THE IMPACT OF UNIX ON WESTERN EUROPEAN

SOFTWARE AND SERVICES

1991 - 1996

INPUT

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Market Analysis Programme—Europe

The Impact of UNIX on Western European Software and Services, 1991-1996

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Abstract

UNIX has become an important and controversial operating system as equipment vendors move away from their own proprietary standards towards more open systems. During the 1980s the PC operating system MS-DOS showed suppliers and users alike how the widespread adoption of an industry standard can have a dramatic effect on the market. Lower prices and much broader product choice are two of the most obvious results of open competition in the market. As users begin to switch their allegiances from equipment brands to software, many vendors are experiencing rapid changes in their competitive market position.

This report analyses the market for the UNIX operating system and its impact on software and service vendors throughout Western Europe. User demand is examined to determine the future competitive position of UNIX. The report identifies the major trends, issues and opportunities for vendors, especially in the areas of adherence to standards, satisfying user requirements and improving value for money. Forecasts of UNIX-based system software are provided for all the major regions of Europe for 1991 through 1996 and for each category of equipment platform: mainframe, minicomputer, and PC or workstation.

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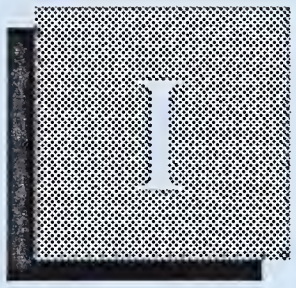
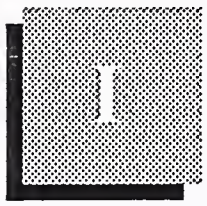


Introduction



Introduction

A Objectives

The purpose of this report is to identify UNIX-related opportunities within the software and services market and indicate in broad terms how this market is likely to develop over the next five years. In particular the report will address:

- Estimates of the size and structure of the UNIX-based systems software products market for Western Europe and its growth potential to 1996.
- Identification of the major forces at work in the market, especially the impact of the UNIX operating system on the demand for:
  - systems software products
  - applications software products
  - turnkey systems
  - professional services.
- Assessment of possible major new opportunity areas for software and services vendors arising out of the changing structure of the market.
- Conclusions on key strategies for vendors in the UNIX market for the 1990s.

B Scope

This report reviews the UNIX software and services market for Western Europe for the period 1991 to 1996.

Geographically the report analyses the following major markets for systems software products:

- France
- Germany
- United Kingdom

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- Italy
- Sweden
- Denmark
- Norway
- Finland
- Netherlands
- Belgium
- Switzerland
- Austria
- Spain
- Rest of Europe

Exhibit I-1 illustrates the schematic structure of INPUT's representation of the software and services market. Detailed definitions of the terms used by INPUT are given in Appendix A.

Omitted from these analyses of software and services are what the user spends on:

- Software and services not related to UNIX and open systems.

- Applications software supported by the UNIX operating system in its many forms.

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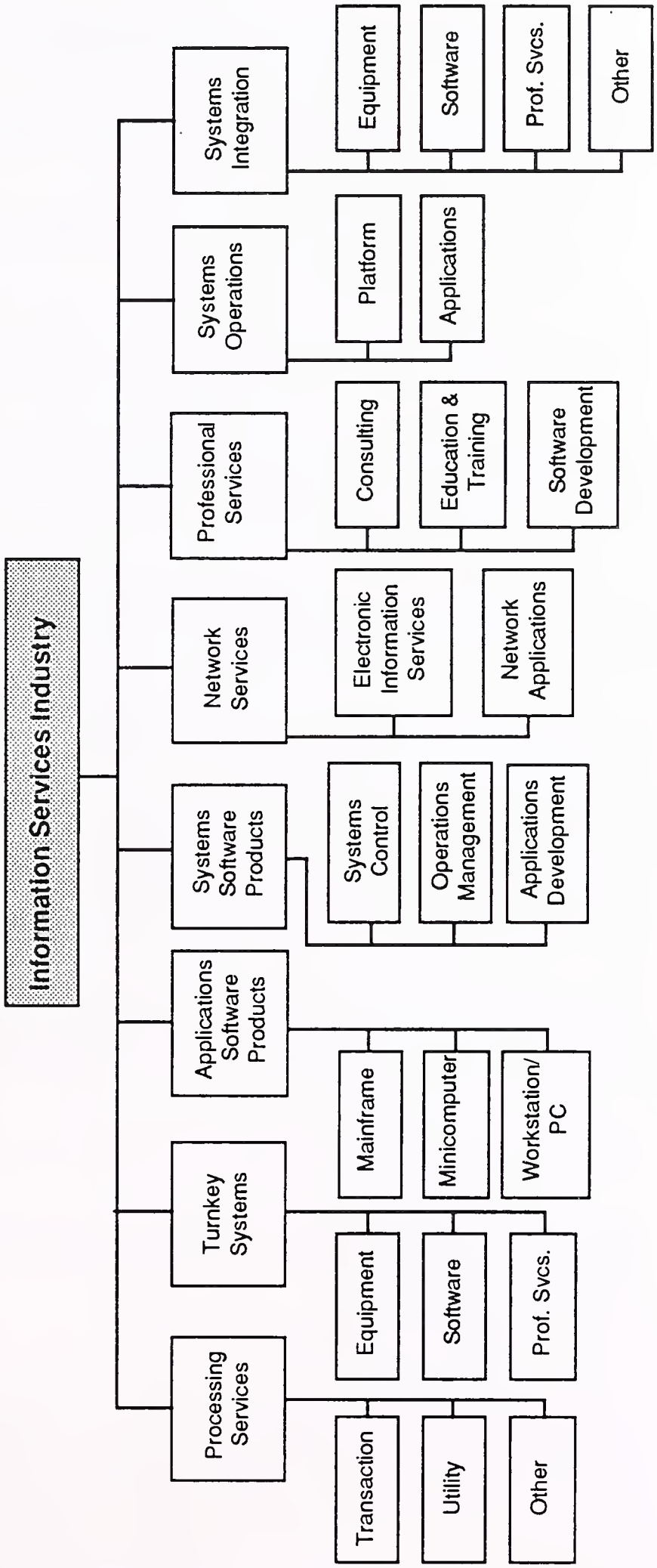
EXHIBIT I-1

Information Services Industry Structure—1991



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C

Methodology

This report is based principally on Western European software and service research activities conducted by INPUT from 1989 through 1991:

- A vendor research programme with more than 300 interviews with software and services vendors across Europe each year.
- A further 200 vendor and user interviews across all European market sectors to determine trends and opinions.
- INPUT's continuous analysis of all the delivery modes comprising the computer software and services market.

Additionally INPUT's extensive library and database of information relating to the software and services industry was utilised.

Twenty leading vendors across Western Europe prominent in the UNIX software and services sector were selected for specific consultation using the questionnaire in Appendix B.

D

Report Structure

This report examines the UNIX sector of the software and services industry in the following Chapters:

Chapter II is an Executive Overview, which provides a management summary of the essential points of the entire report including conclusions and strategic recommendations.

Chapter III sets out INPUT's estimates and forecasts of user expenditures on UNIX-based systems software across Europe as a whole and presents some of the issues and trends identified during the study.

Chapter IV provides an overview of current market conditions in the UNIX market including the structure of the industry, the major pressure groups, the explosive growth of hardware and software platforms and the impact on software and service delivery modes.

Chapter V identifies the positions of the major U.S. vendors.

Appendix A contains detailed definitions of the terms used by INPUT in the analysis of market sectors. See standard definitions alternatively in Volume 1 Section G.

Appendix B is the vendor questionnaire used in this research.

Appendix C is the forecast database of user expenditure in local currency, country by country, on which the report is based. It includes the exchange rate assumptions used for market analysis.

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E

Related INPUT Reports

Readers may find it useful to refer to other INPUT reports which relate to the findings of this report:

- Western European Market reviews
  - The Western European Market for Computer Software and Services, Forecast and Analysis, 1990-1995 (January 1991)
  - The Western European Market for Systems Software, Forecast and Analysis, 1990-1995 (February 1991)
  - The Challenge of the Single European Market - 1992 and Beyond (December 1989)
- U.S. Market reviews
  - The U.S. Market for Computer Software and Services, Forecast and Analysis, 1990-1995
  - The U.S. Market for UNIX, Forecast and Analysis, 1991-1996
  - The U.S. Market for UNIX, Forecast and Analysis, 1989-1994 (November 1989)
- Vendor analysis programme
  - Over 300 profiles of prominent software and services vendors across Europe, including both regular updates and new profiles.

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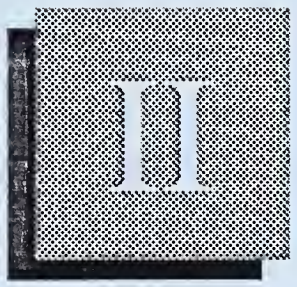

Executive Overview

II

Executive Overview

A

Open Competition Drives UNIX Market Growth

Since the late 1980's UNIX has probably been the most powerful catalyst for change in the whole information services industry. It has stimulated the creation of over 15,000 software products and 600 hardware platforms worldwide. It is freeing customers to make choices of software and service providers independent of their choice of hardware vendors.

The resulting open competition is forcing equipment vendors to slim down their operations, encouraging software vendors to innovate in both product and marketing, and helping service vendors focus on value-for-money business solutions rather than technical invention. Between 1991 and 1996 the market for UNIX-based systems software is expected to have grown four-fold and permeated every sector of the market. By that time UNIX will be so well established that it will have almost disappeared as a topic for wide debate.

The Information Services market can be characterised as oversupplied with hardware technology and still undersupplied with software solutions. UNIX has been a key vehicle encouraging both new and traditional vendors to redress the balance in favour of software and service solutions.

As summarised in Exhibit II-1, UNIX is impacting all types of vendors and leading to significant industry restructuring as software and services start to dominate user budgets and spending decisions.

As their proprietary business slows or falls, the response of traditional equipment vendors has been dramatic:

- All have embraced UNIX either as a necessary defence or as the foundation of their future success.

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- All are looking to build the contribution of software and services in their product mix.

- Many have also chosen systems integration as the new way of winning or retaining major account business, now that customer loyalty to an equipment brand cannot be assured.

The minicomputer sector of UNIX has been established the longest and will continue to be the largest, growing at an average 25% per annum. There is still minimal use of UNIX on mainframes though it is now the favourite operating system for new supercomputers.

EXHIBIT II-1

The Impact of UNIX on Software and Services in Western Europe

- Forcing the pace of industry change
- Workstations and PCs lead growth
- Key software factors:
  - Level of portability
  - Channel strategies
- Key service factors:
  - Productivity gains
  - More client responsive

The rise of UNIX-based workstations and client/server network architectures will continue, with software revenues growing faster than equipment at about 50% CAGR (compound average growth rate) per annum for the next five years. The humble PC has now joined the low-end workstations with the availability of advanced UNIX plus DOS software packages with graphical user interfaces running on 386 PCs. Market acceptance of PC Windows 3.0 is expected to stimulate the use of Graphical User Interfaces (GUI) products like Motif on UNIX systems.

For software product vendors there are two key factors which strongly influence their success:

- Choosing the right level at which to offer applications portability is not simple. Many users are now adopting IS strategies which specify the preferred software platform, common applications environment, or toolset to be used for future systems. Matching these needs has re-

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placed the requirement to run on a preferred brand of proprietary computers.

- The technical superiority of products is giving way to the marketing superiority of their supplier. The marketing channels which are as yet totally under-exploited are the direct sales forces of the major equipment vendors. The large majority of UNIX software business to date has been handled through third-party channels of VARs and dealers.

For service vendors UNIX is opening up two areas of opportunity:

- There is a wealth of advanced and market-leading application development tools and software platforms now available on UNIX. These offer service vendors, who are willing to invest in in-house systems and staff development, the chance of major productivity and quality improvements. These improvements in turn help free resources to ensure that clients are offered the types of service they most seek—those which bridge the gap between a business need and a technological solution, and those which can keep such solutions in step with the pace of business and technology change.

- With UNIX, service vendors can now become even more independent of their equipment vendors, leaving the client to make the choice of hardware and/or software supplier if he so wishes even if the solution is dependent on a particular package. This extra degree of freedom opens up wider markets to the service vendor, and can contribute to improved margins, keener prices or greater added-value for services. At the top of most vendors' priorities is the wish to become more responsive to their clients' needs.

B

UNIX Is the Future

The market for UNIX-related systems software is growing twice as fast as the overall system software products market. Exhibit II-2 shows that the Western European market for UNIX system software is forecast to reach $2.8 billion by 1996. The average growth rate of 32% compares with a forecast of only 15% for the whole systems software market. The market for UNIX-based applications software products is not quantified in this report, but can be expected to grow at around 40% per year.

There are three well-known standards bodies associated with UNIX:

- Unix International (UI is part of AT&T)
- OSF—representing an alternative camp of equipment vendors
- X/Open Company—promoting the use of standards.

Paradoxically none of them is a recognized international standards body such as CCITT, ANSI, or even IEEE. However their pronouncements and the public quarrels between UI and OSF do have a strong influence on the market.

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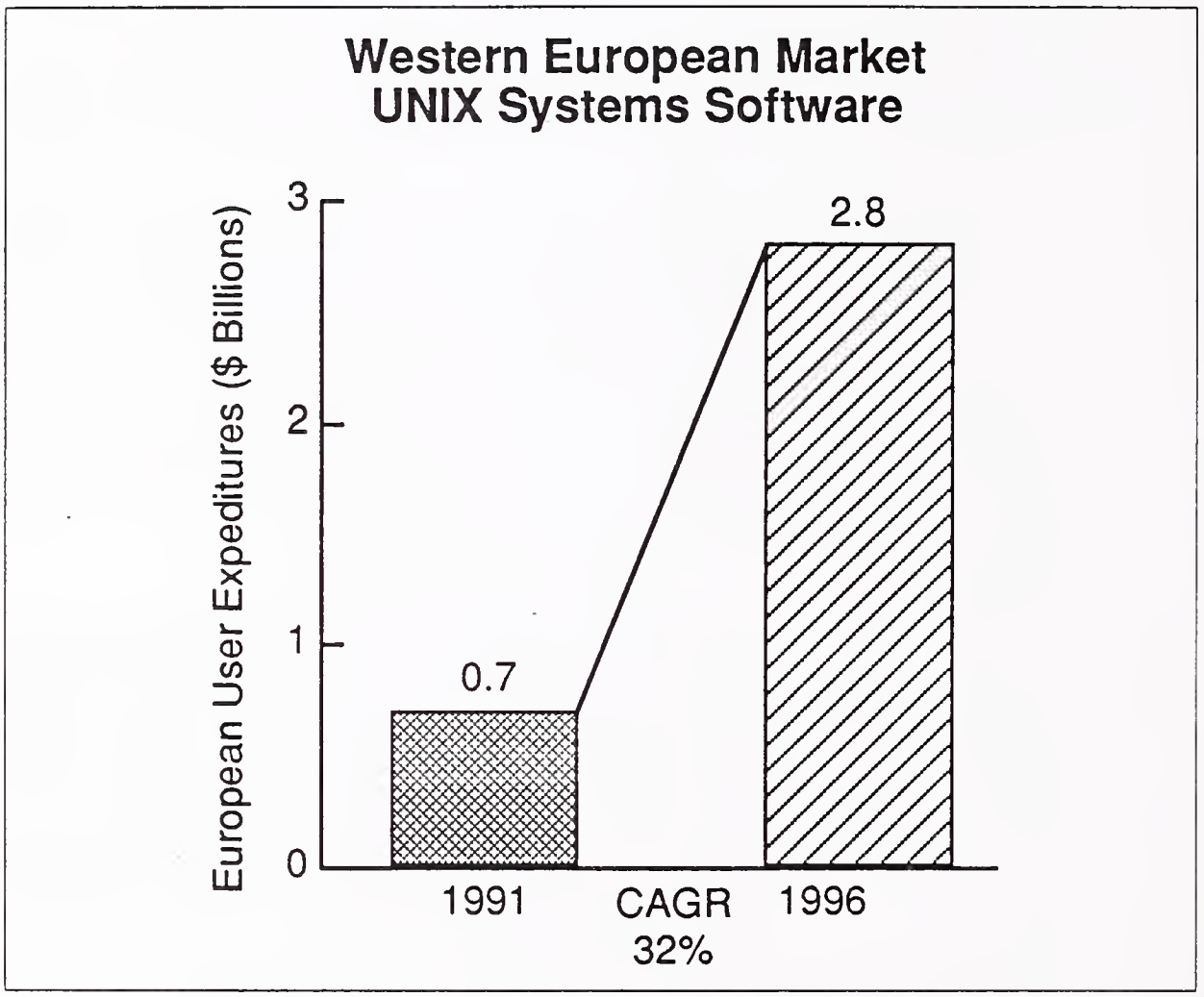
Both OSF and UI are members of X/Open Company Ltd, making it the pivotal organisation in the UNIX market. All five founding members of X/Open are based in Europe, and the long list of members includes the major Japanese computer system vendors. In addition X/Open has over 100 software vendor members worldwide and an established council of end users.

EXHIBIT II-2



Germany is the largest UNIX market in Europe, having had the benefit of a strong government mandate for open systems plus heavy commitment from both Siemens and Nixdorf (now SNI) to UNIX standards. Exhibit II-3 shows the balance of the market by major country. This is slightly different from the overall European software and services market, where France has a lead over Germany. Expected growth rates are very similar across all the European countries, though the highest forecast is Spain at 35% CAGR, with all equipment vendors switching sales and support resources to open systems product lines.

UNIX has become established across all categories of hardware platform, from mainframes and supercomputers down to PCs, as Exhibit II-4 establishes. But nowhere is it more accepted than in the workstation sector.

