

East Coast Tour
Study Tour 1990

1990 Study Tour of the United States

Introduction

This document summarises the presentations made during the Butler Cox Foundation's 1990 Study Tour. Delegates visited suppliers and other organisations in New York and Boston. While the full benefit of the presentations will have been gained only by those who participated in the tour, the purpose of this document is to allow all Foundation members to gain insights into the leading-edge organisations visited.

The information presented here is essentially that provided by the host organisations at the time of the visits. Care has been taken to reflect this information as faithfully as possible, although working from spoken presentations, and without a full transcript, neither completeness nor total accuracy can be guaranteed. Many of the host organisations provided Butler Cox with copies of the visual aids used during the presentations, and a selection of these has been included where appropriate.

We should again like to record our thanks to all of the organisations and individual people we visited.

This document was prepared for the Foundation's 1980 Study Tour of the United States. It contains information about the tour, the Foundation, and the United States. The tour was organized by the Foundation and was held in 1980. The Foundation was established in 1970 and is a charitable organization. The United States is a country in North America. The tour was held in 1980 and was organized by the Foundation. The Foundation was established in 1970 and is a charitable organization. The United States is a country in North America.

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Published by Butler Cox plc
Butler Cox House
12 Bloomsbury Square
London WC1A 2LL
England

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Photoset and printed in Great Britain by Flexiprint Ltd., Lancing, Sussex.

1990 Study Tour of the United States

Contents

Wednesday 9 May	Tandem	1
	Information Builders	4
Thursday 10 May	IBM	7
	Broadview Associates	10
Friday 11 May	AT&T	13
Monday 14 May	Ontologic Inc and Object Design Inc	19
Tuesday 15 May	Digital Equipment Corporation	23
	Banyan Systems Inc	27
Wednesday 16 May	FCMC	30
	Kurzweil Applied Intelligence	32
Thursday 17 May	Butler Raila and Company	35
	Symbolics Inc	37
	Pilot Systems Inc	39
Friday 18 May	Sloan School of Management	41
List of delegates		45

Wednesday 9 May

Tandem

The first visit of the Butler Cox Foundation 1990 Study Tour was to Tandem's executive briefing centre in New York's financial district. Doug Crissman, area manager for New York City, and Sandra Foster of the intercontinental division began with a presentation of Tandem's 1989 results (\$118 million income on a turnover of \$1.6 billion), and a review of the company's international operations. Tandem attributes its international success to two things — its own extensive use of an international computer network, and a set of strategic partnerships or recent acquisitions, listed in Figure 1.

Bob Lakin, director of corporate strategy, related a view of the future that had been presented to Tandem senior executives by the Silicon-Valley-based public relations guru, Regis McKenna. Technology and society advance more or less in step. Mass production catered for mass markets, and coincided with mass education. Now, the trend is increasingly towards fragmentation, micro markets, and micro majorities in politics — supported by the growth of the personal computer, and the shift towards online processing.

Figure 1 Tandem attributes its international success, in part, to its strategic partnerships or recent acquisitions

- Atalla
- Ungermann-Bass
- Apple
- AT&T
- TTSI
- Twinac/Twinco/Volmac
- Netlink
- T.I.M.E.



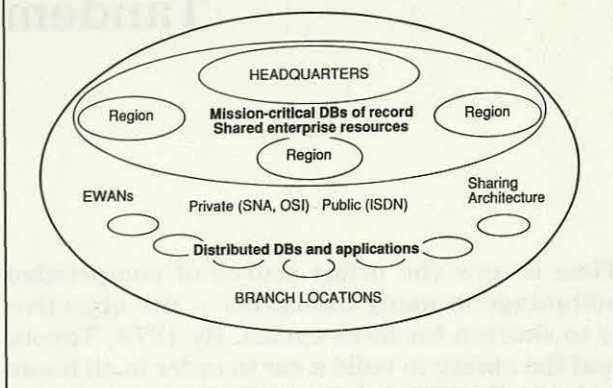
Time is now the prime source of competitive advantage in many industries — the objective is to shorten business cycles. By 1979, Toyota had the ability to build a car to order in 48 hours — including 1,500 different options — but the marketing and delivery cycle was stuck at six to eight weeks. Use of networking has reduced the time from customer's order to delivery to just eight working days, but Toyota's objective is four working days.

Procter & Gamble, together with Safeways, are exploring the concept of total customer knowledge. As each customer enters a supermarket, his or her personal buying profile will be recalled, and 'electronic coupons' will be issued to promote products according to that profile.

Batch systems will be unable to cope with this type of complexity. In this environment, the traditional concept of mainframes, mini-computers, and microcomputers will become irrelevant. Companies must think in terms of enterprise networks. 'Mission-critical' databases will be held centrally but will be accessible throughout the organisation. Individual applications will be distributed to branch locations. This concept is illustrated in Figure 2, overleaf. Tandem claims that it has used this type of client-server architecture inside its proprietary operating system (Guardian) since its inception.

Jeff Spiller, one of Tandem's technical specialists, provided a review of the product strategy, starting with the origins of Tandem's non-stop architecture in 1974. Tandem's view was that proprietary microprocessors were suited to number crunching, but not to online transaction processing. Tandem systems use custom processors, with downloadable micro-code, which is updated with every release of the system software.

Figure 2 In the future, companies will have to think in terms of enterprise networks



Tandem's architecture was compared with other multiprocessor systems, including shared memory, 'lock-step operation', and processor clustering. Tandem believes that its approach offers two prime advantages: resilience not only against hardware failure but also against operating system crashes (since it is unlikely that any two processors will execute the exact same sequence of operating-system calls), and scalability. Unlike other multiprocessor architectures, performance grows linearly as processors are added. A similar concept applies to the disc storage, and in fact, a database can be redistributed over a new set of drives without interruption to service.

Tandem systems are currently limited to 16 processors, but FOX (Fibre Optic Extension) allows this to be extended via what is effectively a local network. Tandem's newest range of processors, called Cyclone, offers a three-to-five-fold improvement in performance over its predecessors.

The review of hardware was followed by a review of software products. 'Pathway' allows the user to specify the maximum response time for each type of transaction. This specification is automatically monitored, and if it is not being met, tasks are redistributed among the available processors to clear the bottleneck. TMF (Transaction Monitoring Facility) ensures end-to-end integrity and consistency through the inclusion of this simple programming construct:

begin transaction

Debit Account A

Credit Account B

end transaction

This concept (also known as a two-phase commit) even works across a distributed system. An audit file is maintained and can be used for recovery purposes or to enable remote standby — where the standby system will typically be less than one second out-of-date. If an application has more than three or four writes per transaction, TMF speeds up the throughput.

Tandem appears to be firmly committed to its proprietary operating system, Guardian. It has recently produced a Unix-based system called S2, primarily in order to tender for government and public contracts. The Unix system provides hardware fault tolerance, but it does not provide software fault tolerance in the same sense as other Tandem systems. It is based on a 32-bit risc architecture, and uses Unix V. Tandem has recently formed an alliance with AT&T to explore further possibilities.

Tandem's future development strategy is summarised in Figure 3.

The Tandem presentations were followed by a user's view from Al Bacetti of SIAC (Securities Industry Automation Corporation), which is a wholly owned subsidiary of the New York and American Stock Exchanges. SIAC operates 268 Tandem processors of various generations. Its current system is capable of handling 200 transactions per second, in markets that can now turn over a billion shares per day. Availability over the last three years has been 99.97 per cent — and Mr Bacetti had the grace to admit that the 0.03 per cent downtime was caused by applications software.

Figure 3 Tandem's development strategy is to build on its fundamentals of OLTP and non-stop computing

- 1 • Leadership in OLTP price/performance
- 2 • High performance, high volume, relational database technology
- 3 • An open application development architecture
- 4 • Open enterprise networking
- 5 • Improving and automating system installation, operation, management & support
- 6 • Bringing Tandem fundamentals to the world of UNIX
- 7 • Building industry application architectures

Delegates found the review of Tandem's software and hardware product ranges informative. Some had not previously appreciated the fact that Tandem systems were linearly scalable. However, there was considerable

scepticism about the company's nominal commitment to Unix. Some delegates felt that, at \$1.6 billion turnover, Tandem fell uncomfortably between the large and small suppliers.

Wednesday 9 May

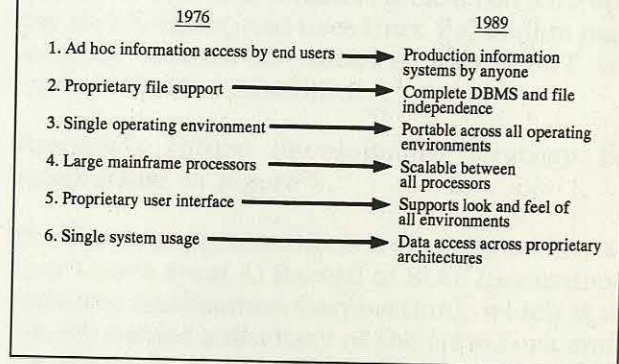
Information Builders

Founded 15 years ago, Information Builders Inc is still a private company whose turnover was \$156 million in 1989. It has its headquarters in New York, branch offices across the United States, and subsidiaries, affiliates, and representatives in 32 other countries around the world.

Its product, FOCUS, which has been continuously developed throughout the life of the company, is claimed to be the most widely used fourth-generation language on the market. The product, which aims to yield a 10-fold productivity gain over Cobol, was launched in 1976, initially for use on mainframes as an online reporting and query tool for end users, and as a reporting tool by data processing professionals. In the early 1980s, it was increasingly employed by end users, supported by the information centre; a PC version was launched, and in the decentralised computing era, which evolved in the mid-1980s, FOCUS was extended to several different operating environments, with end users beginning to develop local applications in the language. As connectivity developed across networks in the late 1980s, and heterogeneous computing environments developed in many large organisations, FOCUS began to be used as a common tool across the different environments, including Vax/VMS, MVS, VM, OS/2 and MS/DOS, and in this context, it was used to execute complete applications.

Figure 1 summarises the key features of the evolution of FOCUS from 1976 to 1989. During this period of continuous development, Information Builders has trained over 600,000 people in FOCUS, and believes that there are well in excess of one million users of the product worldwide. In the 1990s, Information Builders believes that FOCUS can offer an information-access system to all data structures and a development environment for building complete applications.

Figure 1 FOCUS has been continuously developed over the last 15 years

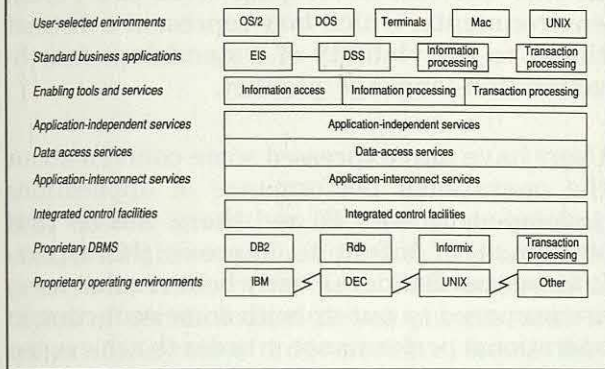


Strategy for the 1990s

Information Builders is convinced that the business environment of the 1990s will change significantly and rapidly. Fully automated workplaces will be required in a decentralised operating structure, with information increasingly valued as a strategic corporate asset and business systems being linked and integrated across hardware and software supplied by a variety of vendors. This will mean that information assets must be capable of being shared and exploited across the enterprise. In turn, this means that information systems, even those operating in proprietary vendor architectures, will need to be interoperable but under clear management control. Such an arrangement will facilitate the integration of new technology as it emerges.

Many organisations will have a multivendor-systems approach based on a more open enterprise information architecture, illustrated in Figure 2, with users having a wide choice of workplace environments accessing a range of database management system servers operating

Figure 2 An enterprise information architecture must cover systems at all levels



in different technical environments. This approach will provide a common data foundation for different applications, as shown in Figure 3. In this context, a fourth-generation language, such as FOCUS, is a strategic component of the enterprise information strategy, as summarised in Figure 4.

Accordingly, Information Builders' strategy for the 1990s is to continue to develop and enhance FOCUS to co-exist with, and provide interoperability across, all the major technological environments. It also intends to integrate knowledge-based systems into the product through the expert-system development tool LEVEL5, and to support the multimedia, graphical user interface, and object-oriented approaches now becoming available. It intends to continue offering a high-quality service, both

Figure 3 A common data foundation will be provided for different applications

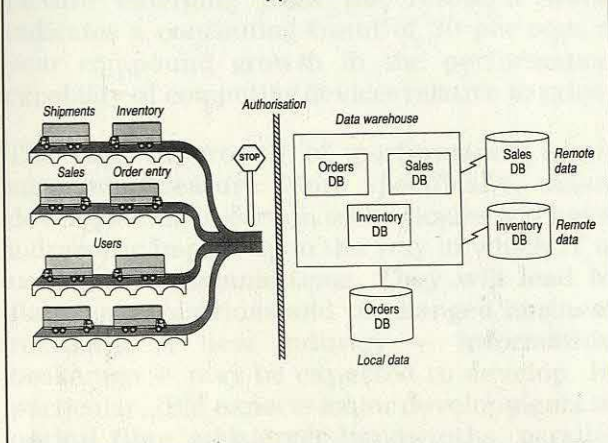


Figure 4 Fourth-generation languages will have many functions in an enterprise information strategy

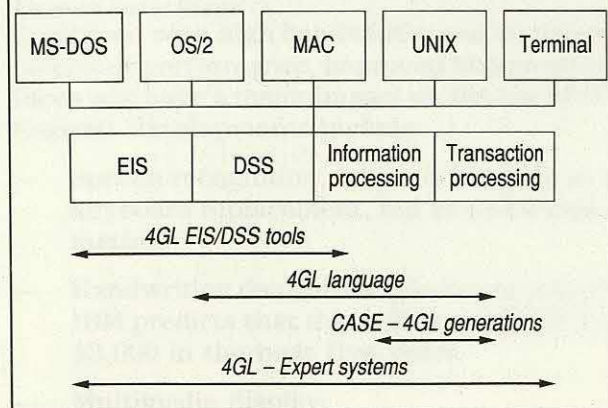
Role of the 4GL in Enterprise Systems

- Enabling of *complete* applications
- Enterprise information access
- Connectivity solution for distributed and interoperable applications
- New technologies integration
- Migration aid from existing environments
- Management and control tool

for education and operational support, to all its customers, and believes that FOCUS will enable a whole range of applications to be developed for different purposes, as shown in Figure 5.

In summary, therefore, the future of FOCUS/LEVEL5 in the 1990s is to provide distributed and interoperable fourth-generation-language and knowledge-based applications that do not need to concern themselves with the physical location of data. The product will be extended to include a graphical environment, so that it can be used to build executive information systems and expert-system tools. CASE tools will also be added. The use of FOCUS will extend across multivendor systems and the product will conform to emerging international standards. In order to achieve this, strategic alliances will be formed with major market influencers.

