A CAHNERS PUBLICATION 112 TOTAL PAGES JULY 15, 1990

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FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

GETTING A GRIP ON COSTS

How IS Managers Are Getting Bigger Bangs For the Buck PAGE 20

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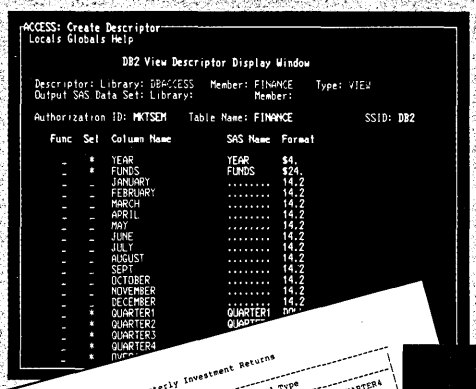

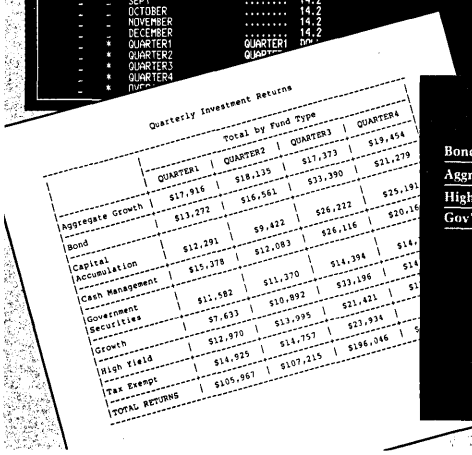

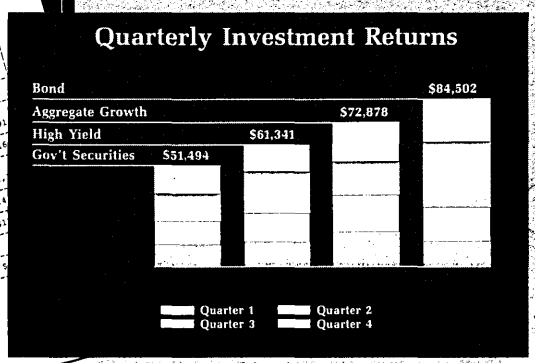

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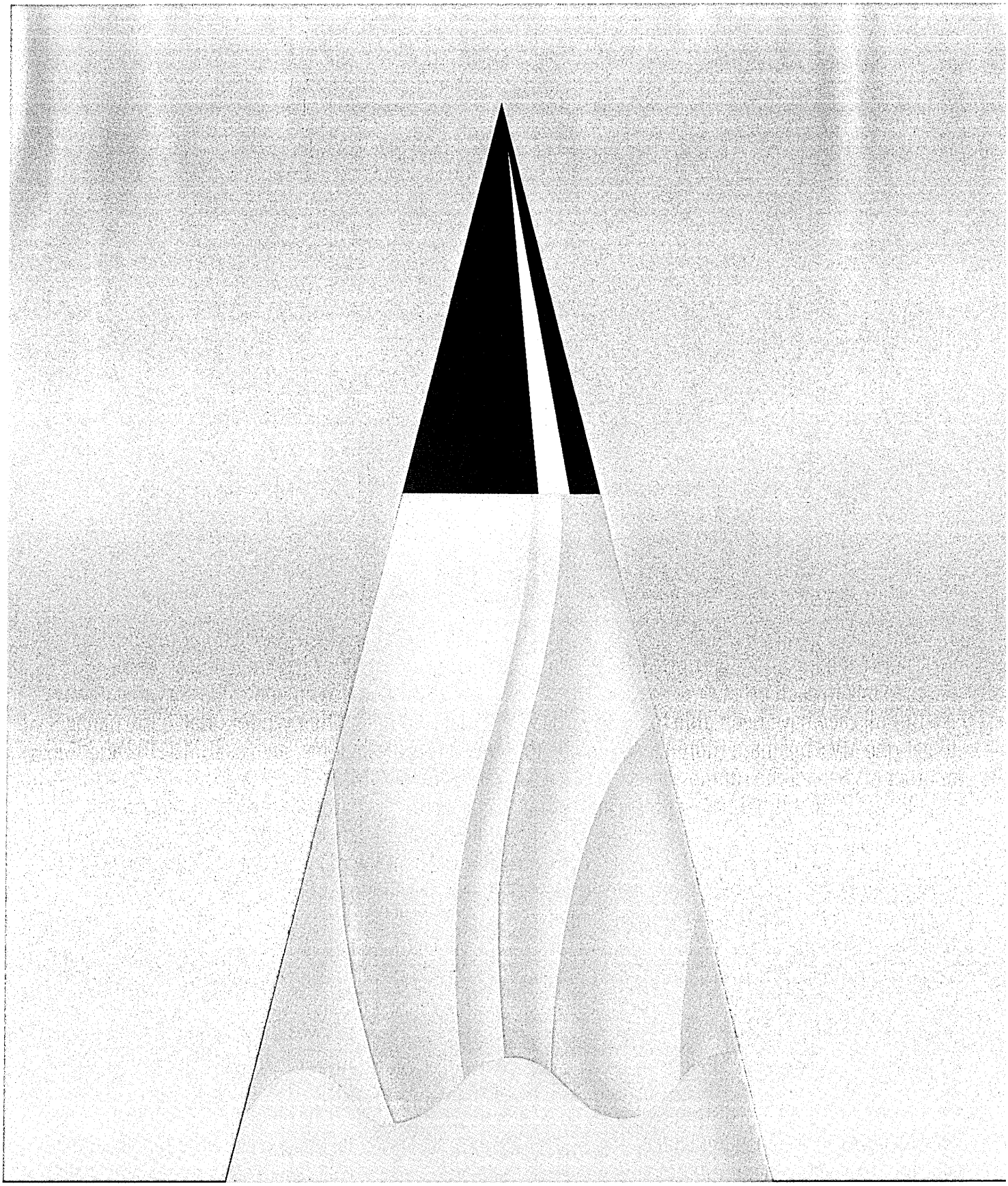

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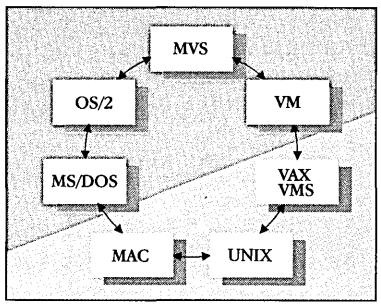

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JULY 15, 1990

VOLUME 36
NUMBER 14

DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

COVER STORY

IS executives look for a careful balance in their evaluation of costs and competitiveness.

Getting a Grip on Costs 20

BY RALPH CARLYLE Is the boss on your back about how much your IS department is spending? Can't figure out a way to cut back any further without hurting operations? Relax! The efficiency experts are on the way.

Cover photography by David Bradley

SOFTWARE

Bristol-Myers' Gilson is having a tough time finding image systems at departmental prices.

IMAGING

The Challenge of Integration 27

BY DAVID STAMPS Image technology keeps getting better, but building image applications remains a considerable challenge. At issue is how to integrate tomorrow's imaging systems with today's business-critical applications.

PROFILE

SAS: Architecting an Open Strategy 35

BY PAUL PINELLA For the past six years, SAS Institute has quietly built a $100 million software architecture, and now it's telling the world. But can the company use its new-found flexibility to keep growing in the brave new world of PCs and workstations?

Proctor & Gamble's Esposito applauds SAS' responsiveness to customer needs.

INSIGHTS ON DISTRIBUTED COMPUTING

The Northwest application represents a much broader use of image. Different databases, different data types, expert systems, a number of different software technologies are all tied together at the workstation level using a client/server, open systems architecture.

Bob Castle
FileNet Corp.
PAGE 27

We are reevaluating the role of our mainframe on the network—the SystemPRO could give our Unisys A5 mainframe a run for its money. We will certainly be moving more of the processing onto our network.

Frank Musick
Franke Contract Group
PAGE 54

We're talking about a fairly large piece of the budget in PCs, because a PC is an integrated component. You have to consider the fully bundled costs involved such as software, support, consulting, the controller port, the LAN administration and the chunk of the mainframe.

Peter Daboul
Mass Mutual
PAGE 69

Making The Same Look Different

Applications built using ORACLE Tools automatically adapt to multiple user interfaces.

Developing a program that runs on the entire spectrum of PCs, Macs, Suns and other workstations is next to impossible. Because each computer has its own graphic user interface (GUI), developers must spend months rewriting each application for each incompatible GUI.

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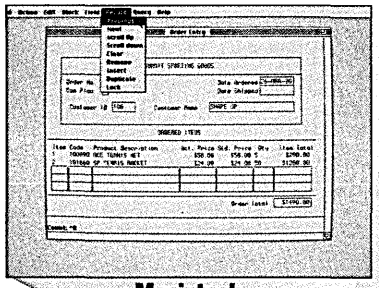
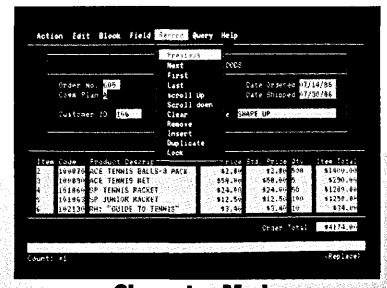
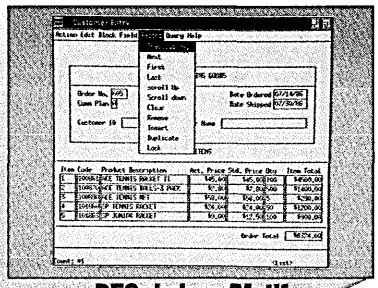


Macintosh

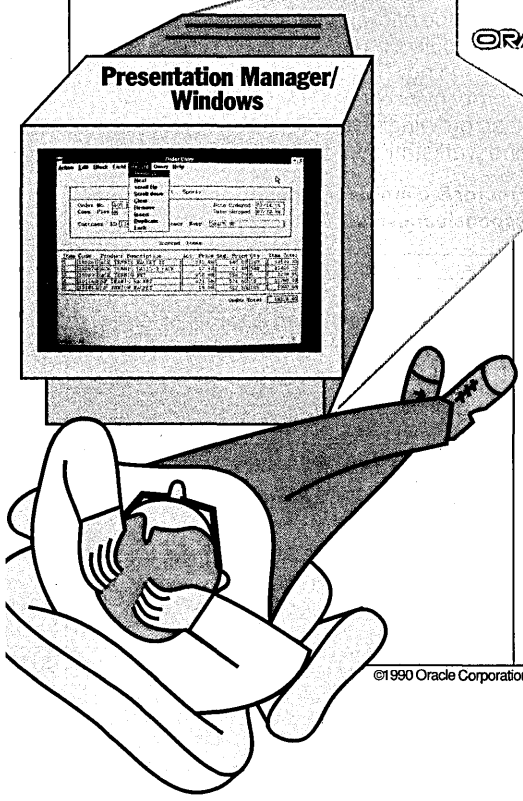


Character Mode



DECwindows/Motif

3270 Block Mode



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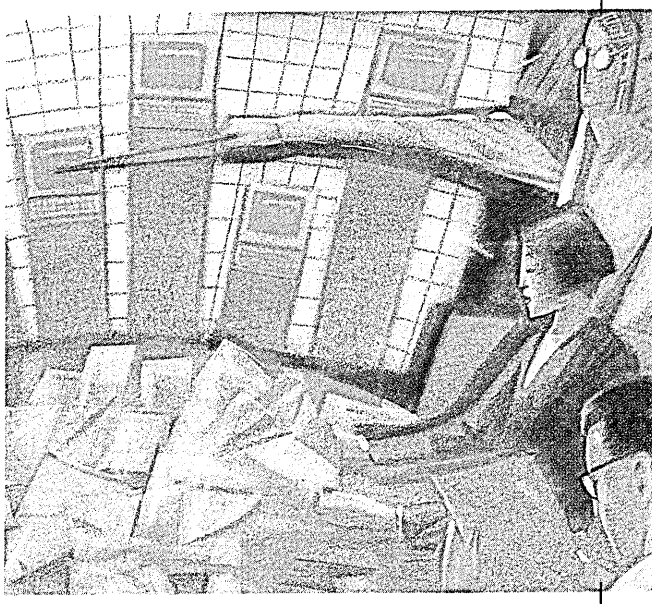

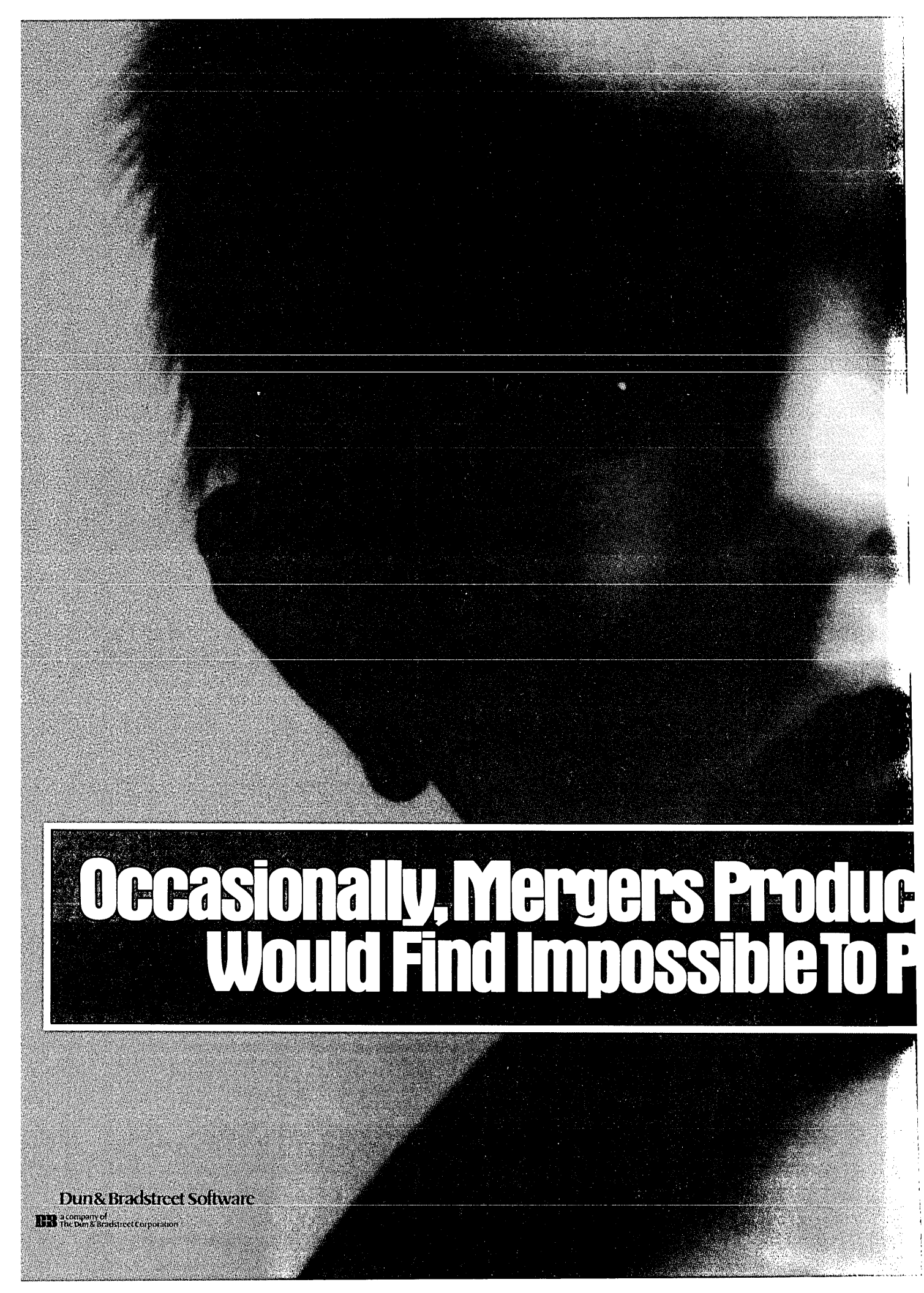

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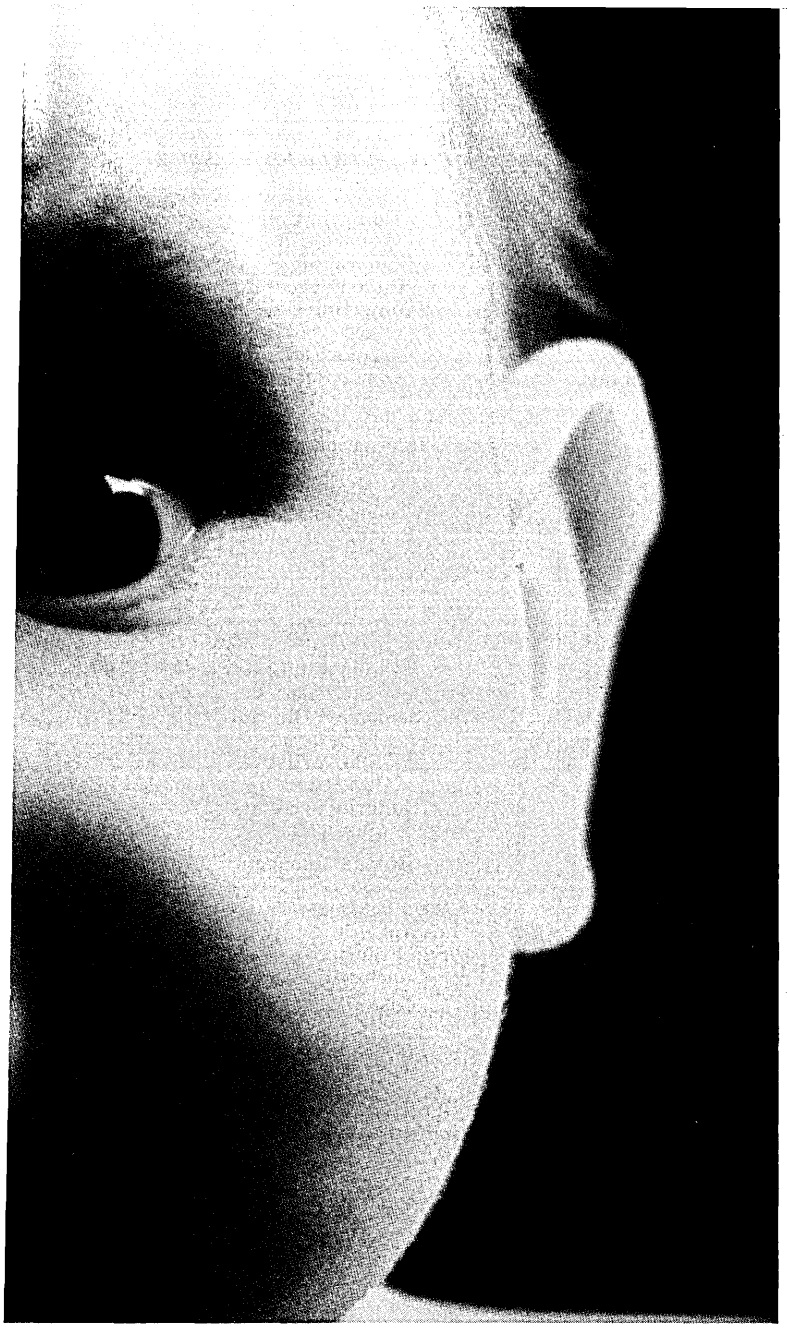

It's not surprising that two can sometimes accomplish things that one never could. What is surprising, however, is just how beneficial the merger of McCormack & Dodge and Management Science America (MSA) promises to be.

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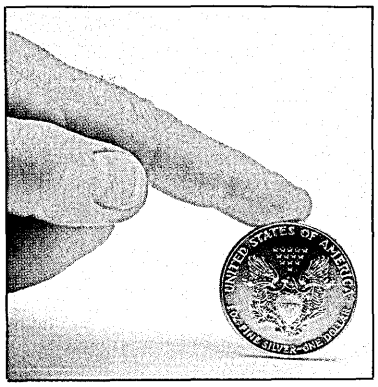
The Real Challenge of Cost

One of the most powerful four-letter words in the lexicon of business is *Cost*—spelled with a capital C. Cost means money, value, goods and services, livelihoods, efficiency or inefficiency, overhead, less is more, individual resentment or opportunity and a host of other things. Cost drives business to succeed or into the ground. It's everywhere, always being accounted for, always in the process of being increased and cut at the same time.

For IS, always looked upon by the executive suite as a center, or as the more cynical might say a black hole, of cost, the issue of what is spent on information systems and personnel and the value derived from these expenditures is of nearly primordial significance. And in the current tough, lean and mean business climate, the significance becomes even greater. The bottom line is not whether to control costs but how and to what extent.



Photograph by David Bradley

BALANCING COSTS in functional areas is a key test for IS managers.

That's why we felt it was time to stop and take a hard look at what IS shops can do to better control their costs. As senior writer Ralph Carlyle explains in our cover story this issue, "Getting a Grip on Costs," page 20, some companies are taking stock of themselves, comparing their IS spending and performance with those of other companies in their industries at home as well as abroad. Some, though, are hesitant, apparently fearful of what they may find. There appear to be a number of reasons why some IS managers aren't eager to sign up for an independent evaluation of their IS costs, and Carlyle uncovers them. "Some CIOs," he writes, "feel their IS organizations will look worse than they actually are, since they will be compared only with leading edge firms."

One way or another, you must get a grip on costs. Either IS will do so itself or some other force will. Be smart and take action before action is taken for you.

Of Network Servers and Database Machines

Another thought to consider is new technology and how it can improve the lot of IS. PCs have been used for simple file and peripherals sharing, but now new systems called network servers are coming to market, and they promise to do much more. For a look-see at what, check out Leila Davis' "The New Generation of Network Servers," page 54, the latest installment of our continuing Systems & Strategies of the '90s series. And for a sneak peak at the latest in database computers, see Tom McCusker's "Teradata Revs Up its Database Machine," page 49.

David R. Brousell, Editor

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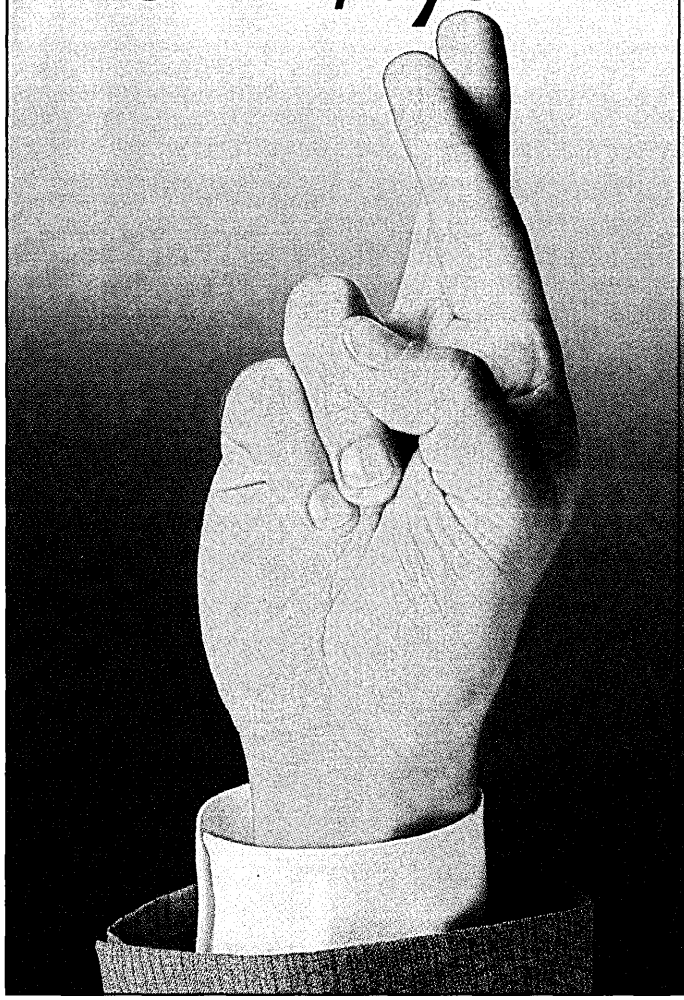

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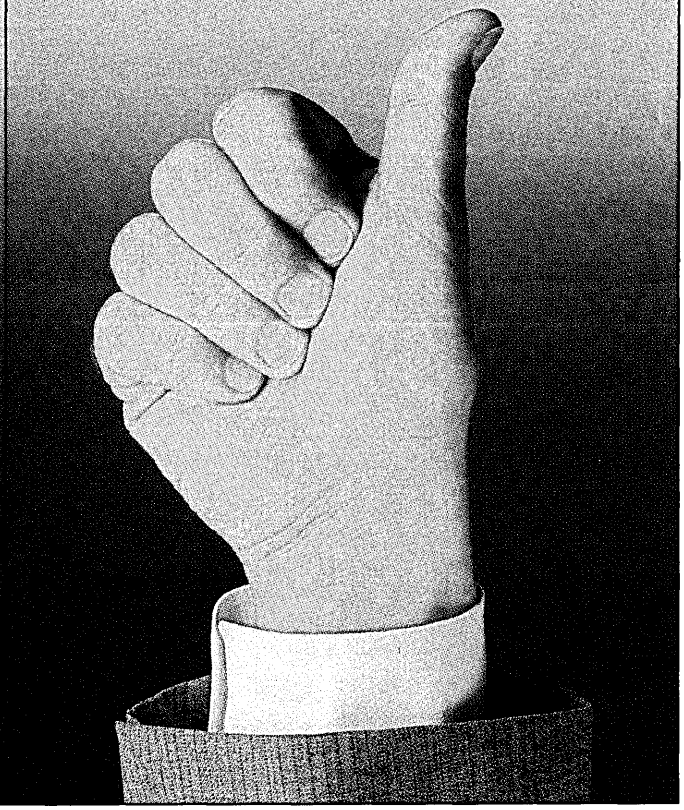

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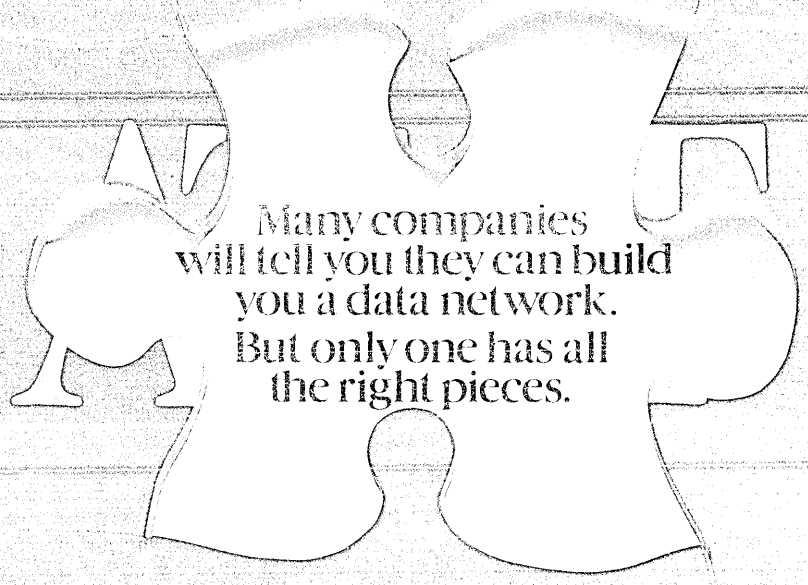

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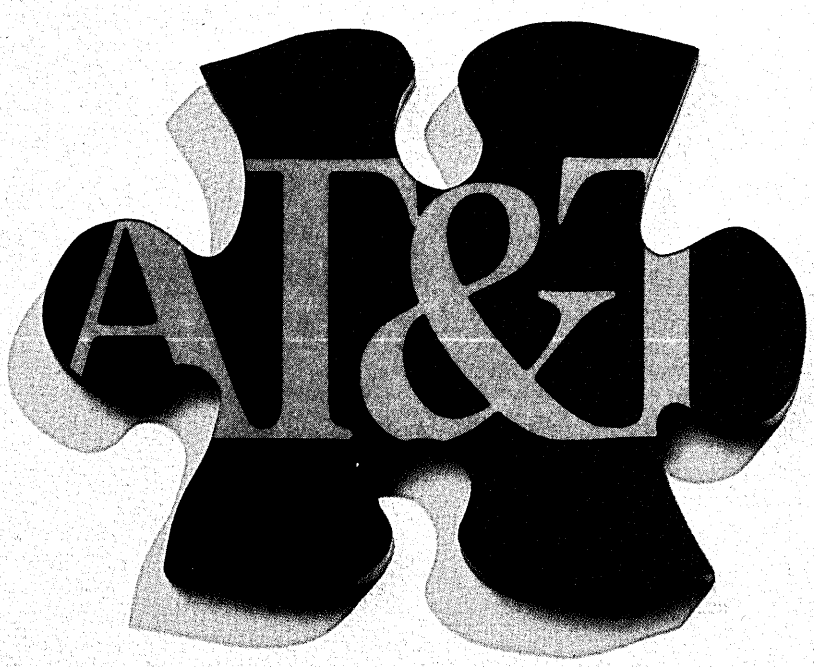

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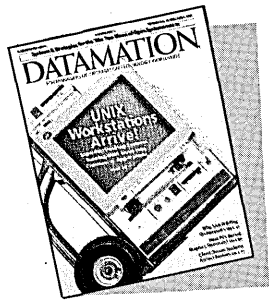

COBOL Bashers

The COBOL bashers strike once again! ["UNIX Workstations Arrive!" June 1, 1990, p.24] To paraphrase George Weiss' comments, "Moving COBOL applications to UNIX is tough." I hope Mr. Weiss realizes that moving COBOL applications to UNIX is no tougher (and probably more cost effective) than moving DOS/VSE COBOL applications to MVS, and infinitely easier than rewriting them in a different language. The biggest challenge the IS director is likely to face in making the UNIX move is deciding what to do with the legion of systems programmers entrenched in the organization.

The world of nonproprietary COBOL has comfortably embraced the UNIX market, from workstations to mainframes, with effective, platform-independent compilers, tools and applications that encourage mixing and matching UNIX platforms. The availability of proven COBOL products for UNIX paves a smooth road that the IS director may walk without crossing the barrier of massive application rewrites to a different language.

Michael Prentice
Vice President
Ryan McFarland Corp.
Austin, Texas

CORRECTIONS

Several points in "Barcelona '92: The Technological Games," in the July 1, 1990 issue, were incorrectly reported. Jose Maria Vila was quoted as saying 300 million people worldwide would view the games. The coordinating committee says that 3 billion people will watch. Electronic Data Systems Corp. is not yet running a prototype of the system for calculating and managing event results.