Workstations have been highly successful among professionals in the engineering disciplines—design, analysis, manufacturing, software development, energy, etc. Now, as hardware costs fall they are appealing to more commercial users such as financial dealers requiring high

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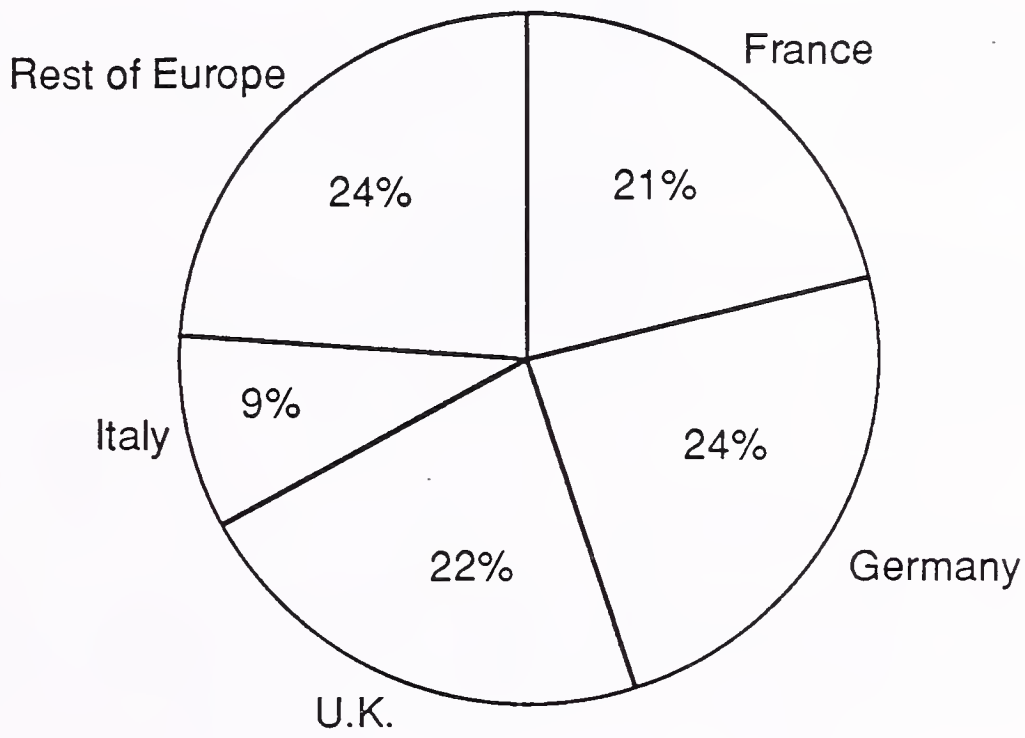
density and mobility of information on screen. High-performance networked PCs and RISC-based workstations are now competing with similar prices and a UNIX-based operating system.

EXHIBIT II-3

Major Country Markets
UNIX Systems Software



1991 Western Europe Total Market = $700 million

EXHIBIT II-4

Key Market Sectors

Platform	UNIX Strength	Direction
Workstations	Engineering disciplines	Commercial and financial
PCs	Departmental Professional	Power servers Workstations
Minicomputer	Government Small business	Large business Large departments
Mainframe	Telecomm. and engineering	Software development

Exhibit II-5 forecasts a market growth of 50% per annum for UNIX system software on workstations and PCs over the next five years.

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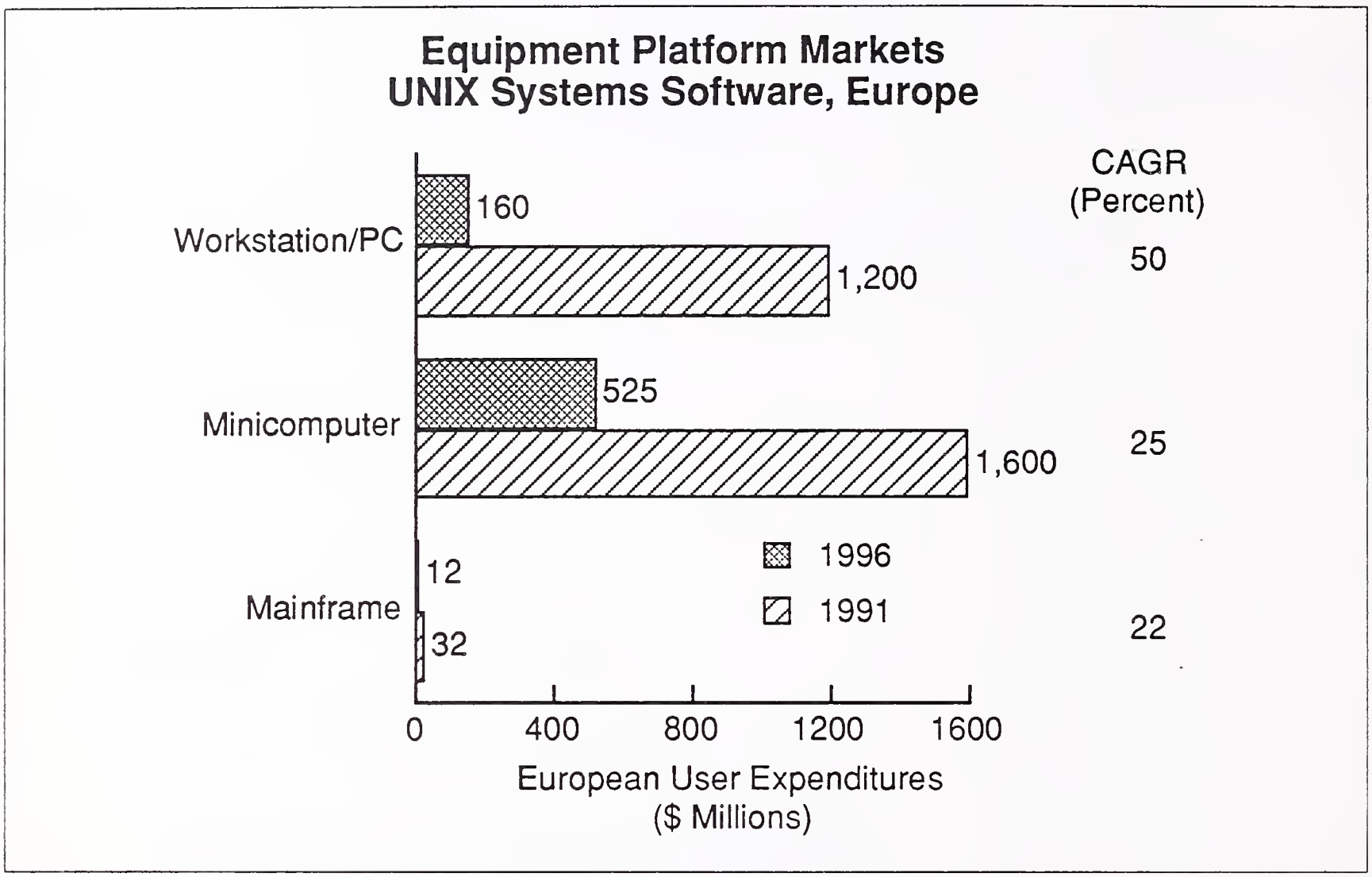
EXHIBIT II-5



The government sector has been, and continues to be, a strong stimulus to growth in Europe. Encouraged by the European Commission, country governments are imposing mandatory requirements for UNIX and other open system standards to be met for all new computer system purchases. In general, only compatibility with installed software or national security considerations can be used by central government departments to avoid requirements such as compliance with Posix and OSI standards. Local government bodies are not quite so constrained, but UNIX is growing in popularity as the means to get best value for money over the lifetime of a system.

Japanese activity in the UNIX market is still relatively invisible. Only one of the vendors interviewed mentioned the Japanese as a potential threat in Europe.

There are signs that many large multinationals in the commercial sector are starting to invest heavily in significant UNIX-based projects. IBM and Digital have both responded strongly to this trend with positive open systems pronouncements.

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Throughout the 1980's UNIX was emerging as an acceptable standard. During that period large numbers of small business systems based on UNIX were delivered, providing the original market opportunity on which most of the small UNIX specialist vendors built their businesses. Many of these vendors continue to grow but within a larger parent organisation interested in bigger customers.

The minicomputer sector is the largest for UNIX systems software and will remain so for some time. Proprietary minicomputer shipments are however declining in the face of UNIX competition, coming not only from the mini makers, but also as a spin-off from the workstation market in the form of powerful multi-user network servers.

UNIX systems software market value is less than one would expect judging by the penetration of UNIX hardware. This is because UNIX pricing is keener due to the more open competitive environment, a factor which is expected to continue to push prices down compared to proprietary softwares.

Mainframes account for over 50% of the current systems software market in Europe and hardly any UNIX business. However, UNIX is pushed strongly by Amdahl, and Fujitsu has also launched products. The arrival of acceptable transaction processing software may boost this market faster than predicted.

UNIX systems and software products are likely to stay largely confined to the workstation and minicomputer sectors, where penetration should increase from 11% in 1990 to 16% by 1996, in response to the continuing demands for open systems, downsizing and portability.

C

Shaping the UNIX Market

Three general communities of interest are shaping the UNIX system software market in Europe: user demands; equipment vendor strategies; and software vendor ambitions.

1. User Demands

The first of these interested parties is the users, and their demands, summarised in Exhibit II-6 with the resulting response from vendors. The search for ever greater value for money is forcing vendors into more open competition and hence the widespread introduction of UNIX-based product lines.

Existing investments in working practices, data, skilled users, IS staff, software, and so on, are considered the largest barrier to change in the user community. The result is great advances in the portability of such investments where open system standards have been employed.

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EXHIBIT II-6

UNIX Market Shapers
User Demands

User Demands versus Vendor Responses		
• Better value	=	More competition
• Protection	=	More portability
• Productivity	=	Tools and skills pool
• Flexibility	=	Federated solutions
• Packages	=	Scalable choices

The demand for productivity gains has resulted in new levels of innovative products and services. The very establishment of standards seems to spawn a whole new breed of products which help to differentiate one vendor from another.

As the pace of business increases, users are demanding more flexibility. Vendors are responding by providing federated solutions which combine the control of a central hub with the pragmatism of distributed systems (minicomputers, servers, workstations and PCs). These equipment platforms can now share common systems software environments and applications.

Many users are now selecting their software package(s) first and then going out to tender for the platforms on which it will run, often ranging in scale from PCs to large multiprocessor servers.

2. Equipment Vendor Strategies

The traditional equipment vendors are suffering the most with the growth of the UNIX market. The hardware market is saturated—every company that will buy computer systems already has bought some and therefore has an existing supplier. This implies that new name business is only gained by winning market share from an existing vendor.

Exhibit II-7 lists the equipment vendor actions which are shaping the UNIX market. All the traditional major equipment vendors have chosen to push their UNIX products through their third-party channels, leaving their powerful direct sales forces still mainly pushing the proprietary ranges. This is probably the single largest barrier to faster adoption of UNIX.

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EXHIBIT II-7

UNIX Market Shapers
Equipment Vendors

- Majors push UNIX through third parties
- Embrace systems integration
- Younger vendors keep direct sales
- All promote UNIX software products
- PC network vendors prepare for UNIX

Many vendors have also embraced systems integration as the means of maintaining major account control, winning new names and increasing the level of software and service added value in their business mix. In doing so they have all announced strategic applications architectures which encompass standards at every level to simplify integration, porting and scaling (downsizing) of applications across wide ranging hardware platforms (e.g., Digital with NAS). These architectural frameworks aim to make customers and resellers and software developers feel comfortable staying with their traditional vendor as they move to open systems.

The younger vendors like Sun, Pyramid, and Sequent have chosen to keep their direct sales channels as well as selling through OEMs and other third-party VARs. Direct dealings with customers ensure that they have a view of the market unblinkered by the sales channels of third parties.

All the equipment vendors promote UNIX software products strongly, but very few of these products are adopted for direct sale, delivery or support by the equipment vendors. This hands-off strategy has been instrumental in growing a large web of third-party channels for UNIX products and services across Europe.

The relatively higher margins available in the UNIX market are attracting vendors in the PC market to follow some of their larger networked customers into UNIX. It is too early to judge whether multi-user systems can be successfully packaged and sold off-the-shelf like PCs. However it is very likely that PC distribution channels will be used for workstation and shrink-wrap software products, both to end-user customers and to VARs.

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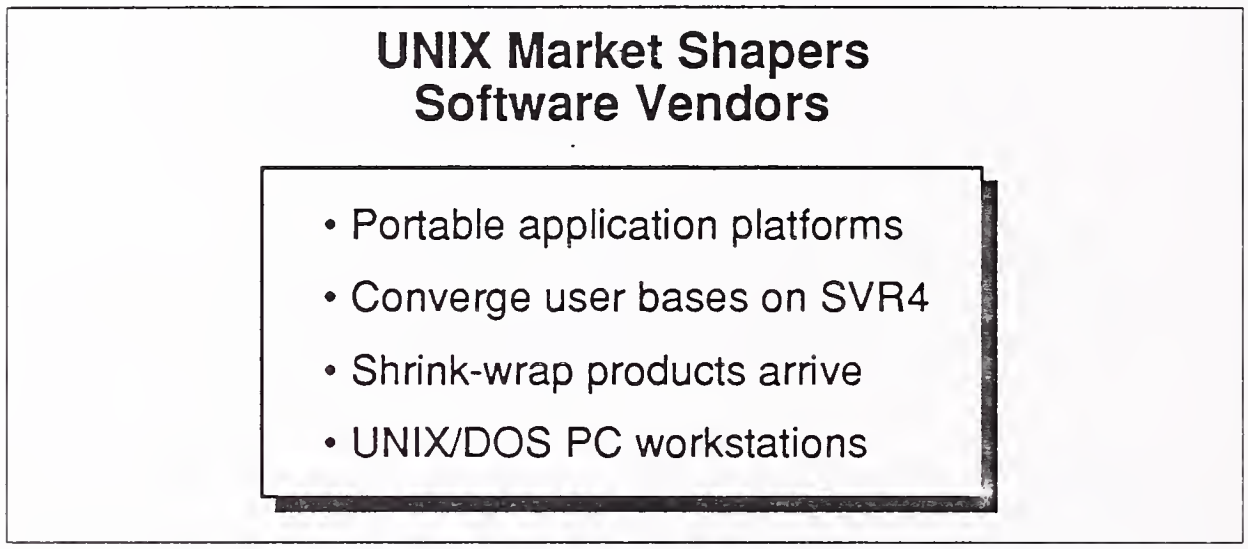
3. Software Vendor Ambitions

Exhibit II-8 lists key strategies through which the independent system software vendors are influencing the UNIX market in Europe. The availability of an enormous variety of good value hardware platforms has encouraged many software vendors to develop extensive software environments to sit on top of UNIX. It seems that establishing a new standard, which threatens to make every product the same, stimulates innovative vendors to create a whole new set of products with which to differentiate themselves.

EXHIBIT II-8



The software platforms all purport to offer the benefit of portability across a wide range of UNIX variants. In the database and 4GL area there are many successful products which are available across both UNIX and other operating systems. Most are still centred on dumb terminal-based multi-user systems, though there is a lot of activity to support the client-server architectures which originated in the workstation and PC markets.

The UNIX operating systems from AT&T, Berkley Software Distribution, Sun Microsytems, and Santa Cruz Operation (SCO) are the basis for nearly all the UNIX systems installed around the world today. UNIX International's System V Release 4 (SVR4) provides a compatible upgrade path for all these operating systems, allowing migration from older versions with minimum difficulty. UI's dominance of the UNIX user base gives it a distinct competitive advantage over OSF/1. Anyway, for Open Systems Foundation (OSF) members IBM, Digital and HP, OSF/1 is now looking more like a common specification to build to than a common product to port and sell.

The influence of the PC world is spreading to the UNIX community with the arrival of popular PC word processing, database and spreadsheet products shrink-wrapped for SCO and Sun platforms.

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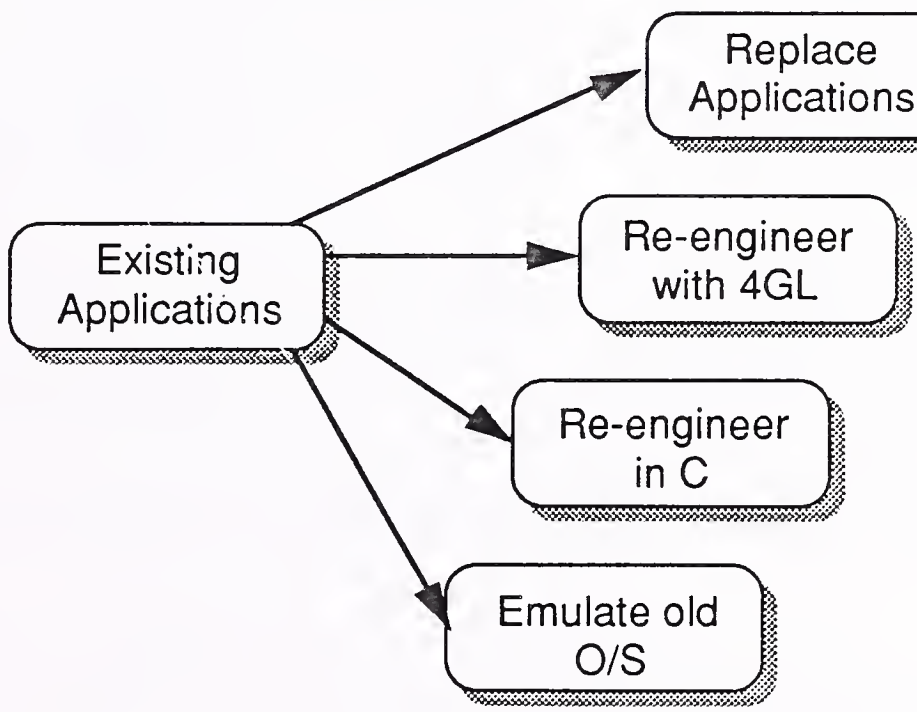
SCO has moved to fill the gap between PCs and workstations with a package of products offering a combined UNIX and DOS environment on 386 and 486 PCs. Their shrink-wrapped workstation "Open Desktop" combines Motif GUI, X-Windows, RDBMS, TCP/IP networking, DOS emulator and UNIX/386. This product is very keenly priced and is already an established success in the market.

Most UNIX system software vendors trading today have experienced rapid growth throughout the late 1980's. They all have variations on a common strategy of offering a rich applications platform above the UNIX operating system. The resulting choices of migration path for users are shown in Exhibit II-9. Each has its own benefits and drawbacks and needs to be judged situation by situation.

The most obvious difficulties result from carrying forward old applications systems, extending their life and trying to manage the enhancement and maintenance of out-of-date software technology.

EXHIBIT II-9

Alternate Migration Paths to UNIX



D

Impact of UNIX on Vendors

UNIX and the open systems movement are encouraging the continued trend for user organisations to outsource more of their IS activities.

The rapid rise of UNIX has had a major impact on both equipment and software product vendors, but is of less critical importance to the software service vendors who focus on customer issues more than products. The impact on each type of vendor is expanded upon in the following paragraphs.

