satisfaction with the price of maintenance (8.0).

- Specific areas of service were assessed by users, and results are presented in Exhibit III-G-5. Two areas of concern surfaced in the ratings in the related areas of parts availability and hardware maintnenance. The extremely high user requirements expressed within these categories, at 9.6 and 9.7, respectively, made satisfaction in these areas difficult for Racal-Vadic vendors. Other categories of maintenance considered surpassed user requirements on the average.

- Exhibit III-G-6 graphs the relative percentages of users expressing satisfaction with the support received in these areas. As could be expected, the high demands users reported in hardware maintenance and parts procurement were cause for low proportions of satisfied users.

- Other areas in which Racal-Vadic support vendors rated highly on the average, however, showed relatively low percentages of satisfied users, reflecting the wide range of responses recorded in these areas. Especially in categories such as engineer skill level and moves/changes/relocations, this is often an indication of inconsistency in the level of service received from maintenance staff. Training, often a more centralized support activity, showed percentages consistent with average ratings (exceeding user requirements by 3.8 points, as shown in Exhibit III-G-5).

- User requirements are graphically compared to vendor support delivery in Exhibit III-G-7. As was pointed out previously, the high-priority areas of hardware maintenance and parts availability are the two categories of service found to be lacking by users. Other areas of lower need, such as training and consulting, are overshot by vendor efforts. To effect the most profound improvement in user satisfaction, these areas of higher importance to users must be addressed, and support resources must be focused on the meeting of user needs in these areas.

EXHIBIT III-G-5

TELECOM USER SERVICE RATINGS
RACAL-VADIC

SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	REQUIRED†	RECEIVED†	
Hardware Maintenance	9.7	8.7	(1.0)
Software Maintenance	3.8	**	-
Training	4.0	7.8	3.8
Consulting	4.8	8.7	3.9
Parts Availability	9.6	8.5	(1.1)
Engineer Skill Level	8.6	9.0	0.4
Moves/Changes/ Relocation	4.8	8.9	4.1

User Expectations Exceed Vendor Performance

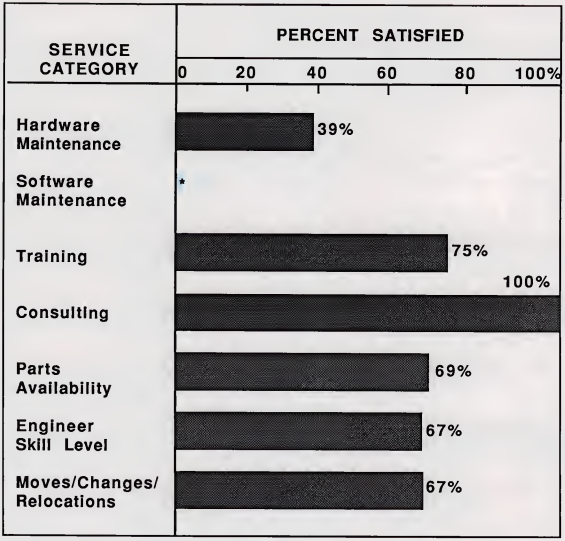
* Rating: 1 = Low, 10 = High

† Average Standard Error of the Mean: 0.4

** Insufficient Response

EXHIBIT III-G-6

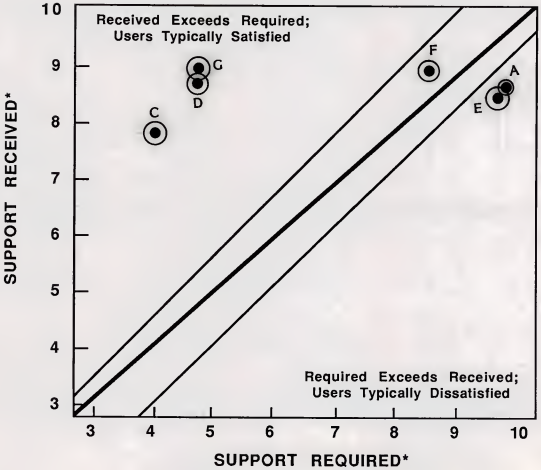
TELECOM USER SATISFACTION
RACAL-VADIC



* Insufficient Response

EXHIBIT III-G-7

TELECOM SERVICES REQUIRED VERSUS RECEIVED RACAL-VADIC



A: Hardware Maintenance
C: Training
D: Consulting
E: Parts Availability
F: Engineer Skill Level
G: Moves/Changes/Relocation

* Rating: 1 = Low, 10 = High

- Users were also asked to rate their requirements within specific modes of support delivery, as shown in Exhibit III-G-8. As was mentioned previously, the Racal-Vadic users receiving depot support were the majority among our sample (55%), and most of these depot users received their service via mail-in agreements. Too few users sampled were experienced with carry-in support to meaningfully evalute this mode of support.

- On-site service, used by 45% of users sampled, showed low requirements of 3.4, easily surpassed by the level of support delivered by Racal-Vadic support vendors at 8.1. Mail-in depot was by far the most important method of support to Racal-Vadic users, rating a high 9.4. Although receiving a rating identical to that of on-site support, users' high requirements surpassed vendor support in this area.

- Exhibit III-G-9 shows associated percentages of on-site support users as satisfied with the level of service delivered by their support vendor. As could be expected, the high requirements placed on the vendors of mail-in support caused low proportions of users to experience satisfactory service.

- Demonstrating Racal-Vadic support vendors' relative positioning to user requirements, Exhibit III-G-10 illustrates the specific areas in need of improvement if user satisfaction is to increase. Support needs are being surpassed in all delivery modes except that of highest importance to users--mail-in depot service. Resources misallocated to areas of lesser priority to users will effect insignificant improvements in users satisfaction. Even slight improvements to this high priority area of mail-in depot support will increase customer satisfaction for users of Racal-Vadic support.

- Among telecommunications user groups considered, Racal-Vadic users reported the greatest willingness to enlist third-party vendors as their source of support. The importance of a single source of service was reported at 7.2, and the combination of these to facts should be taken into consideration by the manufacturer when assessing user satisfaction with support.

EXHIBIT III-G-8

TELECOM SERVICE DELIVERY RATINGS
RACAL-VADIC

SERVICE DELIVERY MODE	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	REQUIRED†	RECEIVED†	
On-Site Support	3.4	8.1	4.7
Carry-In Depot	2.3	**	--
Mail-In Depot	9.4	8.1	(1.3)
Telephone Support	6.3	7.5	1.2
Remote Diagnostics/ Support	5.0	8.7	3.7

▒ User Expectations Exceed Vendor Performance

* Rating: 1 = Low, 10 = High

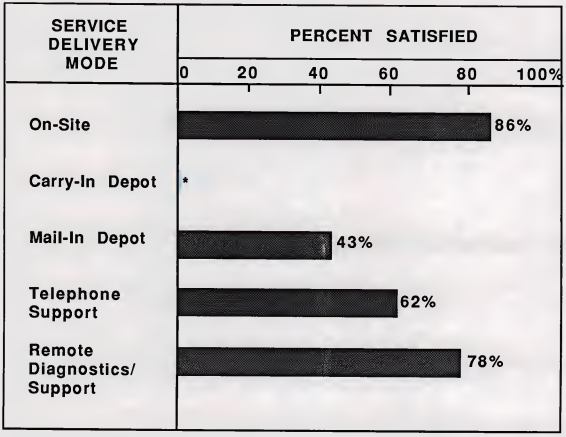
† Average Standard Error of the Mean: 0.4

