DATAMATION 84®

FEBRUARY/4.00 U.S.A.

NEXT?

Model 6455 Cartridge Tape System

Loaded with Features — Loaded with Benefits.

Kennedy products have always provided innovative new features. And these features have always provided added benefits and convenience for the user. For instance, our Model 6455 offers these features and benefits:

Feature: Start/Stop Operation

Benefit: Drive can emulate a ½" tape drive by providing the ability to perform selective file back-ups, file-restructuring, journaling and software updates.
The drive is effectively a ½" Tape Drive in a smaller package.

Feature: Hard Read Error Spec. of 1 in 10^12 bits

Benefit: Best data reliability of any tape cartridge drive. Gives the user confidence in the integrity of the back-up medium.

Feature: On-board Diagnostics

Benefit: Drive can be tested off-line with no test equipment required. Use of S/A also lowers the MTTR.

Feature: Cartridge Jam Protection

Benefit: Protects the cartridge from damage if cartridge jams. This is accomplished by sensing a current surge and then disabling the motor, thus insuring that the cartridge will not be damaged.

Feature: High Density Recording

Benefit: Storage capacity of 23 MB on a single cartridge.

Feature: Optional industry standard ½" tape interface.

Benefit: Operates with existing tape couplers and software. The drive operates as though it were a ½" tape drive without having to modify existing hardware or software.

By now you can see what we're driving at. Model 6455 is full of unique features and benefits for you. For the complete story, write or call us today.

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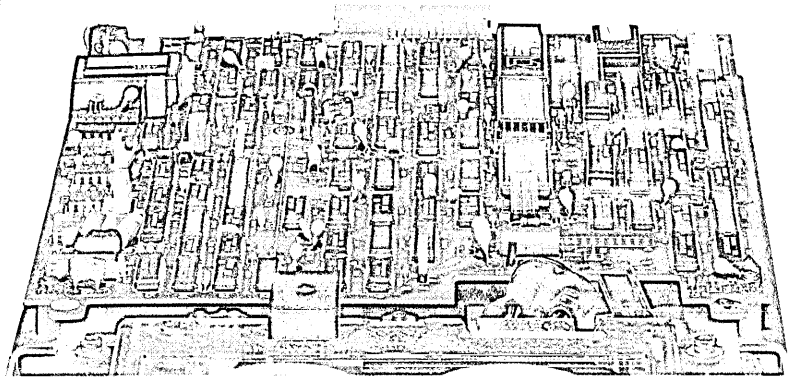

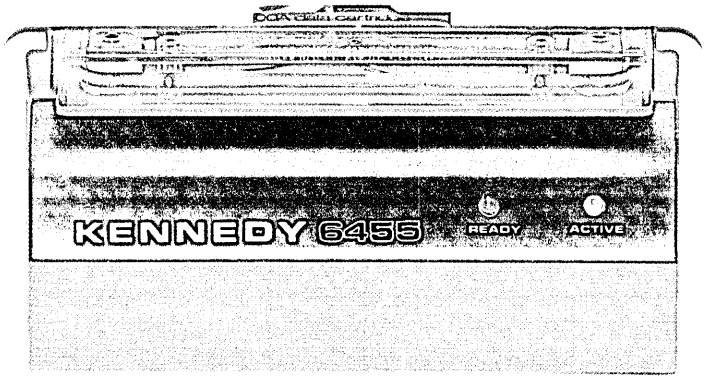

KENNEDY QUALITY COUNT ON IT

CIRCLE ON READER CARD

Our IBM Protocol Converter is not the same under the skin.

MICOM's new Micro7400 is very, very different. It not only provides a Gateway for dumb asynchronous terminals to access IBM mainframe applications, but goes far beyond the basic capabilities of IBM 3270s and other protocol converters. *It's even easy to use.*

Since MICOM is the world's largest volume manufacturer of data concentrators—thanks to its Micro800/2 "Orange Box" family—it's only natural that MICOM's protocol converter should include the same features and capabilities that made the data concentrators so popular. And fortunately for asynchronous terminal users wishing they could connect to IBM mainframes, and for mainframe DP managers looking for less expensive terminals, adding concentrator features to a converter makes for a surprisingly effective hybrid.

All Standard IBM 3270 Features

Functioning as an IBM 3274 Model 51C Cluster Controller using either Bisync or SNA/SDLC protocol, the Micro7400 allows ASCII terminals (or personal computers emulating terminals) to perform as 3270s. Display terminals emulate IBM 3278s, printers emulate IBM 3287s. And special software allows printer terminals to interact with full-screen programs originally developed for CRTs.

Plus Extra Functions

The Micro7400 also offers features not available in the IBM 3270 line, including dial-up access to the protocol converter, terminal-controlled diagnostics, and do-it-yourself channel configuration for setting terminal-related parameters like parity.

Support for IBM Personal Computers

IBM PCs connected to the Micro7400 can emulate IBM 3270 terminals, too, for communicating with mainframes. Diskette-based MICOM software makes it easy.

Switching Between Multiple Hosts

Users can switch between two IBM hosts, or between an IBM host and asynchronous ports on one or more minicomputers—completely under terminal control.

Command Port

Unique among protocol converters, the Micro7400's Command Port allows a network manager to dynamically alter operating parameters like priority assignment, as well as providing monitoring, diagnostic, and control facilities.

As Low As $400 Per Channel

Even the pricing is more like a concentrator. Standard models are available to support from two to 12 channels, at prices as low as $400 per channel. A budget-minded 2-channel "LITE" model is also offered, as are cost-saving versions with built-in modems. And there's much more. Call today for a price list and a 12-page color brochure, or use the Reader Service Number below.

For protocol conversion without tears, think MICOM.

MICOM®

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CIRCLE 4 ON READER CARD

Navigate through performance problems with EPILOG™/MVS.

Before EPILOG/MVS, performance problems were often hidden in piles of printouts and pages of reports.

With EPILOG/MVS, you can find the answers to your questions about...user response... service levels...capacity management... and more.

The problems of wading through masses of data are now solved by a breakthrough in EPILOG/MVS. It's called the System Performance Navigator. With it you visually identify a problem area on the CRT (for example, Figure 1: long response time of 1.81 seconds on Tuesday, July 5) and simply put a command character on this problem line (for example, "D" for degradation and "R" for resource utilization). The System Performance Navigator will immediately generate the next display customized to the specific problem area.

EPILOG/MVS: simple to use—but powerful!

For more information, contact your Candle representative.

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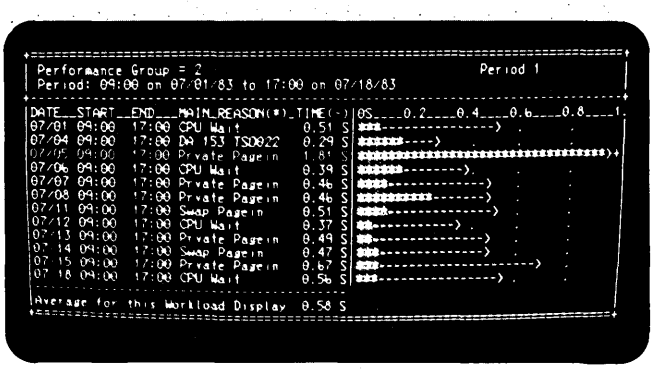

Figure 1—*User notes long response time for July 5, and enters "D" to generate degradation display in figure 2.*

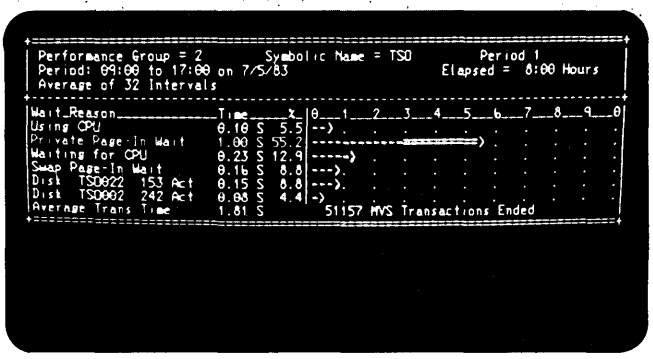

Figure 2—*User observes that Private Page-In Wait is a problem and enters "R" to generate page dataset activity display in figure 3.*

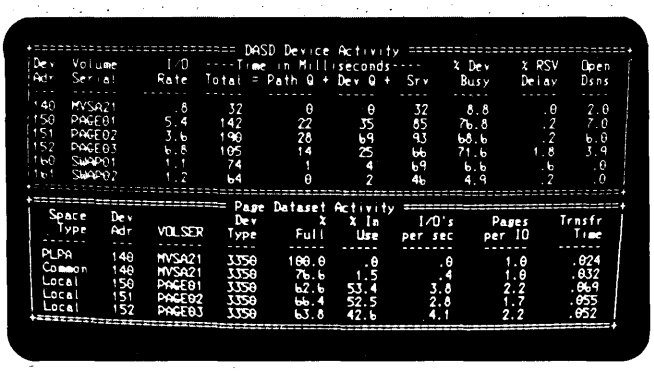

Figure 3—*For detailed analysis of the paging resource, EPILOG/MVS shows statistics on both the page datasets and the DASD devices they reside on. This screen shows the cause of the problem: device contention causing very high busy rates on devices 150-152 which contain the local page datasets.*

CIRCLE 5 ON READER CARD

DATAMATION®

FEBRUARY 1984/$4.00 U.S.A.
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FEATURES

NEWS IN PERSPECTIVE

DEPARTMENTS

A SPECIAL REPORT 102-A

INTERNATIONAL 198-1

OEM SUPPLEMENT 199-1

ILLUSTRATION OF FLAG BY CHUCK SCHMIDT

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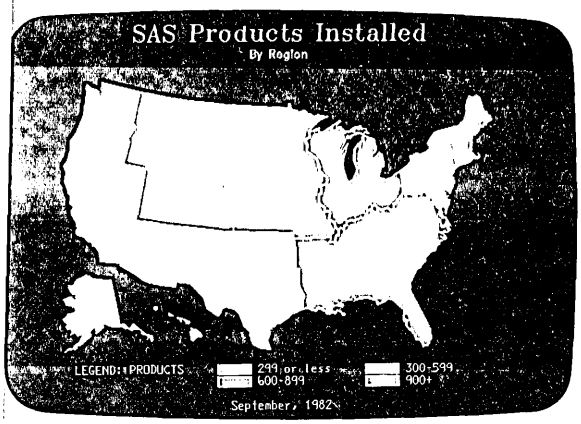
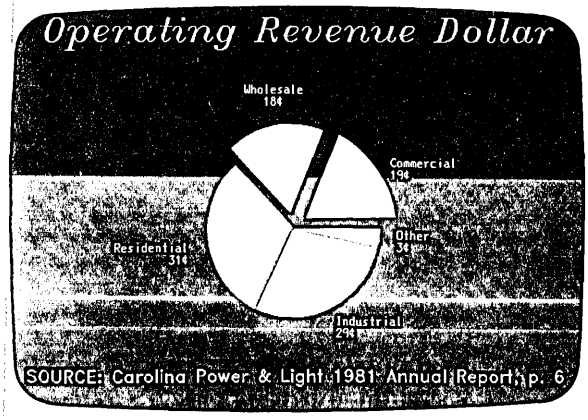
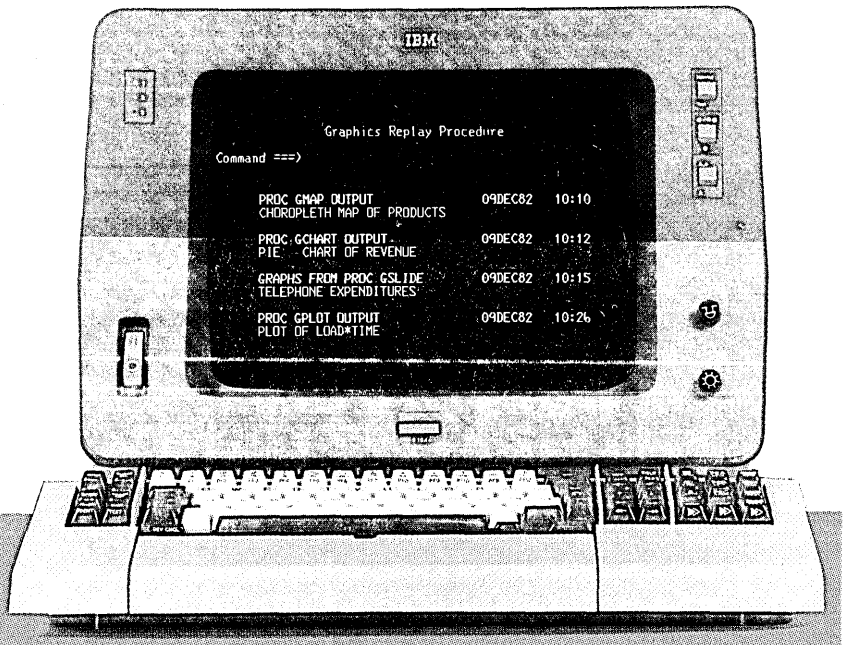


Choropleth Map of Products



Pie Chart of Revenue

SAS/GRAPH brings you Instant Replay

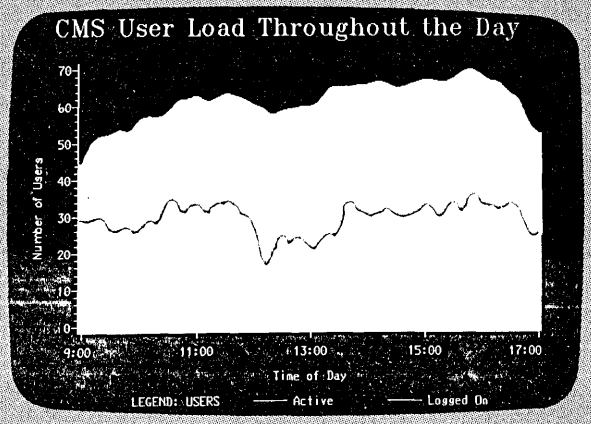


TELEPHONE EXPENDITURES FOR TELEMARKETING
(Estimated Figures)

	(In Millions) 1980	1976
Residential originated local calls	$ 569	$ 232
Residential originated toll calls	689	269
Business originated local calls	4,144	3,045
Business originated toll, WATS, 800 calls	4,443	2,502
TOTAL	$9,845	$6,048

SOURCE: DMMA Fact Book on Direct Marketing

Telephone Expenditures



Plot of Load*Time

Since its introduction in 1980, SAS/GRAPH has provided "state of the art" software for business graphics. Now SAS/GRAPH brings you a new decision support tool—instant replay.

With the menu-oriented replay facility in SAS82 (our newest release) your DSS group can

1. generate numerous graphical analyses and store the results.

Then you can

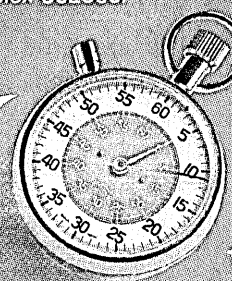
2. choose the best graph—charts, plots or maps—from the annotated selection SAS/GRAPH provides and
3. instantly display the graph with the touch of one PF key on your IBM 3279.

It's as simple as 1 + 2 + 3. And that adds up to a big time-savings.

Think of the flexibility instant replay adds to your operation. Your DSS staff can run overnight batch jobs to graph CPU utilization reports, sales totals and production figures. The reports are ready for display at your desk the next morning.

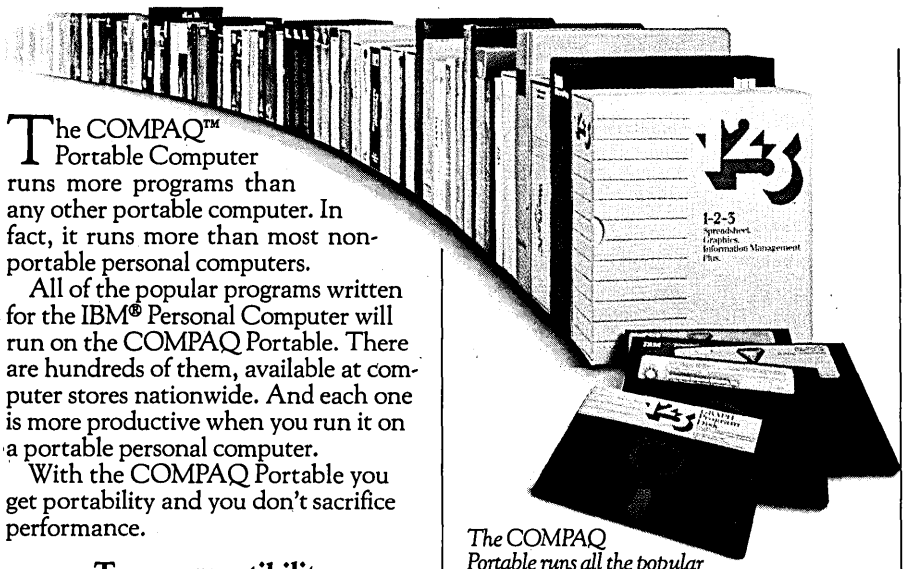
Best of all, SAS/GRAPH® is integrated into the SAS system, so you can get the benefits of SAS for data management, statistical analysis and report writing; SAS/ETS™ for econometric forecasting and modeling; SAS/FSP® for data entry, editing and letter-writing; and SAS/IMS-DL/I™ for interfacing to IMS data bases. The SAS system operates on the IBM 370 Family and compatible machines at more than 5000 OS/MVS, VM/CMS, DOS/VSE and SSX sites around the world.

Call or write today. SAS Institute Inc., Box 8000, Cary, NC USA 27511-8000. Phone (919) 467-8000. Telex 802505.



SAS® saves time.

Computer stores were full of programs for the COMPAQ Portable before there *was* a COMPAQ Portable. Here's why.



The COMPAQ Portable runs all the popular programs written for the IBM Personal Computer. Even the user guides can be used right off the shelf.

The COMPAQ™ Portable Computer runs more programs than any other portable computer. In fact, it runs more than most non-portable personal computers.

All of the popular programs written for the IBM® Personal Computer will run on the COMPAQ Portable. There are hundreds of them, available at computer stores nationwide. And each one is more productive when you run it on a portable personal computer.

With the COMPAQ Portable you get portability and you don't sacrifice performance.

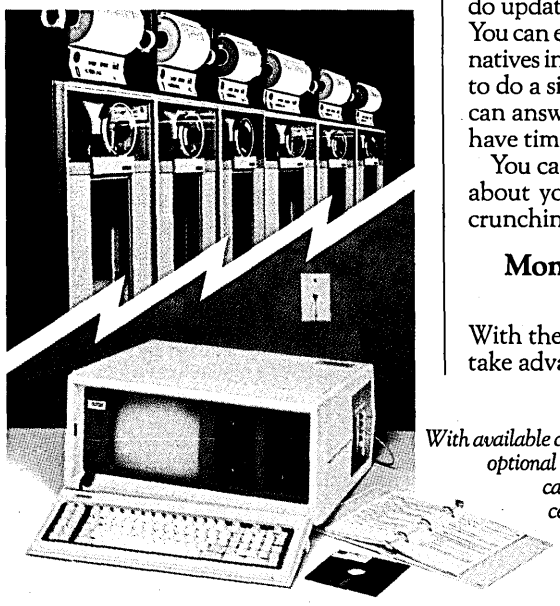
True compatibility

A lot of computer manufacturers claim their computer is compatible with the IBM Personal Computer.

Well, there's compatible and there's compatible.

In a lot of cases, "compatible" means the computer will run IBM programs *after* you spend time and money making modifications to the computer, or the program, or both.

The COMPAQ Portable runs all of the popular programs written for the IBM Personal Computer just the way they come out of the package. As is. *No* modifications whatsoever.



With available communications programs and optional boards, the COMPAQ Portable can give you access to a variety of central computer files. Business information wherever you go.

Find out, "What if...?"

The COMPAQ Portable runs all the popular spreadsheet programs. With them, you can do a better job of almost any task you now do with pencil, paper, and calculator. Create a budget, a plan or a cost analysis. In minutes you can do updates that normally take hours. You can examine several different alternatives in less time than it would take to do a single problem by hand. You can answer questions you didn't even have time to ask before.

You can spend more time thinking about your business and less time crunching numbers.

Money management made portable

With the COMPAQ Portable you can take advantage of a variety of financial programs for full-scale professional money management.

Receivables programs tell you who owes money, how much and since when. Payables programs give you tighter control of outgoing cash. General ledger programs can record financial histories and pull together income statements and balance sheets. Payroll programs keep records, calculate deductions, and generate checks. Inventory management programs help you hold down inventory investment.

With the COMPAQ Portable you can take computerized accounting wherever you need it and keep closer contact with your company's financial status.

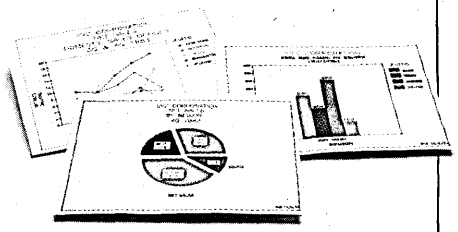
Word processing to go

Would a word processor make you more productive? Then imagine the power of a *portable* word processor.

Choose from a wide variety of popular word processing programs to meet your specific writing need.

With word processing programs and an optional printer you don't have to start fresh when you need to make revisions. You can change formats, move paragraphs, and automatically search for the parts that need to be updated. The COMPAQ Portable even runs programs that can check your spelling.

In other words, you can work smarter—not harder.



The COMPAQ Portable runs popular programs for designing color charts and graphs that can enhance your business presentations.

Computer conversations

The COMPAQ Portable can handle computer-to-computer communications.

There are a number of communications expansion boards and programs available that can keep you in touch.

Some allow you to use the COMPAQ Portable to access a variety of central computer files over the phone. You can have headquarters information wherever you travel.

With others you can retrieve late news or stock prices from data banks covering thousands of topics.

Others enable you to send electronic mail. Across the hall or across the country.

And the COMPAQ Portable can be equipped to link with both local and wide area networks of compatible computers so everyone in your company can work with the same information.

All these expansion boards, and others, will fit into any of three expansion slots in the COMPAQ Portable. The slots accept the popular IBM-compatible boards so your COMPAQ Portable can grow to keep up with your changing needs.

A world of business information is available wherever you and the COMPAQ Portable go.

...and lots of others

There are programs for designing graphs and charts, programs for keeping track of complicated schedules, and programs for electronic filing. There are powerful integrated programs that allow you to perform several different tasks after entering your data only once.

The wealth of programs combined with the convenience of portability makes the COMPAQ Portable the most useful personal computer of all.

Even the most productive program is more efficient when it's used on a portable.

Ready to go

The COMPAQ Portable is big where it counts.

The display measures nine inches diagonally and shows a 25-line-by-80-character page that's easy to read even if you're leaning back in your chair. The keyboard is typewriter-like for ease of use and detached so it can fit the most comfortable working position.

Truly portable means tough enough for the road, and the COMPAQ Portable is. Electronic components are surrounded by a sturdy cross-braced aluminum frame. Disk drives are secured by unique rubber shock mounts. The outer case is made of LEXAN®, a polycarbonate plastic used to make bulletproof windows and faceplates for space suit helmets.

Truly portable also means ready to go without a lot of preparation. You can have the COMPAQ Portable ready to move in less time than it usually takes to pack your briefcase.

The added usefulness is free

The COMPAQ Portable works the way desktop computers do, but in more places. Yet it doesn't cost any more.

In fact, the COMPAQ Portable costs less than a comparably equipped IBM or Apple® III. The COMPAQ Portable comes standard with one 320K byte diskette drive and 128K bytes of memory. A second diskette drive and additional memory are available.

The bottom line is this—you just can't buy a more practical, useful, productive computer.

For the location of the Authorized Dealer nearest you, call 1-800-231-0900.

Specifications

Software
- ☐ Runs all the popular programs written for the IBM PC

Memory
- ☐ 128K bytes RAM
- ☐ Expandable to 640K bytes

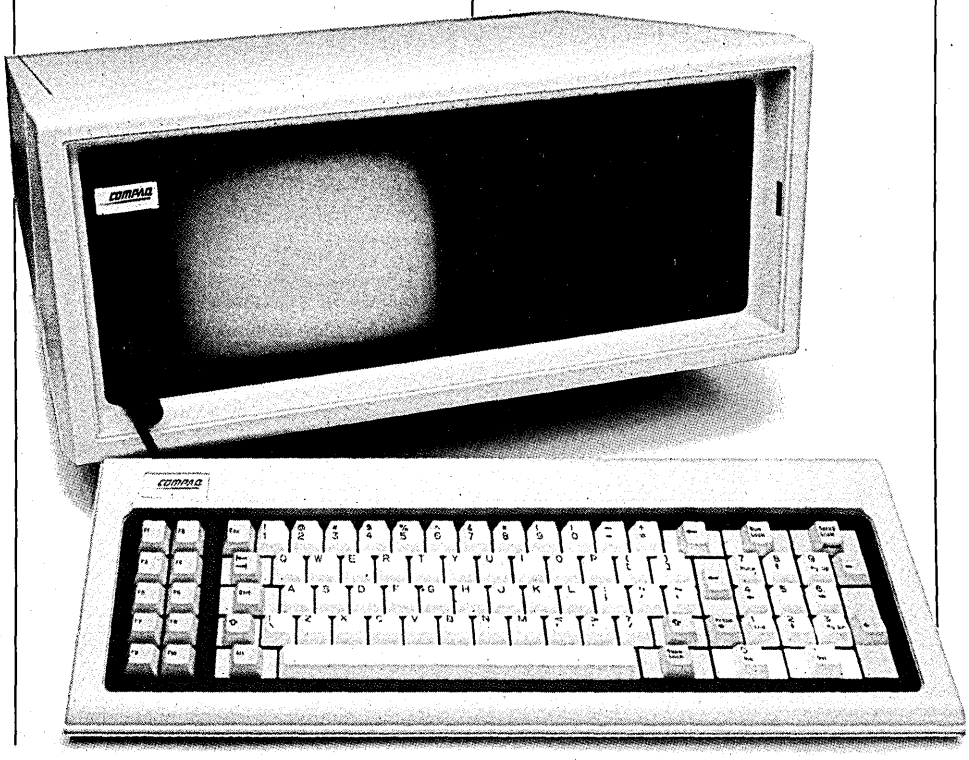
Storage
- ☐ One 320K byte diskette drive, second drive optional

Display
- ☐ 9-inch (diagonal) monochrome screen
- ☐ 25 lines by 80 characters
- ☐ Upper- and lowercase, high-resolution text characters
- ☐ High-resolution graphics

Expansion board slots
- ☐ Three IBM PC-compatible slots

Interfaces
- ☐ Parallel printer interface
- ☐ RGB color monitor interface
- ☐ Composite video monitor interface
- ☐ RF modulator interface

Physical specifications
- ☐ Totally self-contained and portable
- ☐ 20"W × 8½"H × 16"D



COMPAQ™

Twenty Years Ago/Ten Years Ago

LOOKING BACK

HIGH-LEVEL HOPES

February 1964: After taking over the presidency, Lyndon B. Johnson reaffirmed the government's commitment to establish a high-level commission on automation. Said the President, ". . . If we have the brainpower to invent these machines, we have the brainpower to make certain they are a boon and not a bane to humanity."

In efforts to assemble such a commission, a flurry of senatorial activity began. In July 1963, Senator Jacob Javits (R-N.Y.) proposed a measure, SJ 105, in the Senate to establish a Federal Commission on Automation. By February, hearings had been held, testimony taken, and nearly all of it had received favorable reaction. A subcommittee report was being prepared for further legislative action. Meanwhile, Senators Humphrey (D-Minn.) and Hart (D-Mich.) had proposed a different bill that would appoint a Hoover-type commission to deal with the economic and social dislocations caused by automation.

Actually, Johnson could have appointed a commission, but instead, he diplomatically allowed Congress to do the work. Neither of the bills passed.

Another bill, HR 11611, eventually made it through the congressional maze (in September '64) and was granted Johnson's approval. The bill provided for the appointment of a 14-member National Commission on Technology, Automation, and Economic Progress to look into the parameters of technological change and report their findings to the President by the end of '65.

WHICH CAME FIRST?

February 1974: "Eckert and Mauchly did not themselves first invent the automatical electronic digital computer, but instead derived that subject matter from one Dr. John Vincent Atanasoff."

That decision, handed down by Federal District Court judge Earl R. Johnson, remains as controversial today as it was 10 years ago. Ending a 1971 patent infringement suit brought to court by Sperry Rand against Honeywell, the judge ruled that Sperry's patent was invalid, largely because the basic ideas embodied in the machine were derived from Atanasoff's ABC machine (Atanasoff-Berry Computer).

The litigation pitted a small, relatively unknown, disassembled machine against a highly touted, revolutionary, functional one.

It was later noted that, had Eckert and Mauchly not been so overzealous in their claims to the technology, their patent might have been upheld. Mauchly, however, maintained that he had never taken any ideas from Atanasoff.

Scant evidence in the form of a few letters indicated that Mauchly had formed his ideas for the computer long before he met Atanasoff at a scientific conference in 1940. After the initial contact, the two remained in touch. In June 1941 Mauchly visited Atanasoff and was shown the machine. They discussed the ABC at length, and Mauchly was allowed to read a copy of the comprehensive manuscript describing the machine's principles and features.

In 1942, Atanasoff went to the Naval Ordinance Laboratory, and discontinued work on the ABC machine. In a few years the computer was dismantled, and much of it was destroyed.

Mauchly's career led him to the University of Pennsylvania's Moore School of Electrical Engineering, where he started work on a project with Presper Eckert that eventually became ENIAC (Electronic Numerical Integrator and Calculator).

ENIAC was developed for the U.S. Army Ordinance Corps, which began funding the project in 1943. Despite the fact that the Army funded most of the project, the university kept commercial rights to the machine. Eckert and Mauchly, however, managed to convince the university to let them apply for the ENIAC patent in their own names.

Eventually the business activities of the pair led the university to demand they either subjugate their personal interests or have their employment terminated. They resigned and formed the Eckert-Mauchly Computer Corp., which was later sold to Sperry.

One thing is certain: regardless of how the ENIAC came to be, its impact as an innovation in computing is unparalleled.

—Lauren D'Attilo

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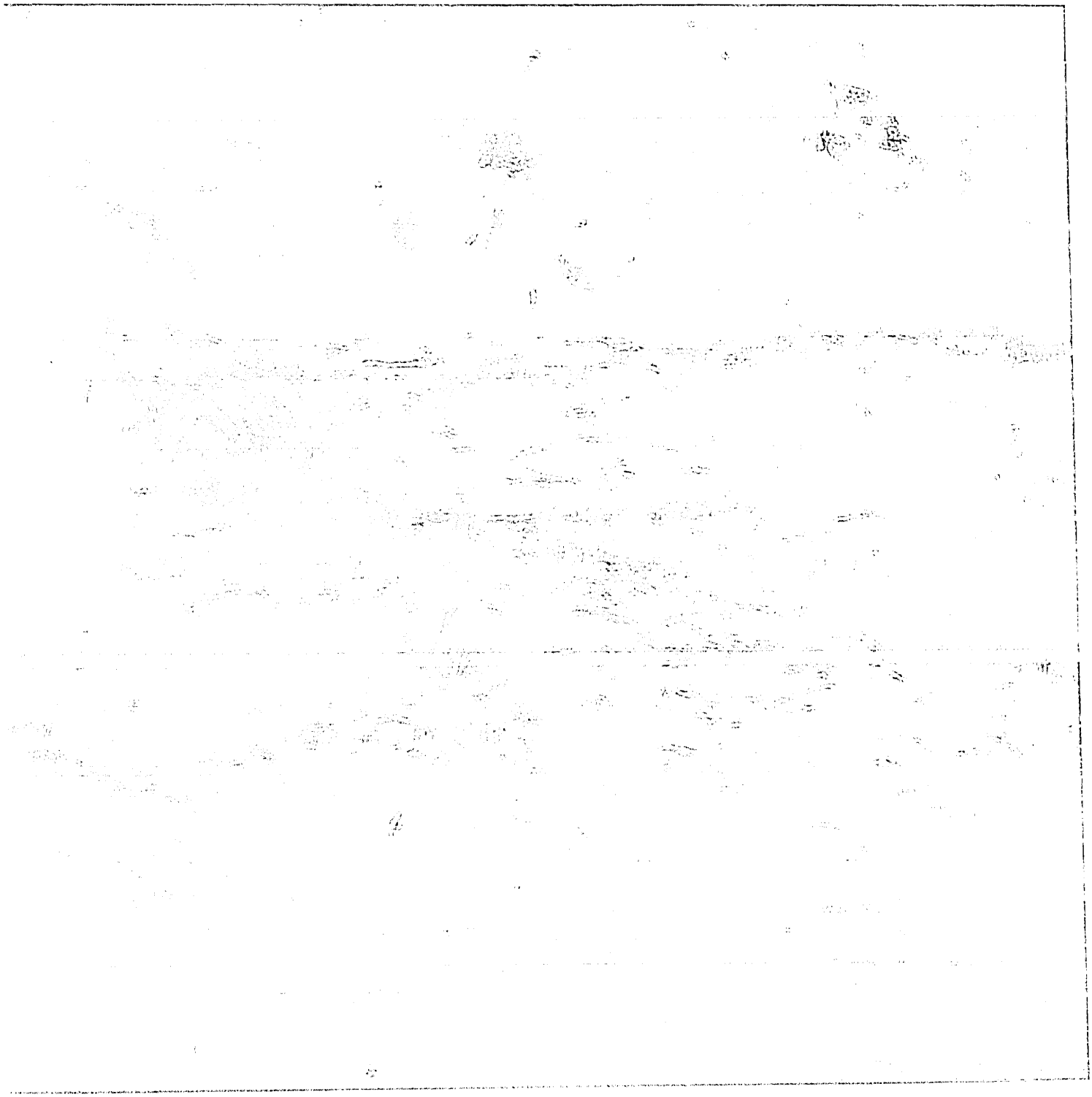

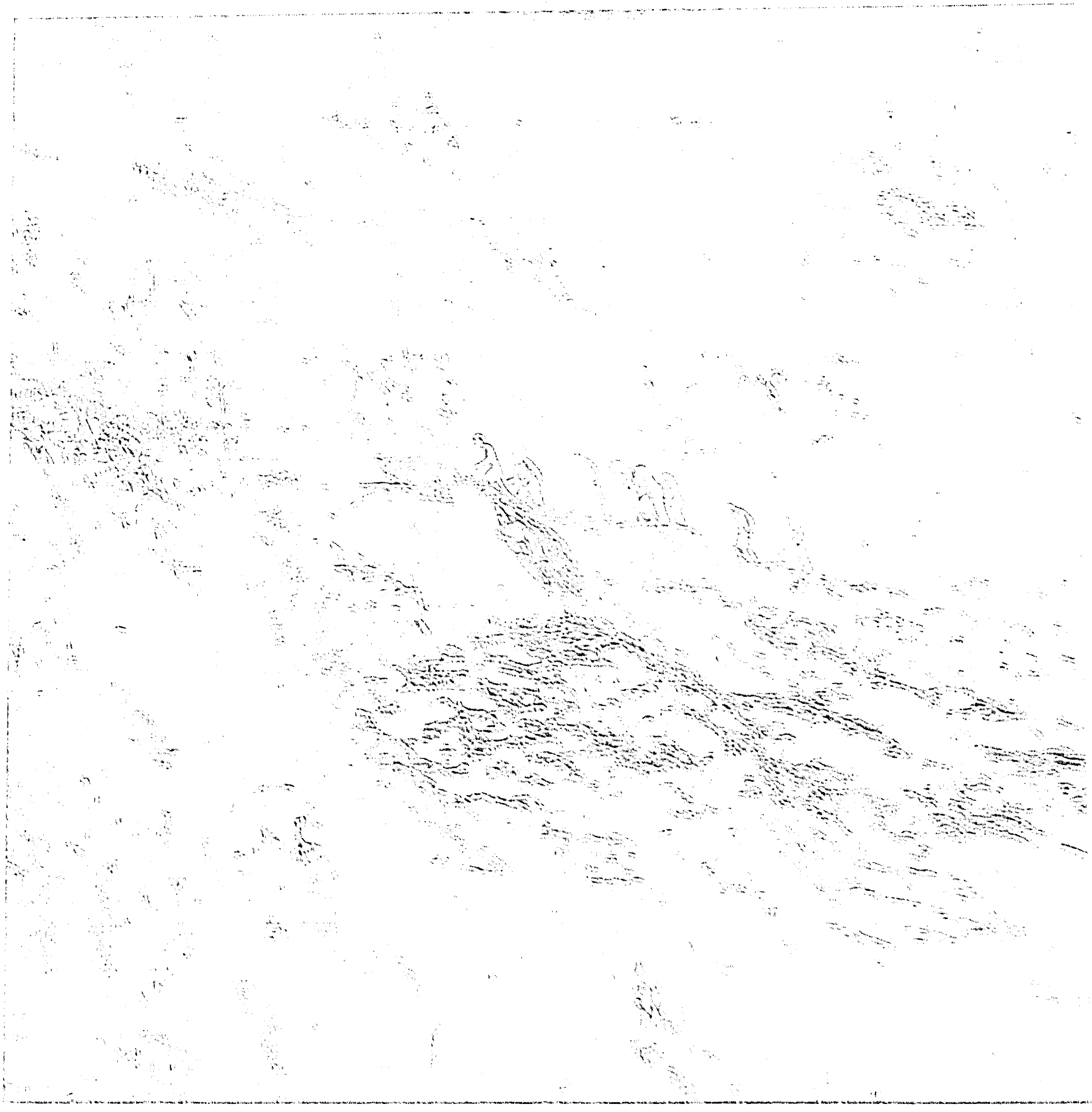

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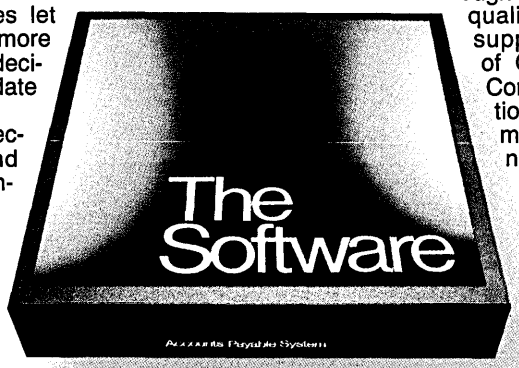

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CIRCLE 9 ON READER CARD

LOOK AHEAD

IBM TO LINK PRODUCT LINES	With coherency between imcompatible computer lines a main objective within IBM, the company has set up three well-funded task forces -- Nina, Pinta, and Santa Maria -- to forge links between different operating systems. The goal is to enable files to be shared between the P.C., System/38, and 4300/308X computer families. Meanwhile, the related Project X is working to consolidate hardware streams around the Intel 8086 family of microprocessors. The XT/370 personal computer is understood to be a subset of the Nina project.
POSSIBLE TAKE-OVER BY ICL	Word has it that United Telecommunications, the Kansas City, Kans., supplier of computing services, data network services, and telephone equipment, is on the block. Two possible suitors have been suggested by industry observers: Control Data Corp. and Britain's International Computers Ltd. CDC already has a strong position in computing services, leaving ICL as the more likely candidate for a takeover. On the other hand, ICL's financial position is not the strongest it's ever been. It's not clear whether the entire United Telecom group is up for sale or just the computing services and networking portion.
CDC GOES VIRTUAL	Control Data is readying a virtual memory operating system for its largely scientific user base. To be introduced in April, the new feature will run on existing 800-series machines. At the same time, the company is to introduce a replacement for the 170 series of mainframes that will be virtually cost free for the user to migrate to. Meanwhile, word has it from Silicon Valley that CDC may be the next computer maker to sign on with Trilogy, Gene Amdahl's company, which has spent huge sums developing advanced, wafer-scale circuit technology.
IBM PERIPHERALS COMING	Plug-compatible peripherals suppliers are going to have their hands full once IBM unveils a long string of new devices expected shortly. Tops on the list is the Ocotillo tape drive, followed by a higher-density version of the 3380 disk drive and a high-speed (3,000 lpm?) line printer, all of which will hit Storage Technology Corp. where it hurts. By the way, wasn't STC to have unveiled its CMOS IBM-compatible mainframe by now?
B OF A AT HOME	Giant Bank of America, which is working on a ticklish plan to close more than 100 of its branch

LOOK AHEAD

offices in California, is beginning to offer statewide home banking this year to customers having any type of personal computer. Access is through Tymnet. Meanwhile, Chase Manhattan bank in New York City is marketing its Pronto home banking service through electronics retail outlets, including Crazy Eddie.

