INPUT

STRATEGIC MARKET PERSPECTIVE

Systems Software Support Contracts in an Open Environment

Europe, 1994

Customer Services Programme—Europe

JUNE 1994

Systems Software Support Contracts in an Open Environment

Europe, 1994

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75016 Paris
France
Tel. +33 (1) 46 47 65 65
Fax +33 (1) 46 47 69 50

San Francisco
1881 Landings Drive
Mountain View
CA 94043-0848
U.S.A.
Tel. 1 (415) 961-3300
Fax 1 (415) 961-3966

Tokyo
Saida Building, 4-6,
Kanda Sakuma-cho
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Japan
Tel. +81 3 3864-0531
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Washington, D.C.
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Suite 560
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Tel. 1 (703) 847-6870
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Abstract

Rapid technological advance has driven the development of the *open systems* environment in which IT users face an unparalleled degree of choice. Consequently, users are demanding quality products supported by quality service. This presents an important challenge to customer services vendors who must seek ways of supplying quality *open services* that are profitable to deliver.

This report reviews the current competitive situation regarding the provision of systems software support, an area which is set to play a key role in customer services in the 1990s. The report is based on a survey of European users and vendors conducted in the three months up to January 1994.

Vendor research examined current practice in the delivery of systems software support services. The primary focus was placed on support service offerings and contract terms.

The user survey researched issues, attitudes and satisfaction concerned with systems software support services in mid-range and substantial networked based PC installations, the sector of the market most dominated by the *open systems* phenomenon. Results of the survey, conducted in Germany, France and the United Kingdom, reveal the need for customer services vendors to shift the focus of their attention to the users of systems software. Vendors are alerted to the importance of targeting customer expectations, demonstrating value for money in pricing and reskilling the service workforce.

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INPUT
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London W1X 7FB
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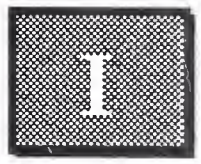
Exhibits



Introduction

This report was produced as part of INPUT's 1994 Customer Services Programme in Europe.

A Purpose

The purpose of this report is to provide customer services vendors with an analysis of current conditions relating to systems software support contracts in the open systems market in Europe.

Software product support is an area of increasing importance, particularly within the highly competitive open systems and client/server markets. In 1993, the European market for software product support was estimated to be worth $3 billion. Vendors from all sectors are now challenging for business in the *open services* market, within which software product support is expected to be a key contributor to success.

This report focuses on the support arrangements for *systems software products,* which includes systems control and data centre management products, but excludes application software products. The report analyses user issues concerning systems software support, and compares support features currently offered by leading vendors in the European market.

B Scope

INPUT defines the Systems Software Support sector as software maintenance activities that relate to systems software, not applications software. Included are associated support activities such as telephone support, problem analysis and software diagnostics.

Exhibit I-1 illustrates INPUT's definition of the software products market. Aspects of systems software support which are included by INPUT in the customer services market are restricted to the large rectangular box on the left of the exhibit. They relate to system control and data centre management software products.

Exhibit I-2 shows the Systems Software Support sector in the overall context of the customer services market. The other five sectors in this market are:

- Equipment services
- Environmental services
- Education and training
- Professional services
- Business continuity services.

In each service sector, the definition of user expenditure includes only those services provided to users by an external organisation on a chargeable basis. Services provided by subsidiaries or internal resources are excluded from the open market.

For a complete coverage of the entire customer services opportunity see the INPUT report *Customer Services Market Analysis and Forecast - Europe, 1993-1998 (October 1993).*

Exhibit I-1

Software Products Market Structure

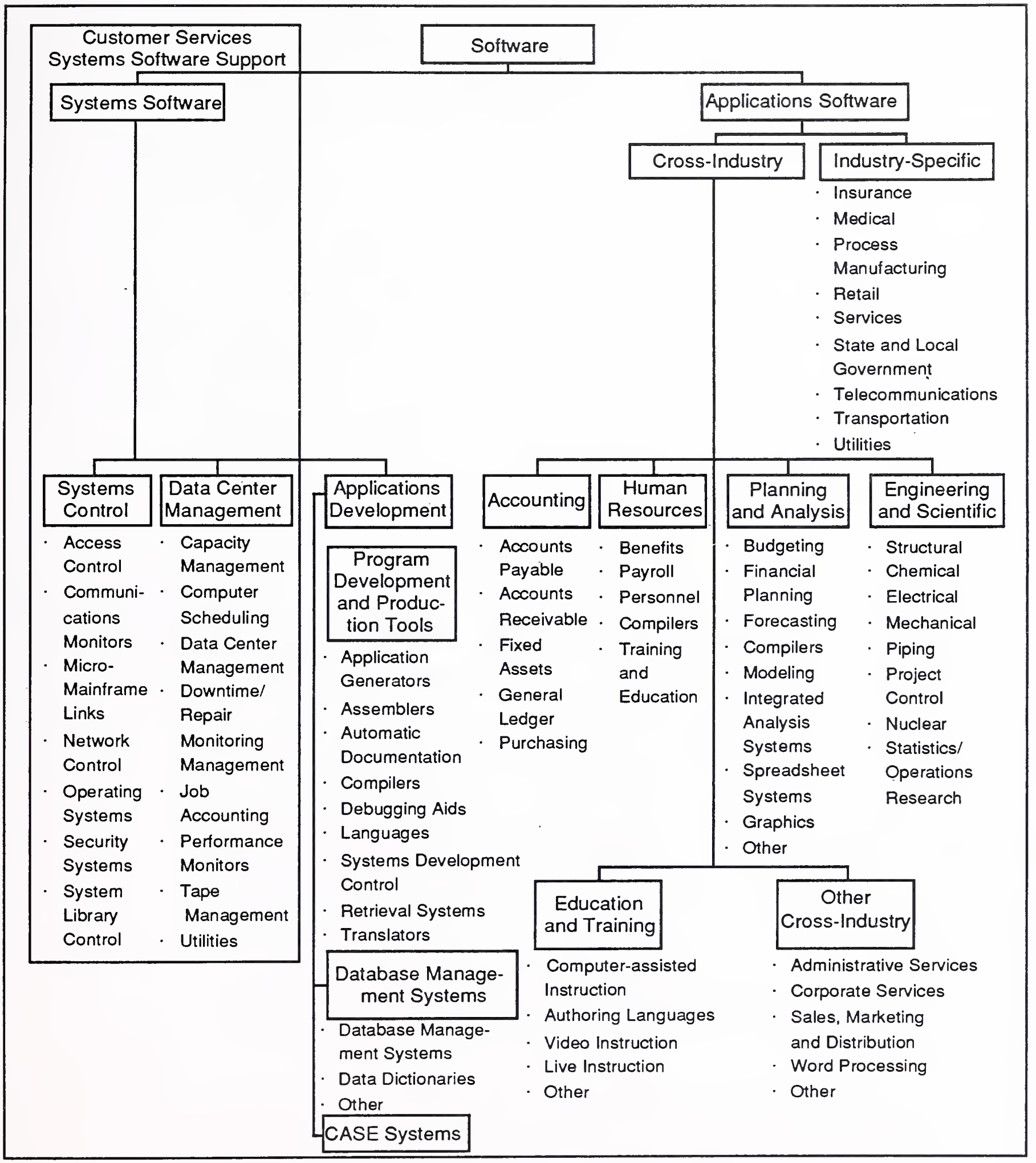
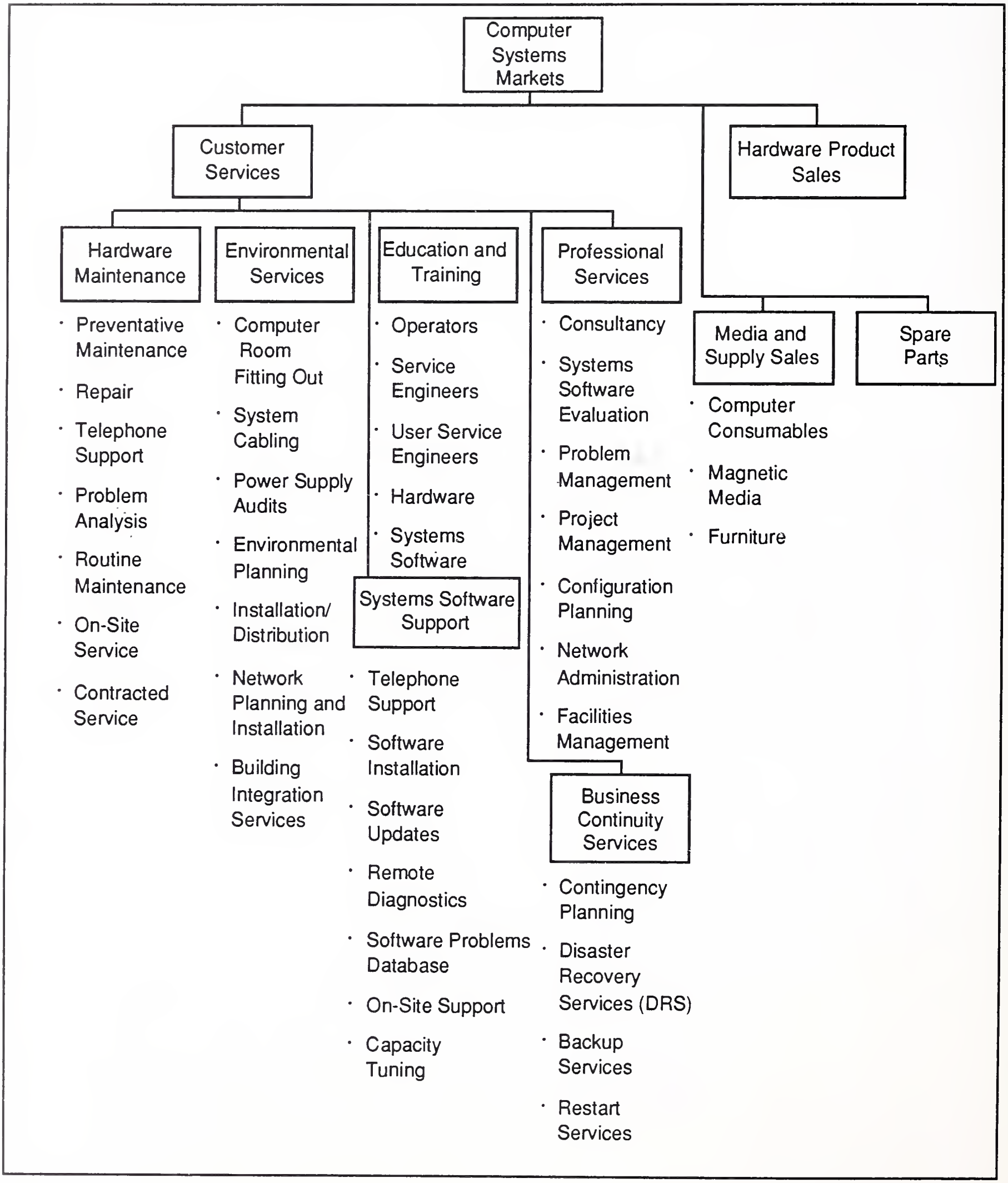


Exhibit I-2

Customer Services Market Structure



C
Methodology

The methodology used in the preparation of this report comprised both a user and a vendor survey supported by INPUT's continuous research of European customer services markets.

The user research was based on a standard questionnaire (see Appendix B) designed to identify key user issues in respect of systems software support contracts and delivery. One hundred interviews were conducted by telephone in Germany, France and the United Kingdom during the three months up to January 1994. Respondents were selected to be a random sample of managers responsible for systems software products operating on mid-range computers and substantial network-*based* PC installations.

The vendor data was obtained from direct communication (both telephone and face-to-face interviews) with major European service vendors from within the IT industry. This information was supplemented by INPUT's continuous research of the customer services industry within Europe.

D
Report Structure

The remaining chapters of this report are organised as follows:

Chapter II is an executive overview that summarises the major findings and recommendations of the report.

Chapter III provides the analysis of the user research covering the topics of user support arrangements, value for money issues, satisfaction with systems software support services and the importance of various features of systems software support contracts.

Chapter IV examines comparative systems software support offerings for the following vendors: IBM, Bull, Pyramid, Sun, Hewlett-Packard and Digital.

Appendix A contains a discussion of the trends and issues currently affecting the US systems software products market, previously published as part of INPUT's Market Analysis Program (MAP) in the U.S.

Appendix B contains the questionnaire used for the user telephone survey

Appendix C contains country data tabulations that support the European analysis shown as exhibits in Chapter III.

E
Related INPUT Reports

Other INPUT reports which address topics related to the subjects discussed here include the following:

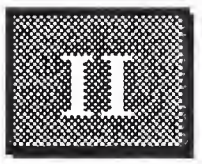
Customer Services Market Analysis and Forecast - Europe, 1993-1998 (October 1993)

US Systems Software Market - 1993-1998 (October 1993)

User Issues and Trends in European Customer Services (February 1993)

User Satisfaction in Europe - Mid-range Systems (March 1993)

Open Systems Services Challenges and Strategies - Europe (March 1993)



Executive Overview

A
User Focus the Key to Systems Software Support

Traditionally, systems software support has meant the response to problems with software products rather than the support of the people using those products. Hence, software product support has tended to be a reactive service, based on the response/restore model of service delivery.

However, driven by the twin forces of *open services* competition and the creation of a mass market of *non-specialist* users, the emphasis of software product support is changing. Exhibit II-1 summarises the key changes occurring in software product support.

Exhibit II-1

Software Support Service Directions

Past	Future
• Product Support	• User Support
• Product-based Pricing	• Service (Cost-based) Pricing
• Response/Restore	• Availability
• Proprietary	• Open
• Data Centre	• Network/Desktop

Source: INPUT

Essentially, vendors' support emphasis needs to switch from reactive, remedial support of products to the provision of proactive support for users. In this environment, vendors can succeed by:

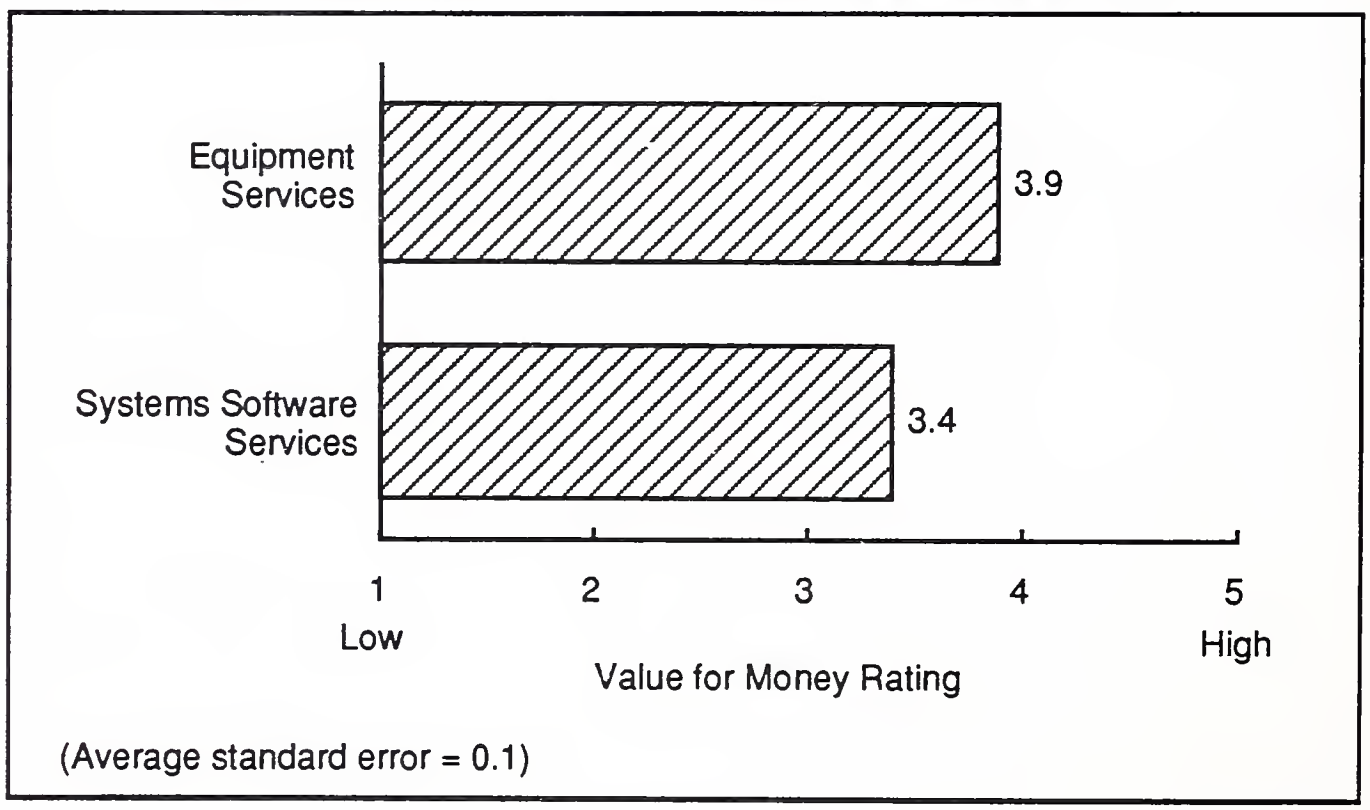
- Demonstrating the value of services using cost-based pricing models
- Targeting customer expectations
- Reskilling the service workforce.