** Insufficient Response

FTEU S

EXHIBIT III-G-9

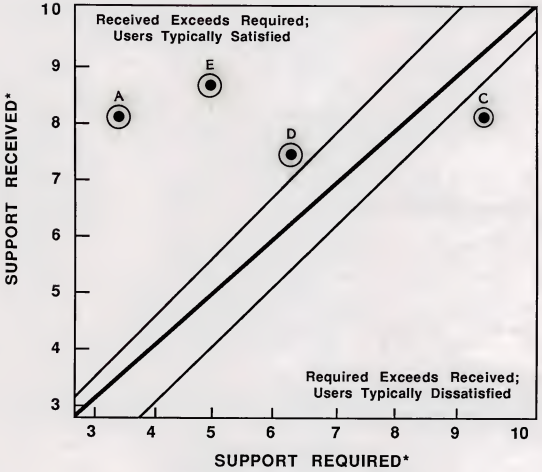
TELECOM USER SATISFACTION WITH SERVICE DELIVERY RACAL-VADIC



* Insufficient Response

EXHIBIT III-G-10

TELECOM DELIVERY REQUIRED VERSUS RECEIVED
RACAL-VADIC



A: On-Site

C: Mail-In Depot

D: Telephone Support

E: Remote Diagnostics/Support

* Rating: 1 = Low, 10 = High

FTEUS

III H. ROLM

- In October of this year, 20 users of Rolm PBX and CBX systems were contacted regarding the quality of service they were receiving from their support vendor. Service was supplied by the manufacturer in 90% of the cases and by third-party vendors in the remaining 10%.

- Each interview was conducted by phone with top telecommunications and data processing personnel, with actual respondents' titles ranging from director of corporate telecommunications and vice president of information and communications to telephone systems administrator, manager of technical support, and computer center director.

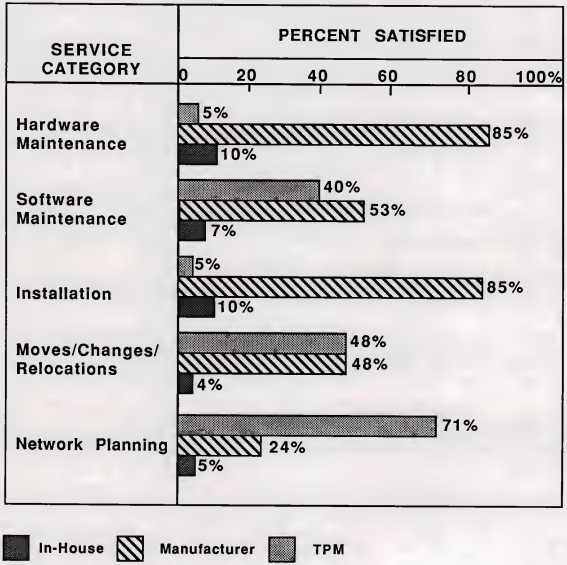
- Ten separate industry categories were covered by the sample, with 20% of users involved in the insurance and manufacturing industries; 15% in utilities; 10% each in the medical and transportation fields; and holding 5% each of the sample in state/local government, services, education, distribution, and banking/finance.

- Exhibit III-H-1 presents the sample breakout by support source, with Rolm holding a significant share in all areas except network planning. This area as well as the service of moves/changes show considerable potential for increased penetration as equal or greater number of customers utilize in-house staff for these activities. Third-party penetration is at or under 10% in all categories addressed, with the greatest involvement in installation and hardware maintenance of the systems.

- Traditional measures of service received by Rolm users are reported in Exhibit III-H-2. System availability was reported at 98.5% on average, with users experiencing slightly over one interruption per month. Nearly all (98%) of these problems were hardware-caused. The average response to calls was reported at 3.7 hours, and problem resolution followed in 5.5 hours on average.

EXHIBIT III-H-1

TELECOM SUPPORT SOURCES
ROLM



FTEU S

EXHIBIT III-H-2

TELECOM SERVICE PERFORMANCE
ROLM

SERVICE COMPONENT	
Average System Availability (Percent)	98.5%
Average Number of System Interruptions	
Per Month (Number)	1.1
Hardware Caused (Percent)	98.0%
Software Caused (Percent)	2.0%
Average Response Time (Hours)	3.7 Hours
Average Repair Time (Hours)	5.5 Hours

- User expectations for support in these categories is presented and compared to support received in Exhibit III-H-3. Rolm users have slightly higher uptime needs--99.1% as compared to 98.5% actual availability. Both response and repair times fall below user expectations, with the mean time to repair of particular concern (discrepancies of 1.4 hours were reported between expectations and actual time to repair).

- Exhibit III-H-4 reveals problem escalation as an integral part of the problem, as perceived by users, as satisfaction with the response to and escalation of problems rates considerably lower than repair time as an individual component. Overall support is rated relatively high, at 8.3 of 10; satisfaction with the cost of this support is somewhat less satisfactory to users, rating only 6.4.

- Specific categories of support were rated by Rolm users, and results are recorded in Exhibit III-H-5. Of highest importance to users were the related categories of hardware maintenance, parts availability, and engineer skill level, at 9.8, 9.6, and 9.2, respectively. Although Rolm users report receiving relatively high levels of support in all categories addressed (no rating falls below 8.0), these extremely high requirements surpass levels of support being delivered in these three categories. The areas of software maintenance and moves/changes, on the other hand, carry the lowest requirements for support and are being provided at levels far surpassing user needs.

- Exhibit III-H-6 lists percentages of satisfied users within these support categories. Not surprisingly, satisfaction is lowest in the areas of hardware maintenance, parts availability and engineer skill--high user requirements that were consistently left unfulfilled. Conversely, the highest percentages of satisfaction were experienced in software support, moves/changes, and relocation activities, consistently rated highly by users. Training and consulting activities remain in the middle ground, with satisfaction ranging in the 60th percentile.

EXHIBIT III-H-3

TELECOM USER EXPECTATIONS FOR SERVICE PERFORMANCE
ROLM

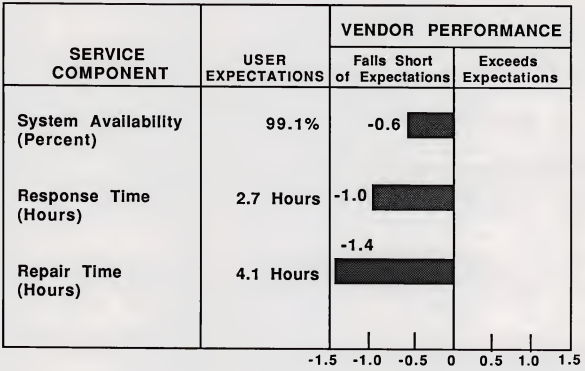
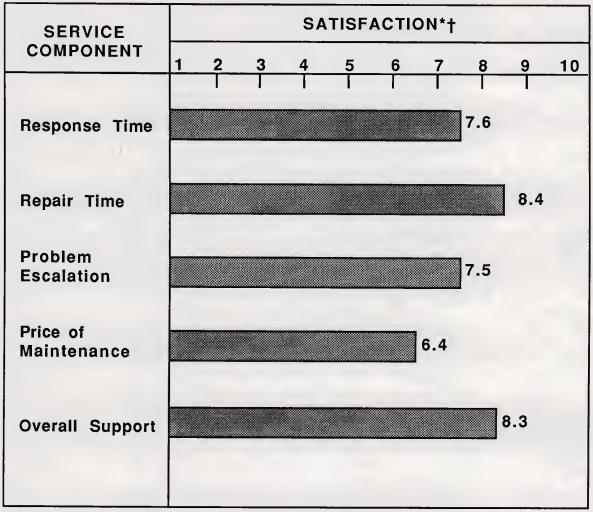