Along with London's Sema Group PLC, Paris-based TiG is developing the umbrella software for managing all operational aspects of the Summer Games. Software being developed for the Olympic family merely provides information on city resources; it will not manage them. The system being developed by Rank Xerox will provide journalists with hard copies of game results only.

Also, when the story was written, the committee planned to allow various sporting federations in Spain to use some of the software applications after the Games. The committee nows says it will be unable to provide such software.

ACCESS

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SIGGRAPH '90: The 17th Annual ACM Conference on Computer Graphics and Interactive Technique

August 6–10, Dallas. Contact SIGGRAPH '90 Conference Management, 111 East Wacker Drive, Suite 600, Chicago, IL 60601, (312)-644-6610.

Information Security Managers Symposium V

August 13–15 (optional workshop on August 16), Hilton Head, S.C. Contact Pamela Bissett, MIS Training Institute, 498 Concord Street, Framingham, MA 01701, (508)-879-7999.

Fourth Annual Eastern Regional ISSA Conference

August 19–21, Washington, D.C. Contact Ralph S. Poore, 1 North Charles Street, Baltimore, MD 21201, (301)-783-3865; or Richard V. Rueb, (714)-250-ISSA.

SCO Forum90: The International SCO Technology and Marketing Conference

August 20–24, Santa Cruz, Calif. Contact The Santa Cruz Operation, 400 Encinal Street, P.O. Box 1900, Santa Cruz, CA 95061, (800)-SCO-UNIX or (408)-425-7222; fax (408)-458-4227.

CASE for the 1990s

August 27–29, Boston. Contact William B. McClure, President, Extended Intelligence Inc., 25 East Washington Street, Suite 600, Chicago, IL 60602, (312)-346-7090; fax (312)-372-7762.

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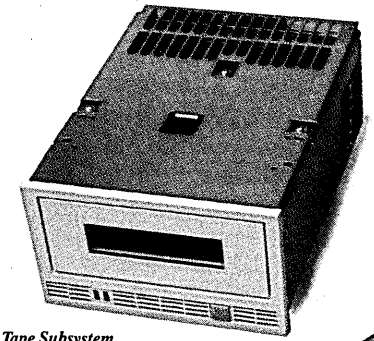

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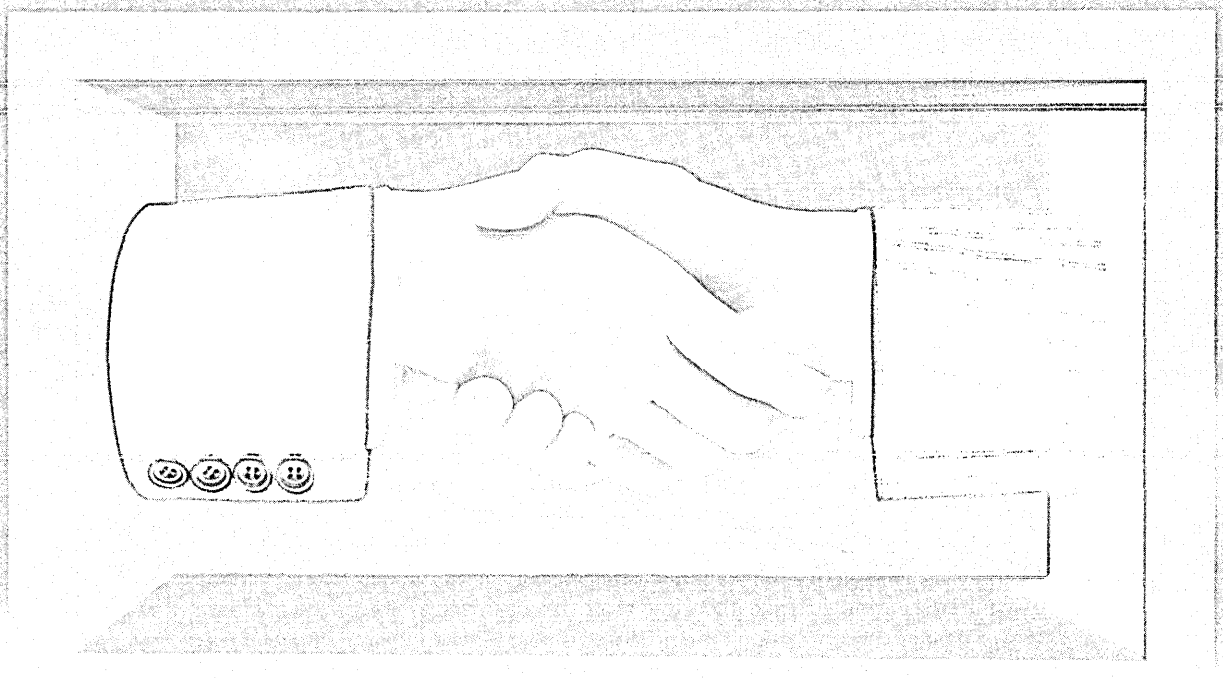

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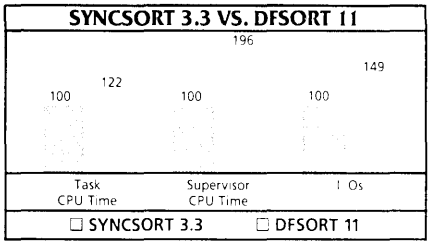

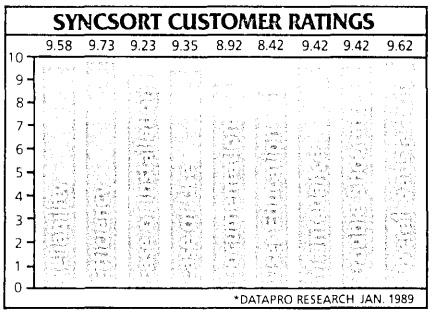

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Circle 7 on Reader Card

Sequent's Deal With Siemens Unraveling?

BEAVERTON, Ore.—It looks like German unification of a corporate nature may be having dire consequences for UNIX multiprocessor vendor **Sequent Computer Systems Inc.** Until recently, Sequent had been enjoying a booming business—to the tune of $14.3 million in 1989—from large OEM customer **Siemens AG**. But Siemens' recent acquisition of **Nixdorf Computer AG** seems to have put the Sequent/Siemens original equipment manufacturer relationship on hold. Analysts say Sequent's OEM revenue from Siemens dropped from $4.1 million last quarter to $1.3 million and could soon dry up altogether as Siemens takes over the Nixdorf product line, which competes with Sequent's. Some stock analysts have noticed the drop and recommended that their clients sell Sequent shares. Sequent didn't return calls by press time.

A Fall Debut For Summit?

ARMONK, N.Y.—Two independent software vendors whose entire businesses are built on supplying products for **IBM** mainframe systems expect the company to introduce its successor to the 3090 large-scale system this fall. Actual shipment of the so-called Summit machines won't begin until well into 1991, giving ISVs and competitors some breathing room to develop products to work with or compete against the Summit series. Big changes in storage architectures are part and parcel of the announcement, they say. IBM has been mum about an announcement date, saying only that functional additions and non-CPU performance kickers are planned (see DATAMATION, May 15, p. 29).

Gates To Speak To IS at GUIDE

CHICAGO—Officials of the 2,850-member **GUIDE International** IBM users group are publicly patting themselves on the back for having lured PC software heavyweight Bill Gates away from Redmond, Wash., and **Microsoft Corp.** to give the keynote speech at the group's annual summer meeting here next week. GUIDE, which represents users of large and midsized IBM systems, usually gets a high-level IBM executive or some other mainframe maven to address the assembled multitudes. This time, it will be Mr. PC software. "He [Gates] realizes mainframe people are having a greater impact on the acceptance of things like OS/2 and Windows," says GUIDE president Ben Parke. Parke says GUIDE had invited Gates to keynote its meetings several times in the past. Gates, until now, had always said thanks, but no thanks.

Talks Begin for OSI Pilot

WASHINGTON,D.C.—With the Government Opens Systems Interconnection Profile (GOSIP) due to kick in this August, federal agencies are stepping up testing and development of Open Systems Interconnection (OSI) networks. The **National Aeronautics and Space Administration** (NASA) is planning an OSI-based network for its upcoming space station. And private industry is doing its part to push OSI over the hump. The **Aerospace Industry Association** (AIA) is talking with public network providers **GTE Corp.**, **MCI Communications Corp.** and others about a pilot project that would, in the words of one AIA member, "demonstrate honest-to-goodness business use of electronic mail [such as X.400], file transfer [such as FTAM], electronic data interchange and other OSI features." The project is still in the planning stages, but the goal is to have the pilot working by or shortly after the GOSIP's August deadline. The AIA has also invited participation by the **National Institute of Standards**' OSI-Net project, which has become the common thread in a number of private and government projects to test and develop OSI interoperability.

Unisys Passes Makeup Test On POSIX

SAN JOSE—The attraction of the IEEE POSIX operating system kernel standard is supposed to be its portability to any operating system, not just UNIX. That means all operating systems with POSIX front ends should share certain operating system services and other goodies. The theory was put to the test recently when **Unisys Corp.** completed development work on the first commercial POSIX front end for a non-UNIX operating system, in this case, Unisys' CTOS OS. But sources at Unisys say that, when they tried to run the software test suite on the CTOS POSIX implementation to prove compliance, the test suite crashed. It seems the test suite, developed by the **National Institute for Standards and Technology** (NIST), made some assumptions about the underlying operating system having UNIX-like qualities. So it was back to the drawing board for the test suite, which was eventually repaired. The CTOS POSIX implementation passed muster the second time around.

Navy Weighs Opening A Database

SAN DIEGO—The **Naval Ocean Systems Center** (NOSC) is thinking of offering general access to its Robotics and Artificial Intelligence Database (RAID). Built a year ago by NOSC and **Computer Sciences Corp.**, it's being used chiefly by about 100 users within the Defense Department. It consists of records of 2,500 projects and is available over MILNET/DDN at no charge to government employees and government contractors. But the database's technical evaluator, Raghubir N. Mathur of Computer Sciences, thinks it could be made available to a larger audience if there's sufficient interest.

Just a Casual Conversation

DALLAS—**IBM** may be looking for a partner to help it meet future contracts for running the data center operations of its clients. One source says that IBM has been talking to **Perot Systems Inc.** of Vienna, Va., which was formed last year by the man who created the commercial facilities management business while at **Electronic Data Systems Corp.**, the now legendary Ross Perot. "I'll not comment on whether we have been talking," says Perot Systems president Pat Horner, "but I will say this: our company is not for sale." IBM is anxious to protect its mainframe hardware margins, and by taking over the operation of its customers' data centers it can ensure they remain with IBM mainframes. Some pressure on IBM may be coming from the fact that IBM's arch rival, EDS,

has been substituting Japanese-built IBM-compatible mainframes for Big Blue machines on some of its facilities management contracts and has in addition taken a 20% stake in **Hitachi Ltd.**'s U.S. distributor.

Cut From The Digital Cloth

PALO ALTO—**Ross Systems Inc.** CEO Dennis Vohs hopes to weave an initial public offering for his applications software company by sticking to his knitting. Despite the temptation to tailor Ross' financial, human resources and distribution software to other platforms, Vohs for the moment is content to work just with **Digital Equipment Corp.**'s operating systems, VMS and ULTRIX. "Digital is committed enough to open architectures and to distributed processing to persuade us to stay with it," Vohs says. If such staying power holds firm, Ross expects to reach $50 million in revenue in 1990—sizable enough to take the company public.

Knowledge-Ware Eyes a Big One

ATLANTA—Having captured the hearts, minds and pocketbooks of Wall Street when it went public last year, **KnowledgeWare Inc.** is seeking to grab the attention of major users of computer-aided software engineering (CASE) tools. The company's latest OS/2-Presentation Manager-based tools are winning raves from experts, and chief operating officer Terry McGowan has told DATAMATION that his company was on the verge of signing a million-dollar order as it closed the books last month on its fiscal year. His company racked up nearly $44 million in sales in the first three quarters of FY90.

BT Tymnet's Global Net Plans

SAN JOSE—If you're seeing better bids from **AT&T**, **IBM** and **MCI Communications Corp.** as a result of their competition for your value-added network services business, consider inviting a fourth supplier to make a VAN proposal: **BT Tymnet**. The $300 million division of $19 billion **British Telecommunications PLC** has its sights set on winning business from major U.S. multinationals—so much so that you'll see the subsidiary rolling out a global network program in the next few months that will embrace electronic data interchange, electronic mail and other features in a very economical package.

Superpower Proposes Swap Meet

LOS ANGELES—A computer official in the U.S.S.R. is proposing that the Soviets swap software for much-needed U.S.-made hardware. Nicolai Kleschev, director of the **International Center for Informatics and Electronics** (InterEVM), which coordinates R&D work at 40 Soviet organizations, says Soviet software specialists are capable of jointly developing advanced versions of existing systems with U.S. developers. They can also go it alone with sophisticated applications software in medicine and publishing. To show he isn't kidding, Kleschev recently led a Soviet delegation to Los Angeles to meet with officers of **XXCAL Inc.**, a third-party software testing company soon will begin certifying Soviet software for sale in the United States.

More Disk Capacity Please

HOUSTON—If you talk to Ivan Brass, vice president and director of information systems for **Manufacturers Hanover Trust Co.** in New York City, he'll tell you that disk capacity on PCs is one of the key issues facing IS and microcomputer managers today as they implement client/server computing. One supplier that picked up on that fact is **Compaq Computer Corp.** The big PC maker is planning to increase disk capacity on its SystemPRO dual-processor computers by the end of the year, according to Mike Clark, Compaq director of systems engineering. "We'll have five to six times more disk capacity in the future," Clark says.

There's Hope Yet for EDI Translation

NORWALK, Conn.—For some users of electronic data interchange (EDI) services, in the translation of EDI data into existing applications programs is no easy task. Often, the EDI data have to be keyed in manually to an application. Now, **TSI International**, makers of KEY/MASTER data input software for IBM mainframes, is planning to offer a remedy for this problem. TSI, which recently entered the EDI market by acquiring a product called TranSlate from **TranSettlements Inc.** in Atlanta, is hard is hard at work on a product that will integrate TranSlate with a variety of applications. No word yet on when the cure will be ready. Current TranSlate customers include **DuPont, Levi Straus & Co.** and **Monsanto Co.** Meanwhile, TSI has brought on board EDI guru Paul Lemme, formerly of **P. Lemme & Associates**, Lemme joins TSI as vice president of consulting, education and documentation.

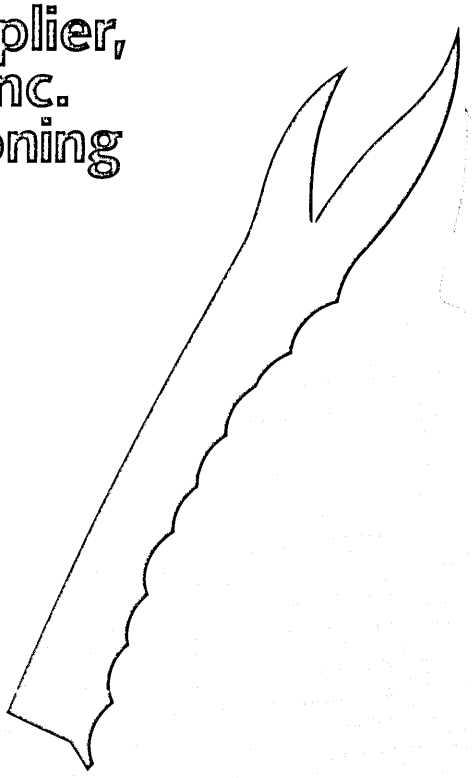
Raw, Random Data

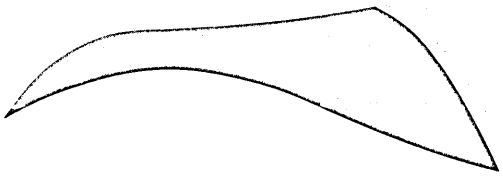
Expect some big announcements out of **Motorola Inc.**'s Computer Systems Division in the next few weeks as large orders pour in for its reduced instruction set computing (RISC)-based MultiPersonal Computers and as a new imaging application is unveiled for the UNIX machines. Division executives, known to be a reticent bunch in the past, are positively gushing about the reception accorded their MPC boxes, which they claim are feeding IS executives' appetite for networked computing systems that they can control but that still appeal to end users.

IN OUR NEXT ISSUE

It's Time To Retrain
No More Manic Media Choices
Assessing Computer Associates' Building Plans
A Winning Strategy for Expert Systems

As the world's largest seed supplier, Pioneer Hi-Bred International, Inc. needed a computer air conditioning system that could create a perfect climate for corporate growth.





Liebert was outstanding in the field.

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"Pioneer is heavily dependent upon computers...which means we're heavily dependent on our environmental support systems. When the time came to upgrade our power distribution systems and add additional air conditioning we chose Liebert because of the stability of the company, its overall reputation and the fact they're extremely customer-oriented. You just can't beat them."

— Steve Huber, Operations Manager, Pioneer Data Systems, A Division of Pioneer Hi-Bred International, Inc., Johnston, IA

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As you'd expect, because it's made by Digital, Rdb is fully integrated with the entire VAX computing family – from the desktop to the VAX 9000 mainframe. On standalone, SMP, networked, and VAXcluster™ systems, Rdb delivers full support with functionality that's optimized for the VMS® operating system. Integration doesn't stop with hardware. A system-wide data dictionary, TP monitors, and a full range of information management products take advantage of the full power of Rdb.

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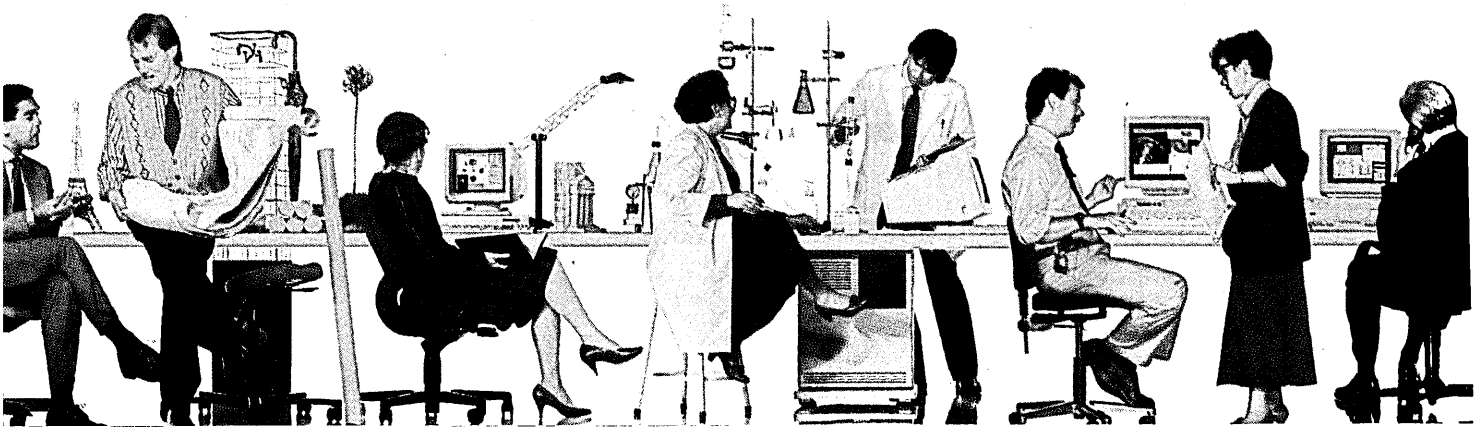

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Choosing a production system database is serious business and Rdb is designed to deliver high availability and integrity that mission critical applications require. Rdb's integration with our full-function TP monitors, VAX ACMS™ and DECintact™, make it the ideal database for supporting high-volume transaction processing. Rdb is tightly integrated with the VMS operating system to take full advantage of automatic failover capabilities on VAXclusters.

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Digital pioneered distributed computing. No wonder Rdb has been giving customers remote access to data since Version 1.0. The optional VAX Data Distributor provides Rdb users with the ability to extract and replicate copies of their database, moving it around the organization for fast access to critical data.

In addition, Rdb's support of two-phase commit lets you update multiple databases throughout the enterprise with guaranteed integrity.

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Since Rdb is part of every VMS system, the runtime license is yours at no additional cost. That means that once you've developed an application, you can run it on any of your VMS computers without the cost of additional licenses.

But value, of course, is more than price. The true value of Rdb – the reason why it is the database of choice – is based on its leadership functionality and the service and support from Digital.

Digital's Rdb/VMS. Now that you've considered the data, there's only one thing left to do. Call 1-800-343-4040 ext. 386 or your local Digital sales office for more information.

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Getting a Grip on Costs

Is the boss on your back about how much your IS department is spending? Can't figure out a way to cut back any further without hurting operations? Relax! The efficiency experts are on the way.

BY RALPH CARLYLE

Tim Smith runs the 17 manufacturing facilities across the nation that produce Ralston Purina Co.'s well-known family of pet foods and cereals. Five years ago, Smith, executive vice president for Ralston's Grocery Products Group in St. Louis, was given charge of all information systems for the group. He had no background in IS and, as he puts it, "no vested interest, either." And he had some big questions that needed answers. Among them were: Which information technology (IT) products should Ralston be making and which should it buy? Are end users being charged too much for data center services? Is the data center cost effective and productive? And, the zinger, Does the company even need an internal IS operation?

Smith says he didn't trust the computer vendors and consultants to give him the answers. "Their careers are too bound up with IT." Although he knew his IS group, aided by IBM or one of the Big Six accounting firms, could do a cost analysis of a site, he says "this information is useless if you want to run IS as a business, as I do. You have to be able to compare your IS utility [data center] to the competition—to others in your industry and even in other industries—if you want to really know what's going on."

So Smith went looking for a firm that could give him such comparative metrics. His search revealed two companies that measured a wide range of information-processing parameters for clients and compared a client's performance with that of its competitors. The firms evaluated everything from CPU downtime to the cost of printing paper. The first company Smith approached was Real Decisions Corp. (RDC) of Darien, Conn.

Smith hired RDC to evaluate the cost of his group's data center and compare it with others in the United States. In the RDC evaluation, Ralston Purina was ranked within its industry category and within RDC's total database and given an overall performance number, the so-called NOW (NOrmalized Weighted) index. The NOW index is a composite cost measurement of the client's total work load, compared against other user organizations in the database. "We discovered that we were barely average as U.S. data centers go, and following changes in staffing and hardware [we] managed to climb into the top 10% by 1988," says Smith.

But Ralston Purina's executive vice president was not content just knowing how he stacked up against U.S. competition. He wanted to know how his data center compared with those overseas, as well. To find out, he went to Compass Holdings, another firm that helps data centers assess their costs. The company has its origins in Sweden; its parent company, Compass Holdings BD, resides in Rotterdam.

Smith was amazed to discover that, even after

Although most companies spend too much on their data centers, not every IS shop is wasteful.

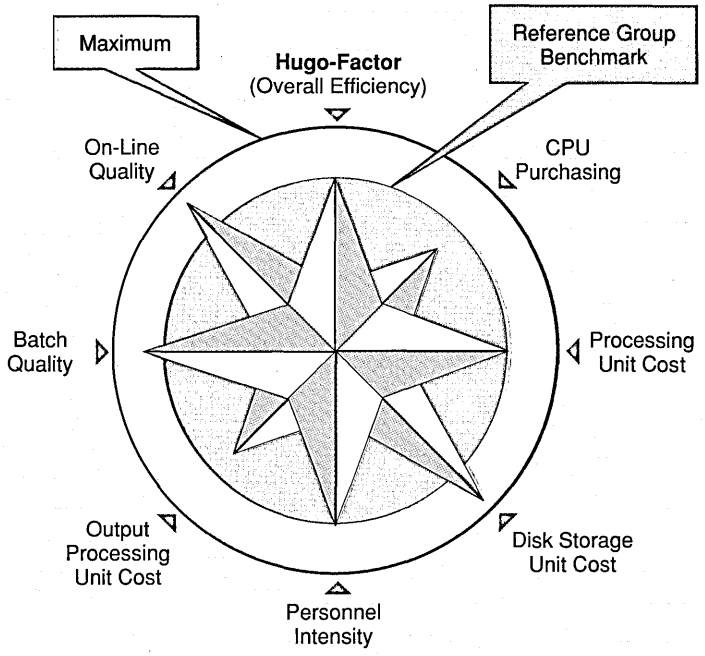
making the improvements, by European standards, "we were an underperformer crummy performer." He says that Swedish companies, for instance, and more recently those in the United Kingdom, are more experienced at measuring IS performance than are their U.S. peers. Since taking Europe as his comparison point, Smith has attacked his IT cost structure.

Smith has used these companies to prune and reshape the IS group in his charge and to save his company millions of dollars. His data center head count was 130 in 1988 and dropped to 80 last year·MDNM/. He's also made significant hardware changes at his 75MIPS (million instructions per second) data center, including a switch from being an all IBM mainframe shop. "We are now an IBM and Amdahl mainframe shop," he says. In addition, the company had seriously considered outsourcing its entire IS function and received bids from McDonnell Douglas Corp., also in St. Louis, as well as from Electronic Data Systems Corp. in Dallas and Litton Computer Services, the computing arm of Beverly Hills, Calif.-based Litton Industries Inc.

"We wanted to find out if these outsourcers could operate our central data-processing site and our data network at lower cost and with better response time and availability of services," says Smith. The Ralston Purina executive had launched a program to establish the best practices for every aspect of the data center and related data network "right down to such things as discovering whether we should be printing on two sides of a paper and moving from impact to laser printers to reduce printing costs," he says.

The outsourcing bids were evaluated for Smith by Compass Holding's U.S. subsidiary, Compass America Inc. in Herndon, Va. The evaluation showed that outsourcers would be no more effective than Ralston Purina's rapidly improving, leaner, meaner IS department. "They were less cost effective, in fact," reveals Smith. "Were it not for our comparative measure and the commitment of our people, we'd be another name on the swelling client list of the outsourcers. We wouldn't even have an internal IS operation today."

How the Compass Approach Works



Compass plots data center performance in a number of areas in comparison with a reference group benchmark. The benchmark is represented by the inner circle. Performance is shown by the length of the individual points; the longer the point, the better the performance. If a point falls short of the inner circle, performance is below the benchmark. The Hugo-Factor is Compass' term for showing the overall unit cost for IS operations.

Source: Compass Holdings BD

A Businesslike Approach

There are many businesspeople like Smith who are taking charge of IS, and many companies attempting to get a handle on IS costs. The two metrics providers that Smith found have 270 clients between them, and other companies are entering the field. Chicago-based Andersen Consulting, for example, has come out with what it calls its Techmetrics service (see sidebar, "How the Metrics Providers Compare"). "These companies want to rise above the primitive cost-accounting mechanisms that currently underlie the IT industry and IS profession," says one British chief information officer (CIO).

Ron Price, group IT director at London's Midland Bank PLC is another IS executive who is determined to run his IS shop in a businesslike manner. Price oversees a $650 million IT budget at the bank this year, representing about 16% of the bank's 1990 operating budget. More than 50% of this money will be consumed by the data centers in his charge; the rest will be spent on departmental IS, which Price also tracks since he not only acts as CIO but controls all purchasing in the group. "In essence, I'm running a $650 million business, and, like any businessman, I must have a measure of business performance," says Price.

According to Price, IS needs to measure its return on IT spending in much the same way as the finance side of the house measures return on investment. "In data center terms, the nearest I've come is Compass," he says. Using Compass as his guide, he has rebuilt Midland's data center over the past three years. During this period he has dramatically cut the number of data centers from 30 to three large and four tiny centers. He once had 13 IT vendors; today, he has four: Digital Equipment Corp., IBM, Tandem Computers Inc. and Unisys Corp. "Since 1987 [and measured in 1987 terms] we've cut 22.3% of our cost, 25% of our work force and achieved a threefold improvement in throughput—that is, in actual measurable work done," he reveals. Compass allows Price to track such things as response time at the end-user terminal, cost per MIPS processed and cost of data stored.

Compass and RDC executives say that although most companies are spending too much on their data centers—as top management suspects—not every IS shop is wasteful. "There are exceptions," says Len Bergstrom, an executive vice president and principal at RDC. "In our database, there are companies that needed to do little more than fine-tune their operations and create a better-balanced work load."

> I'm running a $650 million business, and, like any businessman, I must have a measure of performance.

Some data centers are stellar performers and don't even know it. This was the case with Chicago-based Heller Financial Inc., a subsidiary of the giant Japanese Fuji Bank. "We were a candidate for outsourcing," says Chuck Mallet, senior vice president and CIO at the firm. "Like many companies, our executive suite thought our overall data center costs were probably 20 or 30% too high." Compass, however, told a different story. Mallet can run his 40MIPS, 40-person data center for around $5.5 million a year. "This proved to be 30% lower than the average for comparable companies in our industry," says Mallet. Armed with that knowledge, Mallet staved off the outsourcing threat, and his IS workers gained more respect from the executive suite.

IS managers who use independent measures say they gain a wealth of knowledge on such subjects as whether to outsource, chargeback and buy or rent their computers.

The two companies' client lists read like a veritable *Who's Who* of leading multinationals, top computer vendors and outsourcers. Given their wealth of information, the most remarkable thing about the Compass and RDC databases is how few companies actually use them or services like them. Many thousands of companies, say current customers, could use such knowledge. "And it's not that they [the metrics providers] charge exorbitant fees for their services either," says Midland Bank's Price. Fees range from $20,000 to around $150,000, depending on the size and complexity of the client, say Compass and RDC. "Absolute chicken feed for what you get," declares Price, who keeps exhorting other companies to join in. Price and other clients of the two vendors want the database to swell "so we learn more about ourselves and about the IT industry."

Both RDC and Compass have tried to get more U.S. companies interested in their services. "But the response from top IS executives has been apathetic at best," says RDC's Bergstrom, who recently resorted to an unorthodox method to get one company to sign up. During RDC's April Decision Support Center (DSC) users' conference, Bergstrom announced from the podium that he would offer Rochester, N.Y.-based Eastman Kodak Co. free membership in its DSC 1990 program even though no Kodak executive was even present in the audience. "Our view is if anyone would want to evaluate the merits of outsourcing, they would," says Bergstrom.

Last year, Kodak entered into a much-publicized outsourcing deal with IBM. "We figured they would like to know if they are getting value for money," he says. "But so far they have not responded."