B
Demonstrating Value with Cost-based Pricing

The user survey conducted for this study revealed that a significant number of users perceived that they were receiving low value for money for systems software support services. This is in contrast to the position with equipment services, as shown in Exhibit II-2.

Exhibit II-2

User Perception of Value for Money with Services

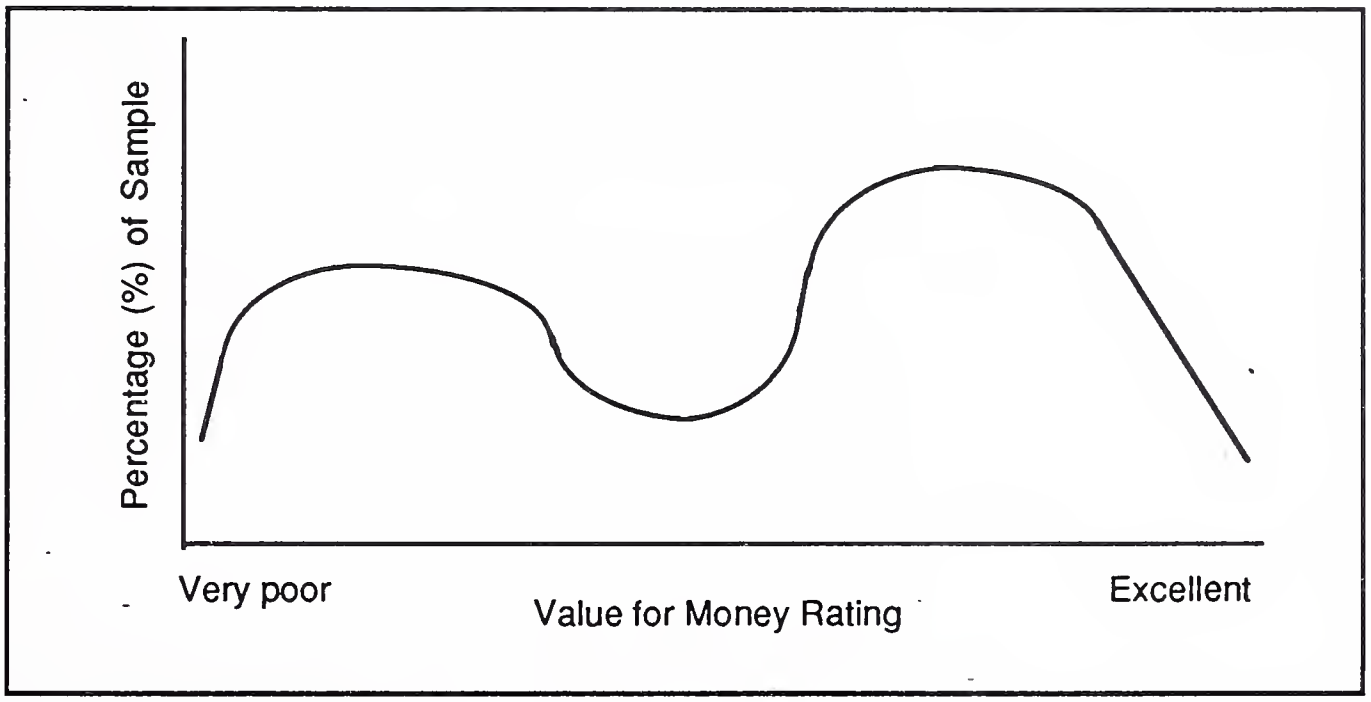


Source: INPUT

As shown in Exhibit II-3, the survey revealed a distinct polarisation of opinion on value for money: a small majority of users perceived better than average value for money, but there was a significant group who perceived poor value for money.

Exhibit II-3

User Perception of Value for Money for Systems Software Support Services



Source: INPUT

Users who perceived poor value for money were primarily concerned about vendors' pricing strategies, and in particular the perpetuation of product-related pricing. Users pointed to high support costs for established systems, where pricing was linked to the original product cost. This was seen as punitive, and user comments revealed a strong desire for pricing to be linked to the delivery of the service.

A popular suggestion for more equitable pricing was to link service to the number of users. However, whether service vendors adopt this or some other method, the key principle to adopt is that of *cost-based pricing,* which is essential to achieve service profitability.

There was also significant feeling amongst users that in many cases systems software support pricing was too complex. Most customer services vendors operate complex pricing structures which reflect a multiplicity of service offerings. However, complex pricing mechanisms are invariably detrimental to both users and

vendors alike, involving significant overheads in terms of accounting and reconciliation.

Vendors must meet the challenge of developing simpler pricing structures, underlying which is a much greater need to simplify software services in total. The evidence of this survey suggests that vendors would do well to put service simplification at the top of their agendas. Clearly, care is required to develop portfolios of flexible, easily configurable service options which avoid customer confusion, while providing vendors with sufficient differentiating factors to create competitive edge.

Exhibit II-4 shows the most common systems software support features offered by vendors. Listed are the basic features which apply to most vendors' service contracts, plus a selection of popular additional features which are offered to users at a premium.

Exhibit II-4

Systems Software Support Features

Basic Features	Extra Features
• Telephone Support During Office Hours	• Telephone Support Extended Beyond Office Hours
• Licence to Use New Versions and Maintained Releases	• Software Update Installation Service
• Electronic Problem Support	• Personalised Support (Assigned Account Manager)
• Documentation and Media	• Advanced Documentation and Media Options, e.g., CD-ROM Service

Source: INPUT

C
Targeting Customer Expectations

Customer services organisations are experiencing difficulty in improving overall *satisfaction* ratings in an increasingly *open services* environment. While it is important to continue to measure customer satisfaction and to address areas of deficiency, it is just as important to look at customer *expectations*. Concentrating solely on satisfaction levels runs the risk of paying too much attention to areas that are not of high importance to clients, and too little to new and emerging requirements.

Exhibit II-5 shows how customer expectations are changing as the emphasis for service delivery evolves from the *software product* to the *user*. Whereas once, customers expected only that the software products they bought were fit for purpose and up to date, they are now demanding proactive services which enable them to derive maximum benefit from those products.

Exhibit II-5

Systems Software Support: Changing Customer Expectations

Product-related Support	User-related Support
• Install Software	• Provide Training
• Fix Bugs and Issue Updates	• Advise User on Software Update Strategy
• Crisis Support	• Operational Support
• Installation Support	• Personal Support

Source: INPUT

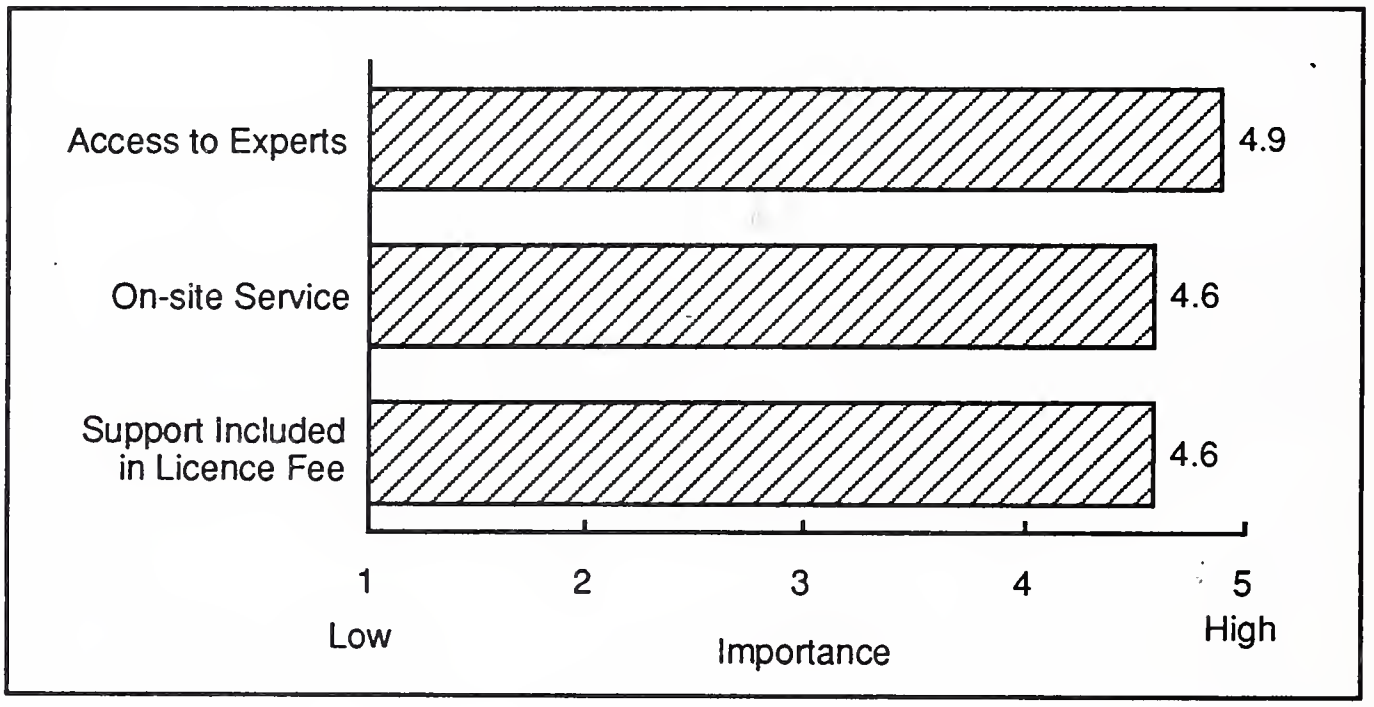
It is important for service vendors to understand the trend of customer expectations, which follows a path from equipment maintenance to systems software (total system) support, and on to business application support. Ultimately organisations will look for, and select suppliers on the basis of, how well their users are supported in a total business context. INPUT forecasts that over the next five to ten years, *business services* will overtake customer services as the key paradigm for the services industry.

However, at the present stage in the evolution of customer expectations, systems software support is attracting increasing attention, with users demanding high levels of technical and problem solving skills from their suppliers, and expecting the sort of service guarantees that were once offered only in the equipment domain.

Users surveyed for this study stressed the importance of human factors, and placed great emphasis on access to experts, both in person and via help desk services. See Exhibit II-6.

Exhibit II-6

Most Important Service Features for Inclusion in Software Support Contract



Source: INPUT

However, while users *expected* high levels of such service, they also expressed a *desire* for more personal assistance, including advice on software management strategy.

Several users, apparently conscious of an increasing need for business services, indicated that they did not wish to distinguish between systems software and applications software. They called for a total service approach from suppliers, including a concurrent operating system and application upgrades strategy.

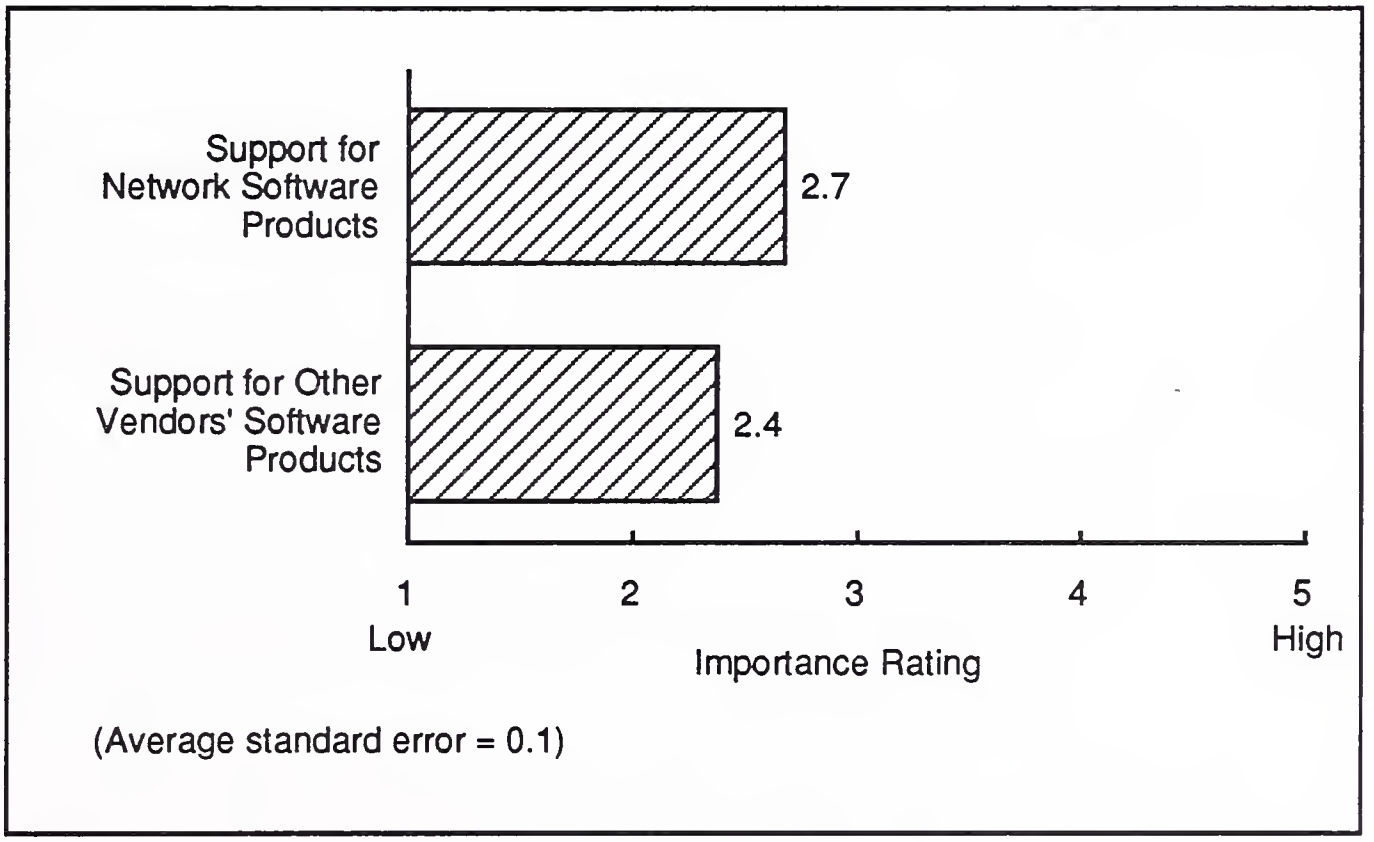
The survey also revealed a potential danger for service organisations who may be inclined to act on *perceived* user expectations without properly interpreting those expectations. In

particular, the survey revealed that users currently place relatively low value on multivendor services (MVS), despite the high industry profile given to this subject (see Exhibit II-7). One of the main reasons for this disparity is that some vendors have acted on a perceived user expectation that they should be able to service software products from a wide range of other vendors. However, on closer examination of what users really want from MVS, it is clear that they are interested in vendors who can demonstrate credible expertise in specific products, and are less concerned with the breadth of products supported.

Another feature that was rated surprisingly low in importance was support for network services, as shown in Exhibit II-7. This would seem to indicate relatively slow take-up of networks within user installations, but there was also evidence to suggest that network software was commonly catered for by a separate service contract.

Exhibit II-7

Least Important Service Features for Inclusion in Software Support Contract



Source: INPUT

D
Reskilling the Service Workforce

As vendors follow the trend of customer expectation to offer more user-focused, value-added services, so *reskilling* becomes imperative. Access to expertise was the most highly rated service feature revealed by the present survey, which means that there needs to be continued emphasis on technical and client liaison skills. However, vendors must ensure that their service personnel are trained to encounter the additional challenges they will face in the open services arena, such as:

- Taking a more holistic view of client requirements, which includes logical as well as physical problem solving
- Specialising in, or having substantial knowledge of, specific business fields, to be able to deliver full *business service* value to the customer
- Understanding customers' support needs in the context of the vendor's wider service portfolio, and the ability to offer appropriate advice.

Many existing service personnel may not be able to make the necessary transition, and customer services managers may be reluctant to radically alter the balance of their workforce, but customer expectations will ultimately drive the need for change. If customer services organisations do not respond to this need, other sectors of the industry will respond.