EXHIBIT III-H-4

TELECOM USER SATISFACTION WITH SERVICE DELIVERY ROLM



* Rating: 1 = Low, 10 = High
† Average Standard Error of the Mean: 0.4

EXHIBIT III-H-5

TELECOM USER SERVICE RATINGS
ROLM

SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	REQUIRED†	RECEIVED†	
Hardware Maintenance	9.8	8.3	(1.5)
Software Maintenance	5.3	8.7	3.4
Training	6.7	8.4	1.7
Consulting	6.6	8.1	1.5
Parts Availability	9.6	8.7	(0.9)
Engineer Skill Level	9.2	8.0	(1.2)
Moves/Changes/ Relocation	5.1	8.6	3.5

User Expectations Exceed Vendor Performance

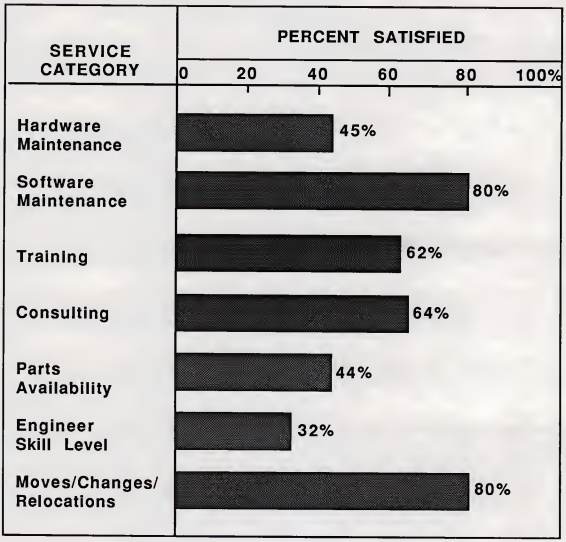
* Rating: 1 = Low, 10 = High

† Average Standard Error of the Mean: 0.5

** Insufficient Response

EXHIBIT III-H-6

TELECOM USER SATISFACTION
ROLM



- As illustrated in Exhibit III-H-7, Rolm support vendors are missing the mark in all areas of support considered, providing an overabundance of service in certain areas of low priority to users and lacking in the service provided in more important categories. Reconsideration of support resource allocation will be necessary if higher levels of user satisfaction are to be achieved.

- Of our sample, 95% of users received support on-site and 95% of users contracted for their service coverage. Exhibit III-H-8 compares user needs to the support they actually received in various modes of service delivery. The very low percentage of users (5%) experienced with either form of depot support precluded statistical conclusions regarding the service they received. Users responding showed an expected low requirement for carry-in or mail-in support (both under 2.0).

- Telephone support was deemed of highest importance by Rolm users, rating a 9.6, and was followed closely by the need for on-site support, at 9.2. Levels of service received in both of these categories fell short of user requirements, especially in the area of telephone "hotline" support.

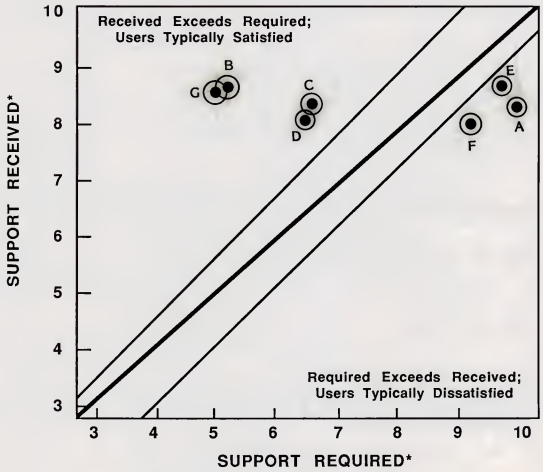
- Exhibit III-H-9 reinforces these low ratings, showing very low percentages of satisfied users in both of these problem areas.

- Remote support was rated slightly higher, with 63% of users expressing satisfaction with their diagnostics and service.

- The positioning of Rolm support vendors' service in these various areas is presented relative to user-expressed needs in Exhibt III-H-10. Users' needs exceed vendor performance in each area and by greater amounts in the areas in which users place the most importance. Support delivery priorities must be realigned to better coincide with user requirements if higher levels of user satisfaction are to be obtained by Rolm service vendors.

EXHIBIT III-H-7

TELECOM SERVICES REQUIRED VERSUS RECEIVED
ROLM



A: Hardware Maintenance
B: Software Maintenance
C: Training
D: Consulting
E: Parts Availability
F: Engineer Skill Level
G: Moves/Changes/Relocation

* Rating: 1 = Low, 10 = High

EXHIBIT III-H-8

TELECOM SERVICE DELIVERY RATINGS
ROLM

SERVICE DELIVERY MODE	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	REQUIRED†	RECEIVED†	
On-Site Support	9.2	8.5	(0.7)
Carry-In Depot	1.0	**	--
Mail-In Depot	1.7	**	--
Telephone Support	9.6	7.7	(1.9)
Remote Diagnostics/ Support	8.5	8.3	(0.2)

User Expectations Exceed Vendor Performance

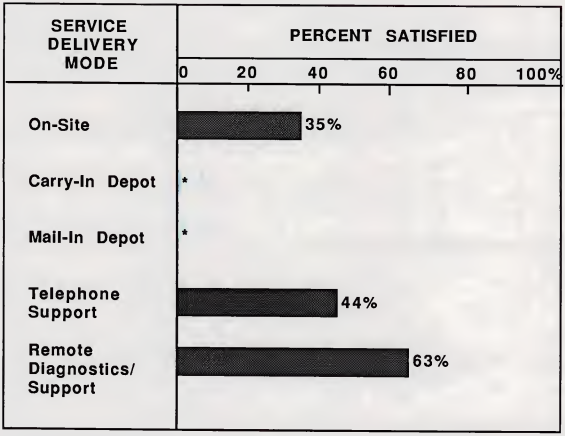
* Rating: 1 = Low, 10 = High

† Average Standard Error of the Mean: 0.4

** Insufficient Response

EXHIBIT III-H-9

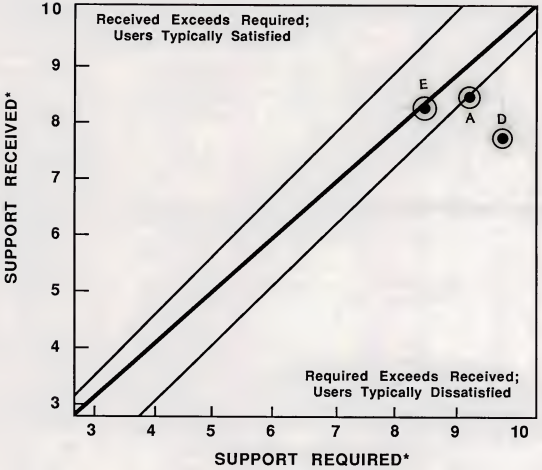
TELECOM USER SATISFACTION WITH SERVICE DELIVERY ROLM



* Insufficient Response

EXHIBIT III-H-10

TELECOM DELIVERY REQUIRED VERSUS RECEIVED ROLM



A: On-Site

D: Telephone Support

E: Remote Diagnostics/Support

* Rating: 1 = Low, 10 = High

FTEU S

- Rolm users did not indicate a significant willingness to use third-party service (rating their willingness as a 5.6 on a scale of 10). The sample expressed a preference for dealing with the manufacturer of a product when support of that product was needed. This preference is also indicated by the importance placed by users on a single source of service (rating a 7.5 on a scale of 10).