OSBORNE AGAIN

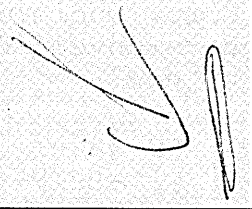
This month's Softcon show promises to be a newsworthy one, with Adam Osborne slated to unveil his new company, Lotus Development Corp. introducing its second act after 1-2-3, and a host of small startups trying to wedge their way into the crowded personal computing market. Those attending the New Orleans show will see the intrepid Osborne's Software Seed Capital Corp. make its debut just months after his portable computer company went down in flames.

IS IT REAL OR IS IT ...?

The microcomputer software industry at the Comdex show in Las Vegas was dealing in three new kinds of goods, according to securities analyst Michelle Preston of L.F. Rothchild: vaporware, demoware, and realware. Vaporware describes programs that are still under development and may never materialize; demoware is available in such limited quantities that evaluation is next to impossible; and realware refers to the 30 or so packages introduced and actually shipped.

RUMORS AND RAW RANDOM DATA

Tandem Computer is expected this month to come out with a new 14-inch disk drive that stores 264 megabytes. Up to eight drives can be attached in a daisychain configuration....Watch for VisiCorp to bring out SNA connections for the IBM P.C. line soon, now that it has bought Communications Solutions, a San Jose, Calif., firm....Reports that AT&T is eyeing Digital Equipment for acquisition continue to circulate, despite AT&T's recent signing of an oem deal with Convergent Technologies....Independent software vendors specializing in low-end, former IBM GSD products are wondering if the upcoming IBM Popcorn machine, expected soon to fill the gap between the P.C. and System/36, will be able to run the same BASIC programs written for the System/23 Datamaster....Former vp of Intel's database group Eugene Lowenthal has moved to the Austin-based MCC consortium, where advanced computer and microelectronic work is under way....Artificial Intelligence Corp., Waltham, Mass., this month will unveil an IBM P.C. version of its Intellect natural language software. The package turns the desktop machine into an intelligent terminal.



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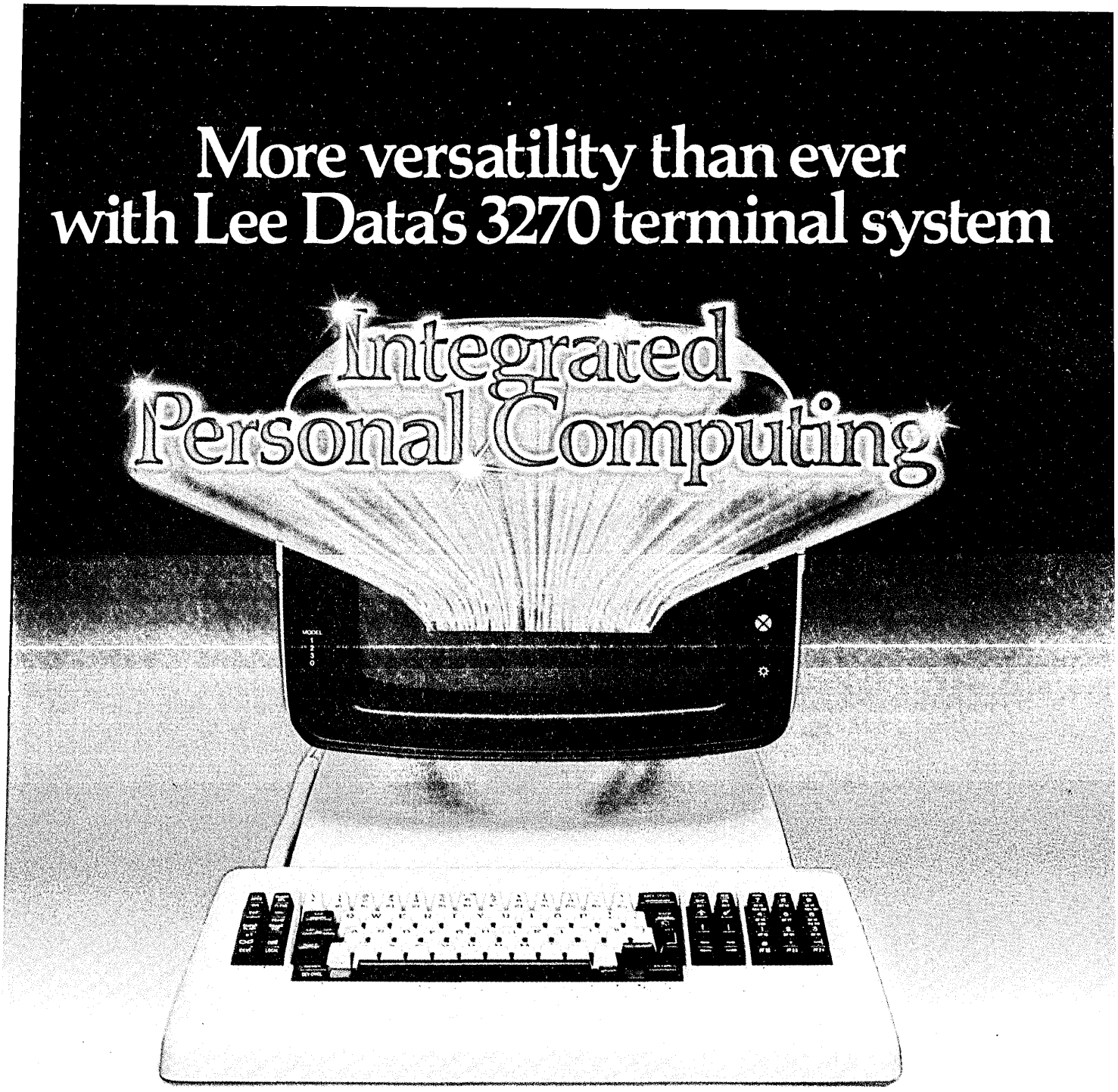

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CALENDAR

FEBRUARY

1984 Office Automation Conference (OAC '84).
Feb. 20-22, Los Angeles, Calif., contact: Ann-Marie Bartels, American Federation of Information Processing Societies (AFIPS), 1899 Preston White Dr., Reston, VA 22091, (703) 558-3613.

Information Technology and Office Automation Exhibition and Conference (INFO '84).
Feb. 21-24, London, England, contact: B.E.D. Exhibitions Ltd., 44 Wallington Square, Wallington, Surrey SM6 8RG England, (01) 647-1001, telex: 893069 BEDATA.

IMPRINTA 84 (International Congress and Exhibition for Communications and Techniques).
Feb. 22-28, Dusseldorf, West Germany, contact: Dusseldorf Trade Shows, 500 Fifth Ave., New York, NY 10110, (212) 840-7744.

MICAD '84.
Feb. 27-March 2, Paris, France, contact: World Computer Graphics Association Inc., 2033 M Street NW, Suite 399, Washington, DC 20036, (202) 775-9556.

The Hong Kong Personal Business Computer Show.
Feb. 29-March 3, Hong Kong, China, contact: Overseas Exhibition Services Ltd., 11 Manchester Square, London W1M 5AB, England.

MARCH

SaudiComputer 84.
March 18-22, Riyadh, Saudi Arabia, contact: Overseas Exhibition Services Ltd., 11 Manchester Square, London W1M 5AB, England (01) 486-1951.

Automated Manufacturing 1984 (AM '84).
March 19-22, Greenville, S.C., contact: AM84, P.O. Box 5823, Greenville, SC 29606, (803) 233-2562.

Federal Office Systems Expo (FOSE '84).
March 19-22, Washington, D.C., contact: Mary Beth Gouled, National Trade Publications Inc., 9418 Annapolis Rd., Lanham, MD 20706, (301) 459-8383 or (800) 638-8510.

International Symposium on the Performance of Computer Communication Systems.
March 21-23, Zurich, Switzerland, contact: Harry Rudin, IBM Research Laboratory, Saumerstrasse 4, CH-8803 Ruschlikon, Switzerland, (01) 724-2727.

The West Coast Computer Faire.
March 23-25, San Francisco, Calif., contact: David Sudkin, General Manager, Computer Faire Inc., 570 Price Ave., Redwood City, CA 94063, (415) 364-4294.

APRIL

Hannover Fair.
April 4-11, Hannover, West Germany, contact: Hannover Fairs Information Center, P.O. Box 338, Route 22 East, Whitehouse, NJ 08888, (201) 534-9044 or (800) 526-5978.

Intergraphics '84.
April 9-12, Tokyo, Japan, contact: World Computer Graphics Association Inc., 2033 M Street NW, Suite 399, Washington, DC 20036, (202) 775-9556.

The Sixth Annual International Conference on Computer Capacity Management (ICCCM).
April 9-12, Washington, D.C., contact: Institute for Software Engineering, 510 Oakmead Parkway, Sunnyvale, CA 94086, (408) 749-0133.

Videotex '84.
April 16-18, Chicago, Ill., contact: London Online Inc., Suite 3314, 1133 Avenue of the Americas, New York, NY 10036, (212) 398-1177.

AUTOFACT Japan Conference & Exhibition.
April 25-27, Kobe, Japan, contact: Public Relations Department, Society of Manufacturing Engineers, One SME Drive, P.O. Box 930, Dearborn, MI 48128, (313) 271-1500.

MAY

Session '84 (The National Conference of the Canadian Information Processing Society, CIPS).
May 9-11, Calgary, Alberta, contact: CIPS Session '84, Canadian Information Processing Society, 722-500 4th Ave. SW, Calgary, Alberta, T2P 2V6 Canada, (403) 261-5744.

Computer Graphics '84.
May 13-17, Anaheim, Calif., contact: Christine A. Radiske, National Computer Graphics Assn., 8401 Arlington Blvd., Suite 601, Fairfax, VA 22031, (703) 698-9600.

1984 IEEE International Conference on Communications (ICC '84).
May 14-17, Amsterdam, the Netherlands, contact: Dr. T.A.C.M. Claasen, Secretary of the Executive Committee, Philips' Research Laboratories, P.O. Box 218, 5800 MD Eindhoven, the Netherlands.

Communications '84.
May 15-18, Birmingham, England, contact: Kallman Associates, U.S. Representative, 5 Maple Court, Ridgewood, NJ 07450, (201) 652-7070; or Terry Brandon, Industrial and Trade Fairs Ltd., Radcliffe House, Blenheim Court, Solihull, West Midlands B91 2BG England, 021-705-6707.

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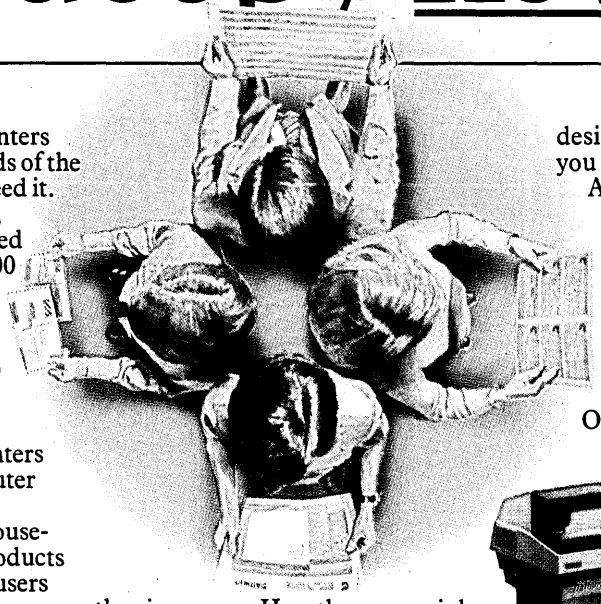

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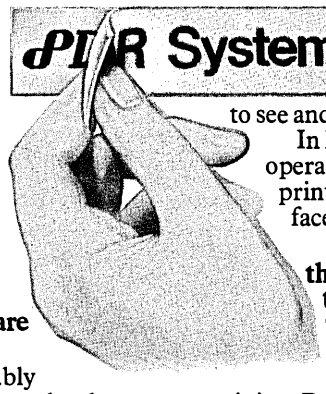

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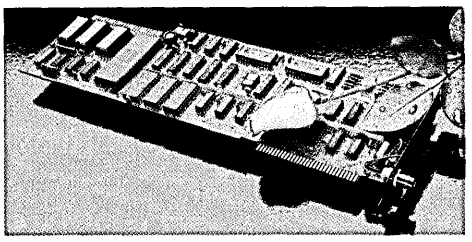

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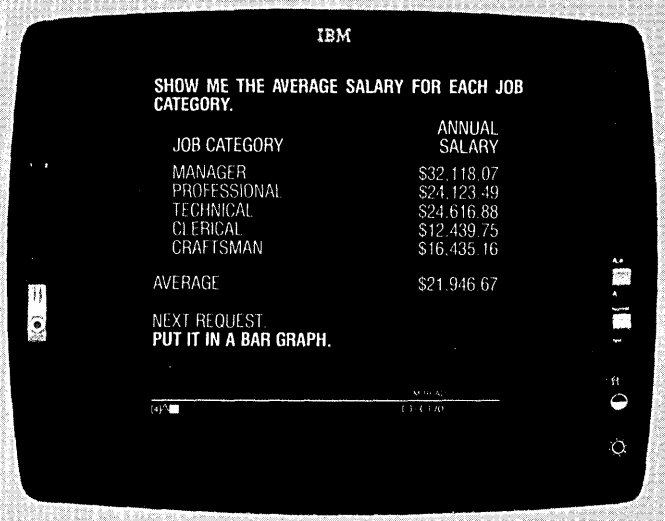

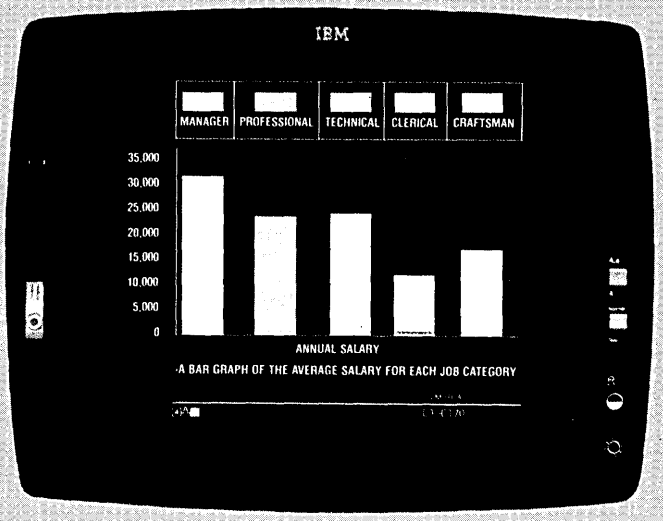

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CIRCLE 14 ON READER CARD

LETTERS

WELL TRAINED!

"Negotiate. Be hard-nosed. When you bring the training firm around to where they are considering not doing the course for you, you've reached the right price."

When I reached this appalling quote, I was convinced. Your article on data processing training (November, p. 202) is out of the Dark Ages, urging caution, suspicion, and focus on the dollar. Total negativism.

Where is a whisper about the contributions training makes? A mention of the satisfaction clients experience with reputable trainers? The success that investments in training have achieved?

As any training company knows, it takes years to build a reputation in a client company, and only one bad seminar to jeopardize that respect. While it may be sensational to picture consultants and trainers as money-grasping charlatans out to rip off corporations, this perspective is neither accurate nor in the best interest of your readers. People in business today need reasons to act, not reasons to avoid. Your article evoked fear and generated suspicion.

People in business, and particularly in dp today, need to take risks, make decisions faster, and get beyond resistance to change. To paraphrase Will Rogers: even if you're on the right track, if you stand still you'll get run over by the next train. Negativism, as demonstrated in this article, just ties people to the rails. DATAMATION owes its readers far better than this.

ANETT D. GRANT
President
Executive Speaking Inc.
Minneapolis, Minnesota

I realize that in your article on dp training it would be impossible to list *all* sources of dp training, but I would like to mention an often overlooked resource—the community college.

Community colleges have grown both in number and scope of courses taught. Many of these colleges have excellent programs in dp. In addition, community colleges are designed to react quickly to the needs of the community.

Here are some of the ways that the community college can help businesses with dp training: 1) most community colleges are eager to work with local businesses to conduct in-house training classes; the school will work with the business to custom-design the course for its needs. 2) Businesses should also look at the course offerings at the community college; if a company needs a course that is not offered, it should contact the school and see if the course could be added to the curriculum or offered in the future.

Companies would find that by taking advantage of what is offered by the community college they could satisfy their training needs at a very reasonable cost, incur no travel expenses, and minimize loss of employee time. In addition, the company would be sure that the course would be taught by someone who is experienced both in the dp area and in teaching classes.

Look around. The best dp training may be right in your own backyard.

JIM HUGHES
Instructor, Data Processing
El Centro College
Dallas, Texas

FROM THE PADDED CELL

Possibly Michael E.D. Koenig is a librarian—or he is wed to one (September, Readers' Forum, p. 243). Those are plausible explanations for his unqualified admiration of librarians as experts, as people who know better than the patrons of a library how "to describe the information they really want or need." My experiences suggest a less sanguine view.

Next time you're in your neighborhood library, look in its catalog (which catalog: Author/title? Subject?) to see if the library contains any "information" about "1984." The first thing you discover, no matter to which of the catalogs you turn, is that numbers, written as I wrote "1984," are unknown to the people who make entries in catalogs. So, you have to spell out "1984." The question is, how? One thousand nine hundred and eighty-four? One nine eight four? Nineteen hundred eighty-four? None of those variations in the spelling out of "1984" will yield a pointer to George Orwell's book, *1984*, or to the books *about* George Orwell. The standard accessing mechanism of libraries, designed by expert librarians, is virtually worthless!

That's one example of how helpful librarians can be.

Recently, for another example, I went to my neighborhood research library to learn about "semantic networks." It was not an entry in either catalog; nor was it an entry in the mind of the reference librarian to whom I referred "my problem." Later, after I had located material in which I was interested (using only my personal resources), I tried to persuade the library that what it had called "my problem" was actually the library's. I asked to have the descriptor "semantic networks" added to the subject catalog. I had hardly uttered the request when little men in white coats appeared on the scene to take me away.

My family had to hire a lawyer to intercede on my behalf. He failed to gain my release. I am being detained for observation, "a potential danger to the community," all because I—unqualified (and unsullied) by professional training as a librarian—wanted to contribute a useful bit of information to one of a library's catalogs.

When I get out of this place (as I am confident I will), I shall return to the business in behalf of which I went to the library in the first place: we help ordinary mortals—including people who "do" computing—improve their abilities to manage collections of information so that they can find what they seek, quickly and easily, every time they look for it. We help our clients manage their collections without reliance on professionally trained "information scientists" (e.g., librarians). I believe we do an outstanding job of serving our clients—mainly because we start from the view that not only don't we know everything, but our clients, collectively, come to know more

about their collections and how they are to be used than we ever can.

It is virtually impossible to put a value on the ability to "consult the record of the race." (That is how Vannevar Bush put it almost 40 years ago in his seminal article, "As We May Think," *Atlantic Monthly*, July 1945. As the wartime head of the Office of Scientific Research and Development, Dr. Bush wrote to identify a postwar task suited to the abilities disclosed by those engineers, scientists, and technicians who had contributed so much to the successful prosecution of the war effort.) Clearly, the ability to consult the records of the race on one's own terms enriches both the records and their users.

I do not mean that librarians can't be, or aren't, helpful to their patrons; I have been helped by them an uncounted number of times, most recently within 24 hours of my writing these words. I do believe, however, there may be a little room for a lot of improvement.

ROBERT M. GORDON
Robert M. Gordon & Associates
Los Angeles, California

POWER TO THE (MANY) PEOPLE WHO CAUGHT THIS ONE

Congratulations for including an article on electrical power and ground for computer installations (October, p. 121). The importance of a good electrical environment is often underestimated.

The author covered many essential points, but his statement that a computer system needs a separate isolated ground should be clarified. It would be unsafe and a code violation to fail to connect a computer unit's conducting enclosure via conduit or equipment ground conductors (color coded green or green with yellow stripes) to the point where the power source neutral is grounded (see National Electrical Code ANSI/NFPA,70-1984, Article 250—Grounding, particularly Sections 250-23, 250-26, 250-74 Exception No. 4, and 384-27 Exception No. 1).

From a safety standpoint, connections to other dedicated ground electrodes are acceptable if they are added as an overlay, but not as a substitute for the required safety equipment ground conductor. Ground loops created by multiple grounds on a system are not acceptable justification for disconnecting the prescribed equipment ground conductor or installing insulating bushings in conduit. Computer installations must be safe and at the same time perform reliably.

These requirements and related details are described on p. 99 of the Federal Information Processing Standards Publication 94 (FIPS PUB 94), "Guideline on Electrical Power for ADP Installations," a publication of the National Bureau of Standards. Copies may be purchased from the National Technical Information Service, U.S. Dept. of Commerce, Springfield, VA 22161.

J. FRED KALBACH, P.E.
Kalbach Engineering
Altadena, California

IT'S SYMBOLIC

In a minor attempt to cut down noise pollution in your magazine, I'd like to call attention to a quote from Russell Noftsker, president of Symbolics Inc., in a story about Lisp machines (October, News In Perspective, p. 93): "Our machine has 20 times the performance of the Xerox 1108."

The artificial intelligence community in general knows that such statements are pure exaggeration, and downgrades Symbolics' otherwise good name. The 3600 is a fine machine, and doesn't need hyping of the worst sort.

As an example of the kind of information the AI community is receiving, I've included the results of a benchmarking study done at the University of Southern California's Information Sciences Institute. It shows that, at least on one major AI system, the Symbolics 3600 is definitely slower than any other major Lisp machine. I urge you to publish statements with some basis, such as this benchmark or others like it, rather than simple advertising.

NORTON R. GREENFELD
Director, AI Technology
Applied Expert Systems Inc.
Cambridge, Massachusetts

THE MISSING (OR MISSED) LINK

The November cover with a "connect-the-dots" picture was missing dot No. 17, and dot no. 26 was improperly located.

JIM FINFROCK
IBM
West Milton, Ohio

Your November cover highlights the "Micro-Mainframe Connection." Is the dot-to-dot drawing making a statement that there is no connection? Dot No. 17 that would connect the mainframe to the micro is missing.

FRANK B. SUMMERS
2nd VP and Director
Data Processing Operations
Western-Southern Life
Cincinnati, Ohio

November 17, 1983
5414 E. Lafayette Blvd.
Phoenix AZ
85018

Dear Sir
I was doing your dot to dot cover on the November Issue of DATAMATION (it is my daddy's magazine) And I got stuck on 16 because there was no 17. So I went on to 18. So please tell Susan Hunt Yule. to next time ~~check~~ check her art-work. But I did finish it anyway. and also tell her to make more ~~dot~~ dot to dots.

Love
Anne Djurdjević
Age 7, Grade 2.
Hopi elementary schod.

For those of you who have found it difficult to connect the micro to the mainframe, see p. 126 of our November issue for the solution. (You may find the missing No. 17 there as well!)—Ed.

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Full featured, less expensive and one-sixth the size of other Data PBXs, the DSS-1 Data Switching System can tie together up to 1,920 terminals and computer ports into an efficient local data network without special cables, or interfacing problems. Even in networks with as few as 50 terminals, the DSS-1 could be a moneysaver.

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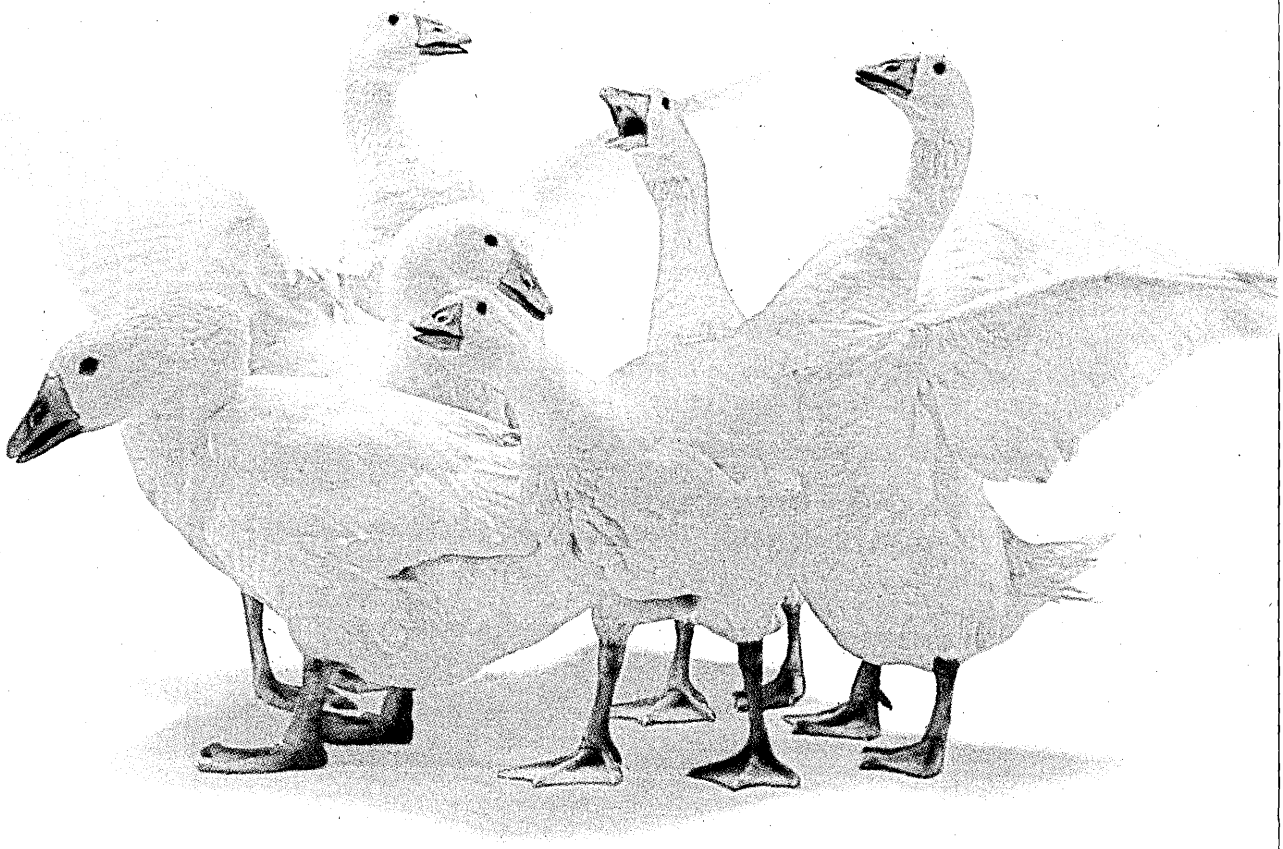


While everyone else has been squawking about private networks, one company has been quietly building them.

Today, with dozens of new companies and hundreds of unproven products all promising to perform networking miracles, the noise level has become exceedingly loud.

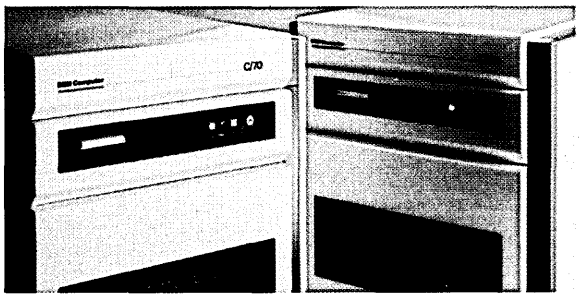
And the job of finding the right company to build your network has become more confusing than ever.

Meet BBN Communications. In the midst of the noise and confusion, we've been quietly building networks for government agencies and major corporations around the world. In fact, we built the world's first packet-switched computer network back in 1969.

But what sets us apart even more than our experience is the way we work. Instead of the usual short-term "fixes," we're committed to providing long-term solutions. So before we design your network, our communications consultants will analyze your specific needs—present and future. And based on them, establish your optimum network configuration. Then we'll build your network. Of course, even after everything is working to your satisfaction, we'll still be around to help with your future needs.

It takes more than computers to make a computer network.

Another thing that makes us different is that we manufacture a full line of our own proven networking hardware and software, not just a few isolated products. Including packet switches, terminal access

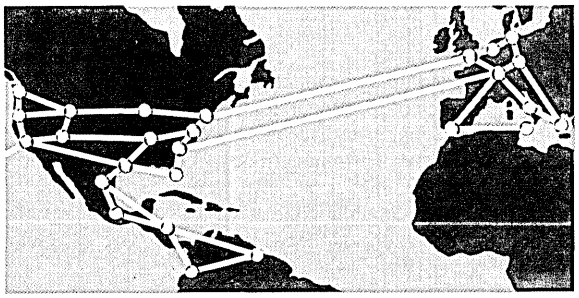


Our communications processors are the most advanced available today.

devices, and electronic mail systems. All of which simply means we can supply everything you need.

What's more, our entire product line is fully X.25 compatible and easily interfaces with public data networks.

But state-of-the-art technology is just the beginning. We also provide a network operations center so you can monitor your entire network at a glance and control it almost as easily. We'll even run the center for you if you like. And to ensure maximum network reliability—and uptime—we offer round-the-clock field service by the most experienced communications engineers in the business.



Packet-switched networks built by BBN Communications link companies with offices around the world.

Just because we're the networking leader, don't think for a minute that we're resting on our accomplishments. Our R and D effort is one of the largest in the industry, with major programs in protocol development, network control, and future network applications. And, of course, our customers receive the full benefits of every breakthrough we make.

We're the networking leader.

Fifteen years ago, we pioneered packet-switching technology to build the Arpanet, the world's first packet-switched computer network. Today, Arpanet supports 10,000 users and over 300 different computers in the United States and Europe, and the technology we invented for it has become a cornerstone of the data communications industry.

As the networking leader, our customers include major financial, manufacturing, and industrial corporations from all over the world. Recently we've even been selected to build and run the U.S. Defense Department's major new computer network, the Defense Data Network.

So if you're tired of all the squawking, consider BBN Communications. We think it's about time you got your network, and some peace and quiet, too.

For a brochure on our complete networking capabilities, contact BBN Communications Corporation, 33 Moulton Street, Cambridge, MA 02238, (617) 497-2800.

BBN Communications Corporation

CIRCLE 16 ON READER CARD

LETTERS

WHAT'S YOUR ALIBI?

Other than VisiCalc and word processing, Louis Naugès fails to get to any point about what office automation is going to do for anybody (November, p. 233). This was my argument in "The OA Hoax" in a Readers' Forum article in September's DATAMATION. I'll bet that if Mr. Naugès ran seminars on "how to make the most effective use of word processing in your office" or "how managers can take advantage of computerized spreadsheet systems," he wouldn't find anybody making the types of excuses he encounters.

The problem isn't that the managers of the world are a bunch of reactionary oafs who haven't the gray matter to accept the grace being offered by the bureautique evangelists. Quite the contrary: the salvation being offered isn't anything like it's promised, and the managers of the world wouldn't be where they were if they fell for such scams.

ALAN KRIGMAN
President
ICON/Information Concepts Inc.
Philadelphia, Pennsylvania

LEST YOU FORGET . . .

Your "Looking Back" column for November attempts to recap the Telex-IBM lawsuit going back 10 years. Some readers might erroneously assume from the item that Judge Christensen's award to Telex remained in force. Your article should have noted the fact that the U.S. Court of Appeals completely overturned the judgment against IBM and let stand a trade secrets judgment against Telex. The matter was settled between the parties prior to a U.S. Supreme Court ruling on Telex's petition. IBM did not pay Telex anything and, as a result of the settlement, Telex was forgiven the monies owed IBM.

EDWARD NANAS
Director of Information
IBM
Armonk, New York

A PICTURE'S WORTH . . .

The photo accompanying the feature article, "Office Automation Without Micros," (November, p. 176) was a definite eye-stopper. The article itself was a morale booster because it showed that supporting office automation can be done without dozens of unlinked micros.

P. S. LOWE
Management Information Services
Garrett Pneumatic Systems Division
The Garrett Corporation
Phoenix, Arizona

LOOKS *AREN'T* DECEIVING

Just got November DATAMATION and turned immediately to the article called "Portable Computing: How High Can It Fly?" I was stunned and delighted by the lead photo! It really looks like the fellow jumped out of an airplane with a computer in his hands.

DR. JOEL N. ORR
Chairman and Principal Consultant
Orr Associates Inc.
Danbury, Connecticut

ABC APPROACH—THE PITS!

Mr. Petersen's idea of having ABC keyboards for computer facilities has already come and gone (November, p. 334). We have one of the archaic devices here on an early model Wang 2200. The machine, even though 10-plus years old, is wonderful, but the keyboard has always been the pits because of the nonqwerty approach!

Wang soon thereafter introduced alternate keyboards that have remained in use to this day. I think Mr. Petersen ought to reconsider his thoughts on this matter. Incidentally, my previously noncomputer-oriented boss now uses a qwerty keyboard and although he doesn't touch-type, I've never heard any complaints about not having an ABC machine.

M. B. DANISH
Ballistic Research Lab
Aberdeen Proving Ground, Maryland

WHAT'S YOUR MAJOR?

I am dismayed that Prof. Archibald (November, Letters, p. 28) should think that "Pascal is now the only viable introduction to programming available to students." Whether or not it is the only viable introduction for computer science students, Pascal is surely not the only way to teach computing to prospective physicists. We must have our students learn FORTRAN. Indeed, for most purposes, we would rather they wrote messy FORTRAN than neat Pascal. No matter what computer scientists may think, most scientific programs in physics and astrophysics are in FORTRAN, and our students have to work with them and add to them.

For generations past, physics students have learned computing on the side, without formally enrolling in computer courses. If it is a choice between a student taking a one-semester or one-year course in computer science or taking an extra elective in physics, we should certainly opt for the physics, even if the programs that student wrote didn't come out well.

JAY M. PASACHOFF
Department of Physics and Astronomy
Williams College
Williamstown, Massachusetts

METHODWARE QUESTIONED

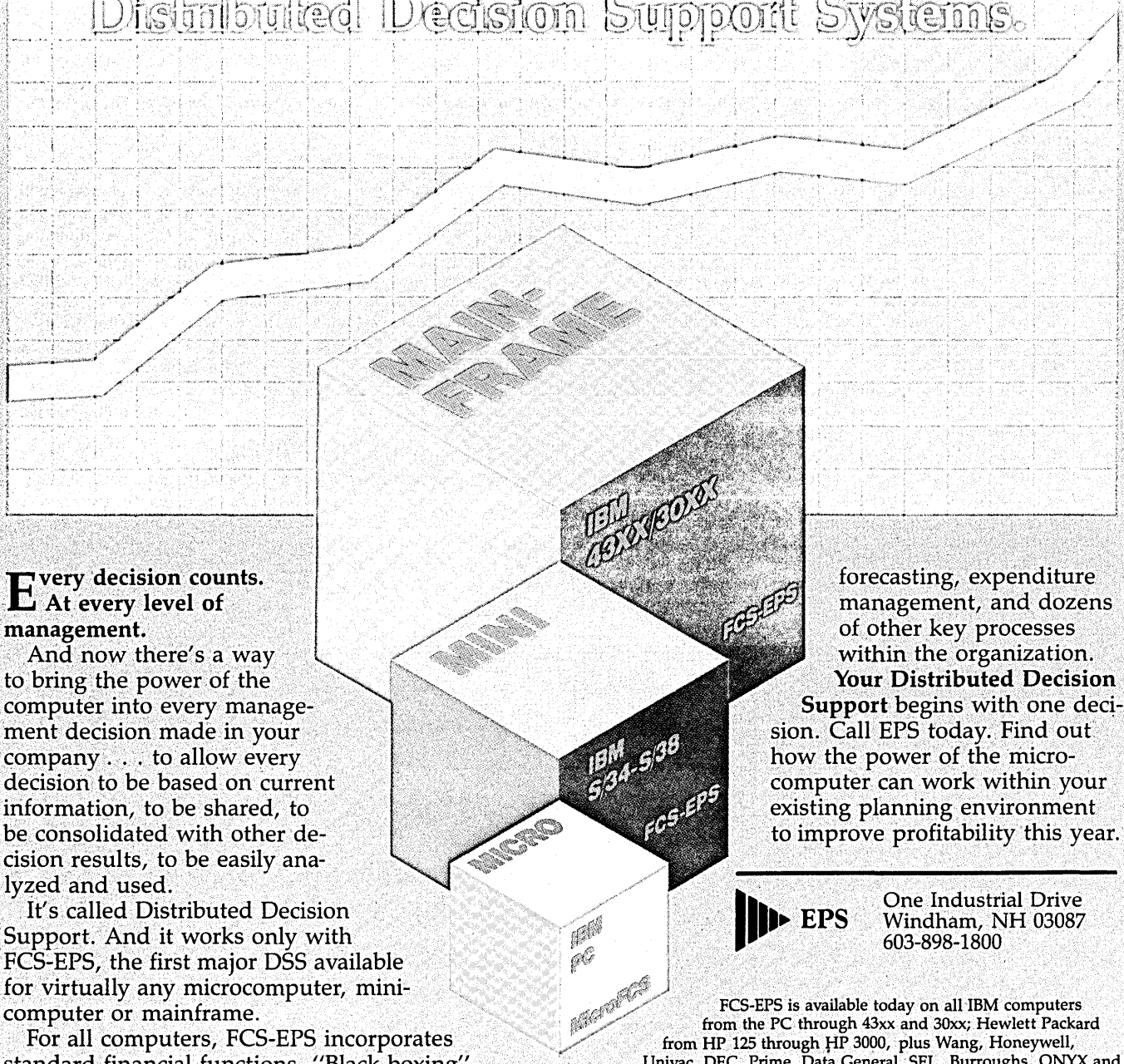
While I absolutely agree with Dan Appleton's premise in "Data-Driven Prototyping" (November, p. 259) that "requirements do change, and should be encouraged to change," I must take issue with his conclusion that functional decomposition methods for specifying processing requirements impose too rigid a framework to accommodate and encourage change. That is only true if the method is unautomated, as his "methodware" clearly is.