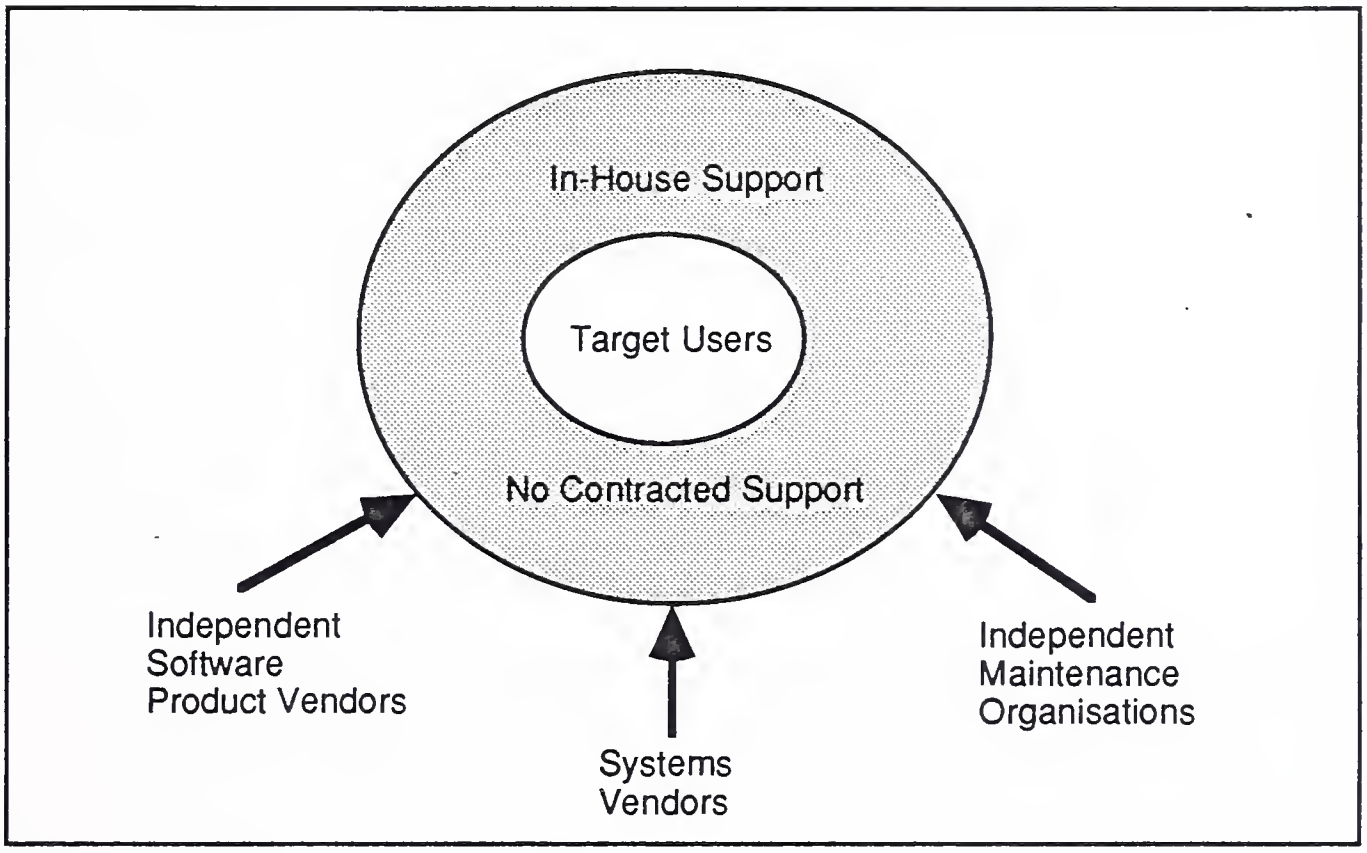
As shown in Exhibit II-8, customer services vendors will increasingly be facing specialist software product and services firms, eager to challenge for new business in many areas. For example, the survey revealed two significant target groups for new business:

- User organisations with *no contracted support* arrangements (24% of the sample used ad hoc T&M services)
- User organisations who rely on *in-house* support (11% of the sample).

Customer services vendors will face competition in winning business in these areas from independent software product vendors and independent maintenance organisations, who can be expected to have the key skills required to compete effectively. This fact places even greater emphasis on the need for vendors to update the skills of their service workforce.

Exhibit II-8

Competitive Pressures on Customer Services Vendors



Source: INPUT

Section B looks at how systems software support services are contracted and with what type of vendor

Section C discusses the *value for money* issue for systems software support

Section D analyses the customer satisfaction data

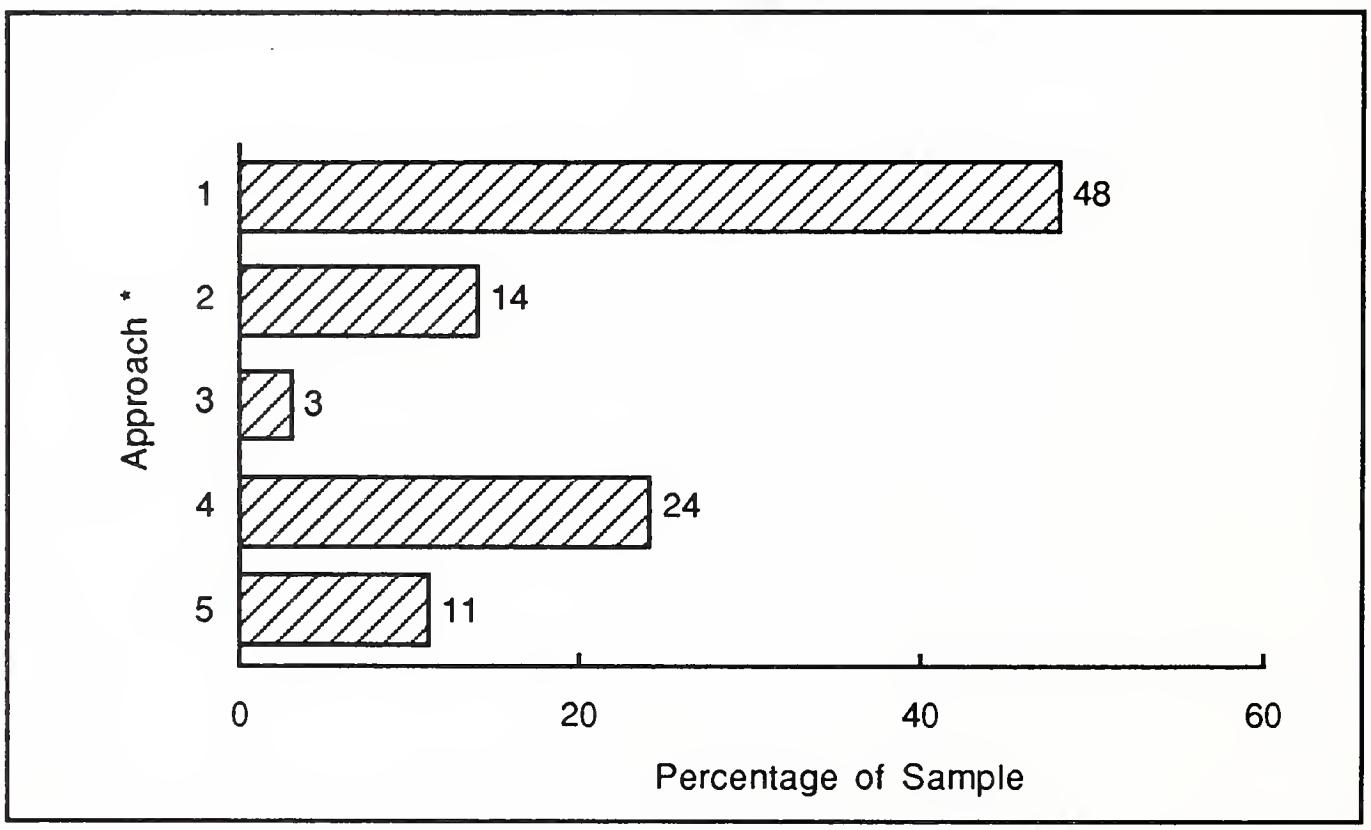
Section E identifies those features of software product support contracts considered of particular future importance.

B
User Support Arrangements

An analysis of the distribution of support supply arrangements for the research sample is shown in Exhibit III-1.

Exhibit III-1

Support Supply Profile



Source: INPUT

* Key

1 One supplier who supports everything on-site

2 Several suppliers each supporting only their own products

3 Some suppliers support products from other suppliers

4 No contracted support service (i.e. provided on time & materials basis)

5 Other support arrangements

Sample of 100 European Firms

The largest group in the sample (48%) was where a single vendor was responsible for all of the systems software on the site.

The second largest group (24%) were those who had no contracted support service, but relied on back-up from time and materials (T&M) services.

Only 14% of users reported having several suppliers, each supporting their own products. An even smaller number (3%) had several suppliers, some of whom supported software from other vendors.

The remaining 11% of the sample reported other software support arrangements, the great majority of which were accounted for by in-house expertise.

The following conclusions can be drawn from this analysis of the support supply profile:

- Despite the high profile given to multivendor services (MVS) in recent years, there appears to be limited demand for this type of service within the systems software product market (only 17% of the sample reported a specific need for MVS). This is in marked contrast to the equipment maintenance market, which shows 30% of users needing MVS according to a recent INPUT survey

- There is a very large group of users whose support arrangements are not aligned to a particular vendor(s). Of these, 24% purchase systems software support services on a time and materials basis, while 11% rely largely on in-house support. Vendors looking for growth opportunities should aim to target these groups.

Exhibit III-2 shows the distribution of vendor categories providing the different service approaches discussed above. The channel suppliers in this sample were exclusively supporting PC network installations.

Exhibit III-2

Distribution of Support Providers (Percent)

Approach*	Equipment Vendor	Independent	Channel Supplier	In-house/Other	Total
1	35	3	10	-	48
2	5	6	3	-	14
3	1	0	2	-	3
4	16	0	8	-	24
5	-	-	-	11	11
Total Sample	**57**	**9**	**23**	**11**	**100**

Source: INPUT

*Key

1 One supplier who supports everything on-site

2 Several suppliers each supporting only their own products

3 Some suppliers support products from other suppliers

4 No contracted support service (T&M)

5 In-house support provided

Sample of 100 European Firms

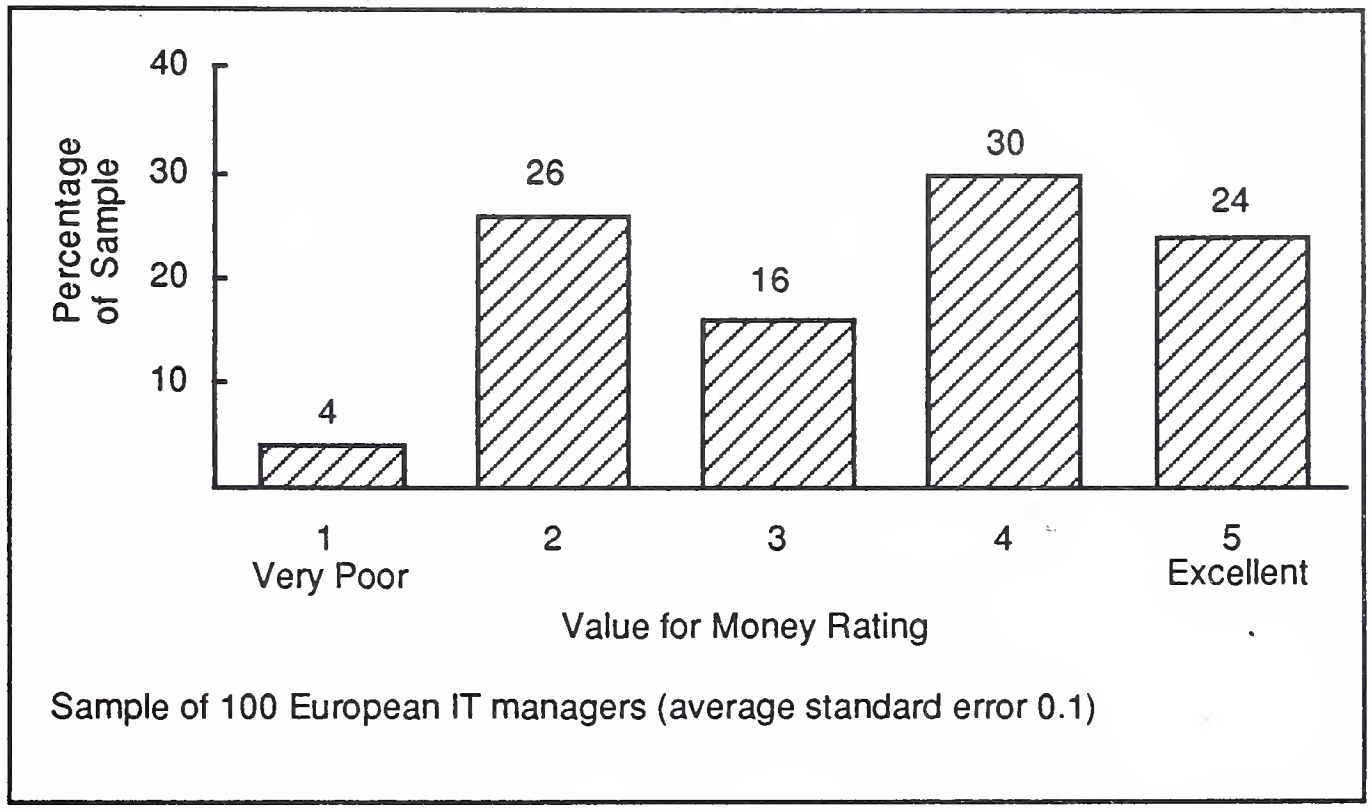
C
Value for Money Issues

Users perceive that they are receiving average value for money from systems software support, as can be seen from Exhibit III-3. The overall rating for value for money received was 3.4 on a scale of 1 (low or poor value) to 5 (high value).

Only 54% of users recorded better than average value for money ratings (4 or 5). Counterbalancing this is a large group of users (30%) who recorded poor or very poor value for money ratings (1 or 2). This clear polarisation of views should send a clear warning message to service providers that value for money is a key issue amongst users, and one with which there is a considerable degree of dissatisfaction.

Exhibit III-3

User Perception of Value for Money for Systems Software Support Services



Sample of 100 European IT managers (average standard error 0.1)

Source: INPUT

Of the main software product supply channels (equipment vendors, independent service organisations, channel suppliers and in-house) the equipment vendors and independents attracted a disproportionate degree of dissatisfaction. Equipment vendors and independent service firms supplied services to 60% of the sample, but accounted for over 80% of the users who recorded low value for money ratings.

All of the users who relied on in-house support services recorded above average value for money ratings.

Software support costs are the key to low value for money perceptions amongst users. The main grievance centres around high support costs for systems software which is perceived to be stable, as illustrated by the following user comments:

- "We are a settled site and require support infrequently, yet we are still expected to pay the same level of support charge as a new site"

- "Paying for a support contract on a stable operating system is unreasonable"

- "Recurring support costs in the operating system and applications areas should be eliminated"

These comments echo user attitudes towards equipment maintenance costs, and highlight the growing dissatisfaction felt across the board by users forced to pay high support costs for little perceived service. The vendors' dilemma is to find ways of combating falling equipment maintenance revenue streams, but it appears that the existing user base is not prepared to shore up vendor revenues by paying inflated contract rates for software support.

A significant group of users are unhappy with fixed support costs which are linked to the product price rather than the cost of delivering the service. *Cost -based* pricing models are essential for vendors seeking to deliver value for money services, and a number of vendors have acknowledged this by introducing schemes such as *user-linked* and *incident -based* pricing. However, vendors who continue to operate product-based pricing should act quickly to adopt cost-based pricing in answer to those users who believe that systems software support represents poor value for money.

In general, vendors are advised to act on the concerns of their existing customers. It would be a mistake for vendors to focus all of their efforts on competitive support arrangements aimed at winning new business if, as a consequence, the existing customer base were dissatisfied with the standard of service.

Users also expressed positive views about systems software support arrangements. Digital and IBM both received praise from users of their mid-range systems, with comments such as:

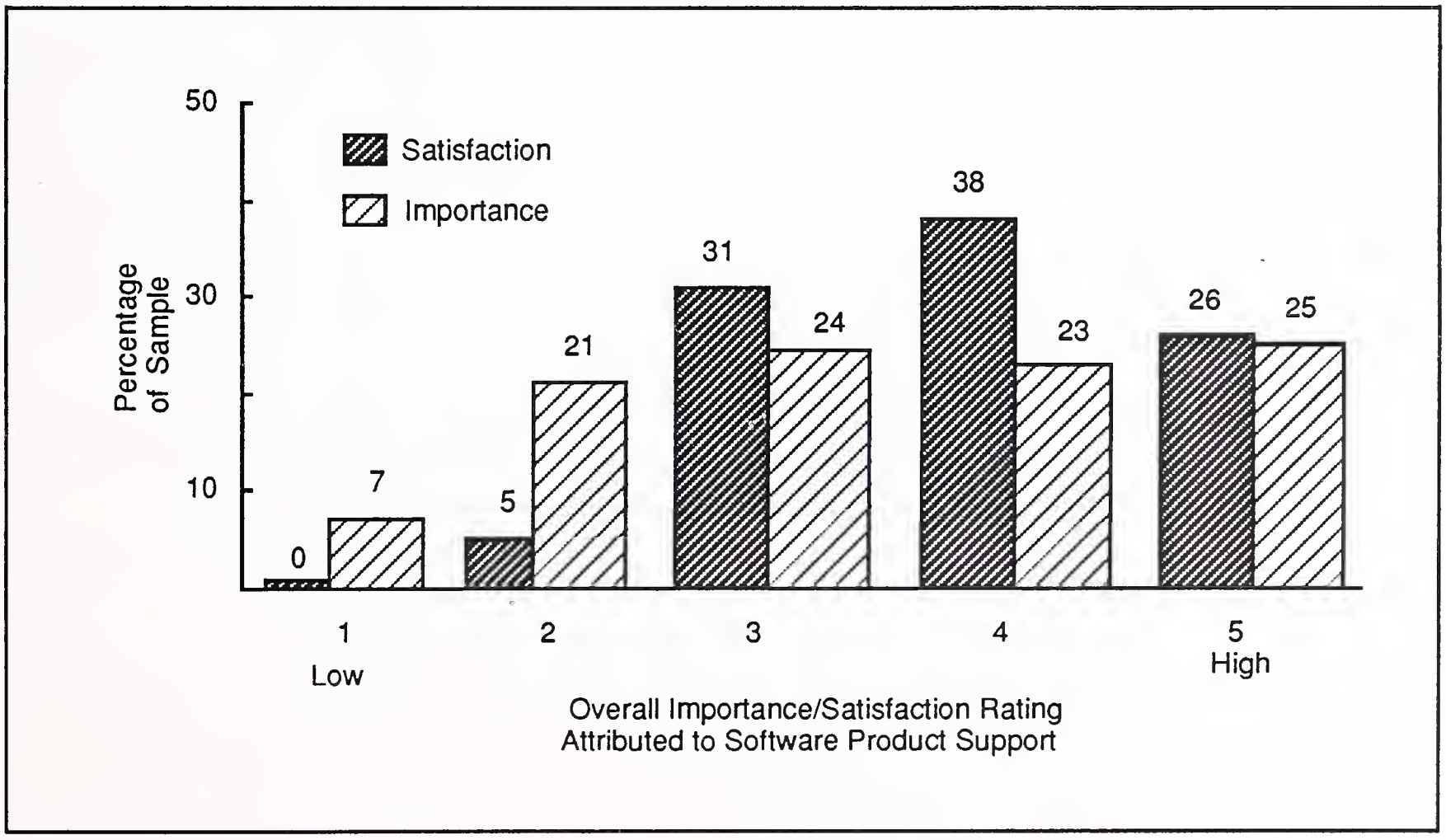
- "DEC's warranty scheme is simple to arrange and very cost effective"
- "IBM's contract is modular and everything is negotiable"

D
Overall Satisfaction Levels

Respondents in the user survey were asked to rate the level of importance and satisfaction that they attributed to the key features of systems software support service. The sample distribution for the overall ratings is shown in Exhibit III-4. This histogram indicates a reasonably high level of overall satisfaction with services, with over 60% of the sample rating software product support at 4 or above.