How the Metrics Providers Compare

One of the Big Six accounting firms is now trying to emulate Compass Holding BD and Real Decisions Corp. (RDC) by providing what is known as Techmetrics. After signing up clients for a $7,500 fee, Houston-based Andersen Consulting, the provider of the Techmetrics service, gets them to fill out a lengthy and detailed questionnaire. Responses are tabulated and analyzed, and clients are provided with a detailed "Participation Report" of how they stack up against others in the program on such matters as data center operations costs, applications delivery, telecommunications costs, end-user responsiveness and miscellaneous expenditures.

"There are 15 such clients this year, up from eight last year," says Brian Dennison, manager of the program. Dennison admits that his service is "embryonic" compared with the two leaders. "But interest is picking up" he says. Dennison also notes that the key to Compass and RDC's current leadership in the metrics field is the range and depth of their databases.

RDC started life in the 1970s by offering a measure of the effectiveness of time-sharing operating systems and has since expanded its metrics to embrace data center and networking costs as well. RDC's service, known as Decision Support Center (DSC), is based on an array of pricing algorithms and on-site benchmarks that compare a client's service levels and costs with those of 120 multiindustry clients in its database.

Compass started life in Sweden as the idea of Tomas Blitz, a consultant working with car giant Volvo. In working with Volvo, Blitz developed Compass, a service for gauging data center costs and comparing them with IS costs of other companies. Compass measures the actual costs and benefits of data center production in extremely fine detail through a total of 900 measurement points. Its international database of 150 clients is fed from subsidiaries in Scandinavia, the United Kingdom, West Germany and now in the United States.

Compass extracts three kinds of data from customers: capacity and load statistics, which can be extracted from the mainframe operating system; financial information, including capital investment and operating costs; and staff information. Compass then presents the IS manager with a huge printout of the results, itemizing every operation and cost. The report includes such items as cost per million instructions per second, response time at the terminal, cost per unit stored and cost per line printed. To make everything digestible for nontechnical managers, Compass presents the overall results in what it calls a Compass diagram. Each point of the compass represents a measure of computing performance: overall efficiency is due north, use of mainframe capacity is east and so on. The longer the compass point, the better the performance. A client thus has a measure of IS performance both in absolute terms and relative to peer companies.

As Ron Price, group IT director for London's Midland Bank PLC, notes, "You can discover some pretty weird things." Price discovered, not happily, that his London data center, the linchpin for other data centers across the country, was printing 19 miles of paper every night when it collated data from across the country and printed it out. "We were consuming a Brazilian rain forest every night," he says.

Katherine Hudson, Kodak's vice president and director of corporate IS, says she was unaware of the offer from RDC. "I appreciate it," she says, "but I know we are getting value for money from IBM. We used our own benchmarking service to find this out." Hudson declined to reveal the name of the benchmarking service she used.

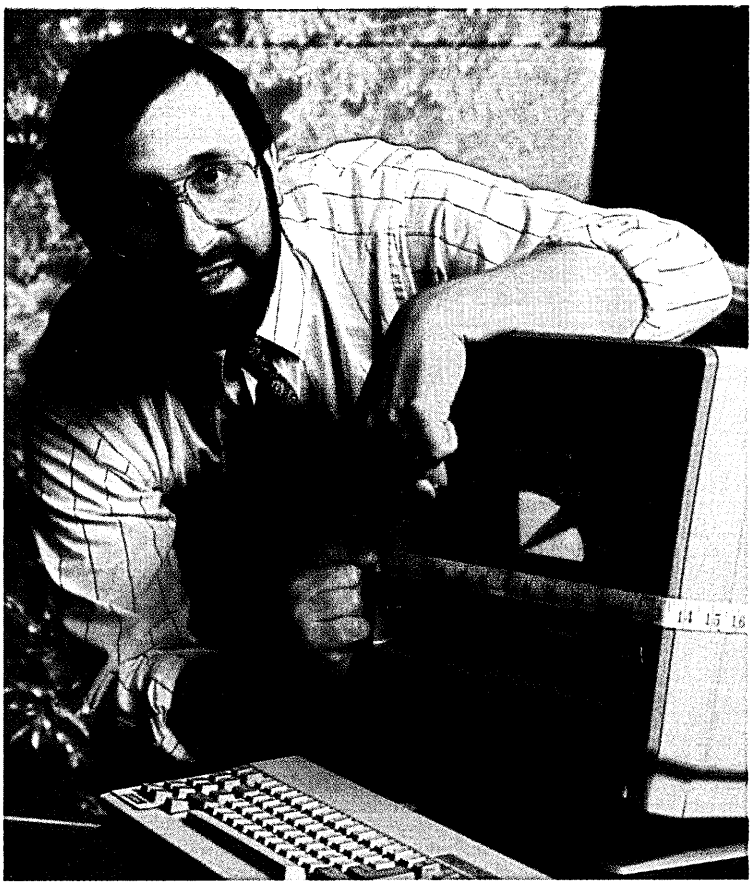
The Perils of Cost Evaluation

IS managers who are reluctant to sign up for independent evaluations of IS costs cite many reasons. Some CIOs feel their IS organizations will look worse than they actually are, since they will be compared only with leading edge firms. These CIOs will wait for more small companies to join the database. "But they shouldn't be scared off by these big names," says Bergstrom. "Big doesn't always mean good. There are a lot of bloated and badly run 300MIPS shops on our client list they would look good against." It should be stressed that companies are not identified when overall averages are computed. Companies with high ratings may, and do, tell the world of this fact, but RDC and Compass are not permitted to do so.

Some companies are unaware that such independent IT metrics exist. They know that econometric models and weird IT cost assessment formulas abound at Big Six accounting firms. "But these are more a matter of art and personal style than they are a scientific measure," says Phil Jordan, vice president of finance and CIO at Muzak L.P. in Seattle. "We weren't even aware that you could compare data center performance in this way."

Compass and RDC both say that one reason for IS apathy toward metrics services overrides all others. "Unless they [the IS managers] are faced with outsourcing threats or a major budget cut, they won't tackle the issue of costs. They'd rather carry a bloated cost structure because they know that, if they have to, there is room to make a cut," says Compass America president Dick Arnold. Adds RDC's Bergstrom, "If you get paid more for running a $100 million data center than a $75 million data center, you're not too eager to discover economies or run your operation in a more prudent manner."

Ralston Purina's Smith agrees that many IS managers aren't eager to control costs, and that it's not their No. 1 concern. "But this approach is shortsighted," he says. "If they don't make the cut then their bosses will, or the next company that buys them will." IS managers were the original target of RDC and Compass, but their lackluster response has forced a reevaluation of that strategy. "Now we're taking our story to the executive suite and those who have been frustrated in their attempts to manage IT in a top-down manner." A particular target is the growing number (but still a minority) of CIOs who have no IS background, and, as Smith put it, no vested interest in IT. This year, at least, they have been aided by a slowing U.S. economy. Companies that can no longer find cheap money or low-cost labor have no way to fix profits other than to cut their costs. The IS organization—traditionally viewed as a cost center—is a natural place to start, and both Compass and RDC are eager to supply the means.



RDC'S BERGSTROM: There are a lot of bloated and badly run 300MIPS shops on our client list.

And why stop at the data center? IT has, in recent years, permeated the whole fabric of the corporation. IT costs are migrating toward business-critical and front office systems where they cease to be reported as IS-controlled spending (see "Recovery!" April 1, 1989, p. 34). The IS budget is only a partial indicator of IT spending, currently accounting for some 50 to 60% of total IT spending. But as RDC's Bergstrom notes, it's a long journey from IS cost comparisons to making a meaningful assessment of the cost of business applications. "An evolution, in fact. And one that is already under way." Both RDC and Compass have already taken the next step. They are both beta testing tools and techniques that will enable a company to get a bead on networking costs.

One test site, NYNEX Corp., headquartered in New York City and White Plains, N.Y., has recently acquired RDC for an undisclosed sum. NYNEX stresses that it will not be permitted to see the RDC database in detail and will know no more than any other client does. "Finding those companies with poor NOW index numbers would be an outsourcer's dream come true and vital information to any company," says Bergstrom.

Once it was deemed impossible to compare data centers. Today, it is easy. "We've got data center cost measurement down to a science," says Joran Kling, president of Volvo Data, the IS arm of the giant car maker based in Goteborg, Sweden. Now, the next Holy Grail to be sought is the ability to measure the costs of business applications being developed in departments and business units. "Everyone says this type of measure is an art," says Kling, "because we are dealing with so many intangibles and hidden costs. But one day they'll be able to measure that, too." ▭

Photograph by Tom Sobolik/Black Star

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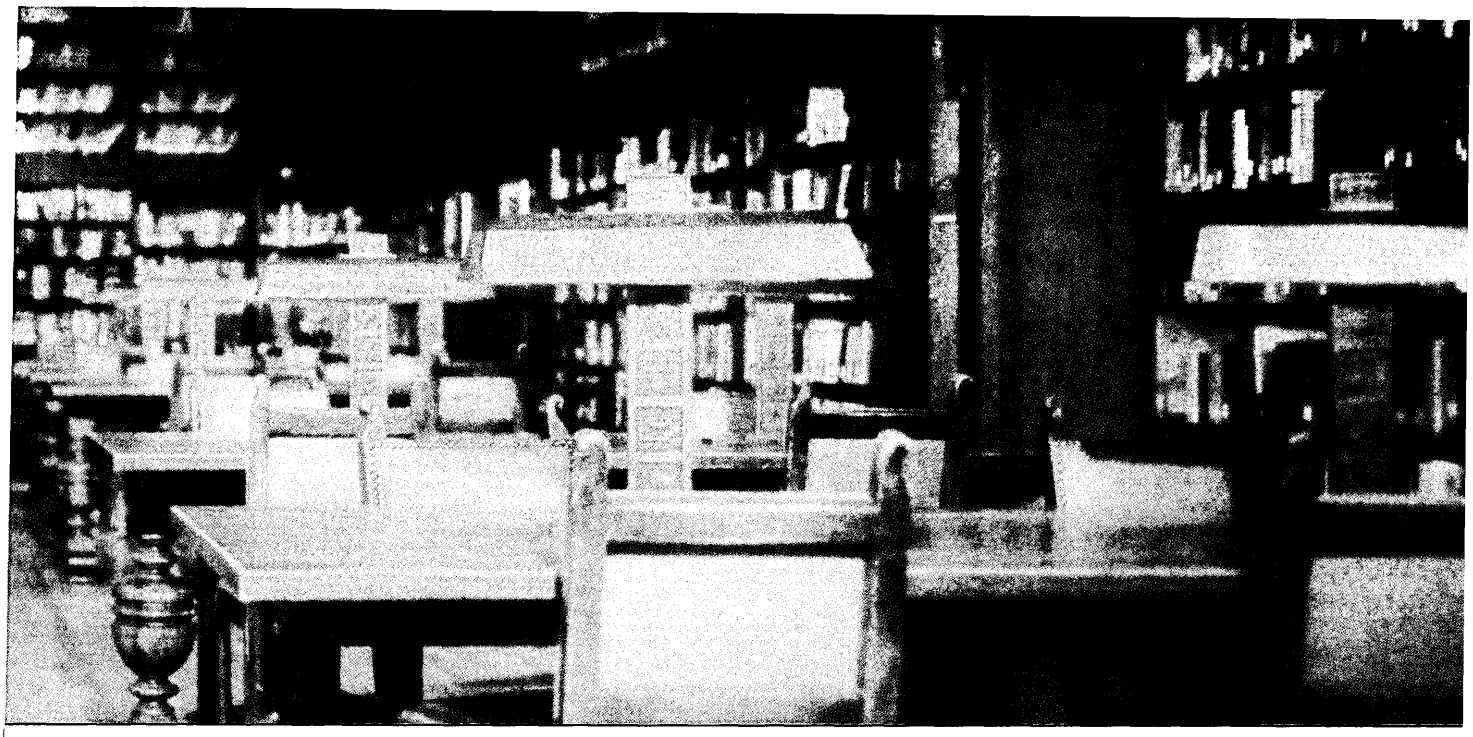

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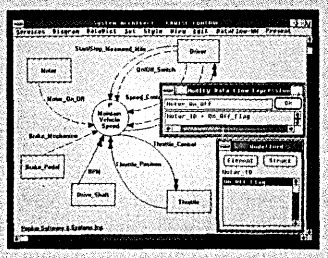

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The Challenge Of Integration

Image technology keeps getting better, but building image applications remains a considerable challenge. At issue is how to integrate tomorrow's imaging systems with today's business-critical applications.

BY DAVID STAMPS

Image-processing technology is on a fast track these days. The pace of new product announcements alone should be enough to make information systems managers pay heed. High-resolution monitors that use as many as 3 million pixels to paint pictures of stunning crispness are available. So, too, are faster and cheaper laser printers and scanners. Optical storage subsystems—the generally favored means for storing electronic images—continue to raise the limit for data storage. Sony Corp., for example, offers a 12-inch disc that holds 3.75 gigabytes of data per side. And 5¼-inch optical jukebox systems are proliferating like rabbits.

Data transfer from an optical disc is still slower than from a magnetic disk. But here, too, new advances promise to close the gap between optical and magnetic data speeds. New compression/decompression algorithms can squeeze the image for a standard paper document from one megabyte down to less than 50 kilobytes.

Songs of Solution

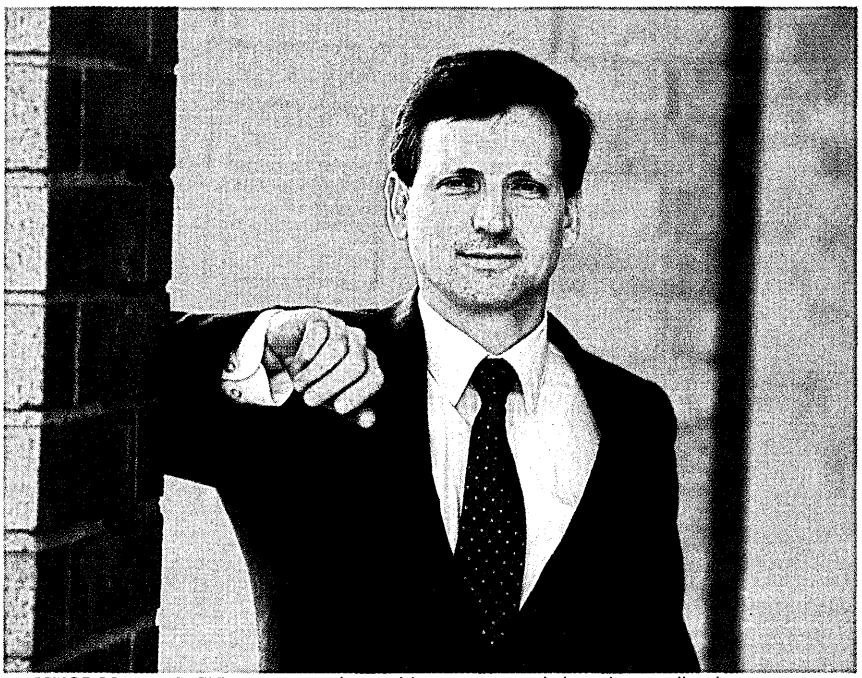
Such an outpouring of technology has the imaging industry bustling with excitement. But what excites many IS pros even more is the fact that it's now possible to tie together these various components into imaging applications that offer enormous returns. Instead of harping on technology, the image industry is suddenly singing songs of solution.

All of this marks a significant change. Not so long ago, imaging was, in the words of one IS director, "a technological curiosity." Image processing tended to be used in stand-alone applications, usually built around the task of document storage and retrieval, an application for which the technology is well suited. But the real returns from imaging won't happen until systems begin to eliminate the physical flow of paper in a company. And without software to replicate work flow or to link imaging to other existing applications built on years of IS effort, an image system is scarcely more than an expensive filing cabinet.

Image systems are starting to live up to their potential to integrate electronic document handling with other business critical applications, however. Consider the case of St. Paul-based Northwest Airlines Inc., which is using image technology to tackle a job that, until recently, defied automation. Northwest, the nation's fourth-largest air carrier, processes over 600 million ticket transactions a year.

The front end of the ticket business is sufficiently automated. Electronic records of every ticket sold by a travel agent or one of Northwest's own 60,000 ticket agents go directly into an IBM mainframe database. The back end of the ticket accounting system, however, was anything but automated. When passengers turned in tickets, the flight coupons were stuffed into envelopes by gate agents and shipped back to Northwest's headquarters. There they were stored in a warehouse stacked to the ceiling with cardboard filing boxes.

The problem facing Northwest—and every other airline—stemmed from the



BRISTOL MEYERS' GILSON started out with a nonstrategic imaging application as a way to minimize risk in case of failure.

fact that passengers use tickets in a way that bears only a passing resemblance to the electronic records housed in the ticket database. They may use a ticket from one airline to fly with another, or they may use only the A-B leg of an A-B-C flight. Because of the discrepancies between original ticket records and actual ticket use, airlines need to match every flight coupon in the warehouse against every ticket in the database to accurately calculate passenger revenues.

Deregulated Complications

Further complicating revenue accounting is the deregulated airline environment, in which daily price changes can affect as many as 1 million tickets. Given the number of passengers carried by Northwest, a manual match for every ticket was clearly impossible. "Instead, we took a sampling of tickets and used a statistical-modeling program to essentially estimate revenues," explains Harold Atkins, assistant controller at the airline.

But this shortcut left much to be desired. For one thing, revenue estimates were not always accurate. Nor did they alleviate the paper problem, since tickets still had to be physically tracked down in the warehouse and pulled each time a fare refund or interairline transfer was required. Of the 600 people employed in Northwest's passenger revenue accounting office, 20 did little else but search for flight coupons.

□ INSTEAD OF CHASING PAPER, WORKERS WILL BE REASSIGNED TO MORE USEFUL JOBS.

So, in 1986, following its merger with Republic Airlines, Northwest realized it had to streamline the process. It hired Chicago-based Andersen Consulting to design an automated Passenger Revenue Accounting (PRA) system. The assignment proved to be an archetypical systems integration job: by the time Andersen sought out the best components for each system element, at least 10 vendors were involved.

From an imaging standpoint, a key element of the PRA is a scanner from Recognition Equipment Inc. of Irving, Texas, that was specially engineered to read 17 tickets per second. Once the ticket images are captured and indexed by ticket number, the images are stored in an optical storage and retrieval library from FileNet Corp. of Costa Mesa, Calif. The optical library consists of two jukeboxes, each containing 204 twelve-inch optical discs and can house a maximum of 40 million documents.

Another key element of the PRA system is a network of workstations from Sun Microsystems Inc. used to access ticket images. Each ticket number is scanned by optical character recognition (OCR) software and then sent to a Sun fileserver. The system uses the relational database management software from Sybase Inc. of Emeryville, Calif., to keep track of the location of each ticket image in the FileNet library.

Special audit software from Los Angeles-based Inference Corp. matches the ticket image in the library with ticket records on the mainframe database. For those cases where audit errors are detected, the ticket in question is fetched from the FileNet library and put in a queue to await further auditing by operators working at the Sun workstations. "The ticket retrieval process—which used to take hours—is now done in seconds," says Rachel Hollstadt, director of the PRA system.

Northwest's application is being touted by some as a vision of the imaging future. "Historically, image applications have been confined to document management with some limited connections between the document storage system and host data," says FileNet's vice president of marketing, Bob Castle. "The [Northwest application] represents a much broader use of image. Different databases, different data types, expert systems, a number of different software technologies are all tied together at the workstation level using a client/server, open systems architecture."

For IS directors contemplating image applications, Northwest's PRA does indeed illustrate the technology's potential. But it also serves to highlight some of the scarier aspects of integrated image systems today. For starters, there is the matter of sticker shock. Northwest won't disclose the cost of the system, but educated guesses put the total tab in the range of $50 million, counting hardware, software, development and training costs.

While not acknowledging the accuracy of the $50 million estimate, Doug Schwinn, then senior director of IS development at Northwest (he has since moved to Dayton Hudson Corp.), who headed up the project, says the cost figures merit some qualification. The total PRA system includes a number of pieces, he says, including a new IBM mainframe and specially developed accounting software to run on it. To that add the costs of expert system audit software and an upgraded data center network. According to Schwinn, the parts of the system directly related to imaging account for only about 10% of the total cost.

By another measure, the image portion of the system—including scanners, workstations, network and servers—comes to about $11,000 per workstation, according to Tom Grudnowski, the partner at Andersen Consulting who led the PRA project team.

Price appears not to be a major concern to Northwest: the airline expects to recoup the costs within the first year through greater employee efficiency and other savings. "Instead of chasing paper, workers will be reassigned to more useful jobs, such as doing audits," explains PRA director Hollstadt. An even greater payoff will come in the form of improved market intelligence. "For the first time,

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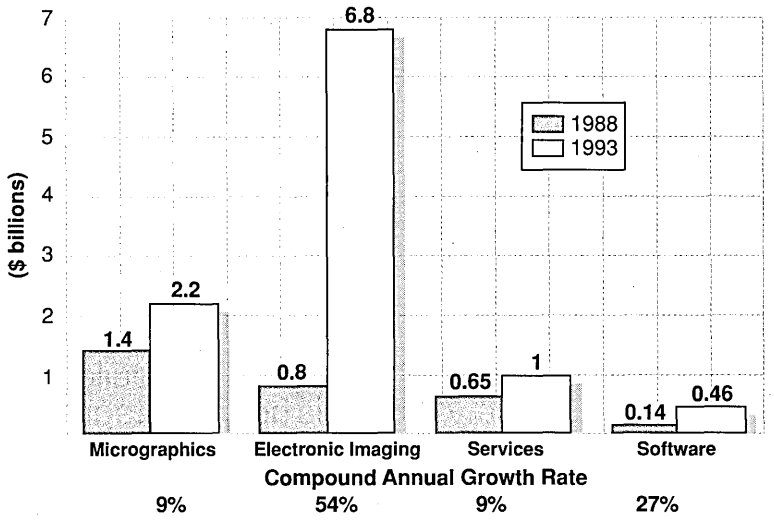

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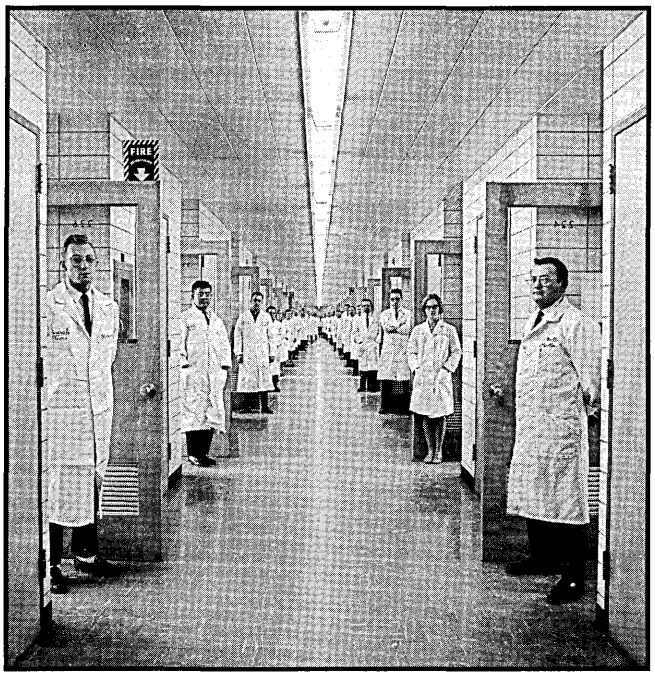

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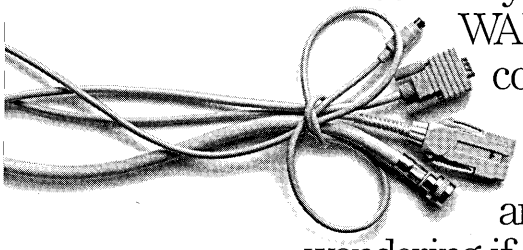

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Northwest will be able to know what its true customer base is and where those customers fly," says Schwinn.

There is another aspect to the Northwest system that may give some IS directors pause, and that is the amount of customization required. At the point of peak activity, some 180 people worked on the PRA system. Many of them were part of the software development effort to build in auditing features and integrate the image capture and storage system into the mainframe ticket database. But a sizable chunk of development time was also devoted simply to tying the various hard-

□ EXPERTS AGREE THAT STANDARDS ARE NO LONGER A MAJOR STUMBLING BLOCK.

ware pieces together. "One of the biggest challenges of the project was to get all the components running at the speed of the scanner," admits Schwinn.

The Integration Question

Integration—how much is needed and at what cost—is a major question in the imaging arena these days. How much customization work is needed to make image technology fit an organization's needs? Depending on the particular application, the answer can be a lot, as the Northwest system shows. But even less-specialized applications will generally require the assistance of a systems integration company.

"There is no single-product company today that gives an optimal solution," says Brendan Reidy, vice president and general manager of Litton Integrated Automation in Alameda, Calif., one of a number of integrators doing a brisk business in building large imaging applications. Reidy points out that for a large imaging system—$10 million and up—roughly one-third of the final cost typically goes to the systems integrator for consulting and integration work. Integration fees often include the programming of entirely new applications or, at the very least, software to link the image system to an existing application.

In many cases, more fundamental integration problems need to be solved. Depending on the needs of an application, it may be necessary to write device drivers for printers, scanners or optical disc systems just to link the various imaging components together. Then there is the issue of linking the imaging components to other computers and databases.

Who Needs Imaging, Anyway?

In 1987, J.C. Penney Co. Inc.'s Credit Division in Dallas decided to consolidate from 13 new account application centers across the country into just three. The plan hinged on the use of image processing to eliminate the flow of paper. "It would have been tough to consolidate without image; it would have meant a lot of people under one roof," says project coordinator James Worthy.

But even before moving to the image-based new accounts system, Penney had already realized substantial benefits from imaging technology. Using an image-based remittance-processing system built in the mid-1980s by TRW Financial Systems Inc. of Berkeley, Calif., Penney routinely handles over 11 million items a month. Yet its labor force is 40% smaller than the older, nonimage system required.

Based on this success, the company is moving ahead with plans to expand its use of imaging. In addition to the image-based new-accounts applications, Penney is planning to install a document image system for all customer correspondence. "Image has been very successful for us; we have a lot of confidence in the technology," says Worthy.

Buoyed by reports of this kind of return, some industry observers are predicting a surge in image processing. In a study for the Association for Information and Image Management (AIIM), Temple, Barker & Sloane Inc. (TBS), a research firm in Lexington, Mass., estimates that the market for electronic-imaging systems will grow at a compound annual rate of 54%. "Electronic imaging may not be the hottest growth market, but it is right up there with some of the hottest, including fax machines, cellular phones and engineering workstations," says Mark Bruneau, a senior associate with TBS.

Other analysts predict the market growth will be slower, limited to high-volume applications such as J.C. Penney's remittance system. "My own guess is that there is something in the neighborhood of 600 high-volume, transaction-processing types of applications that can really justify the cost of a $4 million image system," says Stuart Woodring, director of software strategy for Forrester Research Inc. in Cambridge, Mass.

At $10,000 and up for a high-end imaging workstation, it's tough to cost justify many desktop or departmental image systems. Even image vendors concede that the cost of workstations will have to come down before imaging storms the office the way personal computing did.

The real market for imaging is probably outside the office, in industries such as printing, publishing and health care, says Lawrence Matteson, vice president and general manager of Eastman Kodak Co.'s Imaging Information Systems Group in Rochester, N.Y. At the same time, Matteson believes it may be hard to keep imaging out of the office. "Look what happened to fax. It exploded when electronic mail became available because people wanted images, not ASCII characters."

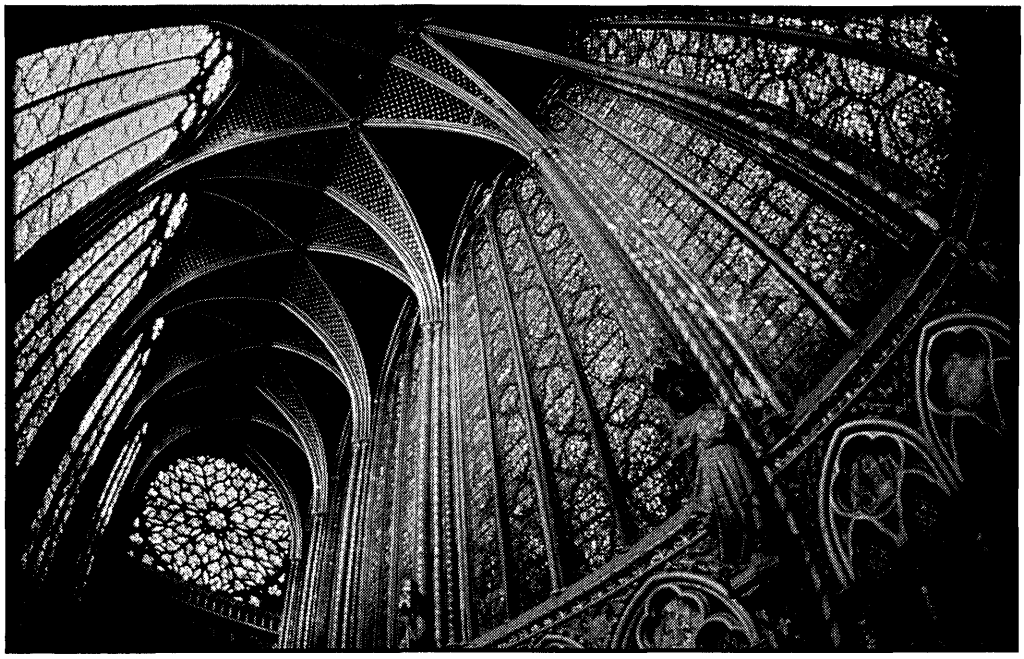
For now, would-be image users are having a tough time finding image systems at departmental or work group prices. "What we have are a number of departmental problems that could be solved very nicely by image," says Alan Gilson, director of technology assessment at Bristol-Myers Squibb Co. "What we don't have are a lot of high-volume applications that can justify bringing image in at a cost of several million dollars. But so far no one has quoted us a system that does what we need for a price we can afford."

For a number of years, standards for optical storage—or the lack of them—were a subject of concern, with discussion typically focusing on such things as data compression/decompression standards and optical-writing techniques. Today, many experts agree that standards are no longer a major stumbling block. Standards for compression/decompression do exist, and standards for interchange of data among optical systems are developing.