III I. RACAL-MILGO

- INPUT interviewed 25 users of Racal-Milgo modems and multiplexers in October of this year regarding the support they were receiving from their service vendor. All members of the sample were supported by Racal-Milgo's service organization, and 96% of users held a contractual agreement for their vendor support.

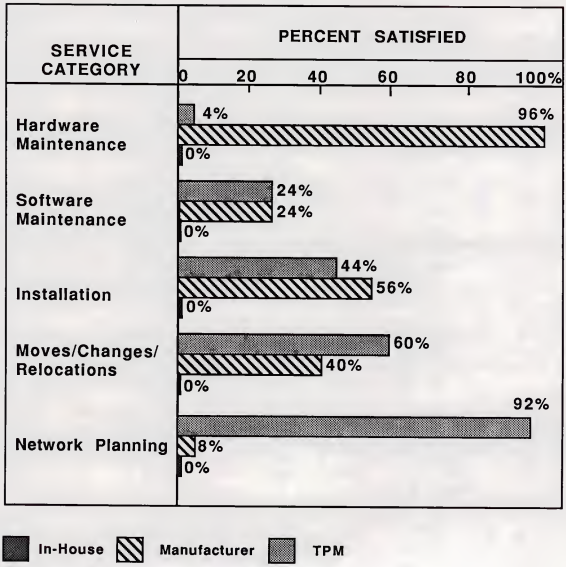
- Each interview was conducted by phone, and high-ranking telecom and data processing personnel were targeted for response. The interviews, lasting approximately 20 to 25 minutes on average, were responded to by staff with titles ranging from vice president-information services, vice president of communications, and teleprocessing specialist to data communications manager, operations supervisor, and technical support administrator.

- Ten standard accepted industry categories were covered within the sample. There was a slight concentration in the distribution industry, with 28% of the sample; federal government, banking and finance, and the insurance industries each comprised 12% of the sample; the services and utilities industries as well as firms included as "other industry specific" each totaled 8%; and medical, transportation, and manufacturing covered 4% each of the sample.

- Exhibit III-1-1 presents the percentages of users' service source within the categories of maintenance addressed. Ninety-six percent of the sample received hardware support from Racal-Milgo, and 56% received installation support from the manufacturer. Slightly lower penetration was achieved by the vendor in the areas of moves/changes and software maintenance; 60% of users performed move/change work internally, and an equal percentage (24%) opted to enlist Racal-Milgo for software service as did the support themselves. An area of very low vendor penetration was network planning, with only 8% of users receiving consulting assistance from their manufacturer. Third-party maintenance held no part of the Racal-Vadic support user base within the sample.

EXHIBIT III-I-1

TELECOM SUPPORT SOURCES
RACAL-MILGO



FTEU S

- Traditional measures of service performance are presented in Exhibit III-1-2. Racal-Milgo users received system availability at 98.8 and experienced 1.3 interruptions per month on the average. Identified causes of the failures were hardware in 75% of the cases and software in 25%.

- Response times reported by Racal-Milgo users varied tremendously, partially because of a relatively high percentage (20%) of users opting for depot support versus quicker on-site response. Both response and repair times ranged between one hour and two days, and the median value for each measure was a more realistic two hours. Mean response as traditionally measured, however, was 9.8 hours, and mean time to repair measured 8.4 hours.

- Exhibit III-1-3 provides measures of users' expectations for performance in these areas as compared to vendor service delivery. Racal-Milgo users expect uptimes over 99%, with actual performance falling below needs by only 0.5%. Response time expectations lag seven hours behind actual times received, and repair times fall more than three hours behind user-expressed needs. Again, the 20% of users receiving depot repair artificially inflate these differences, but on average, users are still expecting somewhat faster response and repair of their units.

- User satisfaction with these areas of service is recorded in Exhibit III-1-4 and shows relatively high levels of satisfaction among Racal-Milgo users, overall among the highest of the user groups contacted. Even in the areas of response and repair, users expressed fair amounts of satisfaction with the support they receive, and the area commonly rated the lowest among the categories--price of support--received a fair rating of 7.2. Overall support is rated at 8.1 among Racal-Milgo users.

- Exhibit III-1-5 compares user requirements in various categories of support to the levels of service received by users. Very high requirements are rated for

EXHIBIT III-I-2

TELECOM SERVICE PERFORMANCE
RACAL-MILGO

SERVICE COMPONENT	
Average System Availability (Percent)	98.8%
Average Number of System Interruptions	
Per Month (Number)	1.3
Hardware Caused (Percent)	75.0%
Software Caused (Percent)	25.0%
Average Response Time (Hours)	9.8 Hours
Average Repair Time (Hours)	8.4 Hours

EXHIBIT III-I-3

TELECOM USER EXPECTATIONS FOR SERVICE PERFORMANCE
RACAL-MILGO

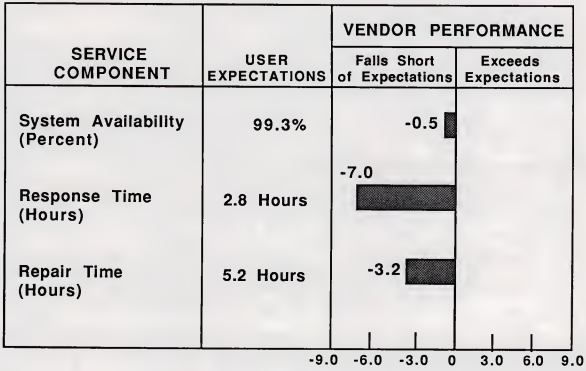
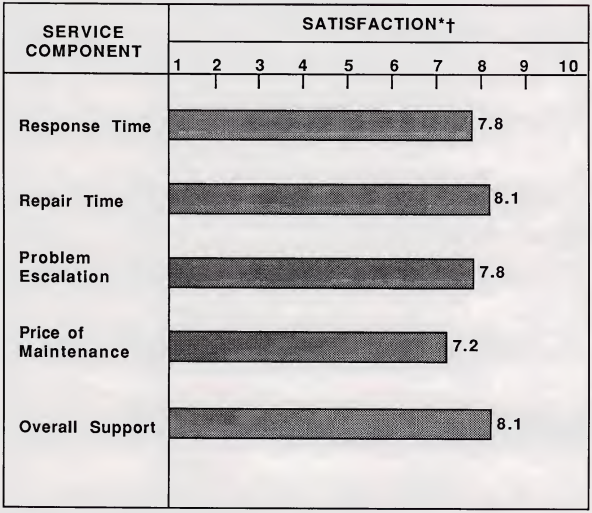


EXHIBIT III-I-4

TELECOM USER SATISFACTION WITH SERVICE DELIVERY
RACAL-MILGO



* Rating: 1 = Low, 10 = High
† Average Standard Error of the Mean: 0.4

EXHIBIT III-I-5

TELECOM USER SERVICE RATINGS
RACAL-MILGO

SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	REQUIRED†	RECEIVED†	
Hardware Maintenance	9.4	8.5	(0.9)
Software Maintenance	4.1	8.7	4.6
Training	4.4	7.4	3.0
Consulting	4.6	7.7	3.1
Parts Availability	9.1	8.2	(0.9)
Engineer Skill Level	8.9	8.1	(0.8)
Moves/Changes/ Relocation	5.2	8.0	2.8

User Expectations Exceed Vendor Performance

* Rating: 1 = Low, 10 = High

† Average Standard Error of the Mean: 0.5

** Insufficient Response

FTEU S

hardware maintenance, parts availability, and engineer skill level, and vendor performance falls below expectations in all of these important areas. The level of software support received, a category of relatively low importance to Racal-Milgo users (rated a requirement of only 4.1), far surpasses user needs; the story is similar with the lower priority categories of training and consulting.