Exhibit III-4

Sample Distribution of Overall Importance/Satisfaction Ratings for Software Product Support



Source: INPUT

The ratings for individual elements of service are shown in Exhibit III-5 together with the ΔSI for each item. (The ΔSI represents the difference between the satisfaction and importance level attributed to any particular item and thus provides a measure of the extent to which a user's requirements are being over fulfilled or under satisfied.)

Exhibit III-5

User Satisfaction with Systems Software Product Support

Support Feature	User Rating (1 Low to 5 High)		
	Importance Rating	Satisfaction Rating	ΔSI*
Software Product Installation	3.6	4.1	+0.5
Engineer Skills	4.5	4.5	-
Problem Escalation	3.5	3.6	+0.1
Documentation	3.8	3.6	-0.2
Remote Diagnostics	3.3	3.5	+0.2
Provision of Updates	3.6	3.2	-0.4
Help Desk Support	4.0	3.9	-0.1

Source: INPUT

*Satisfaction-Importance Index

Sample of 100 European Users (average standard error 0.1)

All of the support elements listed in Exhibit III-5 were considered important (importance ratings were mostly well above average). However, in terms of user satisfaction, one area stands out, software product installation. Interestingly, other *human factors* were considered important and scored well in terms of satisfaction; these include engineer skills, remote diagnostics and help desk support. This would indicate that software service suppliers are meeting customer expectations in the key area of human skills, and reflects the significant efforts made by suppliers to demonstrate expertise in a competitive open market environment.

However, documentation for systems software failed to meet up to user expectations, though it was rated third highest in terms of importance.

The area of strongest dissatisfaction was provision of updates. Many users questioned their service supplier's update policies, and there was considerable confusion amongst established users of mid-range systems. Some users claimed that updates were irregular and too infrequent, while others stated that updates were inconsistently applied. One interviewee referred to "irrelevant updates I'm not sure what to do with".

On the subject of software update procedures, vendors and users often blame each other for the confusion. Vendors point out that they do all they can to inform users of updates, despatching media and documentation according to a well-defined programme, only for the users to deny all knowledge of these events at a later date. Whatever the reality of the situation, it is the users' *perception* that matters, and in this respect vendors would do well to look again at co-ordinating and clarifying their update arrangements.

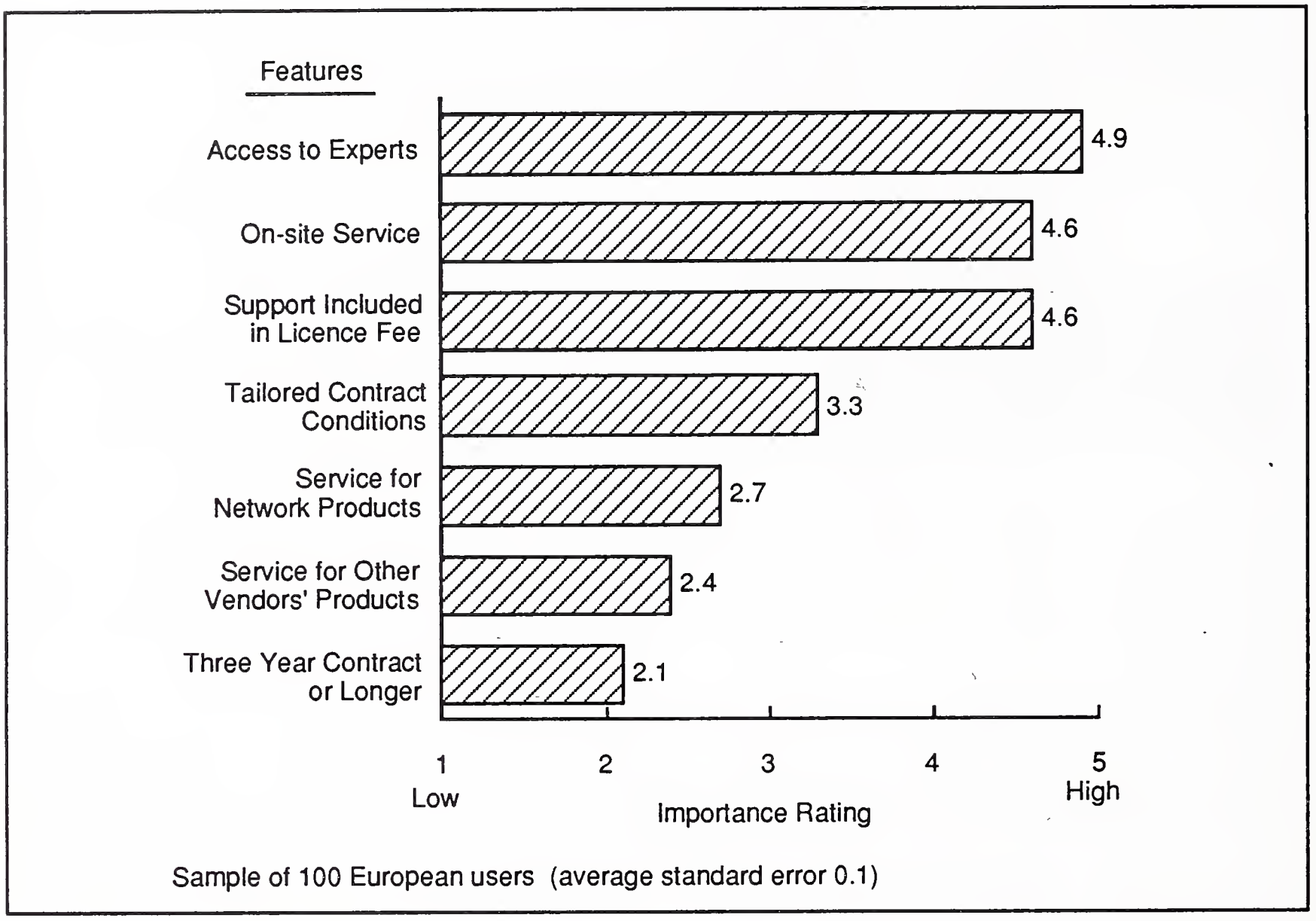
A more general message can be drawn from the satisfaction analysis, which is the importance of providing adequate support and backup in terms of on-site presence and human skills. When a problem occurs, users want to be able to solve it quickly, hence the importance placed on documentation, help desk support and engineer skills.

E
Important Features of Systems Software Support Contracts

Respondents to the user survey were requested to state the level of importance they attributed to specific aspects, potential or otherwise, of a systems software support contract. The summary of the results is shown in Exhibit III-6.

Exhibit III-6

Importance of Service Features for Inclusions in Software Support Contract



Source: INPUT

Three features were rated of particular importance: access to experts, on-site service and support included in licence fee. The first two of these confirm the findings of the importance/satisfaction analysis, the message being that *human factors* are highly valued.

The fact that users want support to be included in the licence fee is interesting, given the general trend away from this form of charging. This finding may reflect a desire by users for simplicity: faced with the additional administrative overhead of separate support arrangements, opting for the bundled approach is an understandable response. The issue of whether to bundle or unbundle software support costs has a long history, and there are viable arguments on both sides. However, the fact that this survey

shows user preference for inclusive support charges should give vendors on the verge of following the current trend for unbundling cause for careful consideration of their marketing approach.

Users considered tailored contract conditions as only average in importance. One interpretation of this is that users are reluctant to pick and choose from different support options, particularly when the choice is a complicated one. Another interpretation is that users are more interested in paying for an all-encompassing support package than in selecting and paying for individual elements.

User comments indicated that while comprehensive support was thought to be important, so too was simplicity of choice. There is considerable evidence that service vendors are beginning to recognise this fact, and INPUT forecasts that *service simplification* will become a major theme for vendors in the next two years.

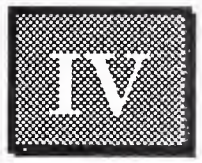
Users considered service for network products as below average in importance. This could be explained by the relatively low incidence of network-based installations in the survey sample, and this position might be expected to change as such environments become more widespread. However, there was some evidence of an alternative explanation: users prefer to have a separate contract for network support supplied by specialists in that field.

Service for other vendors' products was also considered low in importance, reflecting the relatively small number of users (17%) requiring multivendor services (MVS) in the survey sample.

Respondents were also asked to comment on other preferences they might have in relation to their contracts. Here are a few of the suggestions received:

- Concurrent operating system and application upgrades
- Support costs linked to the number of users
- Systems software health checks
- Advice on software management strategy
- Extended warranty for on-site support

The overall synthesis of user comment about systems software support contracts reflected a need for comprehensiveness and simplicity. Users expect basic support offerings to be backed up by good technical skills, and are far less interested in sophisticated contract features. There is, however, a perceived requirement for more specific and personalised support which reflects the growing emphasis on supporting people in the workplace rather than isolated software products.



Systems Software Support Offerings

This chapter looks at the *systems software* support offerings currently available from a number of leading vendors, within the context of the key support issues for service vendors.

A
Support Issues in an Open Services Market

Software product vendors from all sectors are challenging for business in the competitive *open services* market created by the dominant trend towards open systems and client/server environments. Software product support services are key to success in the open services market, and will greatly influence future customer satisfaction and repeat business revenues for vendors.

Contracts and licence agreements for software support services are an accepted business practice for IS data centre managers: in 1993, European IS managers spent a total of $3 billion on such contracts. At the other end of the scale, many PC users have no contracted support services, or rely on free telephone support as part of the equipment warranty.

These two groups of users are steadily converging in the client/server market, via downsizing in the case of the data centre users, and upsizing in the case of the small office/home office (Soho) community. This raises a series of questions about how vendors should handle software support arrangements, given the disparate expectations of the new market users. The following issues typify the sorts of challenges vendors will be increasingly faced with:

- Should support costs be bundled together with licence fees?
- Can warranty be applied effectively to software products?
- Should software product support be a cost-centre or a profit-centre-based activity?

As an example of the sorts of support arrangements currently offered by vendors, Exhibit IV-1 compares the features of two leading systems software support schemes: Digital's DECsystem Support Services (DSS) and Hewlett-Packard's System Support Options. Both schemes cover the operating system and software products during the system warranty period (1 year in both cases).

Exhibit IV-1 compares standard features such as telephone support and provision of updates, plus a variety of additional features available at extra cost; these include extended hours of service and personalised support services.

Exhibit IV-1

Systems Software Support Offerings Compared

Warranty Feature	Digital	Hewlett-Packard
Warranty Period	1 year	1 year
Telephone Problem Logging	Call Customer Support Centre: 7x24x365	Call U.K. Response Centre: 7x24x365
Engineer Cover	09.00 to 17.00, working days	09.00 to 17.00, working days
Response Time	Call back within 1 hour	Call back in no more than 2 hours
Electronic Problem Support	Access to database of: • Known problems • Patches • Solutions • Optional electronic call submittal	Access to database of: • New product information • Software status bulletins • Engineering and application notes • Information browse • Optional electronic call submittal
Licence	To use new versions and maintained releases	To use new versions and maintained releases
Initial Software Load	Yes, plus any other DEC systems software delivered at the same time	Operating system software plus HP subsystems installed to default configuration
Nonconformance Warranty	Yes, product must conform to software product description	No
Documentation and Tapes	Initial set provided	Initial set provided
Chargeable Extras	1. Extended telephone and engineer support to 18 hours a day	1. Can extend telephone support in line with an out of hours equipment contract
	2. Physical provision of software updates and documentation (MDDS and CDDS)	2. Personalised system support contract including: • System release planning seminar • Review of operating procedures
	3. Software Update Installation Service (SUIS)	Installation of software updates (part of personalised support, see 2)

Table source: INPUT

B
Vendor Support Offerings

1. IBM

IBM's AIX operating system and AIX Licenced Program Products (for the RISC System/6000 series) are subject to a one-time charge, graduated by size of processor and/or number of users. There is no warranty, but a 60 day post-installation return option applies.

AIX users are offered basic problem support via mail or fax. However, users requiring telephone support must take out an IBM Support-Line contract for an annual fee, which covers both equipment and systems software products.

Support-Line provides access to the AIX Systems Support Centre either by telephone or electronically. Telephone access is via the Call-AIX service, which offers a single point of contact to AIX technical specialists, who will help with operational questions as well as problem determination and management. Electronic access is via AIX-Connect, whereby customers can transmit not only technical questions but also traces, test cases and information; this service also links in to AIX technical information databases and the selective fix database.

Call-AIX Support-Line Plus offers a range of chargeable service extensions including:

- A customer support specialist, assigned to develop an understanding of the customer's specific system environment and represent the customer's support needs within the Systems Support Centre. The service includes periodic reviews aimed at maximising systems availability and productivity
- On-site assistance for resolution of complex AIX problems
- Extended coverage beyond normal office hours, with options to upgrade to 12 hour support or 24 hour/7 day support

Support-Line and Support-Line Plus features are summarised in Exhibit IV-2.

IBM provides similar support arrangements for its AS/400 users. The Assist/400 support service offers a single point of contact for

hardware queries as well as operating system and software product queries. The service offers telephone access to AS/400 specialists, plus electronic access to a "question and answer database".

Exhibit IV-2

IBM AIX Support Features

Feature	Support-Line	Support-Line Plus
Call-AIX Teleservice	Yes	Yes
AIX-Connect Electronic Support	Yes	Yes
Personal Customer Support Representative	No	Yes
On-site Assistance	No	Yes
Extended Coverage (to 12 and 24 hours)	No	Yes

2. Bull

Bull's standard level service for open systems software (Program Products) is called Level 2, part of the TotalCare service portfolio. Level 2 support applies to UNIX-based systems including RISC System/6000 series and the Motorola-based DPX/20 series. Support features include:

- Remote examination of faults in Program Products, and resolution where possible during Bull's Software Prime Period of Maintenance (Monday to Friday, 9 am to 5.15 pm, excluding statutory holidays)

- Notification of changes to documentation provided with Program Products and supply of one copy upon written request by the customer

- Notification of availability of new releases of Program Products which contain enhanced functionality. Supply of such new releases may be subject to additional charges

- Notification of availability and supply of new updates of Program Products, which include problem fixes but not enhanced functionality. The customer is responsible for implementation of the new updates

- Advice on the availability of services relating to Program Products.

The latest addition to Bull's portfolio of UNIX services is Level 3, which builds on Level 2 by adding the following additional facilities:

- On-site support during the Prime Software Period of Maintenance, at the discretion of the Bull Product Services Manager

- Bulletin board, offering access to fault databases, technical tips and conferencing facilities (called FORUM). The bulletin board is available 24 hours a day, 7 days a week

- Teleservice, aimed at addressing "how to use" queries about Bull products. Teleservice offers technical advice such as configuration information and product usage, plus commercial advice such as availability of education courses, user group activities, services information and contractual queries

Level 2 and Level 3 support features are summarised in Exhibit IV-3.

Bull customers phone a single contact number, at which point calls may be channelled to the appropriate help services. For example, customers phoning with a UNIX software problem will be channelled to the UNIX Technical Assistance Centre.

Charging for Bull's systems software support services is on a monthly basis, and is linked to the number of system users.

Exhibit IV-3

Bull TotalCare Support Features

Feature	Level 2	Level 3
Remote Diagnostics	Yes	Yes
Documentation Update Notification	Yes	Yes
Software Product Release Notification	Yes	Yes
Software Product Update Notification and Supply	Yes	Yes
Advice on Software Product Services	Yes	Yes
On-site Support	No	Yes
On-line Bulletin Board	No	Yes
Teleservice	No	Yes

3. Pyramid

Pyramid's UNIX operating system software, based on AT&T UNIX SVR4, is subject to a one-time licence for use, plus ongoing charges for support. New product releases are issued twice a year.

Two levels of systems software support are available, as shown in Exhibit IV-4. The Basic Maintenance contract offers a 4 hour response time from Pyramid's European Customer Support Centre, a remote diagnostics facility and a software fix service. Software and documentation updates are separately chargeable, as is on-site engineer support.

Pyramid's Enhanced Maintenance contract includes a 30 minute response time, software updates for major releases, plus automatic documentation updates. On-site engineer support is offered on a discretionary basis.

The Enhanced Maintenance contract can be further extended for cover outside the normal hours of 8 am to 5 pm, Monday to Friday.