When functional decompositions can be created, verified, modified, etc., using a software tool, the decompositions cease to be rigid and static. When such requirements definition software is integrated with automated code generation software,

"We didn't have toys like that when I was a boy."

CARTOON BY LEO CULLUM

MicroFCS: The Final Link in Distributed Decision Support Systems.



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CIRCLE 29 ON READER CARD

LETTERS

the resultant ease of accommodating change is obvious, and may well constitute an ideal prototyping environment.

Of course, such process design approaches must be driven by proper data planning, modeling, and by the implementation of shared, normalized databases if their use is to result in truly integrated systems. This is precisely the approach advocated by Database Design Inc., and is reflected in our information engineering software, services, and development plans. And by the way, our planning software tool is called Information Planner, not Data Planner.

CAROL E. SHULMAN
Director of Marketing
Database Design Inc.
Ann Arbor, Michigan

OF BITS AND BYTES

The comment on Prime's arithmetic (October, Look Ahead, p. 14) showed more of the author's incompetence than of Prime's. Writing $2.5 \times 10^{14} = 2^{-2} \times 15^{15} \times 2^{15}$ and $1 \times 10^{15} = 5^{15} \times 2^{15}$, we see that to represent these values without error as binary floating numbers, we must be able to represent 5^{15} exactly. Now 5^{15} is a 35-bit integer. Since 32-bit floating point computers allow at most 24 bits for the significand, the unavoidable error in representing the two factors will be of the order of $2^{25} \approx 10^8$. The error would be even larger for machines using floating hexadecimal. In similar fashion, a 70-bit significand would be needed to represent the product $2.5 \times 10^{29} = 5^{30} \times 2^{28}$. Even an Intel 8087 is inadequate for this task!

Prime software and hardware have enough real problems without being pilloried for unavoidable limitations of nondecimal arithmetic.

HENRY C. THACHER JR.
Professor of Computer Science
University of Kentucky
Lexington, Kentucky

SOUR GRAPES ASIDE

Let's clear up some erroneous points from Ralph Emmett's otherwise insightful article entitled "IBM's Squeeze Play" (November, News In Perspective, p. 66).

In the text, he makes reference to "the current supermini price/performance leader." Referring to your Hardware section on p. 277 of that same issue, you will note the new Harris 1000 reaches 4 MIPS at $250,000. This equals $62,500 per MIP, and a No. 1 ranking.

Mr. Emmett notes that most competitors didn't do well in traditional middle-ground markets, citing DEC's 2.8% growth. The Computer Systems Division of Harris Corp. reported that U.S. orders for its superminicomputers increased 50%. These computer systems serve the same scientific/engineering/technical multi-user, multi-use environment as the other superminis.

This second important item of information was available very close to your deadline, and it's understandable that it could have missed the issue. The first item, however, was previewed to members of your staff, as well as to the Yankee Group and others.

Sour grapes aside, we hope you will accurately recognize us as an important and growing participant in the superminicomputer marketplace. Our traditionally high-performance systems have shown exciting customer acceptance and marked technological advances over the last few years.

DONALD D. WEST
Manager, Public Relations
Harris Corp.
Ft. Lauderdale, Florida

CORRECTION

In "The Dp Population Boom" (September, p. 100), the projection for the number of programmers in 1990 was misprinted. It should have been 625,000, consistent with the estimated 7% annual growth rate from the 317,000 programmers reported in the 1980 census.—Ed.

WHICH TWIN HAS THE TANDBERG?

The ergonomic terminal that puts performance at your fingertips

When it comes to performance, the keyboard of the new TDV 2200S puts more features at your fingertips than any other terminal on the market today. Features such as sixteen soft switches that store and recall up to 416 commonly used words, phrases or code sequences; up to 1024 different characters in a single terminal including mathematic and semigraphic symbols, Latin, Greek, Cyrillic and other alphabets; full editing and cursor control capabilities; a ten key numeric pad; and communications keys for character, page, block or line/field transmission.

The TDV 2200S will emulate virtually any popular terminal and protocol. It can be equipped with up to 56K bytes of memory and some models will store up to eight pages of data. It has an 8085-2 chip for ultra-high speed processing; superb communications capabilities including networking; and optional high resolution business graphics.

But the TDV 2200S is a lot more than a high performance terminal. It is also the first terminal that met the stringent requirements of the German ergonomic standard for operator comfort and safety. This means that the screen not only tilts, but it swivels, raises and lowers to fit all size people, in any room light at any angle. And the keyboard doesn't merely detach. It's a low profile work of art, so slim that it can be used in complete comfort on a standard desk.

To ease operator eye strain the TDV 2200S features a 15″ green on green or black on white screen with big letters; a 70Hz flicker-free refresh rate; an anti-reflex tube and matte finish to minimize reflection and a patented Equilite video system that displays both vertical and horizontal lines with the same intensity.

But to truly appreciate the performance and comfort of the TDV 2200S you should really try one for yourself. We'll be happy to put one at your fingertips. Just give us a call. Tandberg Data, Inc., P.O. Box 99, Labriola Court, Armonk, New York 10504. Phone: (914) 273-6400, Telex: 137357 Tanberg Arnk.

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CIRCLE 20 ON READER CARD

Rebecca S. Barna, Editor

EDITORIAL

IBM IS IN CONTROL

IBM-watchers are clamming up as IBM clamps down

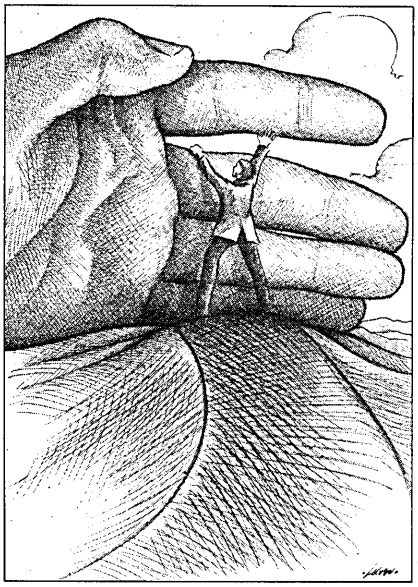

ILLUSTRATION BY RON LOGAN

When IBM opens a window, somewhere it closes a door.

On an unprecedented scale, Big Blue has been bowling over analysts, consultants, customers, and the press alike with its willingness to volunteer information. As DATAMATION began developing this issue's focus on IBM, it became increasingly clear that the company has a new, more open public information posture. Likewise, its position on what constitutes private information has changed; IBM is clamping down on what it considers interlopers.

In an article entitled "Mainframe Maneuvers," Hesh Wiener describes IBM's marketing strategy as a combination of finesse and brute force. The same could be said of IBM's information strategy.

A recent gathering of securities analysts was shocked to hear IBM espouse *specific* projections for the company's year ahead—a revenues growth rate of better than 17%, a tripling of personal computer shipments in '84, and an upturn in sales of 308X mainframes to the tune of 18%, to name a few. All this from traditional "no comment" IBM.

This new openness policy has not bypassed consultants either. Philip H. Dorn says in his article, "The Song Remains the Same," that IBM's "policy towards consultants has improved 1,000%. Any consultant who needs a manual, a price, an availability decision can get a quick answer through a local contact." That's another swing in strategy.

IBM's customers, of course, have always been privy to hints of what's coming next. Now, they sit in an even better seat. One member of an IBM P.C. user group says that as soon as PCjr was announced, IBM reps showed up for an intense Q&A session. "They gave us the pitch and answered as many questions as they could and still keep their jobs," a DATAMATION reporter was told.

Shedding its insular image, IBM has even made compadres out of some onetime competitors. Brian Jeffery reports how IBM, "With a Little Help from Some Friends," arrived at its current status of joint venturing with seven companies and holding a minority interest in seven others. No more of the not-invented-here syndrome.

The goodwill approach is even being tried out on the press. A few months back, DATAMATION received an uncommon offer from IBM: the company would be willing to author an article on its field service operations. Alas, DATAMATION already had a bureau manager assigned to that topic. Would IBM be willing to sit for interviews on the subject instead? The response was hardly unprecedented. In his IBM service story, "An End to Handholding," R. Emmett Carlyle gives IBM's answer: "The company refused to be interviewed at any level on the subject of remote or field service."

So much for IBM's finesse. When that approach doesn't work, brute force comes to the fore. Witness the case of the Gartner Group Inc., the Stamford, Conn., consultancy founded by ex-IBMer and ex-Wall Street analyst Gideon Gartner. In a suit brought and settled in the same day (January, Benchmarks, p. 92), IBM stipulated that the Gartner Group be permanently enjoined from "disclosing, using, or disseminating any IBM Protected Information." Moreover, the Connecticut company agreed, without admitting liability, to identify to IBM all who might have disclosed confidential IBM information, or who may in the future divulge such information; and to cooperate with IBM in any investigations into such disclosures.

Forgetting the question of guilt or innocence, of right or wrong, the Gartner Group case serves as a warning to all who seek out insider information on IBM. "We're all laying low on IBM," commented another prominent IBM-watcher, who requested—understandably—anonymity. "If IBM can so successfully squelch Gartner, who's to say who's next? IBM didn't play detective in finding out who leaked all the information on, say, PCjr. But then, that was information they [IBM] wanted leaked. And there's the rub."

When IBM opens a window, somewhere it closes a door. ❋

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Software Product Quality

- Experience in the design/implementation of quality computer systems
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QA Technical Leader

- Lead a group building quality into new system software
- Sound knowledge of database management software, software reliability and operating systems

Operating Systems

Positions involve design, implementation, and debugging skills, with 5+ years' operating systems development experience. Kernel operating system design desirable.

Datacommunications

- Develop and enhance software from link level protocols to access methods
- Projects involve SNA, terminal access methods, networking management, and networking

Processor Microcode

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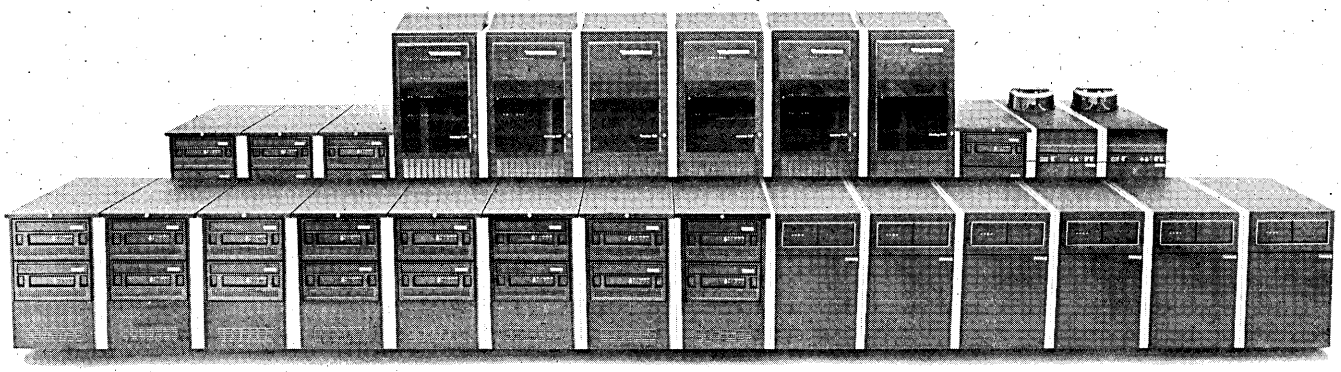

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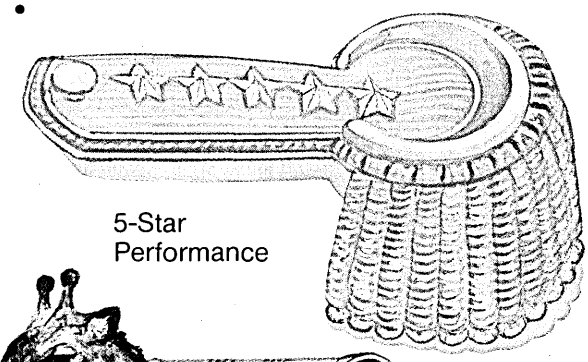

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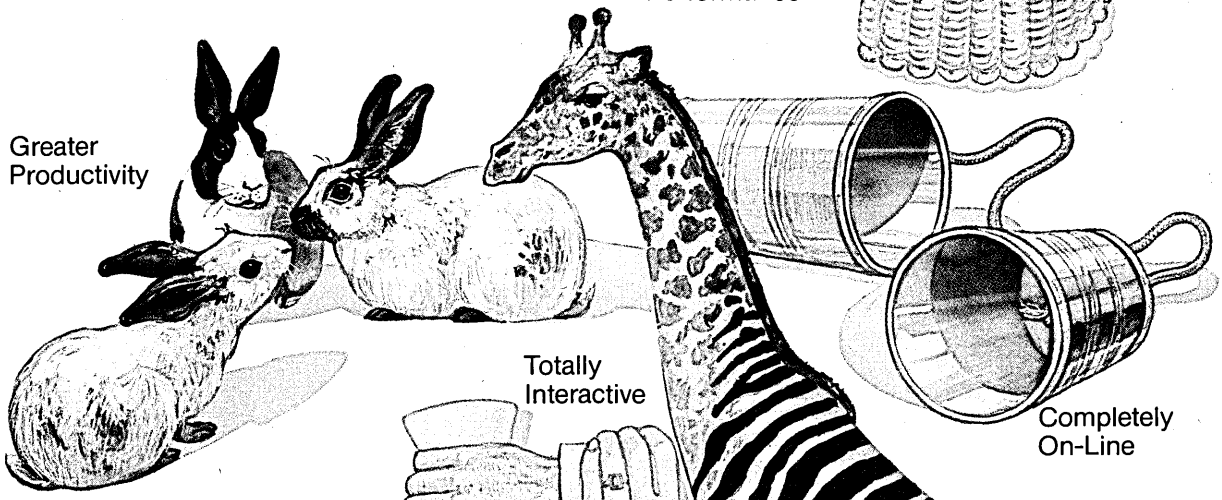

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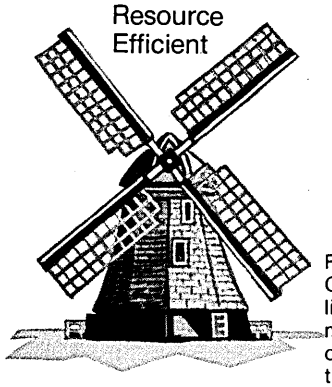

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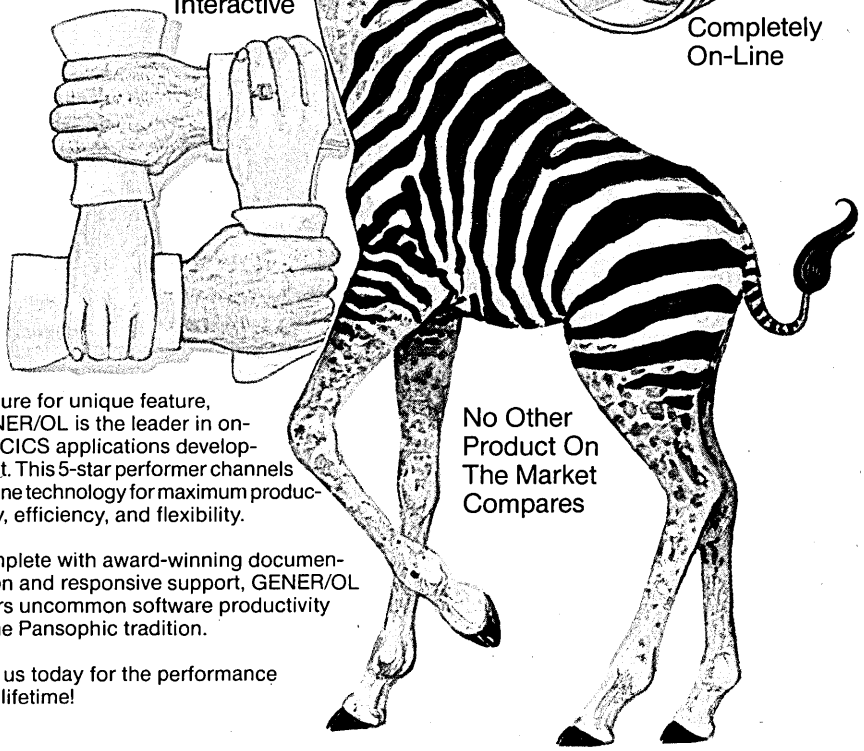

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IN FOCUS

THE OA MIRAGE

Planning for the integrated office of the future may be fun, but it's no substitute for implementing applications that support business needs.

by Michael Hammer

I spend much of my time traveling about the country and talking with that often silent, often forgotten segment of the office automation community—the customers. These individuals, whether dp or OA managers responsible for deploying new technologies in the firm or end users seeking to employ OA systems directly, are uncertain and confused. They hear conflicting and incomplete stories from the vendors. The press overwhelms them with weekly barrages of new products and biweekly reports of new vendors. Their own experiences with office automation range from the disastrous to the inconclusive. Above the din of their plaintive laments, three questions stand out:

1. How do I cost-justify office automation? 2. How do I sell office automation to my senior management? 3. What is the future of office automation?

What is striking about these questions is that they are exactly the same ones that were being asked in 1979. It is depressing to think that we have made so little progress in the last five years that people are still desperately searching for solutions to such fundamental concerns. Fortunately, recent discoveries now enable us to provide definitive answers to these critical questions. First, the bad news:

1. Office automation cannot be cost-justified. 2. Office automation cannot be sold to senior management. 3. Office automation has no future.

The good news is that there is no good news.

All but the hard-core OA enthusiasts recognize that office automation technologies cannot be "cost-justified" in the conventional sense of cost displacement. The putative benefits of office automation are usually expressed in terms of time savings or improved productivity (whatever that is). In reality, of course, the efficiency improvements brought about by technologies like word processing, electronic mail, and the like are only rarely translated into reduced headcount; 15 minutes "saved" by each of 30 people does not mean that one of those persons is now redundant. Rather, two phenomena usually occur as a result of office automation: an enormous increase in the volume of office tasks (typing, revising, communicating, etc.) performed in the organization; and absorption of the "saved

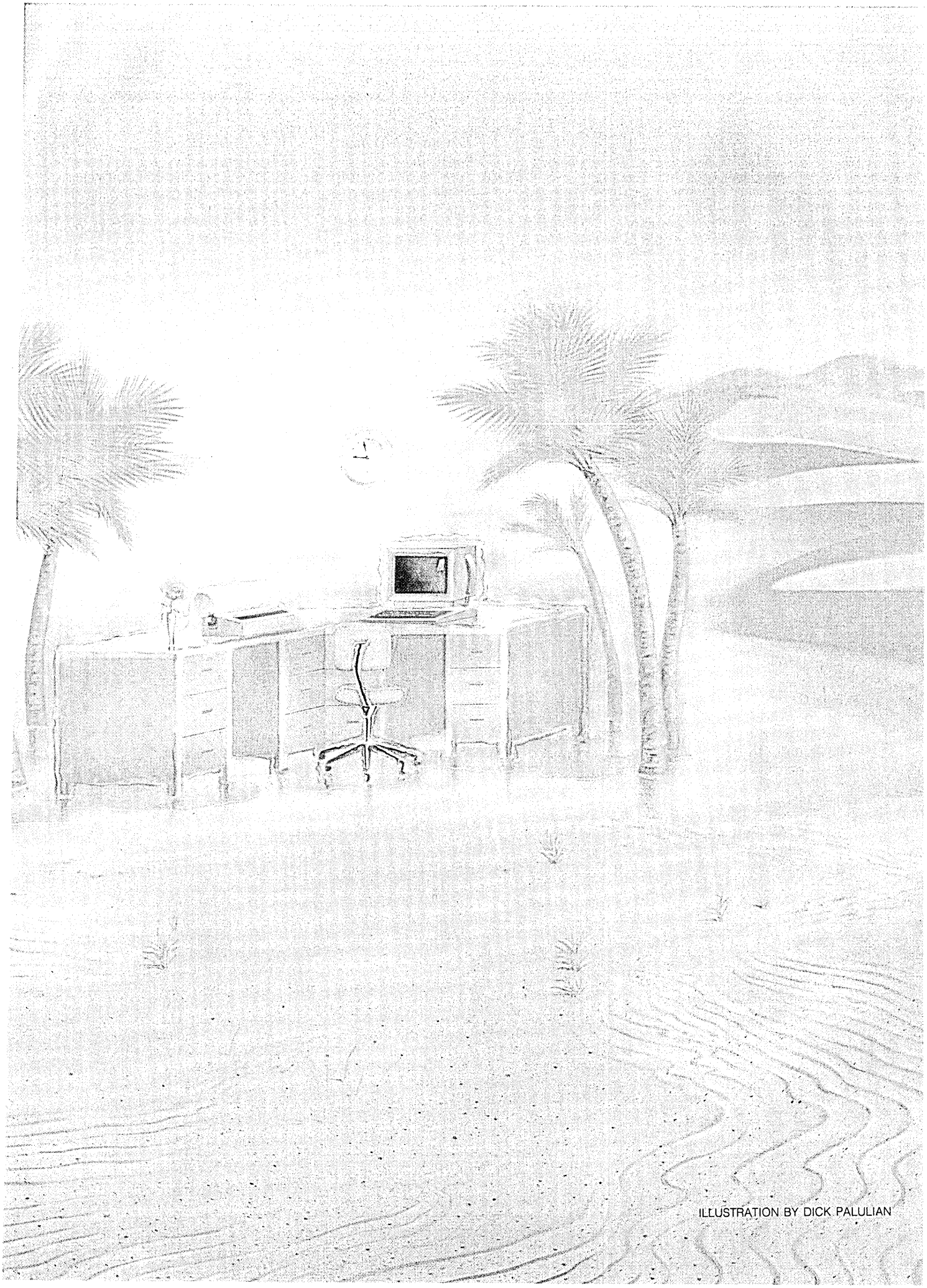

ILLUSTRATION BY DICK PALULIAN

time'' by other high-priority activities, such as lunch.

The first of these represents a variant of Parkinson's Law, which states that work expands to fill the amount of time available for its completion; now, work expands to fill the amount of equipment available for its completion. (In the dp world, this is exemplified by the ancient dictum ''there is no such thing as enough disk storage.'') In either case, simply increasing the efficiency with which administrative tasks are performed does not directly translate into meaningful benefits for the firm.

The form of the original question is also troubling. It suggests an ex post facto, desperate attempt to find a formal rationalization for technologies that ''experts'' insist are the wave of the future. It presumes that office automation is a worthy enterprise and that the onus lies on us to find a suitably clever way to justify it. Unfortunately, the entire OA community has been laboring for years to develop such justification techniques and has yet to come up with anything not patently ridiculous. It is tempting to conclude that we are approaching the issue in a backwards fashion, knowing that the answer is office automation before even hearing the question.

Much of the problem stems from the very phrase office automation, which connotes the use of specific technologies to automate routine administrative office tasks (document production, filing, communication, and the like). This phrase also must bear some of the blame for the impossibility of selling the concept to senior management. Executive reaction to OA ranges from stupefied boredom through skepticism to outright hostility. The idea of investing attention and resources in further automating routine office tasks is not one that senior managers find interesting. They have already seen word processors proliferate throughout their companies, but are hard-pressed to find meaningful measures of the benefits that have been achieved.

That office automation has no future is strongly indicated by the fact that it barely has a present. Malaise is the term that best describes its current state. Users are slow to adopt many of the new systems that have been heralded as the solution to mankind's problems. The vendors are, if anything, even more confused. They introduce surefire products that flop and are astounded by the unanticipated successes of field-developed ad hoceries. They lack a real understanding of the dynamics of their own industry, and so are unable to provide meaningful guidance to their customers. These are hard times for office automation.

A way out of these dilemmas may be found by starting with the simple premise that there is in fact no such thing as office automation—at least, not in the sense of a well-defined, separate set of technologies that has clear perimeters. Rather, office automation is nothing more than a collection of computer applications, in particular, applications that are not of a transaction processing character. A general ledger system is not OA; a decision support system, a document production system, or an electronic mail system used to facilitate executive interaction—these are OA.

Similarly, there is no such thing as a personal computer. Applying that term to those devices now proliferating on desktops is approximately as useful as calling a toaster an energy converter. While a toaster does convert electrical energy into heat energy, that fact is of only peripheral interest to a user; he is interested in crispy bread. A PC user does not care if there is an 8088, or a 68010, or a gerbil on a treadmill inside the box on his desk. What he cares about is that this box delivers a new class of applications, applications unsuitable for other platforms because they demand too much system resource relative to their value.

This emphasis on application is a simple perspective that can help us penetrate the hype and mystery surrounding office automation. Office automation is not a technology (or set of technologies) in search of a problem. It is not a complex and esoteric new field. It is the use of a diverse set of technologies (some old, some new) to support business people in the conduct of their businesses. The key word in the preceding sentence is support. Office automation is no more ''automation'' than computer science is science. OA focuses on providing assistance and support to front-office workers; the major objective of conventional dp systems is displacing back-office workers. Office automation is not word processing. To be sure, OA may utilize word processing, since wp provides useful support to many front-office workers (both secretarial and professional); similarly, it may encompass electronic mail. But it also includes PC-based spreadsheet applications, as well as information center-resident decision support applications.

OA has been afflicted with an extraordinary number of spectacular product failures.

Not only is OA not automation, it also has nothing to do with the office (whatever that is). The notion of reducing the office to its rudimentary units, and applying technology to them, is intellectually bankrupt. Rather, OA connotes the use of information by business people in support of nonroutine business processes. Notions of the paperless office and the electronic office of the future are as silly as they are irrelevant. The objective of OA is simply to improve the performance of business functions through the use of whatever applications are appropriate. The emphasis is on the specific applications that the particular organization requires. There is no such thing as automating the office; there is only building a system to serve the applications in a particular office.

This perspective can also help us avoid many of the snares and delusions that have beset the OA community, users and vendors alike. It should surprise no one that OA has been afflicted with an extraordinary number of spectacular product failures. Any endeavor so fundamentally misunderstood is bound to generate problems. In the absence of any real understanding of customer needs, vendors (and their camp followers among the press and consultants) have had to create an entire mythology of product design. The particular idols to be found in the pantheon vary with the phase of the moon and the inclinations of the lead lemming. Like any mythology, this one has a strong component of sympathetic magic; if a vendor can only adhere to currently accepted principles, the gods (and the customers) will smile upon him. Ritual is thus substituted for understanding.

The vocabulary of the current OA liturgy is rich with terms like user friendly, integrated software, and mouse. Now there is no great harm in adhering to these concepts, just as there is no great harm in painting oneself blue and worshiping the sun on Midsummer Day. But neither approach is likely to yield much result on its own.

The following list indicates the actual relative importance of various aspects of an OA system:

1. Functionality
2. Functionality
3. Nothing
4. Functionality
5. Everything else

The questions that will guide the perplexed through the OA maze (and that would have saved many a vendor from extinction) are these: who will use this product, what will they use it for, and why will they be better off for using it? This acid test can be used to explain otherwise puzzling phenomena. For example, the Xerox Star (8010) was widely hailed upon its introduction as the harbinger of a new age. The Star was positioned as a management/professional workstation; it used a high-resolution screen and employed a user interface based on icons and a mouse. It was intended to advance OA beyond secretarial word processing to the manager and professional. It sank like a stone. Even a casual inspection of the Star's functionality would have predicted this result. The Star did not provide any management/professional applications worthy of the name. It had a host of adequate administrative support applications and a very good word processor, but nothing that would address the business needs of its intended users. (In fact, the one market in which the Star has achieved some suc-

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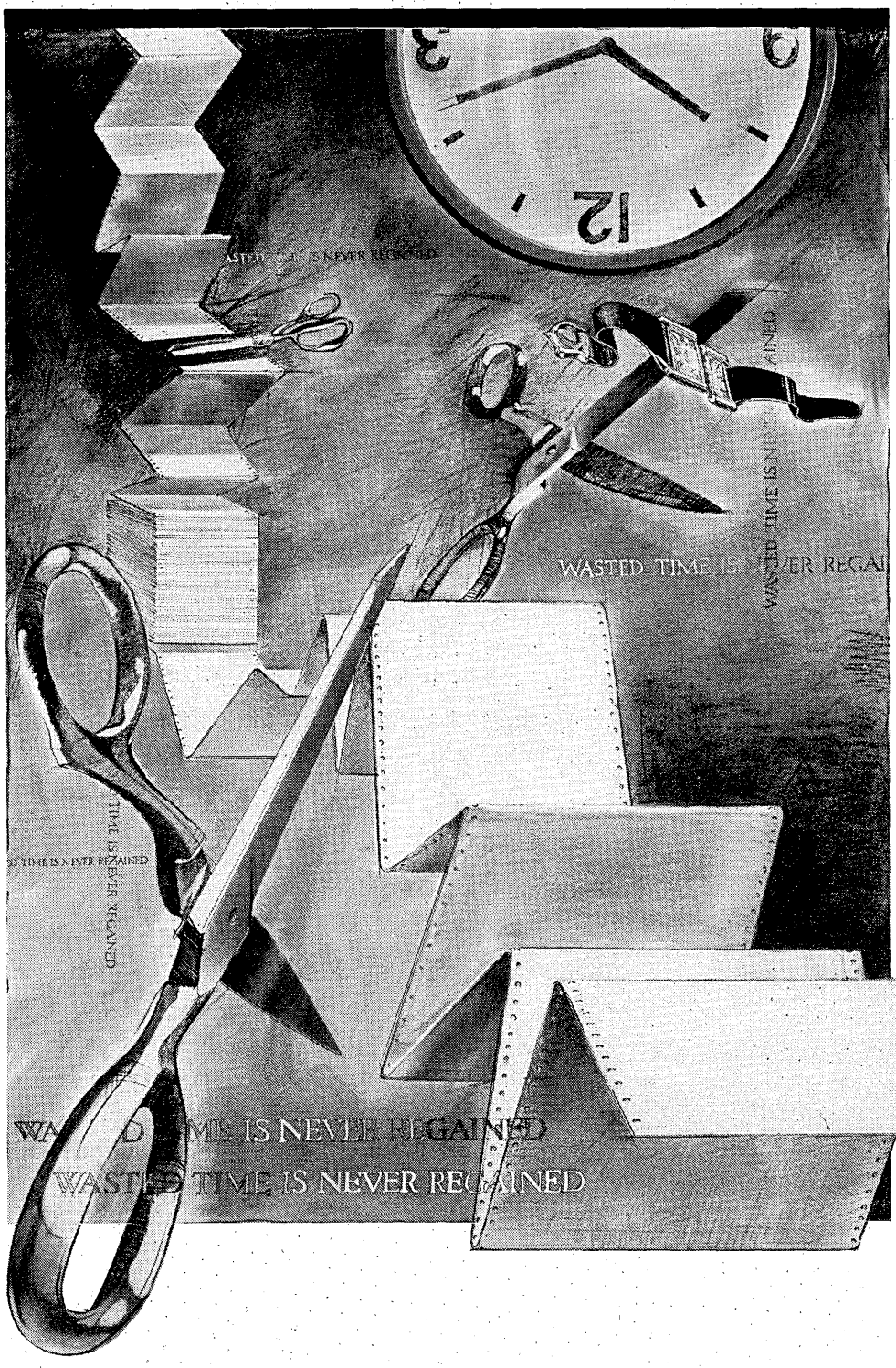

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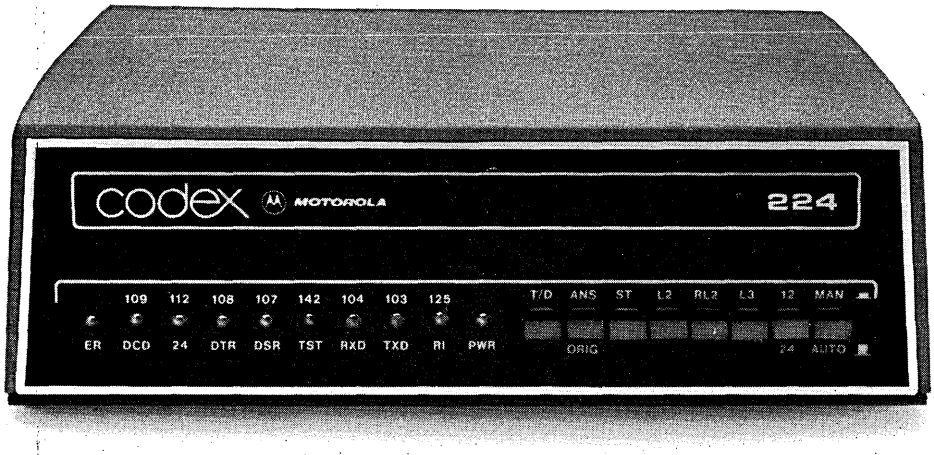

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cess is in the high end of word processing.) The reports in the press were enthusiastic to the point of sycophantry, but even they should have aroused suspicion, for they focused exclusively on the Star's interface, not on its capability.

Vendors have learned a lesson about ease of learning, ease of use, friendly interfaces, and the like, but unfortunately it is the wrong lesson. They have been roundly (and appropriately) chastised for the often unusable interfaces that their systems presented to users; it has finally sunk in that expressing oneself in JCL is an unnatural act. From this, the vendors have reached the imaginative conclusion that a good user interface covers all sins. They have forgotten two laws of nature: first, people buy systems for functions, not for interfaces; and secondly, when a vendor talks about interface, it means he has nothing else to say.

In reality, user interface is a second-order factor. All other things being equal, the system with the better interface is to be preferred. But a system with better functionality will almost always win over one with a better interface. It is no trick to design a system with a good interface; the trick is designing a powerful, functional system with a good interface. The only time that interface is a critical issue is when it in fact affects functionality. That is, a system with much capability but with an unusable interface possesses that capability in theory but not in reality; the poor quality of the interface prevents users from actually achieving the system's potential. Improving this system's interface in effect increases its functionality. But such improvements rapidly reach a point of diminishing returns; once a usable system is achieved, further energy is better invested in providing more capability, rather than in enhancing the interface to that which is already available.

A similar analysis leads to a less than enthusiastic view of the current crop of integrated environments. The determinant of which of the many windows-cum-mouse entrants will succeed depends primarily on the quality of the underlying packages.

Integration does not bring synergy, in which the whole magically exceeds the sum of the parts. It is in fact desirable to integrate, say, a word processor and a spreadsheet program, provide them with consistent interfaces, enable them to exchange data, and allow convenient intersystem mobility. But it is even more desirable to have a powerful word processor and a powerful spreadsheet in the first place. As in the case of interface, integration assumes major importance only when it materially affects functionality. A system that integrates text and graphics can be used to produce documents that a nonintegrated system cannot.

It is clear what the office of the future looks like; what is not so clear is how to get there from here.

Most system users are driven by a motivating application, a requirement that acts as the proximate cause for acquiring and using a system. While they may have use for additional capabilities and may in fact use them once the system is deployed, the motivating application dominates all other considerations. The user will want the very best system for this application that he can get. Other considerations, including the nature and accessibility of secondary applications, pale by comparison.