- Exhibit III-1-6 presents the percentage of users expressing satisfaction with the levels of support received in these categories. As could be expected, the high-priority area of hardware maintenance (rated at the highest requirement in Exhibit III-1-5) shows the fewest users satisfied, while the less important area of software support satisfies 100% of sampled users.

- In viewing Exhibit III-1-7, the discrepancies experienced by Racal-Milgo users are illustrated. Areas of high importance to users are falling below the target area, while other less urgent needs are being served at levels beyond user requirements. To effect the greatest increase in user satisfaction, the categories of support most important to users must be improved drastically. Incremental satisfaction gained by overcompensation in less important areas is insignificant in increasing user satisfaction overall.

- Exhibit III-1-8 compares user requirements to vendor support in the various modes of service delivery. Racal-Milgo users found on-site and telephone support of highest requirement, both areas falling (statistically insignificantly) above levels of requirement among users, on average. Remote support was reported to be received at high levels on average, exceeding user requirements by 3.7 points overall.

- Exhibit III-1-9, however, exposes the variation in these levels of support received as the actual percentages of users satisfied within these areas of support are presented. User satisfaction with on-site support ranks just over 50%, and inconsistencies in reports of service delivery in the remaining two areas of support indicate a similar problem in Racal-Milgo service delivery.

EXHIBIT III-I-6

TELECOM USER SATISFACTION
RACAL-MILGO

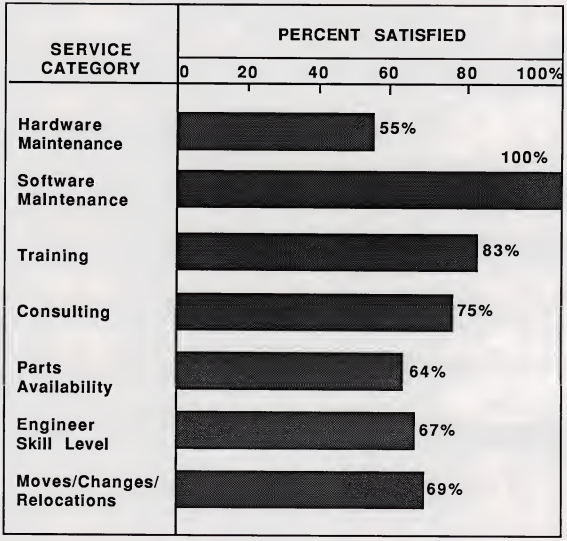
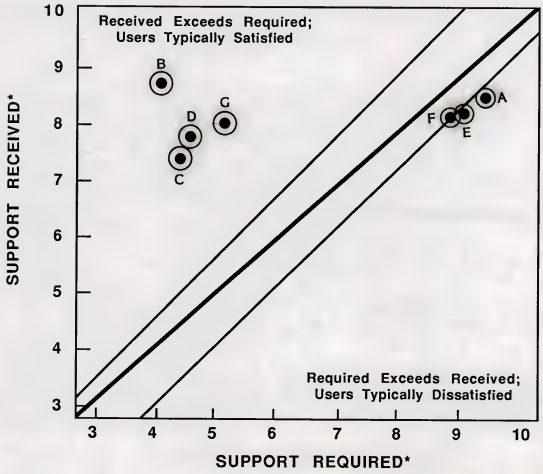


EXHIBIT III-I-7

TELECOM SERVICES REQUIRED VERSUS RECEIVED
RACAL-MILGO



A: Hardware Maintenance
B: Software Maintenance
C: Training
D: Consulting
E: Parts Availability
F: Engineer Skill Level
G: Moves/Changes/Relocation

* Rating: 1 = Low, 10 = High

FTEU S

EXHIBIT III-I-8

TELECOM SERVICE DELIVERY RATINGS
RACAL-MILGO

SERVICE DELIVERY MODE	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	REQUIRED†	RECEIVED†	
On-Site Support	7.6	7.9	0.3
Carry-In Depot	2.3	**	--
Mail-In Depot	3.7	**	--
Telephone Support	7.1	7.8	0.7
Remote Diagnostics/ Support	4.8	8.5	3.7

▨ User Expectations Exceed Vendor Performance

* Rating: 1 = Low, 10 = High

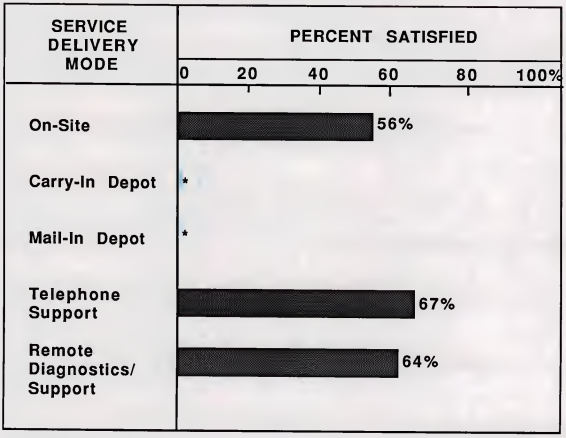
† Average Standard Error of the Mean: 0.7

** Insufficient Response

FTEU S

EXHIBIT III-I-9

TELECOM USER SATISFACTION WITH SERVICE DELIVERY
RACAL-MILGO



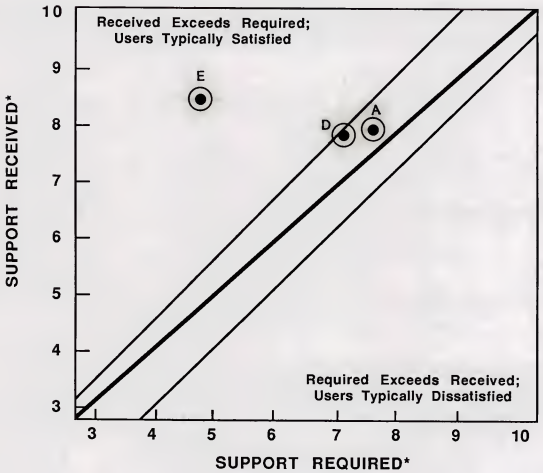
* Insufficient Response

- The positioning of these areas of support on average are graphed in Exhibit III-1-10. Although the two higher rated of the applicable categories approach the target area, the absolute percentages of dissatisfied customers must be kept in mind in order to properly assess Racl-Milgo's performance.

- Users of Racal-Milgo telecom equipment expressed a relatively low willingness to use a third-party vendor for support of their telecom unit, currently rating this willingness at 4.7. The very same users, however, did reveal a higher rating of importance of maintenance from a single source (7.8), and as TPM companies gain a more solid reputation in telecommunications, this importance may interpret into increased willingness to use TPM as an alternative to manufacturer-supplied support.

EXHIBIT III-1-10

TELECOM DELIVERY REQUIRED VERSUS RECEIVED
RACAL-MILGO



A: On-Site

D: Telephone Support

E: Remote Diagnostics/Support

* Rating: 1 = Low, 10 = High

FTEUS

III J. ALL TELECOM USERS

- In September and October of this year, INPUT contacted 195 users of telecommunications equipment from nine specific vendors--AT&T, Codex, General Datacom, IBM, Northern Telecom, Paradyne, Racal-Milgo, Racal-Vadic, and Rolm. The results of each individual study are presented separately in the previous sections of this module, and responses as measured across vendor lines are considered in this final section.