Normal hours can be extended to weekends, and uplifts are available for 12 hours, 16 hours and 24 hours, weekends included.

Exhibit IV-4

Pyramid SVR4 Software Support Features

Feature	Basic Contract	Enhanced Contract
Response Time	4 hours	Within 30 minutes
Software Updates	Chargeable	Major releases
Documentation Updates	Chargeable	Included
Remote Diagnostics	Yes	Yes
Software Bug Fixes	Yes	Yes
Engineer On-site	Chargeable	Discretionary

4. Sun

Sun workstations' Solaris Operating System and software products bearing the Sun label carry a 90 day warranty. During the warranty period, defective media and bugs will be corrected free of charge, but without an on-site visit; all software products will be brought up to their full functionality as specified in the product documentation. The following conditions also apply during warranty:

- Solutions, patches and fixes of a temporary nature will be provided through a Sun Service Centre hotline
- Users can demand a minor release to work around a problem, since there is no guarantee of fix time
- Users are eligible for a patch to be downloaded from the Sun electronic database of faults/patches

Users can invoke warranty through the telephone, and Sun do not require hard-copy verification.

Following the warranty period, users can opt for the full SunSpectrum maintenance agreement which covers both

equipment and software products. SunSpectrum has four service levels, as shown in Exhibit IV-5; they are:

- Platinum, for the most mission critical systems across the whole of the enterprise
- Gold, for important but not mission critical systems
- Silver, a standard level service
- Bronze, a low cost support package

All levels of SunSpectrum include telephone support for the Solaris Operating System and Sun licensed software products, plus all enhancement releases for Solaris. All levels also provide access to SunSolve, Sun's problem resolution and support database, as used in its own response centres. SunSolve is available on-line and on CD-ROM, and updates take place nightly and quarterly respectively.

Sun places great emphasis on remote delivery, both for problem determination and fixes. Other interesting aspects of the Sun approach include customer-defined service priority levels and an optional 99% uptime guarantee for the most mission critical systems.

Exhibit IV-5

SunSpectrum℠ Programme Comparison

Services	Platinum	Gold	Silver	Bronze
Unlimited Phone Support	7 x 24	7 x 24	7am-7pm M-F	9am-5pm M-F
On-site Response	7 x 24	7am-7pm M-F	9am-5pm M-F	OSSC once/wk
Customer Defined Priority	Yes	Yes	Yes	No
P1 - Urgent (Phone/On-site)	Live xfer/2hr	Live xfer/4hr	live xfer/4hr	4hr/not avail.
P2 - Seriously Impaired	2hr/4hr	2hr/1 bus day	2hr/1 bus day	4hr/not avail.
P3 - Not-critical	4hr/planned	4hr/planned	4hr/planned	4hr/not avail.
Systems Approach Coverage	Yes	Yes	Yes	Yes
Remote Dial-in Analysis	Yes	Yes	Yes	Yes
Replacement Hardware Parts	On-site	On-site	On-site	OSSC once/wk
Solaris Enhancement Releases	Yes	Yes	Yes	Yes
Patches & Maintenance Releases	Yes	Yes	Yes	Yes
Sunsolve Licence	Yes	Yes	Yes	Yes
7 X 24 Telephone Coverage	Yes	Yes	Option	No
7 X 24 On-site Coverage	Yes	Option	Option	No
2 Hour On-site Response	Yes	Option	Option	No
Self-paced Education Library	SunTutor/Video	SunTutor/Video	Option	No
Personal Account Support	Yes	Yes	Option	No
On-site Support Reviews	Quarterly	Semi-annual	Option	No
Technical Support Plan	Yes	No	No	No
99% Uptime Guarantee	Yes	Option	No	No
Site Activity Log	Yes	Yes	No	No
Coaching & Training Service	15 days/year	No	No	No
On-site Support-full Time	Option	No	No	No
Additional Telephone Contacts	Option	Option	Option	Option
Unbundled Software Enhancements	Option	Option	Option	Option

Source: SUN Microsystems

5. Hewlett-Packard

Hewlett-Packard's System Support Options cover equipment and systems software products such as HPUX (UNIX machines) and MPEIX (HP 3000 series).

There are seven options in total, OS0 to OS6. The main differences between them are the response times for engineer call-out, whether telephone support is included, and whether network support is included. The features available with each option are summarised in Exhibit IV-6 (note that option OS4 is a specialised installation and configuration option and is not included). The main features are:

- A licence to use updates to HP software products on each system covered by the support option
- Media and documentation updates, including the latest revisions of software and manuals
- Electronic access to HP Supportline, a database of current product and support information including software status bulletins, new product information, engineering and application notes, and information browse capabilities

All but the most basic support options also include telephone support from HP's Response Centre.

Four of the seven System Support Options are referred to as "Open Systems Solutions", which means that they include hardware and software support for networks in addition to the standard support features.

Customers purchasing a support option with telephone support can, in addition, purchase Personalised System Support, an account management service available at three levels to reflect the number of system users: 1 to 32, 33 to 128 and more than 128. Personalised System Support services include:

- An assigned Support Account Manager, who will co-ordinate all equipment, software and network services on-site. The account manager will also schedule operational reviews and software updates and ensure that all appropriate HP resources are made available to the customer
- Installation of operating system updates by a support engineer during normal working hours. Installation must be scheduled a week in advance and the customer system manager or equivalent is required to be present during the installation
- System release planning seminars, in which HP support representatives review changes to new software product releases, including new features and functions, problem fixes and performance and network implications. Seminars, generally held once a year, are provided for major software product releases only

Exhibit IV-6

HP System Support Options

Support Feature	OS0	OS1	OS2	OS3	OS5	OS6
Problem Response Time	Next Day	4hr	Next Day	4hr	4hr	4hr
Licence to Use Updates	Yes	Yes	Yes	Yes	Yes	Yes
Media and Documentation	Yes	Yes	Yes	Yes	Yes	Yes
Access to Supportline Database	Yes	Yes	Yes	Yes	Yes	Yes
Telephone Support	No	No	Yes	Yes	No	Yes
Network Support	No	No	Yes	Yes	No	Yes
Personalised System Support Available	No	No	Yes	Yes	No	Yes

6. Digital

Digital's premium-level open systems support service is DECsystem Support Service (DSS). This covers systems software products such as OpenVMS, Windows NT and UNIX on a variety of equipment bases, during the warranty period. DSS services are charged on a monthly basis.

The systems software support features of DSS include:

- Software Update Subscription Licence (SUSL), a licence to use new versions of the operating system and DECnet software
- Critical on-site software support when a problem cannot be fixed remotely
- Electronic access to DSIN, a worldwide database of known problems, patches and solutions.

The major update licence SUSL not only provides a licence to use new software product versions, but also includes a 1 year non-conformance warranty, covering the user for products which do not conform to their Software Product Description (SPD). In addition, under SUSL, additional DEC software products purchased at the same time as the kernel will be loaded and tested during system installation.

A variety of additional services can be added. These include:

- Media and Documentation Distribution Service (MDDS), which enables users to select the right mix of media and documentation to their system
- CD Distribution Service (CDDS), which delivers to users every two months the appropriate operating system and layered products plus on-line documentation, product descriptions and release notes
- Software Update Installation Service (SUIS), which provides the services of a software specialist who will plan and implement upgrades and carry out update planning and impact analysis.

Digital also offers a Standalone Telephone Support Service (SATS) for users who have alternative maintenance arrangements for their system but who require access to Digital's telephone software support services.

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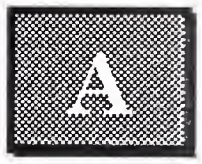


Trends and Issues in the U.S. Systems Software Products Market

This appendix contains a discussion of the trends and issues affecting the U.S. systems software products market, and was first published as part of INPUT's Market Analysis Program in the U.S. in October 1993.

A
Software Markets—Structural Changes

In general, systems software vendors have experienced much stronger growth rates and higher profitability than have application software vendors over the past year.

A significant causal factor is the shift taking place in the corporate computing paradigm toward downsizing/rightsizing, with the distribution of computer resources to LANs and the end user. As a result, many of the traditional application solutions from third-party vendors that address the mainframe and minicomputer markets have experienced considerable softening in demand from prior years.

In contrast, particular segments of the systems software products industry, such as application development tools and operations management products for workstations and minicomputer platforms, have shown particular strength.

Complicating the demand factor for application software products is confusion on the part of users about the proper migration strategies for implementing a rightsizing program. This has delayed buying decisions.

A number of issues are yet to be resolved: The proper migration strategy, who should implement it, and how to quantify rewards from corporate IS rightsizing. Clearly, the cost of hardware, as measured by traditional price/performance factors, has come down dramatically. Logic would suggest that overall corporate data processing costs should also show significant reduction from utilizing the lower-cost computer architectures, and user productivity should also be showing some proportional improvement.

Much of the redistribution of corporate IS resources over the past few years has been to the departmental level, accompanied by the implementation of client/server-based local area networks. This reflects, in part, the number of quality applications which have been developed for office (front end) local-area network computing solutions, with the attendant benefits of reduced cost of application per computer user, based on concurrent usage product licensing. In addition, enhanced access to information through inter-networking of database servers has resulted in a qualitative improvement in decision making by corporate management.

The systems software companies have been major beneficiaries of the more recent acceleration of the downsizing trend to client/server-based inter-LAN computing. Relatively few standard applications software products are currently available for this movement to inter-networking, which often involves migration of "back office" applications to the LAN environment. Application development tool companies as well as networking operating and services companies have been beneficiaries of the need for users to build their own client/server solutions.

Over the past year there has been increasing demand from corporate management (not necessarily supported by the IS department) to rightsize the central IS or back office computing structure. This development can also be viewed in the context of the general trend in corporate America to restructure/re-engineer corporate business processes to reduce corporate cost structures. How to change the traditional vertically structured corporate IS computer paradigm through the reduction of corporate information processing costs and the enhancement of productivity of key mission-critical corporate processes will be principal issues for software vendors over the next several years.

INPUT believes that the shift to rightsizing within the corporate IS model will provide considerably more market opportunity for systems software vendors and computer systems vendors possessing total software and services solutions capabilities than it will for the traditional application software vendors. However, both the application software and systems software vendors can benefit by working more closely together to provide such total solutions capabilities.

Within this general rightsizing trend, there are a number of significant issues that must be addressed by systems software vendors to maximize their revenue growth and profitability potential. The remainder of this chapter will deal with these issues within the context of industry trends associated with the rightsizing of corporate data processing.

B
Decentralization of Corporate IS Computing Trends and Issues

1. Heterogeneous Computer and Operating Systems Connectivity Issues

A significant cost factor in rightsizing is the need to support a number of diverse hardware architectures and operating systems platforms. INPUT surveys of the corporate IS user community strongly indicate that overall software product and maintenance costs have not shown significant reduction with the move to lower-cost, networked platforms.

Portability and interoperability of applications and database architecture are viewed as very important in reducing software costs, an area where rightsizing has not yet produced meaningful cost reductions.

This in turn will continue to bring pressures from both the user and vendor communities to reduce application licensing, maintenance, and support and training costs through the support of standards and open systems in software architectures. Definitions of open systems vary (see Exhibit A-1), which further complicates the issue of what constitutes the optimal open systems solution. Portability of applications, however, appears to be the most frequently cited characteristic of open systems computing.

However, *how* standards-based solutions should be developed is a key issue.

Exhibit A-1

Definitions of Open Systems

- Portability of application
- Interopability of database management
- Support of standards
- Plug and play integration
- Well-defined interface standards-accessible to everyone
- Hardware independence
- Provide for application flexibility
- Provide user with choices—to integrate multiple products from multiple vendors
- Support for major development languages

Standards—de facto and de jure

The number of standards has continued to proliferate over the past few years (see Exhibit A-2). User-based groups such as X/Open have for several years been working to reduce the number of architectures/interfaces used by vendors to a manageable group of standards. Government-sponsored groups such as the International Standards Organization (ISO), CCIT, and the National Institute of Standards and Technology (NIST) have also been working for vendor consensus, but it has taken the threat of major new competition in the industry to finally force the vendor community to seriously consider support for open systems and related standards.

Exhibit A-2

Selected Standards in Progress

Screen	Microsoft Windows, Presentation Manager/OS/2OSF/Motif; X/Open; NewWave; Nextstep; Display PostScript; Quarterdeck's Desqview; Open Desktop
Graphics	TIFF; PICT; CGI; CGM; DMS; WKI; OGES; SGML; ODIF; DDIF; (DEC); PDES; PDF; JPEG
Communications	OSI; SNA; Ethernet; Token Ring; SONET; TCP/IP; MAP/TOPS; LU6.2; APPC; CL/I; NFS C/I; SQLNet; FDDI; X.400; X.12; X.25; CITT.6 (Group 4); NCS; DetBlos; LAN Manager; SMTL CMIS/CMIP SNMP; ISDN; NetWare CICS; TopEnd; Tuxedo
DBM's	Codd's Rules; SQL; ANSI SQL; DB2; ODBC; RDA; XA; CORBA; OSF/DCE
Printers	Adobe's PostScript; DDL; Microsoft/Apple True Type
Program Interfaces	IBM's SAA; POSIX; OPEN DOC; OS/2; Workplace HP's Vue Desktop Environment; COSE/ODE
Operating Systems	MS-DOS; OS/2; VM; MVS; UNIX; DEC VMS; PICK; Windows; Windows NT
CASE	AD/Cycle; CDD/Plus; IRDS; EDIF; CIS

The agenda of the Applications Portability Profile (APP) of the NIST to provide a "standards framework" for multivendor interapplication communications reflects the complexity of interface issues that need to be addressed. The functional areas of communications and applications protocol interfaces that have been under consideration include operating systems, database management systems, data interchange, network services, and user interfaces and programming services. Particular standards associated with APP to be used for federal agencies include: POSIX application program interface standards, X Windows, the OSI protocol stack, and the ISO/ANSI standard Structured Query Language (SQL). A basic concept underlying this effort is that applications and end-user portability can be achieved with applications programming interface (API) standards and acceptance of a common windowing graphical interface convention.

Another major federal government standards effort is the CALS (Computer-Aided Logistics and Support) standard initiative, which helps provide standards for electronic document and database generation and management for DoD computer systems and other military procurement programs. Eventually proposals and other types of documents submitted to federal agencies will have to conform to the SGML (Standardized Generalized Markup Language) standard, which defines particular text objects/elements for document format portability. Other standards efforts surrounding CAS include Initial Graphics Exchange Specification (IGES) to permit intersystem data transfer between CAD/CAM vendors.

Although announced support for the inclusion of POSIX APIs and SGML has become more commonplace, the progress of de jure/government sponsored standards in influencing the commercial computer community to move toward open systems has been only moderately successful.

However, the past year has evidenced a major new interest by the commercial computer community in open systems, as defined by support of particular application programming interfaces (APIs), established by vendor "consensus" groups.

Exhibit A-3

Selected Examples
Vendor Consortium-sponsored Standards Initiatives

- OSF-DCE, DME
- SQL Access Group-RDA/RPC
- COSE (Common Operating Systems Environment)

Probably the most significant influencing factors have been the need to market products within the context of heterogeneous corporate computing environments and the threat of major new systems software solutions which could provide a comprehensive open systems environment, to the exclusion of many systems software vendors.

These vendor consensus groups have generally centred around operating systems portability, management of distributed applications, and distributed relational database management systems interoperability. X/Open, one of the major user-participation groups, is also being more closely consulted by these vendor-sponsored standards groups.

The most significant factor prompting vendor consolidation around systems software is the new challenge Windows NT poses to the traditional operating systems' domain of the large computer systems vendors, with their large, installed base of proprietary operation systems. The issue at stake is what will ultimately become the enterprise-wide operating systems environment in a right-sized, network-based, IS computer paradigm. In particular, this has brought together factions within the UNIX environment in the COSE (Common Operating Systems Environment) initiative, which includes vendors of both the OSF and USL vendor subgroups to create portability between the two major flavours of UNIX. The first offering will be a consistent desktop operating (CDE) environment.

Microsoft also has established a number of vendor relationships for its Windows NT enterprise-wide operating system solution. Unlike the UNIX vendor group, Microsoft appears to be directing more of its alliance effort toward becoming the *de facto* enterprise standard for applications software vendors and corporate developers. However, Microsoft has also garnered a number of systems software supporters for its key APIs within Windows NT, such as its Open Database Connectivity (ODBC) application programming interface for client/server interconnection. A rival standard from a consortium including Borland, IBM, Novell, and WordPerfect is the Integrated Database Application Programming Interface (IDAPI).

2. UNIX versus Windows NT as *De Facto* Standards for Enterprise-Wide Computing

Probably the biggest debate in the systems software arena over the next few years will be over Windows NT and Microsoft's next generation, enterprise-wide operating system, code named Cairo, versus a "unified" UNIX as a better alternative for the right-sized corporate computing platform.

It would appear at the time this report is issued that neither Windows NT nor the UNIX alternatives have relative feature superiority, but rather, the magnitude of corporate and other user preference for the alternatives will determine the relative success of the two operating systems for enterprise-wide computing.

Exhibit A-4 is INPUT's forecast of the estimated success of Windows NT versus UNIX and other *de facto* operating systems standards over the next five years. It suggests that these two will capture approximately equal shares of the market in five years. However, the "wild card" in the operating systems wars will likely be object-oriented technology. An object-oriented operating system architecture could eventually provide the real portability/interoperability required for truly distributed, open systems computing.