To what extent vendors will support these standards remains a valid concern. But whether vendors go their own way on things like compression/decompression and optical writing is not the major hindrance to integrated imaging.

"Data formats for optical disc are irrelevant," maintains Roger Sullivan, vice president of image management systems at BIS/CAP International, a market research firm in Norwell, Mass. "Most customers are making decisions well beyond the question of what are the nuts and bolts of data format or whether they can move data from one optical disc to another. Integration within the data-processing environment is the primary concern. What customers really want is to intercept the data stream on the host or to have the host system automatically retrieve documents from an image system and do something with it."

Even a modest imaging project can easily run into difficulties. For instance, piecing together the various hardware and software elements can be especially



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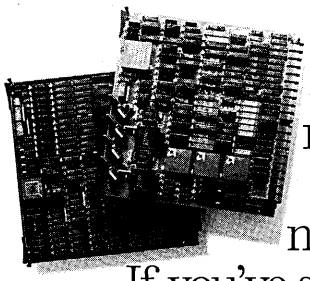

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problematic. Two years ago, Bristol-Myers Squibb Co. of East Brunswick, N.J., undertook a project involving the conversion of all internally developed research and development documents in its Princeton, N.J.-based Research Information Center (RIC) from microfilm to an optical storage and retrieval system.

Risk-Free Conversion

One reason for doing the project was to learn more about the technology. "Down the line, we have some ambitious plans for image, but this [project] was not one of them," says Alan Gilson, manager of the firm's Technology Assessment Group. Gilson terms the RIC project a production pilot that "posed no real risk to the company if the conversion failed."

Just as well, because, says Gilson, "what we learned is that integrating image is a lot more difficult than it needs to be." For example, problems cropped up when the implementers tried to use a session number from a database management system running on a VAX minicomputer as an index number to access an image document. "Sun workstations offered an implementation that was better than other vendors," says Gilson. "Even so, it was clumsier than it needed to be. Operators have to use Sun tools to transfer from the DEC terminal to an imaging session on the Sun server. That should be an automatic transfer; it shouldn't require human intervention."

How long will it take image vendors to develop the kinds of integration that users want? The answer depends on whether this technology truly poses unique challenges or whether it can benefit from the steep learning curve that other IS technologies have followed.

Some experts believe that image applications do pose special challenges. "Architectural issues for image are very different than for data," says Scott McReady, director of image systems for IDC/Avante, a Framingham, Mass., research firm. "They are much more complicated than most users, or many vendors, realize. One vendor may use a proprietary server architecture to handle high-volume I/O; another may opt for a different solution. Then there's a whole host of back-end storage issues and workstation design issues." According to McReady, the solution for one application will generally not be the optimal solution for another.

But this view is not shared by all—and certainly not by the image vendors. "I don't believe image technology requires a higher degree of customization than other new technologies have," asserts David Sarna, president of New York City-based Image Business Systems Inc. "But image is new technology, so people are puzzling through how to implement it with existing technologies. That means they often come up with a detailed requirement that isn't necessarily the ideal solution. It just happens to be the way they solved the puzzle."

Prevailing Platforms

Sarna predicts that, over time, a small number of accepted image platforms and approaches will prevail. He offers the analogy of building one's own database management system: "Today you'd have to be out of your mind to even consider it, but several years ago it was thought to be a reasonable question."

The challenge of piecing together imaging solutions has mainly fallen to systems integrators, many of which have standardized on a particular set of products that they use as a basic imaging platform. Litton Integration Automation, for instance, typically uses as its solution a standard platform consisting of an IBM mainframe, Sun workstations, a high-speed fiber optic backbone and a mix of printers and scanners.

□ INSTEAD OF HARPING ON TECHNOLOGY, THE IMAGE INDUSTRY IS SINGING SONGS OF SOLUTION.

The image vendors now appear to be following this lead by offering standard solution platforms, mainly through a flurry of vendor alliances. Image Business Systems, for instance, offers a package consisting of IBM RT workstations (to be replaced by RS/6000s later this year); optical drives from Laser Magnetic Storage International Co. of Colorado Springs; jukeboxes from Cygnet Systems Inc. of San Jose; OCR scanners from Santa Clara-based Calera Recognition Systems Inc.; Ethernet, Token Ring and fiber-optic networking solutions from a variety of sources; and IBS' own bar code software.

Indeed, there appears to be a real scramble to form alliances. Unisys Corp. recruited at least 10 suppliers—including FileNet, Plexus Software Inc. (also in Santa Clara) and Sigma Imaging Systems Inc. of Anaheim, Calif.—for its general purpose imaging product called InfoImage Folder, introduced earlier this year. Similarly, IBM offers a set of its own and third-party products as building blocks for its AS/400-based imaging system. "We think this approach takes a lot of complexity out of the equation for the customer," says Craig Grant, IBM's manager of AS/400 market development specializing in image applications.

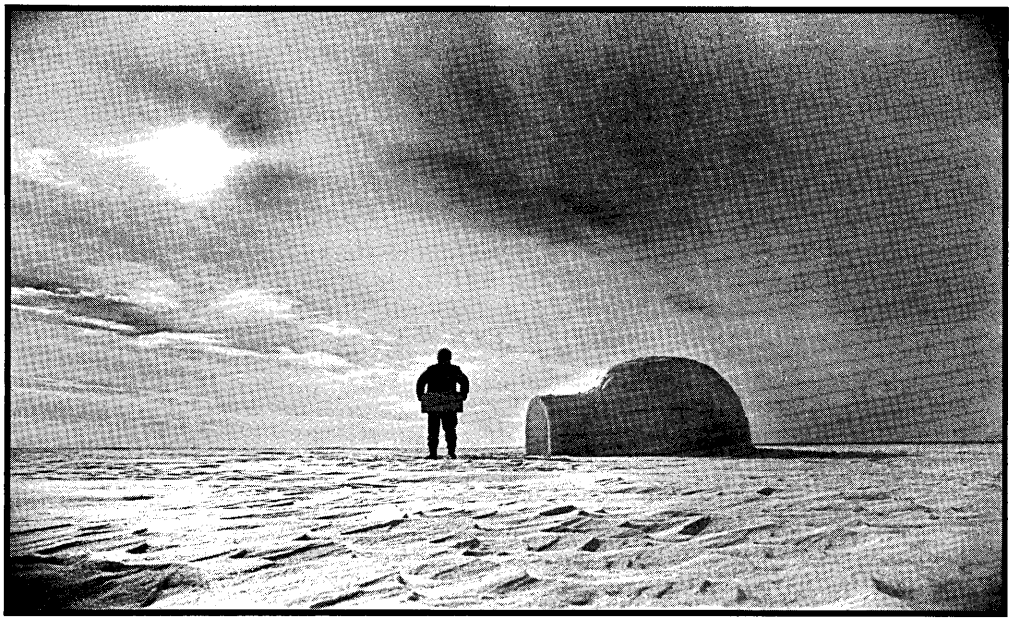
With imaging technology moving so fast, the vendor alliance approach represents in some respects a compromise solution. "We've got a platform that offers basic functionality, but if you have an application that needs the latest and greatest and fastest of a certain type of device, we may not support it today," says Grant.

Of course, there is no guarantee that the rash of vendor alliances will meet the specialized needs of many potential customers. David Coldren, executive director of the Illinois Criminal Justice Information Authority, has a case in point. "I've watched the technology get better and better, and now I'm seeing vendors and systems integrators put the pieces together. But no one has put them together in a system that meets our needs."

What Coldren has in mind is a unique system for storing and retrieving electronic images of court records. It would need to be a big system, he figures; Illinois has millions of court records on file, and the file for the average felony case is 3 inches thick. "There's a lot of information in those files that could have relevance to other criminal cases, if only we could get at it," says Coldren.

The bureau currently stores court documents on microfilm. Optical storage would improve the retrieval time for entire cases, but it still would not allow for key word retrievals based on the information contained within scanned documents. As yet, few vendors have linked OCR technology to imaging in a way that can accomplish this feat. Moreover, an indexing system that could keep track of all the names, aliases, dates, times, places and other data that might be relevant to a criminal prosecutor would be challenging to build. "We've talked with systems integrators," says Coldren. "They are doing some interesting things. But hiring a systems integrator to invent the missing pieces is too expensive." Nor does systems integration lend itself to the needs of a public agency, which typically must be able to point to a specific product before it can secure money from funding agencies.

"It's nice to see that the imaging pieces are starting to be assembled into vertical solutions," says Coldren. "It just doesn't look like ours is going to be one of the target markets anytime soon." □



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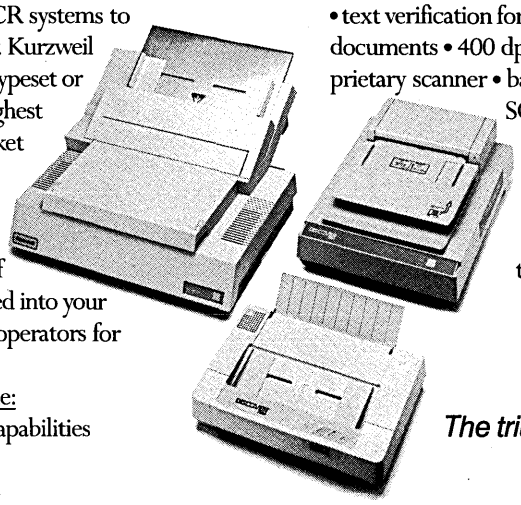

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SAS: Architecting An Open Strategy

For the past six years, SAS Institute has quietly built a $100 million software architecture, and now it's telling the world. But can the company use its new-found flexibility to keep growing in the brave new world of PCs and workstations?

BY PAUL PINELLA

Nashville's Grand Ole Opry House came alive last March as an excited audience of over 3,000 fans gathered to witness the unveiling of a new country hit: the rollout of the new SAS System. Here in the land of Willie Nelson and Dolly Parton, loyal users of the latest software from the SAS Institute Inc. of Cary, N.C., clapped their hands and stomped their feet at the appearance of every added feature. A point and click, menu-driven interface. A new micro-to-mainframe link. SQL support. And more.

Welcome to the kickoff session of the 15th Annual SAS Users Group International. If you want software religion, then the annual SUGI conference is a surefire way to get it. Few software companies inspire as much user loyalty as SAS.

Yet this software powerhouse with 1989 revenues of $205 million and some 2,000 employees has preferred the quiet life. Partly because its culture is more R&D than marketing minded, and partly because the SAS System is so huge that it defies easy categorization, SAS Institute practically drifted unnoticed into its slot as the world's 10th largest software company and one of the nation's largest independent software firms.

But that anonymity may evaporate with the advent of release 6.06 and a new commitment to raising corporate visibility. Founded in 1976 by James Goodnight and John Sall, SAS Institute has evolved from a publisher of data management software for academics and statisticians to a purveyor of 20 integrated products with over 125 built-in applications that are not just for statisticians anymore. With more than 2 million people in 88 countries using the SAS System on a wide variety of platforms, SAS is obviously addressing the needs of a lot more than just the mathematically elite. And, as SAS management likes to point out, the company's products really make up an integrated software system that can be used throughout an organization.

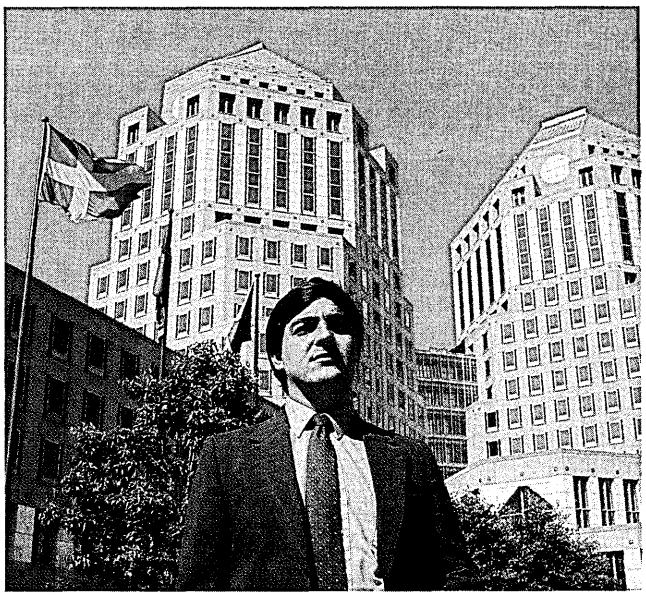
A Mainframe Heritage

SAS started out as a mainframe software company and still carefully nurtures its mainframe roots. The latest version of SAS, for example, breathes new life into mainframes by offering fancy new windows and drop-down menus in a way that few others suppliers have been able to accomplish on big iron. Indeed, the company estimates that half of all 3090 mainframes in the United States and Canada are running the SAS System.

By the early 1980s, SAS expanded its product coverage to include other popular platforms, including Digital Equipment Corp. minicomputers and the IBM PC. Then it ran into a brick wall. With so many platforms to support, it couldn't afford to continually rewrite SAS for every hot new hardware platform.

So in 1984, the company conceived a new structural design for its software that could easily adapt to changing hardware needs. With portability as a goal, the company explored rewriting the entire SAS System in the C language. The strategy made sense, but a problem arose when it was found that none of the commercial C compilers supported the IBM 370 mainframe architecture. To remedy the situation, SAS decided to develop its own mainframe C compiler and acquired Lattice Inc.—a Lombard, Ill., compiler company for PCs—to support the effort. Six years and $100 million later, SAS now has its MultiVendor Architecture (MVA) in place to bring up SAS on a wide variety of systems. "With 3 million lines of code in place, we must be doing something useful," deadpans Goodnight, president of SAS Institute.

Customers seem to agree. To stay in touch with user needs, SAS anually distributes a customer ballot in order to receive input on suggested



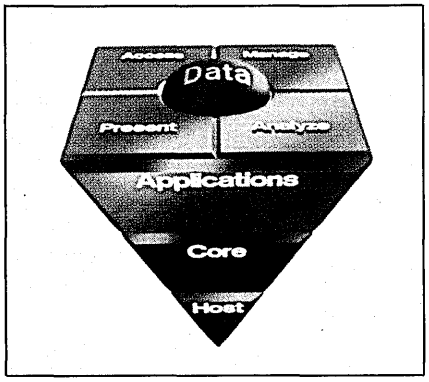
PROCTOR & GAMBLE'S ESPOSITO: With customer input, the new SAS System offers improved mainframe performance.

software changes. "We have a large say in the SAS ballot," says Thomas Esposito, senior systems analyst with The Procter & Gamble Co. of Cincinnati. When Procter & Gamble, a large worldwide user of SAS software, asked for certain efficiency improvements in CPU time, SAS responded with changes in version 6.06. "I feel they have been very responsive to our needs," Esposito says.

Datapro Research, a market research firm based in Delran, N.J., also monitors user satisfaction through an annual survey. On a scale of one to 10, SAS users recently rated their satisfaction better than nine. "It's a very versatile system," says Herb Gepner, senior associate editor at Datapro. Gepner is especially impressed with recent moves at SAS to evolve its software as an IBM DB2 query tool and general purpose database management language. "I don't think SAS would be as popular today if it were strictly dependent on its statistical analysis capabilities. But with its ability to get into more of the day-to-day type of operations and reporting, SAS is finding a whole new world opening up for them," Gepner says.

Pharmaceutical Support

Bill Rosen, senior systems analyst with Pfizer Inc.'s Central Research Division in Groton, Conn., points out another SAS strength—a virtual lock on the pharmaceutical industry. Because SAS Institute was out early with a statistical package, many pharmaceutical companies, like New York City-based Pfizer, began to use it in the product submission process. At



SAS' MULTIVENDOR ARCHITECTURE should allow SAS to be launched quickly on many platforms.

Pfizer, Rosen uses SAS to quickly develop a wide range of end-user applications. "SAS has allowed me to develop prototypes and menu-driven systems very quickly," he says. "It is truly strategic applications software that does a whole lot more than just statistics."

In a sense, the SAS System's breadth is both its strength and a weakness. Because it does so much—data entry, report writing, statistical analysis, business planning, project management, applications development, graphics—people unfamiliar with the product have never grasped its purpose. "The definition of SAS has always met with some confusion," admits Barrett Joyner, director, U.S. marketing.

Yet the problem that such outsiders have in classifying SAS doesn't seem to bother users. In fact, most seem happy to be able to pick and choose from among the modules in ways that suit them best. "It is like a Chinese restaurant," says Datapro's Gepner. "You have this main engine, the basic SAS System, and in there are some basic data management and statistical-type products. In addition, you have all of these other options in graphics, finance, operations and more."

With MVA now a reality, the number of SAS flavors should multiply even faster. SAS is already available for the PC under MS-DOS and on various UNIX-based systems; a version for the Macintosh called JMP was well received by the Apple community last year. The company is aggressively fulfilling a commitment to workstations by getting a point-and-click windowing version of SAS running this year on systems such as Data General Corp.'s AViiON workstations and IBM's RISC System/6000. A version of SAS for microcomptuers running OS/2 Presentation Manager was demonstrated at the company's recent user conference and should be shipped later this year. The company also says that work has started on a Microsoft Windows 3.0 version of the software.

Some observers liken the SAS multiplatform approach to IBM's own Systems Application Architecture (SAA)—the difference being that SAS has already begun to distribute its software, whereas much of SAA remains a statement of direction. Still, much work lies ahead in fully distributing the massive SAS system to take advantage of evolving client/server relationships on mainframes, minis and microcomputers. SAS/Connect, a new module that allows PC users to access information in DB2, Digital and Oracle databases, is a step in this direction.

Already, a few customers are building distributed systems that take advantage of the new SAS architecture. One such user is Richard LaValley, manager of operations analysis at MCI Telecommunica-

For the Record

Over the years, SAS Institute has passed a number of significant milestones, including the following:

1976
Company is founded as a publisher of statistical software for mainframes

1984
Work begins on MultiVendor Architecture (MVA) to bring software portability to the SAS family. Entails rewriting the entire SAS family in C
SAS software fully ported to the Digital VAX family
Acquires the SYSTEM 2000 DBMS from Intel Corp.

1986
Nominated by *Inc.* magazine for the fifth year in a row as one of the fastest growing private companies in the United States
Acquires Lattice Inc., a leading microcomputer C compiler vendor

1987
Releases full implementation of SAS under MVA for IBM PCs
Releases SAS for UNIX-based workstations from HP and Sun
Participates with IBM in announcement of SAA

1989
Revenues reach $205.6 million, 21% more than the previous year
Introduces SAS/ACCESS software for use with major DBMS packages
Participates with IBM in rollouts of AD/Cycle
Releases JMP software for the Macintosh
Cited as a Top 10 company for working mothers in *Working Mother* magazine
Full implementation of MVA appears in the SAS System versions 6.03 and 6.06
Signs a joint development agreement and a cooperative software program agreement with IBM

tions, based in McLean, Va. The MCI Communications Corp. unit is using the SAS multiplatform approach to build a new decision support system for management. "The reality is most companies have lots of different platforms," says LaValley. "But end users want the same touch and feel, no matter what machines they are on. SAS has done an excellent job in providing us with a mechanism to do that."

A Bridge to the Future

Another area where SAS seems well positioned is in its relationships with strategic suppliers. Last year, for example, SAS joined forces with Digital for the announcements of the VAX 9000, the VAX 6000 and the RISC/ULTRIX machines. It also teamed up with database supplier Oracle Corp. of Belmont, Calif., when that company announced its Open Solutions Vendor program.

But it is the company's ongoing partnership with IBM that may pay the highest dividends in coming years. SAS participated with IBM in the official launches of SAA and the AD/Cycle applications development strategy. And earlier this year SAS broke with tradition by signing its first cooperative-selling agreement, a pact allowing IBM to sell the SAS System on RS/6000s and PS/2s running AIX, IBM's version of UNIX. SAS also signed a joint development agreement with Big Blue, which will give SAS researchers early access to still-developing mainframe technologies, including vector and distributed processing.

□ FEW SOFTWARE COMPANIES INSPIRE AS MUCH USER LOYALTY AS SAS.

Despite its strengths, SAS isn't immune from competition. While its mainframe market appears virtually untouchable, the company's PC flank is vulnerable to fast-growing SPSS Inc., a Chicago-based company that parallels SAS in several ways. Both companies, for example, started out in a university environment. Both have evolved into vendors of powerful database management systems, both are privately held and both are run by strongly independent chief executive officers. Many analysts consider SPSS the market leader in the micro environment.

"The fact that these companies are private is quite unique in an industry where public companies tend to take leadership positions in the market," states Bernard Goldstein, director of Broadview Associates of Fort Lee, N.J., an investment banking firm. Although that private status isn't likely to change anytime soon, Goldstein says that SPSS may be more willing to investigate going public in the future. "And that may provide them with yet another opportunity to do an end run around SAS," he says.

Whatever ground SAS may have lost in the PC sector could be made up in the evolving workstation market, however. With MVA in place, several workstation versions of SAS already being shipped and an OS/2 package on the way, SAS seems poised to make the transition from a mainframe-oriented company to a distributed software supplier—even if it does mean loosening its ties to IBM's proprietary systems. □

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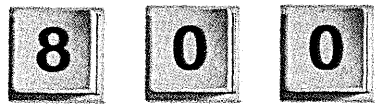

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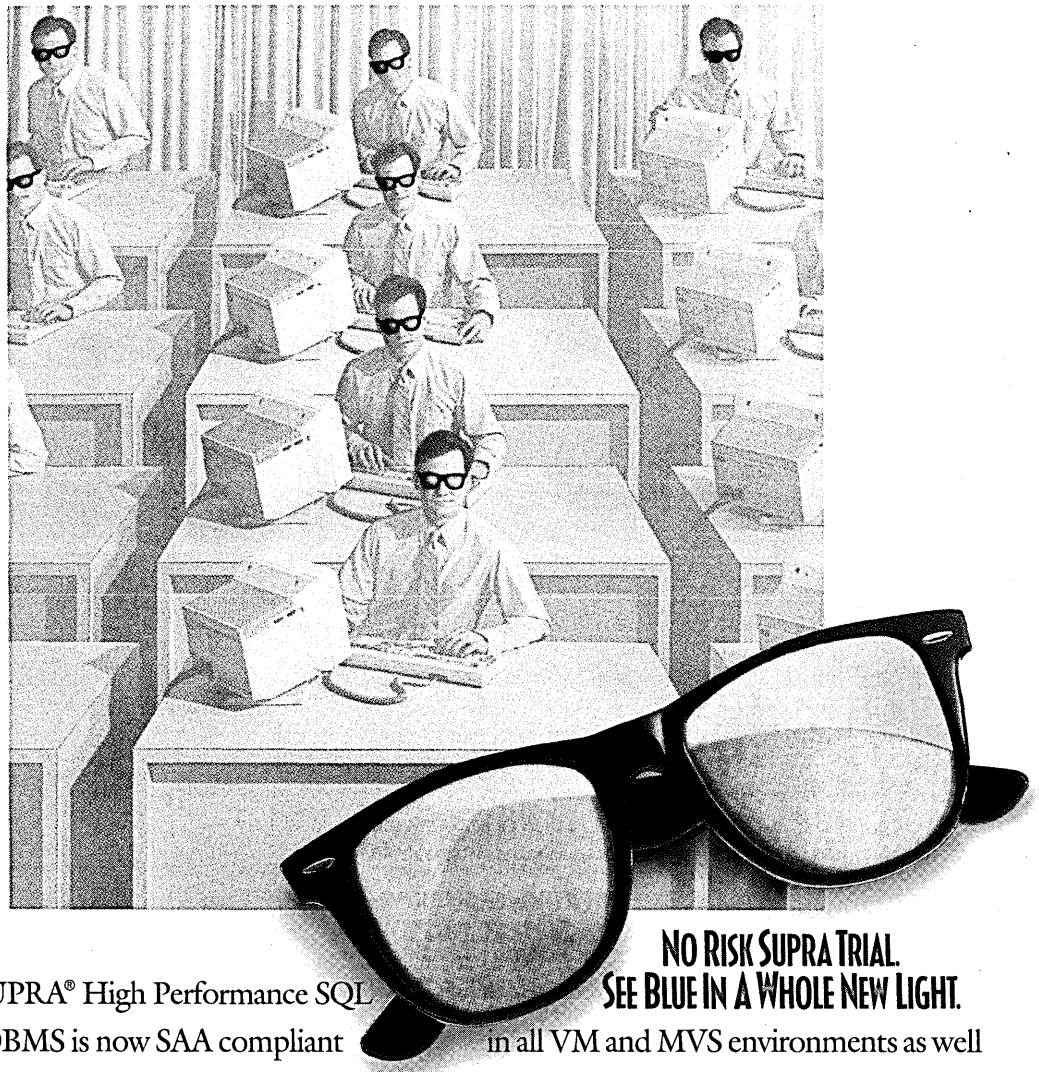

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IBM's Proprietary Paradox

Conventional wisdom holds that IBM's AS/400 cannot compete in a world of open systems and plug-and-play hardware and software. But new data from the 1990 DATAMATION/Cowen & Co. survey suggest otherwise.

BY CHRIS SIVULA

The midrange is dead. Proprietary systems are on the skids. Open systems, powerful workstations, local area networks (LANs), UNIX—such things are the future. At least, that's what many of today's leading analysts conclude.

So who can explain IBM's rollout of the AS/400? It certainly doesn't seem to fit the populist mold. Here's a machine that's as solidly in the midrange and as proprietary as systems get. Its introduction was timely as a new buggy design coming on the heels of Henry Ford's Model T production line. It's little wonder many industry observers view IBM's AS/400 skeptically.

As it turns out, the AS/400 may be a box of surprises. *Thriving* is probably too strong a word. IBM's comments following its first-quarter 1990 results indicate that midrange sales didn't keep up with the pace set by the high-end and PC product lines. Still, the AS/400 is alive, healthy and growing.

A Respectable Market

ADM Inc. of Cheshire, Conn., a consulting firm specializing in IBM midrange machines, estimates the total market for the AS/400 and related products at $10 billion annually. If this revenue belonged to a separate company all its own, those numbers would make it the third largest U.S. IS supplier, behind IBM and Digital Equipment Corp.

A recent survey of 2,756 DATAMATION readers conducted by New York City-based Cowen & Co. indicates that IBM's midrange line figures solidly in IS buying plans over the next two years. Interviews with users, industry analysts and IBM officials substantiate the data.

According to the Cowen data, of the 829 respondents who indicated they were planning to purchase an AS/400 over the next two years, fully 473 of them (57%) were not replacing any existing systems. And 24, or about 3%, of the total purchases are replacing computers built by IBM's competitors. Another 95, or about 11.5%, of the planned new purchases are replacing existing AS/400s.

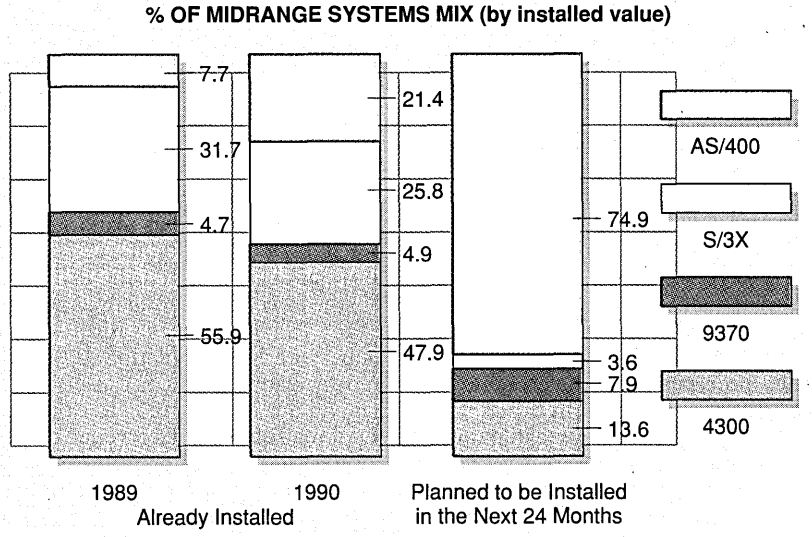
Still, it's impossible to get a definitive fix on the AS/400's success. In late 1988, IBM announced that it had sold 25,000 AS/400s during the first quarter that the machine was available. No sales figures have been released since, and analysts' estimates of the current installed base range widely—from 50,000 machines up to 150,000.

Although more than half of the surveyed readers are not intending to replace existing systems, IBM positions the AS/400 as the midrange successor to its System/36 and System/38. So, the conventional take on the AS/400 is that sales will dry up once IBM finishes upgrading its existing customer base. That's the way Michael S. Swavely, president of the North American Division of Compaq Computer Corp., sees it. "My understanding is that AS/400 sales are already trailing off," he says.

"They have System/36 and 38 replacement business, where they got very quick acceptance in that base and moved

Tomorrow's Midrange Forecast

A dramatic shift is under way in IBM's midrange systems mix. Although the 4300 still rules today in terms of installed systems, the AS/400 is projected to capture nearly 75% of IBM's midrange business over the next two years.



Source: 1990 DATAMATION/Cowen & Co. survey

many of those people very quickly. But they are not really getting into new accounts significantly," Swavely says.

Beyond Upgrades

Compaq recently introduced the SystemPRO, which it has positioned directly against midrange systems like the AS/400. Still, few dispute the fact that the upgrade market is important to the AS/400's future. According to the Cowen data, 211 of the machines that respondents plan to purchase—or a healthy 25% of the total—will replace aging S/3X machines. That's even conservative by IBM's reckoning. Fred Wiele, director of application business systems marketing for IBM, believes the Cowen data underestimate both the number S/3X midrange systems being replaced by the AS/400 and the number of competitors' systems.

"Somewhere between 40 and 50% of our installations are migrations from our installed System 36s and 38s. So, that is not incidental. It's a source that's accelerating," Wiele says.

Wiele declines to specify the number of AS/400s that are replacing competitors' computers, but he says that the success rate is better than twice the 3% the Cowen data indicate. ADM puts the number at 13%.

The Cowen data don't separate planned AS/400 purchases by the size of companies, but IBM estimates that some

□ THE LARGEST AS/400 PASSED THE LIFETIME SALES PROJECTION IN THREE MONTHS.

60% of the potential market for midrange multiuser computers is at small and intermediate-sized businesses. "Through the 1990s, that's a major market opportunity for us," says Wiele.

The Users' Report

Woodson & Bozeman Inc., a wholesale consumer electronics distributor in Memphis, represents both the small-business segment and companies migrating from a competitor's machine to the AS/400. Richard Murphy, vice president for data processing, figures he's one of IBM's smallest customers. His experience left him believing that IBM is taking small accounts seriously.