- Industries within 12 standardly recognized categories were included among the sample as a whole. Firms involved in the insurance industry were most heavily represented with 21% of the sample; distribution was the second most common industry at 17%; manufacturing held a 13% share; banking and finance, 12%; the services industry, 9%; and utilities, 6%. Federal government and medical constituted 4% each. Each of the transportation, education, and state/local government categories constituted 3%, and the telecommunications industry, 2%. The remaining 3% were firms categorized as "other industry specific."

- All of the 195 interviews were conducted by phone, each lasting from 15 to 20 minutes, and high ranking data processing and telecommunications staff at each firm were targeted for response. Fifty percent of respondents were classified as network/telecommunications personnel, with such titles as communications coordinator, director of corporate telecommunications, manager of network systems, and teleprocessing specialist. DP/MIS mangaers were the next most common respondents, with 24% of the sample under such titles as vice president-information systems, data center supervisor, and data coordinator. Another 18% represented technical/operations management, with titles ranging from technical services manager and facilities supervisor, to data support manager and operations supervisor. The remaining 8% were classified among non-specific administrative personnel, such as assistant vice president, administrative manager, and vice president-resources.

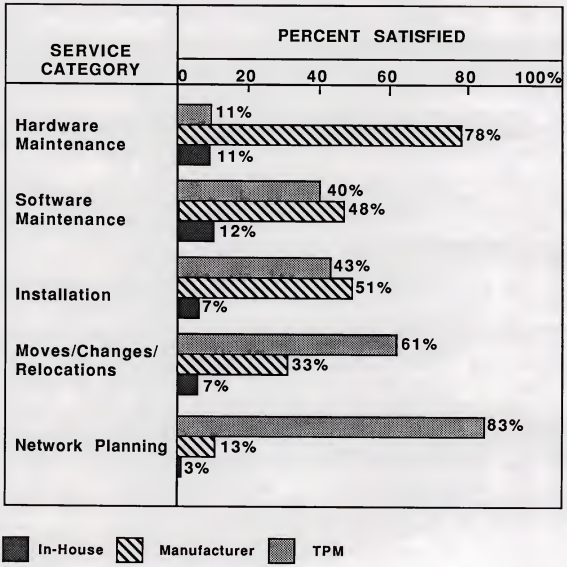
- The most commonly used piece of telecommunications equipment within our sample was modems, with 69% of the users responding with the support received on their modem unit in mind. Twenty-five percent of the sample worked with PBX or CBX units, and the remaining 6% with multiplexers. Support for this equipment was received on-site in 83% of all cases, and 87% of users contracted with their vendor for service.

- Users most often depended on the manufacturer of their unit for support, with 87% of the entire sample purchasing maintenance service from their equipment vendor; 13% of users contacted relied upon third-party support. Users overall rated their concurrent willingness to enlist TPM in support of their telecom units at a relatively low 4.9. This rating, however, will undoubtedly increase in magnitude as third-party gains presence in the telecom market. Currently, few TPM firms enjoy an established reputation as a reliable source of telecomm support, but as TPM vendors gain experience and exposure within the marketplace, users' confidence in third-party support will increase. Most managers of support for data processing equipment already recognized third-party maintenance as a viable alternative to manufacturer-supplied support. Corporate organizations in which telecommunications and computer support are operationally separate may be somewhat less experienced with TPM. As the interrelation of these two operational functions increases, however, third-party support will no doubt become a greater force within the telecom market.

- Exhibit III-J-1 presents the breakdown by service source of our telecom user sample as a whole. Manufacturer support is much more prevalent in the areas of hardware and software maintenance and installation services than in the remaining post-sales support areas of moves/changes and network planning services. Third-party vendors also hold their strongest share in the areas of hardware and software support, but at much lower percentages than enjoyed by manufacturers.

EXHIBIT III-J-1

TELECOM SUPPORT SOURCES
ALL USERS



- The extended services of moves/changes and consulting offer great potential to telecommunications support vendors, as the majority of users do require these services but currently perform them internally for the most part. Network planning will be of particular potential as telecommunications and data processing systems become more interdependent and users increase their need for broad technical expertise in their planning activities.

- Service performance as measured traditionally is presented in Exhibit III-J-2 across our entire sample. Telecom users on the whole experienced an average of two system interruptions per month, resulting in uptimes averaging 98.1%. Actual responses ranged between 80% and 100% availability, with between 0 and 15 interruptions reported. Forty-six percent of users, however, experienced no interruptions in processing over the past six months, and 78% of the sample experienced two or less per month.

- Considering both on-site and depot repair within our user groups, response and repair times vary, as would be expected. Response to trouble calls ranged from 15 minutes to 48 hours, with an average value of 5.7 hours or well within one working day. The median response was two hours, undoubtedly a more realistic measure in consideration of the low (17%) proportion of depot repair users.

- Average repair times fell over an even broader range, reflecting the differentiation of on-site service capabilities versus depot repair turnaround. Repairs were effected as quickly as 15 minutes after field engineer arrival on-site and took as long as three weeks in return of equipment repaired at a support depot. The median value, again, represents a more realistic repair time at 3 hours. Ninety percent of users reported repair times within 48 hours.

- These measures of support performance are viewed in context with user expectations in Exhibit III-J-3. Across vendor lines, users had slightly higher expectations for system availability at 99.2%. Response was expected in just over 4.5 hours on average, vendor performance lagging by close to 1.5 hours

EXHIBIT III-J-2

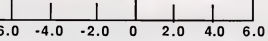
TELECOM SERVICE PERFORMANCE
ALL USERS

SERVICE COMPONENT	
Average System Availability (Percent)	98.1%
Average Number of System Interruptions	
Per Month (Number)	2.0
Hardware Caused (Percent)	70.0%
Software Caused (Percent)	29.2%
Average Response Time (Hours)	5.7 Hours
Average Repair Time (Hours)	27.6 Hours

EXHIBIT III-J-3

TELECOM USER EXPECTATIONS FOR SERVICE PERFORMANCE
ALL USERS

SERVICE COMPONENT	USER EXPECTATIONS	VENDOR PERFORMANCE: Falls Short of Expectations	VENDOR PERFORMANCE: Exceeds Expectations
System Availability (Percent)	99.2%	-1.1	
Response Time (Hours)	4.4 Hours	-1.3	
Repair Time (Hours)	22.2 Hours	-5.4	



overall. Users were also disappointed in problem resolution times, with repairs completed over five hours slower than expected.

- Despite these discrepancies in average measures, users expressed relatively high satisfaction with the support they received in these areas, as reported in Exhibit III-J-4. Overall satisfaction with the support delivered rated 8.0, as did satisfaction with repair times, regardless of differentials in actual times reported. Satisfaction with response followed closely at 7.9, and problem escalation rated 7.6 across user lines. The cost associated with support received was, for all manufacturers, the area of lowest satisfaction, as reflected by this aggregate rating of 6.7.

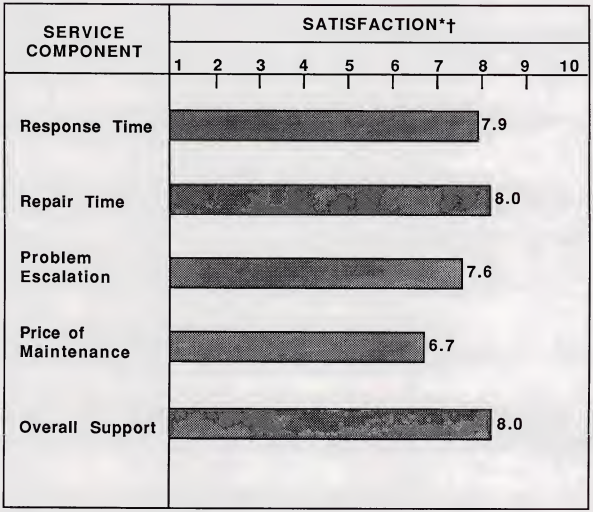
- User ratings of the levels of service supplied in specific areas of support are shown in Exhibit III-J-5. Three areas of support considered lacking by almost every user group were the related categories of hardware maintenance, parts avaliability, and engineer skill level, as reflected by these overall ratings. Consistently high requirements in these areas of support made performance to user needs difficult, if not impossible in some cases, and despite the relatively high levels of vendor performance, support delivery fell below user requirements in most user groups.