The objective of a wide choice of portable and scalable applications was one of the earliest goals of UNIX devotees. The perceived wisdom

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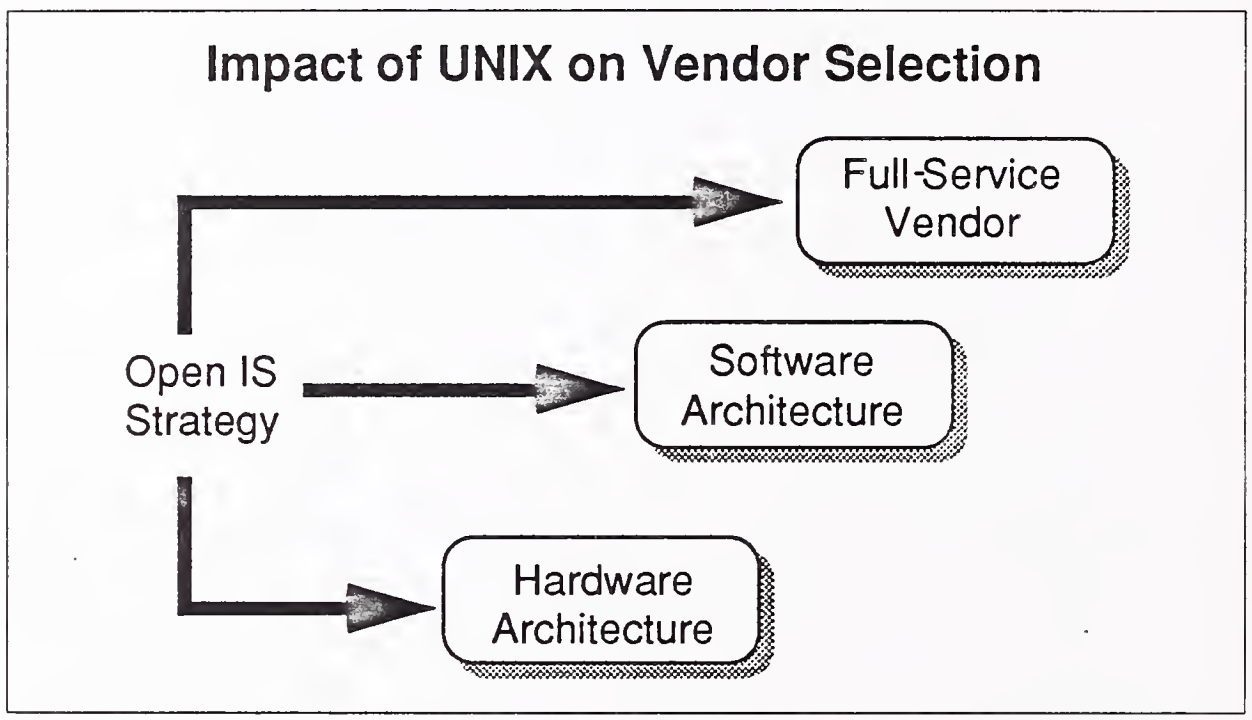
became that in the future the choice facing systems users would narrow down to IBM, Digital or UNIX. Now IBM and Digital are active participants in the UNIX market. With Digital seeking to move its whole corporate image across to open systems, including the VAX/VMS operating system, it may be that in the future the choice will seem narrower still.

Exhibit II-10 shows how user purchasing policies are changing in emphasis. In the past a short list of preferred hardware vendors was a key element of IS strategy. Now hardware has been relegated to a lower order priority. There are many examples of users giving top priority to choosing software products, followed by choosing a prime contractor for system implementation and ongoing support.

EXHIBIT II-10



UNIX and open systems standards, following the example of the DOS world, have encouraged the development of many different supply channels. In some cases there are several different channels for the user to deal with for a single product; for example, different vendors may be responsible for each of the following activities: marketing, selling, delivering, maintaining and supporting.

1. Impact on Equipment Vendors

Key factors impacting the traditional established equipment vendors are shown in Exhibit II-11.

As already discussed, whether embracing UNIX or ignoring it, all the traditional equipment vendors have suffered from falling revenues and margins from their proprietary customer bases. This is caused by:

- Hesitation in purchase plans as users consider an open systems strategy and the IS value-for-money questions

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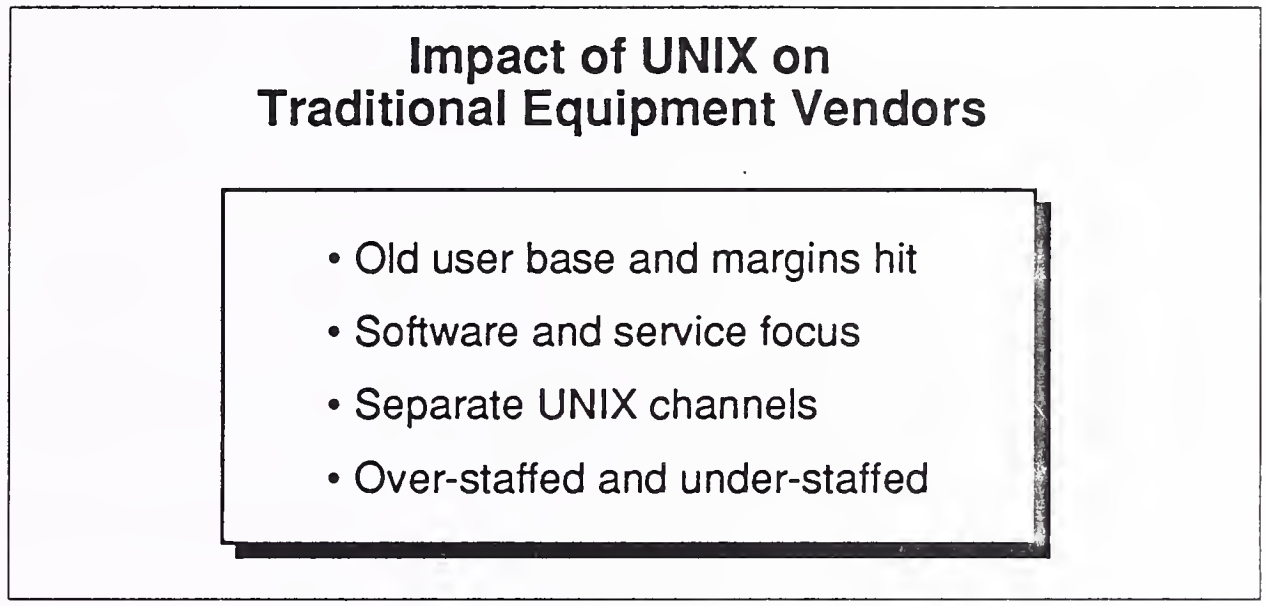
- Price pressure in a buyer's market oversupplied with products—every vendor now offers a wide range of UNIX products.
- Loss of replacement or extension business to a competitor.

EXHIBIT II-11



Most of the major equipment vendors and many of the minor ones have started to switch resources into software and services to regain lost margins and give customers new reasons for remaining loyal to their existing vendor. But massive changes in the business mix cannot be achieved overnight.

In a bid to limit damage to their traditional business the equipment vendors all chose to push UNIX through third-party channels. One result of this is that their customers have often first heard about the benefits of UNIX from a competitor, rather than from their established equipment vendor. As use of equipment vendor direct sales force channels increases and their software and service revenues build up, the dramatic growth and market share experienced by independent third-party channels may reduce.

Retraining the direct channels to sell UNIX products alongside proprietary is a huge task likely to take several years. At the same time the equipment vendors have found they are carrying too many staff in their overheads and need to increase the proportion of staff who are directly revenue generating. Switching product-oriented employees to a software and service culture requires strong change management skills.

2. Impact on Software Product Vendors

Exhibit II-12 summarises the impact on software product vendors. Rather like their large equipment vendor counterparts the large traditional software vendors are reacting slowly to UNIX. There are signs that they are preparing to jump into the UNIX market but are waiting to see the customer demand first. Several admit to re-engineering their most popu-

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lar product lines for open systems—ready for a 1991 or 1992 launch—primarily in response to customer demand for downsizing rather than for UNIX as such.

EXHIBIT II-12

Impact of UNIX on Software Product Vendors

- Traditional vendors (D&B, CA, SAP...)
  - Slow, but re-engineering
- Software platforms (Oracle, Progress...)
  - Emulating 70s manufacturers
- Newer vendors
  - Bet on software platforms
- PC software
  - Following customers to UNIX

The software platform vendors are winning the customer loyalty that users used to have towards hardware vendors in the 1970's. Having apparently escaped from the idea of being locked-in to a hardware supplier, users are now realising that they are choosing to be locked-in to a software supplier instead.

Some vendors offering the same platform across proprietary and UNIX operating systems have found that customers then chose a two-step migration strategy. Once they are happy that UNIX is a future option, they stick with their proprietary systems but adopt the new software platform for all new developments. In the eyes of the customer this reduces the risk of change by offering a piecemeal approach. Something of the same approach can be seen in Digital's opens systems stance—NAS. Producers of *new* software products, both systems software and applications, are chosing to develop on one or more of the software platforms (common application environments). Software platforms offer:

- A community of interest with other vendors who often have different specialisations
- A shield from all the vagaries of new releases of operating and networking software and standards. These are handled by the platform vendor.

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In contrast many longer established vendors have chosen the C language as their route to portability, but are unable to gain maximum benefit from the latest advances in 4GLs and other development tools, and have to keep their applications and tools in step with new operating systems or language standards.

PC software vendors are getting in to UNIX because their customers are now doing so in sufficient numbers, especially corporations that have extensive PC networks.

3. Impact on Software Service Vendors

As far as UNIX is concerned, service vendors are the least affected of the vendor groups analysed. Exhibit II-13 and II-14 list INPUT's standard categories of delivery mode in order of impact of UNIX.

EXHIBIT II-13

Impact of UNIX on Service Vendors

- Systems integrators
  - Distributed systems drive market
  - 2nd-tier stake future on SI & UNIX
- Turnkey systems
  - Win on business merit
  - Customer's hardware choice
- Professional services
  - Improving productivity
  - Responding to transition demand

EXHIBIT II-14

Impact of UNIX on Service Vendors

- Processing services
  - Reviewing potential margin gains
- Network services
  - Little pressure to migrate to UNIX
- Systems operations
  - Transition phase opportunities

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Most affected is systems integration, one of the most rapidly growing market sectors in Europe. The demand for UNIX parallels the demand for systems integration, both being the result of demand for more distributed application systems. UNIX offers flexible low-cost platforms. Systems integration promises to knit together large multivendor system solutions, exploiting to the full existing IS investments.

For a large equipment vendor, having UNIX removes one more possible objection or barrier to winning when bidding for SI contracts.

The most widespread use of multi-user mini- and micro-computer UNIX systems is for turnkey systems. Here the vendor is able to win entirely on his own product and people merits rather than on the basis of the hardware vendor he happens to propose. If the customer has a preference for hardware vendor then the turnkey vendor has a good chance of being able to satisfy the requirement. This has significantly broadened the market opportunity for UNIX-based turnkey system vendors, since suitable platforms are usually available from IBM, Digital and everyone else.

Professional services vendors range from those who offer specialist UNIX services like technical education and training or consultancy, to those who have naturally started to consider UNIX-based solutions across the whole spread of professional services they offer: feasibility studies, architecture recommendations, custom software developments, etc.

Many vendors are already exploiting CASE environments and 4GLs running on UNIX workstations in order to improve the productivity of their own staff, though it takes some very determined investment decisions to ensure that such staff development gets priority.

Customers requiring help in the transition to UNIX and open systems are creating special demands on those vendors who have already built up UNIX-based skills. This is likely to be a long-term demand as the migration to UNIX-based systems will last out the decade, but the skills most in demand will relate to C programming techniques, the new software platform environments and to application areas rather than to the technical intricacies of the UNIX operating system itself.

Overall, UNIX enables these service vendors to minimise their concern with hardware and operating system technicalities and concentrate on the skills most valued by their customers—converting business requirements into working IS solutions through their in-depth knowledge and skill in such aspects as:

- The customer's business environment
- Specialist application areas and alternative solutions selection

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- Suitable IS integration strategies and architectures
- System implementation planning and execution
- Partial or complete project management
- Business, application, and technical problem resolution
- Ongoing customer support and system enhancement or maintenance

The remaining three service delivery modes are listed in Exhibit II-14. They are only marginally affected by UNIX, primarily because of their existing long term investments and the fact that users have not experienced any price benefits from vendors as a result of UNIX.

There are cases where a user decision to go to open systems has created a positive decision to outsource the maintenance, support, operations or management of existing systems during the transition phase between old and new systems.

It is competitive pressure between vendors which stimulated the original demands for UNIX. But it is not possible to forecast when or if any of these vendors will use UNIX systems to offer more cost-effective services, though many vendors are known to be considering their UNIX options.

E

Conclusions

EXHIBIT II-15

Conclusions
UNIX Software and Services

- UNIX—not an issue in 1996
- Software channels:
  - Key to software product success
  - Equipment vendors could dominate
  - Open platform packages will thrive
- Service vendors build client loyalty:
  - Price performance and quality
  - Knowledge of client's business
  - Responsive to service needs

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For many vendors and users, focus has already moved off UNIX and onto other standards issues. Vendors who have ported their software products to dozens, if not hundreds, of UNIX varieties no longer see standardisation as relevant. The debate revolves more around which higher level platforms, either for database or for software tools, will become de facto standards for large sections of the market through sheer numbers of users.

The increasing demand for software products, especially applications, is being matched by an explosion in the number of products available. The key differentiators in the future will tend to be based on the reputation of the vendor. High-volume products will need a recognised brand name. The winners will have invested in establishing the right distribution channels.

The role of equipment vendors in the software products market remains unclear while the majority of UNIX sales go through third-party channels. Equipment vendors could play a key role in the software product supply chain in the future. This is also the chosen role for OSF, though its current aggressive pricing policies may limit its attraction as a channel for small innovative software product producers.

Recognising the pivotal role of a strategic software platform, several hardware manufacturers have announced that they intend to sell their platform software independently from their hardware. This may be the greatest threat to the smaller independent platform vendors.

For the services vendors UNIX will continue to give them greater freedom to concentrate on meeting their customers' service needs. Undoubtedly the migration to open systems is providing exceptional opportunities to assist clients with the transition. But this is only the result of clients seeking greater value for money from their investments in IS. And that is the driving force for the whole of the outsourced software and services market.

Differentiation between service vendors will focus on quality of service, long-term client relationships and value for money. UNIX should have a strong fundamental role to play in improving all three aspects over the next decade.

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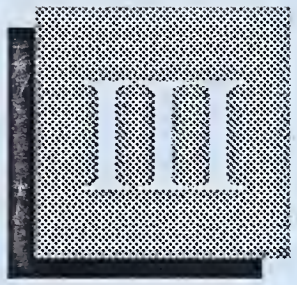
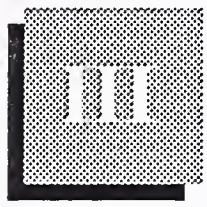


Market Analysis



Market Analysis

The market for UNIX-related systems software is growing twice as fast as the overall system software products market. The Western European market for UNIX system software is forecast to reach $2.8 billion by 1996. The average growth rate of 32% compares with a forecast of only 15% for the whole systems software market. The market for UNIX-based applications software products is not quantified in this report, but can be expected to grow at around 40% per year.

A

Definition of Software Categories

The following pages provide an overview of the market size and forecasts for Europe as a whole, for the three different hardware platforms and for each major European country.

Applications software is specifically excluded from the data. The introduction which follows explains how software sectors are defined and how particular types of product are specified.

Appendix A provides more detailed definitions of all the categories of software and service as used by INPUT.

Exhibit III-1 shows INPUT's formal classification of software products in a hierarchical manner with systems and applications being the main split. Application development tools are increasingly coming to play the interfacing role between these two main categories of software.

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Software Products Market Structure

- **Software**
  - **Systems Software**
    - **Systems Control**
      - Access Control
      - Communications Monitors
      - Micro-Mainframe Links
      - Network Control
      - Operating Systems
      - Security Systems
      - System Library Control
    - **Data Center Management**
      - Capacity Management
      - Computer Operations Scheduling
      - Data Center Management
      - Downtime/Repair Monitoring Management
      - Job Accounting
      - Performance Monitors
      - Tape Management
      - Utilities
    - **Applications Development**
      - **Program Development and Production Tools**
        - Application Generators
        - Assemblers
        - Automatic Documentation
        - Compilers
        - Debugging Aids
        - Languages
        - Systems Development Control
        - Retrieval Systems
        - Translators
      - **Database Management Systems**
        - Database Management Systems
        - Data Dictionaries
        - Other
      - **CASE Systems**
        - Upper
        - Lower
        - Integrated
  - **Applications Software**
    - **Cross-Industry**
      - **Accounting**
        - Accounts Payable
        - Accounts Receivable
        - Fixed Assets
        - General Ledger
        - Purchasing
      - **Human Resources**
        - Benefits
        - Payroll
        - Personnel
        - Training and Education
      - **Planning and Analysis**
        - Budgeting
        - Financial Planning
        - Forecasting
        - Modeling
        - Integrated Analysis Systems
        - Spreadsheet Systems
        - Graphics
        - Other
      - **Engineering and Scientific**
        - Structural
        - Chemical
        - Electrical
        - Mechanical
        - Piping
        - Project Control
        - Nuclear
        - Statistics/Operations Research
      - **Education and Training**
        - Computer-Assisted Instruction
        - Authoring Languages
        - Video Instruction
        - Live Instruction
        - Other
      - **Other Cross-Industry**
        - Administrative Services
        - Corporate Services
        - Sales, Marketing, and Distribution
        - Word Processing
        - Other
    - **Industry-Specific**
      - Federal Government
      - Insurance
      - Medical
      - Process Manufacturing
      - Retail
      - Services
      - State and Local Government
      - Telecommunications
      - Transportation
      - Utilities

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Exhibit III-2 illustrates the layered approach to categorising software products. Its tabular form shows the different layers of standard software now required for most general-purpose systems as the different rows of the table.

EXHIBIT III-2

Definitional Map of Software Classes

Software Product Category	Equipment Platform		
	Mainframe	Mini-computer	Workstation/ PC
Systems Control	S	S	S
Operations Management Tools	S	S	S
Applications Development Tools			
- Program Development	S	S	S
- DBMS	S	S	SA
General Business Software	A	A	A
Application-Specific Products	A	A	A

S = Systems Software Products
A = Applications Software Products

As one moves down the table, the category of software gets closer to the user and his application. As one moves up the table, the software type becomes more related to the equipment platform.

The three columns show three distinct types of hardware platform:

- For the purposes of this report, the minicomputer category is defined to include: IBM's System/3X systems and their replacement the AS/400; Digital's MicroVAX and VAX Server ranges; and the equivalent competitive offerings from the other hardware manufacturers, including the majority of multi-user systems based on UNIX.

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- The workstation and PC segment includes: both PC's and the high performance desk-top or desk-side configurations such as those from Sun Microsystems, Hewlett-Packard (Apollo), Digital and IBM (RS6000). Although these latter systems can be configured either stand-alone or networked, they are distinguished from the minicomputer category by application (today technical applications still predominate over commercial) and by architectural pedigree (they were initially developed as high-performance, single-user engines capable of co-operative networking).