The first release of an object-oriented operating system, NextStep, may not be the initial big winner in the competitive arena of object-oriented computing, but it could become a significant application development platform for a UNIX open systems solution, particularly if NextStep were incorporated into a UNIX standards initiative such as COSE.

The major contests among object-oriented computing systems may be among Taligent (including possible layered Taligent solutions over other operating systems software kernels), Cairo, and object-oriented, layered versions of UNIX. However, these approaches will require a major rewrite of current applications, and thus acceptance of this technology could continue to stretch out well into the latter part of this decade.

Operating Environments, 1993-1998

Operating System	May '93 Installs	1993			1994			1995			1996			1997			1998		
		ship	cum	%	ship	cum	%	ship	cum	%	ship	cum	%	ship	cum	%	ship	cum	%
UNIX	26	5	31	17	7	38	18	12	50	19	17	67	21	24	91	24	25	116	26
AS/400	0.3	0.08	0.375	0	0.1	0.475	0	0.1	0.575	0	0.1	0.68	0	0.1	0.775	0	0.1	0.88	0
OS/2	2	1	3	2	1	4	2	1	5	2	1	6	2	1	7	2	1	8	2
DOS*	120	24	144	81	26	170	79	20	190	73	12	202	64	3	205	55	1	206	46
NT	0.1	0.3	0.4	0	3	3.4	2	12	15.4	24	24	39.4	13	30	69.4	19	50	119	27
Total	148.4	30.4	178.8		37.1	215.8		45.1	261		54.1	315		58.1	373.2		77.1	450	

ship = shipments for that year

(all numbers except percentages are in millions)

cum = cumulative installed base (that year's shipments plus previous year's cumulative)

% = share of installed operating systems listedUNIX includes all versions of UNIX

* DOS includes Windows that runs on DOS

Thus a discussion of the pros and cons of the two operating systems most likely to compete for dominance as enterprise-wide solutions in the new era of "open systems" computing is more realistic. Comparative advantages of UNIX and Windows NT are summarized in Exhibits A-5 and A-6.

Exhibit A-5

Advantages of UNIX

- Peer-to-peer, distributed networking
- Degree of openness-sharing of technology among partners
- Long history of development
- Potential for unified version COSE and OSF distributed processing initiatives
- Scaleable and extensible

Exhibit A-6

Advantages of Windows NT

- Common "Look and Fee" interface with popular Windows/DOS, and expected Windows 4.0 ("CHICAGO")
- Potentially lower cost than competing operating systems within built-in networking characteristics
- Scaleable/extensible
- Strong established Windows user base for application developers to migrate

Both are scaleable/extensible operating systems that can be ported to nearly all existing computer architectures with relative ease, from the desktop to the massively parallel super computers.

a. UNIX Advantages

UNIX has an advantage of having been in existence for over 20 years, and it probably has less risk at this stage for running mission-critical applications. In addition, a strength of UNIX is in its communications capabilities. UNIX, which is inherently a network-based system, with a peer-to-peer communications structure, also has such features as error protection and auditing functions built into its UNIX UUPC communications protocols. Thus, UNIX could have an initial advantage over Windows NT in facilitating distributed application processing.

UNIX systems' peer-to-peer networking services also allows a system to function as a client or server. OSF/Motif, a standard UNIX interface, is based on the X Windows System, a graphical user interface (GUI) designed to be networked.

The support of UNIX communications protocols in Internet enhances inter-company computer communications applications, such as EDI. This could also significantly enhance other types of inter-connected processing applications among companies.

The multi-user UNIX capability has also helped total solutions providers achieve lower costs per user than competing operating systems.

UNIX and Windows NT Advanced Server are designed to network a number of processors and to distribute the processing of data among applications residing on multiple platforms. Most proprietary operating systems were designed to optimize a single CPU architecture.

UNIX works comparatively well in mixed-system networks. UNIX systems have become particularly popular as database servers and communications gateways. UNIX workstations can also be used as both servers and bridges or routers for multiple networks, and a wide variety of utilities are built into UNIX that can be centrally administered.

UNIX has been a fast-growing operating system for client/server database servers. Also, a number of UNIX-based application programming and report generation tools have been developed for client/server database solutions. Some of these tools are also now beginning to offer cross-platform UNIX independence. Applix, Inc. provides Extension Language Facility (ELF), a UNIX-based,

object-oriented tool which enhances such applications linkages. Others with strong 4GL and 5GL capability include LINC and 2 (from Unisys) and Sybase, with its recently acquired Gain Technology, based also on object-oriented technology.

Most of the mainframe and mid-range computer systems vendors have adopted a version of UNIX as an open systems alternative to their proprietary operating systems. Hewlett-Packard, for example, has also established interoperability between its proprietary and HP/UX operating systems.

A number of leading mid-range software vendors that provide applications for proprietary operating systems have over the past year provided UNIX version alternatives, usually for the DEC and HP UNIX versions.

Development of UNIX commercial applications can also be complementary to enterprise-wide connectivity with the large installed base of research and scientific-based corporate UNIX applications.

Newer application program interfaces are making it easier to run Windows applications that display on TCP/IP (UNIX) computers. With the Windows Socket (WinSock) API, created by a group of 20 vendors including DEC, IBM, Novell, and SunSoft, Windows programs can use a variety of TCP/IP (UNIX) services, thus reducing the need to have two desktop systems to work with Windows and UNIX programs.

b. UNIX Disadvantages

A principal current disadvantage to UNIX is the use of multiple versions of the language. The distributed processing standards being developed by OSF will help address interoperability among the variants of UNIX, if the standards are supported by the various UNIX operating systems vendors. X/Open is also working with the newly formed COSE group, which represents the initial attempt for OSF/USL application portability, to provide branded versions of a unified UNIX product.

Powerful proprietary systems such as MVS (IBM) provide strong system management and resource management facilities with interfaces which facilitate the work of other software companies to add complementary systems management products. The lack of

consistent interfaces which work across the various versions of UNIX makes it more difficult for third-party systems management software vendors to enhance system management capabilities of UNIX. This is an issue which will need to be addressed for the vendor standards groups working to provide a multivendor enterprise UNIX solution.

There has been a general lack of good systems management tools for open systems such as UNIX. However, new open systems data center tools, such as CA-Unicenter from Computer Associates, are addressing this issue. CA-Unicenter addresses a wide range of systems management issues, such as security of tape management, desk management console automation, help desk, scheduling, print spooling, report management, and resource account.

In general, UNIX-based LAN environments are more complex to manage than Windows/DOS environments and thus could increase LAN management costs. However, this also provides an opportunity for third-party vendors to provide systems administration services for UNIX-based network solutions.

UNIX continues to be one of the more difficult operating systems to program, but a number of new application development tools from UNIX vendors should ease this considerably. However, programmer retraining to work with UNIX can add an additional cost for IS departments deciding to migrate from Windows/DOS to Windows NT or UNIX.

NetWare and UNIX applications currently need to be run on separate servers to create interoperability between their two network operating systems. However, Novell is moving its System V Release 4 operating system to a microkernel architecture, which will enhance UNIX and NetWare inter-networking. This will allow users to host NetWare applications under the System V Release 4 operating system. Eventually, there could be a single, unified System V Release 4/NetWare server. The microkernel architecture will also allow users to customize their operating system environments by adding layers to the basic microkernel for distributed applications, which could also allow for support for cross-platform (NetWare, DOS, Windows, and Macintosh) applications. This microkernel's modular architecture also will facilitate the use of object-oriented programming and can also likely provide a path to delivering an object-oriented version of

UNIX. The object-oriented programming features allow for the encapsulation of systems elements to enhance distributed applications development.

c. Advantages of Windows NT

The built-in networking characteristics and application-to-application communications capabilities of Windows NT should be a major plus for client/server application development.

The NT Microkernel architecture automatically scales across a wide variety of hardware platforms.

Windows NT, a 32-bit operating system, incorporates many advanced technologies, such as symmetric multiprocessing (SMP), TCP/IP networking, a sophisticated security system, built-in versions of MS-DOS and OS/2 1.3, a POSIX C shell for UNIX C programmers, LAN Manager client software called Workgroup Connection, and support for NetWare's IPX/SPX.

With all the bundled capabilities built in, along with the combination of a network operating systems and applications server, it could be less expensive than other client/server operating systems solutions.

Windows NT continues to support a common Windows programming/user interface, which reduces programmer and user development and training costs. In addition, with the large installed base of Windows-based operating systems, applications vendors have a huge potential market to migrate to enhanced 32-bit, Windows-based solutions.

An important attribute of NT versus other operating systems alternatives is its built-in symmetric-multiprocessing (SMP) capabilities. Companies with SMP and parallel processing architectures, including Sequent and NCR, appear to be showing particular interest. Apparently all UNIX versions do not provide a consistent multithreading/multiprocessing capability.

With its support of distributed architectural standards such as DCE, Windows NT can also be used in a heterogeneous distributed computing environment.

d. Disadvantages of Windows NT

Windows NT as a new system will face a period of testing before IS managers will trust it for mission-critical applications development.

Windows NT could be described from the perspective of other vendors as being a somewhat proprietary systems software solution. Although based on a microkernel, to which other vendors can contribute parts of their technology, it isn't fully open in that other vendors are not currently allowed to modify the technology. Microsoft indicates it intends to keep Windows NT as a homogeneous technology. Contributions from other vendors will be integrated by Microsoft, but there could be a question of a royalty payment on such contributions.

A major issue for computer systems vendors who decide to resell Windows NT as their principal operating system is: how much value will there be in the resale price, considering that many of the PC computer systems vendors will likely bundle the software, and possibly establish a relatively low value for the software? From Microsoft's perspective, it is saving computer systems vendors a great deal in research and development expense by not having to create their own operating systems.

In theory, this will pressure computer systems vendors to sell more professional services to maintain growth and profitability from computer systems sales.

Since there are systems management features incorporated into Windows NT, this can also impact systems management software companies—in terms of what added value they can provide to Windows NT.

UNIX will be more open to vendors providing value-added features to their UNIX-based computer systems product, with more consensus among UNIX vendors on *de facto* standard interfaces.

There is also the question of Microsoft's strategic direction, as to the emphasis it intends to place on providing application software products and solutions for Windows NT—particularly enterprise-wide applications. The issue could arise, as it did for PC applications companies, of potential competitive advantage for a company that controls the operating system development in

providing software applications based on the operating system. There is potentially a considerably expanded vested interest vendor group impacted by Windows NT, compared to DOS and Windows/DOS.

Also, since changes in Windows NT and follow-on operating systems from Microsoft will likely not be developed in sync with changes to other operating systems, such as UNIX, there is the potential issue of being locked into a single vendor alternative.

3. Windows NT as a Network Operating System Solution versus NetWare

Windows NT has frequently been mentioned as a significant competitive threat to NetWare as a network operating system solution for LANs or the enterprise-wide network operating system of choice. Windows NT includes networking protocols for: a) LAN manager b) NetWare, and c) TCP/IP.

A principal strength of Novell's NetWare is that it has a reputation for being an open system. In addition, Novell's third-party development partners benefit financially from their contributions to NetWare.

Although NetWare is not a comprehensive operating system such as Windows NT, it is considered a high-performance network operating system. In particular, it provides a strong networking solution for heterogeneous hardware and operating system environments.

Windows NT could provide a significant cost/performance advantage over NetWare with its ability to be a combined applications and communications server. If a number of hardware vendors bundle Windows NT, there could be some very aggressive pricing of Windows NT, which then pressures Novell to lower the price of NetWare and hurts Novell's profit margins.

Novell, however, also continues to add substantial new capabilities to NetWare, including enterprise-wide directory services and system-wide administration utilities in Versions 4.0 and 4.01, which allow for transparent access to servers across the enterprise.

Novell's NetWare management product, NetWare Services Manger (NMS), is gaining the support of a number of third-party vendors of applications for managing hubs, routers, and workstations.

Novell is also developing a NetWare-based system for delivering advanced network services. This could be considered a competitive product to Microsoft's OpenServices Architecture. Such network services will help eliminate the need for applications developers to create their own systems-level solutions. This aids applications developers in creating work flow-enabling software such as Lotus' Notes.

NetWare 4.0 is also being reconfigured to better support transaction-processing journaling across multiple distributed databases, which will enhance development of OLTP applications.

Novell is also incorporating more object-oriented features into NetWare's suite of services. Novell has indicated that its long-term plans are to make NetWare's Object Request Broker (ORB) interoperate with the ORBs of other UNIX suppliers that comply with the Object Management Group's Common ORB Architecture (CORBA) standard. An initial advantage over Microsoft's Windows Open System Architecture (WOSA) is that Novell's interfaces will work across heterogeneous environments. WOSA initially links only Windows applications with back end network services.

4. UNIX (UnixWare) versus Microsoft's Windows NT and Cairo as Enterprise-Wide Solutions

NetWare users have complained about the weakness of the IPX protocol in wide-area networks. NetWare servers include a TCP/IP protocol stack, but communications with IPX/SPX clients must be through a translation process between the two stacks. Client PCs which access both NetWare and UNIX applications must include both TCP/IP and IPX/SPX protocols. Novell engineers are working on a NetWare/IP product that will give TCP/IP equal access with IPX/SPX to NetWare applications.

It is in Novell's best interest to provide a unified UNIX/NetWare solution, with the cross-platform connectivity which is now a principal strength in using NetWare in heterogeneous computer environments.

UnixWare, however, could also provide an area of conflict for Novell as a strong supporter of open systems. UnixWare essentially competes with other desktop versions, in particular UNIX from Santa Cruz Operations.

One of Microsoft's strongest competitive threats to Novell's NetWare and UnixWare could be the next version of Windows 3.0, code-named Chicago. This 32-bit system, with multi-tasking and other enhanced features, could be the desktop operating system that enhances Microsoft's already strong position as the client/desktop portion of the enterprise-wide client/server solution. Chicago will enhance the migration path to Microsoft's announced next-generation enterprise operating system, the object-oriented Cairo project. Although questions arise about the portability of code from Windows applications to Cairo, Microsoft indicates that working with WIN 32 and OLE 2.0 programming tools will provide much of the core for Cairo program portability. If Cairo is compatible with OSF/DCE and DME standard interfaces, it will enhance Cairo-UNIX interoperability.

5. Cross-Platform Application Development Tools—Object-Oriented and 4GL

A major product need is for cross-platform development tools that simplify the development of applications that operate across heterogeneous platforms. To date most application development tools have been targeted primarily for a single or limited number of operating system environments.

SAS Institute provides one of the best interoperable applications environments. It has developed its own multi-vendor development architecture. 90% of its code is portable among platforms and operating systems, so time and cost of development have been significantly reduced.

SAS Institute works with a number of industry standards and sits on a number of standards boards. Its use of ANSI C is key to the portability of SAS products, and in the future the company also plans more of an emphasis on object-oriented technology.

SAS Institute's product solution is one of the best examples of distributed, cooperative processing. Pieces of its various programs run across multiple platforms. The company also positions the

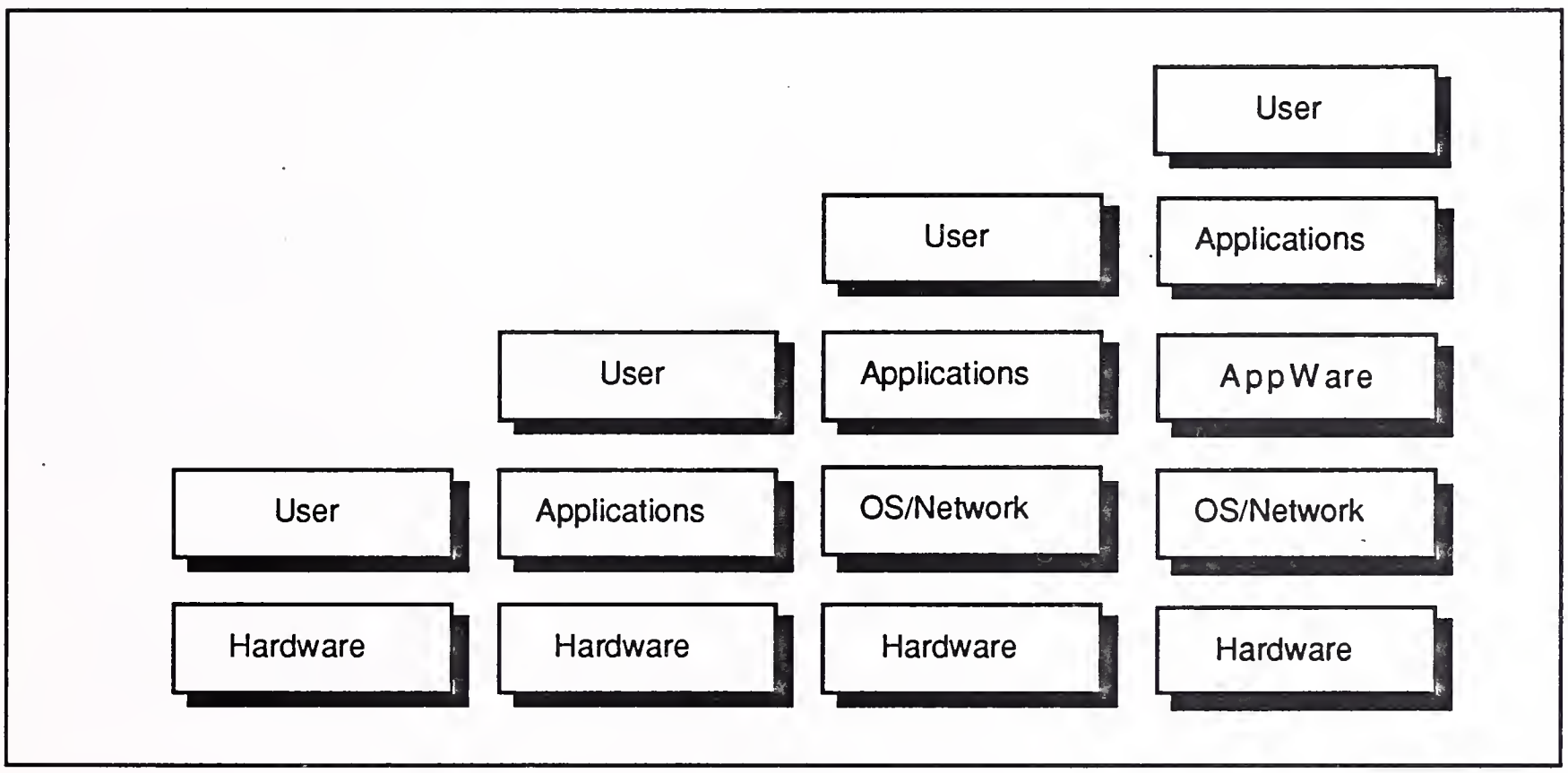
mainframe as more of a server—with modules that were developed for the mainframe being ported to other platforms.