- On the other hand, areas of support rated consistently lower in importance by users were overly provided, often at the cost of performance in the high priority services. Even more basic services, such as software support, were considerably less important to telecom users than the three hardware-related areas.

- Exhibit III-J-6 presents another view of users' perceptions of vendor performance, graphing the percentage of users satisfied with the level of support received in these areas. As could be predicted, the low overall ratings of hardware maintenance, parts access, and engineer skill are reflected in the low proportions of users expressing satisfaction with the vendor performance within these categories. Other areas of low priority, such as consulting and

EXHIBIT III-J-4

TELECOM USER SATISFACTION WITH SERVICE DELIVERY
ALL USERS



* Rating: 1 = Low, 10 = High
† Average Standard Error of the Mean: 0.1

EXHIBIT III-J-5

TELECOM USER SERVICE RATINGS
ALL USERS

SERVICE CATEGORY	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	REQUIRED†	RECEIVED†	
Hardware Maintenance	9.5	8.2	(1.3)
Software Maintenance	5.7	8.1	2.4
Training	5.5	7.5	2.0
Consulting	5.4	7.3	1.9
Parts Availability	9.2	8.1	(1.1)
Engineer Skill Level	9.1	7.9	(1.2)
Moves/Changes/ Relocation	5.4	7.9	2.5

User Expectations Exceed Vendor Performance

* Rating: 1 = Low, 10 = High

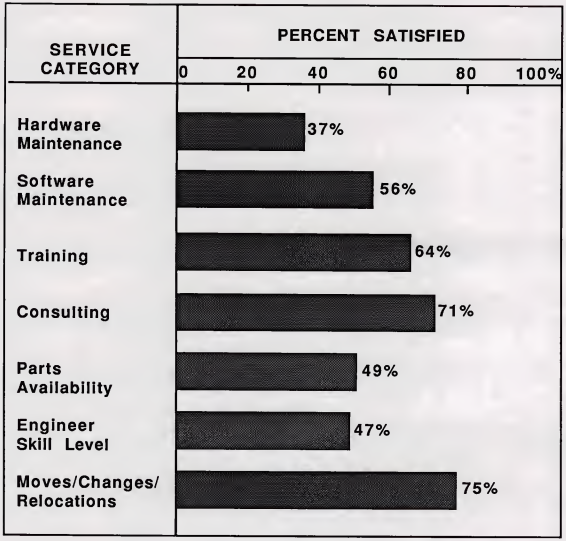
† Average Standard Error of the Mean: 0.1

** Insufficient Response

FTEU S

EXHIBIT III-J-6

TELECOM USER SATISFACTION
ALL USERS



moves/changes/relocations, show consistently higher percentages of satisfied users. The relatively low satisfaction with software support despite high ratings of the support received on average (see Exhibit III-J-5) reflects the wide range in reported software support delivery between vendors.

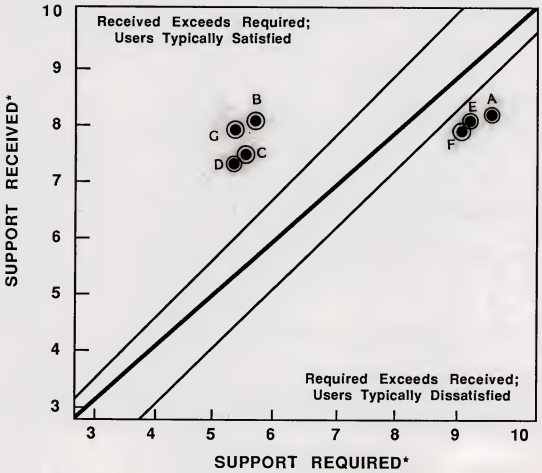
- Exhibit III-J-7 revisits the issue of proper resource allocation among these areas of support. Graphically depicting the discrepancies between user requirements and vendor provision, the exhibit illustrates the overprovision of support in areas of low importance to users (such as software maintenance, training, and moves/changes/relocations) while services of extremely high priority (namely hardware, parts, and engineer support) remain well below user needs. Incrementally, user satisfaction is not affected by service provided beyond user requirements. The reallocation of these underutilized resources toward the meeting of user requirements in high-priority areas, however, would have positive and considerable effect on users' satisfaction with vendor performance.

- Exhibit III-J-8 considers user requirements and vendor performance within the various modes of telecom support delivery. Support delivered on the users' site was rated most highly (a requirement of 7.6), as 83% of the sample participated in this type of maintenance. Users, on the average, were receiving levels of on-site support which satisfied their requirements. Telephone support was also of relative importance to users, at a requirement of 7.5 overall, and on average, these requirements were met within the range of standard error. Carry- and mail-in support were not as popular among our sample, with only 18% utilizing depot service delivery. Requirements were, obviously, lower for such services, rated at 2.5 for carry-in support and 4.1 for mail-in.

- The broad range of vendor performance within these areas is reflected in Exhibit III-J-9. Percentages of users expressing satisfaction with the service in each of these areas are relatively low, in comparison to the average ratings received (in Exhibit III-J-8). Less than half of respondents were satisfied with

EXHIBIT III-J-7

TELECOM SERVICES REQUIRED VERSUS RECEIVED
ALL USERS



A: Hardware Maintenance
B: Software Maintenance
C: Training
D: Consulting
E: Parts Availability
F: Engineer Skill Level
G: Moves/Changes/Relocation

* Rating: 1 = Low, 10 = High

EXHIBIT III-J-8

TELECOM SERVICE DELIVERY RATINGS
ALL USERS

SERVICE DELIVERY MODE	LEVEL OF SERVICE*		SERVICE EXCEEDS (Falls Below) USER REQUIREMENTS
	REQUIRED†	RECEIVED†	
On-Site Support	7.6	8.2	0.6
Carry-In Depot	2.5	6.4	3.9
Mail-In Depot	4.1	7.3	3.2
Telephone Support	7.5	7.6	(0.1)
Remote Diagnostics/ Support	6.3	7.7	1.4

▒ User Expectations Exceed Vendor Performance

* Rating: 1 = Low, 10 = High

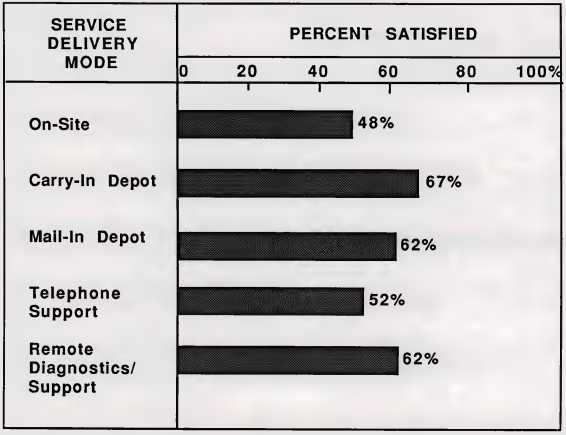
† Average Standard Error of the Mean: 0.3