The company had been running its inventory control and accounting system on a Unisys Corp. B1955 mainframe. After 10 years in operation, it needed to be replaced. The price Unisys offered to upgrade Woodson to one of its A series mainframes was out of reach, Murphy says.

So, based on price alone, the company decided on an AS/400 model B35. Murphy was nervous. "I'm like the typical non-IBM user. You hear all these horror stories—that IBM will walk in and promise you the moon and then, when it comes time to deliver, they won't deliver."

Keeping Promises

But IBM delivered ahead of schedule, even arranging for two employees of a local software house familiar with the AS/400 to step Murphy through the conversion. The system was up ahead of schedule. It handled the company's monthly and quarterly accounting and inventory routines during the first few weeks of operation, all without a hitch, according to Murphy.

Although Woodson & Bozeman was attracted by IBM's favorable pricing, there is evidence to suggest there are fewer customers than IBM expected who are similarly willing to start out with low-cost systems. One surprise to come out of the 1990 Cowen data was a steep increase over 1989 in the average price of AS/400 systems that respondents plan to install, from $239,000 to $479,000.

IBM has acknowledged the drift away from the low end. When analysts pointed out last year that sales in terms of raw numbers were disappointing, IBM countered by claiming that because sales of high-end machines were better than expected, Big Blue met its revenue projections for the AS/400 anyway.

ADM has also tracked the trend. "The upper-end models are just going bonkers," says Dave Andrews, ADM's president. Based on numbers of units sold, the AS/400 fell 40% below IBM's sales projections for 1989, according to Andrews. But, in terms of dollars, sales met projections because of success in the high end. "The larger models are exlleeding their wildest dreams. One IBMer told me that the model 70 (the largest AS/400) passed the lifetime sales projection in its first three months."

ADM attributes that success to companies downsizing to the AS/400 from mainframe machines, a move that would require high-end AS/400s. ADM sent questionnaires to 100 large IS shops with annual budgets ranging from $16 million to $1.5 billion. Some 17% of those shops had already replaced mainframe applications with AS/400s, and another 28% planned to do so over the next 18 months.

When One Is Not Enough

Companies purchasing several, or even hundreds, of AS/400s account for a large slice of survey respondents' midrange business. Averaged out, the number of planned purchases in the Cowen data equals roughly one new AS/400 for every three respondents. Actual sales, however, are far from evenly distributed. Just two of the respondents surveyed by Cowen account for 33% of the total number of planned purchases. One company, an East Coast retailer, is installing 122 AS/400s. The other, a West Coast grocery chain, has 200 of the machines installed and is planning to add 150 over the next two years. They aren't named here because the Cowen questionnaires are considered confidential.

The trend indicated by those two companies is real, however, says IBM's Wiele. "About a quarter of our volumes last year came from multiples, large multiple kinds of orders," Wiele says. "We see it continuing into 1990."

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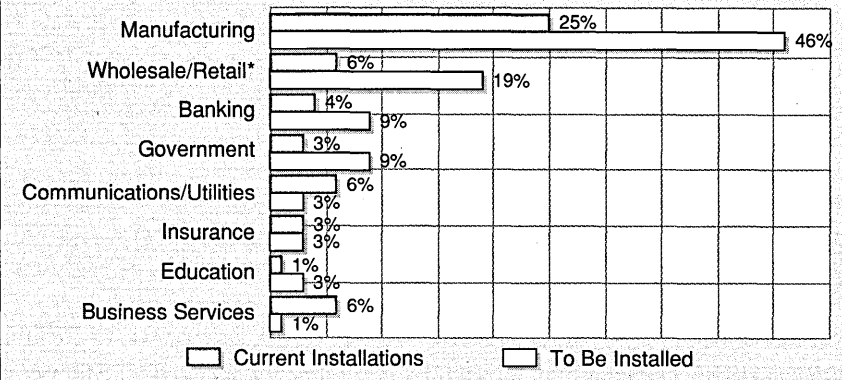

*Excludes four very large sites which, if included, constitute 26% of Current Installations and 61% of To Be Installed systems.

Source: 1990 DATAMATION/Cowen & Co. survey

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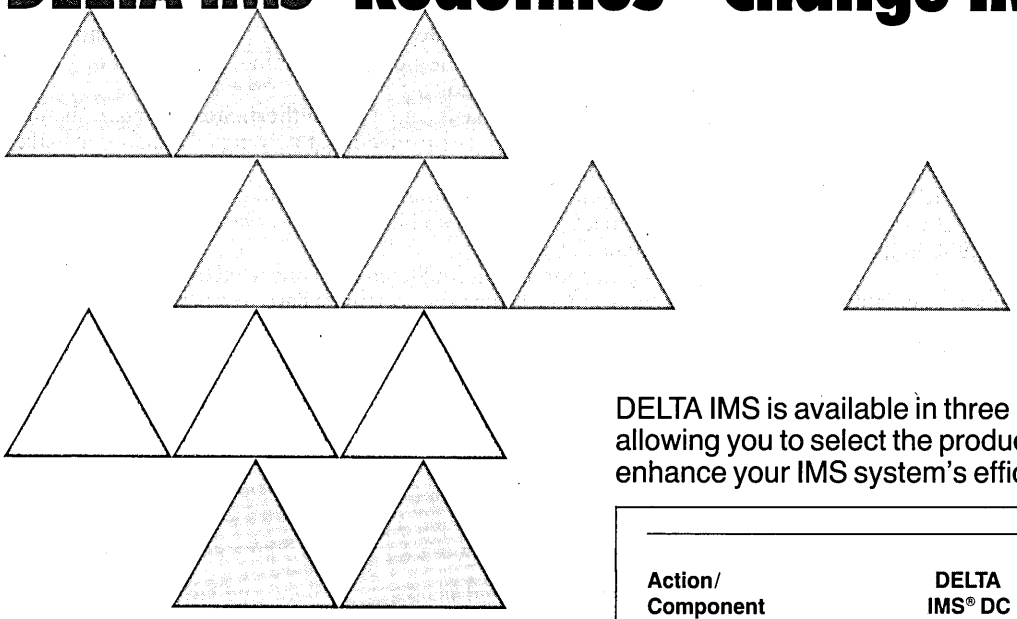

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Circle 17 on Reader Card

The Deutsche Bundesbahn, West Germany's railway system, is another IBM customer buying the AS/400 in multiples. The railway started off with IBM's System/36, installing 140 of them before the AS/400 was announced, says Volker Kiene, chief of data processing.

The transition wasn't entirely smooth, says Kiene. The railway had already begun building a payroll application on the 36s. Porting the software to the AS/400s was difficult. Working with IBM, it took a full year to port some 400,000 lines of code.

The software problems haven't stopped the Bundesbahn from pushing ahead with plans for a network of AS/400s. Some 600 will be installed by year's end. After two years, the full network of 750 machines is expected to be operational. Once complete, the network will control the payroll of 240,000 employees.

Plans call for connecting the AS/400s through a mainframe at the railway's headquarters in Frankfurt, using IBM's Systems Network Architecture (SNA). Eventually, the railway plans to add dispatching systems to control assignment of engines and a fleet of trucks, plus an inventory system for spare parts used in maintenance of the tracks and rolling stock.

At Canada Housing and Mortgage Corp., the IS staff took a similar track, starting to develop their office automation and electronic mail system with a few S/36 machines and converting in the middle of development when the AS/400 became available. Now some 60 AS/400s, ranging from model B20s to B60s, and more than 1,600 PS/2s link all 60 offices and 3,000 employees at the Ottawa-based government agency, which administers housing policy in Canada. Its offices include remote locations like Whitehorse in the Yukon Territory and Yellowknife in the Northwest Territories.

☐ COMPANIES BUYING SEVERAL AS/400S ACCOUNT FOR A LARGE SLICE OF IBM'S MIDRANGE BUSINESS

Installing the nationwide system proved to be a difficult task, says Bill Rowe, director of technical planning and support. "When we got it, it was a new box, and it was new in Canada. So, we lived through every bit of trouble," Rowe says. With heavy assistance from IBM, the network was completed in December. "It took us until this year to get things pretty well under control," he adds.

"As you are installing a system this size, you sort of steamroll over the problems. When you come out of the tunnel at the end, you've got to deal with all of the debris that you've left lying around," Rowe says. "We had as many software problems as we could possibly have imagined we could have with the 400."

Still, the $20 million system is viewed as a success. "Despite what the technicians and support staff have been through, users are pretty well uniformly delighted with the system," Rowe says. Employees, for example, were quick to shift from telephone calls to an electronic mail system on the AS/400 to transfer data, messages and documents.

An Open Debate

It's difficult to say exactly what the success of the AS/400 says about the move toward open systems.

According to IBM's Wiele, the open systems trend has probably been overhyped. AS/400 customers want the commercial applications, the integrated database and the large pool of trained programmers that just aren't currently available in the UNIX world, he says.

At Canada Mortgage and Housing, the proprietary nature of the AS/400 isn't an issue because the agency isn't writing any custom code to run on the AS/400 network. It's used strictly for packaged electronic mail and office automation applications. "Our applications run either on the mainframe or they run on PC LANs in the office. So, we're not tied to the AS/400 any more than we're tied to the word processor," says Rowe.

To replace about 50 S/36s used in its drug and pharmaceutical division, McKesson Corp., the San Francisco-based consumer products distributor, is evaluating both the AS/400s and Tandem Computers Inc.'s CLX systems, another proprietary machine. The issue of open systems never came up, says Rick Sierra, manager of distributed systems for McKesson. Freedom from vendors can come at a cost: a shift in responsibility for support and maintenance from the vendor to the user. "We were more concerned about vendor support of the operating system, rather than us supporting the operating system," he says. ▭

A Convert Confesses

Mike Patano, MIS director at Southern Steam Inc. in Mobile, Ala., wasn't in the market for an AS/400. Now, his company is something of a showcase for IBM's midrange machine. Southern Steam's system is featured in a video produced for Big Blue's sales staff.

The transportation company had $1.5 million invested in its existing system—two Digital Equipment Corp. VAX computers running a shipping system via a network linking 25 offices across the nation. Converting to a different system didn't seem practical.

Besides, in a position at another company, Patano had some bad experiences dealing with IBM. "I was no IBM lover," he says. And two consultants from Price Waterhouse, hired to make recommendations for increasing Southern Steam's computer capacity, said the costs of converting to a non-VAX system would prove prohibitive.

"We had serious problems in 1988," Patano says. The existing system was running at capacity. Although the company was ready to take on new customers, IS couldn't handle the additional work load. By last fall, Southern Steam had all but purchased a new high-end VAX 6000 to resolve the problem. "DEC had a chance to sell us another computer. We were at the point of deciding," says Patano. "We wanted them [Digital] to tell us what to do."

Digital was scheduled to make its pitch to Southern Steam's board members last October. Then, two weeks before the meeting, IBM wangled a chance to make a rival presentation. "I don't know how they did it," Patano says, but IBM came to the meeting with a complete plan, including installation, training and promises of ongoing support and maintenance. "Two weeks later, we were walking away from a $1.5 million investment."

By the first of the year, Southern Steam had converted to an AS/400 B60. Patano the skeptic is an evangelist now. "I no longer have to worry about whether I can deliver what I promised," he says.

A ship delayed in port costs the company up to $15,000 a day, he says. So far, IBM's service and support has been able to meet the company's demand for full-time availability to prevent shipping delays caused by problems with the system. "Our vendors were always pointing fingers at each other in our old system."

As a showcase, Patano thinks he might be getting special attention from IBM. But if Big Blue can deliver similar service and support consistently to other customers, "those guys are going to knock somebody's socks off," he says.

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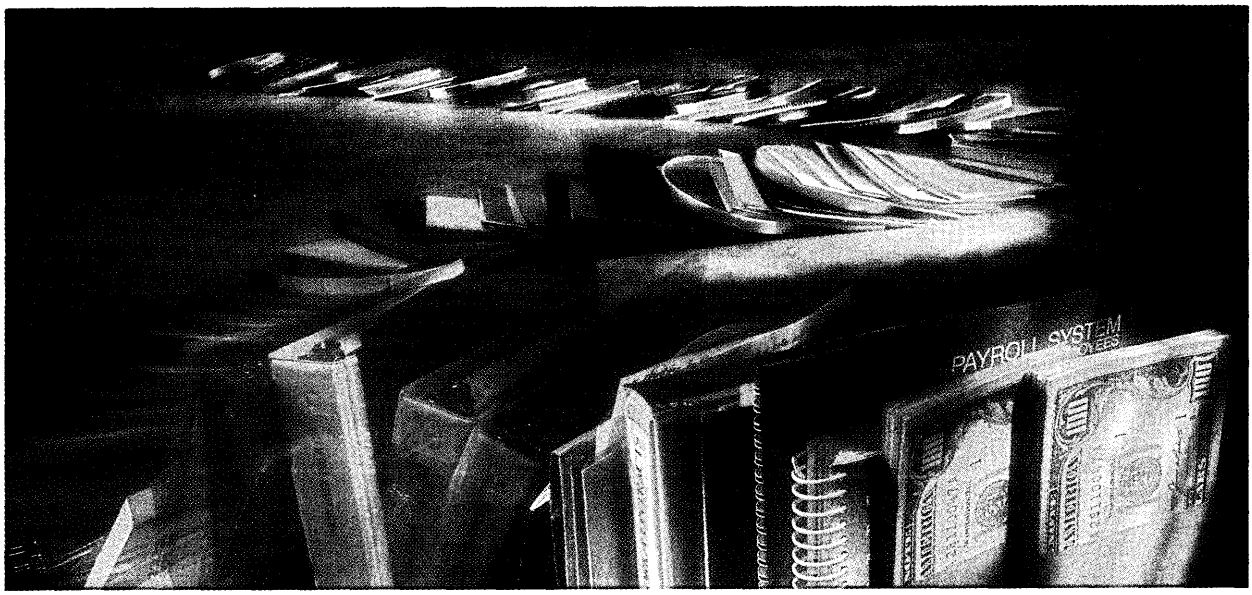

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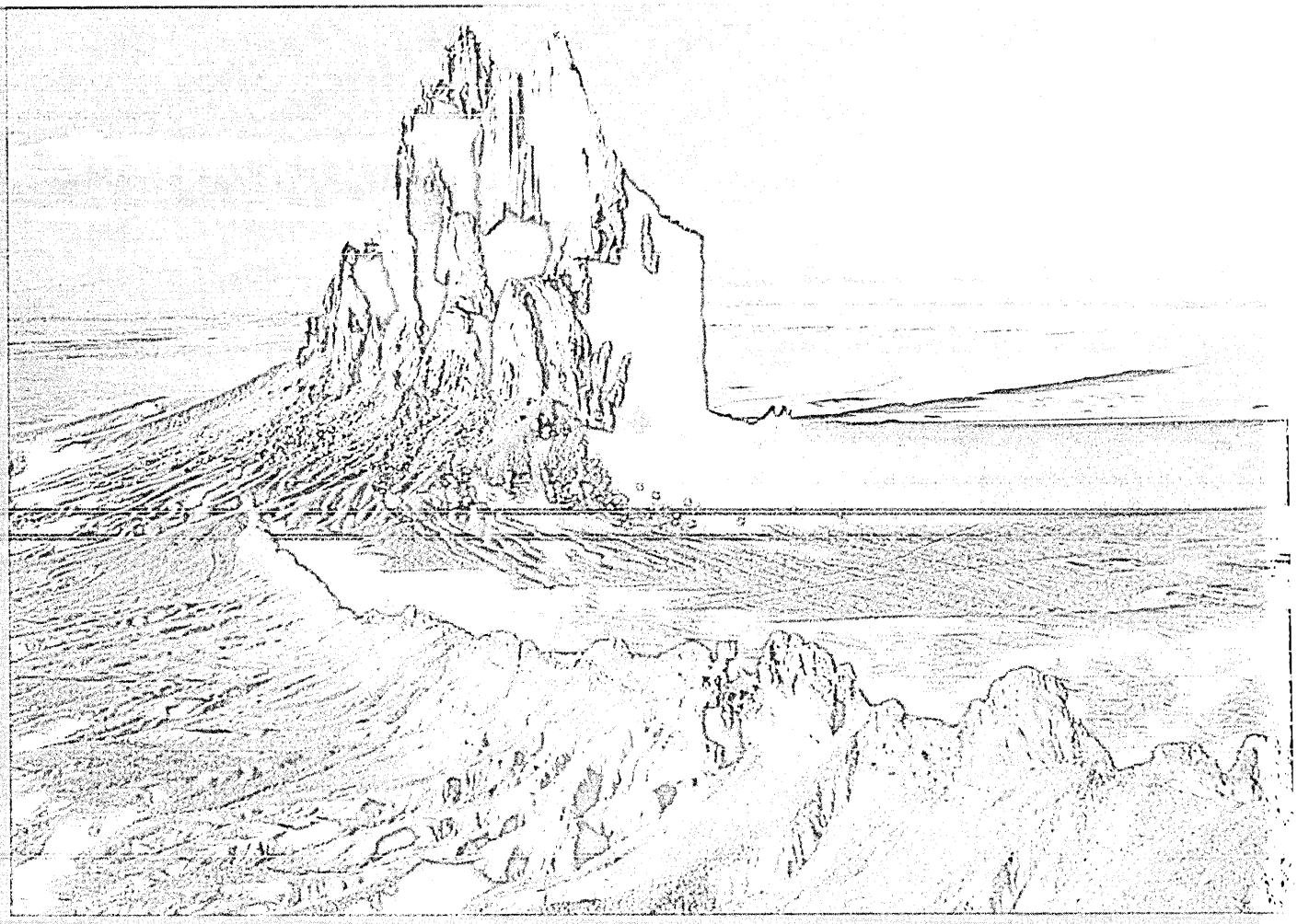

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A Sampling of Servers

Most server products are characterized by high processor power and relatively low cost.

COMPANY	PRODUCT MODELS	PRICE	AVAILABILITY	CIRCLE NUMBER
Advanced Data Servers, a division of Extended Systems Inc., Boise, Idaho	SQL Engine	$23,000	current	Circle 101
Banyan Systems Inc., Westborough, Mass.	Corporate Network Servers:			
	CNS386	$21,995*	all current	Circle 102
	CNS486	31,395*		
Compaq Computer Corp., Houston	SystemPRO Models:			
	386-240	$15,999	all current	Circle 103
	386-420	19,999		
	386-840	25,999		
	486/25-120	13,999		
	486/25-320	17,499		
	486/25-650	20,499		
Digital Equipment Corp., Maynard, Mass.	PC LAN/Server Models:			
	3100	$13,125	all current	Circle 104
	316	10,215		
	333	12,360		
Netframe Systems Inc., Sunnyvale, Calif.	NF Network Mainframes:			
	NF100	$22,500	all current	Circle 105
	NF300	35,000		
	NF400	45,000		
Sun Microsystems Inc., Mountain View, Calif.	SPARCserver Models:			
	1-Plus	$13,900	all current	Circle 106
	330	28,900		
	370	53,900		
	470	59,900 for SCSI		
	470	74,900 for IPI		
	490	99,990		
	40/25	27,900	current	
	44/25	under 35,000	July 1990	
	48/25	under 40,000	Sept. 1990	
Tricord Systems Inc., Minneapolis	Model 30/25	$19,900	current	Circle 107
Zenith Data Systems Corp., Santa Clara	Z-1000 Models:			
	200	$18,500	all current	Circle 108
	300	21,000		
	400	26,300		
	500	34,000		
	600	45,500		
	Z-386/33E Models:			
	150	$11,999	all current	
	320	13,799		

*Base prices for Banyan CNS servers include the Vines 386 or 486 network operating system software. Software is licensed per server, and server hardware is not sold separately.

hard to classify as PCs, given their power and memory features. Machines from new start-up companies such as Netframe Systems Inc. in Sunnyvale, Calif., can provide peak internal transfers at speeds comparable with many mainframes even though they are based on Intel 386 and 486 microprocessors, offer full IBM PC compatibility and run Novell's NetWare and Microsoft's LAN Manager operating systems for PC LANs.

J. Scott Haugdahl, senior technical consultant at Architecture Technology Corp. in Minneapolis, puts the Compaq SystemPRO into both the PC and mini

□ NOW THE SERVER MARKET IS BEING DRIVEN BY THE SHEER NUMBER OF PCS.

categories: at its high end, it falls in the mini camp, at the low end in the PC arena. "SystemPRO has a dual personality, but at the high end, it is definitely a minicomputer." And, he continues, "the exotic new machines like [the ones from] Netframe are not really PCs at all. They are a new, highly specialized category of minicomputer with high performance and high functionality. These servers are not made to [respond to] keystrokes from 100 users, but to serve 100 PCs."

Netframe introduced its first three products late last year (models NF100, 300 and 400) and calls them "network mainframes." Although the company is a new name in the industry, it was started by a familiar face—Carl Amdahl, vice president and founder of Trilogy Ltd. Advanced Data Servers, a division of Extended Systems Inc. of Boise, Idaho, and Minneapolis-based Tricord Systems Inc. are two other start-ups currently in the market. Established network systems vendors Banyan Systems Inc., Sun Microsystems Inc. and 3Com Corp. also offer servers in this category.

Features of Network Computers

Forrester Research Inc., a consulting firm in Cambridge, Mass., calls these new machines, not surprisingly, "network computers." Compared with AT class PCs, these machines sport improved reliability through redundant power supplies, remote diagnostics and duplicate components; greater throughput; and mixed network support. The computers range in size and are priced from $20,000 to $100,000.

Forrester says that the important criterion for servers in the future will not be MIPS—millions of instructions per second—but NIPS—network I/O per second. Faster I/O is a key capability for future network servers, or network computers, according to Forrester president George Colony. These servers will offer five to 25 times the file and processing throughput of PCs or minicomputers.

Colony expects mini/mainframe vendors such as Digital Equipment Corp., Hewlett-Packard Co. and IBM to announce network computers by early 1991, while Kernochan at Yankee Group predicts that other PC companies will follow Compaq's lead and upgrade their offerings to stay in this market, as well.

The larger-systems vendors are currently trying to protect their installed base by selling customers on the idea of using their existing or upgraded mini/mainframe as their network server when their existing PC server becomes overloaded, says Kernochan. "That strategy is playing reasonably right now, but it is purely a defensive move by the vendors and is mainly being pitched to their installed base to make sure that erosion of the low-end mini market doesn't become serious," he suggests.

Kernochan also expects to see these vendors shifting to specialized servers, because, he says, "they also see the server and networking markets as the future."

HP, for example, sees the server market and network computing as being in the process of a three-stage evolution in which minicomputers have a definite role, according to Duncan Campbell, marketing manager for HP's Colorado Networks Division in Fort Collins, Colo.

The first stage, in which DOS servers work in a homogeneous environment to provide shared printers and files, is an established market—one "owned by Novell," says Campbell. The second stage, which he sees as the current leading edge of the market, is where minicomputers will become popular as servers in response to a more heterogeneous environment. "There will be a mix of DOS, UNIX, Macintosh workstations, a need for graphical user interfaces, the beginnings of client/server applications," he says.

In the third stage, distributed computing, networks will become enterprisewide, and applications will be distributed across a variety of equipment on the large, dispersed networks from different vendors.

Minis will be attractive in stage two because of the increased need for centralized database servers, network backup and other applications that require larger machines, says Campbell. PC servers will continue to exist, but will work with the mini server. Enterprisewide network management will become a strong requirement by stage three, he adds.

However, HP's strategy for both stages two and three sound more like Forrester's description of network computers than minis. "By being the developer of LM/X [LAN Manager/UNIX] for LAN Manager, we can get LAN Manager products out pretty early for stage two," says Campbell. To prepare itself for stage three, HP will need a set of applications-programming interfaces (APIs) that can be used across a range of systems. It will also have to support the Network Basic Input/Output System (NetBIOS), an API that activates network operations on IBM PCs and compatibles running under DOS. And it will have to support Named Pipes, a communications channel used in Microsoft's LAN Manager, which provides a pathway for applications developers to use in writing distributed network applications.

While vendors continue to define their server strategies, users are trying to sort out what their servers should do, say analysts. "Two main issues in this market re-

□ MANY NEW SERVERS ARE HARD TO CLASSIFY AS PCS GIVEN THEIR POWER AND MEMORY.

main to be sorted out," says Kernochan. "How much server is the user looking for, and what should it do—applications, communications, file service or all of those?"

Fault Tolerant Hardware

The Yankee Group feels that two important criteria will emerge for server hardware: the communications performance and a high degree of fault tolerance. Kernochan says Novell has been trying to make its NetWare operating system software as fault tolerant as possible, but he adds that fault tolerance must be a hardware requirement, as well.

"You need mirroring disks, symmetric multiprocessors, etc. Hardware is cheap enough now that these features are not prohibitive. None of the servers today meet these criteria. Netframe is probably the closest in fault tolerance, but it is just a start-up," says Kernochan.

Despite the power in the new machines offered by these start-up companies, users may be wary of a smaller company, Kernochan adds. Alza Corp., a Palo Alto-based pharmaceuticals company, is a case

in point. Fred Knox, the firm's director of information systems, recently acquired 16 SystemPROs.

"We looked at Netframe, but Compaq is not as large a departure from standard architecture as Netframe is. Also, you can't run the standard version of NetWare on Netframe; it has to be the Netframe version. And Netframe only supports Ethernet and Token Ring so far, and we have ARCnet cabling," says Knox.

"But we are certainly aware of Netframe and some of the other new server companies and will be watching them. We may add some of those machines after the companies are more established," says Knox.

Knox is already planning to acquire more SystemPROs. He calls his strategy "buying futures." Some of the machines will replace the 30 older Compaq DeskPROs that have been used as file servers on his Novell network of 400-plus PCs at two separate sites (with a third site to be added soon). Others will be used in various server functions until required in the major conversion to network computing that Knox expects to occur within three to five years.

"Our PC network is our primary computing resource. It will become our only computing resource in three to five years, as we move applications off of our DEC VAX and onto the network. By buying these SystemPROs, we are looking ahead to the growth of our network. Some of the DeskPROs are OK now, but may not be in a year—the DeskPRO CPU may be big enough, but the I/O isn't good enough to give us the response time we need."

□ Our PC Network Will Become Our Only Computing Resource In Three To Five Years.

Knox plans to phase out the VAX 6220 minicomputer that now handles many of the firm's financial, human resource, inventory and other applications because it would be too slow and expensive to use as a file server. "We are better off with SystemPROs. If we could use the VAX as a database server, that might be attractive, but it is not clear that we could do it efficiently using NetWare for VMS, and it would be expensive. Specifically, he says, "NetWare for VMS for our size operation would run $19,000, plus about $50,000 worth of compilers, interfaces, programming, etc."

In March, the company converted its Palo Alto site to NetWare 386, and it added its second site in Mountain View, Calif., in May. At press time, the third and smallest site in Vacaville, Calif., was on schedule for conversion in June. All three sites, which are connected via T1 links, had been using Nestar networks.

"With 650 employees and $92 million in revenues, the applications include a little bit of everything," says Knox. Most of that revenue comes from developing the technology for packaging and producing controlled-release drugs, which it licenses to the other drug manufacturers.

Most of the existing PC network is for administrative applications, and systems in the research and development labs and in the manufacturing group are also on it. Shop floor control and other design/manufacturing areas will be added as the network continues to become extended throughout the enterprise.

The SystemPRO's EISA bus feature was attractive, as was its existing support of many standard interfaces. Netframe's proprietary bus architecture does not support some of these interfaces, Knox points out. Faced with the demands of companywide network computing, Knox is looking for machines that can perform as file servers, database servers, communications servers—whatever his needs are as the network evolves.

More Users, More Resources

As this evolution to network computing begins, companies will need to add more users to their networks and increase the resources offered to those users. While the problem of sheer numbers of client workstations could be addressed by adding more PC-level servers to the network, users and analysts see these new, more powerful servers as a more economical alternative for the long term.