Figure 5 FOCUS will enable a whole range of applications to be developed to run on a wide range of systems



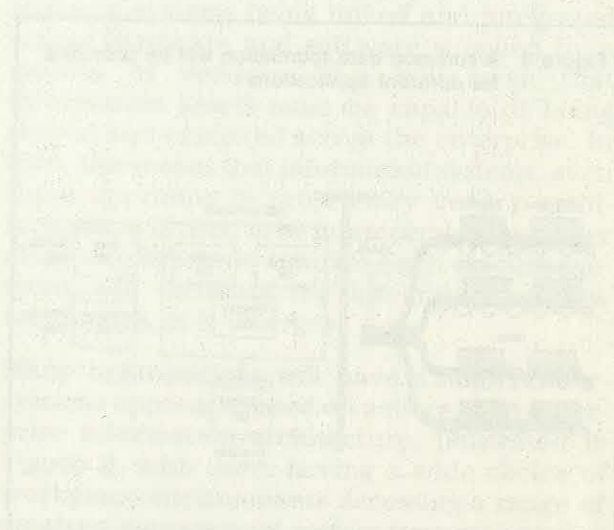
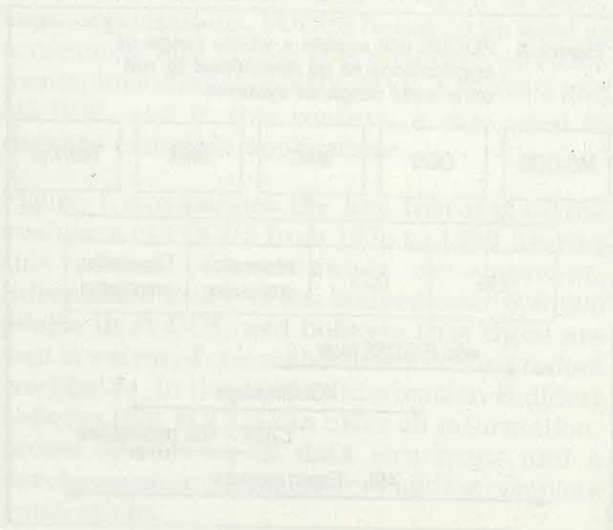
Implications for user organisations

Information Builders' drive towards offering the commonality and portability across the several technical environments that make up an enterprise architecture is clearly an attractive idea. Moreover, if FOCUS/LEVEL5 can be used to help migrate applications from existing environments, its appeal is considerably enhanced. The integration of fourth-generation language and knowledge-based systems is a significant step forward, and the potential for a common user interface across several environments will be attractive to a significant part of the marketplace.

Although FOCUS has clearly been successful during the past 15 years, Information Builders remains essentially a one-product company, and the market that it is targeting to fuel its future growth is not clear. The strategy is to continue

to develop FOCUS so that it is attractive to larger organisations and to try to co-exist with many different technical environments. What is not clear is exactly how FOCUS/LEVEL5 can fit into the fast-developing CASE and I-CASE environments, which may represent a distinct threat to the viability of a standalone fourth-generation-language product.

Users have also expressed some concern about the operational performance of applications developed in FOCUS, and there was no firm statement of intent to improve this aspect. Information Builders clearly believes that users are prepared to put up with some reduction in operational performance in order to achieve the enhanced development productivity that FOCUS provides. Information Builders' strategy is clear, but whether industry trends will overtake it remains to be seen.



Thursday 10 May

IBM

IBM hosted a visit at its executive briefing centre at Palisades. The company was asked to present its vision of the next 10 years, both in terms of technological developments and in terms of the role of information systems. Abe Peled, IBM vice president systems and director of computer sciences, provided a technological view. Steve Haeckel, director advanced marketing development, followed this by an analysis of the strategic impact of IT.

IBM had also been asked to comment on its response to the changing market conditions for IT vendors and this was done by Doug Sweeny, IBM director for business strategy. An integral part of IBM's response to the changing market conditions is the desire to make greater and more efficient use of IT within its own organisation. Larry Ford, IBM vice president information and telecommunications systems, described the changes occurring in that area.

A 10-year view of technology trends

IBM employs 3,500 people worldwide in its Research Division. There are four major laboratories, the largest of which is Yorktown Heights, which employs 2,000 staff. The overall picture emerging from the research work indicates a continuing trend of 30 per cent a year compound growth in the performance capability of computing devices relative to price.

The rate of growth of performance is an aggregate measure. More specifically, major developments in certain technologies will have a dramatic impact upon the way in which IT is used within organisations. They will lead to flatter organisations and to changed business relations. A new industry — information brokerage — may be expected to develop. In particular, IBM expects major developments in optical fibre and larger bandwidths, parallel

computers with optimised compilers, and multimedia workstations with more natural human interfaces.

Optical fibre and increased bandwidths

This will be the most significant technological development. IBM has developed, in the laboratory, a packet-routing system (PARIS) that exploits the potential of optical fibre and that is being used to carry integrated data, voice, and video. The expectation is that input devices will be developed that take advantage of this and offer speech recognition and handwriting recognition.

Parallelism

Improvements in operating systems and chip technology will continue to give the kind of performance improvement recently seen with the RISC System/6000. Parallelism is the next step. Parallelism offers significant benefits for certain processor-intensive applications and IBM is working on the design of a compiler that will enable the same machine to exploit the inherent parallelism in conventional code — not just specialised applications such as neural networks. Current laboratory work involves the development of a 32,000-processor, teraflop (10^{12} flops) machine.

Human interfaces

Combined with high bandwidths and increased processor performance, improved human interfaces will have a major impact on the use of IT. Current developments include:

- Speech recognition, which is not seen as a keyboard replacement, but as a new input method.
- Handwriting recognition (electronic paper). IBM predicts that this will be available for \$3,000 in the next five years.
- Multimedia display.

IBM estimates that only 2 per cent of information is computerised. These new technologies will facilitate the development of applications that tackle the other 98 per cent.

The strategic impact of IT

Steve Haeckel described the changed approach to the application of IT that would be necessary if organisations were going to be able to exploit IT fully. He distinguished between an investment strategy that was application-based (and usually justified in terms of return on investment) and an approach based on investing in a flexible IT infrastructure (usually justified in terms of providing organisational responsiveness).

Organisations are being driven by two major forces — the need to provide customer choice, and the need to provide customer service. Lead times are continually being reduced, and an organisation's ability to stay ahead will be increasingly dependent upon its ability to use IT in an innovative way. Figure 1 shows how the strategic use of IT involves changing the way in which organisations relate to their customers and their suppliers. New products are increasingly dependent on the use of IT.

An organisation's ability to operate in this way will depend on the involvement and commitment of senior management and the influence of the chief information officer. Westpac (an Australian bank) provides a good example of the level of commitment required. In 1985, it invested \$100 million 'on faith' in project CS90, the objective of which was to

make the bank more responsive, more flexible, and more able to meet customer needs.

IBM's strategy and the role of IT

Since 1985, IBM has been following a 10-year programme, designed to move the company from being product-driven to being customer- and market-driven. IBM operates in 132 countries and employs 383,000 people, and is aware of the risk of confusion and demoralisation among its staff, which can be caused by such a major change. However, it believes that it is succeeding.

Further changes are being brought about by the changing IT market. Between 1986 and 1994, the proportion of revenue accounted for by hardware sales will fall from 59 per cent to 48 per cent, while sales of software and services will increase from 41 per cent to 52 per cent. The company will therefore target industry sectors as a vendor of solutions, not as a vendor of hardware. The programme of alliances will be extended to facilitate this change.

The four principles that define IBM's mission are shown in Figure 2. In order to abide by these principles, the company has taken six main initiatives:

- Decentralisation of management, including the management of alliances and partnerships.
- Quality improvement programme.
- Reduction of cycle times.
- Employee involvement.

Figure 1 The strategic use of IT involves changing the way in which organisations relate to their customers and suppliers

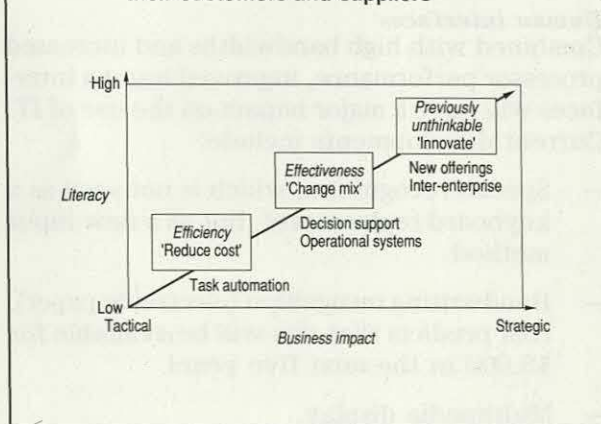
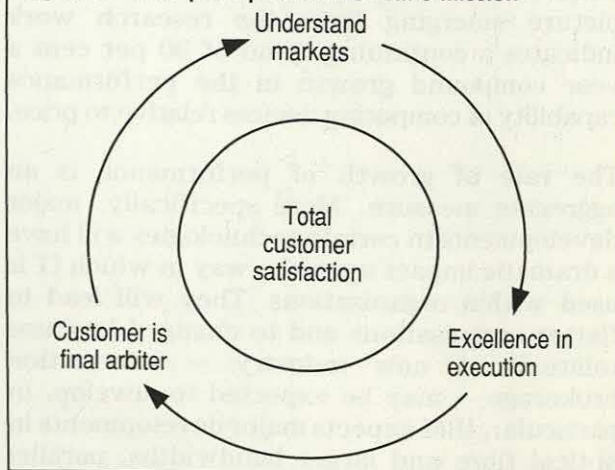


Figure 2 Four principles define IBM's mission



- Customer satisfaction as the prime measure of business performance.
- Improving the effectiveness of the use of IT within IBM.

IBM sees the improved use of IT within the organisation as a significant factor in improving the company's performance. The company spends \$4 billion a year on IT (6 per cent of turnover) and employs 27,000 IT staff internally in 120 IT departments. The IT departments have traditionally been seeking functional excellence, but the current objective is to make them more closely integrated with business operations and more responsive to the needs of business management and customer support.

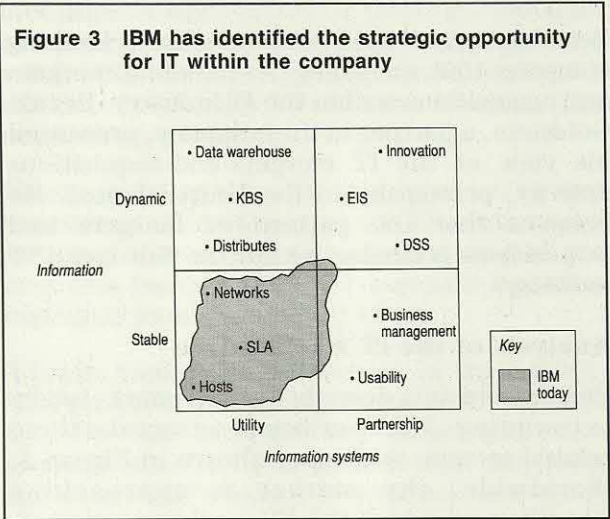
During the last three years, several initiatives have been taken to encourage this:

- A conference of senior managers to ensure involvement and assign ownership.
- Establishment of an enterprise information council to provide a management focus on company-wide information issues.

- Definition of common architectures throughout the corporation.

The overall objective is to support the market-focused organisation, using information systems as a strategic, worldwide, corporate resource rather than as support for specific functional areas. Figure 3 shows the use of IT largely as a utility at the moment, and the potential that IBM has targeted for its IT departments.

Figure 3 IBM has identified the strategic opportunity for IT within the company



Thursday 10 May

Broadview Associates

Broadview Associates is an investment banking company that specialises in handling mergers and acquisitions within the IT industry. Bernie Goldstein, a partner in the company, presented his view of the IT mergers-and-acquisitions activity, principally in the United States. He believes that the pattern of mergers and acquisitions is similar within the European IT industry.

Analysis of the IT marketplace

Bernie Goldstein described the IT marketplace as consisting of three principal sectors and three related sectors, which are shown in Figure 1. Worldwide, the market is approaching \$2 trillion, of which the US market represents 48 per cent. A company in any sector that has serious ambitions to be international must therefore operate in the United States. He defined the information-services sector as embracing software, processing, and network services business. This sector is growing at 19 per cent a year worldwide.

The hardware and telecommunications market is now growing at 11 per cent per year. The

industry is experiencing considerable turbulence as a result of accelerating globalisation, much greater earnings volatility among IT companies, and poor performance in the mainframe and minicomputer markets. Mainframe sales rose by only 1 per cent in 1989 in the United States, and by 4 per cent in Europe. The PC/workstation market is approaching maturity in the United States. Although there has been a boom period for some telecommunications segments, professional-services businesses have suffered some set-backs.

Within the industry, hardware firms have shown the weakest profit profile and information service companies the strongest. Return on equity in the three major segments is shown in Figure 2.

Broadview's map of the industry is shown in Figure 3. Mr Goldstein stated his belief that the online database segment may be the only area that gives suppliers the potential for achieving near-monopoly positions in the marketplace.

In such a fragmented marketplace, acquisitions can be a particularly potent weapon in the battle

Figure 1 The IT marketplace consists of three principal sectors and three related sectors

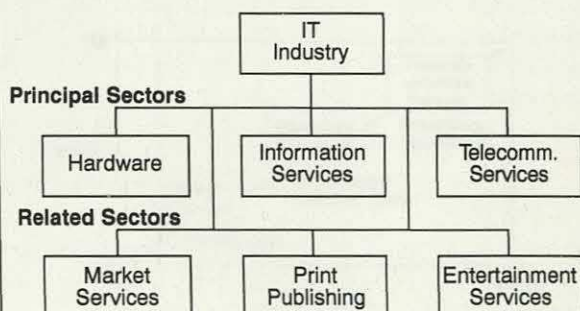
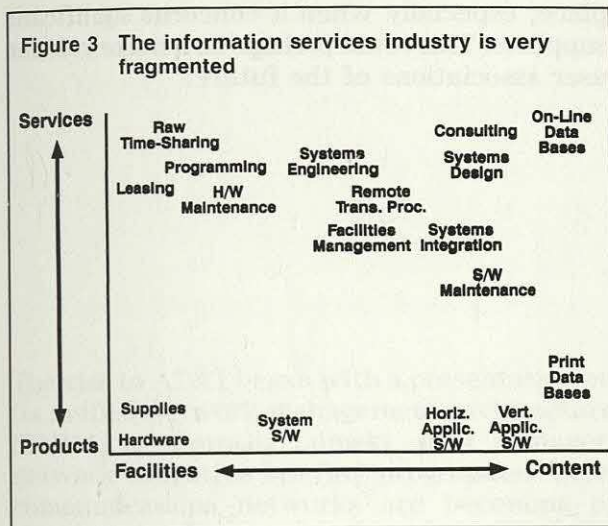


Figure 2 Within the IT industry, hardware companies have shown the weakest profit profile, and information services companies the strongest

13%	5%	24%	>20% ROE
45%	57%	36%	5%-20% ROE
42%	38%	40%	<5% ROE
Hardware	Telecomm. Svcs.	Info. Svcs.	