Moreover, most users will opt for ease of use over user-friendly/easy to learn systems. An easy to learn system presents a user with a small set of concepts that can readily be learned and a set of commands that provide understandable functions. While such a system is likely to serve a novice well, it is also likely to be inad-

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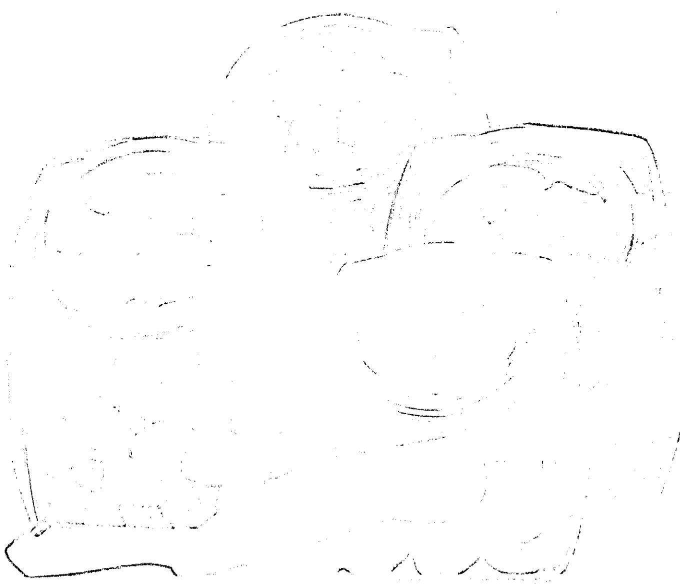

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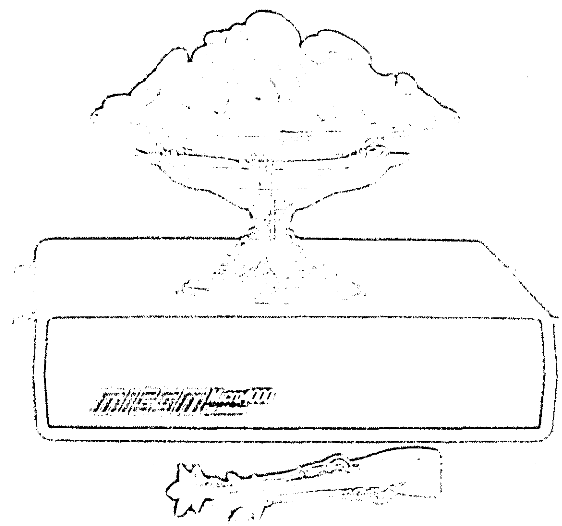

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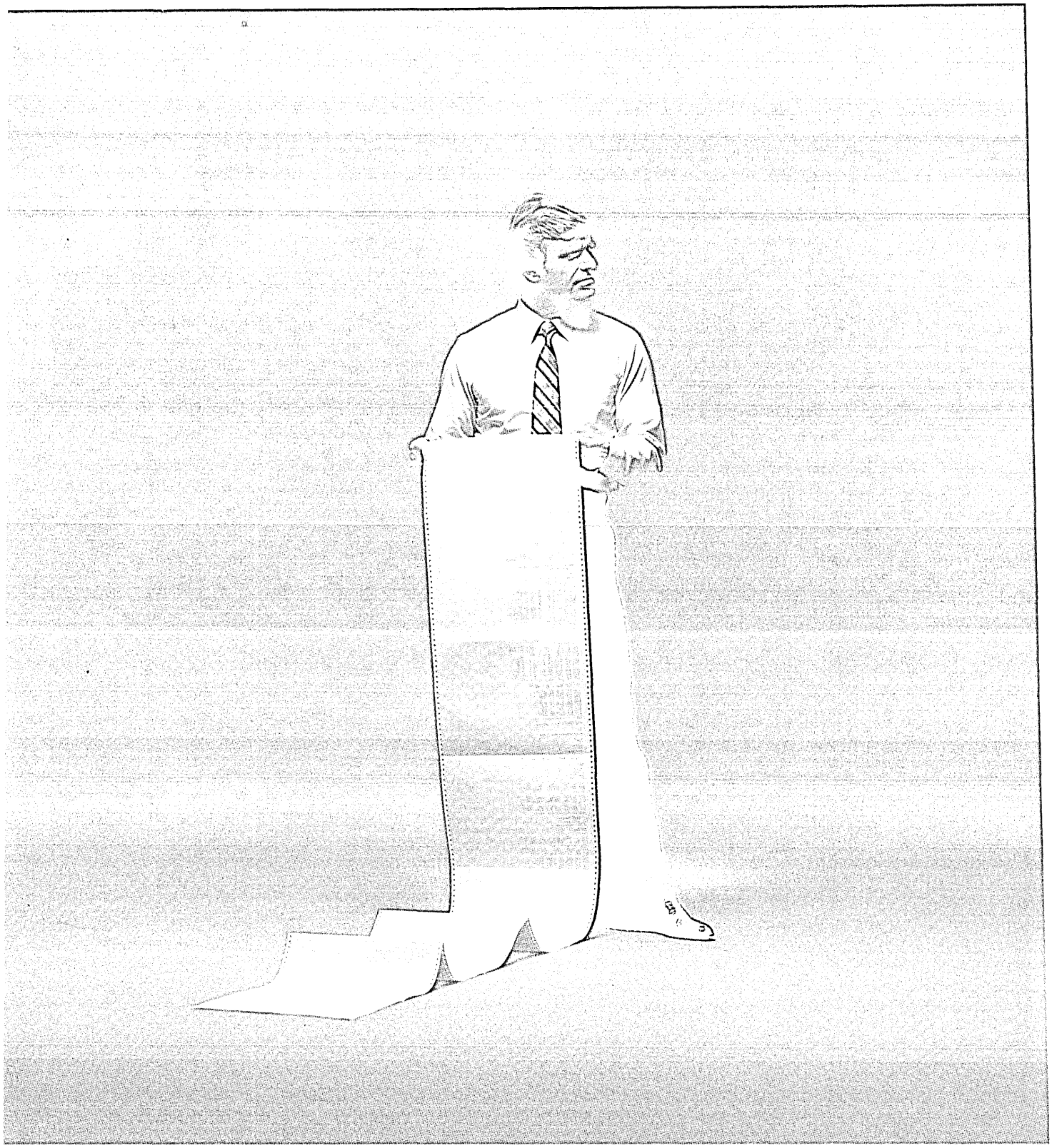

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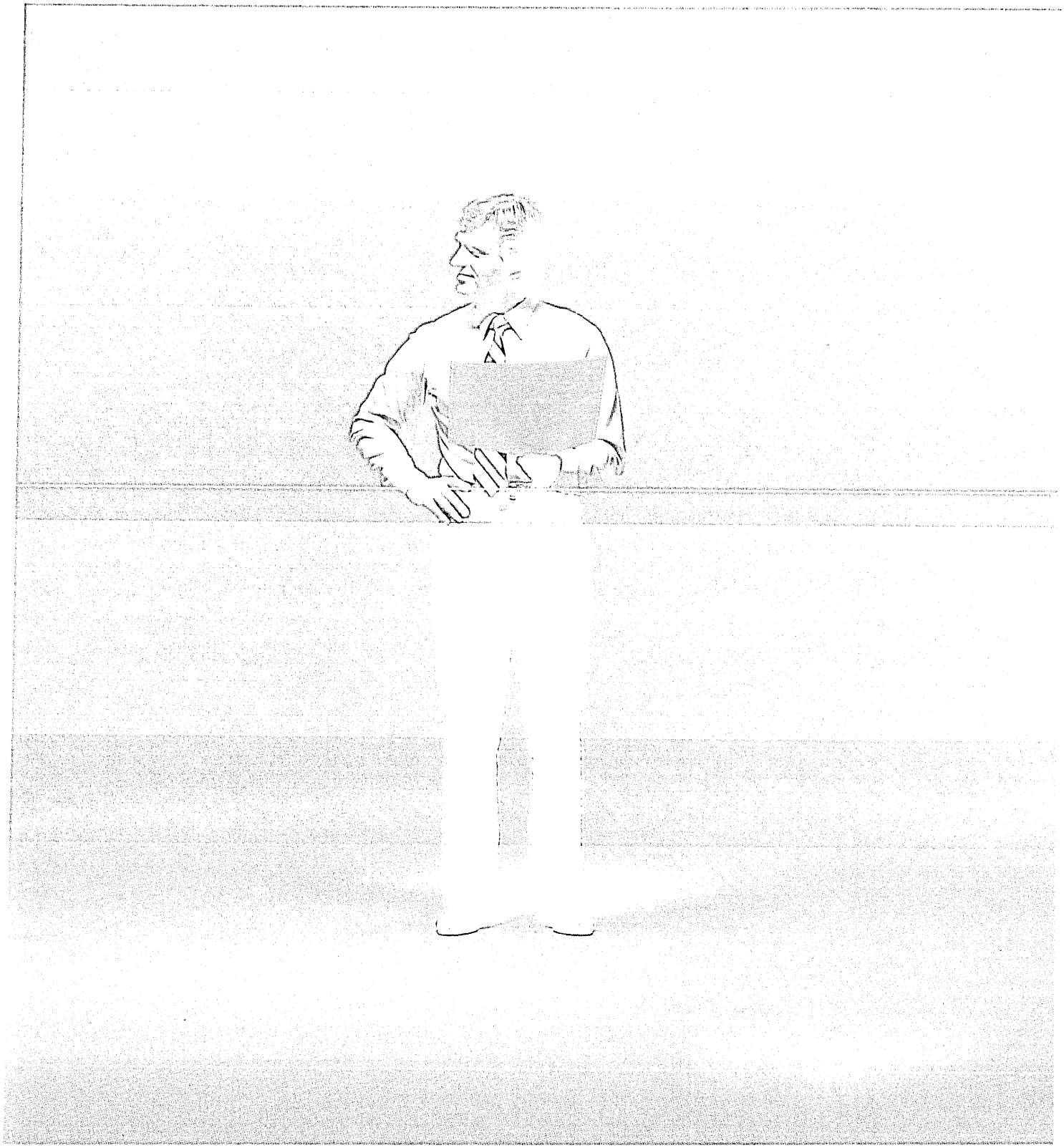

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equate for more complex and intricate applications. The power user requires a powerful set of rich capabilities; ease of use can be expressed in terms of the amount of effort an experienced user must expend to accomplish a task. Power users need power tools on which a novice might hurt himself. Consequently, much of the current crop of integrated software packages is likely to satisfy no one except an imaginary user who has no particular requirement but wishes to make some use of each of a collection of tools.

With this model in mind, we can begin to see a path to the integrated electronic office of the future. The architecture of this office has been drawn so often that by now it has become a visual cliché. It shows many kinds of workstations transacting with information in many forms (text, data, voice, graphics, image, etc.). These workstations are connected with each other and with host processors by means of local and wide area networks.

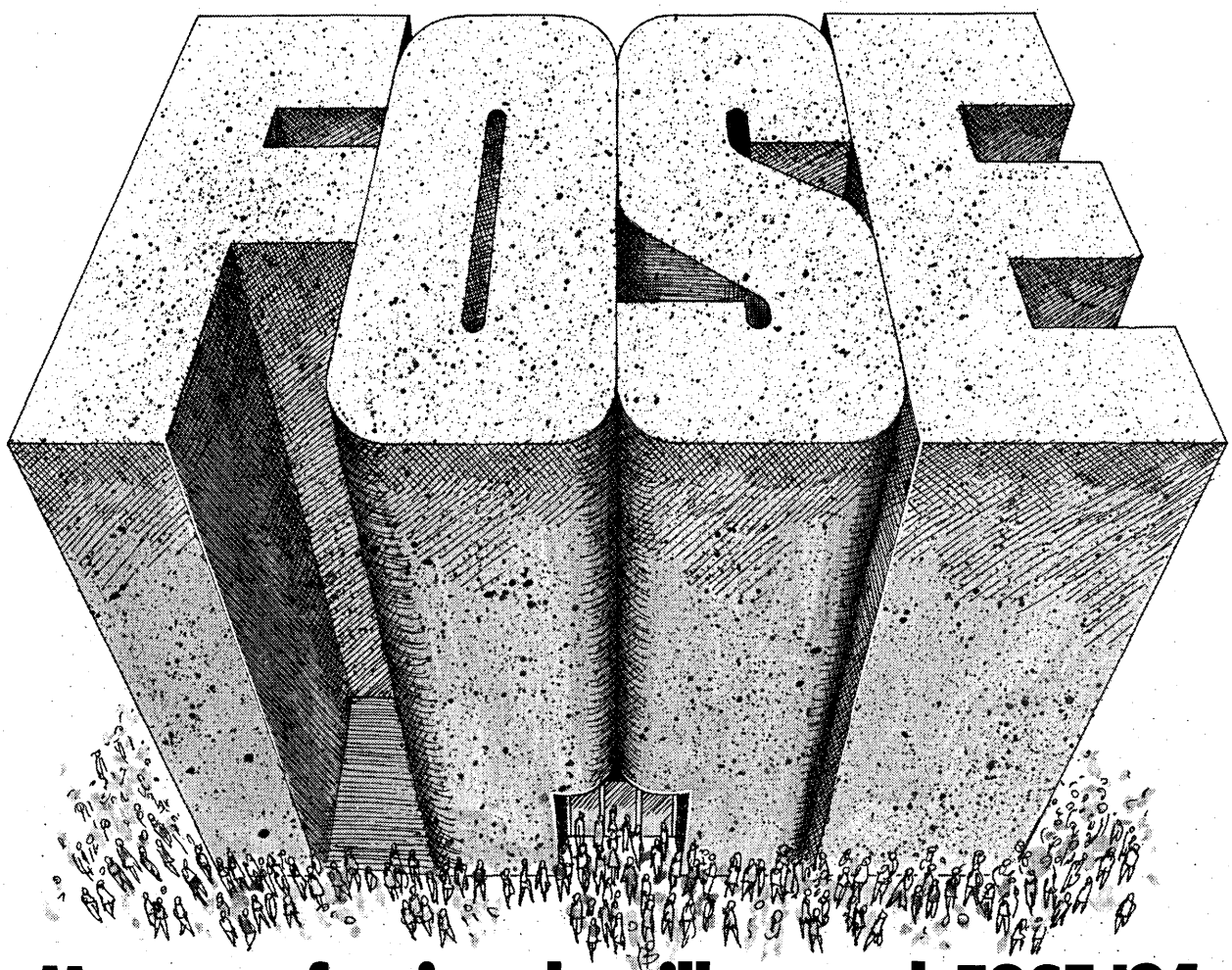
It is relatively clear what the office of the future looks like; what is not so clear is how to get there from here. The answer to that problem is "one application at a time." Very few users are prepared to install massive, corporate systems, based on the potential advantages of having an automated office. Rather, they install individual systems to solve specific application problems. These solutions may be small, single-terminal devices or full electronic mail systems. But they are installed to obtain specific benefits in specific situations.

We will get to the office of the future by installing particular solutions to particular problems, until we wake up one day and find ourselves with a new working environment. System planners must design their ultimate office architectures, but these architectures will be implemented in an indirect fashion. The key to success is ensuring that individual solutions to immediate problems adhere to an overall architectural vision, so that the end product is consistent, rather than fragmented.

This evolutionary model also helps to account for the slow progress of the great phantom of office automation, the local area network. Possibly no OA-related topic has been the subject of as much discussion in the last five years as the LAN. The baseband-broadband controversy has at times made the religious wars of the seventeenth century seem models of rational discourse. But the actual installation of these networks, despite all the talk, has proceeded at a glacial pace. Many factors have contributed to this, but the key one is that a LAN becomes necessary only at a certain point in the evolution of the firm's information systems: namely, when the number of terminals, workstations, and hosts requiring interconnection has reached a critical mass. Prior to that, the LAN is just extra cabling. Now that PCs and similar devices are proliferating, the LAN (or its PBX-like equivalent) becomes a valuable facility rather than the dp world's equivalent of conceptual art.

An application-centered approach to office automation induces a different perspective on OA, one reminiscent of Gertrude Stein's comment about Oakland, Calif.: "There is no *there* there." If one approaches office automation with this point of view, the grand concept melts away like a mirage, leaving in its stead a sea of applications waiting to be implemented. Navigating this sea is challenge enough, without being burdened with the excess baggage of extravagant and unrealistic theories. Oscar Wilde once described a fox hunt as "the unspeakable in pursuit of the uneatable." Those who persist in chasing the illusion of office automation might be termed the unreasoning in pursuit of the unreasonable. ✱

Dr. Michael Hammer is president of Hammer and Co. Inc., a Cambridge, Mass., consulting firm specializing in new information technologies.



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NEWS IN PERSPECTIVE

MILITARY COMPUTING

DARPA'S BIG PUSH IN AI

The Defense Department has proposed a massive, national effort in artificial intelligence research and development.

by Willie Schatz and John W. Verity

In what is likely to become this country's response to Japan's fifth generation computing project, the armed forces have proposed a remarkably ambitious $600 million, five-year R&D program in artificial intelligence (AI), microelectronics, and computer architecture.

The so-called Strategic Computing program would involve universities, industry, and government in a massive, military-coordinated effort to develop "machine intelligence technology" that could make possible "completely autonomous" weapons, battlefield management systems, and even "defense against nuclear missiles." The program would likely be key to development of the space-borne strategic weapons called for by President Reagan in his "Star Wars" speech last spring and could have a profound effect on the character of computer research in the United States.

In an 80-page report written under the direction of ex–Xerox Corp. researcher Lynn Conway (October, p. 63), the Defense Advanced Research Projects Agency (DARPA) claims that if successful, the program would "yield strong new defense systems for use against massed forces" as well as give U.S. industry access to "enormous new commercial markets" by way of technological spin-offs. The report proposes that a trio of "challenging" military applications, one for each branch of the armed services, be developed as a means of stimulating overall AI technology development and demonstrating AI's applicability to "critical" military problems.

DARPA argues in its report that so-called "intelligent" weaponry and battle management aids would help fighting forces enormously because of "the rapidly decreasing predictability of military situations." For instance, the report notes, changing battle tactics by an enemy can overwhelm current computer-controlled weapons, and reprogramming the weapons often takes too long to be effective. Thus, it is noted, a crash effort is needed to develop more flexible weaponry and systems that can improve defenses "against possible assaults by massed forces in the future."

The study notes, however, that military commanders "remain particularly concerned" about autonomous systems being employed on a battlefield "where rules of engagement may be altered quickly."

"An extremely stressing example of such a case is the projected defense against strategic nuclear missiles, where systems must react so rapidly that it is likely that almost complete reliance will have to be placed on autonomous sytems. At the same time, the complexity and unpredictability of factors affecting decisions will be very great," the report says.

"We need computers that have far more capability for intelligent operation, improved survivability in hostile and high-radiation environments, and greatly improved man-machine interfaces," the DARPA document states.

DARPA's plan is to "jointly leverage" a number of recent advances in artificial intelligence, computer science, and microelectronics through carefully coordinated, well-funded R&D. A key element in the plan is the establishment of a national research "infrastructure," which would include a nationwide network of currently available and advanced DARPA-funded AI machinery, the establishment of "silicon foundries" for quick turnaround production of VLSI circuits, and development of rapid prototyping hardware and software tools.

"We need computers that have far more capability for intelligent operation."

DARPA computer research manager Lynn Conway is known for her creative use of networks, particularly DARPA's own Arpanet, in the development of advanced VLSI design techniques. Indeed, it is that experience that helped her get her current DARPA job, and she has said she will put it to extensive use in the Strategic Computing program.

Among the areas of research that lend themselves to the high levels of "machine intelligence"—processes "analogous to those found in lower animals," the report suggests—for which DARPA is aiming are expert systems, speech recognition, machine vision, and natural language understanding. Also ripe for exploitation are advanced system prototyping environments, parallel computing architectures, microsystem design methods, and semiconductor fabrication technology.

The three initial applications of machine intelligence proposed by the agency were chosen to selectively "push" R&D work in specific computer technologies that would eventually find use in a wider spectrum of military—and, supposedly, civilian—engineering. For instance, the autonomous land vehicle is viewed as requiring

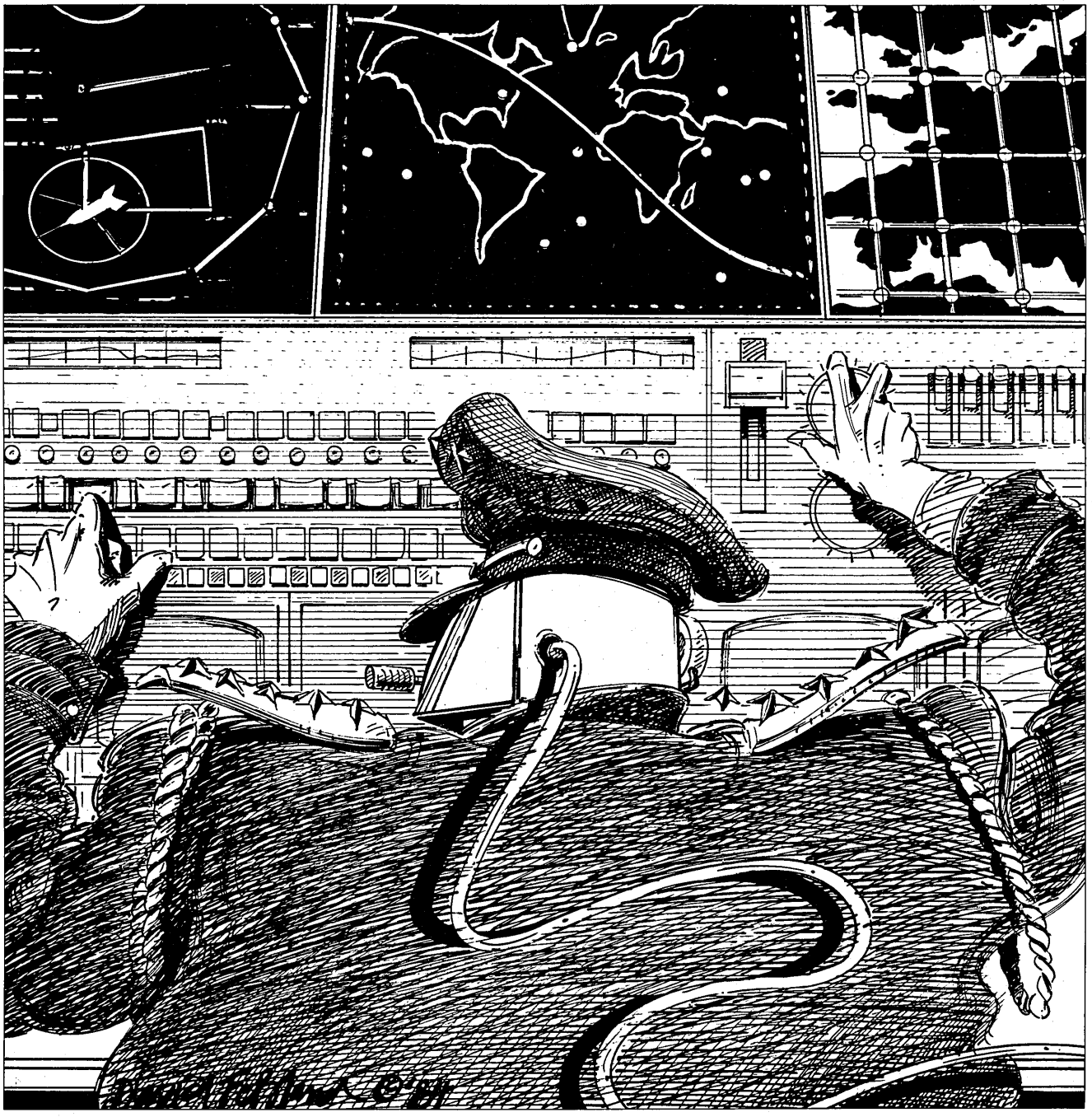

ILLUSTRATION BY DAVID FEBLAND

advanced vision and expert systems capabilities that would also be applicable to such other autonomous machines as cruise missiles, underwater robots, and factory material handling systems.

DARPA envisions its driverless vehicle, which might find use in reconnaissance, ammunition handling, or even the delivery of munitions, as being able to travel cross-country at speeds up to 60 kilometers an hour, navigating its way to a designated point as much as 50 kilometers away by way of visual sensors. An on-board vision system, working in conjunction with a real-time expert system, would enable it to detect obstacles, locate and identify landmarks, and produce a map of the terrain.

DARPA estimates the computing power necessary for such a machine as from 10 billion to 100 billion equivalent von Neumann instructions per second. That compares, it points out, with the 30 million to 40 million instructions per second available on today's most powerful von Neumann-type computers. Memory would be in the range of 10 gigabytes. Moreover, the necessary computer would have to be less than 15 cubic feet in volume, weigh less than 500 lbs., and consume less than a kilowatt of electrical power, the report states.

Research will concentrate on expert systems, speech, vision, and natural language understanding, as well as new computer architectures.

The pilot's associate system, envisioned as helping a fighter pilot manage his aircraft's many flight and weapons systems under intense battle conditions, would make much use of expert systems, speech recognitions, and graphics technologies. The "knowledge bases," or sets of rules stored in the expert system, would be "significantly larger than any previously attempted," the report states, consisting of "several thousand" rules. Each pilot would be able to "train" his system to work closely with him and adapt to changing conditions.

The proposed naval battle management system, which will serve as the model for other large-scale management systems, would forecast likely events, suggest different courses of action, develop detailed action plans, resolve conflicts between various competing goals, and react to changing battle developments. The Navy has been exploring such systems on its carrier U.S.S. Carl Vinson. It envisions future management systems as involving some 20,000 rules in a "distributed expert system" whose computer would need an effective performance level of about 10 billion instructions per second. Much of its interface

Three "critical" military applications, one for each branch of the armed services, have been proposed as experimental test beds.

to naval commanders would be through graphics and speech, two computing-intensive technologies.

The agency views expert systems as "perhaps the most stunning" technology at its disposal. Expert systems, which are gradually coming to the commercial market after several years of academic research (much of it funded by DARPA), employ rules, knowledge, and reasoning mechanisms to help solve problems in a narrowly defined domain (October, p. 92). "The methods for identifying and mechanizing practical knowledge, common sense, and expert knowledge have solidifed, the DARPA report states. The military views expert systems as particularly helpful in the management of complex battle situations and the operation of complex machines such as fighter aircraft. In each case, a soldier can become overwhelmed with the number of decisions he has to make, and an expert system could be used to handle large parts of the task, DARPA claims.

As expert systems become more "expert" (that is, as more "knowledge" is stored in them as rules), however, their operation requires increasing amounts of computing resources. Thus, DARPA proposes building "massively parallel" VLSI-based computers; initially the machines will use silicon technologies, but gallium arsenide (GaAs) is envisioned for the future because of its higher switching speeds and its resistance to the nuclear radiation expected during battle situations.

Response from AI companies, which stand to gain substantial amounts of funding if they participate in the DARPA venture, is generally positive. "I'm impressed with how well it's been thought out," says Daniel Hillis, a scientist at Thinking Machines Corp., a Waltham, Mass., company he cofounded with AI pioneer Marvin Minsky and others. "DARPA is correct in emphasizing symbolic rather than numerical processing, and I think they have the right ideas about building a strong research infrastructure."

Hillis adds that Thinking Machines is eager to participate in the DARPA project, as one of the company's main pursuits is a highly parallel computer called the Connection machine, of which Hillis is the chief architect.

John H. Clippenger of Brattle Research Corp., Cambridge, Mass., praises the DARPA plan as "more realistic" than the Japanese fifth generation effort and says the program would likely have "an enormous impact on the sales of LISP machines." (Interestingly, the report indicates that the majority of Strategic Computing work is to be done in Lisp, a list-processing programming language used extensively in artificial intelligence research, as opposed to Ada, the language developed and backed by the Defense Department in the past few years.)

Some AI industry sources suggest, however, that while the DARPA plan is well structured, it could get bogged down because of its large scope and the need to coordinate so many different activities and researchers.

"DARPA has been a shining example of government efficiency," says one source familiar with the agency's involvement with computer research. "It has been strong because of the small number of bright people who run it. It's not a giant bureaucracy like the National Science Foundation. The question is, will DARPA be able to administer so large a program compared to the past? The funding could get to be a political issue."

Some interested observers say the DARPA program may find itself in direct competition with commercial AI interests for talented, trained personnel. "There is already a shortage of qualified people," notes Clippenger. "If DARPA succeeds, it will almost certainly get raided. The agency will be much more visible now than it ever has been."

Observers generally agree that even if the Strategic Computing report makes no direct mention of the Japanese fifth generation project, it is clear that the two national programs are in a "race for time" against each other. Says one observer, "A one-year delay could lose the race for the U.S."

Ed Zschau, chairman of the Republican task force on high technology and a member of the House representing a Silicon Valley district, called the Strategic Computing plan "worthy," but questioned its heavy emphasis on military applications.

"We may find that the technology gets bottled up inside the military establishment. My concern is that specific technological breakthroughs—other than what's in people's heads—may be classified because they're considered to have military significance and therefore may be difficult to get out into the private sector. I would feel more comfortable if there were two military applications and one commercial one," the former computer company executive said.

He added that the DARPA program would probably help universities establish "centers of excellence" and that because the program appears to be "well focused," it will have substantial impact on the nation's computer research.

"If all this money were going to the Lockheeds of the world, I wouldn't feel as good about it as I do about a program that's going to the universities."

DARPA has received fiscal 1984 funding for the project to the tune of $50 million, and is seeking $95 million next year and $150 million the year after. Funding for FY87 and FY88 is yet to be determined, according to the report.

It described the program's basic acquisition policy as having the three military applications developed by industry, which would draw upon results of research carried out at universities. Advanced computer architectures would be developed primarily in joint projects between the universities and industry, and most hardware and software development efforts would be competitively bid for, the report stated. ❋

NUCLEAR WAR & THE COMPUTER

The innate fallibility of computer systems raises the risk of nuclear war, says a vocal group of computer scientists.

by John W. Verity

"Computer professionals have only given lip service to the social impact of the systems they build. There has been little attention given to the actual use of computers and the systems they control."

Nowhere is that attention so critical as in the control and management of nuclear weapons, says Severo Ornstein, a computer designer recently retired from Xerox Corp. and cofounder of a 400-member organization of computer scientists and engineers called Computer Professionals for Social Responsibility. CPSR, as the international group is known, is out to challenge on technical grounds what its members perceive as an overdependence by the U.S. and Soviet military on unreliable, computer-based systems. That overdependence is found in the

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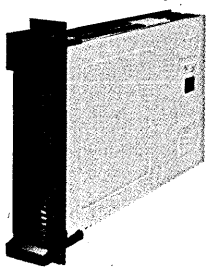

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2-84

nation's early warning systems and in the command, control, and communications systems that would be so crucial in the event of war, CPSR contends.

"I think we as computer professionals have something special to say about the arms race," states Ornstein, a 30-year veteran of the industry whose credentials include the design of high-speed switching nodes for the Defense Department's Arpanet and, jointly, of the Xerox Dorado, a supercharged personal computer sold to artificial intelligence researchers. Just as Concerned Physicians for Social Responsibility has strived to tell the public that surviving even "limited" nuclear war would be horrendously difficult, CPSR wants to educate legislators, other computer workers, and the general public to the dangers of trusting crucial decisions to fallible computers, he says.

"I think we as computer professionals have something special to say about the arms race."

The U.S. early warning system, which until very recently was dependent on vacuum tube SAGE computers, has suffered from a variety of false alarms that pushed the nation precariously close to launching nuclear attacks on the Soviet Union, according to publicly released information. In October 1960, for instance, an early warning system in Thule, Greenland, reported that a flight of missiles was on its way to hit the U.S. After 20 tense minutes of high-level military alert, officials determined that the moon, which had just emerged over the horizon, had triggered the system's alarms.

In late 1979, a test tape containing simulated attack data from satellites was accidently fed into an on-line Strategic Air Command computer, causing U.S. strategic forces to be readied for battle. Soviet leaders protested in a letter to President Carter and testing procedures were claimed to have been changed at SAC.

In June 1980, within a period of only four days, two computer-related false alarms caught SAC officials by surprise in their Nebraskan bunker. Among other responses, B-52 bombers and battle control planes were readied for takeoff and military forces were put on alert. A Congressional inquiry subsequently determined that a faulty IC in a Data General multiplexor had filled normally blank fields in a test message with random numbers, thereby suggesting that an attack was under way.

"These false alarms happened during a peaceful time, so identifying them as false was easier than it would have been during a world crisis," points out Dr. Alan Borning on a videotape CPSR makes available to its local chapters. Borning is a computer scientist at the University of Washington, Seattle, and has been a prime investigator for CPSR in its efforts to document critical computer failures.

"There are two trends that are increasing the danger of such false alarms," says Borning in the taped lecture. "One is the mounting pressure to adopt a launch-on-warning strategy and the other is the shorter flight times of nuclear missiles to their targets."

As a strategy, launch-on-warning is defended as a way to make sure one's own ground-based missiles are not destroyed in their silos by incoming enemy missiles. The strategy calls for launching missiles as soon as an enemy attack is detected by satellite-based sensors or ground-based radar.

However, as Borning and others point out, the dangers of misinterpreting the signals of an early warning system become acute as that system becomes more automated and as the time between the initial detection of enemy missiles and their detonation over targets shrinks.

Lately, of course, that time has lessened considerably, as the U.S., for instance, places Pershing 2 missiles in Germany within six minutes' reach of Soviet targets.

The point, says Borning, is that early warning systems can't be tested totally and designers cannot foretell all modes of potential failures.

Early warning systems and communications and control networks are particularly vulnerable to computer fallibility.

His other fear, and that of CPSR members in general, is that too much reliance is being put on less-than-perfect "command, control, and communications" systems. Generally known in military circles as C^3, these systems are the means by which military commanders would control a battle or even the "limited nuclear war" Reagan administration officials have spoken of to the horror of Europeans and many Americans. Many C^3 systems depend heavily on computers and, points out Borning, computers are highly susceptible to the effects of nuclear blasts.

He explains that in earlier times, when the nation's nuclear strategy was predicated on the so-called MAD (for mutually assured destruction) idea, the basic "message" needed to be conveyed to missile launchers was "retaliate." Nothing more needed to be said. To limit a nuclear exchange now, however—that is, to be able to call a halt to further launchings of strate-

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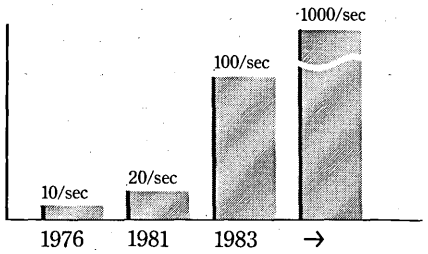

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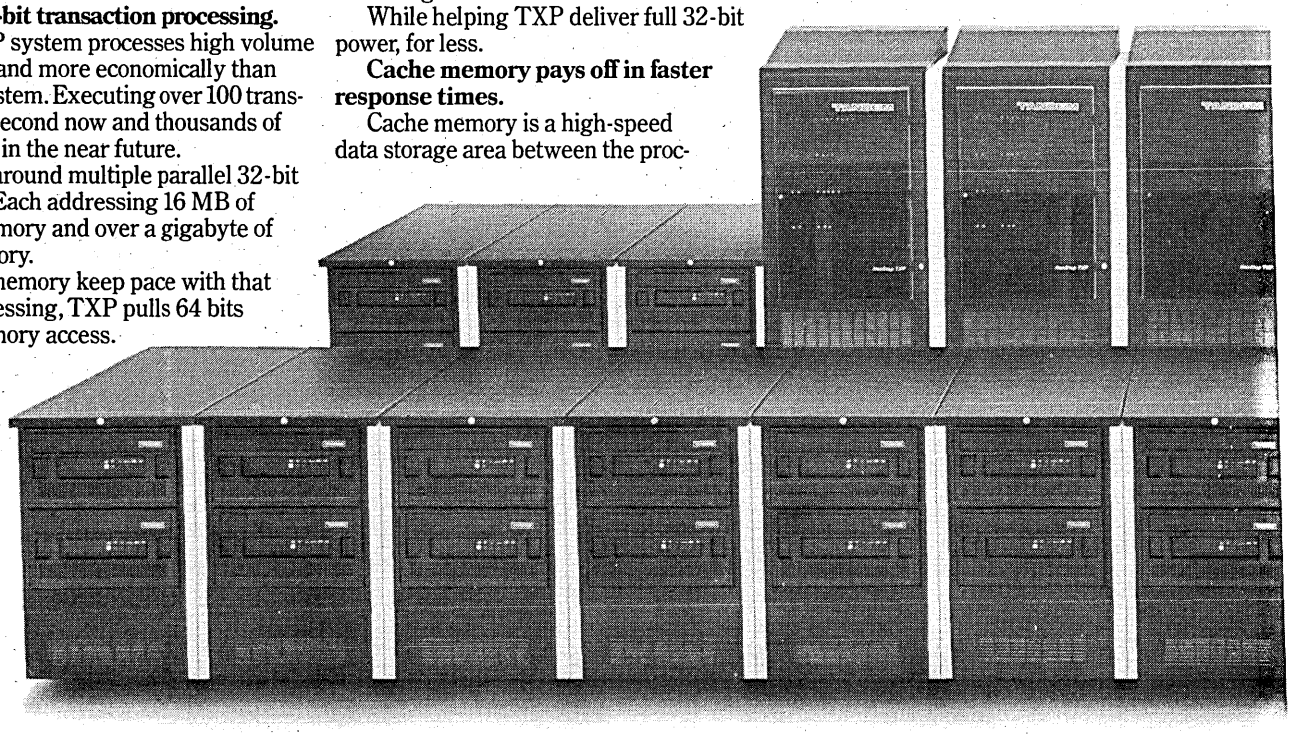

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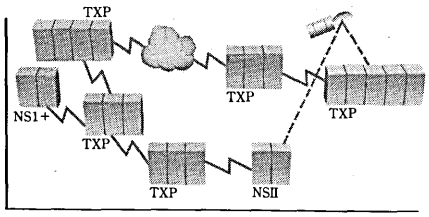

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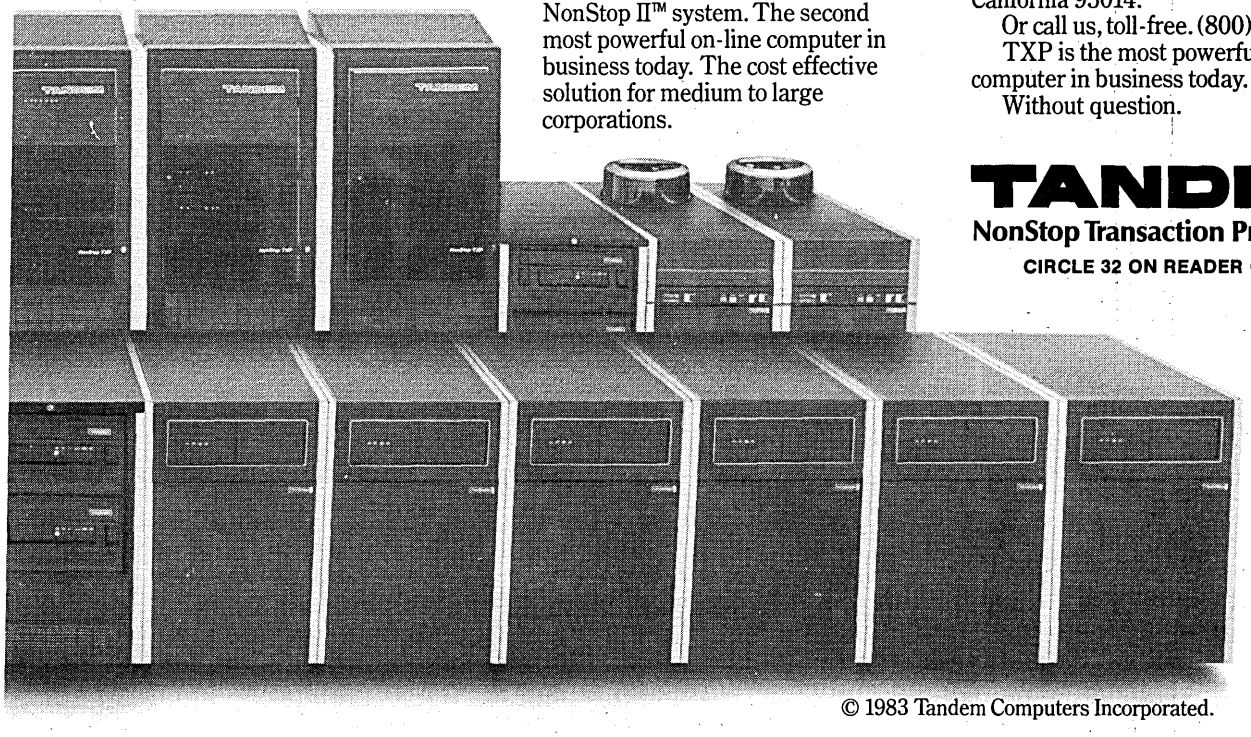

NEWS IN PERSPECTIVE

gic weapons—much more complex messages would have to be transmitted with great accuracy. These messages would need to travel from top commanders to their subordinates and, even more important, between the two combatants. "Even if there was an ideal C^3 system, this kind of communications would be very difficult," says Borning, pointing to the disruptive and destructive effects nuclear explosions would have on electronic systems of all kinds.