- The line between systems and applications software is usually drawn between database management systems (DBMS) products for traditional multi-user platforms such as mainframe and minicomputer. But for PCs and workstations the parameterised DBMS often becomes the user's application engine itself. Hence the dual classification of DBMS under the workstation/PC column. The general business software category includes products like spreadsheets, word processing and office automation.

B

Market Perspective

During the 1980's the market for software products grew extremely rapidly, as shown in Exhibit III-3. By 1990 growth had fallen to around 20% per year overall, but the popularity of UNIX, its many derivatives, and all the systems software supported by it (development environments, languages, tools and methodologies) had created a large new market segment.

Even by 1995 this UNIX segment of the systems software products market will still be dwarfed by products for proprietary operating systems, mainly influenced by the following factors:

- In 1990 mainframe systems accounted for over 50% of the value of the European systems software products market, and by 1995 this is likely to have fallen to about 40%, still the largest sector.

- UNIX systems software products had penetrated the non-mainframe market by 11% in 1990, and should increase that penetration to over 16% by 1996 in response to strong demand for open systems, downsizing and portability.

- Competitive pressure in the UNIX market will keep prices falling as products gain in popularity and sales volume. This will limit the growth in value of the overall UNIX systems software products market as users migrate from proprietary to open platforms. Open systems means open competition and price performance which favours the end-user community.

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- Many of the new generation of systems software products have been specifically designed for UNIX or to be portable across both UNIX and proprietary platforms, reinforcing demand for UNIX systems, especially for workstations or powerful PCs as development workbenches.

EXHIBIT III-3

Western European Software Products Markets
Comparative Growth, 1979-1995

Market Sector	Market Size ($ Millions)				
	1979	1979-1989 CAGR (Percent)	1989	1989-1995 CAGR (Percent)	1995
Systems Software Products	530	33	9,140	15	21,100
Application Software Products	275	35	5,700	23	19,400
UNIX Systems Software Products	N/A	-	400	32	2,130
Total Software & Services Industry	7,000	22	52,000	18	143,000

The figures for the total software and services market are given in Exhibit III-3 to show the relative size and growth rates of the UNIX systems software market. By 1995 it is expected to represent just 1.5% of the total software and services market in Europe.

Although it is clear that UNIX has arrived and is here to stay in Europe, it will still be some time before it becomes dominant in the systems software market sector.

Exhibit III-4 shows the dependence of typical equipment vendors on independent software products vendors. Less than 2% of the products catalogued by this equipment vendor originated from within the company. The reliance of equipment vendors on third parties is currently far higher in the UNIX and open systems market than it has been with their traditional proprietary systems.

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EXHIBIT III-4

Analysis of UNIX Software Catalogue of an Equipment Vendor, 1990

Type of Software	Number of Programs	Number from Equipment Vendor	Number of Software Vendors
Systems Software	51	2	42
Applications Software			
- Cross Industry	152	5	101
- Industry Specific	281	5	128
All Types	484	12	142

Note: A program may consist of a suite of several modules. Systems software covers the operating systems, security routines, utilities and aids, languages, applications development and data management tools.

Such freedom of choice for customers is weakening the influence and hold which any vendor can exert in order to ensure long-term customer loyalty.

Exhibit III-5 illustrates the polarisation of the market, which is currently most evident in the mid-range between the two proprietary giants and the nonproprietary UNIX group:

- Digital remains strongly committed to its VMS environment even though its Ultrix version of UNIX sells well on both VAX and workstation product lines. But it is taking a whole series of steps to make VMS conform to open system standards within an open systems concept named NAS—Networked Application System.

- IBM remains at the summit and promotes SAA as its strategic envelope across incompatible proprietary architectures. Its AIX version of UNIX is strongly promoted only for technical workstation applications, though there is constant pressure for it to push it towards SAA in the long term.

- The rest of the vendors are inevitably drawn to the shelter of the UNIX corner.

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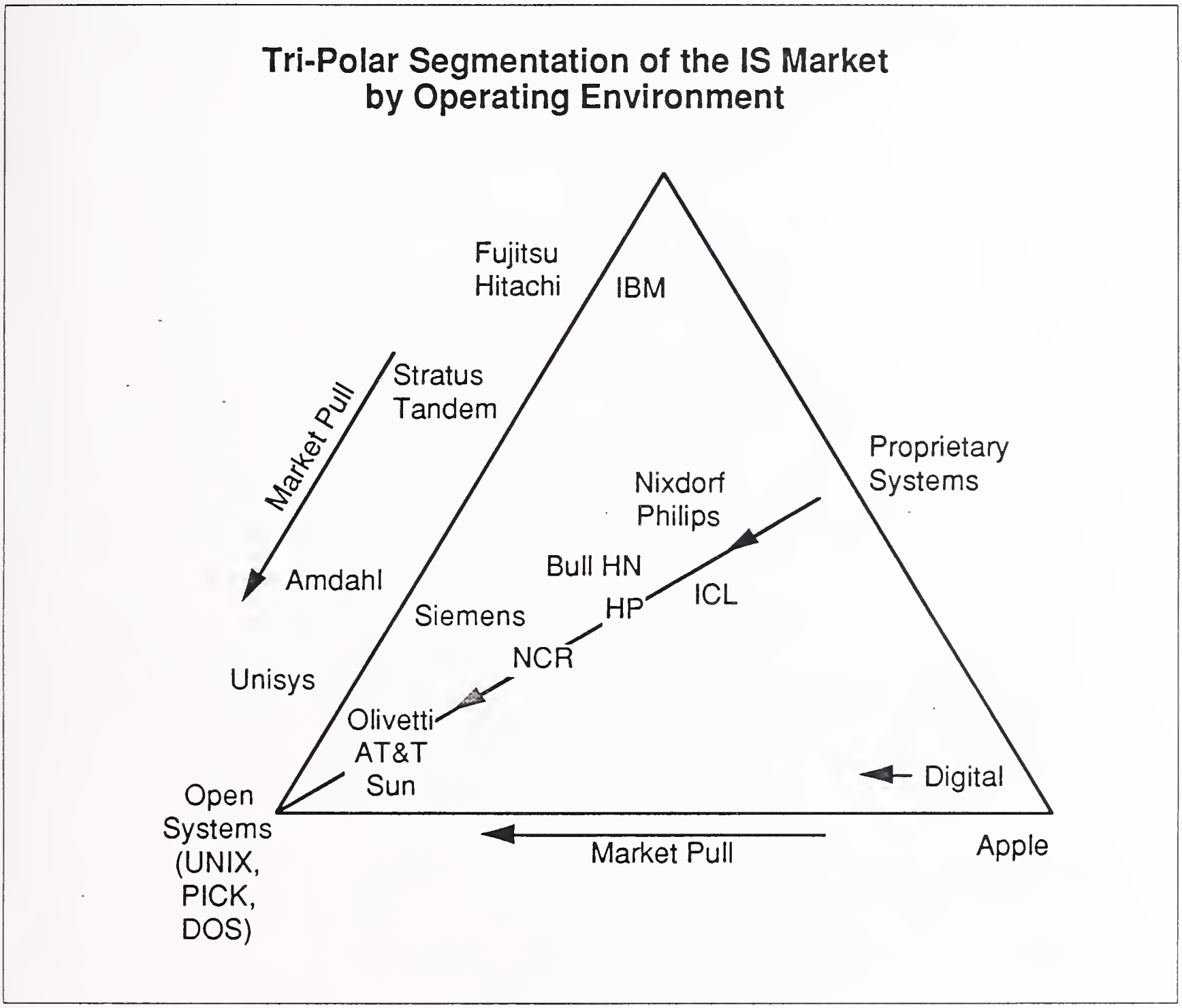
EXHIBIT III-5



C

UNIX Market Forecasts

Exhibits III-6 and III-7 show the changing profile of the UNIX systems software market as the PC/workstation sector continues to grow faster than the rest.

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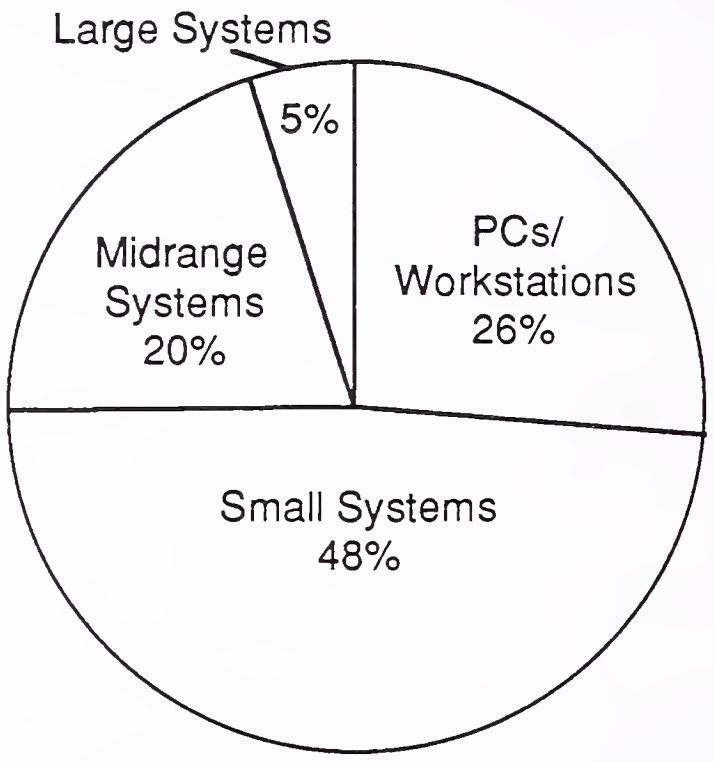
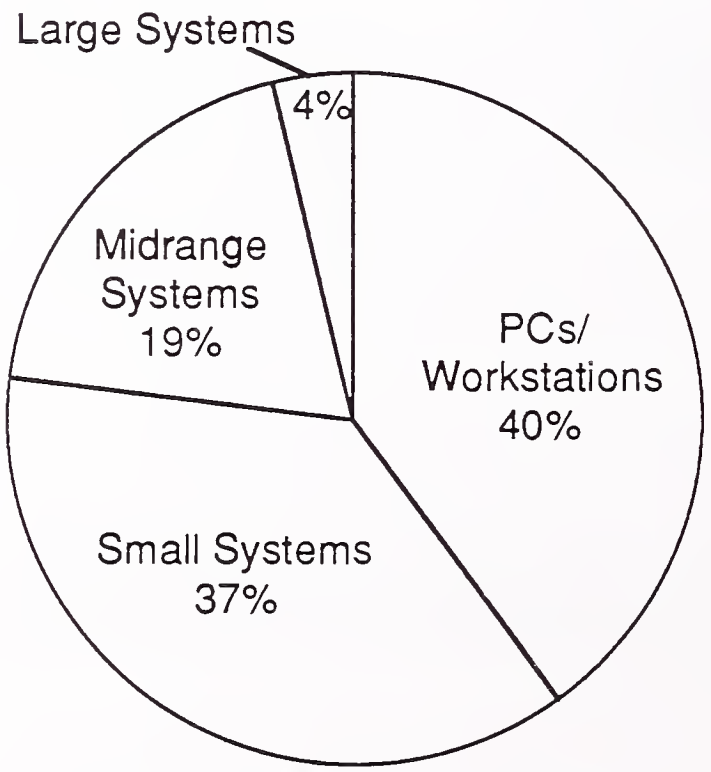
EXHIBIT III-6

UNIX Systems Shipments—Western Europe



Total 1991 Market $5.8 Billion



Total 1996 Market $17 Billion

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EXHIBIT III-7

Market by Equipment Platform
UNIX Systems Software Products
Western Europe

Sector	$ Millions				
	1990	1991	1992	1991-1996 CAGR (Percent)	1996
Mainframe	11	12	14	22	32
Minicomputer	430	525	670	25	1,600
PC/Workstation	100	160	260	50	1,200
Total (Rounded)	540	700	940	32	2,800

The minicomputer sector is the largest for UNIX systems software and will remain so for some time. Proprietary minicomputers shipments are declining in the face of UNIX competition coming not only from the mini makers, but also as a spin-off from the workstation market in the form of powerful multi-user network servers.

UNIX systems software market value is less than one would expect judging by the penetration of UNIX hardware. This is because UNIX pricing is more keen due to the more open competitive environment, a factor which is expected to continue to push prices down compared to proprietary softwares.

Mainframes account for over 50% of the current systems software market in Europe, and hardly any UNIX business, although UNIX is pushed strongly by Amdahl.

UNIX is likely to stay largely confined to the workstation and minicomputer sectors where it should increase its penetration from 11% in 1990 to 16% by 1996 in response to the continuing demands for open systems, downsizing and portability.

Germany is the largest UNIX market in Europe, having had the benefit of a strong government mandate for open systems plus heavy commitment from both Siemens and Nixdorf (now SNI) to UNIX standards. Exhibit III-8 shows the size of the market by each major country. The shape is

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slightly different from the overall European software and services market, where France has a clear lead over Germany. Expected growth rates are very similar across all the European countries, though the highest forecast is Spain at 35% CAGR (compound average growth rate).

EXHIBIT III-8

Country Market Comparison—UNIX Systems Software Products, Western Europe

Sector	$ Millions				
	1990	1991	1992	1991-1996 CAGR (Percent)	1996
France	85	120	155	31	470
Germany	130	160	220	32	635
United Kingdom	85	110	145	31	430
Italy	65	90	125	34	390
Sweden	25	30	40	30	110
Denmark	15	20	25	32	80
Norway	10	12	15	32	45
Finland	7	10	12	32	40
Netherlands	30	40	50	31	150
Belgium	15	20	30	30	75
Switzerland	20	25	35	30	95
Austria	15	20	25	32	80
Spain	25	35	45	35	160
Rest of Europe	8	10	15	32	35
Europe (Rounded)	540	700	940	32	2,800

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Market sizes and forecasts are provided in local currencies for each country in Appendix C of this report.

D

Market Issues

User demands are the primary driving force in the European UNIX market place. These are summarised in Exhibit III-9 along with the resulting response from vendors.

EXHIBIT III-9

User Demands in the UNIX Market

Primary User Demands	Vendor Community Responses
• Better value for money	• More open competition
• Investment protection	• More portability of software and data
• Productivity gains	• Advanced tool and larger skills pool
• Flexibility to change	• Federated solutions
• Packaged solutions	• Reasonable choice of vendors and products

The user search for ever greater value for money is forcing vendors into more open competition and hence the widespread introduction of UNIX-based product lines.

Existing investments in working practices, data, skilled users, IS staff, software, and so on, are considered the largest barrier to change in the user community. The result is great advances in the portability of such investments where open system standards have been employed.

The demand for productivity gains has resulted in new levels of innovative product and service. The very establishment of standards seems to spawn a whole new breed of products which help to differentiate one vendor from another.

As the pace of business increases, users are demanding more flexibility. Vendors are responding by providing federated solutions which combine the control of a central hub with the pragmatism of distributed systems (minicomputers, servers, workstations and PCs). These equipment platforms can now share common systems software environments and applications.

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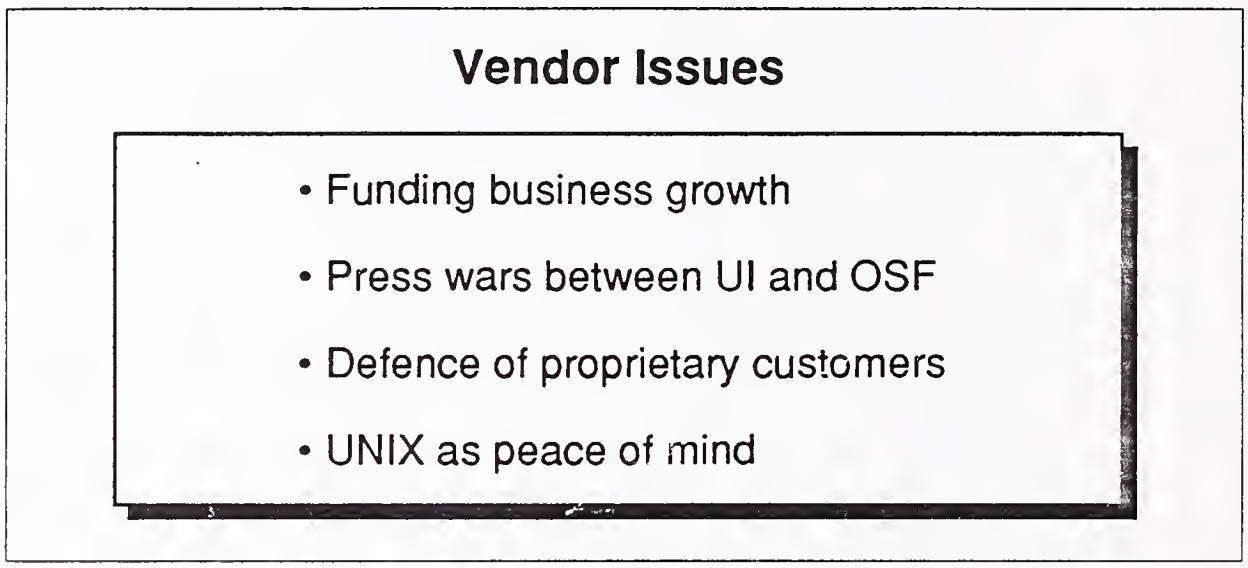
The wide choice of function-rich flexible packaged solutions based on UNIX and other standards allows users to buy effective alternatives to in-house or custom developments. Many users are now selecting their software package(s) first and then going out to tender for the platforms on which it will run, often ranging in scale from PCs through to large multiprocessor servers.

During the vendor research for this report it became clear that UNIX is in no sense a single coherent market. Very few issues were mentioned by more than one interviewee. Those that were are listed in Exhibit III-10. They all represent barriers to even faster migration to UNIX.

EXHIBIT III-10



Small but successful vendors are concerned that their rapid growth has become limited by lack of available funding. Those vendors who wish to retain their independence, rather than be absorbed by a larger company, are finding it difficult to raise additional finance in the current economic climate. In this state they are likely to be plumb take-over targets.

The continuing wars between UI and OSF reported in the press have been and still are a barrier to faster take-up of UNIX in the commercial sector of the market. Some would say this has worked in the interests of OSF members. But there are now signs that open systems (rather than UNIX per se) are getting a fair hearing in the IS strategies of many large corporates. Many large companies are now running pilots to evaluate the promises of open systems.

Traditional equipment vendors have naturally been very protective towards their proprietary system customers. Upgrade and maintenance revenues are conventionally far more profitable than new system sales, so rapid switches to UNIX can damage profit margins. User pressure is running high in 1991 and Digital is now talking openly about embracing open systems for all its customers. Even IBM has made statements about converging SAA with the open systems world.