Source: Broadview Associates, based on analysis of over 500 IT firms December 31, 1989



for strategic advantage. The level of mergers-and-acquisitions activity involving US companies remained high in 1989, and although there were fewer deals than in 1988 (717 compared with 773), they were of greater total value (\$32.6 billion compared with \$23.8 billion). Seventy-four per cent of this activity is accounted for by deals of greater than \$100 million. Activity in the telecommunications-services area has been particularly high, with four large cellular radio deals heading the list of individual transactions.

Private sellers accounted for nearly half the transactions in 1989. Two-thirds of the buyers had existing roots in the information-systems or hardware segments, and over the past year, the scope of pan-European and trans-Atlantic merger-and-acquisition activity has greatly expanded. The United Kingdom, Japan, and France were particularly active in buying companies in the United States.

In recent years, mergers and acquisitions have been a more successful way of raising capital than launching the firm onto the stockmarket. Only one-third of the IT companies that have gone public since 1983 have gained in value.

Joint ventures have not, in general, been successful and the probability of success has been estimated at only 2 per cent.

Outlook for the IT market

General conditions in the IT market will continue to exert pressure on financial results,

and it is likely that merger activity will continue at a strong pace, yielding growth for larger firms and providing access to capital and operating support for companies in the middle of the market.

Some recent successful public launches may lead to greater activity in this area, but only for exceptional performers. With the single unified market becoming a reality in Europe, it is certain that cross-border acquisitions and investments will continue to intensify, although as the large cellular-radio deals abate, the total value of IT mergers and acquisitions could well slacken, despite growth in other areas such as networking products.

When questioned, 54 per cent of chief executives of companies in the IT marketplace said that they expected to be acquired in the next five years, and 64 per cent said that they expected to acquire other firms.

With its traditional dominance of the market, IBM's position is of particular interest. Although software had been the key component of its planned growth, this growth has not been achieved. IBM's recent investment strategy of taking holdings in smaller companies is intended to extend its reach into the applications-development process (thereby proliferating SAA, AIX, and OS/2), and to focus software firms' development resources on IBM environments.

Impact on user organisations

In the rash of mergers and acquisitions that have taken place over the last few years, the user's voice has been remarkably silent. Customers are significant stakeholders, and the impact of some mergers and acquisitions can be very significant. For example, Computer Associates' ownership of several of the database products must have an impact on users of one or other of those products in the medium term. There are real questions over several hardware companies, and users have made no cohesive attempt to make their views known in the marketplace. In general, users can play safe by seeking continuity from the big suppliers, but they may be missing some of the innovative power of the smaller companies by doing this. Although the anti-trust law protects customers in the United States from any monopoly, the situation in Europe is quite different.

Users must exercise their purchasing muscle more. User associations can and should have a voice in the mergers-and-acquisitions market-

place, especially when it concerns significant suppliers. This could perhaps be a major role for user associations of the future.

you and your organization may find it difficult to do this. But the fact is that the only way to ensure that your organization is not left behind is to have a voice in the mergers-and-acquisitions market. User associations can and should have a voice in the mergers-and-acquisitions market. This could perhaps be a major role for user associations of the future.

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Friday 11 May

AT&T

The visit to AT&T began with a presentation on its unified network-management architecture (UNMA) by Dorothy Lumski, staff manager, network executive briefing programme. Telecommunications networks are becoming of strategic significance to many businesses, and network management is an increasing concern. Reasons for this include the growth of multiple networks, government deregulation, the use of multivendor networks, the strategic impact of networks on the business, the use of new technologies, globalisation, growth in size and complexity, the problems of controlling costs, and the scarcity of technical staff. In fact, the multiplicity of network elements and also of network-management approaches is creating a modern Tower of Babel. This problem demands a single overall approach to network management. AT&T's response is UNMA and the Accumaster family of products that supports it.

Unified network-management architecture (UNMA)

UNMA is a three-tier approach to network management, as shown in Figure 1. The bottom

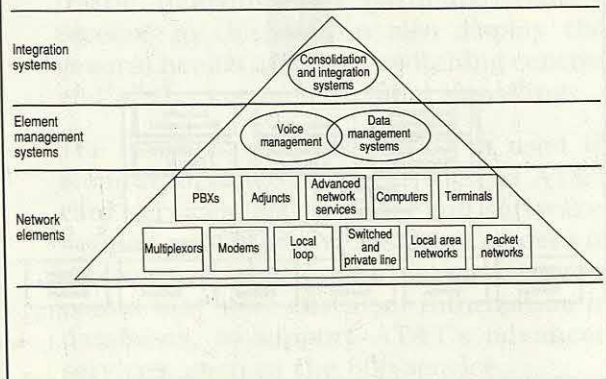
tier consists of all the various network elements that have to be managed to provide users with an end-to-end service. The middle tier consists of the various element-management systems, which are generally designed and implemented independently, but which ought to interrelate. The top tier provides consolidation and integration, but for this to be possible, there needs to be a network-management protocol between the middle and top layers, providing a common interface with the various element-management systems.

In developing UNMA, AT&T is cooperating with other vendors through the OSI Network Management Forum. This an independent, international, not-for-profit corporation, which is open to membership to all organisations and is funded by members' subscriptions. It was formed in 1988 by eight founding members (Amdahl, AT&T, British Telecom, Hewlett-Packard, Northern Telecom, STC, Telecom Canada, and Unisys). There are now around 100 voting members and many more associate members. The objectives of the Network Management Forum are to accelerate interoperability, using ISO/CCITT standards, to bridge the gap between formal standards and the various testing and compliance groups, and generally to accelerate the growth of capability in the telecommunications industry.

The functionality objectives of UNMA are:

- Configuration and name management.
- Fault management.
- Performance measurement and management.
- Accounting, which includes budgeting, cost allocation, and cost verification.
- Security management.
- Network planning, which comprises capacity planning, contingency planning, and strategic planning.

Figure 1 UNMA is a three-tier approach to network management



- Operations management.
- Programmability, which provides software support for network management.
- Integrated system control.

Accumaster family of products

The Accumaster family currently comprises four products, designed to provide AT&T customers with network-management facilities that have already been tried and tested in AT&T's own network-management environment:

Accumaster network management services enable customers to supervise their AT&T services, to analyse network data, to take active command of their AT&T services, and to administer these services by electronic interaction with AT&T.

Accumaster consolidated workstation is a first step in providing consolidated control over many separate network-management systems through a single control point. It handles the management of elements such as modems, multiplexors, local and wide-area networks, network facilities, private branch exchanges, and computer systems. The consolidated workstation does not integrate the separate element-management systems, but it can access and control them all from one workstation — the software includes both 3270 and VT100 terminal emulation.

Accumaster integrator provides a second step in the integration of network management and is designed to handle fault management, configuration management, and consolidation control from many separate element-management systems. This product is currently 18-months old, and in the future, it will be enhanced to include other management functions. It depends upon a network-management protocol that standardises the input from different element-management systems. In the absence of an internationally agreed protocol, AT&T has developed its own protocol and has undertaken to ensure that its protocol will always remain within the OSI framework.

Accumaster management services provide standard support activities to help customers manage their AT&T services. AT&T staff, who can be either on site or on call, are dedicated to a customer's account, and provide

managerial, technical, and administrative services. They are prepared to manage multivendor environments, so that the customer has only one interface with all his equipment and services. The benefits of Accumaster management services include improved network control, the freeing-up of customer's resources for other activities, access to the latest technologies and management processes, and the provision of a sound basic structure for advanced capabilities.

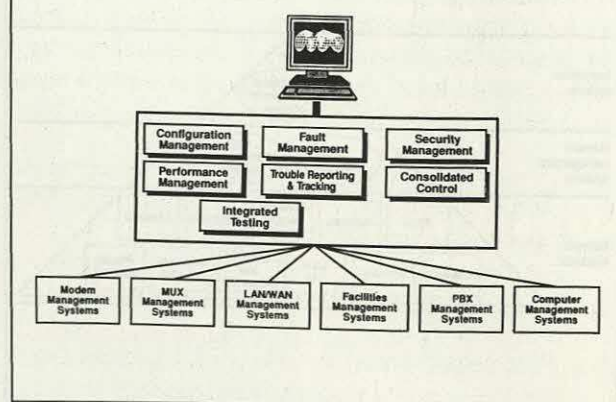
Dorothy Lumski ended her presentation by suggesting an architecture for networks in the future, as shown in Figure 2.

Visit to the Bedminster network-operations centre

The Butler Cox party then divided into two groups for a visit to the network-operations centre at Bedminster. The tour was conducted by Don Smith, the network operations centre programme manager, and by Lori Glover, staff manager, network executive briefing programme. They began their presentation by describing the four components of the AT&T communications service. These are:

- Transmission facilities, with two billion circuit miles using microwave, co-axial, optical-fibre, and satellite circuits. The network will be 100 per cent digital by September 1990.
- The switching facility, which consists of specially designed 4E switching computers designed to handle up to 700,000 calls per hour. They route calls dynamically, with up

Figure 2 In the future, network architectures will be more comprehensive



to 14 different circuits between any two switching centres.

- The network management operational support system (Nemos). This polls the 4E switching centres to obtain traffic and capacity information, and can automatically connect additional routes to a switching centre if demand is too great.
- Common channel signalling, which allows fast call set-up of between four and six seconds per call, and controls additional intelligent services such as special handling instructions, software-defined networks, and card-caller services.

At the heart of the network operations centre is a video wall consisting of 75 large rear-projection screens, arranged in five rows of 15 screens. The video wall, which resembles the NASA mission control room, can be viewed from an observation gallery. The top two rows of screens are principally for demonstration purposes, but are also used to display lists of national and international events that might influence traffic patterns. The bottom three rows display realtime information, which is normally updated every five minutes, showing the status of the network and of its support systems. The video wall is divided into four sections:

- The international network section shows the status of international voice, data, and image traffic flowing through the six gateway cities in the United States, where international traffic enters and leaves the country via AT&T networks.
- The North American section is dominated by screens displaying Nemos information, including graphic displays representing traffic overflows on particular routes. Screens in this section also display the general health of the 4E switching centres and of the common channel signalling.
- The network services section is used to monitor advanced services such as AT&T card services, 800 service, and software-defined network services. Other screens in this section monitor the network-control points that store customer information in databases, to support AT&T's advanced services, such as the 800 service.

- The transmission facilities section principally displays status information on back-up services. Various colours on the display tell the network managers the status of back-up facilities on a given route, to ensure that there is sufficient capacity protection available. These screens also provide information used to set priorities for network repair work.

The control room and the video wall were designed and built by AT&T. Delegates were impressed by the amount and variety of control information available to the network managers, but were left wondering how they actually monitor and use the available information. AT&T said it was considering the use of expert systems to assist it in this task.

To demonstrate the robustness of the system, the presenters recalled information screens from the day of the San Francisco earthquake in 1989 — showing the massive rise in call frequency following the news broadcast, and saturation of the transmission lines from that area. They politely declined, however, to recall screens from 15 January 1990, when a propagating software bug wiped out 50 per cent of the AT&T network!

The evolution of value-added services

The next presentation was given by Mark Mortensen, department head, operations strategic planning, at AT&T Bell Laboratories. He described ways in which value-added services will evolve in the market and the factors that will influence their availability. Figure 3, overleaf, shows how such services will emerge with the availability of increased bandwidth and increased intelligence. In the bottom left-hand corner are existing services, such as plain old telephone service (POTS), facsimile, and text. In the top right-hand corner are universal information services, whose main attraction is convenience, ease of use, and the creation and linking of virtual communities such as workgroups, play groups, and classroom education groups.

Figure 4, also overleaf, shows the expected annual growth of various kinds of service arranged according to complexity. Services that use only basic communications channels are arranged on the left, and data-based services are

Figure 3 Value-added services will become more readily available with increased bandwidth and increased intelligence

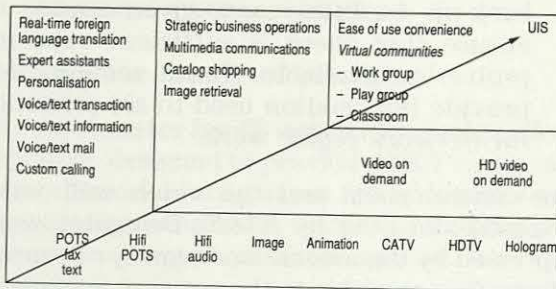


Figure 5 The intervals between service changes vary from minutes to months

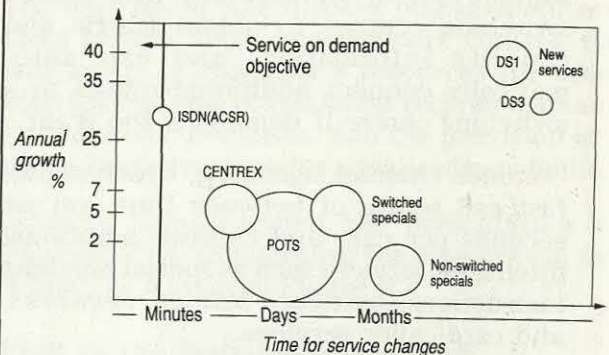


Figure 4 The complexity of value-added services is increasing

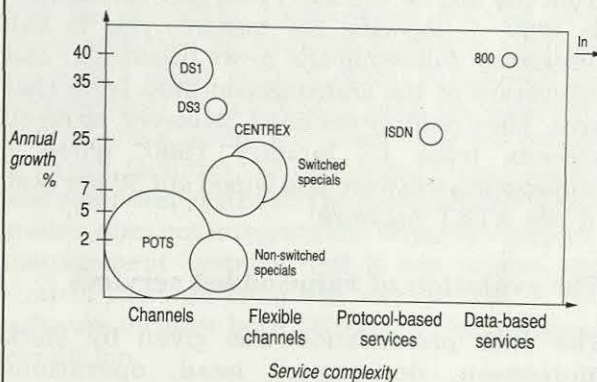
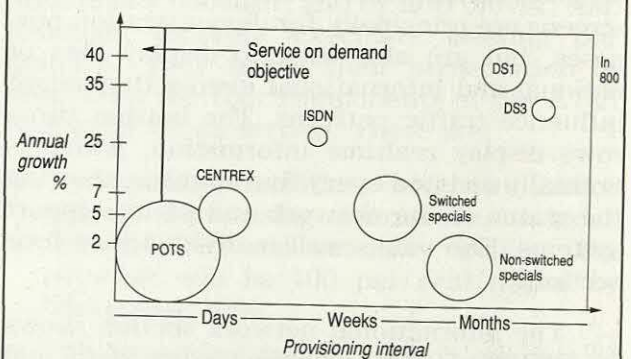


Figure 6 The time required to install a new service varies from a few days to several months



arranged on the right. This figure illustrates how the complexity of value-added services is increasing. The increasing complexity is also illustrated in Figure 5, which shows the interval between service changes for a variety of services. AT&T's objective is to be able to implement service changes on demand — that is, within minutes. The figure illustrates how even POTS requires several days to introduce service changes, and the new services require several months.

Figure 6 illustrates the time required to install a new service, again showing AT&T's service-on-demand objective at the left-hand side. POTS can be provided within a few days, but the newer services, which have the highest expected annual growth, require several months.