The best known of these effects comes from the extremely powerful electromagnetic pulse (EMP) caused by thermonuclear explosions, a pulse that sends tens of thousands of volts through power grids, telecommunications wires, and circuitry of all kinds. Semiconductors made with the NMOS process are particularly vulnerable, says Borning, who adds that the vital C^3 systems, too, can never be fully field tested because that would require an actual atmospheric nuclear explosion, which is banned by treaty.

"Even the hot line between Moscow and Washington isn't hardened against nuclear blast effects."

He also notes that existing C^3 systems have operating problems even without nuclear war raging about them. Several years ago, the U.S.S. Liberty, a spy ship, was sunk by Israeli bombers because it had missed hearing direct orders from the Pentagon to withdraw from the scene of a Mideast war. Four hours of messages from the U.S.S. Pueblo, caught spying off the coast of North Korea, went unheard and the ship was captured. And, says Borning, one test of the U.S. military's worldwide communications network WWMCCS (pronounced Wimics) showed that only 38% of its traffic "got through" during simulated battle conditions.

"Even the hot line between Moscow and Washington isn't hardened against nuclear blast effects," he says. "How could a war be terminated if that hot line doesn't work?"

CPSR, according to Borning, hopes to bring to the nuclear arms debate a strong, well-researched argument that military authorities, both U.S. and Soviet, depend too much on computer systems whose operation cannot be tested under the actual conditions in which they are designed to operate. "I think the military is overrating the simulations they've done," he states.

Severo Ornstein points out that the organization will try to educate people as to the fundamental nature of computer failures. "We want to show what it means to have a computer failure as opposed to a failure in a tv set," he says. "When a tv goes bad it is not a design failure, it is the failure of a particular component.

"When you build a computer you are really only building a shell, into which you put many other components known as software," he explains. "The problems with a computer system are those of intention, of getting the right program into that shell. Most of the time, when a computer system breaks down it is doing exactly what you told it to do, but you just didn't expect that particular situation.

He adds that CPSR's analysis of computer fallibility assumes that system designers are not pushing the limits of technology. "We take it for granted that all of the known reliability tricks have been played but we all know there's no way to test for unexpected situations. You can't find out when or if the system will break down until you put it into action."

And that moment, of course, is by definition "too late" in the case of computer-based nuclear weapons systems.

Ornstein emphasizes that the analysis of computer failures he puts forth applies just as easily to any large, complex system. The near meltdown of the Three Mile Island reactor in 1979 and the East Coast blackout in 1965 were each the result of a concurrence of isolated events that system designers were unable to foresee.

"When you write programs, you try to anticipate the future," he states. "Often there are so many possibilities that you group possible events into lists of categories. At the bottom of that list is usually an ELSE statement, but it is possible that events you could never have known about will find their way into that ELSE category. In most cases, the results of these surprises are disappointments. But with nuclear arms, surprises can turn into catastrophes." That's where trouble can begin.

"Most of the time when a computer system breaks down, it is doing exactly what you told it to do, but you just didn't expect that particular situation," says Severo Ornstein.

How did CPSR get started? "The idea came from Mr. Reagan," Ornstein says, only half jokingly. It was shortly after Reagan took over the presidency that Ornstein and fellow researchers at Xerox's lively Palo Alto, Calif., research center—known as PARC—began sharing thoughts on computers and the escalating nuclear arms race. Messages went back and forth over PARC's internal Ethernet beginning in October 1981, and eventually, in March 1982, 150 employees sent Xerox's top management a letter urging the corporation to sponsor a nationwide television broadcast on the threat of nuclear war. That broadcast came about in the form of an NBC "White Paper" entitled "Facing Up to the Bomb."

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CIRCLE 33 ON READER CARD

"We kept talking and finally decided that we as computer people had something special to say, so we decided to have a public meeting," recalls Ornstein. The first meeting took place in Palo Alto, but soon after, other CPSR chapters were formed in Madison, Wis.; Cambridge, Mass.; and Los Angeles.

Tax-exempt status has been applied for and bylaws drawn up that call for the organization to provide a forum for public education on computer reliability, to link concerned professionals through various electronic networks, and to provide computing resources for other organizations working to prevent nuclear war.

Funding has so far come from the $20 annual dues paid by each member and from sales of educational pamphlets, according to Ornstein, who holds the post of chairman and whose wife, Laura Gould, another PARC employee, is secretary. Brian Smith, also at PARC, is president.

The group is striving to be apolitical "in the sense that our members hold a diverse range of political affiliations," says Ornstein. "We're not all Democrats trying to kick out Reagan. We're trying to encourage a wide political spectrum among members. We're inviting diversity."

Acknowledging that a "large part of the computer industry makes money from the Defense Department," Ornstein said he

"Most of us believe science and technology are important, but they need discussion. There's probably too much faith in technology."

expects that even some defense workers will join CPSR, even if anonymously. So far the group has met with little resistance from the industry except for what Ornstein calls "disgraceful" treatment by the Association of Information Processing Societies (AFIPS), which runs the annual National Computer Conference (NCC).

As he tells it, CPSR applied "well in advance" of the 1983 NCC for permission to set up a stand in the show's lobby. Hearing nothing from AFIPS, the group reapplied and, finally, on the opening day of the show, it received a note from AFIPS denying permission.

"AFIPS treated us very badly. I'm sure we were refused on political grounds. AFIPS' bylaws call for the group to be concerned with the social impact of computers and yet they refused us permission."

Asked about the incident, AFIPS did not respond by press time. Meanwhile, CPSR has applied for admission to this year's NCC, which is to be held in Las Vegas next July.

"There is apparently a giant fear on the part of industry that organizations like this will rock their boat," Ornstein says.

CPSR is not alone in questioning the application of computers to nuclear weapons systems, however, nor is it the first organization to do so. In 1970, a group of distinguished computer scientists including Daniel McCracken, Joseph Weizenbaum, and Paul Armer formed Computer Professionals Against ABM, which argued publicly that a proposed antiballistic missile system would be vulnerable to intractable computer problems. In 1982 a small group of people formed Computer Professionals United to do the same sort of tasks in which CPSR is currently involved. Several of its members have now joined CPSR. Meanwhile, in Cambridge, Mass., High-Tech-

"AFIPS treated us very badly. I'm sure we were refused on political grounds."

nology Professionals for Peace is working to find nondefense-related jobs for computer workers and others.

Interestingly, McCracken is lending his expertise to CPSR. He was slated in late

January to deliver a talk on the "ethical obligations of computer professionals" to the newly formed New York City chapter of CPSR. Also, Weizenbaum, known as one of the most radical and articulate thinkers on the topic of computing's social impact, has been active in CPSR's Boston chapter, while in Palo Alto, Terry Winograd, a pioneer in the field of artificial intelligence, is participating. Says Winograd of CPSR's mission: "As computer scientists we have access to a certain group of other computer scientists who will listen to us and we also have the expertise needed to demystify computer technology for the general public."

That demystification lies at the center of CPSR's goals, suggests Ornstein. "Most of us believe science and technology are important, but they need discussion. There's probably too much faith in technology. It's not going to solve all the world's problems.

"It's a difficult role, to question technology," he concludes, "because in this country there's a feeling that Yankee ingenuity can fix anything."

MICROCOMPUTERS

BIG MAC ATTACK

The industry, personal computer users, and Apple Computer are watching carefully as MacIntosh goes to market.

by Ed Yasaki

Formal introduction of Apple Computer's MacIntosh computer was still more than a month off, but speculation about its features and potential for success against the IBM P.C.'s onslaught was rampant. One interested observer was Dick Webb of the public accounting firm Peat, Marwick, Mitchell.

"Based on what I hear about it," he said, "it sounds like the kind of thing we're looking for." Peat, Marwick, with some 100 offices in the U.S., has around 400 to 500 Apple III machines installed and a smaller quantity of Apple Lisas.

MacIntosh is seen by some industry observers as a do-or-die proposition for Apple's corporate future. Having seen its market share eaten away by the IBM P.C. and compatible machines and having tripped twice with an initially faulty Apple II and a slow-selling Lisa, Apple Computer is betting heavily on Mac, as the new machine is

Characterized by some as a poor man's Lisa, MacIntosh is priced at $1,995 with 128K bytes of memory.

called. Steve Jobs himself, Apple's chairman, headed the machine's development and has declared the product a must-sell item. While details of the machine's technical specs were carefully leaked several months ago, it is only now, with the machine finally and fully unveiled, that industry watchers can make their most informed predictions.

At Arthur Young & Co., another accounting firm that has upwards of a thousand personal computers in use, Rick Richardson was among those given an advance look at Apple's new harvest. "I think it's going to be a winner," Richardson said. A low-priced computer with a Lisa-like operating environment, he stated, would appeal to those who long for Lisa's ease of use but can't afford that machine's hefty $7,000 price tag.

To characterize MacIntosh as a poor man's Lisa would not be inaccurate. For

NEWS IN PERSPECTIVE

$1,995, the buyer gets a computer powered by the same 8MHz Motorola 68000 microprocessor as Lisa. There's also a mouse, keyboard, high-resolution bit-mapped display, the icons representing programs and files, and the general ease of use Lisa is known for. MacIntosh is a 128K byte system that weighs in at a transportable 20 pounds with keyboard and mouse and comes with a built-in handle. Missing in Mac but standard in Lisa are a hard disk and the ability to display several program windows simultaneously.

Most significantly, however, some 100 third-party software firms had Macs on announcement day last month to develop packages. Included among them were Lotus, which is changing the command structure of its popular 1-2-3 package to accommodate the so-called Lisa technology in the Mac. Software Publishing Co. is preparing its database and report writer packages. And Microsoft, which has been in on the development of MacIntosh for two years, was slated to announce by now five packages for the Mac. Microsoft chairman Bill Gates has said that half his company's revenues during 1984 will come from the sale of Mac software.

Significant, too, is the 100% upward compatibility with the Lisa, meaning

Apple has obviously learned its lesson and has made sure independently developed software is available for its new product.

all packages running on the Mac will run unchanged on the Lisa. And because of Apple's commitment to the 3½-inch floppy, that same drive replaces the 5¼-inch floppy drive on the Lisa in what has come to be called Lisa II.

The Lisa II, now totally unbundled, has a 10MB hard disk, up from 5MB on the initial Lisas, incorporates the smaller floppy providing media interchangeability with the Mac, and runs faster. And its price has dropped again.

Marketing of the pricey Lisa was originally targeted at the Fortune 1,000 corporations, where the response was less than enthusiastic. As a result, Apple has broadened its target and increased the number of dealers handling the Lisa.

"I think Apple made a terrible strategic error with Lisa in deciding it would sell the machine primarily with its own applications," said David Ferris, a San Francisco consultant. Users were not satisfied with the few proprietary applications that came bundled with Lisa, he explains. "They want to run name packages that they know and love," such as VisiCalc, which was the most popular package at that time. And any vendor that chooses not to make those popular packages readily available on

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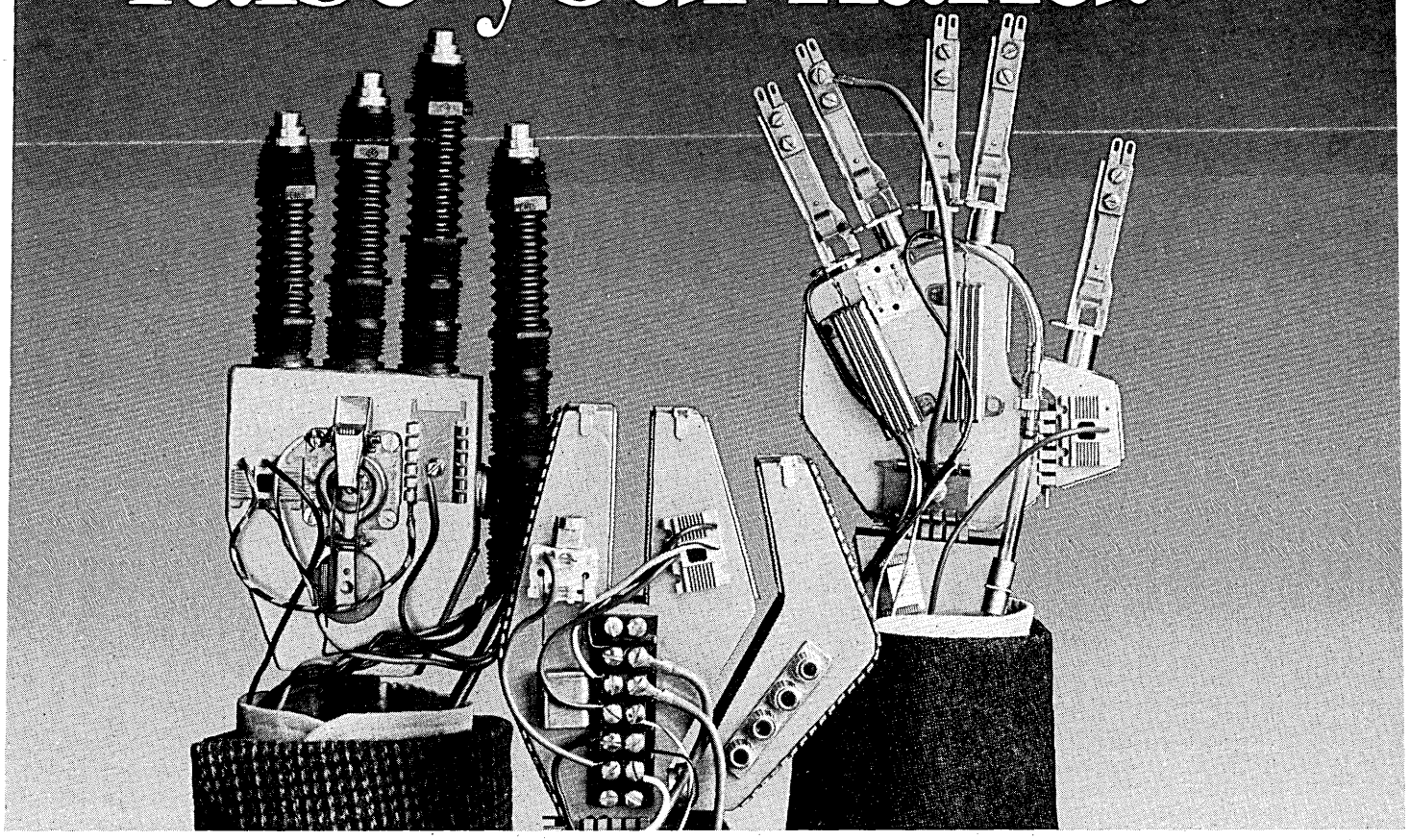

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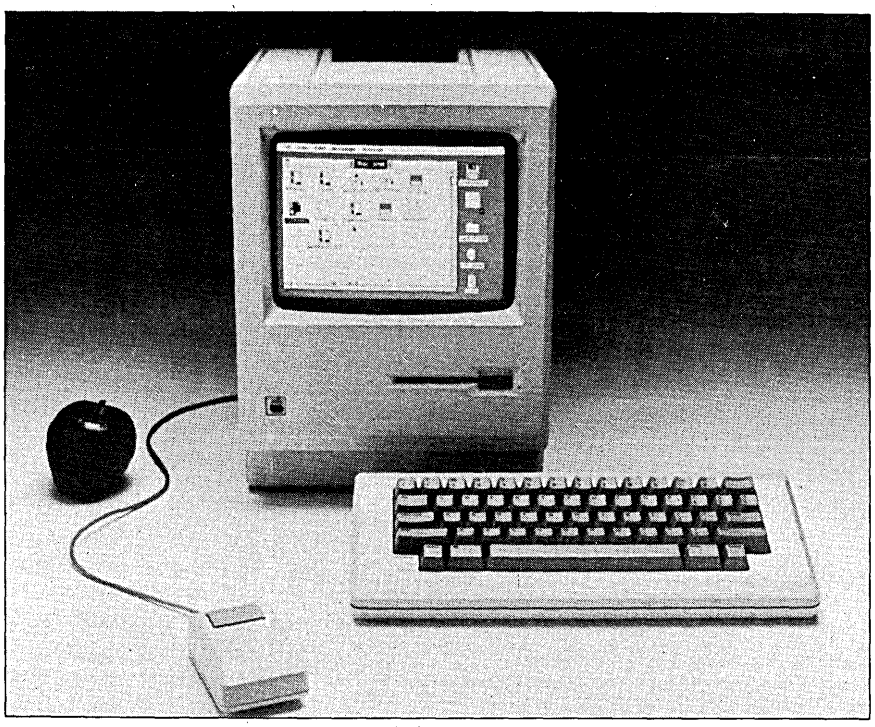

WAITING: An early look at Apple Computer's MacIntosh personal computer shows many features similar to those in the company's Lisa product. In addition to the mouse and keyboard, MacIntosh shares icons, windows, and certain diskettes with its sister product. No explanation was given of the dark object on the left, although there is speculation it may represent a future product for the Cupertino, Calif., company.

a machine is taking chances. "I think Apple certainly suffered greatly with Lisa because of its determination to go it alone and come out with a tiny number of packages that it, itself, had developed."

Apple obviously has learned its lesson, for it now figures that 95% of the packages for the Mac will come from third-party developers. It is anxious to have those packages also run on the Lisa. Such a capability, said Peat, Marwick's Dick Webb, "would be super. In fact, we're kind of banking on that."

"I think Macs will sell Lisas," noted Richardson of Arthur Young. He sees

Industry observers speculate that Apple will soon unveil IBM P.C. compatibility for the Lisa and perhaps even for MacIntosh.

users being attracted by the low price of the Mac and its ease of use. But the user, after an initial period, will begin to feel a need for more of the capabilities available on the Lisa—the ability, for example, to work with three documents on the desk simultaneously.

He thinks the MacIntosh "opens a new price threshold for ease of use, and that's going to make a major difference" between Mac and other machines running, for example, VisiOn, the integrated package running in a window environment and newly available from VisiCorp.

The swarm of software developers preparing packages to run on the Mac, of course, flies in the face of conventional wisdom, which says that in today's market only compatibility with the IBM P.C. could attract independent software firms. Indeed, there has been speculation that Apple will eventually provide IBM compatibility in Lisa and perhaps also in Mac. But analyst Greg Kelsey of Hambrecht & Quist in San Francisco says he wouldn't be surprised if Apple, seeing that Mac is a success in the marketplace without IBM compatibility, would provide that compatibility only for Lisa. "If I were in their shoes, I guess I'd pursue that strategy." An add-on for the Mac would force the company to raise the Mac's price, and any price increase would detract from one of the appealing aspects of the product.

"I think MacIntosh holds the promise of really setting another software standard in its own right and [of being] a far easier machine to use than an IBM P.C., for example, at a very attractive price point," says Kelsey. "So the advantage of having a Mac is that it kind of takes away that issue in the customer's mind." Kelsey, too, thinks the MacIntosh's upward compatibility with Lisa will help Lisa sales.

With the MacIntosh, says Apple chairman Steve Jobs, "what we want to do is re-create the Apple II phenomenon." A scant three years ago, he explains, the company was selling about 10,000 computers a year. It's now manufacturing the Apple IIe at a rate of 50,000 a month, and he looks for the time when Apple is selling 10 million computers a year. To help that along, the company has begun operating a new factory just to build Macs, a highly automated plant capable of chunking them out at a rate of one every 27 seconds, or 1,000 every eight-hour shift.

The test for Apple, of course, is whether it can maintain market share against IBM and the horde of companies selling machines compatible with IBM's P.C. Those machines are estimated to have grabbed more than 30% of the overall personal computer marketplace and have certainly knocked Apple out of the leading position among business and corporate users.

Apple's strong presence in schools, a beefed-up advertising campaign, and the innovation in its products—the apparent lack of which in IBM's PCjr brought that company a healthy dose of criticism in late 1983—are seen as the Cupertino, Calif., firm's main strengths. If nothing else, 1984 will be a decisive year for personal computer makers and, according to those close to Apple Computer, will make Jobs and company work harder and smarter to outfox their competitors from Armonk. ✱

AT&T THE COMPUTER SUPPLIER

A series of 32-bit machines is in the wings, waiting to be introduced by the telephone giant.

by R. Emmett Carlyle

AT&T, which now qualifies as the computer industry's biggest "startup," may enter the commercial computer market as early as March, it has been learned.

Sources claim that a line of 32-bit machines and workstations, known as the 3B series, is being readied. Models could be shipped to customers during the second half of the year. The largest of the family, the 3B-5, is architecturally comparable with DEC's VAX-730, and can accommodate upwards of 20 workstations for about a $30,000 price tag. A smaller multi-user system, the 3B-3, supporting six to 10 terminals, and the single-user 3B-20 may also enter the commercial market, the sources reveal.

On the other hand, the company may introduce machines developed for it by Convergent Technologies, the Santa Clara, Calif., maker of workstations and other systems that recently signed a manufacturing agreement with AT&T (see box).

It is believed that the low-end 3B family has been built around AT&T's proprietary 32-bit chip set, variously called the Bellmac-32 or Western Electric 32000, which was designed to optimize the current System 5 release of AT&T's Unix operating system. In addition, the telecom giant's first commercial computers feature a 256K RAM memory chip—the first in the world to go into high-volume production.

Though AT&T had no physical or tangible presence in the strict computer business before its Jan. breakup into two new operating arms, it has certainly been there in spirit. Its Unix operating system, developed by Bell Labs in the late '60s for the corporation's own internal use, has been widely adopted by outside computer vendors and is fast emerging as the standard operating system in the 32-bit micro world because of its multitasking capabilities. AT&T has signed deals with the four top semiconductor houses—Intel, Motorola, National Semiconductor, and Zilog—to ensure that Unix System 5 can be offered on their upcoming 32-bit micros. Bell Lab's close ties with the academic community have made Unix a strong favorite, and ensured that a steady stream of graduates leave college conversant with the operating system and its programming language, called C.

IBM and other companies are expected to adopt Unix-like operating systems but not go with AT&T's latest version, System 5.

The situation, then, seems ripe for a flowering of Unix applications software—the vital missing ingredient in the commercial and especially the office automation sector that AT&T now wishes to penetrate. As a further inducement to Unix adoption, AT&T lowered its Unix license fee from $750 to $100 and introduced its first educational and technical support programs.

The cumulative effect of all this "prenatal" preparation should be that AT&T's first computer baby will be warmly, even eagerly, received.

"After all," says George Colony, president of Forrester Research, Boston, "who's in a better position to optimize the System 5 standard than AT&T itself?" Unfortunately for AT&T, not all quarters of the industry are favorably disposed toward Unix System 5 becoming the new applications magnet.

"IBM would much rather third-party software companies develop applications for its new desktop 370, the XT/370, or its new P.C.s. Other leading vendors," Colony points out, "are equally concerned about protecting and expanding their own propri-

AT&T REACHES OUT

The fast track to a strong presence in the automated office is through joint venture or acquisition.

AT&T, which has the deepest pockets in the business, has, even at this early stage, shown an inclination to do both. Last December, AT&T said it would pay $260 million for a 25% stake in the Italian office products and information processing conglomerate, Olivetti. This was made possible by a dilution of Olivetti stock to create a 100 million new-share block for the U.S. giant.

European sources reveal that AT&T had originally planned to buy the 30% stake in Olivetti owned by the French industrial group St. Gobain and the Honeywell-Bull computer concern. That deal, it is believed, was blocked at the eleventh hour by the French government, which may yet be reconsidering its decision. Thus the possibility of AT&T buying the additional French stake (now diluted by the new share balance) still exists, should AT&T so desire.

AT&T has virtually no presence in Europe, and through Olivetti is looking for a distribution system for its PBX and office automation products. There could also be a net gain in office products for the U.S. market through access to the Olivetti product line.

In the U.S., AT&T has found another powerful ally from the world of office automation: Wang. The two companies announced in November they would work toward interfacing their two product lines, and AT&T has become the first (and so far, only) licensee of Wang's new Document Communications specs that the New England company proposes as an industry standard (December, p. 82).

At the time of writing, a further announcement of a new project between the two to use AT&T's AIS/Net 1000 as a bridge between IBM and Wang products was also believed imminent, as was a joint venture into electronic publishing. Wang has set about buying the electronic publishing rights to various reference standards such as dictionaries and Roget's Thesaurus. AT&T, in turn, has the Yellow Pages directories to toss into the meld.

Though this hasn't been confirmed by either party, some sources say AT&T could be planning to buy a 15% stake in Wang.

"If this comes to pass," says Marc G. Schulman, First Boston Corp., New York, "it'll be a merger of convenience. For, as things stand, each is his own best ally in the face of IBM pressure."

The IBM-Wang bridge offers a clear indication that AT&T expects to be active in the IBM compatible marketplace, should anyone have ever doubted it. But while Wang has the workstations to hang on the bridge, AT&T doesn't. This could explain another joint venture on which the telecom giant has just embarked, this time with Convergent Technologies. The two partners will design and build a family of office workstations that can attack IBM's MS/DOS base, and eventually become optimized for Unix markets like AT&T's 3B series.

Convergent has already signed oem deals with Burroughs, NCR, and Prime for its three "engines." Two of these, the Miniframe and Megaframe, are based on the Motorola 68000 and the more recent N-Gen is based on Intel's 186 chip and the 286 successor. Though the machines are aimed squarely at MS/DOS markets, one of them, the Miniframe, has been optimized for use with Microsoft's Unix variant, Xenix.

Insiders say the Convergent deal was pushed by AT&T Information Systems' marketing group over solid objections from Bell Labs, which counseled waiting for the 3B series. Both lines will eventually be Unix System 5-MS/DOS hybrids, anyway, Bell Labs is believed to have argued.

Sources aren't certain whether the Convergent deal points to a delay in the 3B program, or is just an indicator of how fast AT&T's increasingly aggressive marketing group wants to get into the office automation business.

Finally, industry reports suggest that AT&T may buy into Storage Technology Corp. of Louisville, Colo., which has been having a hard time lately recapturing its once strong position in the IBM compatible world.

"AT&T has been looking for some time for a way to bypass communications managers and talk to MIS and dp managers at IBM central sites," Alan Fross, vp at IRD, Norwalk, Conn., explains. "An overture by AT&T to STC or Amdahl would be perfectly consistent with this approach."

The most interesting merger that "might have been" nearly took place last year between AT&T and the minicomputer giant, DEC. "Lengthy and involved talks took place on at least two occasions last year, but the deal was eventually smothered by DEC chairman Ken Olsen," one source explained.

Since that time DEC seems to have positioned itself away from Unix to some extent. "But you shouldn't rule out an eventual AT&T-DEC merger, should DEC's upper management change dramatically as a result of its continuing problems," said one investment analyst and DEC watcher.

—R.E.C.

etary operating systems environments."

The upshot of all of this is that IBM and the others will embrace Unix look-alikes—but *not* System 5. The development by IBM's instrumentation subsidiary of a 68000 version of Unix (based on Microsoft Xenix), as well as separate and not wholly unrelated Unix-like workstation programs IBM has embarked on with Carnegie-Mellon and Brown Universities, have already muddied up the System 5 standard waters. IBM is expected to offer its own portable Unix-like operating system across its product line and under the proprietary umbrella of the VM/370 supervisor. Yet another Unix version written by a small outside company for IBM could emerge as the new operating system on IBM's next P.C. (the P.C.2 or "Popcorn"), which is widely expected by insiders in the third quarter of this year (see related story).

Whether this confusion was deliberately or accidentally orchestrated by IBM, it does at least keep the focus on Unix in 1984. "Short term, at least, it's not the biggest threat to AT&T," argues Ken Bosomworth, president of the Norwalk, Conn., research firm, International Resource Development (IRD).

On the surface, the AT&T empire, now shorn of its 22 Bell Telephone operating companies, appears to be a much simpler affair. There is a clean split into two operating arms: one, AT&T Communications Inc. for its continuing long distance business, and the other, AT&T Technologies as the parent of its information processing branch.

"Though AT&T Technology's manufacturing arm, Western Electric, is a $10 billion concern, its factories are now half empty and it has slipped into a pattern of regular layoffs over the past 13 years," comments Bosomworth.

AT&T management now comes along and says, 'Build us 100,000 computers,' and the Western Electric culture says, 'Fine. Give us a 10-year production schedule,' " he adds.

AT&T has had experience building 32-bit systems. "They've shipped 1,500 3B machines internally during the past three years. But the key to the small computer business, as IBM has demonstrated, is a company's ability to launch speedily into large-scale production of desktop boxes," the IRD president explains.

Bosomworth doubts AT&T's abilities to do this in the short term. "They're rusty and will probably have logistics and testing problems. But on the upside, they are early with the 32-bit chip/256K RAM combination. And no one can doubt their eventual production capacity with the awesome resources at their disposal," Bosomworth states.

"AT&T is rusty and will probably have logistics and testing problems," says one observer.

A consensus among observers is that AT&T could produce some 40,000 3B units if it can get shipping by the summer. (This compares with the 2 million PC XT computers that IBM is expected to ship through 1984.) Manufacture of the family will be at its Lisle, Ill., location, but through a joint venture with Gold Star in South Korea, manufacturing is also expected to take place there once a new plant is completed.

In addition to the 3B models already mentioned, a baby desktop, the $350 3B-1, is believed to be slated for eventual manufacture by AT&T's Teletype operation. This machine will offer managers a voice and data terminal, and will include word processing, voice/data store and forward, and other executive services. AT&T's current equivalent is its $2,500 Getset personal communications terminal, part of its upcoming Epic (Executive Planning Information & Communications) system, which,

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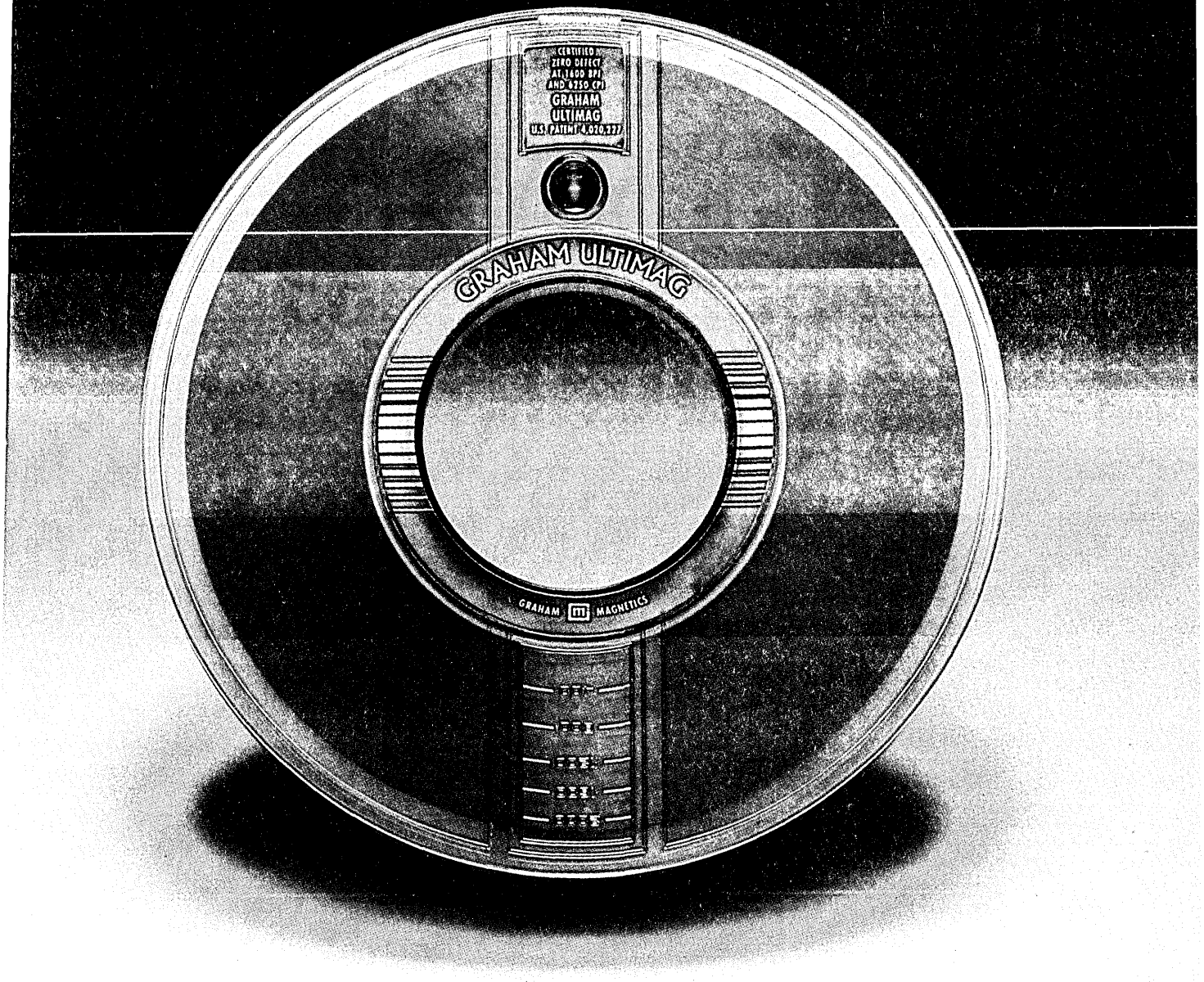

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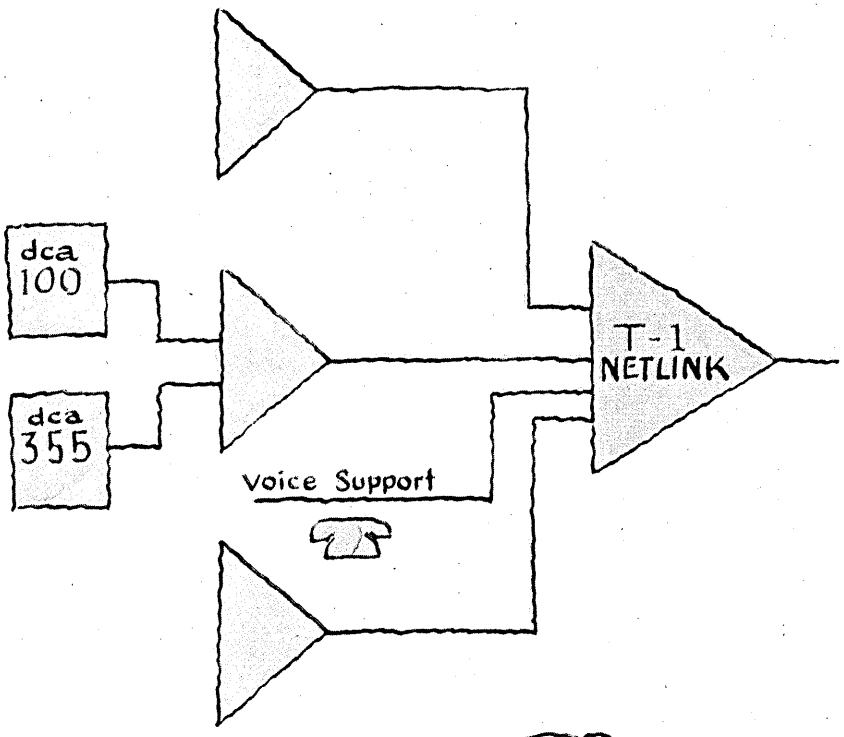

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NEWS IN PERSPECTIVE

like the 3B series, will attach to the corporation's Dimension System 85 PBX. Despite its size and price, AT&T intends to make the 3B-1 fully file-compatible with the larger desktop versions.

Reports persist that although AT&T has been eligible for entry to the computer business since Jan. 1, it may even slip a March announcement. The company could be trying to cover itself by offering a Convergent Technologies N-Gen workstation to the MS/DOS marketplace while its Unix challenge is readied. "Eventually both the 3B and N-Gen workstations will offer both Unix and MS/DOS in any case," said one source. Details of such a deal had not been confirmed at press time.

Observers have one other concern when they discuss AT&T's impending debut in the computer arena. "It's really a marketing issue," says Amy Wohl, Advanced Office Concepts founder. "Can a company that has never marketed a computer in its life avoid going through a painful learning curve? Money is not enough. You also need intelligence and, above all, time."

Wohl adds that for most people in the office, once you take out Bell, AT&T is just a blank. "They will have to add an identity and a presence in the market to those three letters. Because so far, the only perception of AT&T is as a supplier of PBXs." ✱

TRACKING THE IBM P.C.

IBM has created a huge subindustry that must read between the lines to plot its future course.

by R. Emmett Carlyle

What one industry analyst calls the "irresistible tide" of AT&T's Unix now threatens to engulf the current microcomputer operating system standard, MS/DOS, and its creator, Bellevue, Wash.–based Microsoft.

MS/DOS (called PC/DOS by IBM) has been the choice of 96% to 97% of all IBM P.C. owners, according to Microsoft, and the total worldwide number of users could top 3 million by year's end. In the latter part of the year, however, IBM is expected to unveil its P.C. successor, "Popcorn" or P.C. 2, which, unlike the 16-bit P.C., will be based on the 32-bit Intel 286 processor.

"Though a version of MS/DOS will be offered to maintain compatibility, the major operating system will be an IBM proprietary version of Unix," said one IBMer.

NEWS IN PERSPECTIVE

IBM's choice four years ago of MS/DOS for its 16-bit P.C. hardware dimmed the future of the 8-bit champion, Digital Research (DRI) and its CP/M. Could the growing number of vendors choosing Unix over MS/DOS for the more powerful 32-bit micros signal a similar fate for Microsoft?

"In our business, people are 'friends' for the generation of a product, or for as long as they need each other," says Carey Gersten, sales director for Mosaic Software, Cambridge, Mass., one of hundreds of software companies that have sprung up to write applications for the P.C.-MS/DOS combo. "The perception has somehow emerged that Microsoft and IBM are not working together as they used to, that relations have cooled. This feeling has definitely unsettled the P.C. value-added business."