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Software vendors whose products bridge the proprietary and open equipment platforms are finding that this promise of an easy transition to UNIX has slowed the pace of UNIX take-up. Customers are happier to retain their existing equipment vendor and to switch to UNIX at some time in the future, rather than jumping right now.

E

Conclusions

EXHIBIT III-11

UNIX Software and Services—Conclusions

- UNIX—not an issue in 1996
- Software channels:
  - Key to software product success
  - Equipment vendors could dominate
  - Open platform packages will thrive
- Service vendors build client loyalty:
  - Price performance and quality
  - Knowledge of client's business
  - Responsive to service needs

For many vendors and users focus has already moved off UNIX and onto other standards issues. Vendors who have ported their software products to dozens, if not hundreds, of UNIX varieties no longer see standardisation as relevant. The debate revolves more around which higher level platforms, either for database or for software tools, will become de facto standards for large sections of the market through sheer numbers of users.

The increasing demand for software products, especially applications, is being matched by an explosion in the number of products available. The key differentiators in the future will tend to be based on the reputation of the vendor. High-volume products will need a recognised brand name. The winners will have invested in establishing the right distribution channels.

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The role of equipment vendors in the software products market remains unclear while the majority of UNIX sales go through third-party channels. Equipment vendors could play a key role in the software product supply chain in the future. This is also the chosen role for OSF, though its current aggressive pricing policies may limit its attraction as a channel for small innovative software product producers.

Recognising the pivotal role of a strategic software platform, several hardware manufacturers have announced that they intend to sell their platform software independently from their hardware. This may be the greatest threat to the smaller independent platform vendors.

For the services vendors UNIX will continue to give them greater freedom to concentrate on meeting their customers' service needs. Undoubtedly the migration to open systems is providing exceptional opportunities to assist clients with the transition. But this is only the result of clients seeking greater value for money from their investments in IS. And that is the driving force for the whole of the outsourced software and services market.

Differentiation between service vendors will focus on quality of service, long-term client relationships and value for money. UNIX should have a strong fundamental role to play in improving all three aspects over the next decade.

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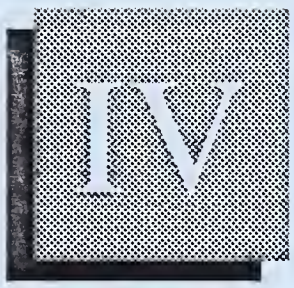
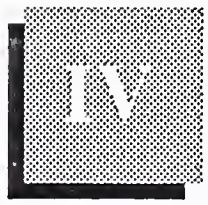


Current UNIX Market Conditions



Current UNIX Market Conditions

This report summarises the status of the UNIX market in Western Europe and the position of software and service vendor groups within it, showing:

- The pressures which different types of software and service vendor are under
- The major consortia and pressure groups and their objectives
- The positions each party has taken to date
- Some of the key software and hardware platform vendor strategies
- The explosive growth in the number of portable software products and platforms
- The impact so far of UNIX on the different delivery modes for software and services

A

UNIX—Changing Industry Structure

The adoption of UNIX as a preferred operating system is continuing at a pace well in excess of the overall IS industry growth rate in 1990. The key underlying factors driving this pace of change are the cost and performance improvements which come from high volume hardware and software production. The industry saw this effect previously when IBM established the PC and DOS specifications as de facto standards in the early 1980's and Microsoft was able to license its version—MS-DOS. Prices fell and the variety and volume of products rose sharply. The PC created new market demand, largely in addition to the existing market for mid-range and mainframe systems, producing new fast-growing PC-based businesses but not too much damage to existing vendors.

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UNIX is much more threatening to the balance of business established over many years by the traditional multi-user system vendors—primarily equipment manufacturers. Price/performance improvements have become more directly linked to the underlying chip technology, and traditional equipment vendors cannot keep up the pace without damaging their own profitability. They are under great pressure to:

- become more responsive to competitive pressure
- find new reasons for customers to remain loyal
- change the balance and structure of their business
- reduce the gross profit margins they have enjoyed for years
- carry fewer overheads and possibly outsource more
- behave more like a distribution channel than a vertically integrated manufacturer
- work in partnership with other vendors rather than aim to remain self-sufficient

Exhibit IV-1 lists all the interested parties who are influencing the pace at which UNIX-based systems and software are being acquired by user organisations.

EXHIBIT IV-1

Influential Groups in the European UNIX Market

- Traditional computer manufacturers
- Open systems equipment vendors
- UNIX o/s software vendors
- Independent software vendors
- Professional service vendors
- Open standards bodies
- Open user pressure groups
- Proprietary system users

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As already mentioned the traditional suppliers are finding the pace of change too fast. They had a tied relationship with their customers, based on there being very little choice of supplier for any proprietary system enhancements or extensions. In the face of open competition many equipment vendors have adopted a strategy of building their software and services revenues and of holding onto key customers by managing large systems integration projects for them.

All of the traditional vendors have embraced UNIX—Siemens Nixdorf, ICL, Olivetti, Bull, Norsk Data, NCR, Unisys, Hewlett-Packard—some more wholeheartedly than others. In general these vendors have adopted UNIX as the product with which to win new business and defend old business, but they continue to invest in existing proprietary product lines to protect their huge customer bases. NCR is probably the most committed to UNIX across its whole business.

The most obvious threat which the UNIX bandwagon has created is the rapid growth of a new breed of equipment vendors who started business in the mid-1980's. The success of companies like Sun Microsystems, Sequent, and Pyramid and the resulting adoption of UNIX by all the major vendors, has led to a belief that in the future there will only be three choices of supplier: IBM, Digital Equipment and all the open systems vendors. This is too simplistic because IBM and Digital are also in the open systems arena with aggressive UNIX-based product lines.

The chip manufacturers also have strong ambitions in the UNIX systems market. Motorola in particular has built a strong presence in Europe through VARs and OEMs. RISC (reduced instruction set computing) technology has established a strong hold supporting UNIX implementations, with the market believing that RISC has a longer future development lifetime than conventional processor architectures.

AT&T and SCO are the two vendors of UNIX operating system software with the strongest apparent grip on the market. It is the pre-eminent position of AT&T as the original licensor of the vast bulk of versions of UNIX which encouraged many of the traditional manufacturers to form the Open Software Foundation. OSF is seen by many in the market as a means of wresting control away from AT&T.

The group expecting to benefit most from the popularity of UNIX are the independent software product vendors. The promise of consistent well defined interface standards and the existence of over 600 possible UNIX-based hardware platforms is encouraging even the most staid of software companies to develop or convert products for UNIX. As UNIX compatibility issues become simplified by the specification of ABI's and API's(application binary interfaces and application programming interfaces) so the market for software packages will become more competitive. Differentiation will become as much an issue of marketing strength as of technical product excellence.

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Differentiation will also come from the quality and value of customer services. The market for professional services is also gaining benefit from UNIX. The standardisation accompanying the open systems movement has made UNIX-related skills a valuable commodity. It may well be this factor which limits even faster growth of the UNIX market in Europe.

There are three well-known standards bodies associated with UNIX—UNIX International (UI is part of AT&T); OSF, representing an alternative camp of vendors; and X/Open Company. Paradoxically none of them is a recognized international standards body such as CCITT, ANSI, or even IEEE. However their pronouncements and public quarrels do have a strong influence on the market. For example many critics are unsure whether OSF was created to stimulate the availability of UNIX products or to put the brakes on and slow down the rapid rate of adoption of product originating from AT&T.

One effect of this uncertainty has been the creation of a number of pressure groups among user communities. The User Alliance for Open Systems (UAOS) brings together over 45 large multinational companies. They intend to try and demolish any barriers put up by vendors which limit the benefits users can gain from adopting open systems—not just UNIX-based.

The enormous installed base of proprietary (closed) computer systems and the investment in existing staff, data, hardware and software creates great inertia in the market. The change management tasks and costs implied by migrating to UNIX continue to restrain market take-up. But this has not deterred many large European companies and most government departments from building an IS strategy based on open systems with UNIX as a central prerequisite for all new procurements.

In Exhibit IV-2 the forces emanating from this broad mix of influential groups are identified. They are split into those forces which resist the change to UNIX, and those which drive the market forward.

Undoubtedly the attraction of UNIX, and the broader area of open systems, is its promise of improved return on investment for the customer and end user.

In Europe both central country governments and the European Economic Commission have introduced mandatory requirements for UNIX and other open system standards to be met in all new computer system purchases. This stance has undoubtedly provided the critical mass of business necessary for the leading vendors to commit to UNIX. In general, only compatibility with installed software or national security considerations can be used to avoid requirements such as compliance with Posix and OSI standards.

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EXHIBIT IV-2

UNIX Market Forces—Europe

Resisting Change	Driving Change
• Familiarity of proprietary systems	• Lower priced UNIX systems
• Private sector DP hierarchies	• EC public sector open tenders
• Traditional direct sales channels	• VAR third-party channels
• Traditional mini and mainframe software vendors	• Software product vendors seeking platform portability
• Past investments in software solutions	• Critical mass of proven UNIX applications and turnkey systems
• Existing proprietary skills base	• Portable software platforms
• Conflicts between standards bodies	• Open systems pressure groups
• Wide variety of UNIX versions	• Promise of shrink-wrap software

In prolonging their traditional customer sales and protecting margins, most manufacturers have chosen to distribute their UNIX product lines through their VAR network rather than through their direct sales forces. This has protected their sales teams, but has confused customers. It has also stimulated the growth of VARs and the software and services with which they add value. The proportion of business won through such third-party channels continues to increase.

Over 90% of software vendors interviewed by INPUT Europe last year were investing significantly in products for UNIX platforms, either announced or unannounced. In many cases this went beyond mere UNIX compatibility and included portability across other platforms such as IBM or Digital. Most were reacting to pressure from users to offer downsized versions of existing packages and improved function, integration or connectivity.

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INPUT estimates that well over 5,000 software products are now available on UNIX platforms across Europe. UNIX International reports that it has identified over 15,000 different applications worldwide, 89% of which run on SVR4. Over 700 office automation products and 500 database products were identified. UI is expecting the number of applications products to double by 1993.

The purchase policies of users are now in a state of flux. They are migrating from a tradition of selecting hardware platforms and vendors to strategically choosing software products and vendors.

Vendors of portable software platforms, such as relational databases or complete application development environments, are beginning to steal the critical purchase decisions away from the large equipment vendors. Equipment becomes a secondary decision. The success of such software companies has been accelerated by the flow and choice of UNIX equipment platforms. In turn their success has created a second tier of software and service vendors who are building their products and turnkey capabilities on top of these software platforms.

Software vendors dedicated to the UNIX market know that UNIX comes in a wide variety of forms. Equipment vendors have found it extremely difficult to break their old habit of seeking competitive edge through unique extensions to the operating system. The specification of ABIs for each basic processor chip set promises to allow software product developers to create "shrink-wrap" versions of their product which will run unchanged on a whole variety of equipment. At present they have to test each version on its target machine before being sure that it will run reliably.

B

The Role of Standards Bodies

This section looks at the industry consortia which focus on UNIX-based systems software.

UI was formed by AT&T with support from Sun Microsystems to provide product direction to new versions of its UNIX SVID (system five interface definition). In response to continued criticism that UI is not independent of the telecommunications giant, AT&T is reported to have been seeking to place up to 30% of the ownership of UI with member companies.

The members of UI are responsible for well over 90% of all UNIX system software installed, giving AT&T what seems to be an unassailable market position. This is the very reason that the world's leading computer manufacturers got together to form OSF.

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EXHIBIT IV-3

Profile—UNIX International (UI)

Founded:	November 1988
Locations:	Parsippany, NJ; Boston; Los Angeles; Tokyo, Japan; Brussels, Belgium
Goals:	Set product and technology directions for System V operating system
Work Groups:	Multiprocessing; security; user interface; distributed systems
Members:	Most of the traditional and newer mid-range vendors. Many of the leading UNIX systems software vendors. More members than OSF.

OSF has announced its first version of UNIX: OSF-1, "containing not one line of AT&T code"! IBM, Digital and Hewlett-Packard are among those who have made commitments to use OSF-1 as their preferred operating system for UNIX product lines, but none has given firm timescales.

EXHIBIT IV-4

Profile—Open Software Foundation

Founded:	May 1988
Locations:	Cambridge, MA, USA
Goals:	Based on member input, promote and develop standard UNIX software products
Technology Emphasis:	Application/database interface operating system advanced system extensions
Members:	Around 40 major computer manufacturers including IBM and Digital. Many key software vendors are UI members also.

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In fact OSF and UI seem to have different and less conflicting roles than is assumed by the press. OSF has a mission to popularise key open systems software products, behaving almost like a distribution channel. UI seems much more concerned to establish workable standards for UNIX components and enhancements.

There is no doubt though that their public rivalry, their failure to unite behind one set of standards, and their desire to continually extend and enhance existing standards has caused hesitation and doubt in the market among the main potential beneficiaries—the users.

Since both OSF and UI are members, the pivotal organisation in the UNIX market is the X/Open Company, Ltd—see Exhibit IV-5. All five founding members of X/Open are based in Europe, and the long list of members includes the major Japanese computer system vendors. In addition X/Open has over 100 software vendor members worldwide and an established council of end-users. Although this is a separate advisory council, rather than including end users on specific committees, the breadth of industries represented may provide a solid "sanity check" on vendor and software developer plans.

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EXHIBIT IV-5

Profile—X/Open Company, Ltd

Founded:	1984 (Incorporated 1987)
Locations:	London,UK; Stamford, CT, USA; San Francisco; Tokyo, Japan
Goals:	To bring greater value to users through practical open systems implementation
Members:	AT&T Bull DEC Fujitsu Hewlett-Packard Hitachi IBM ICL NCR NEC Nokia Data Olivetti Philips Prime Siemens Nixdorf Sun Microsystems Unisys UNIX International Open Software Foundation More than 100 software vendors worldwide
Verification:	Software suite from UniSoft Group (London; Cambridge, MA; Emeryville, CA; New York; Tokyo)
Councils:	X/Open User Council - over 30 members including (Europeans): Automobile Association; British Airways; British Telecom; CCTA; Daimler-Benz; Ford; General Motors; Gerling Konzern; Landesamt fur Datenverarbeitung und Statistik; Michelin; Swedish Agency for Administrative Development ISV Council - including (Europeans): Computer Power; Multihouse NV; Softlab GmbH; Tecsiel; Uniplex

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X/Open has adopted two key roles on behalf of its members:

- a central information source on the meaning and status of open system standards

- the identification of priorities for new areas of open systems standards development.

The detailed results of its research into priorities are published by X/Open in The Open Systems Directive—Shaping the Future of Open Systems. This provides an extensive overview of the technical requirements relating not only to UNIX and the software it supports, but also many other important open systems issues. X/Open is managing programs covering:

- Marketing and Communicating Open Systems Information
- Operating System Interfaces
- Operating System Commands
- Security
- Systems Administration and Management
- Human/Computer Interface
- Networking and Communications
- Distributed Applications
- Transaction Processing
- Application Development Environments
- Object Oriented Management
- C Language
- COBOL
- Data Management
- Internationalization
- Data Interchange
- Standards Verification

X/Open publishes Portability Guides covering many of these topics to help users establish standards and strategies which will ensure maximum compatibility between software and systems from different suppliers.

C

User Pressure Groups

UNIX devotees have always supported the user groups which have become established in most European countries. For many years these groups comprised largely technical users who met to help each other get the most out of their UNIX systems. In the 1980's, as the whole IS industry began to take up the UNIX cause, with vendors taking sides either with AT&T or against it, the user groups played less of a role in shaping the future for UNIX.

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By 1990, with UI and OSF looking like two opposing camps, the battle seemed to be concerned only with the interests of vendors. Users had little or no say in the industries' decisions on open systems. A variety of pressure groups have been formed by groups of like-minded users to balance the proliferation of vendor consortia. For example 42 oil companies formed the Petrotechnical Open Systems Corporation in a joint venture with their software suppliers.

Undoubtedly the strongest reaction from users has been the forming of the User Alliance for Open Systems (UAOS) - see Exhibit IV-6. This organisation was originally called the Houston 30 and it issued a strongly worded report—"Overcoming Barriers to Open Systems Technology"—calling for a global war against proprietary systems. Its main argument was that such systems hold data hostage.

EXHIBIT IV-6

Profile—User Alliance for Open Systems (UAOS)

Founded:	October 1990 (Formerly Houston 30)
Goals:	To encourage vendors to offer vendor-neutral products. Overcoming barriers to open systems information technology
Technology:	Open systems. Specifically those which enhance the ease of sharing information within companies.
Members:	Over 45 multinationals totalling as much as $75 billion purchasing power, including: BP, Eastman Kodak, Du Pont Co, Exxon, Ford Motor Co, General Electric Co, General Motors and Hughes Aircraft, McDonnell Douglas and NASA

D

UNIX Technology

As users mandate more open system standards in their IS purchases vendors seeking to bid have evolved a number of different migration strategies. These are aimed at conforming to standards while minimising the cost of exploiting existing investment in databases, applications, workstations, user skills, etc. There is now a very substantial base of UNIX systems which also represent a source of potential upgrade business.

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Migration strategies seem to fall into four categories, each providing compatibility at a different level in the hierarchy of a computer system:

- Common Applications Environments. This strategy establishes a broad set of application development and run-time tools and interfaces which are common to a range of different hardware and operating system platforms. Oracle is a good example of a vendor offering an application environment which is available not only on a wide range of UNIX systems, but also on Digital, IBM and PC platforms.

- Applications Binary Interfaces (ABI). This is an emerging strategy promising "plug-and-play" for software packages conforming to a specification common to a particular chip set. Exhibit IV-7 lists some of the microprocessors for which ABI specifications exist or soon will.

- POSIX Compliance. Many European governments now mandate POSIX compliance for new open systems, rather than any particular version of UNIX. Both UNIX SVR4 and OSF/1 conform to POSIX which is an IEEE standard for the kernel of operating systems software including the form of low level systems calls. ICL and Digital have both adopted the strategy of modifying their proprietary operating systems (ICL's mainframe VME and Digital's VAX/VMS) to conform to POSIX, arguing that this allows them to bid for open systems contracts without necessarily offering their UNIX product lines. IBM has hinted that it may also follow this route.

- Co-operative Processing. This strategy is built right in the heart of the computer. It provides a close coupling of at least two processors in order to offer two environments side by side with some form of high-speed shared access to common data. Unisys has taken this approach with its "mainframe on the desk top" A Series workstation which now offers an integral Intel 80386 processor running UNIX and/or MS-DOS.