But beyond the boom in sheer numbers of PCs connected to LANs, a change in the way processing is performed over networks will fuel the move toward bigger servers with faster input/output rates and more disk space. IS managers say that the same user needs for access that brought in renegade PCs and LANs several years ago are now driving the need to implement more sophisticated network applications. But because these application needs are enterprisewide, involve more company resources and require more sophisticated programming, they can no longer be introduced by bypassing IS. As a result, new servers from both start-up and established vendors are expected to receive an easy welcome from users who need to upgrade overstretched networks within the next three to five years. □

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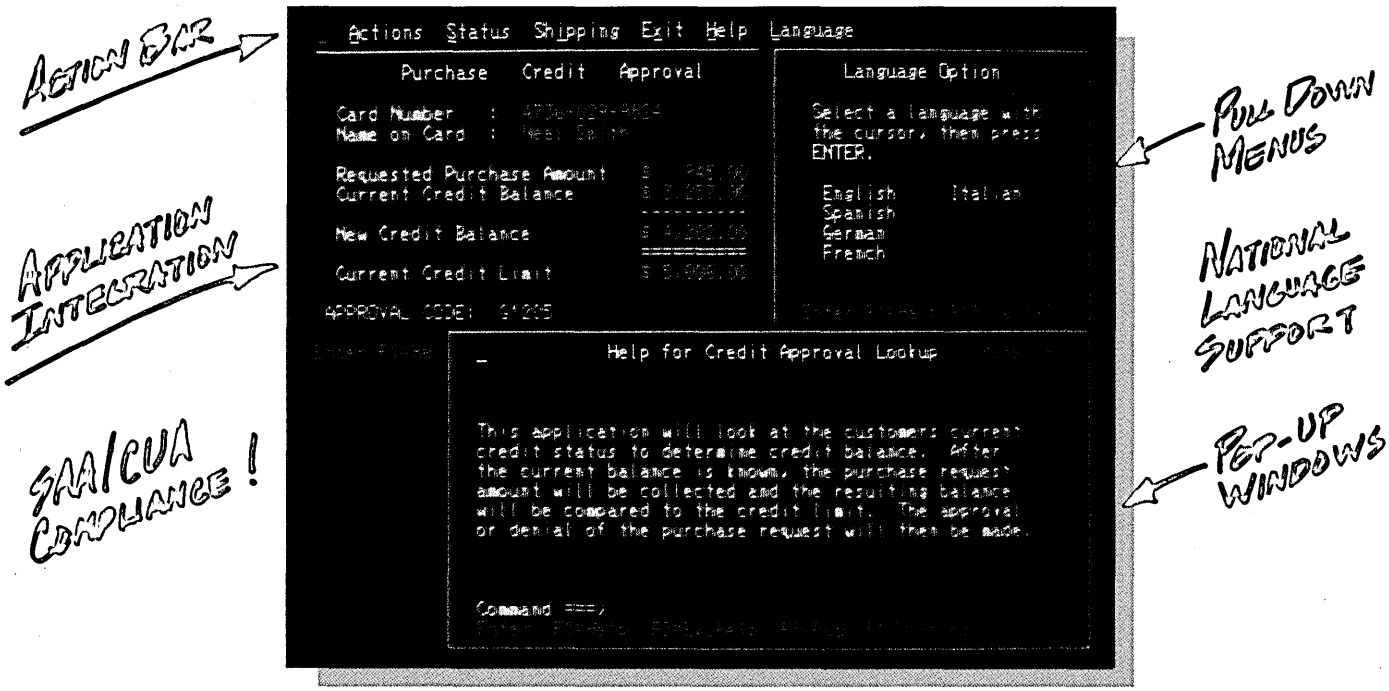

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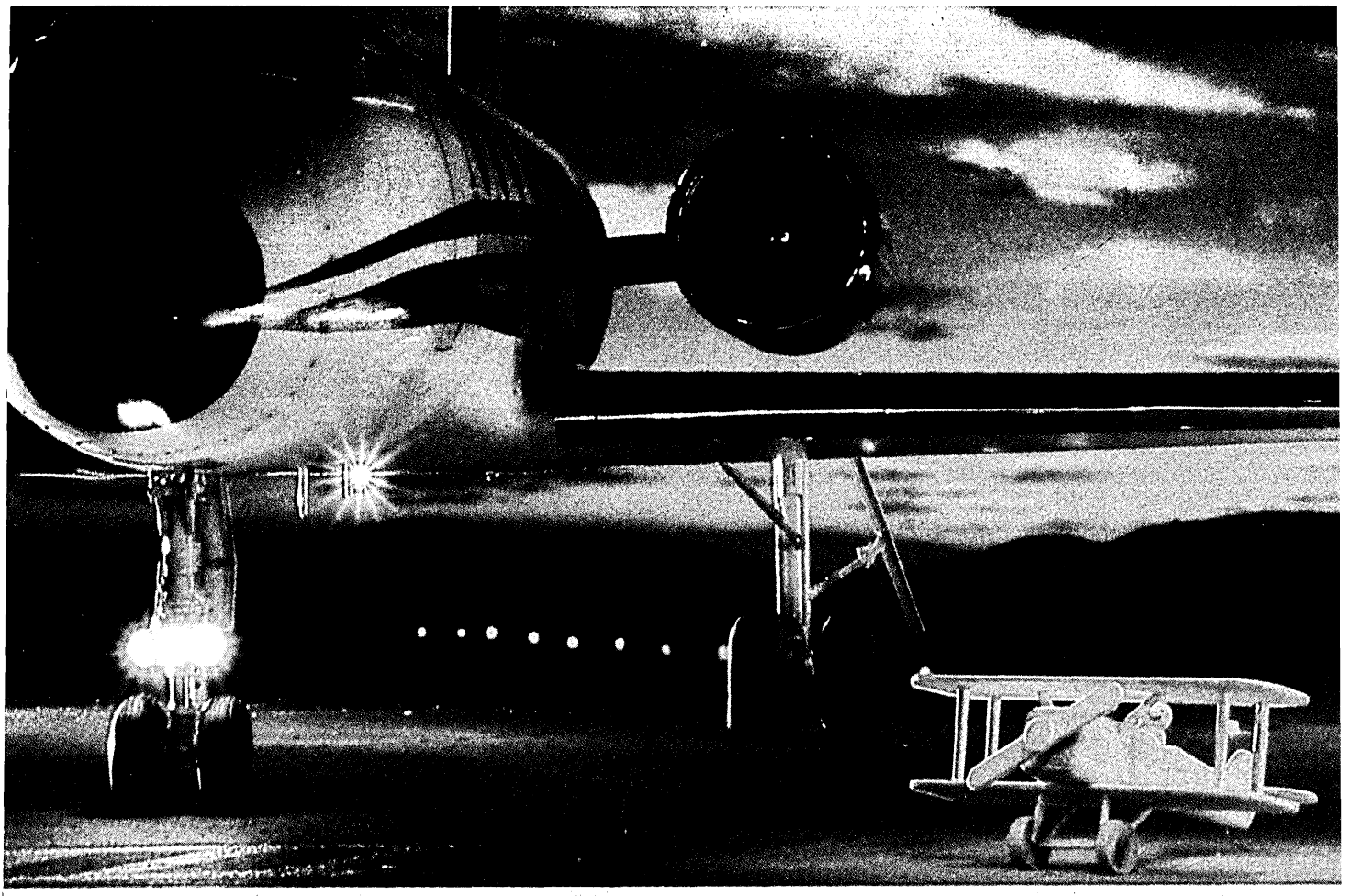

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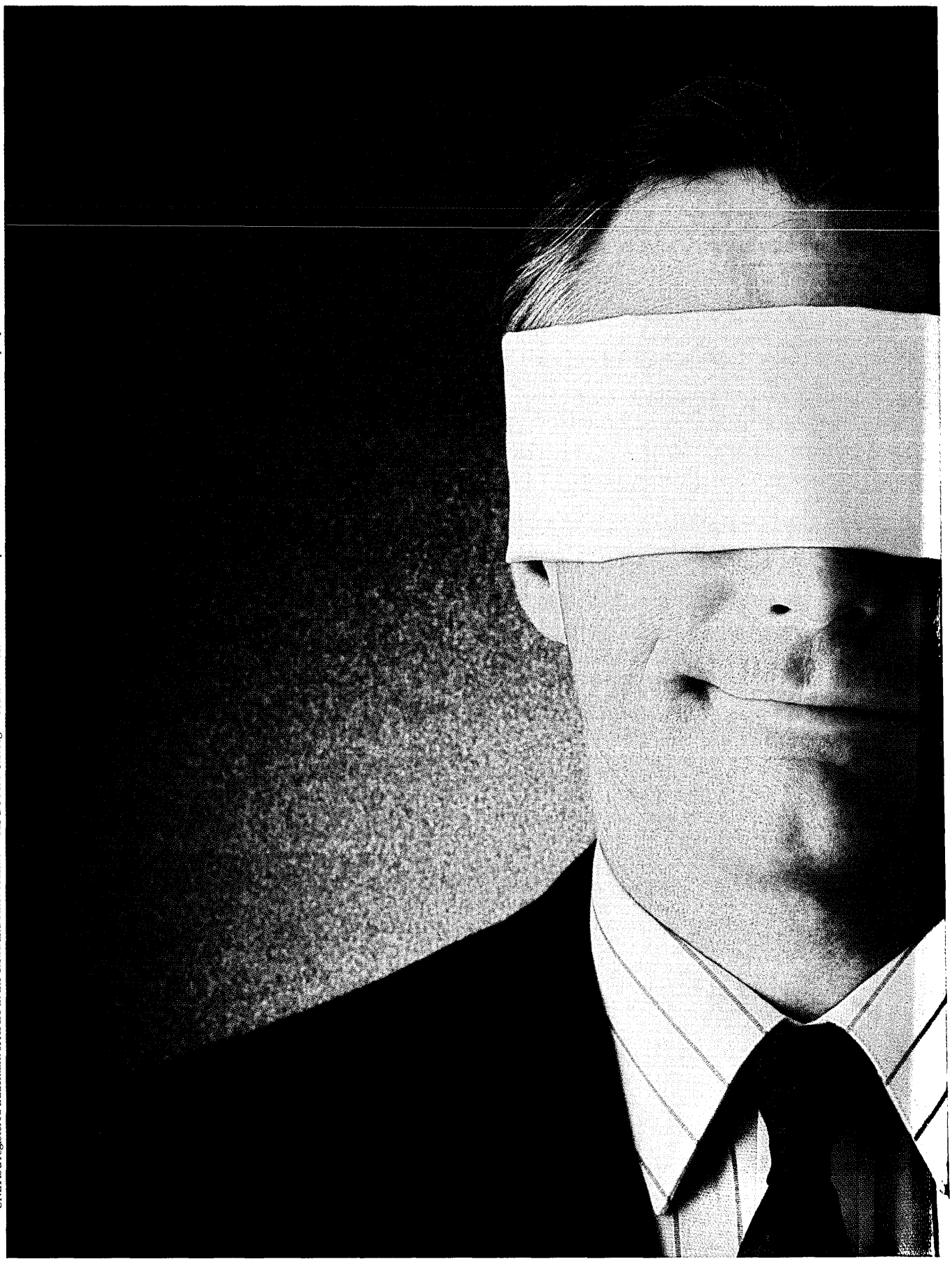
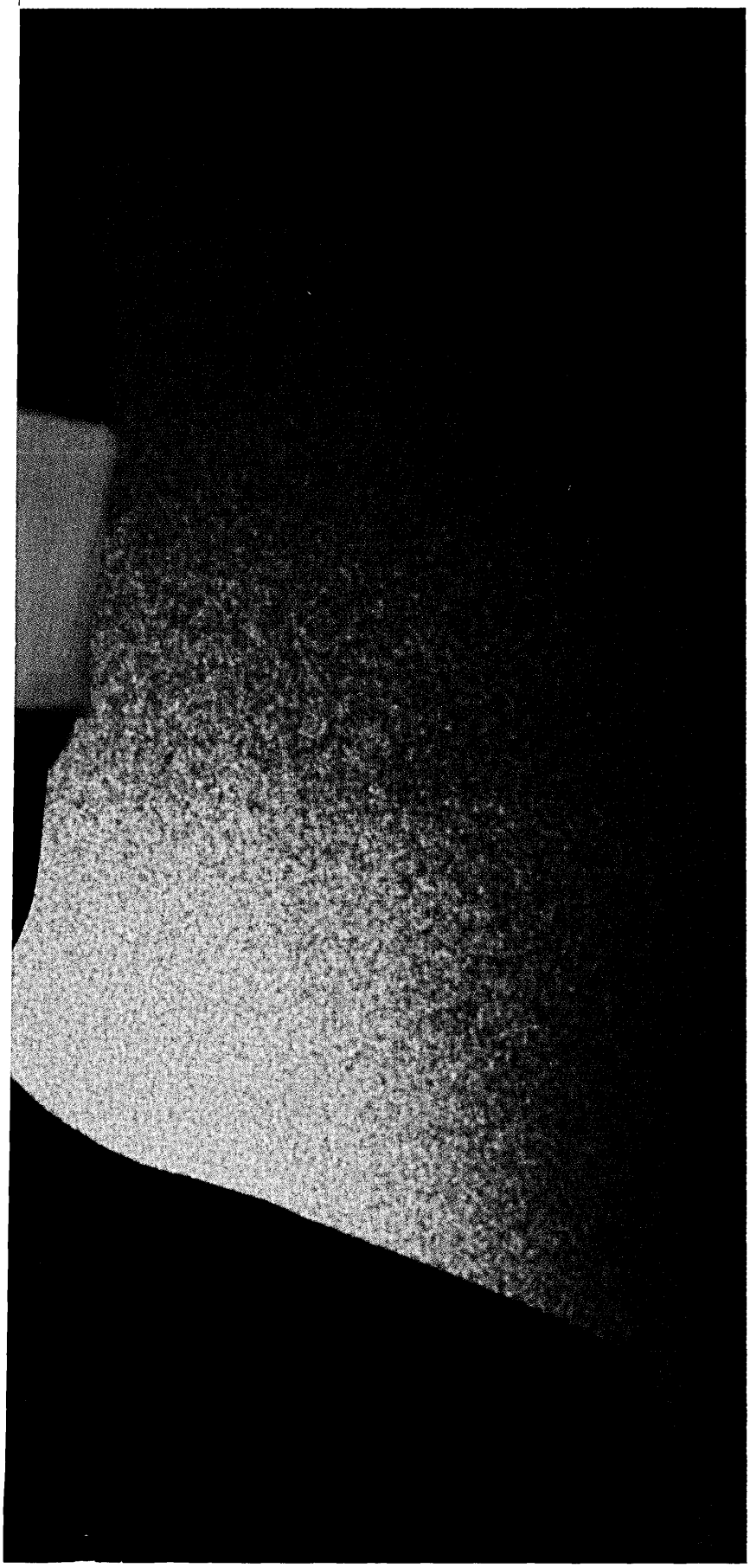


)fficeVision has a few limitations.



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What's Your Strategy For Buying PCs?

All those PCs in your company may now represent your largest technology asset. Should you continue to buy or should you lease? And what's to be done with all those older PCs?

BY JANETTE MARTIN

Buying personal computers can no longer be an uncoordinated exercise of helter-skelter purchases. Decisions about which PCs to invest in, whether to buy or lease, how to depreciate and what to do with older machines are increasingly vital to corporate technology investment strategies.

The purchasing strategies of large, experienced organizations can be illustrative for companies refining or creating their own personal computer strategies. When PCs and PC software constitute a company's largest asset base in information technology, PC investments must be made with care.

Large companies work out their investment strategies in a variety of ways. For example, some companies form a technology committee that meets regularly to coordinate technical needs with market offerings, IS standards and technology acquisition practices. The net effect is to align PC acquisitions with corporate goals.

The PC Workstation Advisory Council at Rochester, N.Y.-based Eastman Kodak Co. is one such group. The council is made up of 12 people who represent Kodak's four business groups (Health, Chemical, Information and Imaging); its major functional areas (Administration, Finance and Corporate IS); and the technical community.

Kodak's PC Picture

Joe Luppino, director of Personal Computing Services for Kodak, is a council member from the technical community. "People from our business groups and functional units bring their PC needs to the meetings," he says. "People from the technical community coordinate those needs with PC acquisition strategies."

Illustration by Sally Wern Comport

Luppino's area oversees acquisition procedures for PCs and related services, such as networking and consulting. He manages a technical staff that provides high-level consulting within the company and coordinates activities across platforms to ensure technical consistency. In a company with an installed base of some 30,000 PCs in the United States alone, that's a pretty tough order.

"We try to match business requirements with the company's technical strategy when we produce a PC acquisition strategy," Luppino says. For example, Kodak is acquiring 32-bit technology. If someone needs PCs, 32-bit machines should be the order of the day. "We're also looking at cross-platform PC software," Luppino adds, "so we give preference to specific products like Microsoft Word that can run on a PC or a Macintosh."

Weyerhaeuser Co., the paper and forest products company headquartered in Federal Way, Wash., uses a different approach. The company's information systems are highly distributed, and autonomous divisions have their own IS groups. Business units make their own decisions about what and when to buy.

For help in making technology decisions, Weyerhaeuser's autonomous divisions turn to the company's Information Management Program. The program includes a task force composed of IS and business unit managers. The task force oversees "improvement teams" for data management, technology management and information management.

☐ IN MANY COMPANIES, PCs REPRESENT THE LARGEST INFORMATION TECHNOLOGY ASSET.

The technology management improvement team identifies technology problems and then seeks resolutions. The team tackles issues of PC investment choices. Resolutions are approved by the Information Management Program and recommended to the unit where the problem originated.

Weyerhaeuser's Personal Computing Support Group publishes acquisition recommendations via "Weyerhaeuser Personal Computing News," a newsletter that it sends to all of the group's clients throughout the company. "Through the newsletter we can keep our clients up to date on new developments and make recommendations, such as to use 386 machines," says Bette Stephens, the group's business manager. "Ultimately, clients are free to choose what they want." Stephens' group is active in holding forums and technology-briefing seminars and in publishing evaluation results, all to make sure clients have as much information as possible when making PC purchasing decisions.

MASS MUTUAL'S DABOUL: Wary of technology advances, he has most of the PCs used by field agents under leasing agreements.

Continental's Top-Level Approach

Continental Corp. of New York City takes yet another tack. Technology investment decisions are made in the office of the senior vice president of systems, where the staff is also involved in approving projects for in-house clients. Even if a client has a platform in mind for a particular project, the senior vice president's staff has the final responsibility for deciding which platform to use.

Large PC users prefer to buy rather than lease, although leasing has its place in an overall PC investment strategy. Peter Hill, senior vice president for BankAmerica Corp. Systems Engineering (BASE) Telecommunications Services in Concord, Calif., explains his company's technology investment plan: "We buy through a quantity agreement with IBM because we get a better discount that way. Because of the quantities we buy and our environments, it doesn't make sense for us to lease or rent machines. But we'll lease or rent if we want to try out a new technology."

At Boston-based Massachusetts Mutual Life Insurance Co., about half of the company's 4,000 PCs are used in the home office. The other half are used by field agents, usually under leasing agreements. The home office assists field agents in choosing machines that conform to companywide standards. Software supplied by the home office reinforces the use of standard machines in the field.

Peter Daboul, vice president of Information Systems Services at Mass Mutual says, "Historically, buying has worked out to be better than leasing for machines that we tend to keep over a period of four to five years. Leasing is attractive when you have technology changes; the downside is the significant capital investment that's required."

Continental's switch from buying to leasing was tied to the company's financial strategy. Says Guckes, vice president of systems, "A few years ago, we had three- to four-year leases on equipment. The term of the lease was based on the life of the project the machines were assigned to. Because of a change in financial strategy and the realization that the PCs had longer lives than we originally thought, Continental began buying rather than leasing."

Because of the negotiating agility of one of Guckes' colleagues, Continental has secured attractive purchase contracts and has even purchased leased equipment for a fraction of its book value.

According to Guckes, IBM encourages Continental to buy from dealers rather than to buy direct. Kodak, too, purchases most of its PC hardware and software from dealers.

Weyerhaeuser has agreements with vendors and dealers from whom the company can purchase or rent PCs. Although Weyerhaeuser divisions can choose their own equipment, all rentals, which are

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usually used for short-term projects, are arranged through Stephens' area.

Kodak's Luppino says about 90% of the PCs used at the company are purchased. "We've done a number of studies and have found that for tax reasons and the best residual asset values it's advantageous to buy." Luppino suggests that PC purchases are a little like car purchases. "If you buy a Yugo you can't expect to have any residual value. But if you buy a Rolls Royce you're counting on having a high residual value."

50 Ways To Leave Your PC

Once equipment is purchased, the company must decide the depreciation terms. This decision is generally based on the length of the project for which the equipment will be used. On the average, PCs are depreciated anywhere from three to five years. However, depreciation terms can be much longer or shorter.

BASE's Hill notes two exceptions in his company. "We expect that PCs networked for transaction processing will have much longer lives than those used in other applications. The depreciation may be up to seven or more years. And while we've been depreciating desktop workstations for spreadsheet, word-processing, or e-mail applications over four years, this year we're expensing them over one year because of technology changes." Many users are thinking about shorter depreciation terms.

Equipment that is fully depreciated and is either no longer needed or is replaced by newer technology can be dealt with in a variety of ways. Indeed, there are many names for the practice of finding a second life for a PC. These include rolling over, redistribution, trickle down, cascade down, hand-me-down and fixed redeployment.

Some companies warehouse used PCs until a request for them comes along. New users are either those who have been using lower-level technology or those who have not had a computer at all. PCs that have been warehoused may be sold to a third party if no one in the company asks for them within a certain period of time. Companies that don't want the bother of warehousing can sell unused PCs immediately.

☐ SOME COMPANIES WAREHOUSE OLD PCs UNTIL A REQUEST FOR THEM COMES ALONG.

One company was able to sell a large quantity of 286-based machines back to IBM, when Big Blue was pushing the company in the direction of 386 machines. An international company that has its processing priorities focused on the United States moves older PCs to international offices.

Kodak's Luppino thinks his company will need to look at redistribution more closely in coming years. "As we need more speed and more memory, we'll have a much greater demand for replacements," he says.

The Effects of OS/2

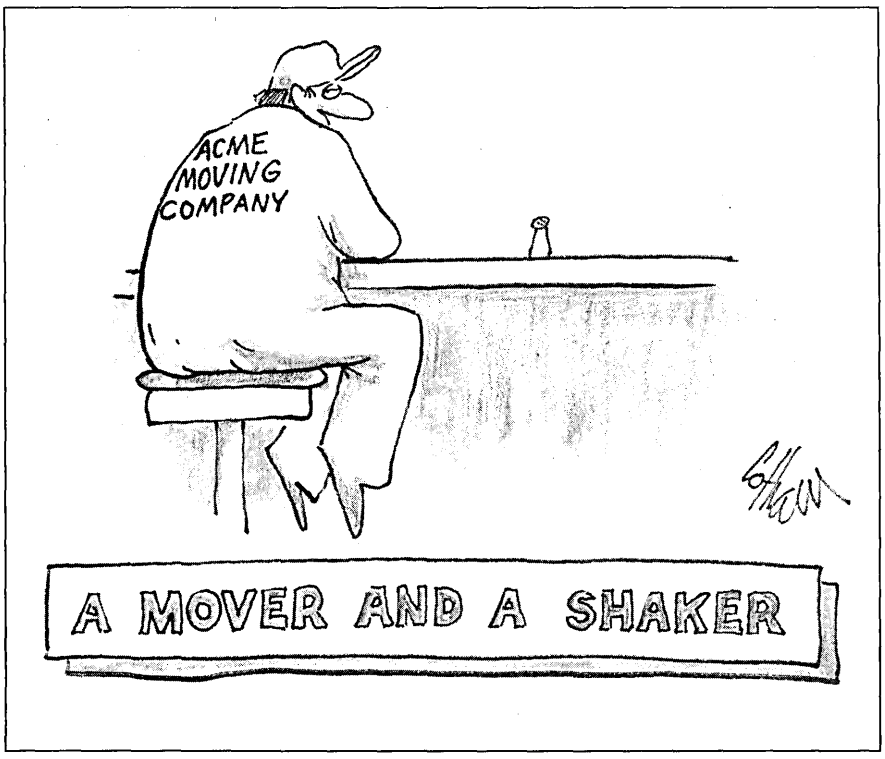
A major concern for IS managers involved in planning their companies' PC investment strategies is the OS/2 operating system. Says Guckes, "Right now, Continental doesn't have an application that requires OS/2, but I can see the need on the horizon. When applications require a certain response time, we'll need OS/2's concurrency. That will mean a major platform change."

Another Continental systems vice president, John Vande Creek, says the company is developing prototype OS/2 applications in areas such as image processing and expert systems. "The OS/2 investment level is significant," says Vande Creek. "But if we get even a 2% gain in productivity, the investment will be worth it."

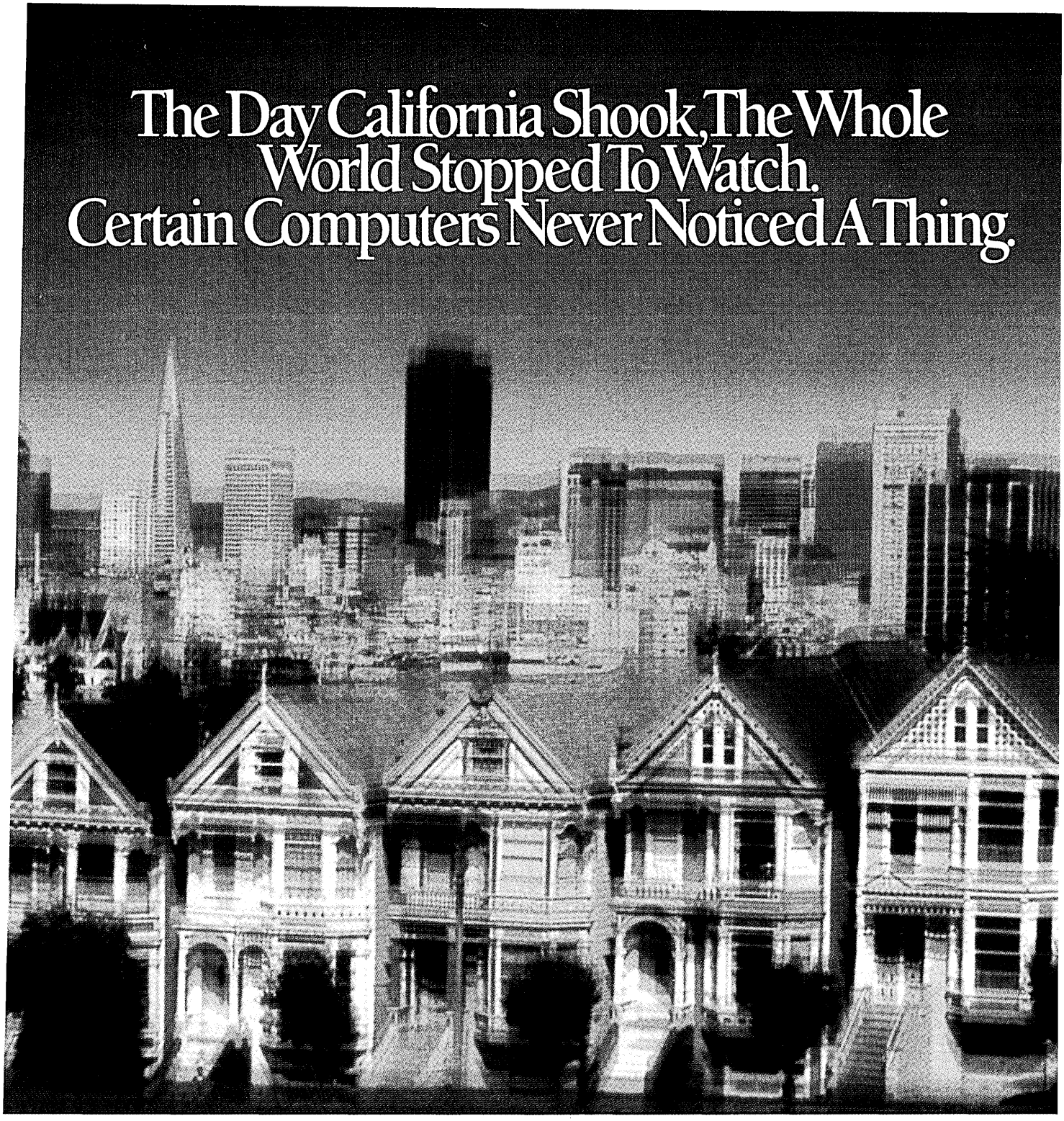
Mass Mutual is also deciding whether to go with OS/2. It's also trying to discern how the architecture might be rolled over in the most efficient, economical manner possible. Mass Mutual's Daboul explains how serious a decision OS/2 is in light of the current investment in non-OS/2 architecture. "We're talking about a fairly large piece of the budget in PCs, because a PC is an integrated component. You have to consider the fully bundled costs involved such as software, support, consulting, the controller port, the LAN administration and the chunk of the mainframe." Daboul estimates that, in the last five years, its investment in bundled workstations has been second only to its investment in mainframes.

PC investment strategies cannot be hastily made. Daboul sums up how many of his colleagues feel about the tricky nature of investing in PCs. "The PC evolution is moving faster now than it was five years ago. Because of OS/2 and 386-to-486 changes, your investment decisions tend to become obsolete faster. In order to minimize risk and protect your investment, you may have to skip a generation of technology and make maximum use of the one you're heavily invested in. You hope you don't have to roll over the technology just for the sake of rolling it over." ▭

Janette Martin is a freelance writer based in Lexington, Ky.



The Day California Shook, The Whole World Stopped To Watch. Certain Computers Never Noticed A Thing.



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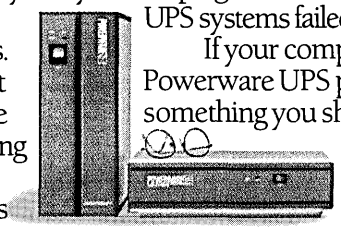

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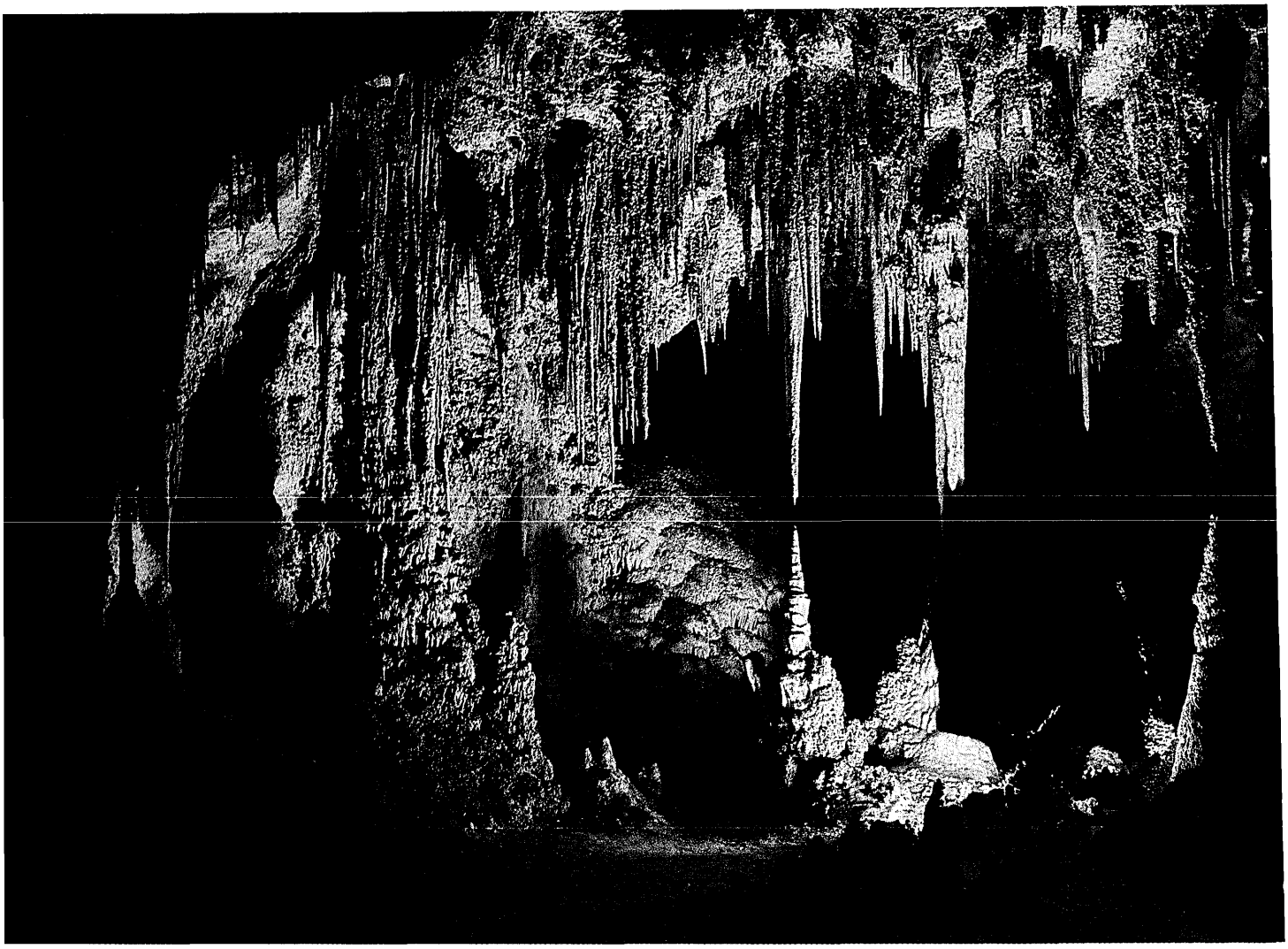

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Learning to Cure Technical Obsolescence

A commitment by IS employees and their employers to ongoing education can help eradicate a lapse in professional development that often strikes professionals after the age of 40.