One possible trigger was IBM's introduction last October of a more "proprietary" P.C., the 3270 P.C. "The product is clearly an attempt to draw the P.C. back into IBM's mainstream business," Gersten explains. IBM developed special software to allow the 3270 screen to split itself into multiple and multicolored application spaces or windows. The development flies in the face of Microsoft attempts to create its own windowing standard under MS/DOS.

The push for greater IBM control of its future P.C.s was also evident in the 3270 P.C. keyboard, which has new function keys specially optimized, sources add, for an upcoming generation of office software. "So in just one product there are already incompatibilities in software, screen, and keyboard between the P.C. and the 3270 P.C.," adds Gersten soberly. "But what's equally clear is that Microsoft didn't even know IBM was developing this machine."

Since the October unveiling of the 3270 P.C., many P.C. add-on companies have been taking a soul-searching look at their growing dependence on IBM. As Mitch Kapor, president of Lotus Development Corp., Cambridge, Mass., puts it: "We're all in a dangerous position, at the mercy of IBM."

"In our business, people are 'friends' for the generation of a product," says Carey Gersten of Mosaic Software.

The trend surfacing with the 3270 P.C. could, according to Kapor, lead IBM to bring more of its software development in-house (to the detriment of Microsoft on the systems side, and of Lotus and the others on the applications side); to make more of the P.C.'s future components proprietary; and to make more of the P.C. itself.

One novel suggestion put forward by Ken Bosomworth of International Resource Development was that so many P.C. "copiers" had now emerged in Taiwan, that rather than fight them legally, IBM may license them as manufacturers.

One IBM source revealed that the company plans to bring all its P.C. I/O work on its hard drives, soft drives, and printers, in-house. It's difficult for the hundreds of P.C.-related companies to anticipate such moves, because their total dependence on IBM has meant the firm has "ex officio taken them over," as one source put it.

"In a sense we all act like IBM subsidiaries," Gersten sighs. "We can't even talk to each other and pool our insights because many of us have signed nondisclosure deals. So you see these trends develop around you, and it's difficult to make sense of them."

This applies just as strongly to the company now perched in the middle of the confusion—Microsoft. "We're aware that this perception of Unix displacing MS/DOS and our relations souring with IBM has suddenly materialized," says Microsoft's director for Xenix (the company's Unix equivalent) development, John Ulett. "But there is about as much substance to it as there is to a phantom."

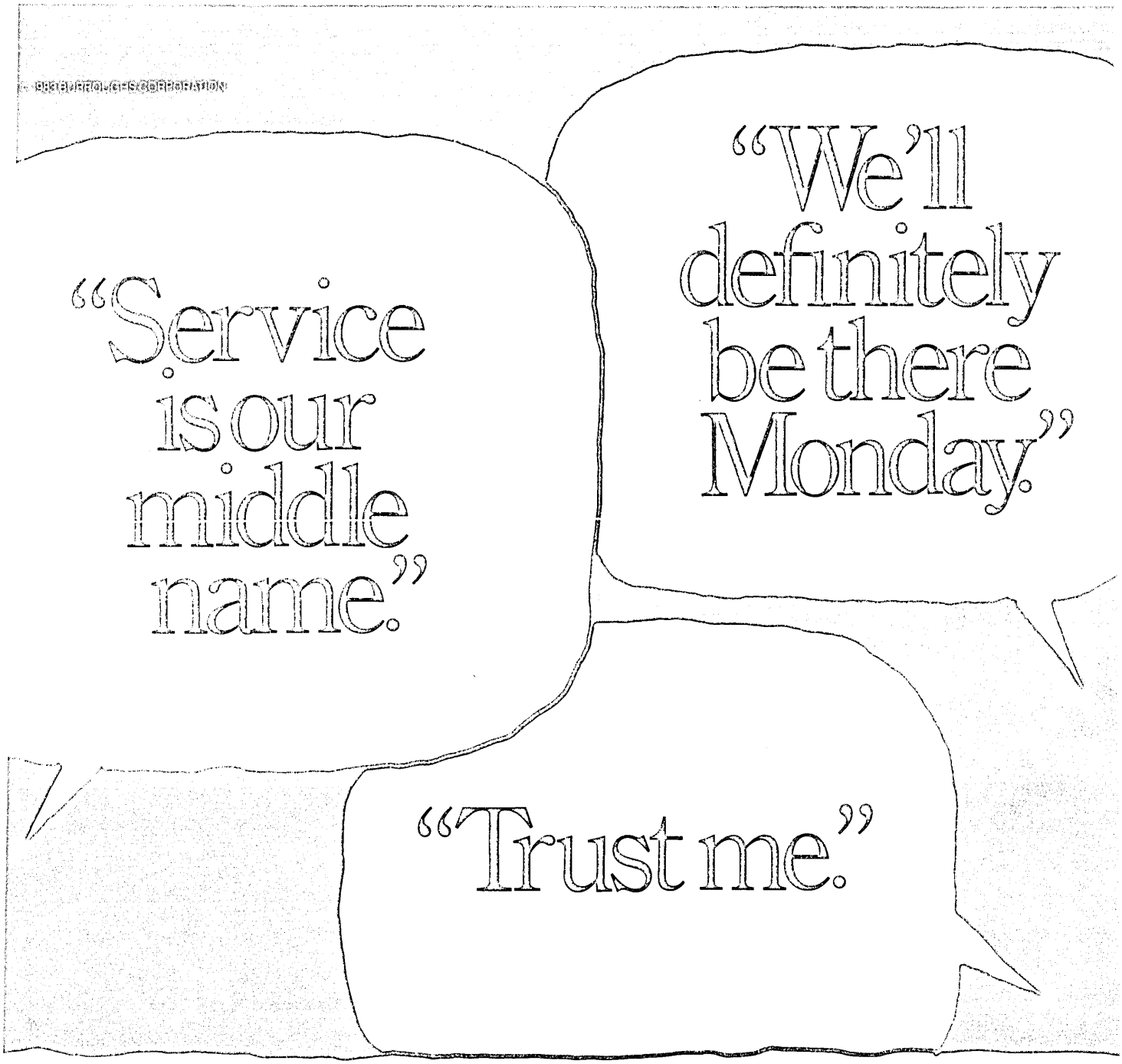
But phantoms scare people. "Yes, we're concerned," he admits, "but we know we have a long-term commitment by IBM to MS/DOS, and various other projects that we're not at liberty to discuss."

Many observers feel that if there is to be an obvious parting of the ways between Microsoft and IBM, it will be on the choice of a Unix-like operating system to run alongside MS/DOS on the upcoming P.C. 2. "Clearly our Xenix is the logical choice to run with MS/DOS on the new P.C.," says Ulett, but it's difficult to discern whether his comments reflect hope or knowledge.

There are reasons for believing that Microsoft is vitally concerned that its Xenix be used on P.C. 2. Xenix was once chosen by Intel as its "flagship" Unix on the forthcoming 286, Ulett claims. Last year Microsoft was asked by Intel to develop a port for AT&T's Unix System 5 to run on the Intel 286, but ended up having the project taken over by arch-rival Digital Research. "It was just a vanilla port and we decided we could use our time more usefully in other areas—for example, bridging MS/DOS and Xenix," is all Ulett will say.

The industry has read the incident in several ways. One, that Microsoft screwed up. Two, that it didn't want to offend IBM by developing a port for Unix System 5 to run on the 286 when it hopes, or anticipates, that its Xenix will run as IBM's Unix on a 286. In other words, it came down to a choice between pleasing AT&T or pleasing IBM, and Microsoft chose Big Blue.

In any event, Microsoft's more pressing concern centers on the unfavorable



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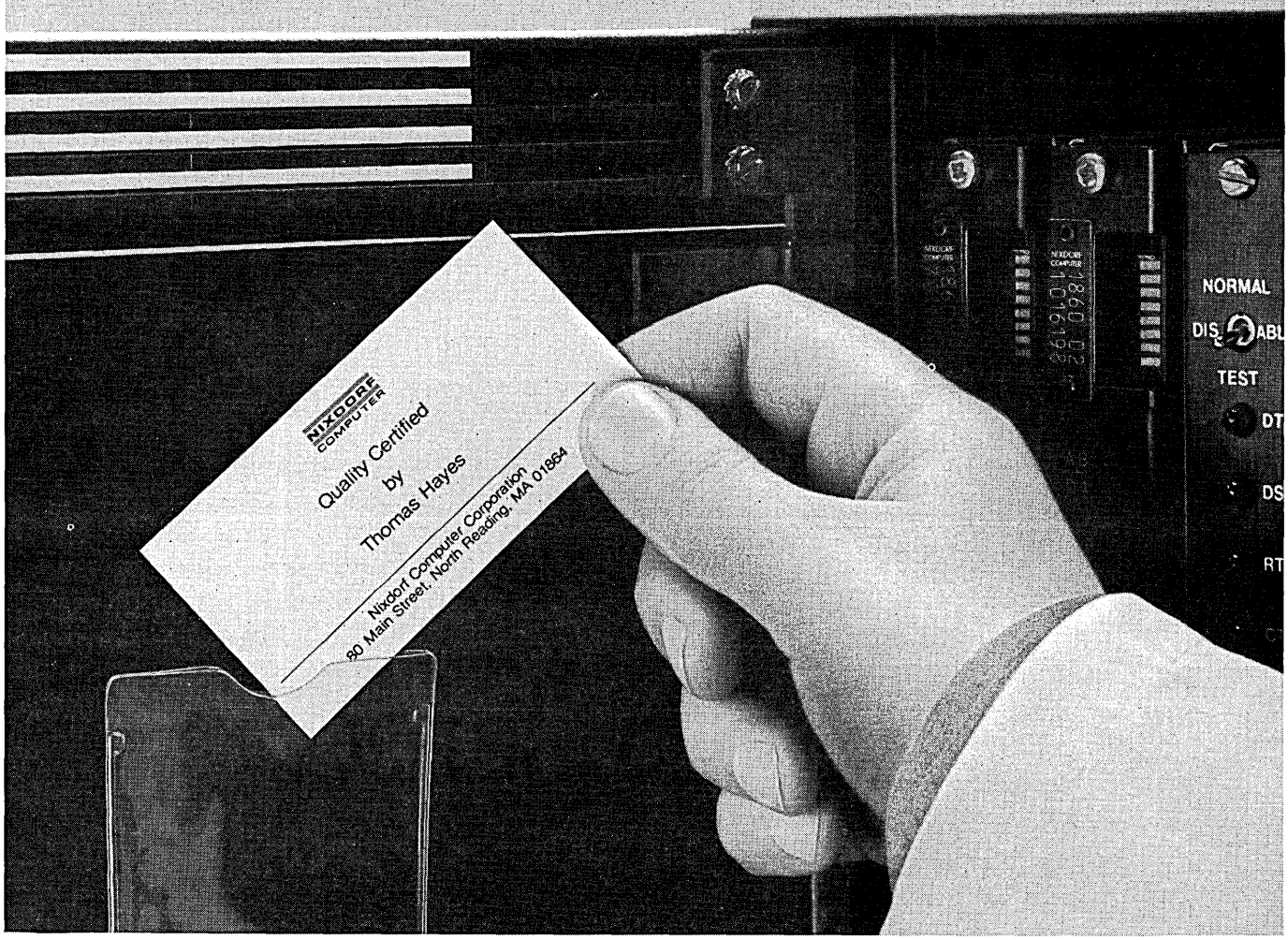

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comparisons between Unix and MS/DOS. "Unix is not yet a satisfactory tool for a single or entry level user," says Ulett. "It's more of a complex programmer system. So we don't see it as the current vehicle for taking over DOS.

"Now if you are talking *son* of Unix," he quips, "that is, if you're talking about something yet to be created, you should be aware that the industry doesn't move overnight. There are lots of companies that have committed to MS/DOS that will not be releasing their products till 1985."

The situation is somewhat different with those new applications software companies that have had to commit to a microcomputer operating system during the past year to develop their products. "Those that wrote everything in MS/DOS could be in trouble next year," says Gersten, who expects many casualties in the P.C. value-added business. "We tried to anticipate this by writing out integrated relational software in Unix's programming language, C, and we know several other new companies that have done this."

As IBM draws its P.C. community into its VM/370 fold by greater control of database and communications links, micro systems will get more complex as they add extra layers for multitasking. Microsoft says its biggest challenge this year is to turn its MS/DOS Xenix combination into a portable, multifunction, local network tool. Much the same sort of thing has already been done by Digital Research with its Softnet and concurrent CP/M, MS/DOS, Unix arrangement.

"Many PC applications companies will fall at this level," predicts Gersten. "Only those with substantial technical, financial, and marketing resources will be in a position to adapt their software to IBM's constant reengineering and retuning." ✱

MEDICAL COMPUTING

PINCHING PENNIES

That's what hospitals now have to do under new Medicare regulations, and computers are coming to the rescue.

by Willie Schatz

It wasn't so long ago that when you went into the hospital, the place spared little expense in nursing you back to health. A few extra tests here and there? No big deal, especially since the more a hospital spent, the more Medicare reimbursed it. Life was easy in those days.

That was before Congress saw the Social Security System slip slidin' away. Now life will be a lot tougher for hospital data processing, information systems, and budget folks. Under the former cost-based reimbursement method, they never paid attention to where the dollars went. With the new prospective payment system (PPS) reimbursement, they'll have to watch every penny. And there's big bucks waiting for those who can help hospitals keep their eyes open.

"If you asked any hospital in the country to tell you how much it spends per patient, none of them could do it," says attorney J. D. Epstein of Wood, Lucksinger & Epstein in Houston. "They never had to worry about costs before. Now the issue is 'how can I save a dollar and reduce my costs? Any dollar I can save reflects on the bottom line.' "

So forget about hospitals dealing only in health care. The business of hospitals is also business.

"The number of hospitals looking for new information systems doubled in

1983," says Ronald Hise, a consultant with Hise, Donahue & Associates. "It's going to double again this year."

And where, pray tell, are those hospitals going to obtain those systems? The computer industry, especially its software half, thought you'd never ask.

"Hospitals will be buying information systems as the most effective way of complying with the new regulations," says Mona Ismail, an industry analyst with Lehman Brothers, Kuhn, Loeb. "After a period of uncertainty, hospitals will reassess their cost structures. They're not quite certain what to buy now, but they can't afford to wait and see for too long. They've got six months at the maximum.

"This is going to be a boon for the whole computer industry. But it's going to be especially significant for software companies and those who can provide turnkey systems linked to personal computers."

Ironically enough, the government can be thanked for this bullish climate. To stop what amounted to a blank check under Medicare's reasonable cost reimbursement formula, the Social Security Amendments of 1983 (P.L. 98-21) established a new method of Medicare reimbursement known as prospective payment. A hospital now knows how much it can collect from Medicare almost as soon as a patient walks in the door, not two months after he's discharged.

Effective last Oct. 1, all health care was divided into 467 diagnosis-related groups (DRGs). Medicare payments for the 5,500 of the country's 7,000 hospitals covered by the law will be made at predetermined, specific rates that represent the average cost, nationwide, of treating a Medicare patient according to his or her diagnosis. If a hospital covers the DRG spread for a patient, it keeps the difference. If it doesn't cover, it eats the loss because it can't increase charges above the DRG level. The system will be eased in 25% a year until Oct. 1, 1986.

"This is going to be a boon for the whole computer industry," says one industry analyst.

So goodbye to "if it feels reasonable, spend it." Any hospital following that philosophy will soon disappear under a sea of red ink, never to be seen again. Say hello to pinching pennies.

"Information technology is the most useful to hospitals in coping with PPS," says Dr. Donald Simborg, director of hospital information systems at the University of California, San Francisco. "There's going to be pressure to enhance the information systems. More functions are going to be automated. Dp and computer budgets will surely go up. There's no question the DRG system is going to make a lot of money for a lot of computer companies."

"Hospitals should have been doing this cost accounting 10 years ago, like other businesses," contends Don Segal, director of management and computer services at Georgetown University Hospital in Washington. "But under reasonable cost reimbursement, there was no reason to do it. The more you spent, the more money you got from the government. It was a disincentive to being efficient.

"Now hospitals are going to need significant databases for each patient. What's important to the physician has never been taken care of before. Hospitals are going to have to start creating larger databases than they have now. They'll have to maintain huge volumes of data and manipulate them effectively. The DRGs are forcing hospitals to think like businesses."

That's music, sweet music, to the computer industry's ears. In ancient times, when DRGs weren't even a gleam in the Department of Health and Human Services's (HHS) eye, information systems were the pitch black sheep of the hospital technology family. Medical applications were where it was at. The latest didn't have to be the greatest as long as it was on-line in time.

"It has been estimated that in the last 12 years more new technologies have been introduced into medicine than in the previous 100 years," Simborg told the recent Symposium on Computer Applications in Medical Care. Citing a 1970s Brookings Institution study on the proliferation of intensive care units (ICUs) as an example, Simborg noted that neither medical efficacy nor perceived need in the community were the prime determinants.

"The attitude seemed to be that if someone else on the block had one, I had to have one, too, to remain competitive," Simborg concluded. "To what can we attribute this insatiable expansion of the use of new technologies if not medical efficacy or need? The overwhelming candidate is our mechanism of reimbursement.

"This was an incredible state of affairs. There was simply no incentive to perform cost benefit or cost effectiveness analyses when considering proliferation and adoption of technology."

But that's history. There's all the incentive in the world now. From here on it's survival of the fittest and the leanest.

The first casualty of this brave new world may well be medical technology. If the DRG payment doesn't cover the operating costs of a particular technical procedure—a lab test, say—or the costs of replacing a piece of equipment or of purchasing a new piece of hardware, hospitals may have to alter their traditional buying patterns. That expensive new technology just might stay permanently on the wish list. Or maybe it will have to be shared by two hospitals, or even three.

Whether or not med tech is the big loser, software is the sure winner. Controlling costs is now literally and figuratively the bottom line, and it's going to take good software to keep a hospital on top.

"This is a good opportunity for startups," Ismail asserts. "The new kid on the block has a better chance. Old information systems are designed to support the old way of doing business. A new supplier can come in, ask you what you need, and design an application to fit. Then you don't have to tear down the old system."

"Most hospital systems are inadequate to take care of present needs, much less future DRG requirements," contends Richard Bendis, chairman and president of Continental Healthcare Systems (CHS). The company designs and markets turnkey minicomputer hospital information systems designed for pharmacies (Pharmakon) and materials management (Matkon).

"If a hospital has an already automated financial system in place, it can enhance it and go to state-of-the-art hardware," Bendis says. "It can totally replace its system. Most small hospitals with under 250 beds, which are more than half of those in the country, aren't automated at all. They can get into their first system and immediately integrate the financial and medical system. There's a significant micro and mini opportunity here."

"Hospitals are going to have to start creating larger databases than they have now," says Don Segal, dp chief at Georgetown University Hospital in Washington.

CHS must believe what it says. The company recently went public with an offering of 1.1 million shares. And it is not alone. Others in this line of work are also high on health care.

Before PPS, three vendors—Shared Medical Systems, McAuto, and HBO & Co.— were the only significant players on the information systems field. They'd been around a while, and had a reliable product and a significant installed base.

That might have been sufficient then, but it won't cut it now.

"Until this point, hospitals tended to do what other hospitals did in information systems because it was safe," says John Mitchell, product manager for Hewlett-Packard's new Case Mix Management System. "Now they're going to do the thing that's going to keep them in business. They're going to look for a system that can help identify and control costs.

"Cost accounting really is virgin territory. It's an untapped market. There's no good system out there today. So while installed base is still important, functionality and applications are now more impor-

tant. That's what vendors are going to compete on," the HP executive says.

We're not talking just hardware and software vendors here. The Big Eight accounting firms are stepping up to this plate as well, and they're not taking any pitches. They want the hospital information systems business, but they want the ensuing consulting more.

And even the Big Eight can't always get what they want.

"Most hospitals, including ours, aren't equipped for the kind of cost-benefit analysis they'll need for PPS," says Ray Dombkiewicz, director of accounting, budget, and cost reimbursement at Greater Southeast Community Hospital (GSCH) in Washington, D.C. "We sent our bids to some Big Eight firms. Two of them came back with a figure over $100,000. We decided we could do it internally for much less."

So they did. GSCH is now using software from Health Sciences International (HSI) called the HSI Grouper. Run on an IBM P.C., the system adds clinical and biographical information, edits the data, and spits out an appropriate DRG number.

"There is definitely a proliferation of products," says Rich Irwin, GSCH's assistant vice president for information systems. "The big companies are selling standalone minis. Some are offering software to operate on their mainframe. But DRG is a federally mandated standard. Like it or not, hospitals have to do it. I'm not surprised everybody and his brother is writing something."

But everybody is answering everybody and his brother.

"We most definitely had an increase in inquiries as DRGs got closer," says Eli Nahmias, vice president of Meta Software, New York City. "I think the other companies in the business—and there are more all the time—experienced the same thing."

Meta Software started out five years ago in the general health-related consulting business, but switched two years ago to health care management software. It recently decided to further specialize in medical records software.

There will surely be more from where Meta Software, HSI, and another rival, CPHA, came. Given the choice of automate or die, hospitals will undoubtedly opt to live. That means more opportunity for good software that can help hospitals take at least as hard a look as the government will at what they're spending where.

"Before, the budgetary risk was the federal government's," says Paul Ertel, a senior scientist at the University of Michigan. "Now, it's the hospital's. The importance of data has gone from minor to critical. Data inaccuracies used to be tolerated. Now they'll be monitored and penalized."

NEWS IN PERSPECTIVE

"Hospitals no longer have a choice," says Georgetown's Segal. "They'll have to know their cost by product. There's a real opportunity here for the smart vendors who have the right product."

Right now Segal is looking for a company intelligent enough to sell him a mainframe that can process a database language and manipulate 3 million to 4 million records effectively and efficiently. The database language alone will set him back about $200,000, but his increased budget can stand the strain. The six Data General machines supporting his current information system are good, as far as they go. They just don't go far enough.

"We're way behind the rest of business in our information systems," Segal says. "We're still out in a little boat on a big ocean. The big waves aren't here yet, but they're coming. The government is going to put the screws on soon. So we all better get to safety."

All aboard. It's not the final call, but it's close. *

APPLICATIONS

EXPERT SYSTEMS: FOR YOU?

An outgrowth of the artificial intelligence field, expert systems require special tools, lots of money, and the right skills to build.

by Jan Johnson

The artificial intelligence industry, which has gained a substantial following in recent months, has created a demand for so-called expert systems. These are computer programs that embody the expertise in a specific domain that would otherwise be available only from a high-priced human expert. The expert system's advantage, proponents claim, is that once built it can be copied and distributed at little marginal cost.

The development of an expert system, however, is something few data processing managers have done and is likely to be a step into relatively uncharted waters. How does one know if an expert system is appropriate? How much will the development of such a program cost? What tools are required? DATAMATION asked several practitioners these and other questions and received the following responses.

Martin Ernst, vice president of advanced information technologies at Arthur D. Little Inc., Cambridge, Mass., offers some basic guidelines. Expert systems are somewhat limited to handling decisions that take human experts anywhere from a few minutes to a few hours to make. If the decision takes less than 45 seconds, the operation can't be too critical or the expert would spend more time on it. Chances are that automating that function would be a waste of time and money, Ernst says.

If the decision takes less than a few minutes, it still falls in the doubtful range, he adds.

If more than a couple of hours are involved, "you could spend years watching your expert" waiting for that infrequent situation when a special rule applies. Problems requiring extensive analysis are also inapplicable. "You probably won't be able to develop the rules before the rules or environment change," Ernst explains.

A critical situation that may only occur infrequently but that requires the services of a highly skilled expert is a likely candidate for an expert system application, suggests Henry Baker, national sales director of Symbolics Inc., Cambridge, Mass. Fault detection systems and systems that respond to change and reschedule operations based on that change are other likely candidates, he says. Within service organizations, "applications usually deal with standardization of the delivery of a service," observes Jerrold Kaplan, chief development officer at Teknowledge Inc., Palo Alto, Calif.

Kaplan also offers a few guidelines for identifying good applications. Agreement among the experts is a prime characteristic of a good expert system problem. If they don't agree, back off, he cautions. Always ask the question "What is the value of taking the best expert and making him available around the clock at all locations?" If there is little value in doing this, "then you don't have an expert on your hands. You want something that will have a significant impact of value to the organization," says Kaplan.

Once the team settles on an application, it must then convince management to finance its project. The cost of building a prototype is $1 million to $3 million, estimate consultants. That endowment covers computer equipment, software tools, staff time and training, and, of course, the ever present, high-dollar consultant or two. If a company is not willing to go that distance, to spend that much, the team can forget pulling together a "serious" but small demonstration prototype system, suggest industry consultants. To move from a prototype to a production system, add another year or two and another $1 million to $3 million.

As a result, many low-budget, "toy system" prototypes have been developed. Eamon Barrett, president of Smart Systems Technology, McLean, Va., worries that the "toy systems" are giving the expert systems business a bad name. "The negative side to this business is that as serious people go looking for real solutions, they look at some of the demos out there and realize those demos are not substantial enough to scale up.

"The conclusion, incorrectly drawn," states Barrett, is that artificial intelligence (AI) technology is cute but not ready for real problems. The conclusion that should be drawn, he insists, is that AI is real, but a "substantial effort" is required to build a working system. Some observers estimate DEC spent about $10 million to evolve R1, an expert system, into the current production product, XCOM, a VAX configuration aid.

Armed with an expert system application and money, the team now faces the design problem. As one industry source jokes, "No one really knows what they're doing." While some may defend this or that "expert" expert system developer, most agree the design process is an inexact technology.

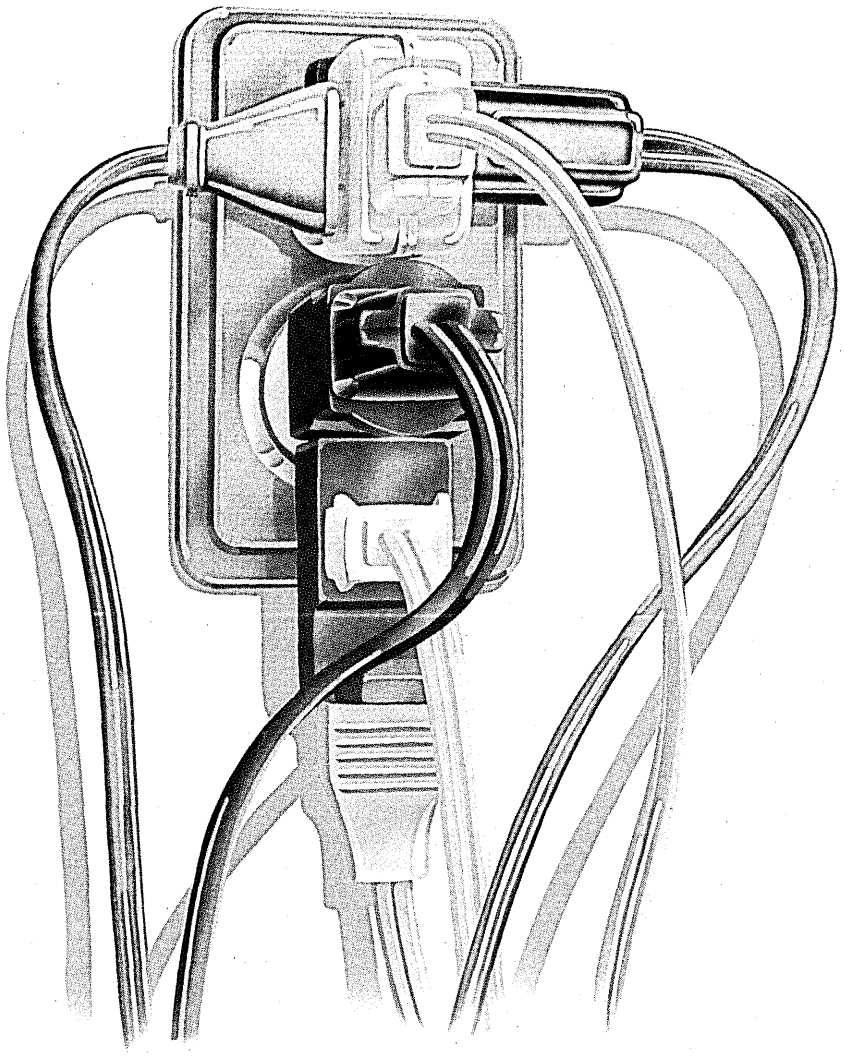
"People look at some demos and realize that those demos are not substantial enough to scale up."

"What happens is you talk to experts and they give you all these rules," explained ADL's Ernst. "Then while you are watching, they violate their own rules. You ask them why and they give you another rule they didn't realize they had." To build a "really good" expert system, "you have to fuse the expert with the knowledge engineer," suggests Harold Payne, a program manager with Verac Inc., San Diego.

Rule extraction is one bottleneck; what to do with those rules is yet another. The crux of the AI design problem is making models out of perceptions, observes Verac's Payne and Dan Schutzer, who recently joined CitiCorp as vice president, money market division, responsible for decision support systems. He came to CitiCorp from Naval Intelligence where he served as a technical director and worked with expert systems.

Expert system design suffers from the same malady that strikes conventional system design efforts: inexact programs are designed because people are inexact when they try to explain what they do and need. Expert systems designers have an invaluable tool for managing the inexact nature of its work—the Lisp programming environment. Lisp easily and quickly accommodates changes. Those working in the traditional dp environment are not so lucky—yet.

AI programmers are not without their own nightmares. The AI field is littered with incompatible versions of Lisp and a



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plethora of other programming languages. Expert system designers have a choice when they start their project, explained Verac's Payne. "You can use what is available, or you can write your own." It's fairly evident many are writing their own.

Universities are said to be the worst offenders. There "almost every individual has a language," said Payne. "It is often part of a paper he is writing so he designs the best language for his specific problem." Some industry sources say they believe the lack of standards will impair the development of a well-recognized practice of engineering. Imagine if conventional software engineering had grown up with 75 different languages. Instead, people focused on FORTRAN, so the industry could focus on "how best to use the language," recalls Payne.

AI programmers are not without their own nightmares. The field is littered with incompatible versions of Lisp.

Not everyone sees the language proliferation issue as a negative. "Nobody says there are too many mathematical systems," counters Smart Systems' Barrett. "Math provides a wonderfully rich variety of structures for dealing with many kinds of problems. AI is at a more primitive state than mathematics, but the spirit is the same—one of developing a variety of structures for representing many different kinds of knowledge." Barrett, like others, singles out Lisp as a language that has distinguished itself as a superior development tool, but he adds a caveat. "After the prototype system is built, it is generally desirable to rewrite the program in some other more efficient language."

Among the other problems facing the intrepid corporate AI team is the painful shortage of knowledge engineers, a lack of experience among many in the field, and a dearth of software tools to assist them. Within commercial companies, such as Westinghouse, General Electric, or Honeywell, AI staff people tend to fall into one of three categories: the occasional AI-trained specialists, computer scientists who have followed technical developments, or, working under them, actual experts from different application areas.

Within commercial companies, small AI teams have been operating, on average, for three years. Only within the past year have teams of five to 10 been easily found, observe several sources. Because these efforts have been small and often very quiet, it is surprising to discover that several major companies, such as General Dynamics, Shell Oil, and General Electric, are at a critical crossroad in deciding whether to give in and go with the next $1 million to $3 million round of funding to get a production system, or to back off. Sources expect the companies will forge ahead.

ADL's Ernst speculates that maybe 2% to 3%—"possibly 5% at the high end"—of the Fortune 500 companies are at that crossroad. "A lot of that type of situation has happened in '83, relative to a year or two ago."

From a technology perspective, the crossroad means a transition from prototype to production, from special Lisp-based machine to a conventional hardware environment. It is not an easy process, say industry sources, and often requires a system rewrite, changing upwards of 2,000 lines of code. Even then, four or five users on an AI-based production system can easily use an entire computer.

"In porting from a Lisp-based machine to a conventional machine, you can wind up with a lot of disk storage and paging overhead, and the response time goes way down," notes David Musser, project leader for the logic and inference system program at General Electric's research center, Schenectady, N.Y.

One way to minimize the port problem is "to write for the target machine" during development, advises Verac's Payne. Verac, like several other companies involved in designing custom expert systems for clients, is thinking of adding an expert system port service to its current business.

Why port? Who can afford to support a production application that requires a $100,000 or more single-user Lisp box?

It is estimated that only 3% or so of the biggest U.S. corporations are involved in AI.

Most development machines, such as Symbolic's Inc.'s 3600 processor, Xerox's 1108, or Lisp Machine Inc.'s Lambda, are single-user cpus, although an expert system researcher with Westinghouse's Water Reactor Division, Pittsburgh, said he expects, with a little tweaking, to squeeze up to six users on a Lambda processor.

The end-user equipment problem has not gone unnoticed by several manufacturers. In what could be read as a vote of confidence in the future of AI computing, Sperry Corp., Apollo Computer, Data General, Hewlett-Packard, and Digital Equipment all indicated they will offer a version of Lisp for their machines (October, p. 92).

Meanwhile, Lisp machine vendors are all working to reduce costs. Symbolics, for instance, is working on a custom-designed VLSI chip said to be ready sometime late in 1985 or 1986.

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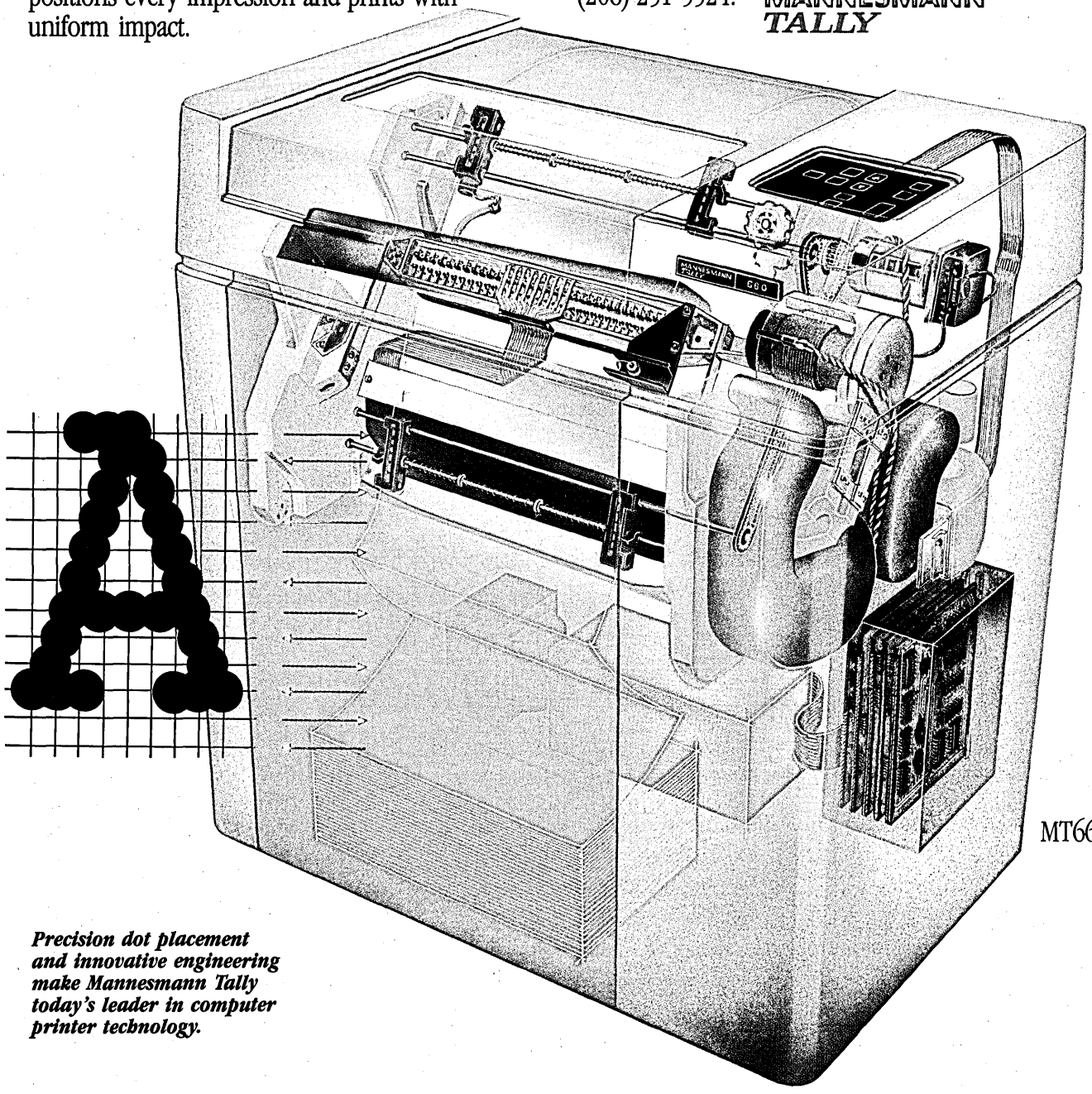

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CIRCLE 48 ON READER CARD

SCIENCE/SCOPE

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The new Telstar 3 communications satellite carries solid-state power amplifiers to boost its ability to carry TV, radio, voice, and high-speed data transmission services. Telstar 3, owned and operated by American Telephone and Telegraph Co., is the first Hughes satellite to use solid-state amplifiers. When combined with advanced signal transmission techniques, these devices allow the spacecraft to carry nearly four times as many telephone calls as other satellites in service. Current satellites almost exclusively use traveling-wave tube amplifiers. While these tubes use the satellite's solar-generated power more efficiently, the solid-state amplifiers are more reliable and will last longer.

Approximately 2900 U.S. and foreign patents have been granted to Hughes inventors in the last 15 years. To honor its best and brightest talent, the company each year presents the Lawrence A. Hyland Patent Award to a handful of its outstanding inventors. The award, which includes an honorarium, is named for the company's retired chairman of the board. A leading electronics inventor and radar pioneer, Mr. Hyland was granted nearly 40 patents. Among his earliest was the one for the first shielded spark plug that permitted radio equipment to be used effectively aboard aircraft. To date 104 inventors have received the Hyland award.

A new computer system promises to reduce scrap and rework, thereby helping one Hughes group slash costs by an estimated $1.5 million annually. The Quality Information System (QIS), now under development, will compile and analyze data on how defects happen and how they are corrected. Information will be made available to manufacturing employees for immediate feedback and for use during production. Data will also be kept in a central historical file for future reference. QIS is expected to improve quality by spotting problems that stem from faulty design, poor supplier quality, and improper manufacturing methods. In addition, by keeping track of how often certain hardware needs replacing, the system will help pinpoint problems with components or their applications.