Figure 7 illustrates the impact of downtime in the network on network users, in terms of the cost of one hour of downtime. It also shows that AT&T estimates that a large insurance company would lose up to \$20,000 per hour, that a major airline would lose up to \$2.5 million per hour, and that a trading and investment-banking company would lose up to \$6 million per hour of downtime. These figures illustrate the growing importance of network services. Mark Mortensen said that the market is moving towards self-provisioning, self-monitoring, and self-healing network services.

Mark Mortensen ended his presentation by describing ways in which expert systems are being used to automate many of the traditional management functions and to reduce the cost

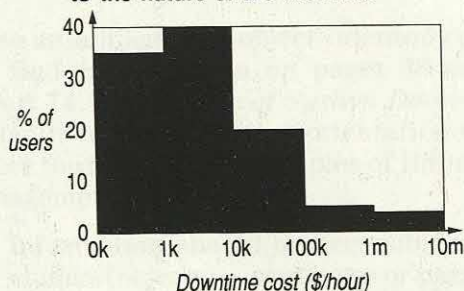
of those activities. AT&T now has 20 or 30 expert systems in various parts of its business. One example is a system called 'Lester the Tester', which is used to test AT&T's private lines, of which there are 10 million. This system now handles 50 per cent of all AT&T's testing problems. It has reduced the false send-out of test engineers from 7 per cent to 3 per cent of all incidents, and it has cut its solution time from 2.5 hours to 15 minutes. However, one of the disadvantages of expert systems is that, because they handle more and more of the basic, straightforward problems and leave only the really difficult problems for manual resolution, testing engineers are not able to build up their skills and experience. He estimated that AT&T has completed only around 10 per cent of its potential automation.

AT&T ISTEEL

The final presentation was given by John Leighfield, Executive Chairman of AT&T ISTEEL. (The British network services company, Istel, was acquired by AT&T in 1989, and changed its name to AT&T ISTEEL in 1990.)

He said that AT&T's long-term mission is to become the global leader in providing its customers with the benefits of information technology, and described a pyramid of international communications services, with facilities and infrastructure at the bottom, moving up through communications products and services, network-management services, and horizontal customer services, to vertical industry applications at the top of the pyramid.

Figure 7 The impact of network downtime on network users varies according to the nature of the business



- Large insurance carrier • \$20k/hour
- Major airlines • \$2.5m/hour
- Trading/investment banking • \$6m/hour

AT&T is well established in the bottom two layers, but its strategy requires it to move up to horizontal customer services and vertical industry applications. This implies that AT&T should seek out suitable companies to acquire.

Under the AT&T umbrella, ISTEEL is seeking ways to enlarge and globalise, in order to survive in an increasingly competitive marketplace. Its strategic objective is to become one of the top three IT services companies in Europe.

ISTEEL has been well established in the network-management sector for many years, both managing its own network and providing networks and network-management facilities for its customers. He said that it has many network-management facilities and desperately needs a product such as UNMA.

He described some of the vertical industry applications that ISTEEL is providing. These are targeted at specific industry niches — for example, the automobile industry, general manufacturing, the distribution industry, retail finance, travel, and healthcare. The earliest example of ISTEEL's vertical application is the stock-locator service, which was introduced for the BL Automobile Company, now the Rover Group, in 1980. This was the first value-added videotex application in Britain, and is now the basis of transaction communications throughout the Rover Group.

The next application was in the travel industry, where ISTEEL set up a database containing information about holidays offered by various tour operators and made it available over its network to travel agents. In 1986, it was providing holiday information from 20 tour operators to around 6,000 travel agents. Now, it has information from 50 tour operators and its service is used by the majority of travel agents in Britain and handles around 60 per cent of all holiday bookings in Britain. The network links right through from the travel agent's videotex terminal to the tour operator's computer system, so that when the customer selects a holiday, the agent is able to transmit the customer's booking details directly into the tour operator's computer, which can then send a holiday confirmation back to the customer.

A new service has been introduced for purchasing stationery. This is effectively an electronic market that links suppliers of

stationery items with potential customers for those items. A major buyer of stationery can contact a stationery merchant through the network to enquire about the supply of stationery items. The merchant can then access a database to obtain information about stationery products, their suppliers, the suppliers' quality and delivery record, and prices. A pseudo expert system then matches the customer's requirements against information from the database and makes suggestions on who to buy from. The merchant then invites these suggested suppliers to bid for the customer's business. The suppliers enter their response to this bid invitation and the system matches the responses with the customer's requirements and recommends a specific supplier for the order. Finally, the customer can place an order on this supplier through the system, and the supplier can transmit the order confirmation back to the customer. This

electronic market in stationery could be the first of many value-added services of this type, linking customers and suppliers of various kinds of commodity items.

Many factors influence the success of value-added services. The first is the basic communications infrastructure — the competitive telecommunications industry in Britain helped ISTEEL to provide a good basic infrastructure for its service. The second factor is end-to-end integration, crucial in providing customers with a complete service. The third factor is methods — all suppliers of value-added services suffer from a lack of rigorous methods. ISTEEL is developing such methods for itself. The final factor is the need to provide customers with complete solutions to their application needs; ISTEEL is positioned as AT&T's solutions provider for vertical markets.

Monday 14 May

Ontologic Inc and Object Design Inc

The concept of object-oriented techniques was a recurring theme of the 1990 Study Tour, and it came to the fore with visits to Ontologic and to Object Design. The two companies have much in common: both are pioneers in the field of object-oriented databases, both are located on Route 128 (the East coast's equivalent to Silicon Valley), both are backed by venture capital, and Thomas Atwood, now Chairman of Object Design, was previously a founding member of Ontologic. The relationship between the two companies is competitive rather than co-operative — something that delegates felt was a pity, given the embryonic nature of the market (a spot survey having revealed that only two delegates were currently doing any kind of object management). It is appropriate, however, to discuss the two presentations together.

Both companies sell object-oriented database products. Ontologic's is called Ontos (an earlier version was called Vbase), and Object Design's is called ObjectStore. The former has a longer (four-year) history, and is installed in approximately 100 sites, of which only 40 are in the United States; Object Design claims that its product is technically superior, but it is currently at Beta release stage with seven customers.

Those unfamiliar with object-oriented concepts can find a description on pages 38 to 44 of Report 74, *The Future of System Development Tools*. In summary, object-orientation encompasses four emerging principles of information management:

- Information should be accessible in small chunks (objects) — sentences or paragraphs in a text file, for example.
- Objects contain not only a chunk of data but also the procedures that can operate on that chunk. This is called encapsulation.

- Objects can be manipulated in groups (known as classes). In this way, objects can inherit the properties of other objects.
- Objects are conceptually much wider than data records, ranging from single numbers, chunks of text, image files, or even sections of video.

An object-oriented database essentially does for object-oriented programming what a conventional database does for conventional programming — it adds 'persistence' to the data being manipulated. It also provides features that enhance the security and integrity of the data (such as recovery procedures) and permits multi-user access to the data (such as locking and multistage transactions). The important thing to realise is that neither product has much benefit to offer to applications that are not written in an object-oriented language.

Although the first general-purpose object-oriented language was Smalltalk (the first commercial version appeared in 1980 as Smalltalk80), the *de facto* standard language is now C++, which comprises a set of extensions to the standard C language. Both Ontos and ObjectStore are designed to work with applications written in C++ (and both are written in C++ themselves).

Although one survey suggests that there are 65,000 C++ programmers worldwide, the number of existing applications is small. Most are technical and engineering applications. CAD/CAE lends itself well to the object-oriented approach, because of the complexity of the data — the large number of 'objects' being handled. The kinds of companies currently using these approaches (and the two companies' database products) tend to be large companies with substantial engineering facilities such as General Dynamics, AT&T, and Kodak.

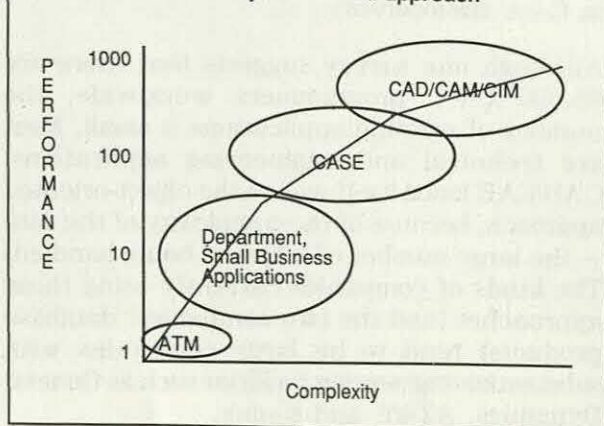
The principal benefits offered by the object-oriented approach for this type of application are:

- Programmer productivity (fewer lines of code).
- Maintainability of applications.
- Performance.

The performance of the final system is the most impressive. Both companies claimed speed improvements of one to two orders of magnitude over relational database management systems. Indeed, most of the existing applications are ones where a relational system would simply not offer the performance needed. Object-oriented programming combined with an object-oriented database is able to compete, effectively, with custom file-based approaches. Figure 1 demonstrates that the more complex an application, the greater the potential performance increase from the object-oriented approach.

An object is essentially a software module that simulates an object in the real world. Thus, a word processing application might be made up from the following types of objects — document, paragraph, word, character, header, and footer. The concept of modularity is not new, but it has traditionally been applied either to the data structure (with techniques such as the Jackson method), or to the programming, in terms of functional decomposition. In the object-oriented approach, the two are inseparable. Each object contains not only some data, but a list of the operations that can be applied to that data, and a list of the relationships with other objects.

Figure 1 The more complex an application, the greater potential performance increase from the object-oriented approach



An important concept in the object-oriented approach is that there should be no difference between the structure of the application as specified at the concept stage and the structure of the application as actually implemented inside the machine. This is illustrated in Figures 2 and 3. A user ought to be able to 'peer inside' object-oriented applications and recognise objects that make sense even to a non-programmer. This is part of the reason why the object-oriented approach makes for easier program maintenance. Some users observed this effect in the migration from C to C++ over a period of five years: new C applications typically comprised 20 per cent existing code and 80 per cent new code. With the object-oriented approach of C++, the ratio has been reversed.

The continuity of structure from concept to implementation also applies to the database. In

Figure 2 With non-object languages, there is no relationship between the conceptual model of an application and the structure of a program

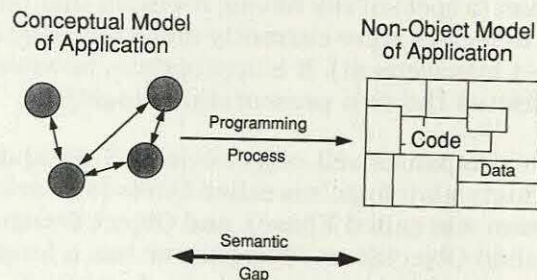
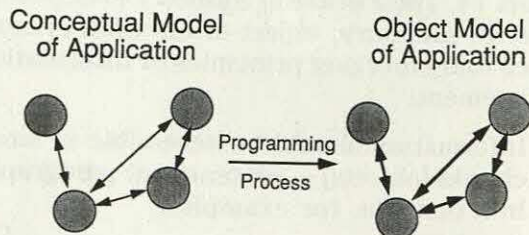


Figure 3 With object-orientation, the conceptual model of an application is retained



conventional applications, the data structure inside a particular application is typically very different from the structure inside the database (relational or other), and considerable effort is expended converting between the two. Indeed, many applications are written in a mixture of languages: perhaps Cobol for the processing and SQL for the access. In an object-oriented system, the retrieved objects are stored in memory identically to their disc representation. This makes it possible to implement large applications using single pointers to virtual memory, and facilitates client-server architectures.

In the case of ObjectStore, a single new C++ command (PERSISTENT) enables virtually all code associated with reading and writing data to be eliminated. The effects of this are illustrated in Figure 4.

The object-oriented approach will offer increasing benefits with the emergence of loosely coupled distributed processing (including heterogeneous systems — those that use different kinds of processors), and with the emergence of massively parallel computers (see Report 73, *Emerging Technologies*). This is because objects communicate by sending messages between each other. Currently, these are implemented in C++ as sequential function calls, but ultimately, objects will be implemented as autonomous structures running asynchronously on separate processors.

The commercial implementation of object-oriented technology is so new that standards have yet to emerge (with the exception of C++ as the favoured language). ANSI is developing

standards for C++, and has an object-oriented database task group. Other initiatives include an object-version of SQL.

Delegates reminded Ontologic and Object Design that the majority of commercial programming was still performed in Cobol. Ontologic stated its intention of developing some form of Cobol interface. However, it was pointed out that, even if object-oriented facilities were added to the Cobol language, using those facilities would require such a 'paradigm shift' (a phrase heard frequently during the day) in the minds of programmers that there would be little advantage over completely rewriting existing applications.

Both companies felt that it would be several years before object-oriented databases were applied to transaction processing. Figure 5 shows the timetable predicted by Object Design. In the long term, however, the maintainability of object-oriented applications will offer huge advantages for corporate-wide information systems. It was recommended that systems managers should be experimenting with the techniques on small applications that have a high degree of change.

Delegates found the claims for improved performance and maintainability impressive, but thought the incompatibility with existing systems was a severe disadvantage. Organisations that are currently considering switching to relational databases face a particularly difficult decision — should they wait for improved object-based systems that might offer better compatibility?

Figure 4 With ObjectStore, virtually all code associated with reading and writing data can be eliminated

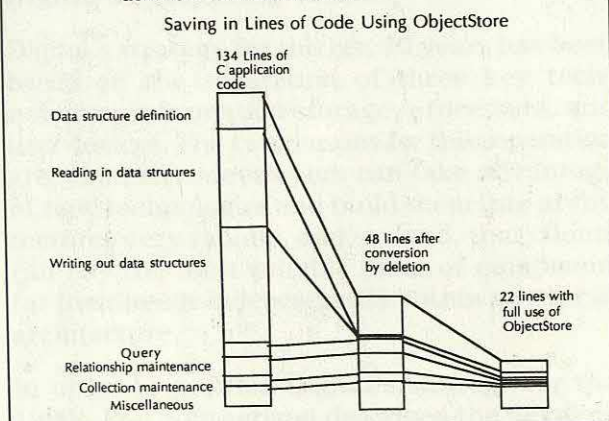
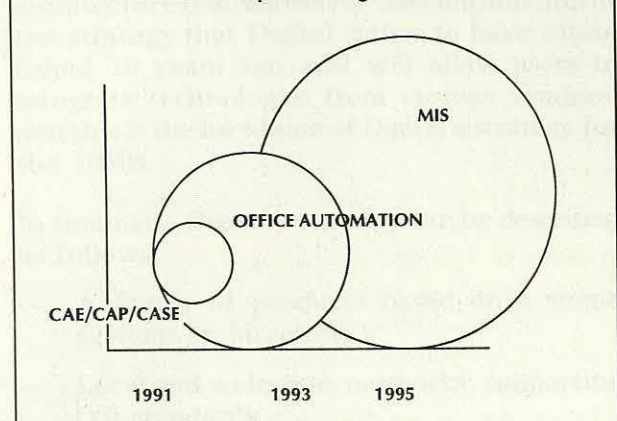


Figure 5 It will be several years before object-oriented databases are applied to transaction processing



Currently, object-oriented programming is seen as a small subset of commercial computing (Figure 6), the majority of which is record-oriented. Both Ontologic and Object Design

feel that in the future, as multimedia applications take over from simple text and data, the object-oriented approach will dwarf record-oriented data (Figure 7).