BY WILLIAM A. WOODARD

Information systems professionals who work in one organization year after year doing energetic and valuable work for their employers may be in for a rude awakening. Dedication to a particular job that they do well may have led to a false sense of security. That security is summarily stripped away when a pink slip comes floating their way, making these workers the latest in a long list of victims of technical obsolescence.

Technical obsolescence, which spells cancer for a career, is a serious and growing problem afflicting IS professionals, particularly senior analysts and programmers. The disease, which can stop a computer career dead in its tracks, strikes employees whose technical knowledge hasn't kept up with the state of the art. These hapless employees, usually in their 40s and 50s, are sidelined into marginal functions or given less important assignments. Sometimes, they're even laid off.

IS professionals can cure this debilitating disease by taking charge of their own careers and pursuing ongoing learning programs. This is done in partnership with enlightened management that encourages continued education and retraining. Age, after all, does not affect a person's ability to learn new tools, techniques and work approaches.

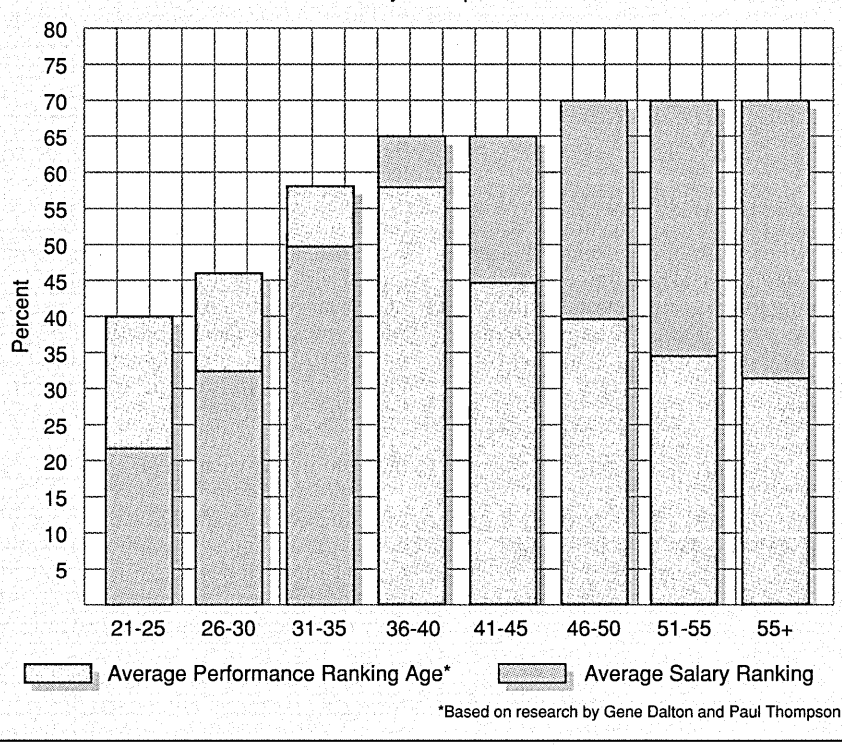
Age, however, does appear to affect job performance. This was one of the major findings of research conducted in the 1970s by Gene Dalton and Paul Thompson on engineer obsolescence. Based on my own independent research toward a PhD dissertation, I found that this study generally applies to the IS profession. No other relevant research has been published to date.

The Dalton and Thompson research showed performance evaluations falling after the age of 40. In the peak periods between the ages of 31-35 and 36-40, performance hit nearly 60%. In real terms, that means engineers in those age brackets were judged to perform better than 60% of all the engineers who were rated. Performance then rapidly dropped off for each subsequent age bracket. (It is important to note that these are average ratings and they are not meant to reflect negatively on the many older engineers who receive top performance ratings until they retire.)

If you compare these ratings to average IS salary practices, the widening gap between performance and pay after the age of 40 becomes very apparent. To make this comparison, the same percentage scale is used and applied in a similar fashion. So, the average IS employee in the 31-35 age bracket, say, would fall into the 50% salary range. And again in real terms, this would mean that the person would earn a salary that's better than 50% of all other IS personnel

The Salary-Performance Gap

After 40, pay outdistances performance for the average information systems professional.



*Based on research by Gene Dalton and Paul Thompson

in the organization.

Although performance decreases after the age of 40, salary does not. In fact, the salary levels of older employees actually go up slightly, even though their yearly increases diminish. The continued high salaries for lower performing people after age 40 is a cause for concern and raises other issues such as pay-for-performance and equity. This salary-performance gap graphically and dramatically illustrates the economic impact of technical obsolescence.

Pay for Performance

Are the organizations that have to pay the economic penalties ultimately responsible for technical obsolescence? Are these same organizations suffering from organizational obsolescence which in turn spawns technical obsolescence?

Modern management approaches such as those espoused by Peter Drucker typically make the organization responsible for the well-being of its employees. I believe, on the other hand, that an employee takes quite a risk by trusting the organization in this regard. After all, the drive for customer satisfaction and profit in the immediate quarter places heavy demands on organizations—particularly on line managers.

Some major companies have the resources and commitment to take care of an employee from entry to retirement. But only a handful of companies fall into that category. One that does is IBM, whose "no layoff" policy forces it to address the issue of obsolescence. The company has undertaken complete career retraining for large groups of its employees whose areas of expertise are no longer required due to changing market conditions.

□ THE VIEW OF THE COMPANY AS CARETAKER HAS TO CHANGE.

Most IS professionals, however, do not work for IBM or similar companies. Many work for government agencies or private IS user organizations that don't have lifetime employment policies; nor do they have a day-to-day association with current technology and techniques. Thus, the view of the company as caretaker has to change. Employees must take control of their own careers. The company's role then becomes one of a partner, assisting the employee in career-long education and development.

Unfortunately, the concept of the adult learner is not well understood, even among employees themselves. For IS employees vulnerable to technical obsolescence, the need to explore ongoing educational opportunities is particularly crucial. Many IS professionals have to realize, perhaps for the first time in their careers, that doing the same thing for 15 years has made them obsolete and overpriced. And as a result, they become candidates for replacement or they fall victim to downsizing or other cost-cutting campaigns.

Typical line managers are equally in the dark when it comes to adult education, which they tend to view as the domain of the human resources department. Managers themselves need to learn how adults learn, and they need to become aware of modern adult-learning principles. Such awareness helps ensure that their own practices are actually conducive to employee development.

A Lesson in Learning

Although there are many experts in the field, no single, unified view of adult education exists. There is, however, general agreement about the major characteristics of the adult as learner. One leading authority, Malcolm Knowles, offers the following assumptions about the adult learner:

- The adult learner sees himself as increasingly self directed.
- The adult learner's experience is valuable and should be taken advantage of by others.
- The adult learner's readiness to learn develops from life tasks and problems.
- The adult learner's orientation to learning is task centered.
- The adult learner is motivated by internal incentives.

Adult-learning principles do a good job of involving the individual. They place a large burden on the organization, which must properly identify development requirements. The organization must also plan, design, conduct and evaluate effective development programs, always bearing in mind the needs of the individual learner.

Adult learning principles tend to consider the person as more of an independent agent who must be supported by the organization. In essence, it's the individual, not the organization, who is responsible for his own training and learning.

This responsibility means that career planning and education pursuits over a person's lifetime should be self directed. So, any deficiencies between current and desired proficiencies must be assessed and plans implemented to close the gap.

In assuming this responsibility, individuals must also make sure that their work tasks and assignments provide learning opportunities. It is not safe to assume that job assignments will automatically be done in your best interest. Therefore, it's a good idea to keep your eyes open for project assignments, which often provide the best opportunity for on-the-job and other forms of informal learning.

Education does not have to mean sitting people down in a classroom, supervising them, lecturing them and hoping they get something out of it. Education can, and should, be conducted outside the classroom as well, via such means as interactive videodisc or even satellite networks. I would recommend that 75% or more of the educational effort be done outside the classroom.

□ DOING THE SAME THING FOR 15 YEARS HAS MADE IS STAFF OBSOLETE AND OVERPRICED.

Enlightened companies will support self-directed career development because it provides them with a more productive and stable work force. In the long run, it saves them money while saving their employees and their families from the trauma and disruptions associated with technical obsolescence.

The solution to the salary-performance gap then, is not to reduce salaries or eliminate IS employees after the age of 40. Instead, the solution stems from ensuring their performance remains high. Nevertheless, the primary responsibility rests with the individual. It is my belief that a commitment to life-long learning—on the part of both employer and employee—is the only way to prevent technical obsolescence. Without such prevention, this career cancer will continue to rob individual companies and industry of the critical contribution that can be made by an aging work force. □

A 21-year IS veteran, William Woodard is currently a PhD candidate working on his dissertation on the topic of technical obsolescence of computer professionals. Woodard is eastern region vice president of Computer Science Corp.'s Applied Technology Division in Falls Church, Va., which provides facilities management, software development, maintenance and support services including training.

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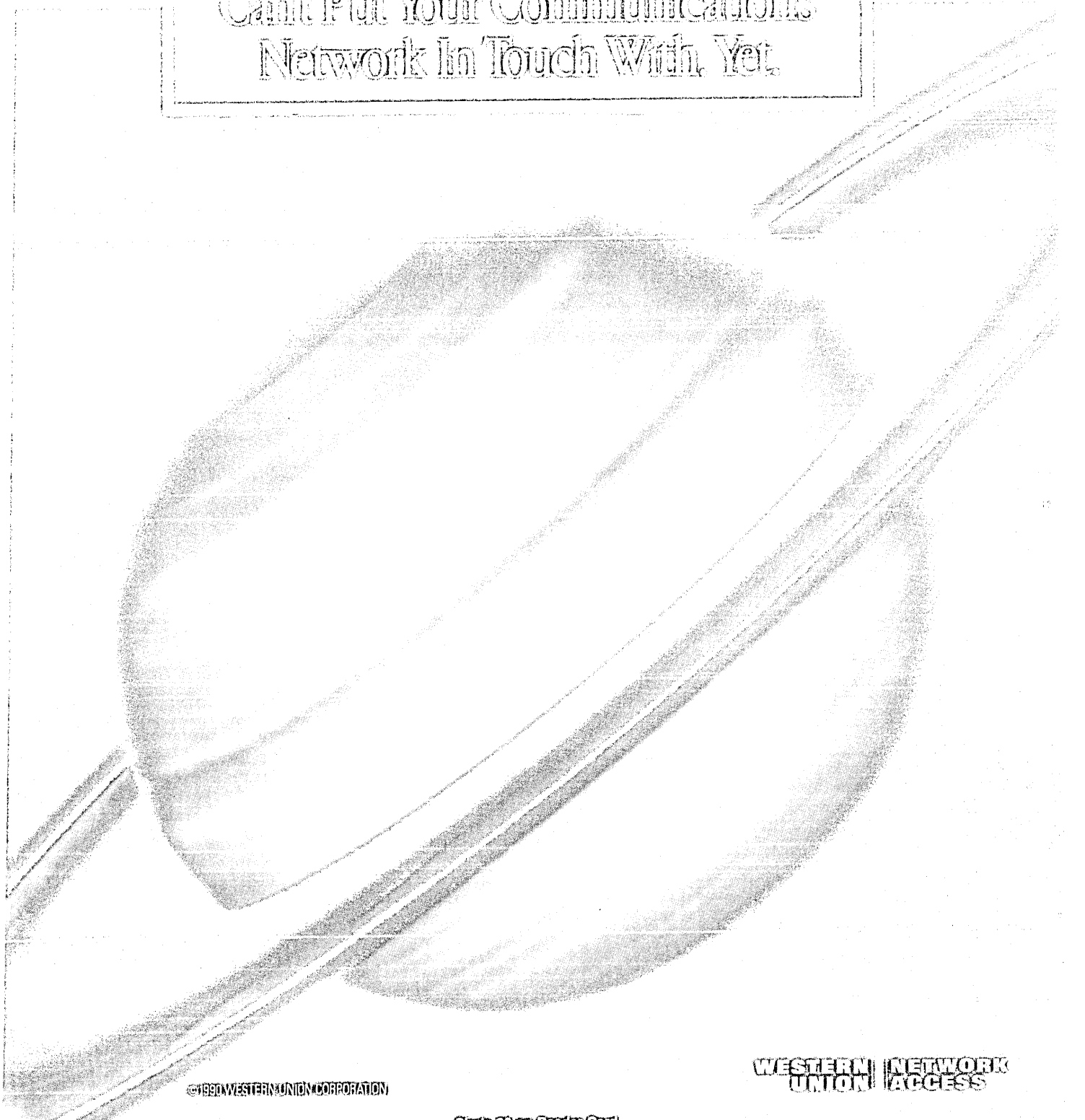

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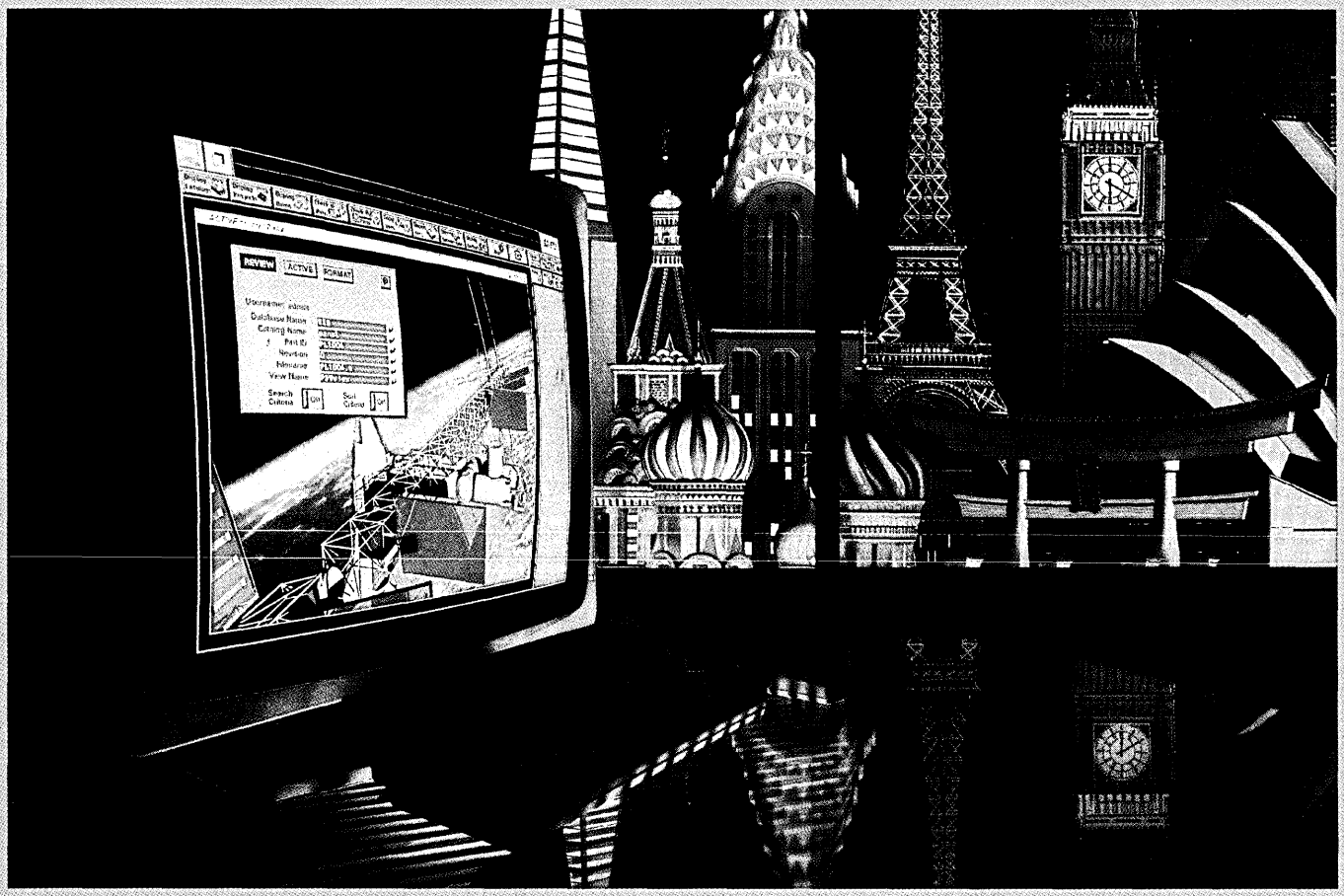

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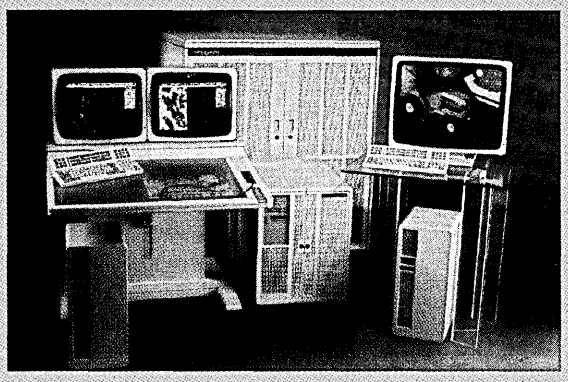

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A PC Refugee Arises in Paris

If adversity breeds strength, France's newest PC maker, Pekin Stone, promises to be a powerhouse. Its founders won't give up their revolutionary vision born in Tiananmen Square.

BY TREVOR HUGGINS

The Stone 800 and 700 series personal computers may have seemed like ordinary IBM PC clones when they appeared on the shelves of French retailers this year, but the fact that they appeared at all is extraordinary.

The odds against the machines ever seeing the light of day were enormous. Not because of lack of venture capital, technological acumen or any other hurdle known to plague young companies. No, the reason the products almost didn't make it was that the executives who produce the machines almost didn't survive last year's uprising in China.

These clones—the 825C, an Intel 386-based machine capable of running as fast as 25 megahertz, the 816SX (386 horsepower at 16MHz), the 716D (a 286-based 16MHz system) and the 712D (286-based, 12MHz)—are the products of Wan Runnan, Yin Ke and three other individuals who started Pekin Stone in Paris in November 1989. Just five months earlier they fled China in the wake of the political demonstrations at Tiananmen Square that led to the deaths of hundreds of protesters—including some business associates of Wan and Yin.

Wan and a group of fellow engineers had left the safety of Chinese government-run institutions in 1984 to start their own company, Beijing Stone Group. Although still a communist state, the limited reforms made by Chinese leader Deng Xiaoping had paved the way for private enterprise—especially in key sectors such as computers, and Beijing Stone became the country's largest computer company, achieving $85 million in annual sales and employing 800 workers prior to the events of June 1989.

The entrepreneurial spirit never left Wan, who surfaced in Paris last fall to start Pekin Stone with funds that he and others had managed to accumulate outside China during brighter days at Beijing Stone Group. Wan serves as president and Yin as managing director of the new company, which they expect to reach $10 million in sales this year.

The Movement of a Legend

The start-up's slogan, "a legend passes over to the West," is really much more than a marketing pitch. It accurately suggests that Pekin Stone is doing business in much the same way that made Beijing Stone the success it was: applying engineering skills with a knack for winning contracts from big companies. Piloting the original operation in China in 1984 was Wan, then 38, who had made a name for himself as a computer technician at the Chinese Academy of Sciences. Under his management, Beijing Stone Group quickly secured typewriter development contracts with Mitsui of Japan, and it branched into word processors. In each of the next three years sales tripled to reach $85 million.

Wan & Co. opened offices in Australia, Hong Kong, Japan and San Francisco in search of markets in both the East and the West. Stone, a transliteration of the Chinese word meaning "moving in all directions," was an apt name for the group.

The dream lasted until the spring of 1988. Wan and his colleagues threw their full support behind the prodemocracy demonstrators, joining in the speeches and the sit-down protests. When the shooting was over, the Chinese authori-

A FITTING BACKDROP: for Pekin Stone, where revolutionary vision triumphs over a repressive regime.

ties took over the company.

Wan fled to the United States while four other executives followed a dissidents' trail that already had formed between China and France. Wan later joined his colleagues in the French capital, where they founded Pekin Stone. He then spent the following months sealing distribution contracts with a Taiwanese PC supplier, which he declines to identify.

□ WHEN THE SHOOTING WAS OVER, THE CHINESE AUTHORITIES TOOK OVER THE COMPANY.

The fledgling company's twin targets for its 386- and 286-based PCs are the French dealer network and, less conventionally, computer firms in Eastern Europe looking for suppliers of board-level systems. Stone is setting up a sales office in Prague. Willing customers have already been found in Czechoslovakia and Poland, and the company claims to have established contacts in East Germany, Hungary and the Soviet Union. A visit to Moscow is scheduled for July. Stone's moves couldn't be better timed: the Coordinating Committee for Multilateral Export Controls (CoCom) is easing controls on East-West computer trade.

Political Restraints

As much as Pekin Stone would like to do business in the United States, that's unlikely to happen through conventional means. The reason is more political than financial. The most likely partner for a U.S. venture—North American Stone, an independent company set up long ago in San Francisco to market Beijing Stone's products—still maintains some export-import business with the Chinese-based Stone Group and therefore cannot easily do business with the dissidents.

Its former distributor may not be Pekin Stone's only access to the U.S. market, though. Yin claims that two U.S. computer manufacturers are negotiating to buy stakes in Pekin Stone. The company, he adds, is holding similar talks with two Taiwanese electronics firms. Yin declines to identify either the U.S. or the Taiwanese companies.

Either investment would be risky: the immediate benefit would only be a piece of a company with just 11 full-time employees. But such an investment would have to be long term. And in the long term the dividends could be high—particularly if Pekin Stone's leaders are allowed to return to China and set up shop once again.

Such a return clearly is in the dreams of Yin. Wan and others. "The change will happen," Yin says, speaking of democratic political reform. "It's a question of time and opportunity." What the likes of Deng fail to realize, he says, is that true economic reform is impossible without political reform.

"The crisis of last year was a result of the economic reform of the past 10 years," Yin says. "It produced some dramatic contradictions, and the same causes will have the same effects in the future." □

Trevor Huggins is a freelance writer based in Paris who writes frequently for DATAMATION.

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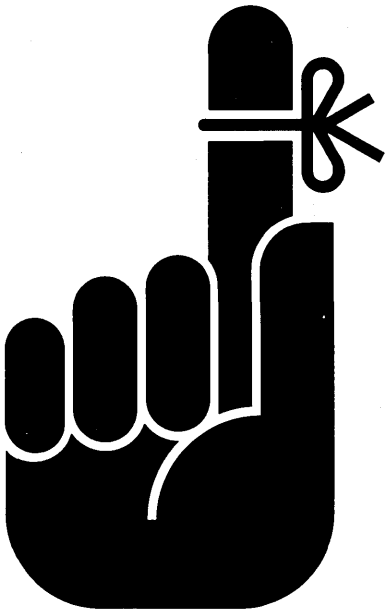

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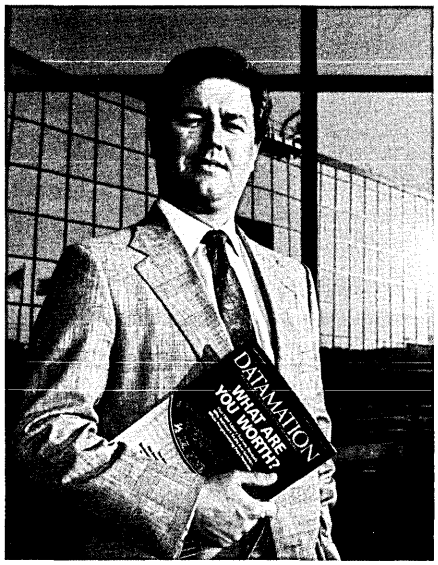

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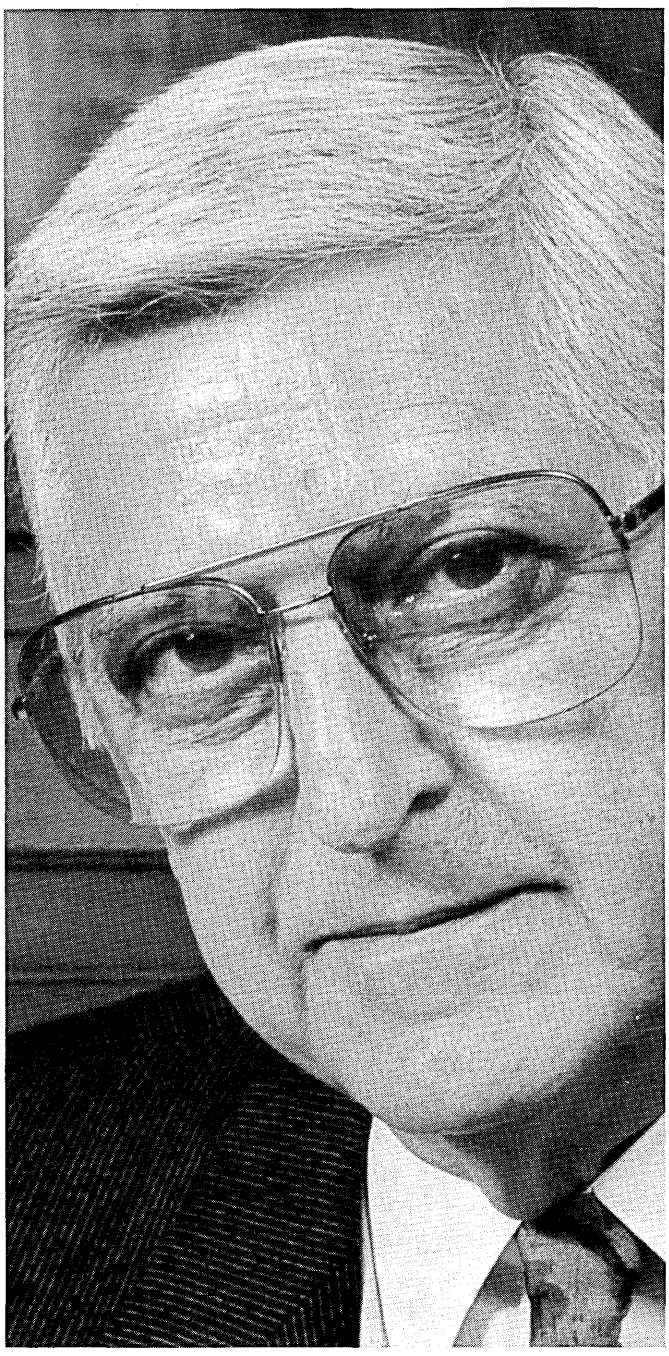

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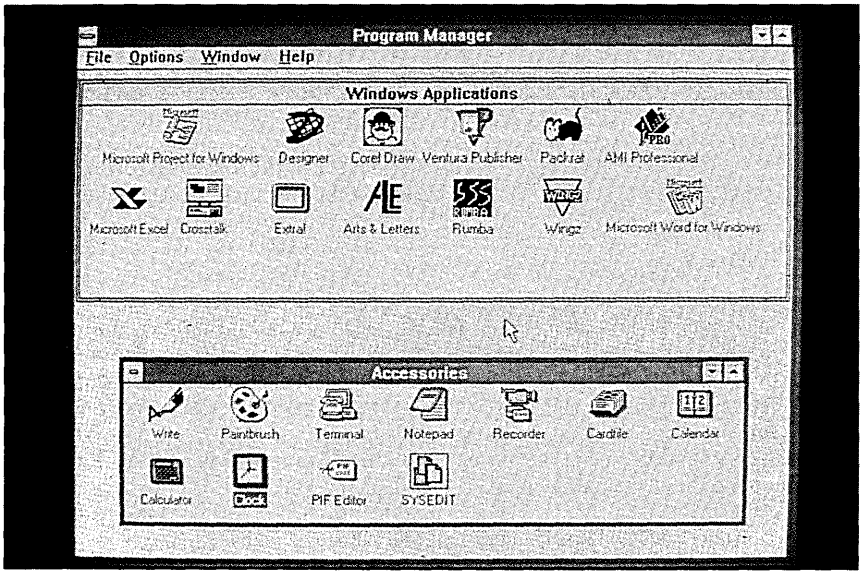
SOFTWARE

Windows 3.0 Arrives With New Local Area Network Support

Microsoft has given the graphical user interface for DOS PCs a face-lift and has streamlined its operation.

BY MIKE RICCIUTI



WINDOWS 3.0 INCLUDES the Program Manager, a part of a new user shell, that lets users run Windows and non-Windows applications.

Microsoft Corp. has introduced Windows 3.0, the latest version of the company's graphical user interface for DOS-based microcomputers. The new version is the most radical redesign of Windows to date and includes many improvements over previous releases, including better memory management and built-in local area network (LAN) support. Windows 3.0 merges both Windows 286 and Windows 386 into one product that automatically senses what system processor is being used.

The company says it developed the new version to look and feel more like its OS/2 Presentation Manager for consistency in applications written for both DOS and OS/2. Microsoft says it used the 80286-based PC with 1 megabyte of internal memory as the design point for the new product, making Windows 3.0 accessible to the majority of PCs in use today.

The redesign adds a new user shell and three new applications, replacing the MS-DOS Manager function of previous Windows versions. Included in the shell is Program Manager, a component that represents user programs and systems functions as icons that can be custom arranged by users. Windows 3.0 will also run non-Windows applications—traditional DOS programs—from icons in the Windows shell. File manager, a second shell component, uses a file tree directory to display file names and details. It also lets users "drag and drop" any file to and from any disk drive, including a file server. Control Panel, the third shell component, allows users to customize their Windows look, with a variety of screen colors and backgrounds.