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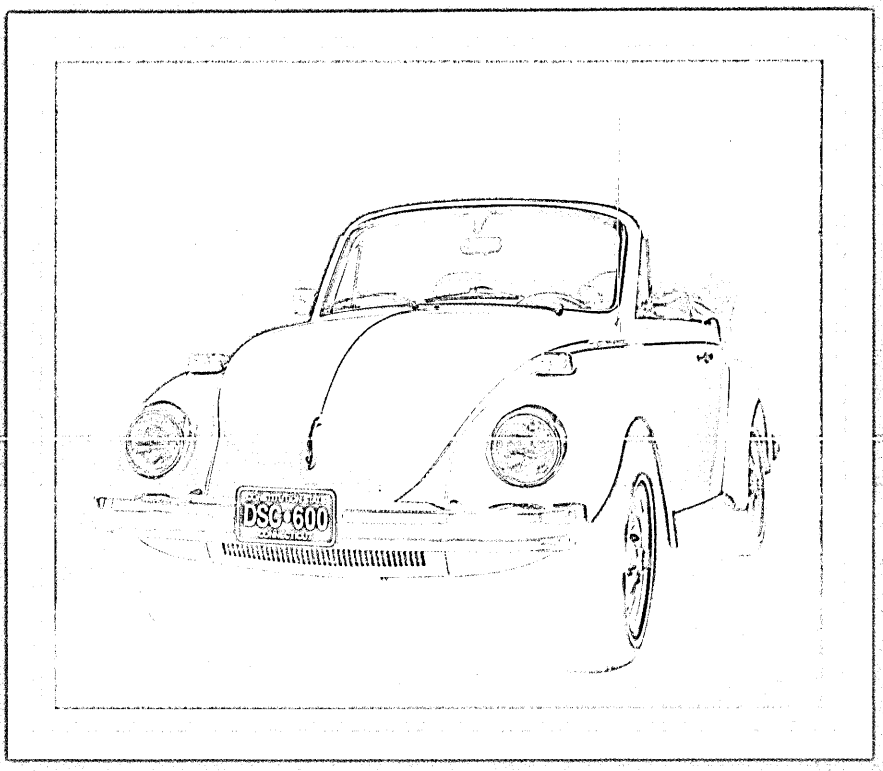

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CIRCLE 49 ON READER CARD

is IBM, but not for long. A small Waltham, Mass., company has some novel ideas on how to catapult IBM users into the AI world, and at the same time get around the port problem. Expert Systems Corp.'s strategy is to develop a Lisp-like development language and expert applications specifically for IBM general purpose mainframes, micros, and operating systems. The special twist to Expert Systems' approach is its incremental introduction of AI capabilities.

Large expert programs bog down on IBM systems because of IBM's miserly provisions for address space and virtual memory managment, claims Jerry Deisenroth, president of Expert Systems. A Lisp system running on an IBM mainframe "runs so poorly four users can eat up an entire million dollar machine," he maintains.

The good news, according to Deisenroth, is that these limitations are a software, not hardware, constraint, and IBM has begun to address those constraints. He points to the XA (extended architecture) announcement as the first step in IBM's long-term plan. Prior to forming Expert Systems about a year ago, Deisenroth was vice president of marketing at Artificial Intelligence Corp., also of Waltham.

Confident of IBM's direction, Deisenroth has set out to build yet another AI-oriented language, Expertise, but this one is targeted at conventional IBM hardware and operating systems. It will be priced in the $75,000 range and offer "a Lisp-like programming environment," says Deisenroth. The micro version is yet to be priced.

"Look at the AI world. They have an astounding development environment. That environment deserves to be in an IBM machine. Think what Lisp-like capabilities could do to the incredible cost of maintaining programs," he muses.

If all goes as planned, Expertise should make its product debut in the fourth quarter of this year. The plan is to introduce, a year later, the first in a series of "Expert" applications. The first release will contain "a little AI," he says.

Expertise should make its product debut in the fourth quarter.

Central to Expert Systems' corporate philosophy is the idea that the AI component is not the critical element. "It's more the frosting on the cake until IBM removes the current memory constraints and we can put in an interesting amount of AI," claims Deisenroth. "What is critical is the development environment, the ability to develop and manage AI programs.

"The real world is much less concerned with AI and more concerned with production volumes and disk space. So we looked about for applications where a small amount of AI would give a lot of benefit," he says.

The first of his application products will be general accounting packages that make use of FASB (Financial Accounting Standards Board) rules, tax rules, and industry standard data by SIC (standard industrial code). The packages will be tailored to specific industries, he notes.

User reaction to the Expert Systems approach is best described as skeptically positive. Says CitiCorp's Schutzer: "If someone can build a system that allows me to write an expert system in a Lisp-like environment and run fast and use dumb, cheap terminals, then I think they might have something. Bear in mind that you need terminals that can handle windows, graphics, and local storage. You also have the inherent problem of IBM's operating system overhead. My initial gut reaction is that anything [Deisenroth] can do, looking at the price of hardware, can be done with a smart dedicated machine that can be interfaced to an IBM database." Meanwhile, Xerox, Symbolics, and LMI are coming down in price.

Despite the embryonic nature of expert systems development, the field appears to have reached a critical growth point. This year a handful of commercial companies will begin to convert large prototypes into production systems. If the results of those efforts are positive, the pace of AI development within the commercial sector could get a power boost. If the results are disappointing, funding and interest may dry up, the six-person research teams may dwindle back to individual efforts, and AI efforts may retreat back into university labs and the military. ✱

BRINGING THE OED ON-LINE

The venerable dictionary is being installed on a computer for its 100th birthday.

by John Lamb

What is the "muckledom" of your bank account? Have you been caught "booty-haling" your freezer recently? The answer to these and other linguistic teasers should be a lot easier to come by in the future because the Oxford English Dictionary (OED), the last word on the English language, is going on-line.

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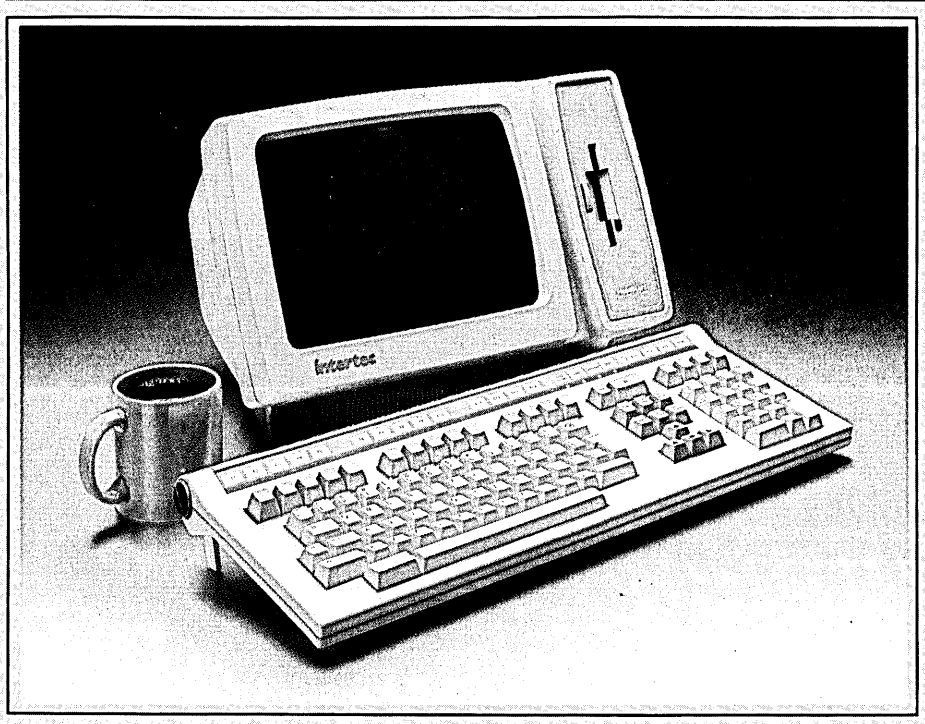

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CIRCLE 52 ON READER CARD

Oxford University Press, British publishers of the OED, are spending £8 million ($11.4 million) on a three-year project to digitize the 600,000 entries in the dictionary. The scheme has the personal interest of British Prime Minister Margaret Thatcher and the financial backing of IBM, which will be contributing a 4300 system estimated to be worth some £1 million.

IBM's involvement in this prestige project will be another feather in the company's U.K. cap, as it comes soon after the knighthood bestowed in the New Year Honours List on its U.K. managing director, Eddie Nixon.

Although IBM declined to comment on the deal at the time of writing, it is a major coup over the British firm ICL. Despite the fact that ICL has a database management system (IDMS), a free-text search package (Status), a fast retrieval system (CAFS), and a full range of mainframes, the U.K.'s biggest computer company declined an invitation to bid for the project.

IBM is donating a 4300 to the project after ICL declined to bid.

Apart from IBM's gift, the U.K.'s Department of Trade and Industry will probably chip in a further £300,000 ($430,000) toward the £1 million it will cost to update entries in the current edition.

"We see the transfer of the dictionary into machine-readable form as a marriage between traditional British scholarship and modern information technology," says Richard Charkin, deputy publisher at Oxford University Press. "It's much more complicated than putting an encyclopedia onto a computer because English does not lend itself to structuring, especially so far as the grammar is concerned."

The first volume of the OED appeared 100 years ago. At that time the dictionary was known as a "New English Dictionary"—"new" because unlike earlier English dictionaries it set out to record every word in the language, whether in current use or not. The full edition of 12 thick volumes was not completed until 1928 and has since been joined by four supplements containing new entries and revisions to existing ones.

The Oxford University Press has, in effect, two databases—the original 12 volumes, and the supplements. Richard Charkin hopes the system he is planning will enable the press to shuffle the two together, producing a single electronic dictionary that can be updated constantly and be made available to scholars around the world.

Apart from the 4300 mainframe, the dictionary will require storage for 1 billion characters, £250,000 worth ($355,000) of software development and up to 24 terminals for the 30 editors at present working on the OED. Data capture will cost an initial £2.5 million while a further £200,000 will have to be spent on designing the databases.

The OED is not just a dictionary. Apart from definitions, the first edition contains almost 2 million quotations that record the first known appearance of a word in print and its subsequent changes in meaning. The word "social," for example, is illustrated by about 80 quotations. Oxford University Press has gathered 10 times as many quotations as actually appear in print.

The database will be designed so that scholars can access these quotations, searching them by date, by combinations of words, and so on. The ability to search the database would greatly increase the usefulness of these quotations, since each contains examples of the use of several words. Universities will be able to buy copies of the database on tape, but it will be accessible through commercial database systems like Dialog, Lexis, and Infoline. "It would eventually be nice to think you could run it on a PC" says Charkin. "It could fit onto a couple of laser disks."

Another advantage that Oxford University Press will gain from computerizing the OED is the opportunity to update the dictionary. At present it is weak on more recent scientific and technical terms. For example, the original dictionary defines "computer" as a person who computes. The OED also mentions a "computis," one skilled in the use of a "computus"—or alternatively, an accountant.

Production of the dictionary will also be modernized. At present it is produced using a hot metal printing process. Once the OED is in machine-readable form, the Oxford University Press will set it using Lasercomp typesetting equipment.

Japan is currently the leading market for the £700 printed OED, followed by the U.S. and Britain.

The Oxford University Press hopes that computerization will also improve the finances of the OED. Despite the fact that a full set costs £700 ($1,000) to buy, Charkin describes losses on the publication as "horrific," amounting to £1 million for each volume.

Overseas sales are vital to the Oxford University Press. Japan is easily the biggest market for the OED, followed by the U.S. and then Britain. The dictionary also includes words from every country where English is the main language, and once the OED is in its more convenient electronic form, Charkin hopes foreign sales will increase.

Finally, Charkin explains, "muckledom" means size, and "booty-haling" is another word for plundering. *

STILL A NEED FOR PAPER

Electronic publishing, paper style, is concerning itself with aesthetics now.

by Edith Myers

'Midst talk of the spread of electronic mail, electronic storage and retrieval, and electronically delivered publications comes this assertion from Robert V. Adams, group vice president, Xerox Corp. and president of Xerox Systems Group: "Paper still is the overwhelming medium of communications."

He's high on electronic publishing all right, but when he uses the term, he doesn't mean the kind where information is delivered on a crt. His kind uses paper and, naturally, Xerox electronic printers. When he was president of Xerox Printing Systems Group (before he assumed his current position), Adams says he had to do a lot of missionary selling of the concept. "You had to get high enough up in an organization to reach someone bothered by cost."

Cost savings was the big attraction to Paul Ingevaldson, data processing director for Ace Hardware Co., Oak Brook, Ill. Ace produces 10 different versions of its catalog, each about 4,400 pages and each containing 35,000 items. Updating was constant. "We had been doing it manually, cut and paste with a word processor."

Some three and a half years ago, Ingevaldson says, he visited Mitel Corp. in Kanata, Ontario, and saw what it was doing with a Xerox 9700 laser printer, Addressograph Multigraph scanner, DEC PDP/11 computer, and text and print merging software from a now defunct Los Angeles firm, Krontek Corp.

"It was interesting, but we're not as high tech as Mitel." When a Xerox salesman later came to him to sell him a 9700, he says, "I told him, 'If you can get that guy to merge pictures and text, come back.' " Xerox pointed him in the direction of Krontek and aroused some concrete interest.

Subsequently, Xerox, through acquisition of another small Los Angeles graphics software company, CSS, acquired its own ability to merge text and graphics and introduced its XICS (Xerox Integrated Composition System) software, which is what ACE is using today along with some software developed in-house.

"It was a two-year development program," Ingevaldson says. "We were a beta test site for Xerox through the whole process. We're on the leading edge with

them." Besides XICS, he says, there are 50 computer programs involved in the process.

Ace started implementing its electronic publishing project late last fall. At year-end, it had three of its 10 warehouses converted and expected to have the remainder up and running by summer.

"They supply us with data, and the catalogs are printed centrally and mailed to dealers." Software is run on an IBM 3081, which drives the 9700 to produce camera-ready masters.

Ace's catalogs are divided into nine different departments, and dealers receive a new version of one department every week. "Changes can be entered later in the cycle now," says Ingevaldson, "so the information is more up-to-date."

This, plus cost savings, speed, and accuracy, is what he sees as the major value of the new system. "It does look a little better. We've changed to fonts that are more attractive and we can do bolding when we want to, but this was not the big thing for us."

Xerox's Adams believes aesthetics are very important to some people. "When we first introduced the 9700 [in 1978]," he said, "it drew ooohs and aaahs from everyone. When we showed the output to a printer, he said 'That's terrible.' "

This was the beginning of the thinking that led to formation of Xerox's Corporate Font Center in late 1981. "Before that, we had developed typefaces for specific printing products," says Liz Bond, Font Center manager. "We wanted the same print quality for all our products. We started with fonts like Helvetica, faces everybody's familiar with."

Now the center has a font library. It gets the type in different forms. "Morganthaller provides actual digitized fonts," she said. "Interstate Typeface Corp. supplies artwork and we do the digitizing." The center also creates original designs. Its staff is a mix of software developers, typography experts, and artists.

Bond says she initially had to go out and solicit typefaces. "Now people are knocking at my door to sell me type. People are worried about how to make information look better."

She believes electronic publishing will augment, not replace, traditional phototypesetting. "I see them as standing side by side. A typesetter can always be added as an alternative."

"It does look a little better. We've changed to fonts that are more attractive."

Bond sees the biggest uses of electronic printing in what she calls "utility publishing, short-run manuscripts, publishing where it's advantageous to be able to change your mind at the last minute."

The Xerox Font Center has done work with electronic printing of handwriting. "Normally," says Bond, "we can do a custom font in 20 working days. With the handwritten project we had to go through 23 iterations and it took about six or seven weeks." The center also is working on foreign language characters such as Arabic and Indian. "We've already done Cyrillic as a demo." Fuji Xerox is working on kanji.

The latest addition at the center is a hot line; customers can call in toll free with font requests or problems.

And while Krontek, the small company that helped Mitel get going with its graphics and text merger project, is no more, one of its principals, Dr. Henry Kramer, has a new company, Image Research Corp., Santa Barbara, Calif., which still counts Mitel as a major customer.

"Our software," says Kramer, "makes it possible for graphics characters to be stored as a regular font. It takes the specifications of an image and stores them as a vector or bit map. The specifications can be decomposed into a mosaic of pre-

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stored characters. It's as if the graphics are done by a plotter but much faster. It [the software] reduces storage requirements because only names and bit maps are stored. It also reduces need for cpu time."

Image Research's first product after its founding in 1980 was Graph 97 to print scanned graphics on the 9700. It was this software, obtained from Krontek, that was used by Mitel. The second product was Plot 97, which was developed in the spring of 1981 and was first installed at Martin Marietta in Denver, and has since been installed by some 40 organizations, including Lawrence Berkeley Laboratory, A.C. Nielsen, Sperry, AT&T, and Continental Bank.

Also in 1981 came IRC Flowchart, which takes textual input at a vdt and produces a complete, stylized flowchart for installation and maintenance documentation on the 9700. In the fall of the same year, an adaptation of Plot 97 was written to output vector graphics to the Autologic APS5.

In 1983, software interfaces were written to allow Plot 97 to be actuated from the graphics input packages Tell-A-Graf and DISSPLA produced by ISSCO, San Diego, and SAS/GRAPH, produced and marketed by SAS Institute of North Carolina.

In the spring of 1983, Image Research entered into an agreement with A.C. Nielsen for installation of Plot 97 at the latter's many 9700 sites worldwide. In the fall of 1983, IRC contracted with Digital Equipment Corp. for marketing of PLOTLN, an adaptation of Plot 97 for printing graphics on the DEC LN01 laser printer.

Xerox's Bond sums up the need for the ability to change typographic image: "How you pass on information on paper is your image. You don't want to wear the same outfit year after year." ❋

SECURITY AND SECRETS

SOFTWARE DOWN UNDER

Apple Computer's loss may be the Australian industry's gain as moves are made to reform the country's software protection laws.

by Norman Kemp

Apple Computer Inc. has been making software copyright history lately in a pair of globe-spanning decisions that may both turn out to be victories for the feisty personal computer company in particular and computer companies in general.

In New Jersey, Apple forced Franklin Computer Corp. to pay it $2.5 million in damages for copying Apple's operating system for the Apple II. Franklin had challenged Apple's right to copyright the software, which Franklin had used bit-for-bit in its Ace 1000, a machine that runs Apple programs unaltered.

Meanwhile, in Australia, where Apple had fought a Taiwanese company that also was copying the Apple II machine, a court ruled that software was not copyrightable under that country's laws, but the shock waves from that decision appeared likely to set in motion industry-backed proposals to strengthen Australian software law.

The judge ruled that ROM-based software is not a literary work and therefore not copyrightable.

Sources in Australia say the government is planning amendments that would provide protection to software that forms an integral part of a computer. The moves followed the dismissal by federal court judge Justice Beaumont in Sydney of an action brought by Apple Computer and its local subsidiary to suppress a machine dubbed Wombat. The latter was imported into Australia as an Apple II lookalike by a Melbourne company, Computer Edge Propietary Ltd. and sold for about one-third lower than the Apple II. The Wombat uses three read-only memory (ROM) chips which contain the disputed software.

Prior to the hearing, which Apple Australia managing director David Strong had predicted would be a "landmark," Apple had successfully won out-of-court settlements against one New Zealand and two other Australian companies dealing in Taiwanese Apple copies. These companies had agreed not to sell further copies, but Computer Edge wouldn't give in. Apple's case against that firm had been pending for seven months, during which time a U.S. Federal Appeals court had decided that software could be copyrighted in the U.S.

Judge Beaumont in Australia said, however, that software contained on chips were not literary works under Australian law and he dismissed Apple's claim. His opinion noted that when the law had been last amended to include sound recordings and films, computers were already invented and the lawmakers had apparently thought it better for other laws to take care of software protection. Computer Edge was also cleared of a second alleged offense, that of deceptive and misleading advertising.

Apple's immediate reaction to the surprise ruling was that an appeal was under consideration.

Philip Woolley, marketing director for Imagineering, a large software distributor whose suppliers include Micropro and about 100 overseas companies, said that all microprocessor software was being packaged and sold to users under license and not as outright purchase. This was aimed at controlling the use and copying of software. Concern over unauthorized use of software has been expressed by Australian vendors for some time, and intensified recently when it was discovered that Southeast Asian companies were duplicating copyrighted manuals and documentation.

Ironically, just as the Australian courts overturned the commonly held belief that software could be copyrighted, the World Intellectual Property Organization, a United Nations agency, asked Australia to host an upcoming international meeting on the protection of software. The Australian government was expected to support the event officially.

"By deciding that computer machine systems are not able to be copyrighted under Australian law, the judge has opened up a whole new field of possible litigation," commented Apple Australia marketing communication director David Roman. "Does Apple in fact have the ownership of its property in Australia or not?"

Apple considers copying of the new MacIntosh and other products' operating systems in Australia unlikely since attorney general Gareth Evans has quickly stepped in to assure the industry that the law will be amended to include protection for computer systems. Apple Australia has also appealed against the ruling to the federal bench of the Australia high court. A hearing will be held Feb. 20. But the possibility of system copying cannot be ruled out, as the company is on the fringe of Asian territories where large-scale imitation of Apples is already prevalent despite numerous court actions.

The ruling may have strong implications for IBM, which is funding a large-scale software development in Australia.

The delay between the court hearings and parliamentary action, which would come later in the year, could still enable software in new machines to be studied and copied. It is a vulnerable period for Apple as it cannot at this point legally prevent through copyright a duplication of the new MacIntosh machine language by competitive vendors. This could lead to the appearance of counterfeit or lookalike MacIntoshs, and compound Apple's problems and costs in taking court actions in countries where they could be sold.

Although IBM Australia will not comment officially on the decision, a spokesman said it was a matter to be taken up by the industry as a whole. A source who did not want to be named said the company was also very worried about possible spin-

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offs from the decision, as it prepares to manufacture the P.C. for Australian and Asian markets at a factory in Victoria, with first units scheduled in April.

In addition, IBM Australia is financing large machine software development through third-party contracts which will be used on its mainframes internationally. The entire project is costing IBM Australia about $45 million and includes the largest expenditure on local manufacturing this company has ever made. The main object is to obtain offset credits with the Australian government which will assist it when tendering for government contracts. The credits indicate the goodwill held by a foreign-owned contracting company when it provides technical resources and development facilities for Australian industry and services so that they can benefit from the sale of products made mainly overseas. With the IBM P.C. production line at an advanced stage of preparation IBM Australia could be manufacturing in a country without protection either for its own systems or for programs written in Australia and overseas for the P.C.

Alleviating this would be copyright protection that applies to printed instruction manuals and technical data, so that copying would be restricted to concepts and components not covered by copyright. IBM Australia is also concerned that R&D work at its new software development center—which it has financed at A$2 million ($1.6 million)—could be open to illicit copying. Future software development is understood to be in abeyance or proceeding under careful scrutiny until the situation is clarified. IBM Australia is also cautiously evaluating the implications for its automated office projects, not only in the P.C. range and for terminals but also throughout its minicomputer and mainframe lines.

Vendors of software for mainframe computers generally have agreed to leave handling of the situation to their industry associations and the Australian government. John Vanspall, managing director of

Government legislators expect the situation will be resolved by year's end.

McCormack & Dodge, which last year formed a local subsidiary, said the company had little to worry about over large software systems, which are complex and require training.

"But everyone has to consider the situation and I can't believe the government will let it drag on," he said. "I sure as hell wouldn't like to be at the low end of the market," he added.

Microsoft Corporation in the U.S. is studying a plan by its recently formed Australian subsidiary, Microsoft Australia, to license standalone applications packages to schools and large business and government institutions. According to Linda Graham, managing director, the firm wants to provide manuals and other aids at a reduced rate to purchasers of more than five copies. The aim is to reduce photocopying of manuals, which is endemic particularly among schools. Microsoft is not so concerned that the Apple decision will threaten its application programs but is worried over the unauthorized copying of programs in the general market, she said. If the plan is successful in Australia, Microsoft may apply it in the U.S. and Europe, she added.

The Apple-Franklin settlement ended a two-year controversy between the two microcomputer makers that had not prevented Franklin, a Cherry Hill, N.J., company, from shipping any products but that had been watched closely by the industry as a major test case. Franklin had disputed Apple's claims that software contained in ROM was copyrightable and managed to rack up sales of about $70 million last year.

After a court decision last summer that Apple's claims were in fact legitimate, Franklin sat down at the bargaining table with Apple and also, apparently, finished development of its own operating system, which Franklin claims will run virtually all Apple II-supported programs without modifications.

"We think it was a total victory," said Jack Brown, the attorney who had represented Apple against Franklin. "The message has gone out that companies involved in copying will simply not be tolerated." Reportedly, however, others in the software business would have liked to have seen a more substantial Supreme Court decision on the matter. One day, perhaps, they will get their wish. ✱

SECURITY GROUP FORMING

A nonprofit organization is being formed to bring security-conscious computer managers together.

by Edith Myers

A fledgling Southern California professional society is spreading its wings nationally.

The Information Systems Security Association (ISSA), a Los Angeles-based nonprofit organization for computer security and contingency planning professionals, celebrated its first birthday as a local society in July and immediately set out to go national.

Within a few months the nuclei of chapters had been formed in New York, Washington, D.C., Denver, Minneapolis, and the San Francisco-San Jose areas. They're not chapters yet, emphasizes Sandra Mann, a founder and currently vice president of the local group, which grew from 15 to 60 members in its first year. "We're in the process of getting acceptance as a nonprofit organization nationally. We're filling out the forms. Until that's finished we can't formally set up additional chapters." She thinks the process will take about two months. "It took six weeks to get acceptance in California."

Mann formed ISSA with Nancy Woolsey, Lockheed California Corp., now its treasurer. They had attended national security seminars put on by for-profit organizations and had found them useful. "The tutorials are good and you learn many things," said Mann, "but we felt a need for more one-on-one exchange of information.

She believes ISSA, when it becomes national, will be the only organization of its kind. "The EDP Auditors Association does have some information systems security professionals but its aims are broader than that."

She says typical titles of members are information systems security officer or data security officer. "We have all types of companies from banks to manufacturing, aircraft, and insurance, and all sizes including firms just establishing an information system security function."

Topics of interest to the group include contingency planning, standards for secure systems, investigating computer crime, and maintaining security in a distributed environment.

In its first year, the Los Angeles group spawned two subgroups, one for users of RACF, and IBM software security product, and one for users of ACF2, a product of the Cambridge group. Others could follow.

Mann notes that informal exchanges at meetings are almost as valuable as formal presentations. "Someone might ask, 'Do you have a security awareness program? How did you do it?' Or, 'We're implementing RACF under CICS; anyone else doing it?' Each question might only get a couple of answers but they're usually worthwhile."

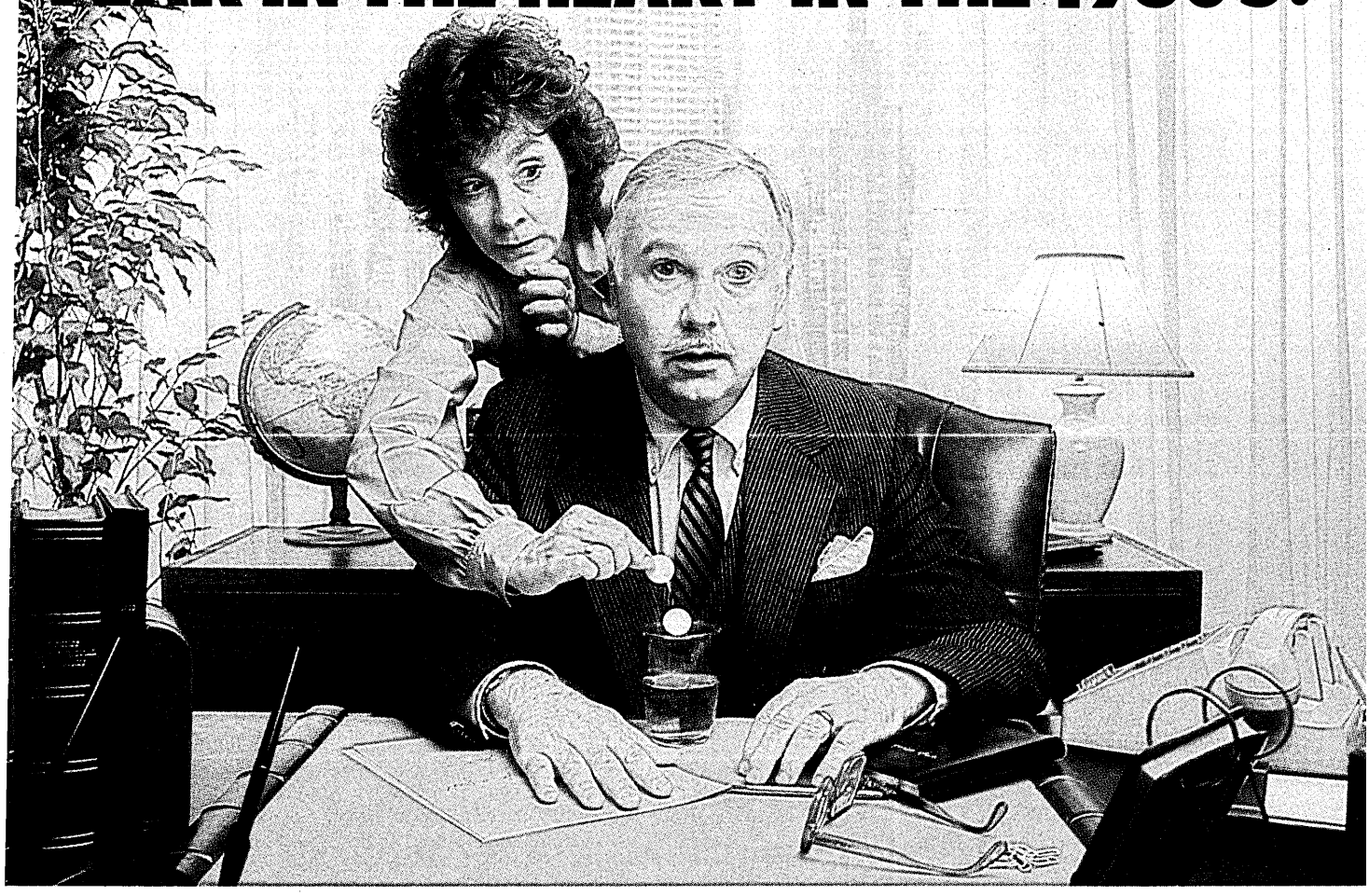
Even as they're preparing their filing for national nonprofit status, the ISSA is preparing general guidelines for establishing chapters. "We don't want to be overly structured," said Mann.

She states she envisions national officers and a once-a-year national conference when the formalities are over.

Meanwhile, the Los Angeles group is planning a one-day seminar for some time in the first quarter of 1984 for companies just setting up an information security function.

ISSA can be contacted at P.O. Box 71926, Los Angeles, CA 90071. ✱

FOUR LITTLE WORDS THAT STRIKE FEAR IN THE HEART IN THE 1980'S.



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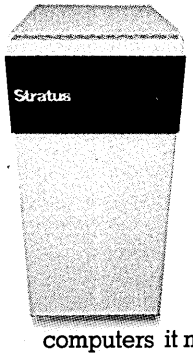

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NEWS IN PERSPECTIVE

BENCHMARKS

YEN TO PAY: After finally conceding that some of its software is dangerously close in design and function to IBM's MVS SP package, Hitachi Ltd. asked 20 of its users to switch their software licenses to IBM. The first user to be asked was Tokyo University, which was running the Hitachi software on a machine that included Hitachi's S-810/20 array processor. The Japanese company said it would eventually come out with new software to replace the original package, which was deemed as falling under IBM's software copyright. Hitachi had earlier disclosed that it is paying IBM as much as $4.2 million a month for the use of IBM software. It was not immediately known if the university actually would make the switch to IBM as was reported in U.S. newspapers, but Hitachi confirmed that it had asked university officials to make the move. The Japanese company pleaded guilty last year to conspiring to steal IBM trade secrets, which included details of mainframe software as well as of peripherals and cpu components. IBM declined to comment on the software situation.

TRADE SECRET SUIT: IBM has sued a thin-film media startup for having passed IBM trade secrets to Control Data Corp. in an effort to solicit a CDC investment. Trimedia Corp., Fremont, Calif., was charged with having passed to CDC trade secrets obtained during confidential discovery for a previous IBM suit involving Lin Data Corp., which spun out of IBM's San Jose magnetic recording R&D facility. According to IBM, trade secrets relating to its thin-film efforts were given to a CDC lawyer who then passed them on to "at least five" other persons employed by CDC and its jointly owned subsidiaries, Magnetic Peripherals Inc. and Peripheral Components Inc. Involved in those subsidiaries are Honeywell, Sperry, and Burroughs, through its Memorex subsidiary. While Control Data was not named as a defendant in the suit, which called for an immediate restraining order against Trimedia, IBM declared in its court papers that CDC should have known trade secrets when it saw them and should have declined further involvement with them. Trimedia's counsel James Pooley called the suit "absolutely without merit." CDC confirmed that it had made a small investment in Trimedia but declined further comment on the IBM suit. IBM, which generally leads the industry in disk technology, has been active in the courts in the past year or so, pursuing new recording head and media companies started by former IBM employees. It has settled several suits out of court.

TRILOGY WANTS "MORE": Like Oliver Twist, Gene Amdahl's Trilogy Corp. is asking for more cash—$70 million more—to fund its effort to get into the plug-compatible cpu market. The company disclosed in filings with government agencies that it will need an additional $70 million through the first half of 1985 in order to complete its planned 30MIPS processor. So far the company has raised more than $200 million in startup funding. Even that may not be enough for successful market entry, Trilogy says. "Significant additional financing" might be required to cover the costs of delays in initial customer shipments and unanticipated operating expenses. "If such financing became necessary and were not obtained, Trilogy Ltd. might not be able to continue its operation." The company plans to exchange 6.9 million common shares for the 11,000 outstanding investment units of Trilogy Computer Development Partners Ltd., a limited partnership that raised $55 million in late 1981. Additional investments, totaling $77 million, have come from Sperry Corp., Digital Equipment Corp., and CII-Honeywell Bull, the French company. And, this past fall, Trilogy registered to sell close to $100 million worth of stock.

IBM DISK OPERATION: The company has formed another independent business unit, this time to concentrate on designing and building low-end Winchester-type disk subsystems for the company's Systems/34, 36, and 38 business computers. Based in Rochester, Minn., where it will report to the firm's Systems Products division, the new unit is expected to work on 5¼-inch drives with capacities in the range of 30 to 50 megabytes. The products are expected to be ready for market by next year, industry observers suggest. IBM currently buys small hard disk drives for its P.C. from a trio of disk makers but apparently thinks it will require bigger volumes of disk drives than the oem industry can supply. The company has set up several independent business units in recent years, the most visibly successful one being the Entry Systems Division, which brought the P.C. and PCjr to market. The units are understood to be relatively free of IBM's notorious bureaucracy and are able to develop and market products in a much quicker fashion than would be possible through normal IBM product development channels. IBM declined to provide details of the disk products planned by the new unit. Nor would it say how many people are involved, but a Wall Street analyst, William Easterbrook of Kidder, Peabody & Co., estimated that some 1,500 people are working on disks at Rochester. That would seem to imply a rather large operation, one that would give independent disk suppliers a run for their money.

In any case, IBM's entrance to the small hard-disk market marks a further expansion of its already broad product line.

RESHUFFLING AT SPERRY: The Blue Bell, Pa., computer maker merged its Office Information Systems (OIS) and Communications & Terminals operations at the recommendation of a high-level task force. The new combined operation will be headed by Stuart J. Miller, who had been vice president of office information, and will operate as the OIS division, a company spokesman said. OIS previously had been a development group in Blue Bell, while the Communications & Terminals operation had manufactured and developed a variety of display terminals, communications processors, and small computers in Salt Lake City. The latter is to be headed by Mark M. Koschmann, vice president. The company said its intention in the merger was to enhance development of its Sperrylink office automation system, which was introduced in late 1982 but which has reportedly not lived up to initial marketing expectations.

TROUBLE AT ANACOMP: The Indianapolis software firm has been forced to lay off 200 employees, freeze salaries, and consider unloading several parts of its business. Having racked up losses of more than $23 million during the last two quarters of 1983, the company is struggling to complete the IBM version of its customer information system (CIS), an integrated banking information package originally designed for NCR machines. After several years of aggressively buying smaller software and services companies, Anacomp's mere mention of selling pieces of its business came as a significant change in corporate thinking. The most likely operations to be dropped are hardware distribution and services for small banks and credit unions, according to chief operating officer John Flanagan, who addressed stockholders about the changes. The company also revealed that it was unable to meet certain financial requirements dictated by a $45 million credit agreement signed with five banks. The banks have waived the requirements for now, according to a spokesman.