Figure 6 Currently, object-oriented programming is seen as a small subset of commercial computing

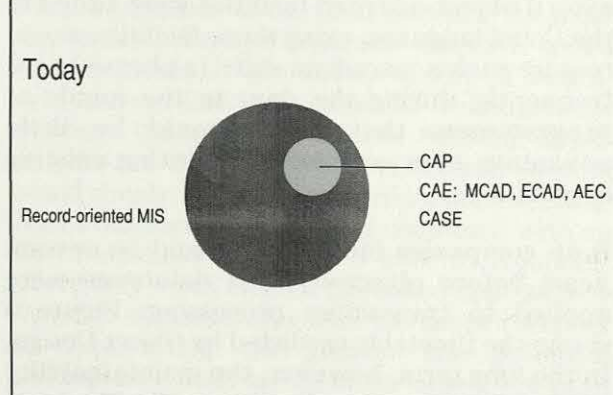
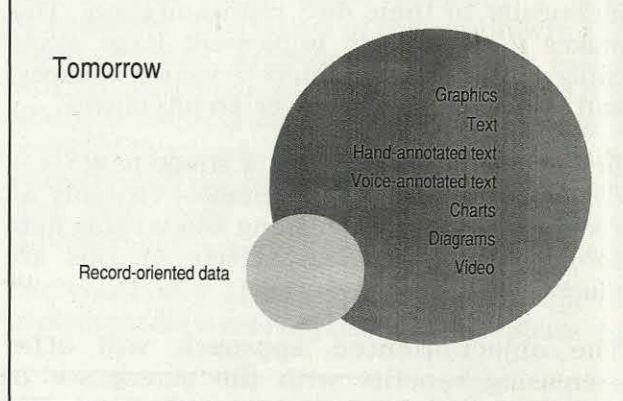


Figure 7 In the future, the object-oriented approach will dwarf record-oriented data



Tuesday 15 May

Digital Equipment Corporation

The Study Tour visit to Digital Equipment Corporation was hosted at the Mill in Maynard, which has been the home of the company since it was founded in 1957.

Digital had been asked to provide an insight into its vision for the 1990s and the first presentation which addressed this subject was given by Rod Southerland, manager, corporate accounts consulting. A key component of Digital's computing vision is the Network Applications Support (NAS) architecture and this was described by Bruce Adams, technology consultant. One of the early applications of the NAS architecture is to be found in Digital's approach to the integration of hitherto discrete office automation applications. These discrete technologies have been brought together within an architecture known as Compound Document Architecture (CDA), and Julie Bourdet (also a technology consultant in Boston), explained the concepts behind this architecture.

During lunch, the group was addressed by Ken Olsen, president of Digital who explained his views on the future of computing, and in particular, on some of the industry trends that are currently affecting Digital.

Digital's computing vision

Digital's strategy for the last 10 years has been based on the separation of three key technologies: information storage, processors, and user devices. The two reasons for this separation are, first, that developers can take advantage of new technologies and build them into architectures very rapidly, and, second, that clients can buy the most suitable piece of equipment for their needs independently within an overall architecture.

In order to position Digital's strategy for the 1990s, Rod Southerland described the develop-

ment of computer systems from the 1960s. The 1960s were described as the 'EDP era', where the main objective of computer systems was efficiency in terms of data processing. During the 1970s (the 'MIS era'), productivity was the objective, and was based largely on the introduction of departmental minicomputer systems. In the 1980s, categorised as the 'IS era', the focus was on effectiveness in terms of the application of systems, and it was during this period that distributed computer systems started to appear. Organisations began to reshape, functional teams became prevalent, personal computers were introduced, and the notion of client-server architectures was introduced for the first time.

The 1990s will be categorised as the 'systems integration era', and organisations will use computer systems to aid them in their competitive strategies. Computing will come to be considered as an organisational utility, somewhat analogous to a power plant. In this era, organisations will come to think of networking as the key to their systems architecture.

Digital will be basing the development of its networking architectures on OSI, an open architecture that allows for the continuation of the strategy that Digital claims to have established 10 years ago. OSI will allow users to integrate technologies from various vendors, and this is the backbone of Digital's strategy for the 1990s.

In summary, Digital's strategy can be described as follows:

- A family of products based on a single systems architecture.
- Local and wide-area networks, supporting OSI standards.

- The provision of network applications support (via the NAS architecture), upon which networked applications can be developed.
- Integration of key external business relationships.

Single systems architecture

Digital described its systems architecture as covering five main elements: hardware, communications, operating systems, data management, and applications integration.

Hardware

Digital will continue to develop the Vax range of computers. This provides a full range of computer power from the desktop through to the large mainframe environment. One of the major benefits of the Vax technology is its scalability. In the future, existing products will be complemented by risc-based technology, which will be built into workstations and servers.

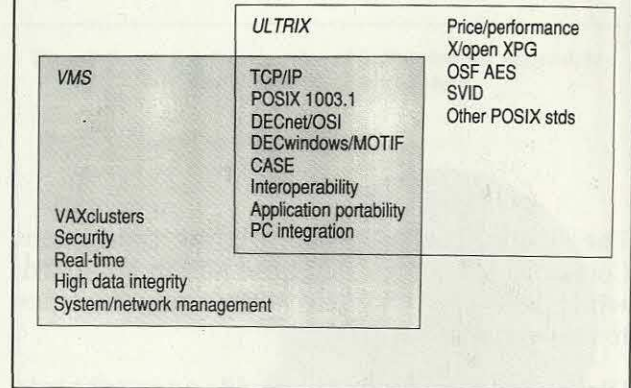
Communications

Traditionally, Digital has supported peer-to-peer communications through the integration of Vax technology over DECnet (its proprietary network architecture). Peer-to-peer integration will be extended to facilitate the integration of computers conforming to OSI standards. This will provide the facility for multivendor computer support — providing that vendors are following the same standards as Digital.

Operating systems

Digital's strategy on operating systems is to continue with the development and support of VMS, but to complement this with support of an OSF-based version of Ultrix for its workstation, departmental, and server technology. Digital is continually asked by its customers whether they should choose VMS or Ultrix. The company view on this question is that the two operating environments are complementary, with VMS being the main environment for the development of innovative features, while at the same time, also complying with emerging standards. On the other hand, Ultrix is predominantly a standards-based operating environment, within which innovative features will be built. The degree of overlap in terms of standards compliance will increase in the future. The current situation is shown in Figure 1.

Figure 1 Digital will continue with the development and support of VMS, but complement this with support of an OSF-based version of Ultrix



Data management

Digital will continue to pursue a distributed data management architecture, and will also provide support for the increasing number of standard third-party data management architectures, in particular SQL, which will be supported in conjunction with Digital's relational product.

Applications integration

Figure 2 shows Digital's computing strategy under the four systems architecture elements described above. However, the company is convinced that the largest area of activity in the IT industry for the next few years is that of applications integration. The Network Applications Support architecture is Digital's approach to dealing with this problem and it therefore sits on top of all the other aspects of Digital's strategy shown in the figure.

Figure 2 Network Applications Support architecture sits on top of all the other aspects of Digital's strategy

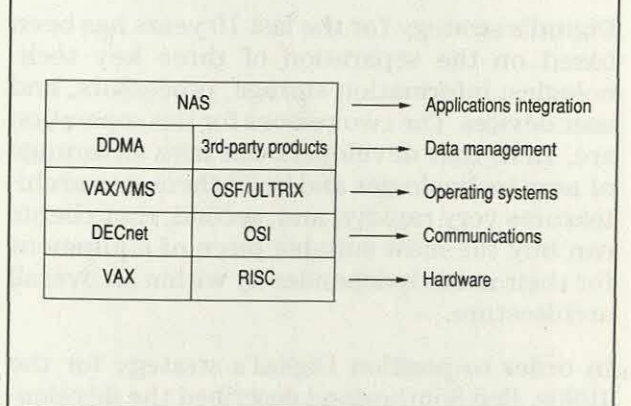
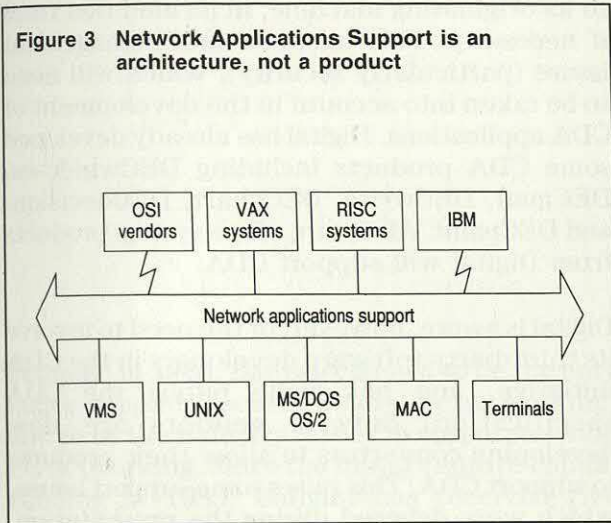


Figure 3 Network Applications Support is an architecture, not a product



As Figure 3 shows, NAS is a set of software services based on standards for interoperability and portability in a distributed computing environment. It is not a product but an approach, or an architecture, which assumes the use of standards and allows for integration of multivendor equipment and distributed applications. Digital's approach is to accept that it has no control over the computer technology put on the desktop, but that users will require full interoperability between their desktop devices and other systems. In this context, NAS provides Digital with its significant source of competitive advantage for the 1990s. Comparing its approach with that of IBM, Digital claimed that SAA offered only a segregated environment, with no more functionality than the previous VMS and DECnet architecture. NAS offers an integrated environment fully supportive of open standards and allows for the interoperability of equipment from multiple vendors.

Strategy for open systems in the 1990s

Bruce Adams explained Digital's approach to the use of standards in the 1990s. The policy is to use standards from vendor-neutral bodies — in particular, Digital supports the Open Systems Foundation (OSF). However, the evolution of standards is often a long process, and in the absence of standards from OSF, Digital will use *de facto* standards, although it will always switch to standards endorsed by OSF at the appropriate time.

In response to questions from delegates, Digital explained OSF's financial position. Although the

original target had been for OSF to be self-sustaining within three years of its formation, this goal has currently not been reached. Additional funding has been provided and Digital's view is that OSF provides the most secure route for future development of standards. In this sense, Unix is not considered to be a standard. Rather, it is a proprietary operating system from AT&T.

Digital is predicting that the client-server model will become the dominant style of computing in the 1990s, posing several management challenges:

- How to connect and manage multivendor environments.
- How to protect past investments in hardware, software, and people while taking advantage of new technology and solutions.
- How to satisfy personal, departmental, and cross-organisation needs.

NAS is the vehicle for tackling these management challenges. During the 1990s, the number of applications using NAS will be extended. The degree to which standards are supported will be extended and NAS services will be included with major software products.

Compound Document Architecture

The Compound Document Architecture (CDA) is a major component of Digital's unified software environment, using the NAS concepts. The intention is to remove the gridlock on information that exists in today's office automation applications. CDA will enable the integration of information from multiple sources into a common document. It will also provide document-management and tracking systems to allow the results of this processing to be made available to the distributed computer users within the NAS architecture. The current implementation of CDA allows for the integration of many data types including text, graphics, images, and spreadsheets, and in the future, Digital will be integrating voice and video.

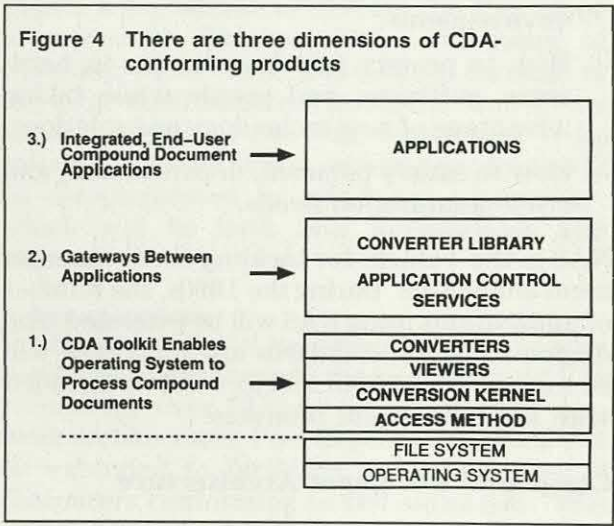
This integration is possible across multiple environments. CDA is a specification for the processing of data, compliance to which allows software developers to integrate within a CDA architecture. There are three dimensions of

CDA-conforming products, as shown in Figure 4. The objective of these products is to make CDA applications transparent to the user, in the sense that the user need not worry where on the network of computer systems the data has been obtained from. Toolkits are provided for the application developer to facilitate conversion from various operating systems, and also to provide gateways between applications and between operating environments. With CDA, users will be able to bring together a wide variety of data from different sources, manipulate the data, store it, and pass it back

to its originating machine, in its modified form if necessary. This raises several management issues (particularly security), which will need to be taken into account in the development of CDA applications. Digital has already developed some CDA products including DECwindows, DECmail, DECwrite, DECchart, DECdecision, and DECpaint. All future office system products from Digital will support CDA.

Digital is aware, however, of the need to involve its third-party software developers in the CDA initiative, and has made public the CDA specification. Several vendors are now developing convertors to allow their products to support CDA. This raises some support issues, which were debated during the presentation. Ultimately, Digital may need to guarantee higher levels of support for third-party software than it has done in the past. This area seems to be somewhat undefined at the moment, however.

In summary, the CDA approach appears to offer the opportunity to integrate data from multiple operating systems and environments into single documents. Furthermore, being based on evolving industry standards, it is likely that office system products, not only from Digital's software developers, but also software developed for other vendors' equipment, will conform with CDA.



Tuesday 15 May

Banyan Systems Inc

Founded in 1983, Banyan claimed to be the only major supplier focused solely on networking, and to be the industry leader in corporate-wide PC networking. Since the initial venture-capital funding in 1983, Banyan has received five additional injections of capital and its revenue had grown to \$80 million by 1989 on which it made an operating profit of \$7 million. International revenues account for 18 per cent of this total. Banyan has a wholly owned UK subsidiary, and agents in another 14 European countries and around the world. The number of employees will reach nearly 600 by the end of 1990. Of these, some 30 per cent are in sales and marketing and 37 per cent are in product development, increasingly in software and hardware.

The product and the market

Banyan's product is called Vines (Virtual NEtwork System). This is a distributed network operating system that can join together other local area and wide-area networks to make a PC network look like a single computer. It runs within the client/server architectural model, which the company sees as the style of computing for the 1990s and beyond.

In this model, data centres will, in effect, become distributed, so that many servers can be interconnected on a global basis. Applications can be geographically distributed and processing will be decentralised, but under centralised control.

Vines supports this concept and aims to provide users with access (through the network), to the total computing environment, and to support the growing population of geographically dispersed and diverse desktop computers. The largest network currently installed (for Compaq) supports 9,500 users and the customer base

spans industry, commerce, and educational users. (Compaq, according to Banyan, manages the whole corporation exclusively with PCs.)