Microsoft has also improved Windows' memory management software, allowing Windows applications to run faster in less memory space. The program takes advantage of the protected mode on Intel 80286 and 80386 microprocessors to break the 640-kilobyte internal memory barrier. Windows can now access up to 16 megabytes of memory on 286 systems and up to 48MB of memory on 386 systems. Windows 3.0 manages memory automatically on applications written for Windows.

The company says the memory management improvements in version 3.0 make it ideal for network applications. The program includes device drivers for a wide range of network software, including Microsoft Networks, LAN Manager, IBM LAN Server, Novell NetWare 2.10 and later, Novell NetWare 386 and Banyan VINES 4.0. New network drivers will be provided as they become available through Microsoft's new Driver Library Disk Service. The drivers let users connect and disconnect to networks without leaving the Windows shell.

Through Windows Setup program, network administrators can store multiple workstation configurations in a single Windows directory on a server instead of having to maintain a separate copy of Windows for each user's system. After loading the network software, all network access and interaction can take place from within Windows. Print Manager, another shell function, lets users view the status of their print jobs and view all files in a network printer's queue in addition to their own.

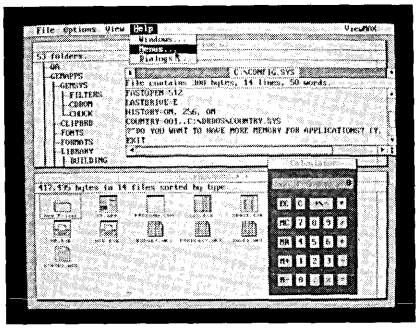
Windows 3.0 is available now for $149. Minimum configuration is a 286-based PC with 640KB of random access memory and MS-DOS 3.0 or later. A Microsoft License Pak is also available for networked and multiuser systems at $125 per copy. Users of previous Windows versions may obtain upgrades for $50. MICROSOFT CORP., Redmond, Wash.

Circle 150

An Alternative DOS

Digital Research Inc. of Monterey, Calif., has introduced DR DOS 5.0, a new version of its single-user DOS operating system that provides a graphical user interface, advanced memory management and file transfer capabilities.

The new version of DR DOS is executable from read only or random access memory and runs all applications supported by Microsoft Corp.'s MS-DOS, says Digital Research. In addition, it contains ViewMAX, a common user access-compliant graphical user interface. A menu-driven installation and setup program with built-in, context-sensitive help screens is provided.



DR DOS PROVIDES an automatic installation and reconfiguration menu with on-line help.

The company says a new feature called MemoryMAX allows DR DOS 5.0 to reside in as little as 20 kilobytes of standard or conventional memory on 386 and 486 machines (as well as on 286 microprocessors based on Chips and Technologies Inc.'s NEAT chip set). Also included is FileLINK, a utility that facilitates high-speed transfer of files between systems over standard serial cables. Historically, Digital Research has sold DR DOS to original equipment manufacturers (OEMs), and it will continue to do so. However, in a departure from the past, the company will also sell DR DOS 5.0 directly to users for $199. DIGITAL RESEARCH INC., Monterey, Calif.

Circle 151

Project Management Gets Graphic

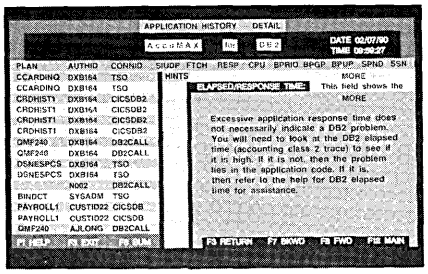
Project Software and Development Inc. (PSDI), has announced QUICKNET Professional release 2.0, a graphical version of the company's project management software. The program is designed for government agencies, systems integrators and aerospace/defense companies that need planning and scheduling software.

The new version of QUICKNET offers a drawing board feature that lets users sketch out project schedules. PSDI says a new windowing system eases navigation among screens and menus.

QUICKNET offers connectivity between IBM PCs, PS/2s and compatibles; popular local area networks; and Digital Equipment Corp.'s VAX computer line. The new version can exchange data with PSDI's mainframe and minicomputer-based project management systems as well as with PSDI's UNIX-based APECS 8000 project management program. Available now, QUICKNET Professional 2.0 is priced at $2,500 for a stand-alone DOS copy, $8,600 for a four-user LAN package, $18,900 for a four-user VAX package and $4,725 for a stand-alone VAX package. PROJECT SOFTWARE AND DEVELOPMENT INC., Cambridge, Mass.

Circle 152

DB2 Performance To the MAX



ACCUMAX FOR DB2'S help facility offers field-level help, hints and pop-up windows to eliminate guesswork and interpretation.

Legent Corp. has introduced AccuMAX, which the company says is the first DB2 performance manager with direct interfaces to the MVS mainframe operating environment and the DB2 database management system.

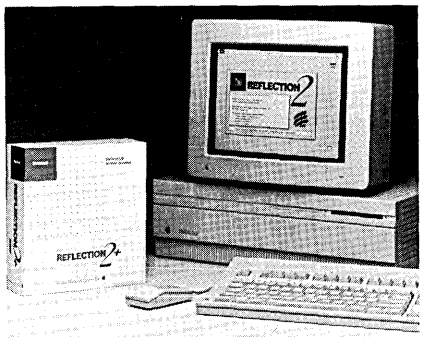
The company says that by replacing IBM's Instrument Facility Interface with its own direct interfaces, AccuMAX offers real-time monitoring of DB2. AccuMAX keeps track of both application and subsystem activity and displays current as well as historical information on line. It also complies with IBM's Common User Access design standards, such as screen auto-refresh, function-key-driven displays, helpful hints and pop-up windows.

Other features include concurrent monitoring of multiple DB2 subsystems without changing system parameters or leaving the system and a trace application that lets users start or stop DB2 traces. AccuMAX is available now and is priced from $8,750, depending on CPU size. LEGENT CORP., Vienna, Va.

Circle 153

A Reflection on the Mac

Walker Richer & Quinn Inc. has released Reflection 2 for the Macintosh, a program that emulates Digital Equipment Corp.'s VT120 terminals. The product joins the company's VT120 emulation software for IBM PCs.



REFLECTION 2 PLUS offers VT120 emulation for Macintosh users.

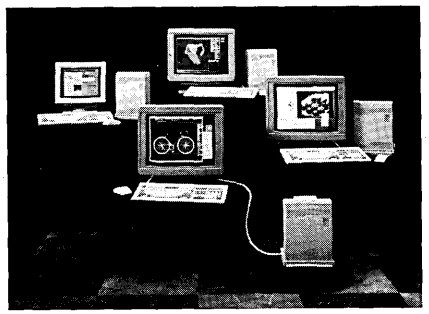
Walker Richer & Quinn says that, by offering emulation software for both types of microcomputer, it gives companies the option of standardizing on one emulation product, guaranteeing a common command language and common file protocol.

The new program features error-checking file transfer, a graphical user interface and multitasking capability. The software also provides emulation of Digital VT220, VT102 and VT52 terminals for connections to Digital's VAXs and other hosts. The company says all emulations on the Mac appear exactly as they do on the actual terminals. Reflection 2 is available now for $249. WALKER RICHER & QUINN INC., Seattle.

Circle 154

SYSTEMS

High-Tek X-Terminals



THREE NEW TEKTRONIX X-terminals offer dual parallel processing with both a Motorola and a TI microprocessor.

Tektronix Inc. has announced three color X-terminals. The company is calling its second-generation, color X Station family the TekXpress. The XP25,

XP27 and XP29 models are small footprint X-terminals capable of parallel processing, operating with both a Motorola 68030 and a Texas Instruments 34020 microprocessor.

The new X-terminals feature Tektronix's TekColor Management System, a method of color selection, editing and screen-to-printer color matching. In addition, each TekXpress terminal supports networking standards such as DECnet and Ethernet with Transmission Control Protocol/Internet Protocol (TCP/IP).

Tektronix says the terminals come standard with 3 megabytes of memory expandable to 13MB, and they support the new release of the X Windows software standard X11.4 from the X Consortium, the nonprofit group that monitors X-terminal software. TekXpress terminals provide a Motif-like, menu-driven interface that, Tektronix claims, makes system setup easier. The three new models, which will be available later this month, support up to 256 colors and come with a three-year warranty. Prices for the TekXpress are $3,995 for the XP25, a 14-inch model with 1,152×900 pixel resolution; $4,995 for the XP27, a 19-inch model with the same resolution; and $5,995 for the XP29, a 19-inch model with 1,290×1,024 resolution. TEKTRONIX INC., Beaverton, Ore.

Circle 155

NCR Offers Five X-Terminals

NCR Corp.'s Engineering and Manufacturing division has unveiled five new networking X-terminals, three color and two gray-scale monochrome models. A Motorola Inc. 68020 chip handles the X-server control, while a TI 34010 microprocessor handles the graphic processes such as frame buffer management and drawing operations on NCR's new X-Stations. NCR claims this is different from other dual-processing X-terminals, which it says typically allow a TI chip to handle the X-server control.

NCR's XL14C is a 14-inch color model with 800×600 pixel resolution and 512 kilobytes of random access memory. Sporting 1,024×768 color resolution and 1 megabyte of RAM are the 17-inch XL17C and the 19-inch XL19C. Monochrome models are the 15-inch XL15, with 1,024×800 resolution and the 19-inch XL19 with 1,280×1,024 resolution. Pricing for the NCR X-Stations ranges from $3,000 to $6,000. NCR CORP. ENGINEERING AND MANUFACTURING DIVISION, Orlando, Fla.

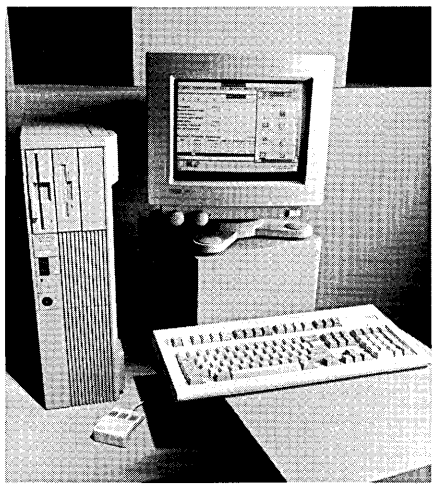
Circle 156

Wang Unveils a Speedy 386-Based PC

The PC 380/33C, a 33-megahertz PC based on Intel Corp.'s 80386 microprocessor, has been introduced by Wang Laboratories Inc. The new PC—the company's fastest 386 machine—is being positioned as a local area network fileserver, a multiuser UNIX server or a technical workstation.

A unique feature of the PC 380/33C is its ability to copy the Basic Input/Output System (BIOS) and video programs from read only to random access memory for faster system access and speedier operation.

A basic configuration includes 1 megabyte of internal memory, expandable to 16MB; a 64-kilobyte cache memory; one parallel and two serial ports; a 1.2MB or 1.44MB disk drive; and a keyboard. Available now, the system is priced from $5,995. WANG LABORATORIES INC., Lowell, Mass.



AT 33 MEGAHERTZ, the PC 380/33C is the fastest of Wang's 80386-based PCs.

Circle 157

Mainframe Current Events

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IBM Releases VM/XA SP2.1

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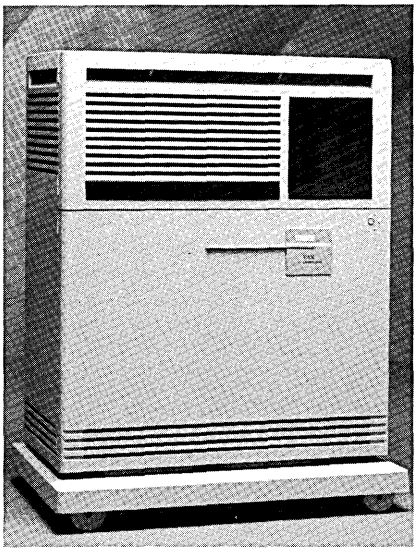
Mini-VAX With Mighty Power

Digital Equipment Corp. has introduced the VAX 4000 model 300, a mini-VAX that provides the power and performance of a midrange computer in a system the size of a two-drawer file cabinet. The new VAX is available in both server and timeshare models.



THE VAX 4000 MODEL 300 offers users the power and performance of a midrange system in a smaller, less expensive package.

The VAX 4000 model 300's system memory is expandable from 32 megabytes to 128MB. The system can handle up to 28 storage devices, including a newly announced 381MB half-height hard disk. System performance has been increased to more than twice the speed of a VAX-11/780.

The VAXserver 4000 model 300 can connect to Apple Macintoshes, IBM PS/2s running OS/2, Compaq Computer Corp. PCs, Sun Microsystems Inc. UNIX workstations and Digital's VMS and ULTRIX workstations. Dual processor models are also available. Prices begin at $79,000 for server models and $114,000 for timeshare models. DIGITAL EQUIPMENT CORP., Maynard, Mass.

Circle 158

Apollo Launches Workstation Line

Apollo Computer Inc., a subsidiary of Hewlett-Packard Co., has introduced the 9000 series 400 line of workstations and servers. The new line supports both HP's Domain/OS operating system and HP-UX, HP's version of UNIX. The company says it is the first workstation line based on the Motorola 68040 microprocessor for processing speeds up to 26 million instructions per second (MIPS). The new systems integrate HP's new VRX family of graphics systems for graphics performance of up to 1 million 3-D vectors per second.

The HP Apollo 9000 models 425t/400t offer up to 20MIPS performance, 8 to 64 megabytes of internal memory, up to 400MB of internal mass storage and up to 4.6 gigabytes of external mass storage. Prices begin at $6,990.

Running up to 26MIPS are the models 433s/400s. They offer up to 128MB of internal memory, up to 1.2GB of internal mass storage and 4.6GB of external mass storage. They are priced from $13,990. Also offered by HP Apollo are the models 433s/400s servers, with prices beginning at $12,990. APOLLO COMPUTER INC., Chelmsford, Mass.

Circle 159

COMMUNICATIONS

Ethernet Terminal Server Offers 16 Channels

Lantronix has introduced the ETS-16, a 16-port terminal server for Ethernet local area networks. The company says that the product is priced lower and is also smaller than comparable units produced by Digital Equipment Corp (DEC).

The ETS-16 supports systems conforming to the Transmission Control Protocol/Internet Protocol (TCP/IP) and Local Area Transport standards. The ETS-16 comes with an interface to Ethernet nets.

Lantronix says the ETS-16 allows users to connect more lines at a lower cost than its ETS-8 eight terminal server. The company says both models are about one-eighth the size of DEC's units. Available now, the ETS-16 is priced at $2,495. LANTRONIX, Laguna Hills, Calif.

Circle 160

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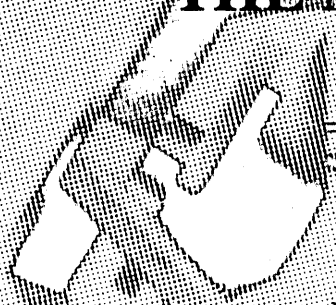
Business Videotape

DATABASE FUTURES: THE MAINFRAME ENVIRONMENT



Moderated by: Shaku Atre

Guest Speakers Include:

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Charles Wang	**Computer Associates Int.**
Richard Stewart	**Computer Corp. of America**
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Circle 38 on Reader Card

Flex Plex

Codex Corp. has introduced the 3600 Series Communications Platform, a flexible transmission device that provides both analog and digital communications. The product replaces Codex's 2600 line of leased-line modems.

Codex says the 3600 combines digital and analog transmission services at speeds of up to 24 kilobits per second for analog and up to 56Kbps for digital communications. Users can add either digital or analog ports through plug-in modules. The platform supports four-wire analog leased line, two- and four-wire analog switched services, digital leased lines and digital switched services.

Prices for the 3600 series range from $2,500 to $6,500. The platform with analog features is available now. Digital options will be available in the fourth quarter. CODEX CORP., Mansfield, Mass.

Circle 161

Ethernet Connector Added By Cisco

Cisco Systems Inc. has unveiled the Multiport Ethernet Connector (MEC), a six-port Ethernet connector card for the company's AGS+ router/bridge chassis. The card allows the AGS+ to support up to 28 Ethernet local area network connections.

The MEC provides a high-speed communications path for Ethernet-to-Ethernet local area networks or from Ethernet to Fiber Distributed Data Interface (FDDI) systems. Data is transmitted at rates up to 20,000 packets per second. Used in conjunction with Cisco's FDDI interface card, the MEC allows the AGS+ to support connections between an FDDI ring and more than 20 Ethernet networks.

The MEC is priced at $6,000 for two Ethernet ports, $9,500 for four ports and $12,000 for a six-port model. CISCO SYSTEMS INC., Menlo Park, Calif.

Circle 162

Hayes Offers New ULTRA 96 Modem

Hayes Microcomputer Products Inc. has announced that its ULTRA Smartmodem 96, introduced in Britain earlier this year, is now available in North America. The ULTRA 96 conforms to the V.32 protocol for 9.6 kilobits per second (Kbps) data transmission and the V.42bis protocol for data compression.

The ULTRA 96 is compatible with the Hayes V-series Smartmodem 9600 fast turnaround protocol for 9.6Kbps and 19.2Kbps transmission speeds. The modem also supports the V.22bis protocol at 2.4Kbps, the V.23 protocol at 1.2kbps, the V.22 and the V.21 protocols.

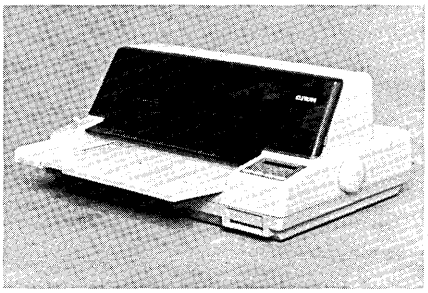
The modem also supports the X.32 protocol for packet-switched networks. When used with software, such as Hayes Smartcom III, the ULTRA 96 allows up to four simultaneous connections over one transmission link. Available now, the ULTRA 96 is priced at $1,199. HAYES MICROCOMPUTER PRODUCTS INC., Norcross, Ga.

Circle 163

PERIPHERALS

C-Tech Offers New, Low-Profile Printer Line

Six new dot-matrix printers have been introduced by C-Tech Electronics Inc. The printers offer a new low-profile design and faster print speeds than earlier models.



THE C-610+ PRINTER from C-Tech offers a new straight-through paper feed design for fewer paper jams and easier setup.

The C-240 and the wide carriage C-245 printers are 9-pin models that feature built-in serial and parallel interfaces. The printers come with a 19.25-kilobyte buffer and IBM ProPrinter XL and Epson FX-800/1000 emulation. Available now, the C-240 is priced at $449 and the C-245 at $559.

For higher resolution, C-Tech offers the C-510 for $639 and the wide-carriage

C-515 for $749. Both feature 24-pin print heads and 28KB buffers, as well as serial and parallel ports. The printers will be available in the third quarter.

On the high end, C-Tech offers the C-610+, which is priced at $799 and is available now. The printer features a 24-pin print head and a unique straight-through paper feed that the company says reduces paper jams. The C-645 features a 28-pin print head for superior print quality in high-volume applications. The C-645 also includes straight-through paper handling and is priced at $1,395. It is available now. C-TECH ELECTRONICS INC., Irvine, Calif.

Circle 164

Emulation Keyboard From Key Tronic

Key Tronic Corp. has released the KB 3270 PLUS, a 122-key keyboard that the company says is fully compatible with every terminal emulation software package on the market for DOS computers.

The keyboard includes setup software for standard emulation packages and a program for customizing keyboard setup. The keyboard also includes 8 kilobytes of random access memory for keyboard drivers, eliminating the need to keep them on the host computer.

The 3270 PLUS is plug-compatible with the IBM PC, XT, AT and the PS/2, with an optional adapter. English, French, German and Swedish versions of the keyboard are available. The keyboard is priced at $349 and is available now. KEY TRONIC CORP., Spokane, Wash.

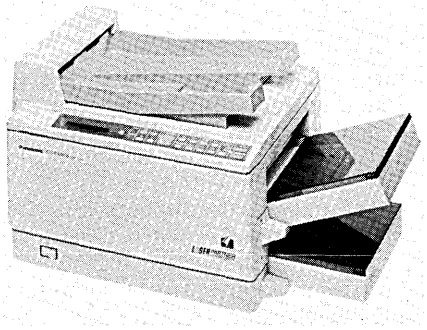
Circle 165

Panasonic Offers PostScript Printer

Panasonic Communications & Systems Co. has announced the KX-P4455 laser printer, featuring PostScript and Hewlett-Packard language compatibility and resolution of up to 300 dots per inch.

The printer offers speeds of up to 11 pages per minute and up to 36 fonts in PostScript mode and 26 in HP mode. Users can add additional fonts via optional font cards. All print functions can be selected on a front-panel liquid crystal display (LCD) screen.

Standard interfaces include a parallel, serial and AppleTalk port. Two megabytes of memory, expandable to 4MB, are



THE PANASONIC KX-P4455 offers PostScript compatibility and 11 pages per minute for under $3,500.

standard. The printer is available now for $3,495. PANASONIC COMMUNICATIONS & SYSTEMS CO., Seacaucus, N.J.

Circle 166

BRIEFS

Logic Works Inc., of Princeton, N.J., has released a **Windows 3.0-compatible** version of Erwin, its **graphical database design tool**. The new version is priced at $795.

Circle 167

New York-based **LANSystems Inc.** has upgraded its **LANSpace 2.0** memory extender to work with Novell's NETx Shell and IPX drivers for NetWare. The program is priced at $495.

Circle 168

Goal Systems International Inc. of Columbus, Ohio, has announced release 2.3 of INSIGHT for DB2. The **DB2 performance monitor** is priced at $32,500.

Circle 169

Sun Microsystems Inc., based in Mountain View, Calif., has announced that its **XView toolkit** has been **ported to** Digital Equipment Corp.'s **VAX/VMS**. Available in the third quarter, the toolkit will be priced around $1,000.

Circle 170

Mountain View, Calif.-based **SynOptics Communications Inc.** has released a **thin coaxial cable module** for its LatisNet 3000 wiring concentrator. The module is priced at $1,795.

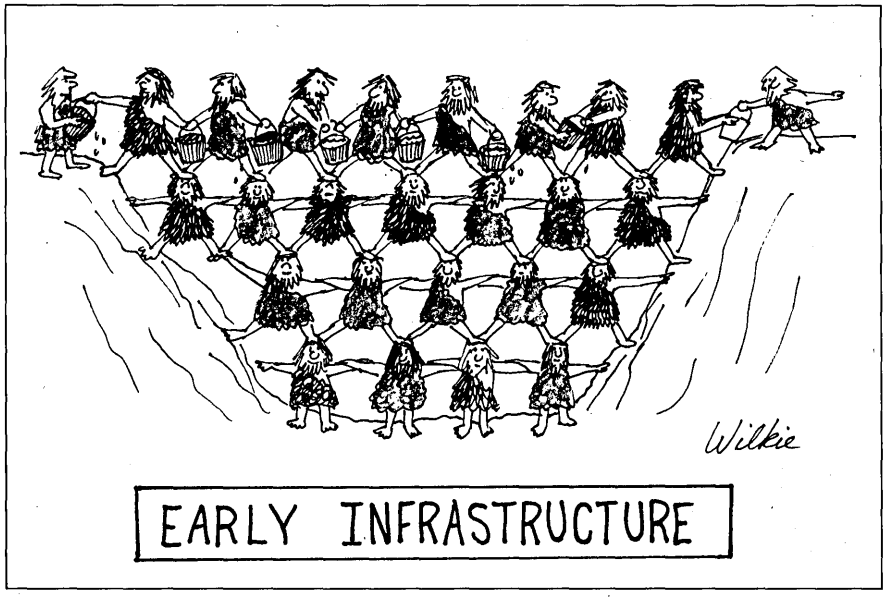
Circle 171

An **all-in-one communications program** for PC communications, pcANYWHERE IV/LAN, has been announced by **Dynamic Microprocessor Associates Inc.** of Huntington, N.Y. Priced at $495, the software connects PCs to LANs, to other PCs, or to workstations.

Circle 172

Boston Business Computing Ltd., based in Andover, Mass., has **ported its VMS emulation software** to Digital's **DECstation 5000 line** of ULTRIX-based workstations. The product is priced at $995.

Circle 173



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Issue Date	Recruitment Deadline	Editorial Emphasis
Aug. 1	July 13	• Artificial Intelligence • Networking-Evaluation
Aug. 15	July 27	• MRP II • Satellite Communications
Sept. 1	Aug. 13	• Cooperative Processing • Word Processing

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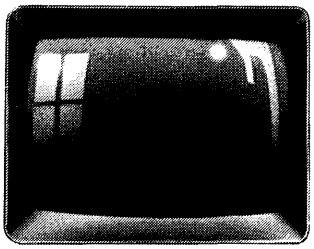

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Currently, IS&T is building peer-to-peer interactive sessions with host computers, fully utilizing the power of Macintosh®, the host and the network. Integrating host applications with the Macintosh interface. And using HyperCard® with CL/1™ to prototype and test custom applications, by building stacks that interact with host-based data. But we're not going to stop here.

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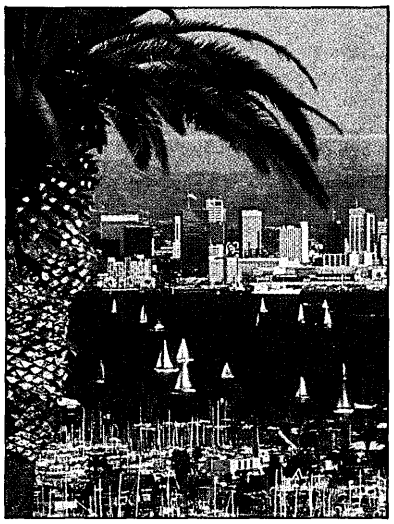

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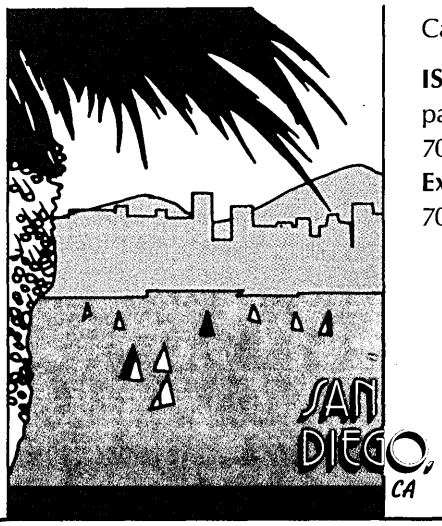

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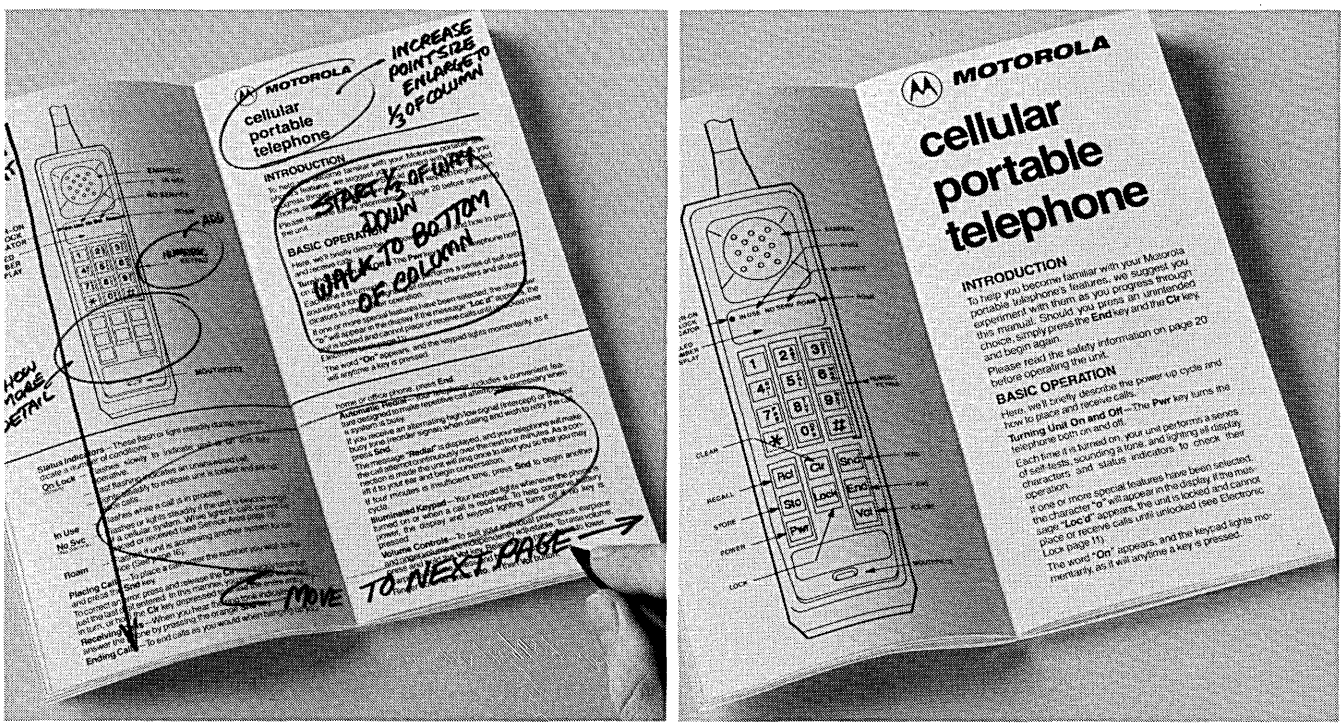
Printed by Graftek Press Inc. **All inquiries and requests for change of address should be accompanied by mailing label from latest issue of magazine.** Allow two months for change to be made. POSTMASTER: send address changes to DATAMATION®, 44 Cook St., Denver, CO 80206.

XEROX



Motorola wrote the book on cellular phones. A Xerox system lets them rewrite it in minutes.

Motorola is the world's largest producer of cellular phones. Not to mention cellular phone manuals. For which they turn to a company called Rich Graphics.

But when Motorola decided they wanted to be able to revise and reprint their manuals on a "just-in-time" production schedule, Rich Graphics turned to Xerox.

Working with Rich Graphics, Xerox developed a solution that integrated both hardware and software, Xerox products and other suppliers' products. And the resulting phone manual production is something to talk about—to say the least.

The manuals are now printed on Xerox laser printers just minutes after the revisions flash across the screen of a Xerox workstation. Turnaround time is 80% faster. Costs are down 50%. And the documents produced are 99.99966% perfect.

Of course, Motorola isn't the only client that Rich Graphics uses Xerox for. And the resulting improvement in customer satisfaction has helped Rich Graphics *double* their printing business every year since they came to Xerox.

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