** Insufficient Response

FTEU S

EXHIBIT III-J-9

TELECOM USER SATISFACTION WITH SERVICE DELIVERY
ALL USERS



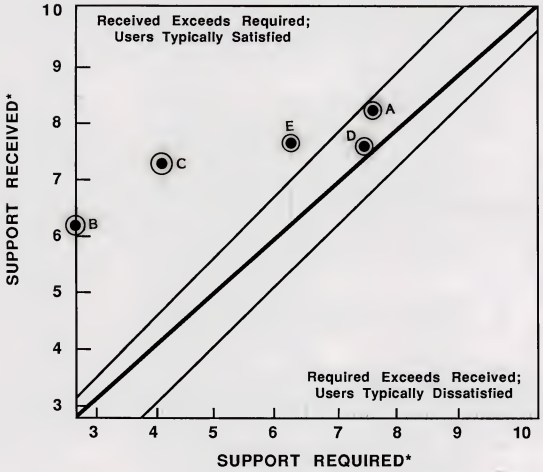
* Insufficient Response

the level of on-site support received (a factor of low satisfaction with hardware maintenance, and problem areas such as parts procurement and engineer skill as previously discussed), and just over half found "hotline" support satisfactory. Again, the areas of highest priority among users show the lowest levels of satisfaction.

- Exhibit III-J-10 demonstrates the relationship between user prioritization and vendor performance of service. Areas of greatest importance to users, such as phone support and on-site delivery, although approaching the target area when considered on average, are areas in need of considerable improvement by some vendors, as reflected by the percentages reported in Exhibit III-J-9. Comments regarding the disconcerting turnaround in engineering support staff as well as inconsistency in the quality of service over time were common. Interface with hotline staff and on-site engineers are often the only "tangible" aspects of a support relationship, and the users' perception of the consistency as well as the quality of a vendors' support product are often based primarily on these aspects. A lack of communication and flexibility were other common complaints recorded by interviewers and, again, can be closely tied to the relationship between user and support staff. This aspect of service delivery, no matter how inconsequential this level of communication may be to actual uptime or repair procedures, is key to user satisfaction and, in turn, key to support vendors' success in the market.

EXHIBIT III-J-10

TELECOM DELIVERY REQUIRED VERSUS RECEIVED
ALL USERS



A: On-Site
B: Carry-In Depot
C: Mail-In Depot
D: Telephone Support
E: Remote Diagnostics/Support

* Rating: 1 = Low, 10 = High

ABOUT INPUT

Company Profile

Founded in 1974, INPUT has become a leading international planning services firm. Clients include over 200 of the world's largest and most technically advanced companies.

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, office systems, and information services. Clients receive reports, presentations, access to data on which analyses are based, and continuous client support.

INPUT is a service company. Through advisory/research subscription services, multiclient studies, and proprietary consulting, INPUT serves clients' on-going planning information needs.

INPUT Planning Services

INPUT offers five continuous information services addressing U.S. markets and two programs covering Western European markets:

- **Market Analysis and Planning Service (MAPS)** provides up-to-date market analyses, five-year forecasts, trend analyses, and sound recommendations for action. MAPS is designed to satisfy planning and marketing requirements of information services vendors.

- **Company Analysis and Monitoring Service (CAMS)** is a comprehensive reference service covering more than 4,000 U.S. information services vendor organizations. CAMS is often used for competitive analysis and pre-screening of acquisition and joint venture candidates.

- **Information Systems Program (ISP)** is designed for executives of large information systems organizations and provides crucial information for planning, procurement, and management decision making. The program examines new service offerings, technological advances, user requirements for systems and services, MIS spending patterns, and more. ISP is widely used by both user and vendor organizations.

- **Customer Service Program (CSP)** provides senior customer service organization management with data and analysis needed for marketing, technical, financial, and organizational planning. The program pinpoints user perceptions of service received, presents vendor-by-vendor service comparisons, and analyzes and forecasts the following markets:

- Large systems service.
- Small systems service.
- Telecommunications systems service.
- Software maintenance.
- Third-party maintenance.

- **Federal Information Systems and Services Program (FISSP)** presents highly specific information on federal procurement practices, identifies vendor opportunities, and provides guidance from INPUT's experienced Washington professionals to help clients maximize sales effectiveness in the government marketplace.

- **Western European Customer Service Program** parallels the U.S. Customer Service Program, dealing with comparable issues in European markets.

- **Western European Software and Services Planning Service (SSPS)** analyzes and forecasts information for European information services markets. Clients receive timely planning information through research-based studies, conferences, client meetings, and continuous client support.

Proprietary Services

The combination of INPUT's planning services and staff expertise provides clients with a uniquely qualified resource for custom research. These proprietary studies take two forms: **multiclient research services,** or in-depth analyses of common issues; and **custom consulting** for a single client. Some of the recent and more frequent topics are:

- Strategy planning and support.
- Product evaluation.
- New market identification.
- Distribution channels.
- Due diligence analysis and support.
- Customer attitude surveys.
- Acquisition research and support.
- Sales and marketing audits.

Clients also benefit from secondary research performed by INPUT for other programs and from INPUT's concentration on the information services industry in general.

Staff Profile

INPUT's professional staff have backgrounds in marketing, planning, information processing, and market research. Educational backgrounds include both technical and business specializations, and many INPUT staff hold advanced degrees.

Many of INPUT's professional staff have held executive positions in the following business sectors:

- Computer systems
- Software
- Turnkey systems
- Field service (customer service)
- Processing services
- Professional services
- Data processing
- Network services
- Communications

About INPUT...

- More than 5,000 organizations, worldwide, have charted business directions based on INPUT's research and analysis.
- Many clients invest more than $50,000 each year to receive INPUT's recommendations and planning information.
- INPUT conducts proprietary research, regularly, for some of the largest companies in the world.
- INPUT has developed and maintains one of the most complete information industry libraries in the world (access is granted to all INPUT clients).
- INPUT clients control an estimated 70% of the total information industry market.
- INPUT analyses and forecasts are founded upon years of practical experience, knowledge of historical industry performance, continual tracking of day-to-day industry events, knowledge of user and vendor plans, and business savvy.
- INPUT analysts accurately predicted the growth of the information services market--at a time when most research organizations deemed it a transient market. INPUT predicted the growth of the microcomputer market in 1980 and accurately forecasted its slowdown in 1984.

For More Information...

INPUT offers products and services that can improve productivity, and ultimately profit, in your firm. Please give us a call today. Our representatives will be happy to send you further information on our services or to arrange a formal presentation at your offices.

For details on delivery schedules, client service entitlement, or **Hotline support simply call your nearest INPUT office (listed on the next page);** our customer support group will be available to answer your questions.

INPUT Offices

California (Headquarters)
1943 Landings Drive
Mountain View, CA 94043
(415) 960-3990
Telex 171407

INPUT, Inc.
8298 C, Old Courthouse Rd.
Vienna, VA 22180
(703) 847-6870

United Kingdom
INPUT Ltd.
41 Dover Street
London W1X 3RB
England
(441) 493-9335
Telex 27113

Japan
ODS Corporation
Dai-ni Kuyo Building
5-10-2, Minami-Aoyama
Minato-ku,
Tokyo 107, Japan
(03) 400-7090
Telex 26487

New York
Parsippany Place Corporate Center
Suite 201
959 Route 46 East
Parsippany, NJ 07054
(201) 299-6999
Telex 134630

Italy
Nomos Sistema SRL
20124 Milano
Viale Vittorio Veneto 6
Italy
228140 and 225151
Telex 321137

Sweden
Athena Konsult AB
Box 22232
S-104 22 Stockholm
Sweden
08-542025
Telex 17041