Banyan sees corporate PC-networking as the major network growth area (see Figure 1), with corporate-wide PC networks interlinking to existing mainframe and minicomputer environments. The company perceives IBM and Digital to be its major competitors but believes it is better positioned to service the evolution of the distributed-applications environment (see Figure 2, overleaf).

Vines creates a transparent environment across many servers and makes multiple network operating systems appear as a single system. Banyan claims that Vines is easy to install and operate, is based on an open architecture, and is being developed within industry standards which will allow applications portability and network interoperability (Figure 3, also overleaf, shows the standards covered by the software). It is also designed to allow network growth: users, servers, networks, and

Figure 1 Banyan sees PC-networking as the major network growth area

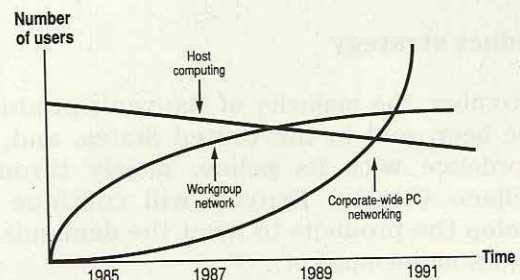


Figure 2 Banyan believes that it is better positioned than its competitors to service the evolution of the distributed-applications environment

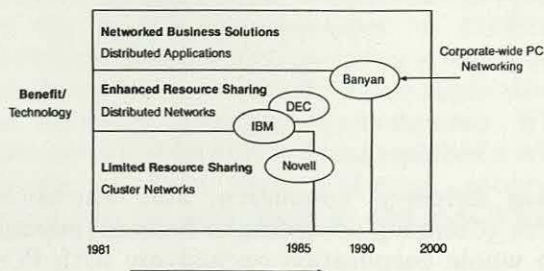


Figure 3 Vines is being developed within industry standards

- Application Programmatic Interfaces - DOS Macintosh OS/2 POSIX Named Pipes NetBIOS Mailslots
- Application Protocols - X.400 X.500 SMB NFS AFP
- Communications Protocols - OSI TCP/IP SNA X.25 AppleTalk DecNet
POSIX Server Base

applications can all be easily added. The software includes network-management tools, integrated security features, and directory facilities. It is resident both at the desktop and in the servers. Banyan makes its own server hardware, but the software can be loaded into a range of other server devices.

Product strategy

Up to now, the majority of Banyan's products have been sold in the United States, and, in accordance with its policy, mostly through resellers. Clearly, Banyan will continue to develop the products to meet the demands of this, its major market.

The proportion of international business has grown but still represents less than 20 per cent

of revenues, with much of this being follow-on sales to the overseas operations of existing US customers. By 1993, the company expects that the percentage of international business will have risen to 28 per cent.

Banyan sees the continuing of growth of the PC market in Europe and the rest of the world as offering high potential for the development of its product on a global basis. Multilingual capability is seen as an important factor in this, and versions in French and German are already available. Five more languages will be implemented in 1990.

Banyan's international goals may be summarised as follows:

- Establish Vines as a global networking solution.
- Make use of the expertise gained in the United States by moving into the international networking marketplace.
- Support and expand the multinational customer base.
- Rationalise the distribution channel (agents) internationally and ensure that pricing and discounting is consistent across the world.
- Establish international support organisations in London for Europe, and in Westborough, Massachusetts for the rest of the world. The prime support for international users will come from the reselling agents in the different companies who will be trained by Banyan.

Banyan is committed to selling only through agents, and these resellers must be committed to Vines as their major product. There will be only one distributor per country and, in the major markets, the minimum contract with those distributors will be three years. Distributors must demonstrate networking expertise and be able to offer other systems-integration services. They must also be able to demonstrate their capability to train and support customers in the country in which they operate.

Summary and conclusion

Banyan has clearly identified a major market opportunity and has pursued it with vigour and skill. The company has evolved steadily over its

six-year life and its list of customers is impressive. Based on a continuing investment programme, its financial position appears very sound.

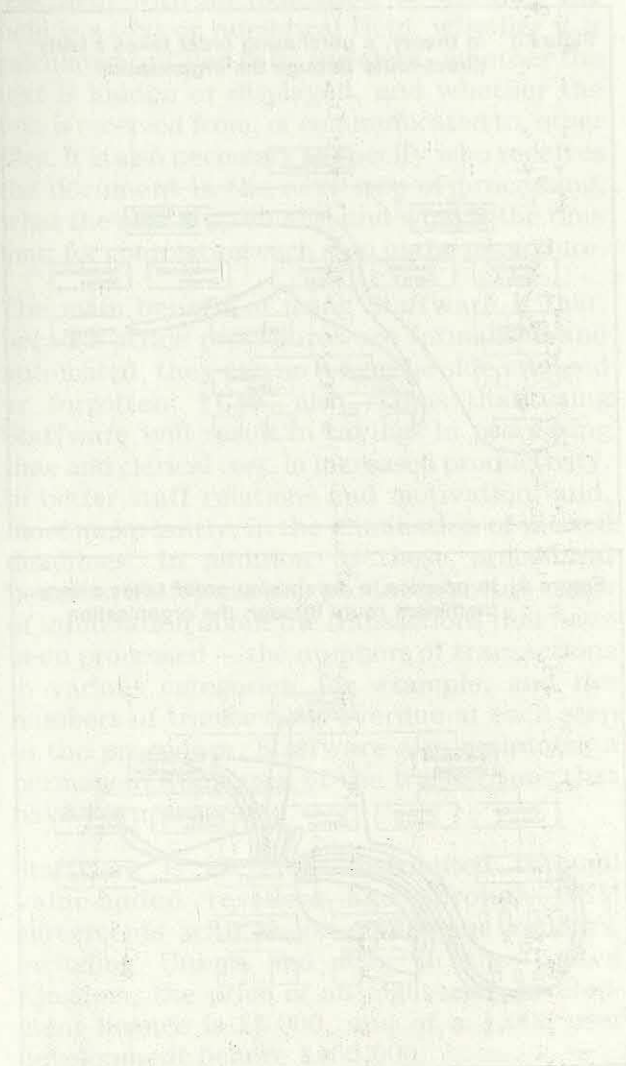
The Vines product is sharply focused at the distributed-computing network environment which most large organisations are developing. It offers users an excellent opportunity to rationalise and simplify some of the complex network-management issues that accompany a multivendor system.

Banyan forecasts a growth of 25 per cent in revenues for 1989/90 as against 70 per cent in

1988/89 and 100 per cent in 1987/88. The reason for this slowdown was attributed to its intention to re-align its marketing to a more international approach through resellers, rather than concentrating on local US sales.

Banyan's continuing growth will depend on how well its international approach succeeds. As a one-product organisation in an increasingly important segment of the market, it is obviously vulnerable to a merger or acquisition.

In summary, Banyan is an impressive company. Users should consider the Vines product carefully as PC networks are installed across their corporations.



Wednesday 16 May

FCMC

FCMC is a British company, established in 1980 with its headquarters in London, a development centre in Swindon, England, and a branch office in Boston. It employs 35 staff and has two main products, Finar, which is an accounting and modelling product for group financial accounts, and Staffware. The presentations were given by John O'Connell, FCMC's chief executive, Cindy Wild, marketing manager, and Don Moss, programme general manager, office systems at Unisys Corporation.

The staffware product

Staffware is a development tool for office procedures. The concept developed from the idea of applying PERT techniques to office work. Staffware is designed to automate not only individual office tasks, but also the procedures that link these tasks, and to control the flow of documents through the office. The product is aimed at office managers and analysts with some knowledge of information technology, rather than at technical development staff. It is designed to be simple to use, and is written in the C language to run on a Unix processor.

It can be used at two levels, either just to control the procedures that link office tasks, but not to automate the tasks themselves, or to control both the procedures and the tasks. Staffware can therefore be used to enable a group of office staff to achieve a common work objective, even though the individuals may be separated by time and geography. In this sense, Staffware can be considered an example of groupware.

Staffware is designed to solve the common problems of office procedures — the procedural rules are frequently broken, processing deadlines are missed, the procedures are expensive to control, and as a result, office staff are confused and demotivated. Figure 1 shows the

theoretical path taken by a purchasing order in one company. Figure 2 shows the actual path taken by one purchasing order. Staffware is designed to eliminate much of this inefficiency. The software effectively allows passive, optional, clerical procedures to be converted into active, mandatory, automated procedures.

Figure 1 In theory, a purchasing order takes a fairly direct route through the organisation

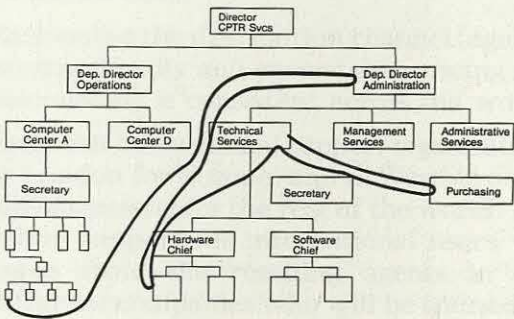
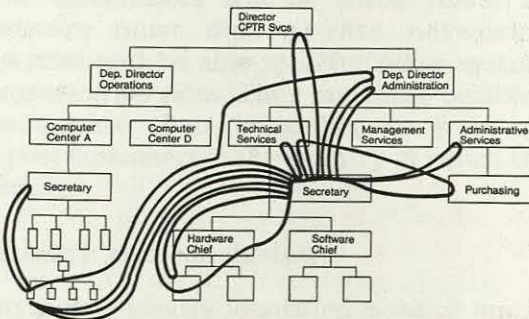


Figure 2 In practice, a purchasing order takes a very inefficient route through the organisation



Staffware combines the features of text processing, electronic mail, database management, and conditional logic into a single office systems tool. To some extent, the Staffware procedure can be integrated with existing automated tasks running on other systems, and the Staffware work-menu can be integrated with other program menus. Staffware also contains 'process invocation', by which information retrieval from existing databases can be initiated, or tasks initiated in other systems. It is also possible to attach a scanned copy of an external document to a Staffware procedure.

A Staffware application is developed by defining a series of 'directives', which are documents, each of which has a function within the procedure. There is a set of steps that must be followed to define each 'directive'. For example, each field on the document must be specified, with an indication of whether the field is a text or numerical field, whether it is calculated or filled in by the clerk, whether the text is hidden or displayed, and whether the text is received from, or communicated to, other files. It is also necessary to specify who receives the document in the next step of processing, what the next step entails, and what is the time limit for completing each step in the procedure.

The main benefit of using Staffware is that, because office procedures are formalised and automated, they can no longer be side-stepped or forgotten. FCMC also claims that using Staffware will result in savings in processing time and clerical cost, in increased productivity, in better staff relations and motivation, and, most importantly, in the elimination of missed deadlines. In addition to these procedural benefits, Staffware also produces a wide range of information about the transactions that have been processed — the numbers of transactions in various categories, for example, and the numbers of transactions overdue at each step in the procedure. Staffware also maintains a permanent audit trail of the transactions that have been processed.

Staffware is currently distributed through value-added resellers and through OEM agreements with major equipment vendors, including Unisys and ICL. In the United Kingdom, the price of an eight-user development licence is £5,000, and of a 1,000 user development licence £100,000.

Unisys's OFIS product

Don Moss described the reasons why Unisys took on Staffware as an OEM product. He said that Unisys needed a product that would manage the what, when, and where of information flows in offices. The company was particularly looking for a flexible product that could respond to rapid changes in office organisation and office procedures, because it had identified these characteristics as becoming increasingly important in offices in the future. Unisys identified Staffware in 1985 and, after some customisation, released it as OFIS in 1986.

Future developments

John O'Connell concluded by describing some likely future developments. He said that, originally, FCMC saw Staffware as a development tool for departmental office systems, which is why it was implemented to run in a Unix environment. FCMC now sees an opportunity for using Staffware to manage office procedures across networks of distributed computers within an open systems architecture, perhaps going as far as links between different organisations via electronic mail and EDI. It expects to release a version in early 1991, designed for a client/server architecture, and including support for PCs, dumb terminals, and user interfaces such as Presentation Manager, Motif, and Microsoft's Windows. In the future, FCMC may also provide support for integrated standard databases and even proprietary environments such as IBM and Digital. He said that Staffware would be translated to provide support for foreign languages including, French, German, Dutch, Spanish, Swedish, Portuguese, and Italian.

Staffware would be a very useful tool for organisations with a lot of routine office procedures, especially those whose main computing systems were based on Unix. This would make the product particularly attractive to public-sector organisations such as central and local government departments. Indeed, many of FCMC's existing customers come from this sector. Staffware would probably be less useful in commercial organisations with existing applications running on proprietary systems. Furthermore, the extent to which Staffware could link a series of existing highly automated tasks into a procedure, was not at all clear.

Wednesday 16 May

Kurzweil Applied Intelligence

Speech-recognition technology has been the subject of extensive research for at least two decades. A wide variety of low-cost plug-in boards is available, and these have been successfully applied in environments where keyboards would be inconvenient — such as mail-room parcel sorting. Almost all such systems, however, are characterised by a very limited vocabulary (typically 10 to 100 words), and often need to be trained to recognise individual speakers.

Kurzweil Applied Intelligence has developed a technology that is capable of recognising very large vocabularies — in excess of 10,000 words — and is speaker-independent. The technology has been incorporated into a series of vertical market applications, initially all in the medical field, that offer very real benefits to the users. Figure 1 shows the structure of an application. The four existing application products are:

- VoiceRAD — for producing radiology reports.
- VoiceEM — for reports on emergency admissions.
- VoicePATH — for pathology reports.
- VoiceReport — a general-purpose report generation development kit.

Each of these applications is essentially a dictation system — the user is able to dictate a report and initiate its printing entirely through voice commands. The accuracy of the speech recognition is high, and the systems are well able to cope with the levels of background noise found in medical environments.

The most striking feature of the applications is the use of 'trigger words' that are used to recall whole standard sentences or paragraphs ('leveraged dictation'). These 'boilerplate' paragraphs will often contain several options, and the user merely has to select the options orally as they are presented. For example, the trigger phrase 'abdominal pain' recalls the standard sentence:

'ABDOMINAL PAIN: Patient complains of [severity] pain in [position] abdomen'.

Speaking just two more words — 'moderate' and 'right' — completes the comment:

'ABDOMINAL PAIN: Patient complains of moderate pain in right abdomen'.

An example from VoiceRAD is shown in Figure 2.

It is this feature that overcomes the limitation of the need for 'discrete speech'. In discrete speech, each — word — must — be — stated — with — a — pause — in between. In normal talking or dictation, there are no such pauses.