Other leading-edge tools for cross-platform development include object-oriented programming languages, such as C++ and Smalltalk, as well as C and non-procedural, higher-level 4GL languages.

Novell AppWare is an interesting new application development tool framework from Novell for unifying the Novell product offerings and for continuing Novell's open system support policy (see Exhibit A-7). It represents Novell's unfolding architecture for client application development across different computing and network environments.

Exhibit A-7

Application Development Platforms



Source: Novell

Novell describes AppWare as a new system for developing Network Applications. The AppWare system is comprised of two major software components: The AppWare Foundation and AppWare Bus.

These components are designed to provide a consistent set of platform- and network-independent, service-focused interfaces for

creating cross-platform network applications, with reusable code for simplifying development in a complex, heterogeneous environment.

AppWare also uses object-oriented, interchangeable software components that eliminate the need for developers to write lines of programming code. These software components are known as AppWare Loadable Modules (ALMs). Third parties can also add ALMS to the AppWare technology.

AppWare also makes it easier to incorporate messaging, telephony, multimedia, imaging, and other networked capabilities into an application.

Novell intends to work with developers, development tool vendors, hardware and operating system suppliers, and other third parties to make AppWare a standard for network application development.

a. Re-engineering Migration Tools

Another newer area of application development tool technology addresses re-engineering of business processes. This technology is being incorporated as a front end to leading integrated CASE solutions from companies such as Texas Instruments, Andersen Consulting and KnowledgeWare. In theory, such tools will enable the development of enterprise-wide application solutions—an area of wide-open opportunity today.

Another role for re-engineering tools is to provide a migration function from the mainframe to other platforms, based on work flow assessment of how departments and applications throughout an enterprise should be integrated.

An interesting new enterprise application development tool based on the re-engineering of work flow business processes within a corporation is ProcessIt from NCR Corp. This is based on a work flow technology that separates process management logic from application logic for re-engineering legacy applications. It physically separates the two functions and leaves open the alternative of staying with legacy mainframe applications or migrating to smaller platforms, including client/server.

ProcessIT as an enterprise-wide application development tool is now supported on UNIX and will be supported on Windows NT and other platforms as customers demand.

Computer Associates' re-engineering tool strategy is based on the CA90s Cooperative Processing Model, which includes CA-COBOLVISION for analyzing COBOL programs. In addition, Computer Associates provides a number of migration tools, such as CA-PAN/LCM (Life Cycle Manager) for migrating the process of application development and maintenance from the host to the workstation, and CA-PAN/LCM for change and configuration management for use in large, networked programming applications.

The market for change management tools appears to be benefiting from the rightsizing phenomenon. Change management tools for the mainframe are more readily available. Also, a number of partnerships have been developed between change management vendors and applications software vendors.

b. Systems Software Vendors as Application Developers

A major revenue opportunity for computer systems and systems software vendors today is in providing application development and product migration solutions as a substitute for in-house application product development.

Implementing a migration/rightsizing solution has become a major headache for many central IS departments. Lack of application development tools, properly trained staff, contending power issues with decentralized departments, and lack of good Return on Investment models (ROI) all complicate the issues.

For systems software companies (such as DBMS vendors) and computer systems vendors with strong application development tool technology, migration/rightsizing problems for IS present a major opportunity.

Since the vast majority of corporate software applications are developed internally, this is really the major untapped, available market for software vendors for the rest of this decade.

An advantage of the systems software and computer systems vendors is also their "captive", installed base of customers. A basic

issue here is that computer systems vendors should be a major beneficiary of their customers' rightsizing programs. A major emphasis by computer systems and systems software vendors is cross-platform application development tools which provide a major competitive advantage in leveraging consulting services and software implementation for the rightsizing market.

Oracle, for example, has recently announced its Oracle Industries program, a customized application development program targeted at particular vertical industries, with partnerships with industry members. Initially, targeted vertical markets represent those with more of a public, general-interest solution, such as education, government, or finance, to enhance sharing of applications development methodology among industry participants.

It also involves the use of application development templates, which include a repository of tested, reusable modules that provide a significant "jump start" in the creation of industry-specific solutions.

Business models are also captured in Oracle's CASE environment, which helps to provide rapid prototyping to improve application development productivity.

The inclusion of VAR business partners also enhances Oracle's total solutions selling capability.

Unisys has also established an application migration development strategy to move its clients from their proprietary mainframes to more open systems, OSI/POSIX-compliant solutions. They are wrapping (encapsulating) X/Open compliance around the mainframe transaction environment to make the mainframe software compatible with open systems, enhancing the development of enterprise-wide OLTP solutions.

c. Middleware and Application Enabling Services

A new category of products which is receiving a lot of attention is that of middleware. As yet, there is no precise definition of the product. The term has been used frequently by companies such as Hewlett-Packard in describing a layer of software which enhances the ability of programmers to develop distributed applications.

One definition is that middleware provides a software bridge between an application and the operating system. It simplifies the development of distributed applications by providing APIs which streamline programming through an environment of diverse protocols, platforms, and programming languages.

More concrete examples of middleware include enabling software such as Lotus' Notes application development environment and Adobe's Portable Document Format (PDF) technology, which it markets under the name Acrobat.

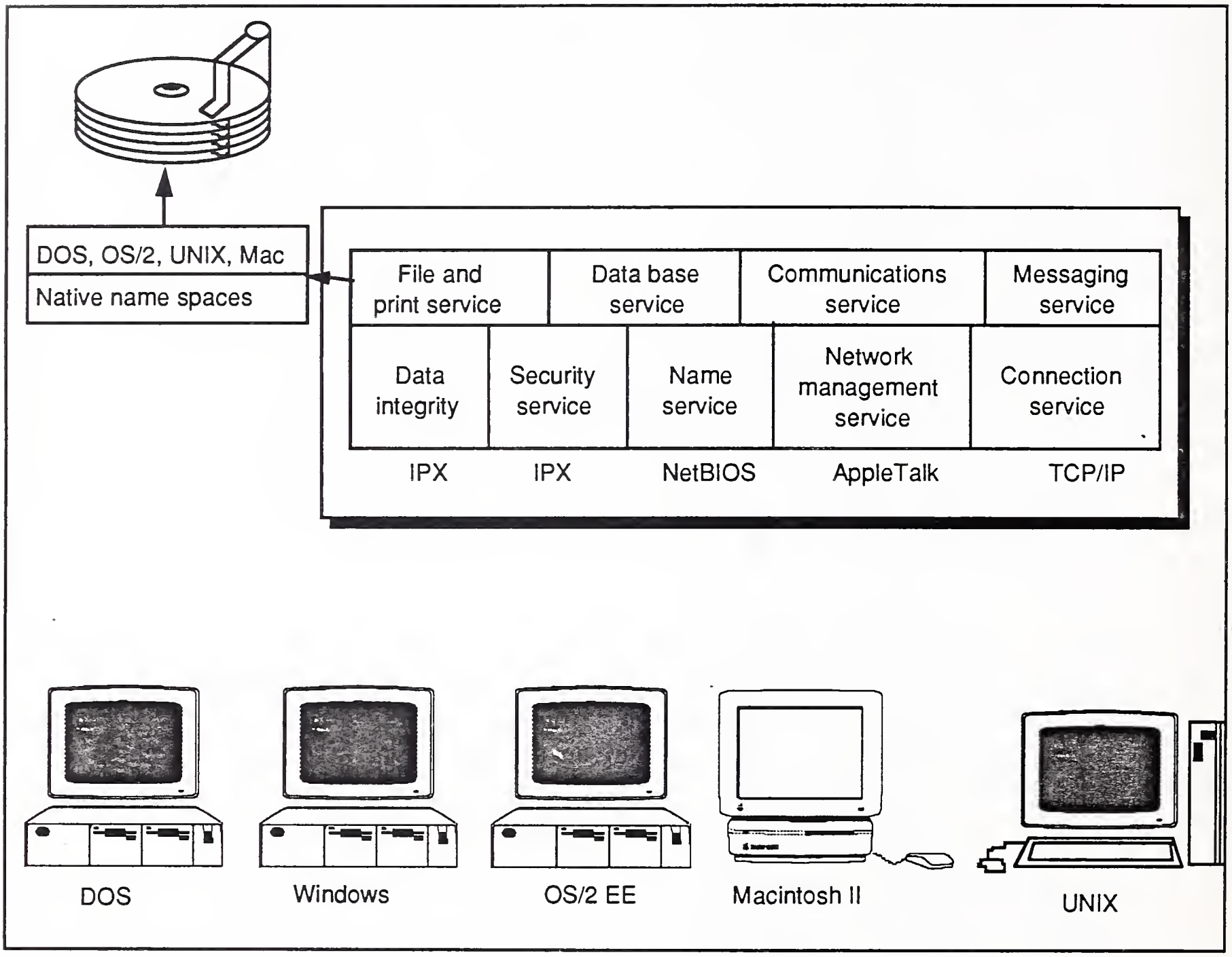
Distributed architectures being provided by vendor consortiums and individual companies can also be considered as forms of middleware. An example of Novell's middleware distributed network services, which runs on NetWare, is depicted in Exhibit A-8. Known as Novell's Integrated Computing Architecture (NICA), it is an open architecture that can provide such functionality as common file sharing across heterogeneous client platforms.

A discussion is developing within the computer industry as to what characteristics of middleware technologies are best suited for enhancing distributed processing across heterogeneous environments. The two principal competing technologies are based on the message-oriented middleware (MOM) approach, versus the conversation-based remote procedure call (RPC) approach. Message-oriented middleware is mentioned as being better for enterprise-wide communication that takes place less frequently, for example, message-enabled E-mail.

Middleware is enhancing the development of integrated, network-based application solutions (for enterprise-wide connectivity) and also provides a source of added value for systems software providers who are seeking to enhance their solutions capability.

Exhibit A-8

Middleware: Distributed Network Services



Source: Novell

d. Distributed Relational Database Solutions

With recent releases of database management systems such as System 10 from Sybase and Oracle's Release 7.0, in particular, the era of distributed database management is beginning to emerge. This includes updates across heterogeneous platforms for transaction processing and the ability to fragment a single local database across several physically separate processors.

The database management market consists of query-based systems and transaction processing systems, with each category

having its own unique solutions. Transaction processing involves updating of smaller amounts of data in a repetitive manner.

Most database architectures today that cross heterogeneous platforms are optimized only for query-based processing. Major transaction processing applications tend to be accomplished within the environment of a single-vendor solution.

The technology for heterogeneous transaction processing over the past few years has been based on that of two-phase commit. Newer technologies within distributed database architecture from companies such as Oracle, Sybase, Cincom, and Computer Associates are emerging to improve upon the current two-phase commit solution, to enhance transaction processing in mixed data- base environments.

Another complicating factor in the development of cross-platform, enterprise-wide OLTP solutions is the variety of distributed data-base architectures that have emerged within client/server (local area network) solutions. Three such architectures have been articulated by various suppliers of relational database management software: 1) the Remote Data Access (RDA) Model (ISO defined), where much of the presentation and application logic processing takes place on the client/front end, 2) the Data-base Server Model, where most of the data access processing takes place through the use of such protocol standards as SQL, IBM's Distributed Relational Data Architecture (DRDA), and ISO's RDA, with the use of such *de facto* standards for distributed transaction processing as XA from X/Open Ltd., and 3) the Application Server Model, which is based on the use of transaction processing (TP) models.

Traditionally, TP monitor technology has been used with centralized computing solutions. This is now being incorporated into enterprise-wide distributed processing solutions, and provides for the blending of business application processing with database processing. A problem for heterogeneous processing is the number of leading TP monitors on the market today, including CICS from IBM, Top End from NCR, ACMS from Digital Equipment, Encina from Transarc, Tuxedo from USL, and Pathway from Tandem.

The use of TP monitors as part of the distributed processing solution appears to be an optimal direction to follow today. In

particular, this more effectively addresses the issue of data integrity under the two-phase commit approach to provide synchronous data updates.

Inter-connectivity across heterogeneous databases will continue to be a complex issue because of the need for each supplier of database management systems to support a variety of remote data request procedures involving competing remote procedure calls, transaction processing monitors, communication monitors, and distributed architectures for ensuring data integrity. This provides a product opportunity for application development tool vendors who are addressing the enterprise-wide distributed processing application development market.

The optimal solution will probably come from the gradual adoption of object-oriented application development technology and standards.

Aggregate Computing recently announced another complementary solution for UNIX workstations called NetShare, which will transparently determine which computers are available in an environment and then remotely execute applications/database transactions on these platforms. NetShare allows users to process applications in parallel on separate machines. It is based on an object-structured database. NetShare should be complementary to network environments such as SCE, ONC and NetWare.

e. Object-Oriented Technology

Object-oriented technology is increasingly being incorporated into application development tools to enhance cross-platform inter-operability of applications. One use is in graphical user interfaces for building client/server applications, as well as its increasing integration in enterprise-wide application development tools such as 4GLs and integrated CASE solutions.

In the future, object-oriented technology could be the ultimate solution for integrated data processing solutions across diverse operating systems, hardware platforms and communications networking alternatives.

The Object Management Group is a leading vendor standards consortium that is developing specifications for the Object Request

Broker (ORB), a proposed distributed transport mechanism for objects. OMG is working to provide vendors with a common software interface that can provide applications interoperability and portability across multiple platform networks. The first implementations are in vendor application development tools.

Also, the Object Management Group is developing a Common Object Request Broker Architecture (CORBA), which is a set of specifications for allowing objects to transparently make requests and receive responses across a computer network. The OMF proposal supports two networking protocols—Sun's Open Network Computing (ONC) and HP's Network Computing Systems (NCS). The Transarc transaction processing technology is being used to link the various network computing environments in the OSF/DCE solution.

The CORBA technology is supplied by NCR, Object Design and DEC. OSF and OMG have each agreed to support the other's object-oriented specifications.

The use of CORBA as an application development tool will initiate application programming that splits applications and databases across platforms and provides an alternative application tool to object-oriented databases and operating systems. The CORBA model also provides for the encapsulation of legacy applications into objects that work in broader enterprise-wide application frameworks. A principal benefit of object-oriented technology is its ability to address the legacy migration problem.

Object-oriented class libraries are also being developed for resale and reuse by internal developers. However, for class libraries and other object-oriented developed tools to be used widely, there is a great need for the implementation of *de facto* standards by the vendor community.

There is still considerable debate in the vendor community about the best approach for building a framework that allows varying objects to work together. A principal alternative is an operating system designed initially with object orientation. Another approach being implemented by key vendors is the layering of an existing operating system with a layer that can support object-oriented computing.

Microsoft is proposing its own object-oriented standards, based initially on a Windows API (Object Linking and Embedding 2.0-OLE) and eventually on Cairo. OLE 2.0 currently provides a linking service for objects, but only within Windows.

Another current issue is the importance of object-oriented database management in the development of future versions of relational database systems. The leading DBMS vendors have suggested that the next generations of their products will provide object-oriented characteristics, including business modelling capability.

Many application development tools today incorporate some element of object-oriented technology. In particular, developers of 4GL programming and report generation programs are continuing to enhance their application development tools with more object-oriented features.

In addition, object-oriented technology is now beginning to make end-user programming more of a reality for "drag and drop" elements in graphic interfaces. Also, there will be increasing use of such end-user, object-oriented programming tools in soon-to-be released Personal Digital Assistants, particularly for creating personal scheduling and calendaring applications.

IBM also has demonstrated an increasing interest in object-oriented technology. This provides a way for IBM to enhance inter-connectivity among its own and non-IBM platforms. IBM has its own object-technology architecture, known as System Object Management (SOM) technology, which is an object-oriented framework for defining and managing binary class libraries and building distributed applications. HP and IBM have announced licenses for their respective object-oriented frameworks. HP's architecture is now known as the Distributed Object Management Facility (DOMF) and allows developers to create applications that are interoperable. However, IBM has also announced that it will provide support of CORBA for developers of object-oriented applications based on SOM.

In addition, IBM is working with Apple to jointly deliver the object-oriented operating system known as Taligent. SOM and DOMF could be used to provide a layered approach to support distributed object computing for Taligent.

For greater usage of object-oriented language development tools across a distributed environment, however, standards need to be accepted for a single object syntax for a common language and semantics.

6. Operations Management Systems Management

Operations management systems software includes solutions for capacity management, computer operations scheduling, data center management, disk management, downtime/repair (monitoring management), job accounting, performance, performance monitoring, tape management and other utilities.