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EXHIBIT IV-7

Application Binary Interfaces (ABI's)

Chip Vendor	ABI Target Product Ranges
Intel	80386 & 80486 CISC i860 RISC
Motorola	86030 & 86040 CISC 88000 RISC
Sun Microsystems	Sparc RISC
MIPS Computers	MIPS RISC

Cisc = complex instruction set computer
Risc = reduced instruction set computer

There are many demands for improvements to the UNIX standards. Most of these have emerged from attempts to exploit UNIX in larger minicomputer and mainframe environments.

The early popularity of UNIX in universities and research laboratories was followed by its use in small business systems and in powerful workstations aimed at the technical market. None of these environments demanded the stringent integrity, the performance, or the applications complexity common to the larger commercial data processing systems.

The vendors of large UNIX systems have all enhanced their versions of UNIX to meet these more critical requirements, but in doing so they have reduced the chances of remaining UNIX compatible and keeping applications portable on to other vendors' systems.

Both UI and OSF are working on introducing new standards in these areas, with UI looking well advanced, having published a clear "roadmap" of what its priorities are and when new versions should emerge.

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EXHIBIT IV-8

Future UNIX Standards Extensions

- Common applications environment
- User interfaces (e.g., Windows)
- Transaction processing
- Multi-processor environments
- Security and recovery

E

Software Platforms above UNIX

While the industry consortia fight it out and try to satisfy the opposing demands from users—for stable standards and new enhancements—there is another, possibly more important, competition going on between software vendors. Who can establish their products as de-facto standards within the IS strategies of major users? Just how relevant is all this concern with UNIX standards if users can standardise at a different level well above the hardware and operating systems architectures.

Exhibit IV-9 identifies the various types of software platform which are available on UNIX, and Exhibit IV-10 illustrates the widespread availability of both software platforms and other popular software products on UNIX.

It is interesting to note that some software and systems vendors have been able to relatively easily migrate their users to UNIX and open systems since complete operating system environments such as Mumps and Pick are now available and well proven running on top of UNIX systems and running concurrently.

The number of vendors and products now available for UNIX is well past achieving the necessary critical mass. UNIX has arrived, though for the vast majority of users it is totally hidden under a rich set of applications, systems and data management facilities.

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EXHIBIT IV-9

Portable Software Platforms

Systems Software	Relational and other databases
	Alternative operating systems
	CASE tools
	Languages & 4GLs
	Conversion and performance aids
	Network interfaces
S/W Solutions	Applications software products
	Integrated business systems
	Turnkey systems packages
	Network applications

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EXHIBIT IV-10

Software Product Availability on UNIX

Some major application platforms on UNIX:

Dataflex	Empress
Focus	Foxbase
Informix*	Ingres
Mumps	Oracle
Progress	Unify•
Uniplex*	Uni-Verse (Pick)*

*only available under UNIX

INPUT estimates of UNIX activity in Europe:

Over 1,500 product originators

Over 5,000 software products

Over 90% of Europe's top 100 software and service vendors have a UNIX business strategy

F

Impact of UNIX on Software Product Vendors

All software vendors are faced with strategic decisions related to introducing UNIX-based software products and services. Exhibit IV-11 lists some of the key areas such strategies address, covering:

- The approach to existing clients needs to consider the most mutually profitable way to migrate from existing products, whether this is necessary at all, client requirements for downsized and distributed versions of products. Downsizing does seem to be a very key requirement driving users towards open systems.

- In marketing open system products should these replace existing offerings or add to the portfolio. Many vendors have chosen UNIX as the vehicle for winning new name accounts. Customers need to be able to choose between staying with old product and moving to open systems. Many are happy just to know it is possible in the future, that there is a development path, rather than being left with no clear future.

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- One of the most difficult decisions is choosing a common applications environment which will give the flexibility to develop in-house as well as buy-in other people's products. As already discussed there are many different levels at which portability and compatibility can be established.

- The UNIX world requires new skill sets. Staff development and retention need constant management attention. The wide adoption of UNIX is not likely to create a large industry pool of skilled resource, because the standardisation of UNIX is raising the variety of innovative new products and tools available. As ever, it is not UNIX skills that are actually in the greatest demand, it is software platform, solution and application-related skills which will remain a top priority.

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EXHIBIT IV-11

Software Vendor UNIX Strategies

Clients	Identify migration path
	Evaluate cost of UNIX solutions
	Evaluate downsizing alternatives
Marketing	Add UNIX-based solutions
	Primarily to win new business
	Offer the customer a choice
Applications	Port to chosen UNIX (variants)
	Or
	Port to portable proprietary platform(s)
	Or
	Re-engineer DBMS independent
	Or
	Select third-party product(s)
Software Tools	Select a set of standards
	Decide preferred vendors
	Form alliances
	Carefully evaluate in-house enhancements
Professional Staff	Impose standard methods
	Invest in continuous training
	Focus on retaining good staff

UNIX and the open systems movement generally are impacting every sector of the software and services market in Europe. Exhibit IV-12 identifies the impact in each of the major sectors researched by INPUT.

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UNIX is at the root of the open systems movement, and the open systems movement is at the root of most of the fundamental changes occurring in the IS industry.

EXHIBIT IV-12

UNIX Impact on Software and Services Delivery Modes in Europe

Processing Services	Significant cost savings in hardware, operators and environment
Systems Software	Rich choice of tools, platforms and user interfaces, but some standards not yet clear. Character handling encourages pan-European language support
Applications Software	Greater incentive to integrate third-party products. Larger markets for products and more choice of distribution channel
Turnkey Systems	Lower cost, higher performance solutions with greater connectivity can be more profitable
Professional Services	Managing the transition to open systems is increasing demand for services but with shorter payback periods
Network Services	Downsizing and distributed computing are encouraging new network applications
Systems Operations	Open systems strategies often lead to outsourcing of existing mainframe operations
Systems Integration	UNIX is a key platform both for integrating disparate systems and for winning new major accounts

The pace of these changes is going to continue to upset the traditional status quo between major and minor vendors. But it is very clear that the software and service industry has already seen many benefits arising from the availability of lower cost, relatively standard hardware platforms:

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- Software product vendors are seeing new markets and new distribution channels opening up
- Systems vendors are able to offer more "best of breed" application and system solutions
- Service providers are finding that lower hardware costs and increased system complexity are stimulating more outsourcing.

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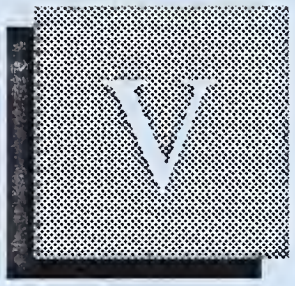
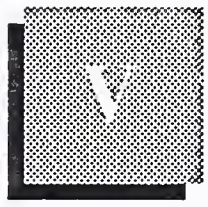


The U.S. Vendor View



The U.S. Vendor View

A Industry Structure

European equipment vendors such as Siemens Nixdorf, Olivetti, Bull and ICL (now owned by Fujitsu) have been prime movers in the widespread adoption of UNIX-based open systems in replacement of proprietary architectures. In spite of this it is the major U.S. vendors, of both equipment and software, who have the broadest Pan-European coverage and represent the strongest competitive threat to the indigenous European suppliers. The reaction of the European vendors to this threat will be expanded upon in future INPUT research. Many believe that they must be combined in some form in order to compete globally with their U.S. and Japanese counterparts.

The UNIX software industry could well become dominated by major systems manufacturers; major systems and applications software products companies will vie second place, and opportunities will abound for niche players who will form alliances with larger systems and/or software products vendors. Third-party distribution companies—VARs and OEMs, systems integrators and professional services firms—will play key roles in the spread of UNIX.

Unlike the traditional or mainstream software products industry, however, a new breed of hardware vendors will play a pivotal role as market drivers and as a distribution channel for UNIX software. These companies include Compaq Computer Systems, MIPS Computer Systems, Pyramid Technology, Sequent Computer Systems and Sun Microsystems. Some of their products are PC-compatible, yet have multiple CPUs, run UNIX, support gigabytes of storage, and support many users.

In addition, because of the emphasis placed on "open systems" rather than on UNIX per se, the other twist in the industry structure will be more and more variations of alliances between would-be competitors who are working together to develop interoperability schemes.

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- For example, IBM and Hewlett-Packard are submitting a joint response to the OSF request for technology to create a Distributed Management Environment, a systems management scheme for the OSF/1 operating system.

- Another notable example is Hewlett-Packard's and Sun Microsystems' joint submission of an object-oriented technology to the Object Management Group.

- Another new alliance, with a direct impact on systems software, is between Microsoft, Digital, Compaq and MIPS to define and develop a new RISC-based open systems platform.

Technology solutions are complex, making it difficult for small systems and applications software companies to succeed by themselves. The UNIX operating system is a small part of the open systems challenge. Applications software, software development tools, data management, networking and user environment technology challenges abound. A vendor must have a large infrastructure, lots of money, and/or plenty of friends.

B

Level of Vendor Involvement

Over the last six to eight months leading mid-range vendors have moved from a position of begrudgingly providing a proprietary flavor of UNIX if users request it (Microsoft), to endorsing UNIX as a viable option; to endorsing a standard operating system kernel, to moving fully in the direction of "open systems" where UNIX is one piece of the whole, to total product line migration to UNIX (NCR). These companies are not only endorsing integration of UNIX with their proprietary systems but they are also beginning to endorse interoperability with other vendors' systems.

IBM as well has begun to change its tune although not quite as enthusiastically as the mid-range vendors. Its recently announced strategy is to incorporate OSF/1 kernel into AIX, whereas before AIX was IBM's own proprietary flavor of UNIX. Although IBM is not encouraging interoperability with other vendors' hardware, it will integrate AIX under the SAA umbrella thereby making it interoperable with OS/2, OS/400, VM and MVS environments (see IBM profile below).

In addition to large systems vendors, all other types of vendors are beginning to announce UNIX plans and make products available. Large independent software vendors, such as Computer Associates, are publicly announcing UNIX plans and for some, such as Oracle, close to 50% of revenues now comes from UNIX software products. Clearly the march to UNIX and open systems is gaining major momentum.

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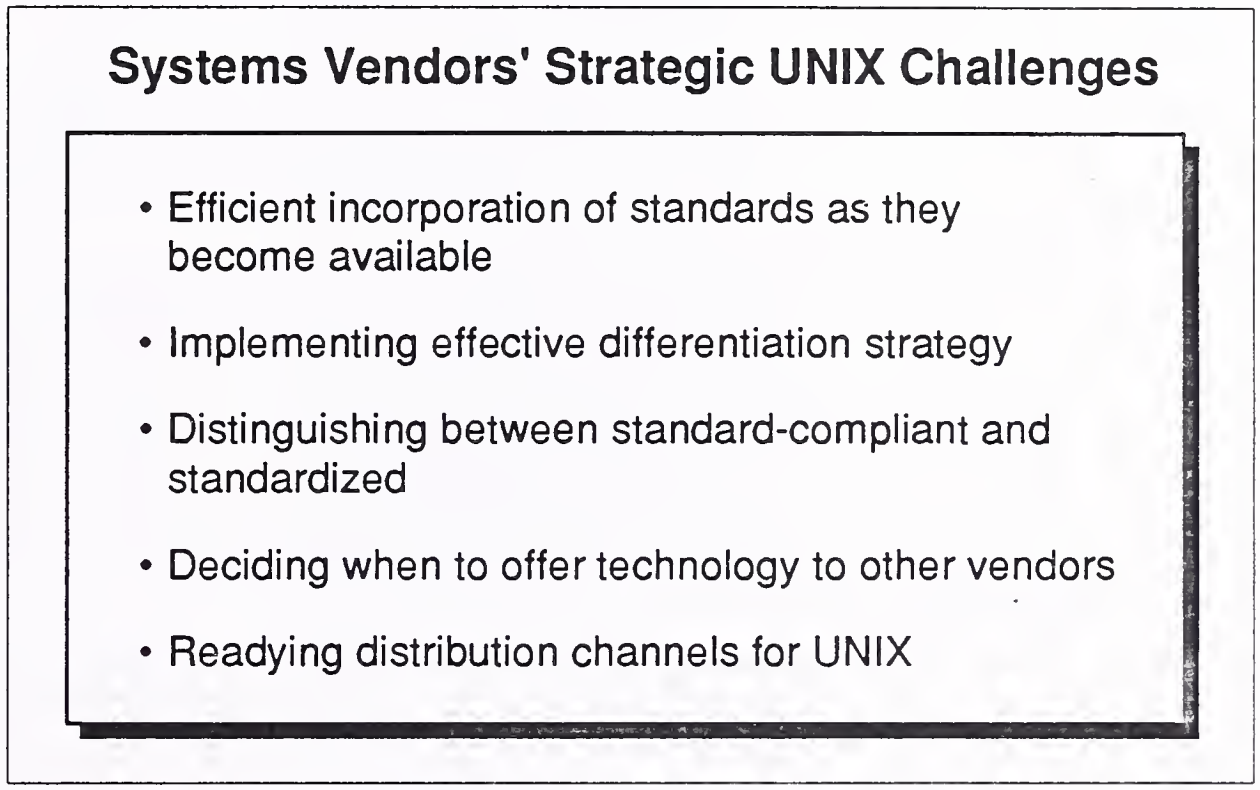
1. Systems Vendors

Large systems vendors as they migrate to UNIX have begun a complete reversal from the once cherished strategy of locking in the customer and locking out the competition. This reversal brings with it a number of difficult challenges which are summarized in Exhibit V-1.

EXHIBIT V-1



The balancing act between proprietary/differentiation and "open"/standards is being played out in the following ways:

- Being efficient about integrating a standard operating system kernel into an existing product set. Vendors are learning that they can't spend too much time and money on making a standard better or different, because it will most probably change.

- Implementing a differentiation strategy that sets a vendor apart yet not too far apart. As examples of degrees of differentiation, vendors being employed are:

  - Enhancing the operating system kernel with added-value systems control capabilities. Eventually these added-value features may be sold as add-ons to the operating system kernel so that if the user wants to purchase a standards-only operating system, this can be done.

  - Providing own enhanced "flavor" of UNIX such as Microsoft's NT kernel and SCO's Xenix.

  - Targeting vertical industries and applications such as Siemens Nixdorf's pursuit of financial and retail distribution industries with UNIX-based OLTP products.

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  - Provision of additional UNIX technology capabilities such as image processing (Unisys) and multimedia (Digital).

  - Providing hardware price/performance advantages. This differentiator, however, will always be a short-lived advantage due to the rapid pace of technological improvements in microprocessor technology.

- Getting the message across to the marketplace that there's a distinction between standard-compliant and standardized products, thereby allowing room for differentiation within a standard-compliant framework.

- Another challenge facing vendors is deciding whether, and when, to make their internally developed technology—which on one level could give them a competitive edge—available to other vendors through submission to standards bodies. The advantage of sharing technology is the creation of a broader market coupled with being first to market with the new technology because you're the first one that had it. Another advantage is enhancing marketplace perception that your firm is committed to standards and open systems.

Technologies that will be the most shared are the ones that standards groups are emphasizing. Among technologies the OSF emphasizes are application/database interfaces and advanced system extensions.

- Readying the distribution channels for new technologies and new pricing structures. Hardware will be different—it will be smaller—and the accompanying software will be not only be lower priced but also more complex. Thus more service and support will be needed for products that are less expensive.

The UNIX posture of selected leading hardware vendors are outlined in Exhibit V-2 and described below. Note that these are directional statements only, and vendor strategies are in various stages of implementation. Hewlett-Packard, the largest UNIX supplier, and NCR are the farthest along. Although there is variety in approach, the central theme is "open systems", UNIX being one element of the integrated whole. What also stands out is that vendors are beginning to realize and capitalize on the inevitability of UNIX standards.

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EXHIBIT V-2

Selected Hardware Vendors' UNIX Directions

Digital	UNIX and VMS equal Ultrix and OSF/1 Kernel with NAS umbrella Interoperability between UNIX, VMS and other vendors' systems "Open" VMS Revamping complete product line to RISC architecture Added value above operating system; CASE
H-P	HP-UX and MPE separate but equal HP-UX and OSF/1 kernel NetWave computing umbrella Interoperability between UNIX, MPE and other vendors' systems First out with mid-range RISC platform Broadening software products base; CASE
IBM	UNIX as an alternative AIX and OSF/1 kernel SAA umbrella Interoperability between UNIX and SAA
NCR	All UNIX UNIX system V.4 standard OCCA umbrella New X486 hardware and massively parallel machines OLTP emphasis
Unisys	UNIX and proprietary equal IIE umbrella Interoperability between UNIX, and other vendors' systems Vertical specialization and OLTP

a. Digital Equipment Corp.

Although initially straddling the fence, Digital has in recent months revealed a strategy that positions UNIX of equal importance to VMS over the long term. Digital's version of UNIX—Ultrix—has been even less

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portable than most, since it has all sorts of Digital enhancements. Now, however, Digital has indicated that it will integrate the OSF/1 operating kernel into Ultrix.

- Digital was the first company to have a Posix-compliant UNIX operating system. And VMS will be compliant with Posix. It will also meet standards and requirements for X/Open certification. With this move, VMS will meet existing portability and interoperability standards, providing many of the end-user benefits found in UNIX but without being vendor independent. It thus makes VMS more acceptable to developers who can write applications to run on VMS and then on Ultrix with only minor revisions.

- Digital's overall theme is distributed systems. The company's goal is one kernel, desktop to the data centre. Just as IBM's SAA unites various IBM operating environments, Digital's Network Application Support (NAS) will be the "umbrella" providing distributed computing capability and eventual interoperability between Digital VMS, Ultrix, and OSF/1-based Ultrix. It will also eventually provide interoperability between Digital systems and other vendors' systems including MS-DOS and OS/2.

- To differentiate, Digital will emphasize value-added features above the operating system level. As starters it has announced Fuse—an integrated group of back-end CASE tools for programmers to use in debugging, coding and testing. Its long-term strategy includes continued development of multimedia technology architected into a distributed computing environment.

- Digital currently has no plans to move its popular Rdb relational database to Ultrix; however Ultrix users will be able to access Rdb running on VMS.

- Digital has a popular RISC workstation product line and several months ago announced a -486 machine. Digital has recently announced a replacement for its 11-year-old VAX product line, to be completed in two years. Thus Digital is redesigning its entire VAX architecture and VMS operating system—a challenging and expensive undertaking. The new computers will range from workstations to mainframes and will all use RISC. The customer will have a choice of operating system—either VMS or UNIX—for the new RISC product line.

b. Hewlett-Packard

HP's dominant operating system is its proprietary MPE. Nonetheless revenues from its multi-user UNIX operating system grew an estimated 60% last year whereas MPE revenues only grew 10%. Strategically, HP considers MPE and UNIX equally important.