Figure 1 Kurzweil's system combines large-vocabulary voice recognition with domain-specific knowledge

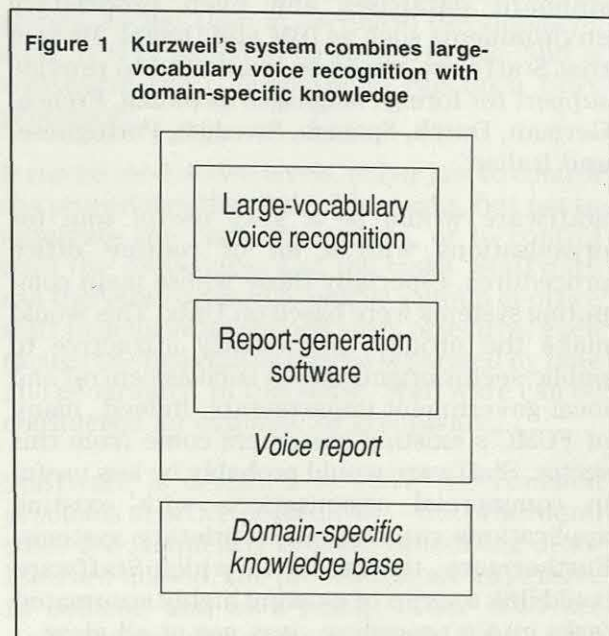


Figure 2 A complete radiology report can be dictated using just 13 keywords

Say	Display
'Today'	1/11/1987 Mammography (bilateral)
'Mammography'	
'Bilateral'	
'Routine'	A low dose film technique was used. Cephalocaudad and modified lateral views were obtained.
'Diffuse nodularity'	Both breasts show a very prominent dual pattern with diffuse nodularity throughout. Such diffuse nodularity makes the breasts difficult to evaluate.
'No focal lesions'	There are no dominant masses or clustered calcifications on either side.
'Obtain outside study'	The patient gives a history of previous mammography elsewhere. If these could be obtained for comparison it would be helpful to exclude any interval change.
'Signature'	John H Jones MD 9:18:32 2/11/1987

Continuous speech is many orders of magnitude harder to decipher than discrete speech because the syllables can be broken up into words in many different ways.

Although there have been research demonstrations of continuous-speech recognition, they currently work only with an extremely limited vocabulary, require supercomputer power, and do not function in real time. Kurzweil is itself working on continuous-speech recognition, but estimates that it will be three to five years before it is available in product form. Continuous-speech recognition requires the development of appropriate software algorithms, and the availability of massive and cheap processing power. Kurzweil believes that by the time the former have been developed, the latter will be available.

Kurzweil had a general-purpose large vocabulary dictation system available in 1987. However, trials showed that the requirement to use discrete speech was too restrictive. The concept of leveraged dictation overcomes this drawback. Users are able to dictate a typical medical report in less time than they could speak the final text in full, and there are also other benefits:

- Legible, printed reports: in many hospitals, handwritten reports are used, and these are frequently almost illegible.
- Instant turnaround: some hospitals use centralised dictation systems, but the turnaround is typically 36 to 72 hours.

- Around-the-clock service.
- Reduced costs of transcription: one hospital claimed that the payback period was less than 12 months.
- Responsive service: the system prompts doctors to record information that is sometimes overlooked.
- Improved risk management: although the legality of the generated reports has not been tested in court, insurance companies are sufficiently impressed by the quality-assurance benefits to offer a 20 per cent reduction in premiums to users.

A complete system costs in the region of \$30,000. This comprises a PC-AT computer with 100 megabyte hard disc, printer, software, and speech board. The board contains 10 megabytes of RAM, which is sufficient to hold a vocabulary of around 10,000 words (more can be added).

The system is delivered pretrained. At the start of each session, the background noise is sampled for a few seconds, and the user is asked to count aloud from one to ten. Although it is speaker-independent, the recognition system is adaptive and therefore improves with use. Each user can store his or her adapted speech parameters on disc at the end of a session — and this is the prime reason for such a large hard disc capacity.

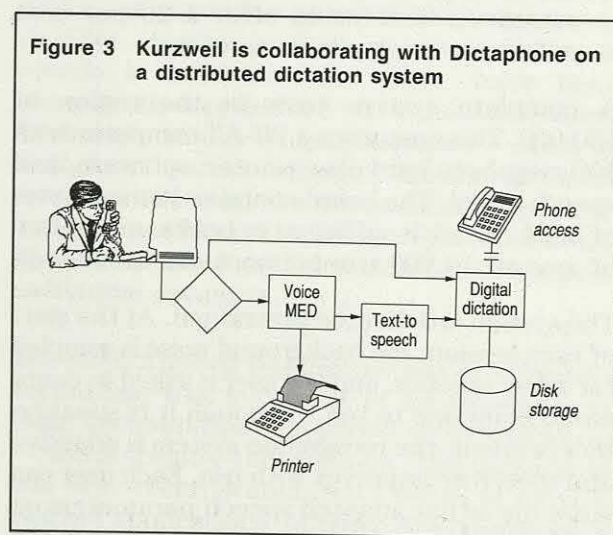
In addition to the trigger-phrase and option-select modes, the user can insert free-form dictation, teaching the system new words if needed.

During the presentation, delegates were invited to use the system. Considering the very wide range of accents, and the background noise of comments and questions, the performance was very impressive, a high proportion of the errors coming from a lack of familiarity with the application, rather than the word recognition itself. Several delegates could envisage broadly equivalent applications within their own organisations, ranging from insurance claims, to financial services, to railway timetable enquiries.

In response to questions, Bernie Bradstreet, President of Kurzweil Applied Intelligence, stated that the system works well over a PABX network, but that long-distance telephone lines degraded the accuracy considerably. The

problem was, surprisingly, the noise levels rather than the restricted bandwidth.

The system does not have a multi-user facility at present, although this is under development. Kurzweil does have an agreement with Dictaphone to develop a distributed dictation system with computerised transcription. Such a system would also incorporate text-to-speech synthesis to allow remote proof reading (see Figure 3).



The leveraged dictation concept had originally been conceived to overcome the limitations of the discrete speech requirement, but had become one of the major attractions of the product. Asked if speech recognition was really needed (why not use a light pen or touch screen?), Bernie Bradstreet replied that the medical applications allowed hundreds of options at each point in the dictation process. With other technologies, options would have to be nested, perhaps 20 deep, into menus.

Kurzweil Applied Intelligence was formed in 1982, and delivered its first speech-recognition tools in 1985. VoiceRAD, the first of the vertical applications was available in 1987. Approximately 300 systems have been sold to date. The company was founded by Ray Kurzweil, the pioneer of optical character recognition and reading systems for the blind. Kurzweil Applied Intelligence operates independently of the other companies, which include Kurzweil Music Systems.

Delegates were impressed by the demonstrations, and felt that the company was selling applications rather than a technology. It was agreed that the technology has now genuinely reached a stage where further applications are limited mostly by imagination.

Thursday 17 May

Butler Raila and Company

Butler Raila is a pioneer in the multimedia marketplace, providing interactive computer systems that use a combination of text, graphics, animation, sound, and video. While Butler Raila is a small company, it has developed a unique set of skills that it intends to use to attain a strong position in the electronic publishing marketplace. However, the technology can be used in a wide range of application areas, and the majority of the presentation was based on examples of interactive multimedia systems used in the training and sales and marketing areas. The technology can also be applied in public relations and public awareness, and increasingly for point-of-sale and in point-of-purchase applications.

The following applications were demonstrated, each developed by Butler Raila under contract to a client:

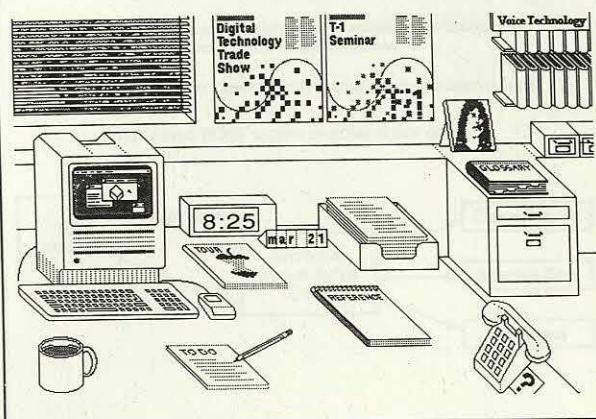
- *The basics of digital voice technology.* The first example was of a system adapted by Apple Computer and the Codex Corporation to train sales staff in new lines of products. Learning was facilitated by a 'business simulation' that entailed exploratory and decision-making work. The multimedia approach caught the awareness and attention of the trainee to the extent that learning happened almost incidentally, and had the additional benefit that immediate feedback was provided to the trainee. (This application was described in Report 73, *Emerging Technologies.*)

Figure 1 shows a screen from the application. The user plays out the role of a telecommunications manager, responding to requests arriving in the in-tray from colleagues. He can look up new terminology by pointing to the A-Z index box, visit a trade show by pointing at the poster on the wall, and take a break by pointing at the coffee cup!

- *Smart Move.* The second example demonstrated by Butler Raila was a trade show application for the New England Telephone Company. Here, multimedia is used as a way of attracting people to the company's stand and as a way of keeping people's attention for long enough to enable a salesman to approach them. The application involves an animated game called *Smart Move*, which takes delegates through a fun game but at the same time exposes them to New England Telephone's products and services. One of the key design features of this system was its flexibility — thus allowing new products to be included very simply.

Other multimedia applications were described during the presentation but all were built on the same basic technology, which included analogue videodiscs, PCs equipped with video cards for switching and overlaying a video display, and infra-red touch screens. The principal software tools were the C programming language, for development of ad hoc routines, and HyperCard. Butler Raila has developed a niche

Figure 1 The multimedia approach of digital voice technology captures the attention of the trainee



market for integrating equipment that is available off the shelf from a variety of vendors. The company offers two skills: the technical ability to interconnect various hardware equipment, and design, production, and implementation skills for multimedia applications.

As yet, no significant standards or conventions are available in the multimedia marketplace to help in the development of systems, and no support tools for hypermedia authors have yet become established. In this sense, the development of multimedia systems is still at the crafting stage. This may change in the future and Butler Raila indicated that several major vendors are poised to establish a full range of components for the development of multimedia systems. In particular, Sony and Commodore are moving towards this situation, although it is unlikely that any vendor would make a major commitment until digital video standards have become established.

Developing multimedia systems

Butler Raila explained that a multimedia development team must include the following roles:

- Interactive designer.
- Subject-matter expert.
- Media producer/creative director.
- Software development (programming).
- Project management.

It was pointed out that this team structure is different from that currently employed in most software development. The project manager

must bridge the communications gap between the different disciplines.

It is very important to involve the users throughout the development. In this sense, two types of users exist. The first is the client, who may have particular views, opinions, and objectives for the multimedia application. The second, and more important, type of user is the eventual interactive user of the system. Butler Raila's approach to establishing the needs of the latter group is to run a series of focus groups during the design stage of the project.

Opportunities for using multimedia systems

As well as the uses described above, Butler Raila sees multimedia technology being included in desktop systems, where it will be used for both learning and reference, and where it will also be integrated with existing applications. New skills will be required within the systems area to take advantage of this technology — both technical skills and, more importantly, the creative skills needed to exploit the multimedia concept and achieve a high degree of user acceptance through a process of interaction.

The cost of the technology is falling rapidly. Currently, it is possible to construct a basic hardware configuration of personal computer, videodisc, video/graphics overlay board, and digital audio equipment for \$13,000 to \$17,000. As standards become more established and as the larger vendors move into the multimedia marketplace, and as fully integrated hardware becomes available, the price can be expected to fall still further.

Thursday 17 May

Symbolics Inc

Symbolics' aim is to deliver applications support and implementation for business organisations in the area of advanced information technology — specifically, planning and scheduling, online documentation, visualisation graphics, and programme productivity. The technologies that support the deliverables are object-oriented programming and databases, program-code generators, knowledge-based expert systems (hardware and shells), and graphic presentation techniques.

The company was incorporated in 1980 as an offshoot of MIT's Artificial Intelligence Laboratory. However, Symbolics is wary of the term 'AI' and prefers to describe its service as 'providing solutions to very hard problems'. The company employs 450 professionals and has a strong presence in Germany and the United Kingdom. Originally, Symbolics was in the business of designing and producing sophisticated AI-workstations and supporting software. Today, its strategy has shifted towards delivering solutions (custom-built applications), aimed at either increasing the profit margins of its customers or reducing their risk of doing business. In all cases, the objectives are specific — to amortise the investment of its clients within two years, and to return a minimum of 300 per cent of the original investment during the product life cycle. The focus is selective, and is aimed at providing solutions at the strategic and tactical levels of clients' businesses — Symbolics does not concentrate on addressing operational issues.

Examples of risk-reduction products are the American Express Authorizers' Assistant (see Figure 1) and the US Sprint Fraud Detector — both of which rely on accumulated knowledge bases of customers' spending or calling patterns. Examples of Symbolics' work in the area of increasing profit margins are the Houston Light

& Power Maintenance Scheduler (Figure 2) and the Setpoint Inc Interactive Plant Scheduler (Figure 3, overleaf).

In providing services to its clients, Symbolics has adopted two distinctive strategies:

- The use of highly sophisticated toolkits — in particular, the use of object-oriented

Figure 1 One of Symbolics' risk-reduction products is the American Express Authorizer's Assistant

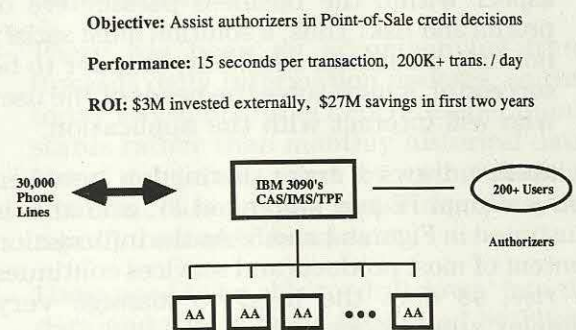


Figure 2 Maintenance Scheduler is designed to help increase profit margins

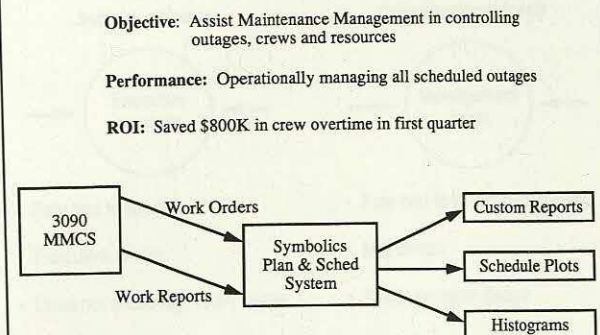
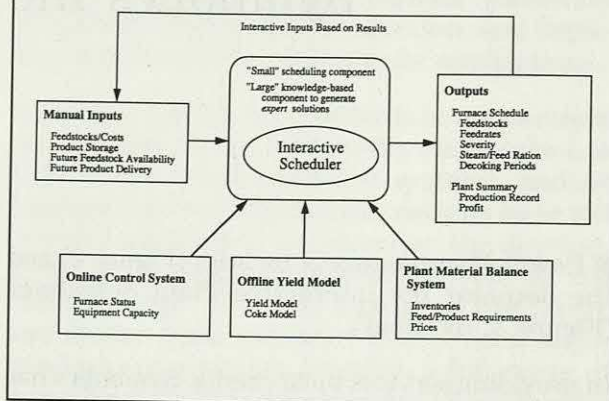


Figure 3 The Interactive Plant Scheduler is also designed to help increase profit margins



programming and database techniques. Object orientation is defined as: "the ability to work with program or data segments as objects and to manage their entities, relationships, and attributes dynamically".