There is a general lack of "open systems" data center operations management systems software, as well as integrated operations management, single console solutions. UNIX solutions available are generally specific to a particular platform.

Many larger users of open systems data centres have developed their own management solutions.

There is also a major longer-term need for systems management solutions that work across various platforms throughout an enterprise-wide computing environment.

Providers of such systems management solutions also need to work more closely with equipment vendors that are providing network-based distributed processing architectures.

Although comprehensive, integrated solutions for managing heterogeneous systems across an enterprise are probably a few years away, a number of vendors are beginning to provide pieces of the solution. This includes companies such as Computer Associates, Candle, Legent, Sterling/Systems Center, BMC, and Boole and Baggage.

One of the more broadly based solutions for open systems monitoring is Computer Associates' CA-Unicenter for UNIX, which established a rules-based system similar to CA's mainframe products, CA-ACF2 and CA-Top Secret. CA-Unicenter for UNIX facilities include: an automated production control capability for workload scheduling, a restart tool to diagnose failed processes, a report distribution system, spool management functions, a performance monitor that supports

system account data in a central database, a problem management system to open and track problems, and a console management system that can improve upon UNIX's traditional messaging methods.

A newer company in the industry is 4th Dimension Software, which addresses open systems management products as well as a new Enterprise Control Station for integrating job flow control across data centers and across a number of platforms such as MVS, AS/400, VAX/VMS and UNIX.

Asset management/software inventory management packages are also in demand, particularly those that automatically update changes in the software database. Some of the leading companies in this area are Computer Associates, IBM, Legent, and Peregrine Systems.

Change management/configuration packages, which track changes in both software and hardware, particularly for remote management, are also increasing in popularity.

The idea of a more fully automated data center management solution continues to be a driving force in the mainframe systems management market.

7. Enterprise-Wide Application Solutions

Enterprise-wide application solutions—based on distributed, network-based connectivity—should be a major new business area for both applications software vendors and systems software vendors in the second half of the 1990s.

However, standard interface issues need to be resolved, and optimal technologies for reducing the cost and increasing the reliability of such applications are still in the emerging stage.

The independent applications software products vendor could be at a disadvantage in providing such products, because they will require very sophisticated application development tools to cost-effectively create the customized type of solutions that will be required for each corporation.

The computer systems and application development tools product companies are in a strong position to provide such products. However, it is in the best interest of all vendors that address

application development to create partnerships of companies that work together to provide key modules for enterprise-wide applications.

Oracle's Industries program is one such example, in which Oracle is cooperating with VARs that have expertise in the vertical markets they are addressing.

In general, independent applications software products companies should concentrate their resources more on R&D, and resell through the major computer systems companies, application development tool companies, or through VARs who address smaller business environments. Computer systems vendors should be able to leverage their sales and services organizations through providing a greater breadth of product from third-party providers. Computer systems vendors should also act as VARs, where they receive a portion of the revenues from the third-party supplier, not just reference sale the application product.

8. Positives and Negatives about Rightsizing

There is considerable controversy about the proper approaches to and rewards from an investment in rightsizing.

The origins of rightsizing include the downsizing from higher-cost (per MIP) computers to lower-cost platforms and the upsizing from standalone PCs to LANs and LAN-interconnectivity. The LAN and inter-LAN phenomenon is enhanced by the development of client/server-based solutions, and the spread of relational data-bases that allow corporate decision makers greater access to key corporate data on a more timely basis.

A principal controversy surrounding rightsizing is that it hasn't seemed to significantly reduce overall computing costs and has also created additional concerns about corporate data integrity.

Pressure for migration from the mainframe has much to do with the declining cost per MIPS of frequently equivalent processing power on lower-cost platforms, such as minicomputers and workstations. In addition, traditional software pricing has been tied to the cost of the hardware, leading to the users' conclusion that lower costs would follow if systems and applications software were placed on the lower-cost platforms.

Studies conducted by INPUT over the past year do indicate that software costs could be meaningfully reduced by users following a downsizing strategy.

Principal cost problems are associated with the need to retrain developers to work with multiple platforms, networking cost increases, and an increase in the end-user training and services costs.

There is more consensus now that a hurried approach to rightsizing should be avoided, and that the mainframe continues to have valuable attributes in an enterprise-wide interconnected computing environment.

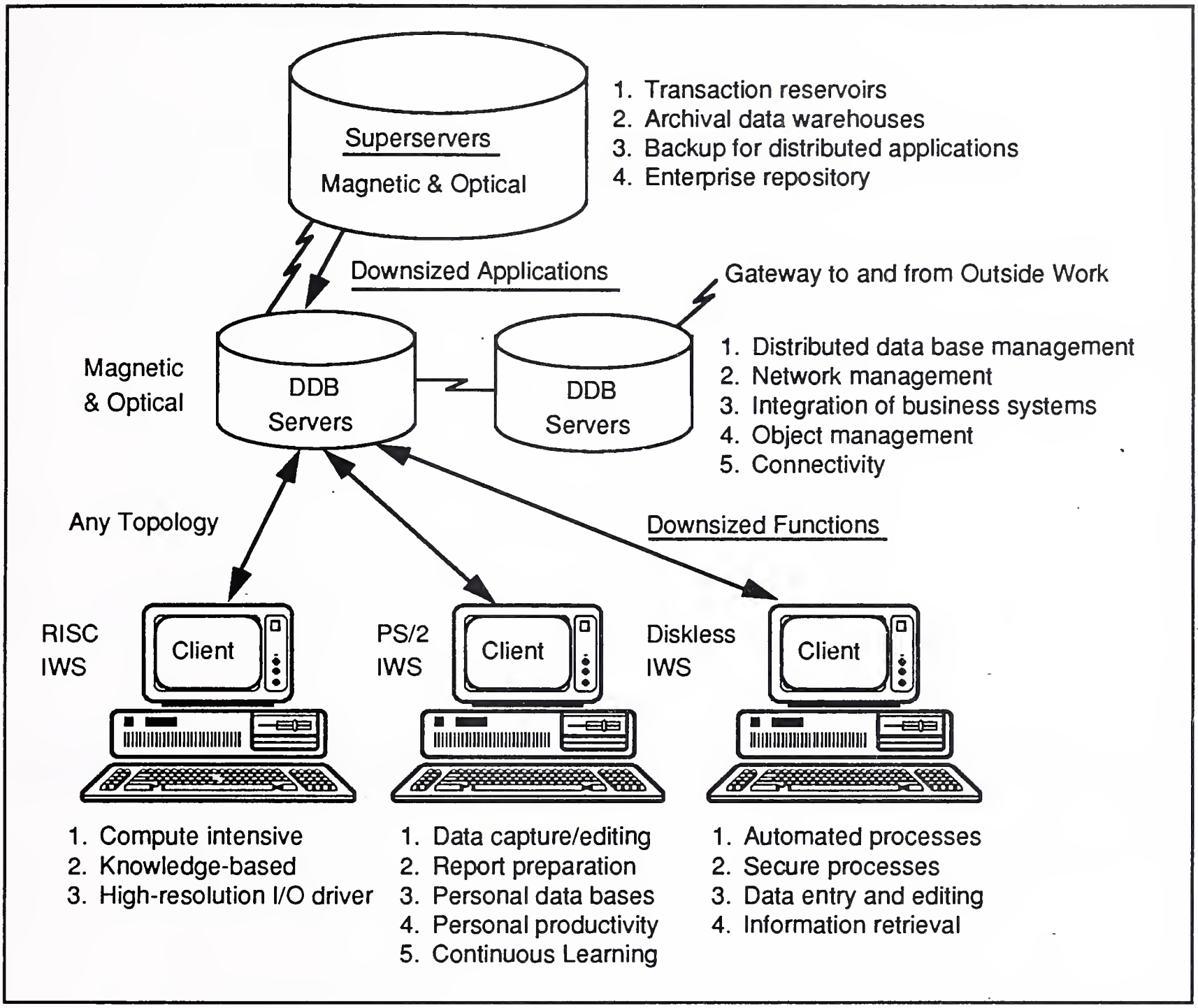
INPUT investigations have indicated that some mainframe prices (as measured by cost per MIPS) have come down to the $40,000 to $60,000/MIPS level, getting closer to the $10,000/MIPS level for some mid-range platforms.

Eventually mainframe and minicomputer definitions may merge, with the MIPS cost differentiation between the systems gradually disappearing. The cost of manufacturing the systems could also decrease significantly with the increased use of CMOS semiconductor technology. This suggests that the valuable attributes of these sophisticated architectures can be salvaged by improving the quality of the distributed processing solutions with their advanced utilities and systems management features. These machines are likely to find life extension as more specialized application and database servers.

Exhibit A-9 states INPUT's view of the proper distributed network architecture for the rightsized world of the 1990s.

Exhibit A-9

Distributed Network Architecture of the 1990s



9. Software Pricing Issues in an Enterprise Environment

There is significant pressure by user groups for software vendors to adjust their product and licensing prices to reflect the lower cost of computers in a distributed, lower-cost platform environment. This has led to a number of vendor pricing alternatives offering a great deal of pricing flexibility.

Some of the more common changes have been to: user-based metered pricing versus per machine and tiered pricing; pricing based on aggregated MIPs across multiple sites; upgrade savings plans that allow a program to be moved to larger models without

incurring traditional upgrade charges; residual value credits for licenses to help clients move to distributed systems; fixed maintenance rates; enterprise-wide rates; and longer-term, flat-fee contracts, among others.

An important consideration for vendors is to retain their client base as it migrates to new platforms in a rightsized environment. Flexible pricing alternatives can be important to maintaining the customer base. Also, software vendors should put more emphasis on providing professional services to traditional software clients, to offset lower prices and margins on standards software product and also to be included in customers' longer-term software development product strategies.

B

User Questionnaire

Systems Software Support

Q1

a) Could I first of all ask what are your support arrangements and who are your principal suppliers? Which of the following statements best fits your situation?

Option	Description	Principal Vendor
1	One vendor who supports everything on-site.	
2	Several suppliers each supporting only their own products.	
3	Some providers support products from other vendors; some support only their own.	
4	No contracted support service. It is provided on a T&M (time and materials) basis.	
5	Other arrangements. (Please describe)	

b) What is your rating for the importance of software product support overall to your business and how satisfied are you with your main service vendor's performance?

Importance (1-5)	Satisfaction (1-5)
_____	_____

Q2 What is your rating of the following aspects of the systems software product support that you receive?

	Importance (1-5)	Satisfaction (1-5)
Software product installation	_____	_____
Engineer skills	_____	_____
Problem escalation	_____	_____
Documentation	_____	_____
Remote diagnostics	_____	_____
Provision of updates	_____	_____
Help-desk support	_____	_____
Other (please state)	_____	_____

Q3 I would now like to ask you some questions regarding your systems software support contract. Please rate again on a 1-5 scale the importance of the following features of a support contract to you?

	Importance Rating (1-5)
Support included in the licence fee	_____
Three year contract or longer	_____
Access to experts	_____
Service for other vendor's products	_____
Service for network products	_____
Tailored contract conditions	_____
On-site service	_____
Ad-hoc seervice only	_____
Other (please state)	_____

Q4 What aspects of your system software support contract are significant issues for you? i.e. are there conditions/clauses which should be included/excluded?

i)_____

ii) _____

iii)_____
e.g. comprehensiveness of the contract; too restrictive, not modularly priced, etc.

Comments _____

_____

Q5 Are there any changes to your contracted conditions that would make it more relevant to your business environment?

_____

_____

Q6 On a 1(low) to 5(high) scale, to what extent do you consider that you are getting value for money from your systems software support contract?

_____

Q7 What changes would markedly affect your perception of the value for money that you receive?

_____

_____

Thank You

(Blank)

C

User Survey Data Tabulations

This appendix provides data tabulations from the European user survey to show the country market data for the exhibits included in Chapter III.

Exhibit C-1

Support Supply Profile—Country Analysis

Approach*	Numbers of Respondents by Country			Total
	Germany	France	U.K.	
1	18	13	17	48
2	1	4	9	14
3	2	1	0	3
4	8	7	9	24
5	1	5	5	11
Total	**30**	**30**	**40**	**100**

* Key

1 One supplier who supports everything on-site

2 Several suppliers each supporting only their own products

3 Some suppliers support products from other suppliers

4 No contracted support service (T&M)

5 In-house support provided

Sample of 100 European Firms

Exhibit C-2

Distribution of Support Providers—Germany

Approach*	Vendor Category (No. of Respondents)				Total
	Equipment Vendor	Independent Supplier	Channel Supplier	In-House	
1	15	0	3		18
2	1	0	0		1
3	1	0	1		2
4	6	0	2		8
5				1	1
Total	**23**	**0**	**6**	**1**	**30**

* Key

1 One supplier who supports everything on-site

2 Several suppliers each supporting only their own products

3 Some suppliers support products from other suppliers

4 No contracted support service (T&M)

5 In-house support provided

Exhibit C-3

Distribution of Support Providers—France

Approach*	Vendor Category (No. of Respondents)				Total
	Equipment Vendor	Independent Supplier	Channel Supplier	In-House	
1	9	1	3		13
2	1	1	2		4
3	-	-	1		1
4	4	-	3		7
5				5	5
Total	**14**	**2**	**9**	**5**	**30**

* Key

1 One supplier who supports everything on-site

2 Several suppliers each supporting only their own products

3 Some suppliers support products from other suppliers

4 No contracted support service (T&M)

5 In-house support provided

Exhibit C-4

Distribution of Support Providers—U.K.

Approach*	Vendor Category (No. of Respondents)				Total
	Equipment Vendor	Independent Supplier	Channel Supplier	In-House	
1	11	2	4		17
2	3	5	1		9
3	-	-	-		-
4	6	-	3		9
5				5	5
Total	**20**	**7**	**8**	**5**	**40**

* Key

1 One supplier who supports everything on-site

2 Several suppliers each supporting only their own products

3 Some suppliers support products from other suppliers

4 No contracted support service (T&M)

5 In-house support provided

Exhibit C-5

User Perception of Value for Money for Systems Software Support Country Analysis

Country	User Rating (1 Very Poor to 5 Excellent)						Average Rating
	0 (no resp)	1	2	3	4	5	
Germany	9	-	2	6	9	4	3.7
France	13	-	5	3	4	5	3.5
U.K.	8	3	11	2	8	8	3.2
Total	**30**	**3**	**18**	**11**	**21**	**17**	**3.4**

Exhibit C-6

Sample Distribution of Overall Importance/Satisfaction Ratings for Systems Software Support Services

Country	Importance/User Rating (1 Low to 5 High)					
	1	2	3	4	5	Total
Germany	1	7	9	6	7	30
France	4	7	4	6	9	30
U.K.	2	7	11	11	9	40
Total	**7**	**21**	**24**	**23**	**25**	**100**

Country	Satisfaction/User Rating (1 Low to 5 High)					
	1	2	3	4	5	Total
Germany	-	2	9	10	9	30
France	-	-	12	9	9	30
U.K.	-	5	10	18	7	40
Total	**-**	**7**	**31**	**37**	**25**	**100**

Exhibit C-7

User Satisfaction with Systems Software Support Services—Germany

User Rating (1 Low to 5 High)			
Service Feature	**Importance Rating**	**Satisfaction Rating**	**Delta**
Software Product Installation	3.6	4.0	+0.4
Engineer Skills	4.5	4.5	-
Problem Escalation	3.2	3.6	+0.4
Documentation	3.6	4.0	+0.4
Remote Diagnostics	3.3	3.8	+0.5
Provision of Updates	3.4	3.4	-
Help Desk Support	4.2	4.1	-0.1

Sample size 30 (average standard error 0.2)

Exhibit C-8

User Satisfaction with Systems Software Support Services—France

User Rating (1 Low to 5 High)			
Service Feature	**Importance Rating**	**Satisfaction Rating**	**Delta**
Software Product Installation	3.3	4.1	+0.8
Engineer Skills	4.5	4.5	-
Problem Escalation	3.5	3.5	-
Documentation	3.8	3.6	-0.2
Remote Diagnostics	3.2	3.3	+0.1
Provision of Updates	3.7	3.6	+0.1
Help Desk Support	3.7	3.7	-

Sample size 30 (average standard error 0.2)

Exhibit C-9

User Satisfaction with Systems Software Support Services—U.K.

User Rating (1 Low to 5 High)			
Service Feature	**Importance Rating**	**Satisfaction Rating**	**Delta**
Software Product Installation	3.8	4.1	+0.3
Engineer Skills	4.4	4.4	-
Problem Escalation	3.6	3.6	-
Documentation	3.9	3.3	-0.6
Remote Diagnostics	3.3	3.5	+0.2
Provision of Updates	3.6	2.8	-0.8
Help Desk Support	4.1	3.9	-0.2

Sample size 40 (average standard error 0.2)

Exhibit C-10

Importance of Service Features for Inclusion in Systems Software Support Contracts

Average Importance Rating (1 Low to 5 High)				
Feature	Germany	France	U.K.	Total Sample
Support Included in Licence Fee	4.9	4.6	4.4	4.6
Three-Year Contract or Longer	2.1	2.2	2.0	2.1
Access to Experts	5.0	4.8	5.0	4.9
Service for Other Vendors' Products	2.6	2.4	2.2	2.4
Service for Network Products	2.6	3.0	2.5	2.7
Tailored Contract Conditions	3.2	3.5	3.2	3.3
On-site Service	4.8	4.5	4.6	4.6

Sample of 100 users (average standard error 0.1)