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HP's UNIX involvement includes:

- A RISC product line spanning workstations, including the 9000/400 merged HP/Apollo workstation, through the 9000 mid-range multi-user series. HP is expected to introduce a RISC processor that is more than twice as fast as Motorola's 88000. HP was first among the leading computer vendors to make a significant market impact with its RISC technology.

- HP's version of UNIX is System V-based UX; HP also plans to offer the OSF/1 operating system kernel.

- HP is aggressively broadening its system and applications software products offerings through strategic partnerships. It has recently announced a partnership with Computer Associates (CA) whereby CA will develop system management products, DBMSs, and applications software products that run under HP UX. CA will first migrate its systems management tools to HP-UX with product rollouts in December of this year.

- HP has licensed its SoftBench technology to Informix as part of an integrated, flexible CASE environment that Informix will make available to other hardware and software companies for UNIX applications development. SoftBench provides a common interface to and communication among tools used to analyze, design, construct, debug, test and maintain software products.

- HP and Sun recently announced a plan to jointly develop an object-oriented software environment for distributed, multivendor computing.

c. IBM

IBM's systems and software supremacy in enterprise solutions is being threatened by strong market interest in downsizing as well as increasingly available communications and computer technology to allow downsizing to happen. Its position is also threatened by mid-range vendors' increasingly strong response to the declining markets for their hardware. IBM is starting to respond.

IBM is now positioning itself as the industry's "leading open systems vendor" which in reality means the industry's leading integrated computing vendor—within the IBM family of products. Its primary thrust into integrated computing is through SAA which was first described by IBM in March 1987.

The migration to SAA is slow due in large part to lack of product availability. However, IBM is expected to announce an OS/2 version of its Advanced Peer-to-Peer Networking platform next month whereby users

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will have transparent access to all of IBM's SAA computing resources across a multinode network.

SAA's original objective was to unite OS/2EE, OS/400, VM and MVS environments. Although the timing is unclear, these environments will eventually interoperate with AIX.

In addition to providing interoperability between SAA and AIX, IBM's future direction is to incorporate the OSF UNIX operating kernel into AIX. Incorporation of the OSF kernel is a significant step for IBM and for the UNIX marketplace as a whole. It clearly signals a strong vendor movement to address user demands for standards versus the longstanding IBM (and other vendors') strategy of customer "lock-in".

Strategic issues for IBM include:

- Whether it can implement enough pieces of SAA fast enough so that it can continue to allow UNIX to be a secondary alternative rather than of equal importance to SAA.

- What to do about declining interest and market confusion over OS/2. IBM has positioned OS/2 as a core platform for implementing SAA, yet users favor easier-to-use Windows, introduced last year, and DOS. If OS/2's position fails to improve, IBM may be forced to hurry up its UNIX commitment and AIX's integration with SAA, perhaps positioning its well accepted RISC workstations as the desktop of choice for an integrated solution.

AIX currently runs on IBM's RISC System/6000 workstations, OS/2, 386 and 486, the RT system and the ES/3090. Introduced in early 1990, 25,000 RISC workstations worth $1 billion were sold during the last six months of 1990.

IBM is beginning to establish porting centers worldwide to assist software developers in moving their applications to the RISC System/6000 family, and it is developing AIX/RISC CASE products in conjunction with IBM business partners.

d. NCR

NCR is the only one of the original "BUNCH" vendors that is migrating all of its products to UNIX. In Fall 1990 it became the first major computer vendor to make a unilateral commitment to UNIX when it announced a complete line of hardware based on the Intel X86 architecture. The company is developing software based on a blueprint called Open Cooperative Computing Architecture (OCCA) and is billing itself as the first company to offer OSI products from the desktop to the mainframe. OCCA encompasses MS-DOS, OS/2 and UNIX operating systems.

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- NCR will provide an end-to-end enterprise solution using UNIX System V.4. Another key differentiator of NCR's strategy compared to its traditional competition is its partnership with Terradata to bring UNIX to massively parallel machines with 100,000 MIPS as a commercial general purpose computer system.

- The System 3000 line is a scalable computer family ranging from laptops to mainframes, all based on Intel X86 microprocessors with IBM's Microchannel architecture.

- NCR's forte is OLTP and it has a strong presence in banking and retail distribution sectors. NCR's Top End, a commercial UNIX OLTP software system designed for its new System 3000 midrange line, is integrated with Oracle, Sybase and Informix databases and will ship in June.

- NCR Cooperation is a common development environment that runs UNIX V.4 and OS/2 and incorporates OSF/Motif. It includes an object framework library, which makes it possible to encapsulate old applications as objects which can coexist with other, more contemporary applications within a system. This allows users to move from an older NCR platform—or anyone else's—to System 3000 without having to rewrite every line of code.

- Open Network Environment is a network architecture that is consistent with Open Systems Interconnection (OSI) protocols in all seven layers.

The key to NCR's success now is execution as all of the pieces are in place.

e. Unisys

Unisys is strongly and deliberately using UNIX as one of its "weapons". The nation's third-largest computer firm was among the first (October 1990) to announce a plan to mix open, proprietary and de facto standards to unite Unisys' and other vendors' systems. Unisys, like its competitors, is working towards a solution that protects its proprietary systems while at the same time offers an open systems approach. Unisys may open its proprietary system as Digital plans to do with VMS.

Other key elements of Unisys' strategy are its own software tools, notably its third-generation application programming interfaces and fourth-generation CASE offerings.

Unisys will add value through "premium services" for open systems which will take advantage of its existing product and technology strengths and include industrial-strength transaction systems, integrated database recovery, and multilevel security, CASE/4GL and image/voice processing.

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2. Systems Management and Application Development Tool Vendors

Although the market for UNIX systems management and design tools is highly fragmented, largely U.S.-based RDBMS companies are leading the charge. They will need to continue to form alliances with other third-party tool vendors and/or the large systems vendors in order to become providers of complete UNIX development environments.

For systems and applications software products vendors alike, the cost of supporting all the different variants and new hardware platforms is enormous and is a drain on development funds that could be spent on improving their core products. Systems software interacts closely with the operating system kernel, which may vary dramatically from vendor-to-vendor. Informix alone supports more than 600 variants of UNIX on more than 80 hardware platforms. Therefore it is imperative that they begin to consolidate their efforts individually and in alliance; the movement towards standards will help.

Product issues and market needs being addressed by system management and tool vendors as they begin to provide UNIX products are outlined in Exhibit V-3 and include:

- Network reporting and management products on the market today are functionally limited to networks in the 200-300 node range, which is one reason users are not adopting UNIX en masse for enterprise-wide solutions.
- Tools do not exist that can tune a network which consists of UNIX-based machines from different vendors.
- How to maintain consistency of data across a widely distributed network without having a main backbone network in place is a challenge.
- Few if any configuration management tools exist.
- Performance monitoring and capacity management tools do not exist for UNIX.
- OLTP monitors do not exist.
- CASE for UNIX consists of a confusing set of utilities that don't interface well with each other.
- A broad suite of application development tools for UNIX is available, especially windowing environments and RDBMS tools. An environment that integrates them with non-UNIX design tools is needed.

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- With so many variants of UNIX and C, the marketplace is confused about what implementation of C the tools run on and what the actual version of C is that the tool produces.
- Standards bodies need to design a set of tools so they all look similar—have the same look and feel and provide a programmer's library.
- Levels of security need to be improved for networked UNIX.

EXHIBIT V-3

UNIX System Management and Development Tools Product Issues and Market Needs

- Network reporting and management
- Tools to "tune" networks and maintain data consistency across a distributed network
- Configuration management tools
- Performance monitoring and capacity management
- Integrated CASE environments
- Improved security

Technical users or individual workstation users do not need much in the way of systems and network management tools but when UNIX systems become database servers in corporate networks or platforms for mission critical systems, then these tools become critically important. When standards are fully implemented by vendors, systems software companies will be offered a broader market and we may expect to see more tools of the kind usually seen on MVS and VMS.

The level of involvement in UNIX and the UNIX activities of several leading systems software vendors are outlined in Exhibit V-4 and in the text below. As the RDBMS companies have been experiencing declining or negative profitability they are looking to growth in areas—UNIX tools included—outside their original RDBMS business. It is interesting to note how each one is approaching integration of UNIX tools with other non-UNIX tools.

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EXHIBIT V-4

Systems Software Vendors' UNIX Activities

Informix	Major thrust is UNIX OpenCase through SoftBench framework
Oracle	GUIs, networking, CASE, applications software products
Digital	Cohesion applications development environment Fuse integrated CASE
Microsoft	Xenix development OS/2 version 3 with New Technology, RISC
IBM	AIX/RISC CASE products
TI	Multiplatform capabilities of IEF

a. Informix

Informix was the first company with a commercial RDBMS for UNIX in 1981. This lead gives Informix the largest installed base of RDBMS applications for UNIX. Its RDBMS products include:

- Informix OnLine, a mainframe replacement database engine with online transaction procession/multimedia capabilities.

- Informix SE, an SQL database engine targeted at smaller MIS organizations that require light transaction processing for decision support applications.

Informix's fundamental focus has always been UNIX, first with RDBMS products, 4GL, and then an OLTP data base server for UNIX.

Informix is positioning itself as a catalyst for pulling together design tools. It will provide a UNIX CASE environment through the overall framework of Hewlett-Packard's Softbench tool kit that will manage the entire life-cycle of large-scale UNIX and DOS-based applications. As part of the HP-Informix alliance, HP will acquire up to 10% of Informix common stock.

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The suite of products will include the character-based Informix/4GL as well as third-party CASE products plus a wide range of CASE tools already compatible with the SoftBench.

Informix's own application development tools to support the OpenCase environment include OpenCase/SSADM which is an analysis and design workbench, and 4GL programming languages. OpenCase is scheduled to be shipped in late 1991 and is supported by AT&T and Sun.

b. Oracle Systems Corp.

UNIX has become Oracle's largest revenue generator. For the first two quarters of fiscal 1991 UNIX accounted for 48% of worldwide revenues, up from 35% in fiscal 1990 and 27 percent in fiscal 1989. Oracle's development efforts are focused on GUIs, networking, CASE and applications software products with less emphasis on RDBMS.

In January, Oracle introduced Oracle RDBMS Version 6.0 on AT&T platforms running UNIX System V.4. It also introduced versions of its SQL•Forms and SQL•Menu for the OSF/Motif user environment. Thus users can run their existing character-based applications on the OSF/Motif environment transparently. Additionally, developers can develop applications on either character-mode or bit-mapped computers without having to reprogram or recompile the application.

c. Other Vendors

- Digital is addressing a key market need by offering a variety of associated development tools under one overall umbrella, its Cohesion application development environment. Digital Fuse is an integrated group of back-end CASE tools for programmers to use in debugging, coding and testing. The product runs on Digital RISC platforms under Ultrix.

- Microsoft is integrating PCs into the UNIX world in the following ways:

  - It developed Xenix and owns almost 20% of SCO.

  - Windows 3.0 has received recognition as a client interface in a UNIX server environment and the company plans to move Windows into a 32-bit environment.

  - OS/2 version 3 will offer DOS, Windows, Posix and OS/2 application program interface compatibility. At the ground level of Version 3 is a component called New Technology (NT), a proprietary yet UNIX-like kernel.

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- A coalition has recently formed between Microsoft, Digital, Compaq, Mips Computer Systems and SCO to help move Windows and Microsoft's forthcoming NT operating system into the RISC market.

- IBM is developing AIX/RISC CASE products in conjunction with IBM business partners.

- Texas Instruments has added multiplatform capabilities to its Information Engineering Facility (IEF) CASE software which will allow users to build applications using C that are executable under IBM's MVS, VM and OS/2, Digital's VMS, and several versions of UNIX.

3. Applications Software Products Vendors

Most of the UNIX applications software products available today are either from PC vendors porting their products to UNIX platforms or UNIX vendors offering PC-like products for UNIX platforms. Although thousands of UNIX software packages are available, ranging from accounting and time management to spreadsheets and word processing, much of it is the same character-based functionality that a user gets on a PC but now it's on a more expensive hardware platform.

Applications software products are needed to take advantage of UNIX's networking and application linking functionality. Production-level applications software products require a data base strategy, communications capability, and hierarchical storage technology among other things. This means that vendors who successfully offer production-level applications need to be technically broad-based.

Transitional issues, as applications software products vendors begin to develop more sophisticated UNIX products, are outlined in Exhibit V-5 and include:

- Trying to protect license revenue from existing applications software products based on proprietary operating systems is a critical issue. UNIX applications software products that are on the drawing boards are not talked about because of concern over erosion rate and loss of existing installed base.

- Application development tool standards and integrated environments do not exist for UNIX. Lack of standards causes confusion. For example, what GUI do I write to? (E.g., Motif, OpenLook, X-Window System.) What network API's do I write to?

Due to the confusion, applications software vendors, such as Lawson Associates, are falling back upon themselves and developing their own tool environments. Systems vendors in particular are beginning to offer integrated programming environments, such as NCR's Cooperation and Digital's Fuse.

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- Inexpensively providing portability across multiple machines and multiple operating systems is another key issue. A number of applications software products vendors are developing their own tools. Vendors are most concerned about transportability, not specifically UNIX.

- To succeed, mid-range and mainframe-based applications software vendors will need to re-orient their product marketing and sales efforts to reflect the realities of lower priced applications software products.

Distribution channels will either have to add value such as systems integration or vertical sector expertise or be very low cost. New distribution technologies such as CD ROM will come into play. Thus companies with already existing strong alliances with third parties, including VARs and systems integrators, will be in better position to prosper with UNIX.

Software vendors will be more incented to write applications software when the market pull is stronger and when they do not have to re-write from vendor to vendor.

EXHIBIT V-5

Applications Software Products Vendors' UNIX Opportunities/Challenges

- Protecting existing licensing revenue
- Providing portability inexpensively
- Lack of development tool standards and integrated environments
- Re-orienting marketing and sales efforts

Exhibit V-6 and the following brief profiles give examples of how applications software products companies are positioning themselves. They logically take direction from the systems vendors upon which their current/proprietary products are based.

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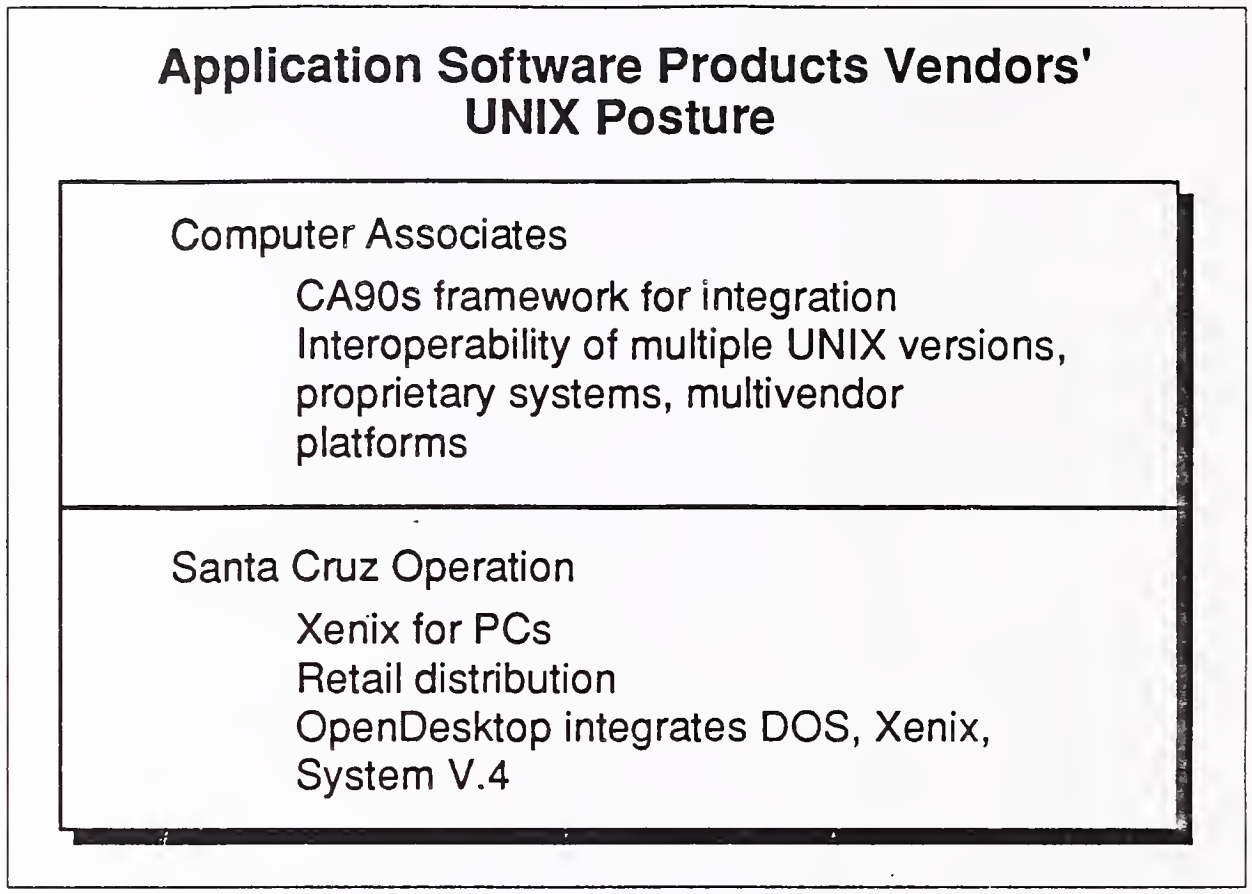
EXHIBIT V-6



a. Computer Associates

CA90s, introduced last year as the technical foundation for Computer Associates' (CA) "Enterprise Software Solutions", will continue to be the underpinning by which Computer Associates integrates its software products offerings. UNIX will operate within the CA90s foundation: CA90s will provide service layers for UNIX-based products as well as other operating systems-based products.

CA made known its UNIX position and direction in January; it provides a clear example of vendor intention to provide interoperability rather than UNIX per se. CA will provide applications software products across homogeneous and heterogeneous networks, identical UNIX systems, and UNIX systems from multiple vendors. Most CA products will address the UNIX platforms from the major vendors including AT&T, Bull, Digital, HP, IBM, NCR, Olivetti, The Santa Cruz Operations, Siemens/Nixdorf, Sun and Unisys.

UNIX-based products will be integrated closely with all other CA offerings across IBM mainframes, Digital VAX/VMS systems, PCs and other platforms. Actual implementation of this large an undertaking is at least several years away from being realized.