- Concentration on the people (customer) aspect within the business parameters of profits and risk. Thus, a solution must satisfy not only a business need but, in order to be successful, it must solve the needs of the user who will interact with the application.

Symbolics draws a major distinction between conventional IT and advanced IT, and this is illustrated in Figures 4 and 5. As the information content of most products and services continues to rise, so does the need to manage very complex applications.

Figure 4 Advanced information technology has an increasingly important role to play as the information content of most products and services increases

Historically, Information Technology has been concerned with the storage/retrieval of data.

Now, AIT must:

- *Extract data*
at the right time,
at the right level,
under the right circumstances,
- *Merge data*
correctly with other data sources,
- *Process data*
while considering both tactical data and strategic information.

Figure 5 Advanced information technology helps to meet the need for a greater information content in products and services

To help fill Information Content needs by:

- Applying knowledge to information, not algorithms to data
- Developing "Expert Assistants"
- Supporting the knowledge worker

Thursday 17 May

Pilot System Inc

Pilot Systems was established in 1983 with venture-capital backing. The president and chief executive is David Friend, who developed a screen-based graphical system to support the operation of his former business in music synthesisers. It was this system that formed the basis of the Pilot executive information system that is now used in more than 200 organisations across the world.

The product has been steadily developed since its inception, and Pilot claims to be the industry leader. The current implementation uses a client/server approach, with functionality being shared between a mainframe and a PC on the desktop. The way the functions are shared is shown in Figure 1.

Several significant changes have taken place since the product was first designed, and many of these have become critical success factors for executive information systems:

- Extreme ease of use is a vital factor. Users of this type of system require minimal

learning time and need help features built into the system.

- Early systems were focused on individuals; current implementations have a wider organisational focus. There are important differences between these two approaches, as shown in Figure 2.
- The trend is for executive information systems (now more accurately described as CINs — corporate information networks) to become larger and more widespread through the organisation.
- There has been an accompanying trend towards daily information updates, so that today's systems reflect current operational status rather than monthly historical data. Many companies start by using monthly financial data as their major input but this rapidly becomes redundant.
- Users need to be able to 'drill down' into the data and this is being facilitated by Pilot's ability to interface, via SQL, with proprietary

Figure 1 Pilot distributes functions between the (host) mainframe and desktop PC

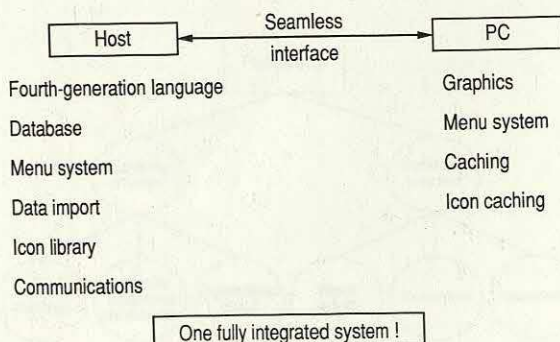
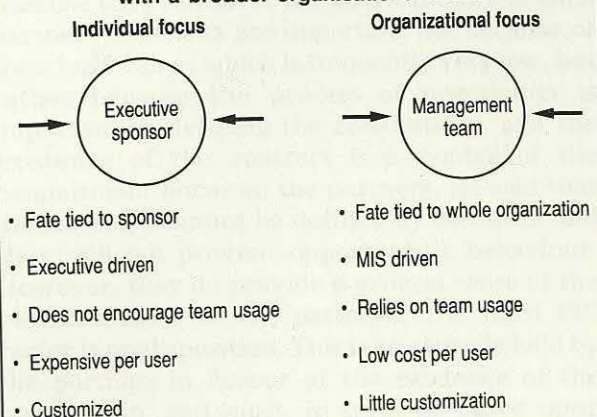


Figure 2 There are significant distinctions between systems focused on individuals and those with a broader organisational focus



database systems such as Oracle or DB2, as well as referencing its own internal database.

- There is an increasing demand for off-the-shelf applications, and for code generators. Technology growth has supported the development of these features.

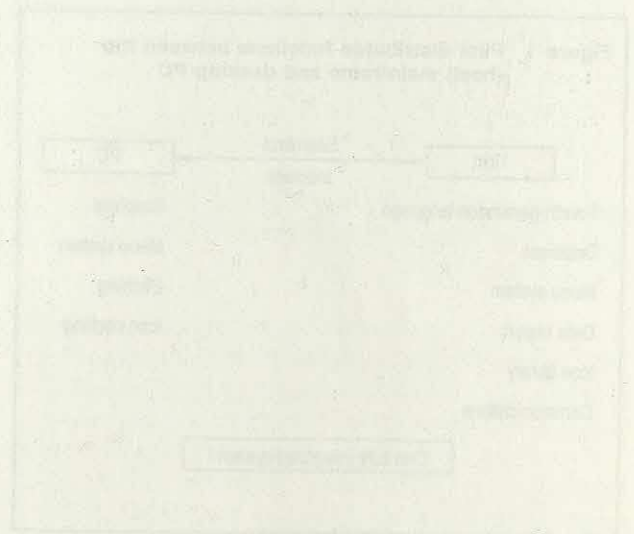
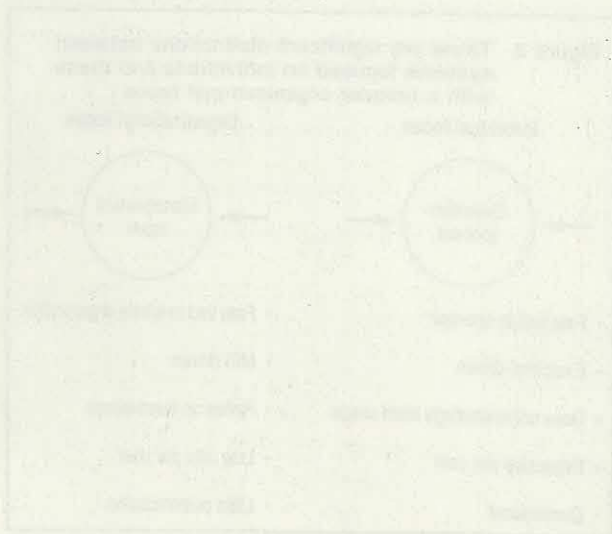
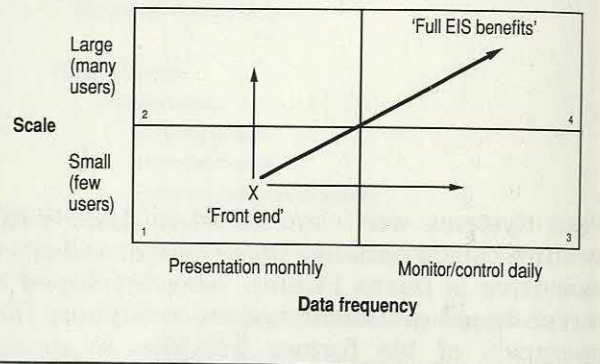
In short, executive information systems achieve greater benefits as the number of users and the immediacy of the data increase (see Figure 3).

Future development will conform to popular standards, including SAA, NAS, Unix V, and Macintosh. An X-Windows-based application was demonstrated.

When implementing an executive information system, users should take note of the following:

- Prepare for growth in scale, in the form of an ever-widening user base.
- Prepare for near realtime access as systems support more operational needs.
- Prepare to provide access to larger and more wide-ranging databases including both internal and external ones.
- Be sure that the system will work and can be supported when it is 10 times larger than today.

Figure 3 Executive information systems achieve greater benefits as the number of users and the immediacy of the data increase



Friday 18 May

Sloan School of Management

Presentations at the Sloan School of Management were given by John Henderson, associate professor of management science and Dr Diane Wilson, principal research associate.

Building a relationship between line and systems managers

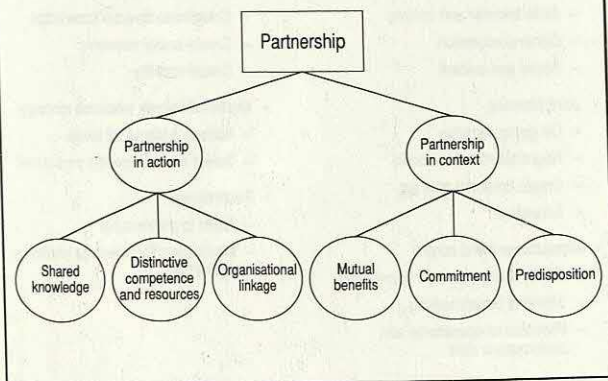
John Henderson described the research he has carried out on building and sustaining a partnership between line managers and information systems managers. The objective of the research was to identify the factors that influence an external partnership between a company and its suppliers or customers, and so build a model that might explain the internal relationship between an information systems department and its users. He said he has identified six factors, which divide into two groups (see Figure 1).

The first group is concerned with partnership in action (PIA), which was defined as the ability of members of the partnership to influence effectively key policies and decisions that affect the performance of the partnership. These factors

create the day-to-day working relationship. The first PIA factor is knowledge and understanding of the partners' organisation and methods of working. One manager described it this way, "If we don't understand how they work, we cannot effectively influence them in areas that are critical". The second PIA factor is distinctive competence and resources, where the skills and resources of the whole partnership are greater than the sum of the individual contributions. The third PIA factor is organisational linkage, of which there are three types: linkage of physical processes, information linkage, and social networks.

The second group of factors can be termed partnership in context (PIC), defined as the degree to which members of the partnership believe that the partnership will be sustained over time. The first PIC factor is mutual benefits, of which the most common are financial benefits, but process or product innovation and the sharing of risk are also mutual benefits. The second PIC factor is commitment. Three major indicators of commitment are shared goals, shared-incentive systems, and contracts. Shared goals provide a common ground upon which to negotiate solutions to conflicts and are particularly critical when members of a partnership include potential competitors. Shared-incentive systems are important because they reinforce the goal structure of each partner. Contracts are important not because of their legal value, which is frequently very low, but rather because the process of negotiation is important in defining the relationship, and the existence of the contract is a symbol of the commitment between the partners. He said that partnerships cannot be defined by contracts and they will not prevent opportunistic behaviour. However, they do provide a general sense of the responsibilities of the partners. The third PIC factor is predisposition. This is an attitude held by the partners in favour of the existence of the partnership, and must, in turn, be based upon

Figure 1 Six factors explain the internal relationship between an information systems department and its users



trust and the existence of positive assumptions. Generally, these are based upon good personal relationships.

He then tested this six-factors model by interviewing executives involved in the partnership between information systems and users. Within the PIA group, mutual knowledge and understanding was consistently highlighted as a key to effective working relationships. Each partner needed to develop an appreciation and deep understanding of the other's environment.

Many examples were provided of the need for each partner to provide distinctive competence and resources. These included technical skills, available staff, and control over physical assets. The most interesting example of mutual dependence was the effective management of data. Several executives had argued that data could not be managed if it was viewed as being owned exclusively by either information systems or users. Rather, both sides brought the critical skills, experience, and physical assets necessary to manage data across the corporation. One executive had said, "We've tried it centralised, and we've tried it decentralised. I believe the only solution is to recognise that both line and IS have unique skills to manage data".

The importance of personal relationships was also highlighted in the discussion of internal partnerships. One IS executive had said, "My measure of partnership is defined as whether or not, when a key decision is made, one of my people is in the room".

Within the PIC group, the mutual benefits were frequently stressed. These tended to fall under the categories of financial benefits, operational efficiencies, and quality of working life. The ability explicitly to articulate the financial contribution made by the systems function to the achievement of business objectives was consistently raised as an important requirement to sustain an effective partnership.

Under the heading of commitment, several executives had pointed to their use of formal service-level contracts. They had described how the nature of a partnership cannot be specified in contractual terms. The commitment reflected by service-level contracts was often symbolic of a deeper working relationship.

An analysis of the actions that have been taken by the executives to build or sustain the partnership is summarised in Figure 2.

Many of the lessons learned from external market partnerships are applicable to internal partnerships. Three kinds of market relationship can be identified, in order of increasing partnership, strength, and commitment. The weakest was a transaction relationship, in which there was no intention to sustain an ongoing relationship. The second type was a value-added service relationship, in which the partners recognised some degree of mutual dependence but fell short of an ongoing sustainable relationship. The strongest form of external relationship was a strategic partnership.

Firms that had analysed their external relationships under these three headings had often been surprised to find that the majority were of the transaction type. It is rarely possible to convert relationships directly from transaction type to strategic type. Instead, it is generally necessary to convert transaction relationships to value-added relationships, as a step towards forming a strategic partnership. No firm can attempt to be a strategic partner with all its suppliers and customers. It must therefore take strategic decisions about the distribution of relationships between the three types.

These lessons are important for any information systems department that is seeking to improve relationships with its users. The systems manager should analyse the relationships between his department and his users under the six categories described earlier and should make

Figure 2 Building and sustaining a partnership requires executives to take actions

- | | |
|---|--|
| • Education | • Effective use of teams |
| – Skills transfer and training | – Coordinate diverse knowledge |
| – General education | – Create social networks |
| – Social and cultural | – Create stability |
| • Joint planning | • Multilevel human resource strategy |
| – On-going, iterative | – Actions address all levels |
| – Negotiate mutual benefits | – Select and assign key personnel |
| – Create common goal set | • Technology |
| – Education | – Asset to partnership |
| • Measurement and control | – Mechanism for interorganisational exchange |
| – Jointly designed and implemented | |
| – Effective benchmarking | |
| – Provision of operational and performance data | |

a strategic decision to treat certain users as transaction customers, certain users as value-added service customers, and a small number of users as strategic partners.

(This presentation is described in detail in a working paper, No 195, dated September 1989, published by the Center for Information Systems Research at the Massachusetts Institute of Technology.)

Chief executives' attitudes to IT

Diane Wilson then described the results of a research study of the attitudes of chief executives and other top managers to information systems and information technology. In-depth interviews had been conducted with 94 senior managers, including 71 chief executives. Although 39 per cent made some personal use of information technology, only one-third of the sample recognised information technology as of strategic importance to their firm. Senior managers tend to show different responses to information technology, depending on whether they perceive it as a threat or an opportunity. The threat of IT tends to produce a centralised response, a search for internal solutions, and a general tendency of those affected to ignore the threat and minimise their involvement. By

contrast, IT perceived as an opportunity tends to lead to the involvement of many parties and a search for external solutions.

Four categories of senior manager were identified from the research — according to their attitude to information technology. The first can be called the 'utopian idealist'. This is a manager who sees nothing but the benefits of information technology, who encourages its use and sees IT as a strategic opportunity. The second type is the 'realistic utopian'. He recognises the potential benefits of IT, but is also realistic about the problems of implementation. The third type may be called the 'realistic sceptic', who is aware of the potential benefits of IT but is basically doubtful about achieving those benefits. Typically, he treats information systems as a cost that needs to be controlled. The fourth type is the 'utopian sceptic', who sees IT as primarily harmful and sees his mission to minimise its use.

Utopian idealists and realistic utopians typically responded to IT as an opportunity in the ways described above, whereas realistic sceptics and utopian sceptics treated IT as a threat and responded accordingly. There is no 'best type' but each type would be appropriate under particular circumstances.

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