CA has recently joined UNIX International and OSF. Its first steps in UNIX are to release RDBMS products running on HP-UX platform which are in beta testing. It has recently reached an agreement with Hewlett-Packard for joint development and marketing of system manage-

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ment tools based on HP-UX. The first system administration tools are due on in early 1992. CA will resell HP's multiuser RISC platform for UX.

b. The Santa Cruz Operation (SCO)

SCO, founded in 1979 and privately held, has built its business by offering a version of UNIX for the Intel Corp. platform. This company's product line exemplifies a blurring distinction between PCs and workstations.

In 1981 SCO began working with Microsoft to develop and market Xenix, the first commercial version of UNIX operating system. It is an enhanced version of AT&T UNIX System V.

SCO is also a leading supplier of UNIX applications software, with over 3,000 applications software products ported to Xenix. SCO is the only UNIX vendor with significant retail presence.

SCO's Open Desktop, is a graphical operating system which can:

- Run DOS, Xenix and UNIX System V applications, or Open Desktop applications.
- Run multiple applications in separate windows at same time.
- Use Open Desktop programming tools to develop applications. Includes application programming interfaces (APIs) for GUI networking, database and DOS-UNIX integration.

Open Desktop is an interesting example of integration from both the user and developer standpoint; it integrates Motif, UNIX, networks, applications and RDBMSs through a single graphical user interface. Open Desktop uses Ingres/386 RDBMS and SCO ISAM, which provides a library of C-language functions for creating and manipulating indexed file systems. It also includes interface specifications and libraries to other major networked relational database systems such as Oracle.

- Oracle - In addition to its UNIX systems software products, application software products are Oracle Personnel and Oracle Financials. Both are distributed applications based on the Oracle RDBMS.

c. Niche Players

Because of all the product opportunities, some of which were described above, hundreds of small companies have entered the fray. Several examples of the products they offer are briefly mentioned below which portray the diversity of opportunities and products:

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- Cleo Communications - software that allows UNIX workstation users to interact with IBM 3270 mainframes at high data transfer rates.

- JSB Computer Systems - a window manager for dumb terminals that mimics the look and feel of OSF/Motif.

- Locus Computing - A PC/Interface for Macintosh which allows Macintosh users to share application, file and print services when connected to UNIX hosts.

- TGV - X/View toolkit which allows Window-based applications written for Sun Microsystems workstations to be ported to Digital's VAX VMS platform.

- Visix - Looking Glass desktop manager provides a set of icons for UNIX file types.

C

Support and Distribution

The support and distribution infrastructure for UNIX is underdeveloped. Large systems integrators are not emphasizing UNIX; smaller specialty systems integrators are cropping up to take advantage of the void.

1. Professional Services and Systems Integrators

Systems integrators are providers of solutions rather than a specific technology or UNIX; they do not go out of their way to "sell" UNIX. These companies are just getting started in UNIX.

- Andersen Consulting, New Age Systems Group, founded six years ago, is a small group of 60 people that spearheads new technology. Its emphasis is distributed computing, not specifically UNIX. Last year 50% of this group's chargeable hours were UNIX related and 50% were OS/2 related. The group's revenue split expectation for this year is 75% UNIX related and 25% OS/2 related.

- Computer Task Group does not consider UNIX a major influencer on its strategy; an estimated 10% of its business is UNIX related. It does, however, believe that future growing momentum behind AIX will be a clear influencer on its business.

- EDS, as an integrator of customized solutions for specific industries and traditionally IBM in its orientation, sees UNIX as a component of the overall solution. EDS' position on UNIX is that it encourages the continued development of standards and more robust UNIX products.

Third-party systems integrators, or the internal systems integration organizations of systems vendors, are becoming the key way to sell UNIX to large multinational companies. The reason is that one of the biggest barriers to moving to open systems is that the potential major

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users are only just beginning to learn how. UNIX systems integration and custom consulting will be big business as users grapple with issues such as the following:

- Implementation of enterprise solutions and standards
- UNIX networking design/implementation
- UNIX networking management
- Testing and porting
- Maintenance services

Vendors are beginning to respond to these needs. Hardware vendors, such as Pyramid Technology are developing new professional services organizations. Large systems integrators, however, who are doing a good business in proprietary-to-proprietary integration have not found a huge market opportunity yet in UNIX except in the government sector and some areas of banking and finance.

2. Distribution

The technical superiority of products is giving way to the marketing superiority of their supplier. The marketing channels which are as yet totally under-exploited are the direct sales forces of the major equipment vendors. The large majority of UNIX software business to date has been handled through third-party channels of VARs and dealers.

All the traditional major equipment vendors have chosen to push their UNIX products through their third-party channels, leaving their powerful direct sales forces still mainly pushing the proprietary ranges. This is probably the single largest barrier to faster adoption of UNIX.

All the equipment vendors promote UNIX software products strongly, but very few of these products are adopted for direct sale, delivery or support by the equipment vendors. This hands-off strategy has been instrumental in growing a large web of third-party channels for UNIX products and services across Europe.

The relatively higher margins available in the UNIX market are attracting vendors in the PC market to follow some of their larger networked customers into UNIX. It is too early to judge whether multi-user systems can be successfully packaged and sold off-the-shelf like PCs. However it is very likely that PC distribution channels will be used for workstation and shrink-wrap software products, both to end-user customers and to VARs.

UNIX and open systems standards, following the example of the DOS world, has encouraged the development of many different supply channels.

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In some cases there are several different channels for the user to deal with for a single product:

- Marketing/stimulating demand
- Selling/ordering
- Delivering/configuring/maintaining
- Supporting/help desks

The increasing demand for software products, especially applications, is being matched by an explosion in the number of products available. The key differentiators in the future will tend to be based on the reputation of the vendor. High-volume products will need a recognised brand name. The winners will have invested in establishing the right distribution channels.

D

Conclusions about Vendors

All the UNIX pieces are not here today; but a level of vendor commitment and planning is taking place that was not taking place even one year ago. Large systems and software vendors are adding to the momentum. Notable examples include IBM's success with its RISC workstation and NCR's total move to a standard UNIX platform. Large professional services firms will follow.

Vendor migration to UNIX and open systems is a tremendously costly undertaking and only the very large vendors can sustain both proprietary and "open" strategies. UNIX directions have been announced and strategies are in place. How effectively and quickly each vendor implements its strategies remains to be seen.

Many transitional issues are surfacing. To protect their proprietary installed base, vendors are beginning to add "openness" to them through meeting Posix standards and X/Open certification requirements.

Although the UNIX evolution poses large challenges for vendors, many exciting opportunities exist. Value and differentiation will be added through service and software and through enhancing hardware technology. UNIX represents a tremendous opportunity for systems and software companies to leverage their R&D dollars and to bring out new and better technologies.

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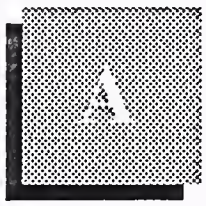
Appendixes



Definition of Terms

A

Overall Definitions and Analytical Framework

Information Services - Computer/telecommunications-related products and services that are oriented toward the development or use of information systems. Information services typically involve one or more of the following:

- Processing of specific applications using vendor-provided systems (called Processing Services)
- A combination of hardware, packaged software and associated support services which will meet a specific application processing need (called Turnkey Systems)
- Packaged software (called Software Products)
- People services that support users in developing and operating their own information systems (called Professional Services)
- Bundled combinations of products and services where the vendor assumes responsibility for the development of a custom solution to an information system problem (called Systems Integration)
- Services that provide operation and management of all or a significant part of a user's information systems functions under a long-term contract (called **Systems Operations**)
- Services associated with the delivery of information in electronic form-typically network-oriented services such as value-added networks, electronic mail and document interchange, on-line data bases, on-line news and data feeds, videotex, etc. (called **Network Services**)

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In general, the market for information services does not involve providing equipment to users. The exception is where the equipment is bundled as part of an overall service offering such as a turnkey system, a systems operations contract, or a systems integration project.

The information services market also excludes pure data transport services (i.e., data or voice communications circuits). However, where information transport is associated with a network-based service (e.g., EDI or VAN services), or cannot be feasibly separated from other bundled services (e.g., some systems operations contracts), the transport costs are included as part of the services market.

The analytical framework of the **Information Services Industry** consists of the following interacting factors: overall and industry-specific business environment (trends, events and issues); technology environment; user information system requirements; size and structure of information services markets; vendors and their products, services and revenues; distribution channels, and competitive issues.

All **Information Services Market** forecasts are estimates of **User Expenditures** for information services. When questions arise about the proper place to count these expenditures, INPUT addresses them from the user's viewpoint: expenditures are categorized according to what users perceive they are buying.

By focusing on user expenditures, INPUT avoids two problems which are related to the distribution channels for various categories of services:

- Double counting, which can occur by estimating total vendor revenues when there is significant reselling within the industry (e.g., software sales to turnkey vendors for re-packaging and resale to end users)

- Missed counting, which can occur when sales to end users go through indirect channels such as mail order retailers

Market Sectors or markets, are groupings or categories of the users who purchase information services. There are three types of user markets:

- *Vertical Industry* markets, such as Banking, Transportation, Utilities, etc.

- *Functional Application* markets, such as Human Resources, Accounting, etc. These are also called "Cross-Industry" markets.

- *Generic* markets, which are neither industry- nor application-specific, such as the market for systems software.

Specific market sectors used by INPUT are defined in Section D, below.

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Captive Information Services User Expenditures are expenditures for products and services provided by a vendor that is part of the same parent corporation as the user. These expenditures are not included in INPUT forecasts.

Non-captive Information Services User Expenditures are expenditures that go to vendors which have a different parent corporation than the user. It is these expenditures which constitute the information services market.

Delivery Modes are defined as specific products and services that satisfy a given user need. While *Market Sectors* specify *who* the buyer is, *Delivery Modes* specify *what* the user is buying.

Of the eight delivery modes defined by INPUT, five are considered primary products or services:

- *Processing Services*
- *Network Services*
- *Professional Services*
- *Applications Software Products*
- *Systems Software Products*

The remaining three delivery modes represent combinations of these products and services, bundled together with equipment, management and/or other services:

- *Turnkey Systems*
- *Systems Operations*
- *Systems Integration*

Section B describes the delivery modes and their structure in more detail.

Outsourcing is defined as the contracting of information systems (IS) functions to outside vendors. Outsourcing should be viewed as the opposite of *insourcing*: anything that IS management has considered feasible to do internally (e.g., data centre operations, applications development and maintenance, network management, training, etc.) is a potential candidate for outsourcing.

IS has always bought systems software, as it is infeasible for companies to develop it internally. However, all other delivery modes represent functions or products that IS management could choose to perform or develop in-house. Viewed this way, outsourcing is the result of a make-or-buy decision, and the outsourcing market covers any product or service where the vendor must compete against the client firm's own internal resources.

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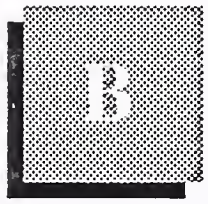

Vendor Questionnaire

A

Introduction

INPUT is a market research and consulting firm, specialising in the software and services industries.

The purpose of my call is to identify the manager responsible for market planning and strategy of your UNIX-related activities - areas such as software products, professional services and customer systems.

Are you the right person? Who else then?

Can you spare some time to answer a few questions on the critical issues facing your business relating to the UNIX market place?

Please confirm your name, position and address for me.

_____

_____

_____

_____

(We will be sending you a copy of the Executive Overview of the report as a thank you for your contribution).

Business Mix	Page 1, 2
Differentiation	Page 3
Channels	Page 5
Standards	Page 5

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B

Business Mix

1. Could you indicate the size of your organisation - number of staff:

2. Total Annual Turnover in Europe: _____ Year: _____

3. Proportion dependent on UNIX? _____

4. Proportion from Software and Services: _____%

5. Proportion from Software and Services dependent on UNIX: _____%

6. Can you tell me what proportion of your UNIX-related business fits the following categories of software and services defined by INPUT.

UNIX-Related Business	Proportion %	Growth Rates % Current	Growth Rates % Future	Importance Rank (1-5)
7. Professional Services (e.g., consulting)	_____	_____	_____	_____
8. Applications Software	_____	_____	_____	_____
9. Turnkey Systems	_____	_____	_____	_____
10. Processing Services	_____	_____	_____	_____
11. Network Applications (EDI, EFT)	_____	_____	_____	_____
12. Education and Training	_____	_____	_____	_____
13. Electronic Information	_____	_____	_____	_____
14. Systems Software	_____	_____	_____	_____
15. Customer Services	_____	_____	_____	_____
16. Systems Operations	_____	_____	_____	_____
17. Systems Integration	_____	_____	_____	_____

18. What are your current and future growth expectations in these sectors? (Complete next two columns above).

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19. On a scale of 1 (unimportant) to 5 (vital) how would you rank each type of business in importance to your future? (Complete final column)

20. For UNIX business which is your Main Western European Market (M), other European Markets (O).

    Swi Aus Bel Ned Fra Ger UK Ita Yug Gre Spa Por Nor Dk Swe Fin

21. Which of these do you expect to grow fastest?

    _____

C

Differentiation

22. What do you see as the most important opportunities or challenging issues facing you in the UNIX market over the next few years? (Economic, Business, Technology, Applications, Outsourcing, etc.)

    _____

    _____

23. How do you differentiate yourselves in the UNIX market for:

Old Customers	New customers	Existing UNIX users
_____	_____	_____
_____	_____	_____

24. How will you sustain UNIX customer loyalty in the open market?

    _____

    _____

25. Is there a fundamental benefit to the customer in dealing with you?

    _____

    _____

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26. What are the major threats which might limit your success in the UNIX market?

Internal	External
_____	_____
_____	_____
_____	_____

27. Where is the most profit being made out of UNIX? In the future?

_____

28. Which industry sectors or vertical markets have been most successful for your UNIX initiatives?

Discrete Manufacturing	Process Manufacturing
Retail Distribution	Wholesale Distribution
Transport	Utilities
Banking & Finance	Insurance
Central Government	Local Government
Services	Others

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D

Channels

29. What distribution channels do you favour for selling and delivering UNIX-based business? (1 = unimportant, 5 = very important)

	Hardware	Software	Services	Systems	Comments
Own Sales	_____	_____	_____	_____	_____
Own Service	_____	_____	_____	_____	_____
OEMs	_____	_____	_____	_____	_____
VARs	_____	_____	_____	_____	_____
Agents	_____	_____	_____	_____	_____
Retailers	_____	_____	_____	_____	_____
Other _____	_____	_____	_____	_____	_____

E

Standards

30. When do you expect users and vendors to see benefits from ABIs (Application Binary Interfaces)?

_____

_____

_____

31. In what role will UNIX International or OSF help you win?

_____

_____

_____

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32. Who else is particularly key to your success in the UNIX market?

_____

_____

_____

That's all I wanted to ask at this stage. Very many thanks for your time. May I call you again to clarify any point of detail? Are there any questions you'd like to put to me?

Thanks once again.

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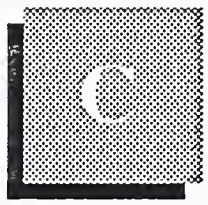

Forecast Database by Country Local Currency, 1991-1996, and by Equipment Platform

EXHIBIT C-1

UNIX-Related Systems Software Local Currency Forecast Database Western Europe, 1991-1996

Country	$ Exchange Rates	Currency	1991	1992	1993	1994	1995	1996	1991-1996 CAGR (%)
France	5.65	FF Millions	680	880	110	1,350	1,800	2,650	31
Germany	1.68	DM Millions	270	370	490	650	870	1,050	31
United Kingdom	0.515	£ Millions	55	75	100	135	180	220	32
Italy	1.233	Lira Billions	110	150	200	160	240	480	34
Sweden	5.61	Sek Millions	170	230	290	400	530	620	30
Denmark	6.39	DK Millions	125	160	220	290	380	510	32
Norway	6.49	NK Millions	75	95	130	190	260	300	32
Finland	3.96	FM Millions	40	45	65	90	120	150	30
Netherlands	1.69	Dfl Millions	65	90	110	145	190	260	32
Belgium	34.6	BF Millions	690	1,050	320	1,550	1,900	2,550	30
Switzerland	1.27	SF Millions	30	45	55	70	95	120	32
Austria	11.8	Sch Millions	230	300	350	470	650	920	32
Spain	95.0	Ptas Millions	3,350	4,250	5,750	7,600	10,400	15,100	35
Rest of Europe	1	$ Millions	10	15	20	25	30	35	28
Europe (Rounded)		$ Millions	700	940	1,200	1,520	2,120	2,800	32

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EXHIBIT C-2

UNIX-Related Systems Software by Equipment Platform Western Europe, 1991-1996

Equipment Platform	1990	1990-1996 CAGR (%)	1991	1992	1993	1994	1995	1996	1990-1996 CAGR (%)
Mainframe	11	9	12	14	19	25	29	32	22
Minicomputer	430	22	525	670	850	1,090	1,350	1,600	25
PC/Workstation	100	60	160	260	380	540	750	1,200	50
Total (Rounded)	540	30	700	940	1,250	1,650	2,130	2,830	32

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Report Quality Evaluation

To our clients:
To ensure that the highest standards of report quality are maintained, INPUT would appreciate your assessment of this report. Please take a moment to provide your evaluation of the usefulness and quality of this study. When complete, simply fold, staple, and drop in the post.

Thank You.

1. Report title: ***The Impact of UNIX on Western European Software and Services, 1991-1996*** (MEUM1)

2. Please indicate your reason for reading this report:
   - ☐ Required reading
   - ☐ Area of high interest
   - ☐ Area of general interest
   - ☐ New product development
   - ☐ Business/market planning
   - ☐ Product planning
   - ☐ Future purchase decision
   - ☐ Systems planning
   - ☐ Other _____

3. Please indicate extent report used and overall usefulness:

	Extent		Usefulness (1=Low, 5=High)				
	Read	Skimmed	1	2	3	4	5
Executive Overview	☐	☐	☐	☐	☐	☐	☐
Complete Report	☐	☐	☐	☐	☐	☐	☐
Part of Report (_____ %)	☐	☐	☐	☐	☐	☐	☐

4. How Useful was:

Data presented	☐	☐	☐	☐	☐
Analyses	☐	☐	☐	☐	☐
Recommendations	☐	☐	☐	☐	☐

5. How useful was the report in these areas:

Alert you to new opportunities or approaches	☐	☐	☐	☐	☐
Cover new areas not covered elsewhere	☐	☐	☐	☐	☐
Confirm existing ideas	☐	☐	☐	☐	☐
Meet Expectations	☐	☐	☐	☐	☐
Other _____	☐	☐	☐	☐	☐

6. Which topics in the report were the most useful? Why?_____

_____

7. In what ways could the report have been improved? _____

_____

8. Other comments or suggestions: _____

_____

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Thank you for your time and cooperation.

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