QIC LIVES ON: The 11-member companies of QIC (Quarter-Inch Cartridge Drive Compatibility), an ad hoc group developing standards for tape drives used primarily for disk backup, have decided to continue their efforts which, in 1983, saw development of the QIC-02 device interface and the QIC-24 recording format. Both specs are being considered as worldwide standards by the American National Standards Institute and the European Computer Manufacturers Association. For their new goals, the members chose development of standards proposals for a basic device level interface, to serve as an alternative to the QIC-02 intelligent interface, and new high capacity drives to meet the backup needs of disk drives in the 100-megabyte to 500-megabyte range. ✲

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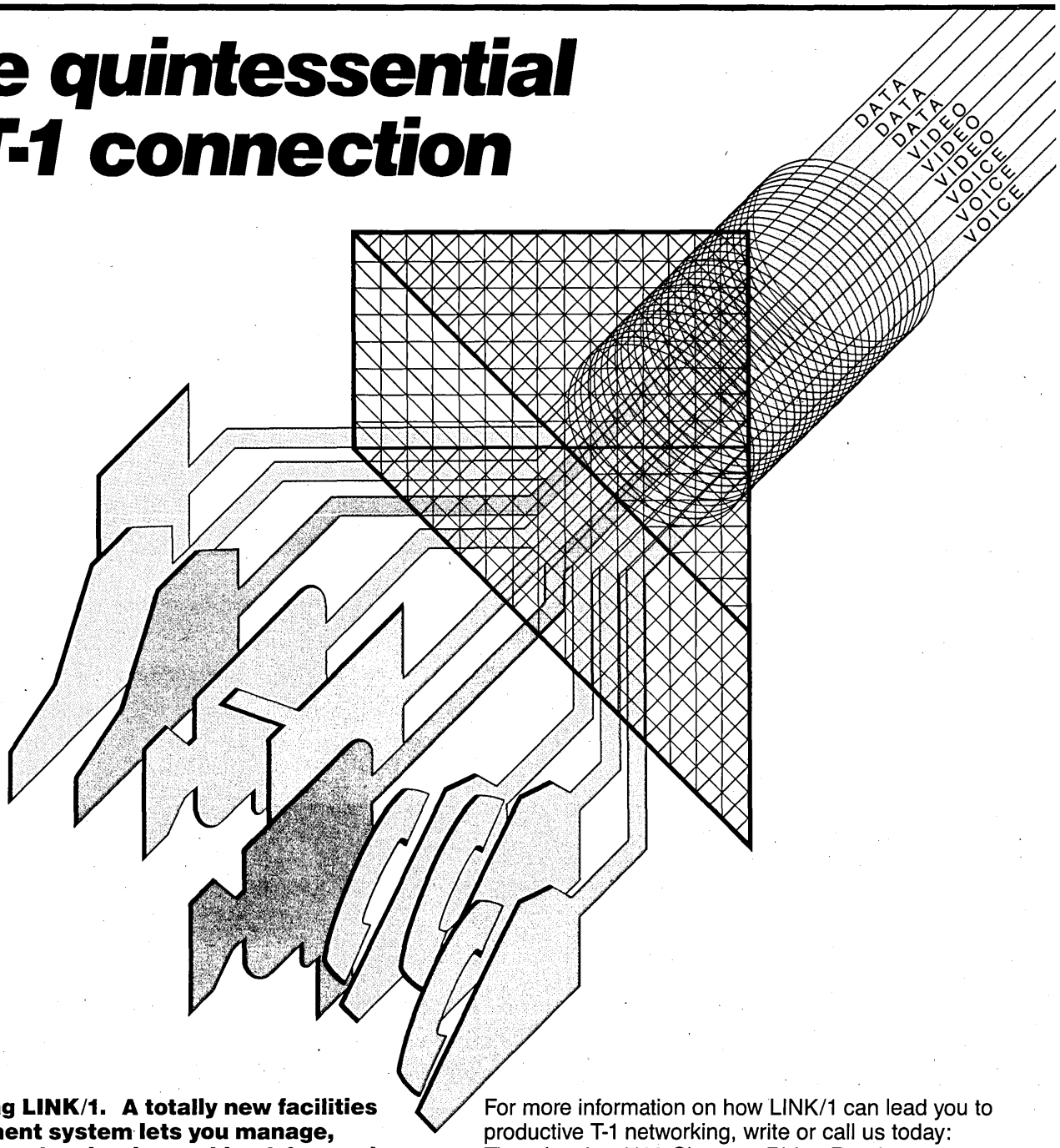

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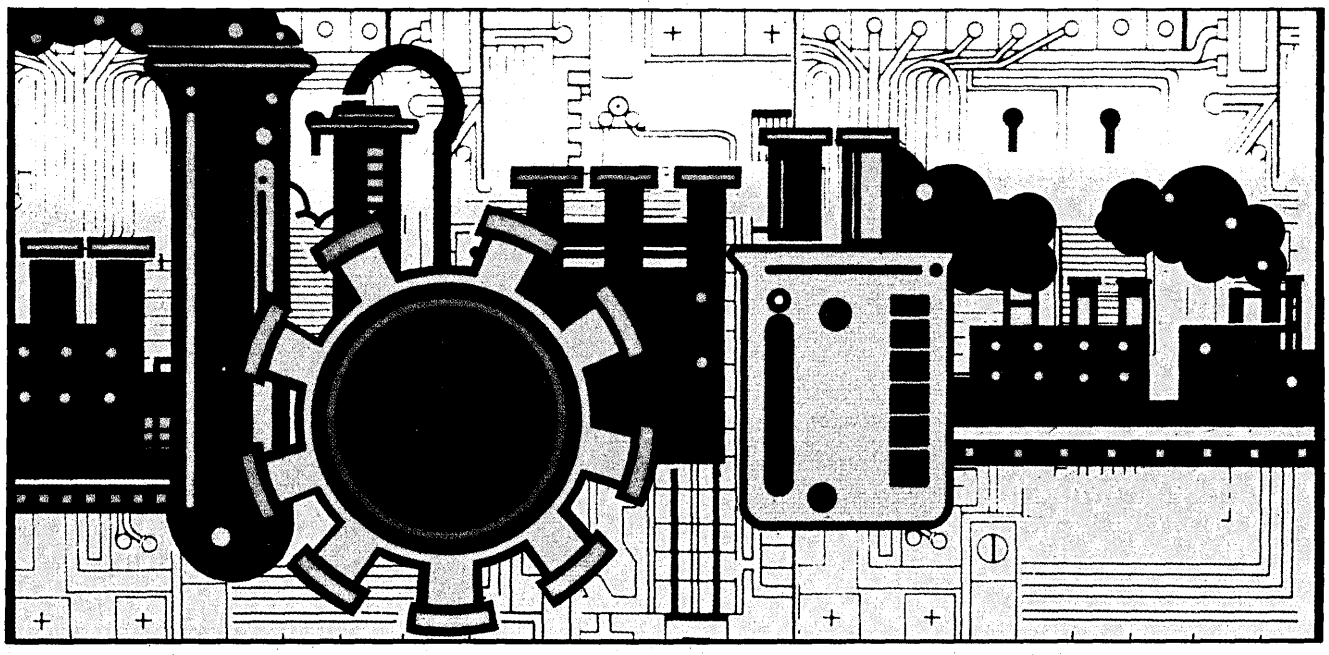
MANUFACTURING TECHNOLOGY:

A REPORT TO MANAGEMENT



Never before have so many manufacturers had so many ways to do things better. New technologies are revolutionizing manufacturing, from the ordering of raw materials to the shipping of finished products. For the most part, these methods of improving productivity are tied to computer technology.

Simple computers, now embodied in a single sliver of etched silicon, permit robots to take over dangerous or repetitive jobs, and, more importantly, to do things no human ever could. Larger computers are being used to automate drafting and to translate the sketches of designers into detailed manufacturing information. And giant mainframe computers are helping management track materials, production work, and shipments.

Beyond the capabilities of individual factory machines or stand-alone computer systems are networks of terminals and workstations, sharing facts about the way things are going in a plant or even an entire company. This is called computer-integrated manufacturing, or CIM. And it means unprecedented control for management. As airlines can call up the availability of aircraft, the number of seats in various classes on a given plane, even the special meal requirements of a vegetarian visiting from the Far East, so, too, can CIM company management track work that is planned or in process down to the tiniest detail.

It can be overwhelming. And in reaction to the current availability of a huge number of productivity dream machines, many companies are taking what they euphemistically call the "long view." In other words, they are doing very little to bring the new technologies to bear on their manufacturing problems.

"The issue," says James Baker, a vice president of General Electric, "boils down to whether American manufacturing will be able to survive the combination of cheap labor and sophisticated manufacturing technology that faces us . . . not just from Japan, but from places like Korea, Brazil, Malaysia, Taiwan, and scores of other nations."

The threat of increased competition, in Baker's view, has not sunk in. And it is the foundation of our economy, the mature basic industries, that will suffer the consequences.

"The annual reports and company magazines are full of exotic pictures of chips and wafers and people wearing white bunny suits and hair nets," Baker points out. "But when you walk into the same companies' factories, you're likely to see the same old grungy, inefficient processes, the bottlenecks, the poor quality, and the waste. Apparently this goddess of electronics we worship belongs on a pedestal where there's no danger of getting grease on her skirt from our factory floors."

Baker, in case you've missed the message, is not impressed by managers' talking about technology. He does not think manufacturing technology is an option, or something for the labs today and the factories tomorrow. He thinks manufacturing technology is imperative. And that it must be used now.

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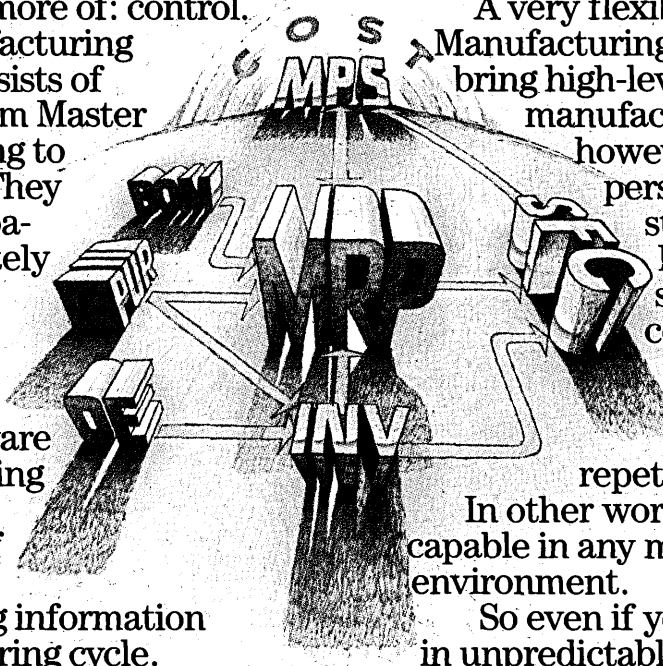

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that on a two-shift basis over a five-year period it can perform at an average of four dollars an hour . . . about a third the cost of a very bored human.

"There is no escape. GE, too, has moved plants to Singapore and Taiwan for lower labor costs. Now we find that we have to automate *them* as well, for product quality as well as labor savings. We may even move them back here as our assembly automation tips the scales away from labor cost advantages."

Baker makes a very strong case, and for companies that have not yet studied manufacturing technology, his words are right on target. But research data shows that some American companies have already gotten the message. The markets for computer-based design equipment, robots, and other automation devices are poised for an explosion. In addition, an increasing number of large manufacturing companies are putting their data processing systems to work on behalf of their factory managers through the use of programs for manufacturing resource planning; the second generation of such programs is known collectively as MRP II.

According to Predicasts, the Cleveland market research house, American manufacturers spent $1.9 billion on automated machine tools and controllers in 1967, and $3.9 billion on such equipment in 1982. They will spend $7.9 billion in 1987 and more than $18 billion in 1995 on similar equipment. Robots, which were not even measurable on the American manufacturing scene in 1962, accounted for $190 million in expenditures in 1982. By 1987, American manufacturing companies will be spending $900 million a year on robots, and this will grow, say the researchers, to $4 billion a year by 1995. Automated design equipment, which accounted for $930 million in American capital equipment outlays last year, will represent a $2.8 billion investment by 1987, and a $9.8 billion annual expenditure by 1995. When general-purpose computers are included, the capital outlay for all factory automation 10 years from now will top $37 billion.

These figures, which indicate a willingness on the part of American manufacturers to modernize, say little about the distribution of high-tech equipment among various industries. As it turns out, some of the industry sectors with the greatest interest in automation are those connected with electronics and computing. It may be that executives in high-tech companies feel comfortable with automated equipment. But another factor is one they have in common with managers in other fields: competition is fierce, and their rivals, domestically and offshore, are automating their companies, too.

Managers are learning to characterize manufacturing technology by its primary function. While the services provided by computer-based systems overlap to a degree, and, in the long run, will be interconnected, today's systems are usually aimed at solving one class of problem.

One problem that plagues manufacturing companies is the inefficiency of purchasing, job movement, and resource allocation. The problems associated with keeping production rolling, and matching it with raw materials intake, factory orders, and shipping, are handled by programs for manufacturing resource planning that run on various kinds of computers. IBM's mainframes are the most popular machines to use with these programs, now in their second generation and called MRP II systems. But programs for a wide variety of computers, in every price range, that allow top managers, middle managers, foremen, purchasing agents, and shipping clerks to get a snapshot of factory conditions on a crt screen are also available.

Problems caused by poor scheduling are easy to spot, but not so easy to solve. George P. Peterson, an executive of an Air Force lab whose mission is to help the service's suppliers become more effective, admits that "productivity statistics for much of the aerospace manufacturing in this country, as well as basic industrial manufacturing, are not very good. We lag too far behind similar industries in other countries."

His group, in an unpublished report, notes that America's "most efficient machine centers . . . have multi-million dollar equipment actually deburring metal only 24% of the time. . . . Factories in Germany and Japan, on the other hand, have been reported to keep the same type of machinery in operation 60% or 70% of the time."

The situation in other industries is often the same. But at companies that have computers tuned to schedule production, monitor inventories, and provide assistance to managers at all levels, the utilization rate of machines is up, the amount of capital tied up in inventory and partially completed assembly is down, and the pace of work for everyone on the payroll is steady.

In some industries, production problems loom largest. But in others, the biggest snags come when products have to be designed or modified. Every industry has its own peculiar bottlenecks. Producers of consumer items, from stereos to refrigerators, must develop products that conform to changing styles as well as to the characteristics of new materials. When the salient characteristics of one component in an appliance change—the shape of a fan motor in a clothes dryer, for instance—everything from mounting hardware to cabinet geometry may have to be modified. In the auto business, style is only part of the story. Safety regulations, the availability of new materials, and the development of whole new lines of vehicles to meet new market needs require a process of rethinking components. Automated systems enable successful components, from transmissions to door hinges, to be preserved as designs change, while at the same time allowing improved versions of the same components to be designed into existing products with minimal disruption.

Daniel S. Raker, who heads Design and Systems Research, a Cambridge, Mass. consulting company, believes automated design systems are already well accepted. "I was six years old and playing with an Etch-a-Sketch when Ivan Sutherland developed the first Sketch Pad design system. Now, a couple of decades later, computer-assisted design and manufacturing is becoming the mainstay in manufacturing, if not a necessity to remaining in the marketplace."

A company cannot compete if its adversaries have the technology to translate product improvements to production items several times faster. Nor can a company idle its factories to implement a production change, whether mandated by market considerations or other forces, because engineers are unable to quickly bring their revisions to production departments.

Computer-aided design systems permit engineers to sketch pictures of mechanical assemblies and match them with existing or planned parts that connect to them. Plans and their revisions can be stored in a computer and called up at will. As both vendors and users of these machines grow more sophisticated, design systems will be integrated into other automated facilities in a factory.

Forward-looking manufacturers are making the most of automated design systems by linking them to computer-driven machines on factory floors. High-tech production equipment, which descended from numerical control gear, can now control complex milling and grinding, as well as high-speed stamping and drilling.

In addition, the use of design systems linked to electronic file systems permits an engineer to specify parts and instantly determine if those parts are currently used in production. If the specified parts are not in inventory, similar parts may be, which simplifies the task of a purchasing department and minimizes inventories. Further, engineers who are reluctant to change product designs just because one component has changed can review an entire design to see if one cost-saving revision can lead to others.

Robots are the most impressive machines in the automated factory. These tireless mechanical servants have captured the imagination of people for decades. Real robots are placed on factory floors and move

arms that bear little resemblance to human appendages. But their work has a miraculous quality.

Today, the auto industry is the biggest user of robots. But as robots get better and cheaper, and as alternative assembly methods become more expensive, other types of companies will look to robots.

Japan's Nissan has set up a plant in Tennessee that will serve as an example for automation in both its own industry and in others. Nissan's robots help in a high-precision job involving potentially dangerous materials, working with other automated machinery. There are 38 painting robots in Nissan's plant on two separate assembly lines; they are located in spray booths where they apply a prime coat of paint to hard-to-reach places. Then, an electrostatic atomizer (made by a German manufacturer, Behr) applies paint to the broad area of the truck with the guidance of a laser beam.

"The robots give us a consistent covering in deep recesses," notes plant manager Emil Hassan, "but they would not be efficient if we used them over the total truck area. We've brought in the atomizer, and by using both automated processes the painting operation is near perfect. It easily beats the work a human could do." Hassan adds that once the robot is correctly programmed, it will operate tirelessly until its plug is pulled.

Rick Sommer, manager of Nissan's body, frame, and stamping plant, has had similar results. Sommer's plant is considered the most automated of the three Nissan plants under one roof at the Smyrna, Tenn. facility.

In addition to the 179 different robots in Sommer's plant, there is a mechanical floor conveyer system called a "towveyer," which routes stamped parts in dollies to different shop areas.

In the body shop, there are 124 different resistance welding robots on a series of assembly lines. Sommer explains that there are three main robot manufacturers who supply welding robots to his division. Nissan and Kawasaki Unimate robots are used for spot welding, while a third Japanese supplier, OTC Osaka, supplies frame welding robots. Recently, three GM-Fanuc robots were added for door and hood sealing operations.

"Robots give you more flexibility than conventional automation," says Sommer. "You can reprogram a robot to do any number of tasks, but other equipment is more stationary. So you are really reusing your investment for other purposes." From March through October of last year, the welding robots worked on over 9,000 trucks, free from any long downtime.

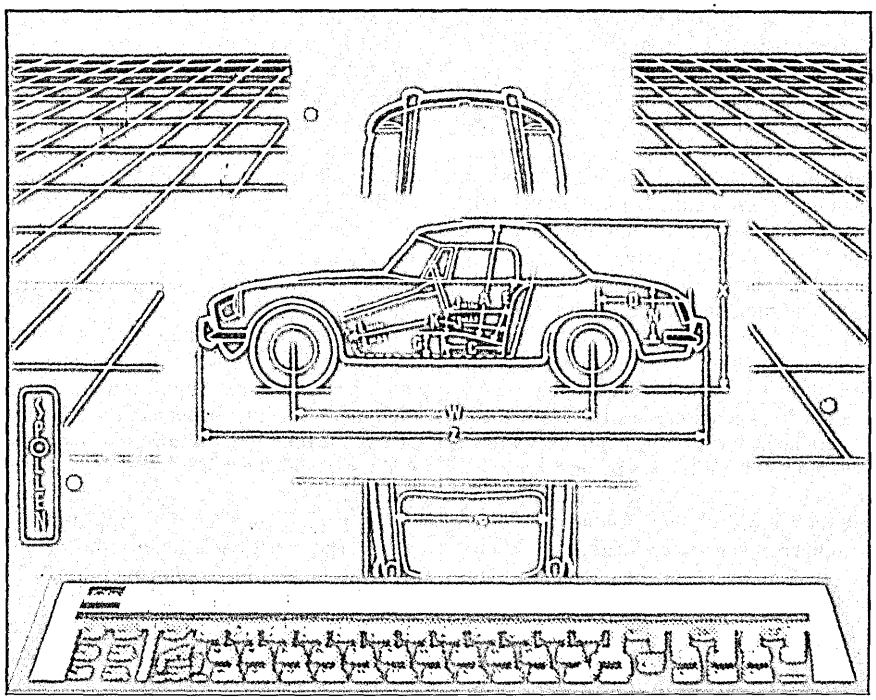
"If we were to assemble the trucks manually, we could probably build more and we might not spend as much money in the short run," says Sommer. "But in the long run, it is the robot that gives you the better quality product."

Pete Walser, Nissan's automation supervisor, agrees. "A man will weld faster, but not as well. What happens sometime later down the road? A customer opens the door and flinches at a long creaky squeak. You know that squeak came from the human operator. Robot welds are usually within one millimeter of tolerance, one hundred percent of the time. And that means the customer is satisfied."

Some of the robots at the Nissan facility are American; many are from Japan. But the workforce is American, proud of it, and happy to be part of a high-tech truck-building operation; they're not worried about job security.

The end result of well-planned automation is a fully-integrated factory. Data from design computers is used to train robots and to program automated manufacturing machinery. Parts required by engineers are ordered and kept in appropriate quantities by an inventory system. Work flow is monitored from computer terminals at workstations, and can be changed, as necessary, to accommodate retooling, maintenance, and unexpected shifts in orders.

Running a tight ship is the goal of every factory manager. Computers make that task easier. The time to move is now, when profits are picking up, when employees are less afraid of layoffs, and when the economies of some of America's competitors on world markets are less able to support modernization. America can regain its edge if management is willing to make the effort. There's no easy way to turn around aging plants, but for those companies willing to invest in high-technology, education, and training, the rewards are now greater than the risks. ●



CAD/CAM: FROM CONCEPT TO CREATION

A pair of high-tech management tools is overturning traditional methods of product engineering and production. They are called computer-aided design (CAD) and computer-aided manufacturing (CAM). CAD includes computer-powered drafting and design; CAM includes automated machine tools and systems that coordinate them. They both speed the development of new products and streamline their fabrication.

Currently, these independent systems are being linked to larger systems that take manufacturers from design sketches to actual production with a minimum of effort. Even the name for this technology is changing; it's now called CAD/CAM, and it is a

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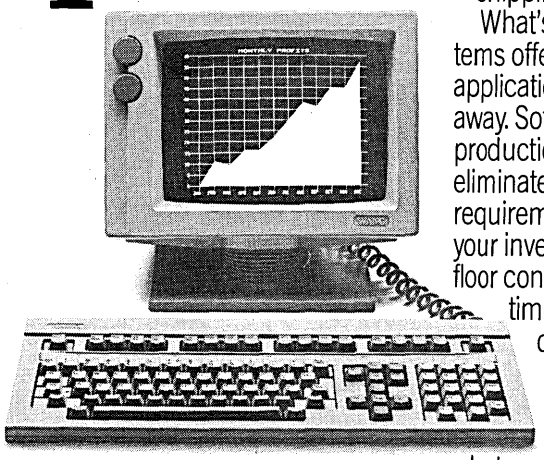

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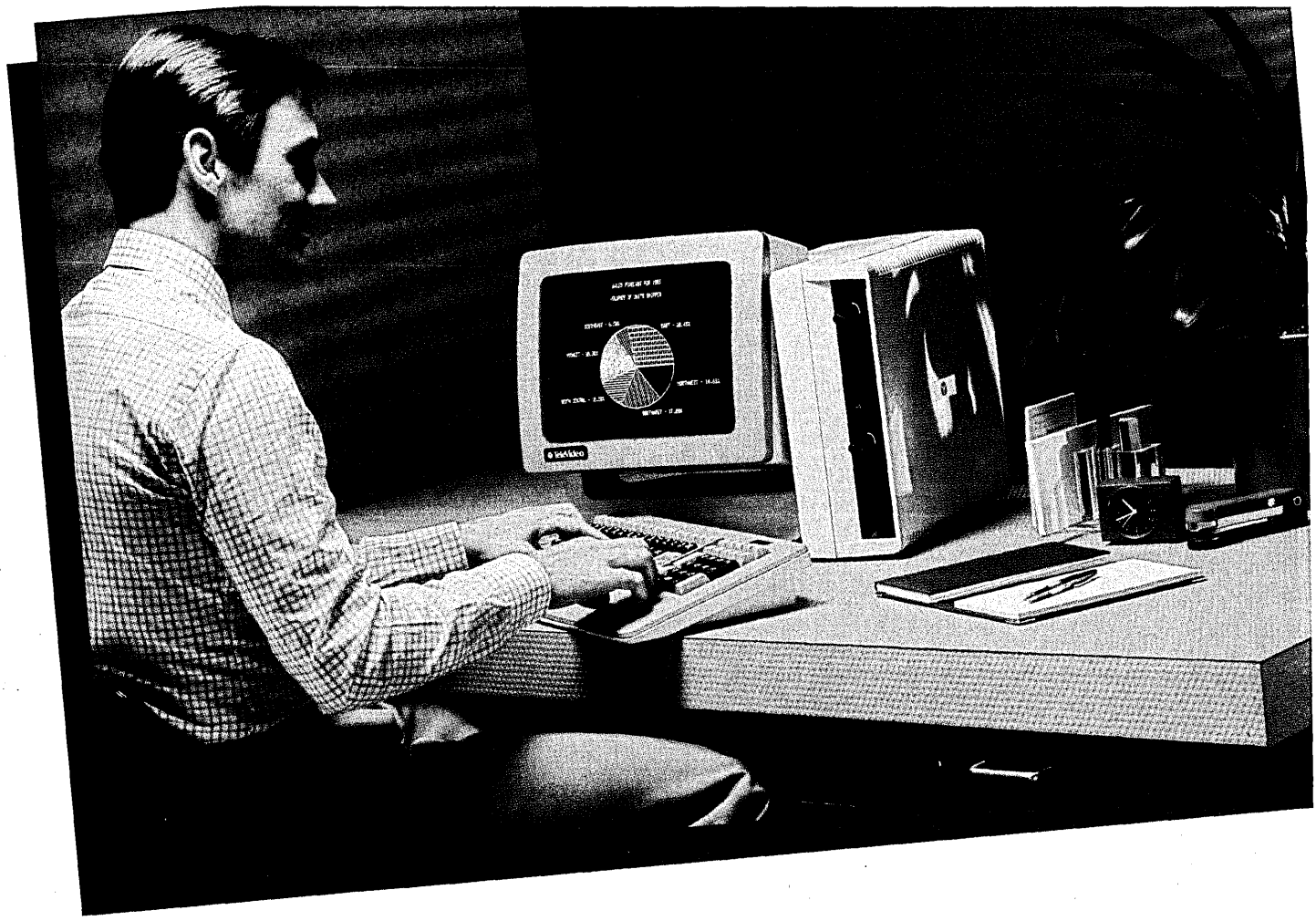

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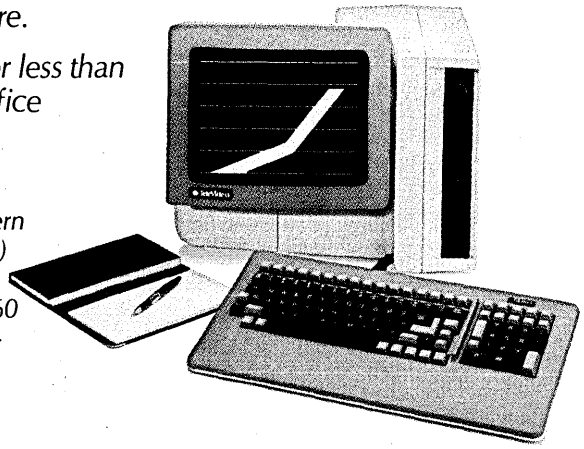

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one-two punch that can knock out the high costs associated with job shop manufacturing and beat down the overhead associated with high-precision production.

CAD and CAM systems exist both independently and in integrated manufacturing systems. CAD is to design what word processing is to typing. Independent CAD systems automate design work, reduce design time, perform drafting and drafting revisions, store key specifications and, in some cases, even allow engineering departments to simulate the motion of a mechanism's parts. Most CAD systems employ special terminals equipped with high-resolution screens capable of displaying intricate graphics, often in color. These terminals feature other special devices, including plotters, light pens, "mouse" pointing devices, and touch-sensitive pads, that allow an engineer or designer to "talk" to the computer. While many CAD systems are based on large, expensive mainframe computers, the newer breed of CAD machines use small, relatively inexpensive microcomputers. The most powerful desktop CAD workstations rival the power of minicomputers.

CAM systems, fewer in number than CAD machines, take numerical data produced by CAD, and put it in a form that can be used by manufacturing departments. CAM is the electronic embodiment of a pro-

CAD/CAM at General Electric

"Double up on the current. Let's see if it can take it."

The circuit breaker shuddered and then . . . snap! The trip bar had shattered. High voltage was arcing all over the place.

"Let's roll it back to the trip point, fellas. Thicken up on that pivot, and run it again."

The three engineers gathered around the screen at General Electric's Plainville, Conn., plant were running a simulated circuit breaker through its paces on an Evans & Sutherland interactive design terminal. Because many of its engineering experiments take place within the confines of a computer, design changes and product testing take place on the spot. The results of experiments, stored in the computer's memory, can be replayed again and again, until the engineers are satisfied with their work.

Engineers at GE's Plainville plant have used CAD/CAM since the late 1970s. Initially, computers were used for laying out wiring diagrams. Since 1981, GE has used CAD/CAM for mechanical analysis as well. The plant's main products are home and industrial circuit breakers, the switches that automatically interrupt electric current during power surges. CAD/CAM helps GE to design, analyze, and build these circuit breakers more reliably and quickly.

"We weren't looking to drastically alter our circuit breaker designs," says Hank Owen, the plant's manager of engineering systems and services, "but we were interested in analyzing the stresses within the units. Another important factor was production time—how we could design and manufacture a breaker product with a minimum of delay."

Time savings have proved to be CAD/CAM's greatest benefit. Owen says the plant has experienced a 60% rise in productivity. The company has found other benefits, too. For instance, the clarity of drawings has been improved. Instead of low-level draftsmen rendering designs, high-level designers have assumed the responsibility for drawing on terminals storing images in a database.

That shared database, which links engineering with manufacturing, has changed the whole process of prototype production. "It used to take seven to eight weeks for our people to manufacture a prototype; there were numerous changes which sometimes meant that the prototype was cut here, and pasted there," recalls Owen. "But now with our Calma machine, we can design that same prototype within a week's time. And then we generate an NC tape which will run for maybe an hour until we get our finished prototype."

These significant time savings require a commitment to CAD/CAM, which GE management made. According to Judith Baar, manager of the plant's computer graphics facility, "We have two separate Calma interactive graphics systems. Each has its own computer (one a Data General Eclipse S-230, the other an Eclipse S-140) and four graphics workstations, one programming terminal, a tape unit, and dual disk drives with three hundred megabytes of capacity each."

In addition, an Applicon system is used for the design of wiring harnesses and diagrams. It's tied to a Digital PDP-11/34, four workstations, and dual disk drives, each with 200 megabytes of capacity.

"It might seem to some people that we have a lot of memory," says Owen, "but many of our files are large, in the two million character range. It's not uncommon for our files to be that big because we have a lot of model detail work."

For detail work, the company has an Evans and Sutherland PS-300 system with one terminal. The PS-300 has a dynamic motion simulator. Engineers key in design information and simulate an abnormal current tripping a newly designed breaker. This tells the engineers and designers about the degree of stresses applied in various parts of the mechanism as it works. The Evans and Sutherland system is used mainly as a standalone system, but it can be linked to the plant's DEC VAX-11/780.

Increasingly, GE is linking CAD with CAM. Its CAD/CAM center produces mold designs and die designs for manufacturing and it does the NC tape programming for prototyping and manufacturing. Also, the center is expected to be the first GE shop using programmed NC tapes to control automatic component insertion equipment used in the production of printed circuit boards.

Owen says GE's CAD/CAM venture required special in-house training. Several managers were sent to vendors, like Calma, for orientation, but the bulk of the training was done at GE. Because of tight production schedules, some GE training occurs at odd hours.

"We held classes at 4 a.m.," says Owen, "because that's when the terminals were open. They were four-hour classes, until 8 a.m., when the normal shift began. They were voluntary. That's because the program wasn't meant to be shoved down anyone's throat.

"Well, the class was so successful that we actually turned people away at 4 a.m. because we didn't have enough terminals for everyone." ●

THE CALMA DUAL-CRT WORKSTATION allows GE employees to view both the circuit breaker design and its specs at the same time.

duction technician, and more. It includes a wide range of specialized systems, from automated machine tools to shop floor control systems.

When CAD and CAM are integrated, they can share a database of files containing engineering specifications, part and subassembly numbers, and instructions that enable specifications to be turned into directions for specialized tools.

The CAD/CAM database is the key element in integrated manufacturing systems. Many industrial consultants say CAD/CAM—using all the bells and whistles—can reduce product design time to a third of that normally required. In isolated instances, CAD/CAM has reduced design time by a factor of 20. CAD/CAM really pays off when engineering modifications are made. New drawings, machine tool instructions, and parts breakdowns can be developed, much the way revised contracts are produced on word processing systems. In manufacturing, faster reflexes mean bigger profits.

"The most important aspect of CAD/CAM," says Hank Owen, an engineering manager at General Electric, "is that you can design and manufacture a product months before your competition gets a handle on the project. If you can get that product to the market well before your competitor, you own that market."

One way that CAD saves time is by eliminating the need to redraw a product design. When an engineer wants to modify an earlier design, instead of redrawing the original, he retrieves it from the CAD system's database and makes his changes.

By itself, CAD is only half the story. "The benefits are in the integration," says Jim Brimson, a Price Waterhouse consultant. "If you try to justify CAD all by itself you may not be able to do it; CAD with the CAM systems, well, then you will have a total information system to shoot for. And that's where you will get the benefits."

Because the integration of CAD/CAM reduces work in process (WIP), it also results in significant cost savings. Fully featured CAD/CAM reduces WIP by specifying which parts are needed to make or assemble a product, as well as when the parts are needed. It creates a parts schedule. In many manufacturing operations that are without CAD, inventory is tied up, perhaps half assembled, waiting to be finished; other inventory is slowed up in transit from work area to work area.

According to John Maddox, president of Factory Automation Inc., and a CAD/CAM consultant, "If you are using CAD/CAM correctly, then your objective should be to go after some form of continuous production where you are producing a sufficient flow to meet your demands, but no more."

This can be done by centralizing machinery into work centers, also called work cells, which produce an entire product without having to transfer it from department to department. For instance, one particular work cell may include a drill press for milling, a lathe for routing, several robots, and a painting machine.

In a CAD/CAM operation, the design and manufacture of a product is controlled by a computer. When an engineer designs a project on a video screen, the computer helps fill in point and figure calculations in either standard or metric systems. The computer then stores the design, or, if it is finished, sends it to a computer-driven production machine, such as an automated drill press, where the prototype is produced. Meanwhile, the design data is stored in the database, so the computer—which knows about raw materials as well as purchased parts—can create bills of materials, purchase orders and inventory reports, and any other information necessary to keep management up to date.

While in theory CAD and CAM ought to be used together, in practice, half the CAD/CAM equation is usually missing. "There is no CAM at most sites," says Thomas Kurlak, a market analyst with Merrill Lynch. John Maddox, the Texas CAD/

CAM consultant, agrees: "I would suggest that 85% to 90% of the work that has been done in the area of CAD/CAM is really CAD. None of the CAD/CAM companies have done much work on the manufacturing side, and that is because CAM is a helluva difficult task to get hold of."

Those system problems are already being identified. CAD/CAM analysts believe group technology (GT) is the missing link in the total integration of CAD and CAM. GT is the classification of a product part according to shape, size, function, and other parameters. When a part is designed, it is given a code number. Since all parts are included in the database, when a designer needs a part for a new product, he searches the database that meets the requirements of the new product. A computer can suggest appropriate parts that have already been produced or designed and coded in a standard form.

"Our experience," says John Maddox, "is that between 20% and 30% of a company's engineering database time is spent duplicating items that already exist. GT eliminates reinventing things if something similar has been previously designed."

CAD/CAM pays off handsomely when you must produce three-dimensional models, or otherwise automate drafting. Using simple commands, a designer can create solid, three-dimensional models of products or parts. Once the designer has created a model, he can view the object from different angles, explode it, or create a cross-section. Other functions available to the designer include analysis of properties that include mass, weight, moment of inertia, and radius of gyration.

With CAD/CAM, line drawings can be automatically generated. And as the designer calculates measurements, he can instruct the computer to place the results of the calculations right in the drawing.

Data can be shared between geometric modeling and drafting. After the design process, a CAD/CAM system may compute stresses and displacements in moving parts; these can be displayed on a screen.

In addition, CAD/CAM can use design data in the production of numerical control tapes. The tapes can be fed into a machine that mills out a prototype on a drill press.

"CAD/CAM systems speak a language that generates tapes automatically," says Alan Christman, general manager of manufacturing industry marketing for Control Data Corporation.

Before a company invests in CAD/CAM, consultants suggest, its senior managers should determine if CAD/CAM will solve key problems and save money. But for managers in some companies, the question isn't one of a worthwhile investment, says Robert Schmidt, a consultant with Price Waterhouse. "It's a 'me too' issue for many companies," he explains. "If your competitor has CAD/CAM, then no doubt you will have to invest in it yourself to keep pace."

Smart companies look at their expenses when deciding if CAD/CAM is worthwhile. How complex is the design of various products? How often must engineering changes be made? What is the total cost of engineering?

"Take a body count," explains Carl Machover, a New York CAD/CAM consultant. "It usually works out that if a company has 20,000 man-hours of drafting per year (that's about 10 full-time draftspeople), it can afford a large automated drafting system. In about 10 years, they'd probably be working with a full-scale CAD/CAM system."

Machover adds that when managers evaluate a CAD/CAM installation, they are often biased. "The usual issue for managers is that they are asked to justify a half million dollar system; usually they do so in terms of return on investment. In most companies the only dollars they can identify are the hard dollars—the actual cost. And in doing so, they can identify how long it will

take for a return on investment. But the problem lies with intangibles, and with CAD/CAM there are many. If I start talking about reducing errors, improving tooling, and improving my competitive position, well, there's no way to assign a dollar value that will satisfy accounting."

Nor can other departments be ignored. Once top management commits a company to CAD/CAM, all levels of management must then assume special responsibilities. "You're really talking about a whole new operational structure of management," says John Maddox.

And a different structure it is. Instead of buying a manufacturing system that is run mainly by middle managers, CAD/CAM requires more interaction by top-level managers, and more interaction between departments in addition to engineering and manufacturing. High-level managers have special responsibilities. They use the information provided by CAD/CAM (the bill of material data, or factory floor schedules, for example) to make planning decisions. High-level managers should be prepared to restructure traditional company lines in order to implement CAD/CAM.

"You have to break down the interdepartmental rivalries," notes Dan Raker, president of Design and System Research, a CAD/CAM consulting firm, "and you have to get engineers and manufacturing people to cooperate."

Top managers must also realize that CAD/CAM is primarily a way to increase productivity, and not simply a way to replace people. And, consultants insist, top managers should inform their employees that increasing everybody's productivity—and not eliminating their jobs—is the reason why CAD/CAM is being implemented.

Middle-level managers, on the other hand, have their own responsibilities when CAD/CAM is implemented. Middle managers are typically responsible for the daily operation of the CAD/CAM system. That means they must first train employees. Then they must make sure that their older workers are not traumatized by the drastic changes in the way work is performed.

Middle managers must also make sure the goals they set are realistic. Task groups often propose CAD/CAM programs with optimistic figures. Upper management, on the basis of those inflated figures, will expect too much from a CAD/CAM system. When the work force gets wind of the padded figures, it will balk. Any program that meets employee resistance won't run efficiently; it may not run at all.

The cost of a CAD/CAM sytem varies from shop to shop, and for good reason. A small company that uses two intelligent workstations for design will spend much less than a decentralized corporation that uses four mainframes and 25 workstations.

"You're looking at a typical installation that will most likely cost you $400,000 that pays for a four or five workstation setup with a good deal of capacity," says Tom Kurlak of Merrill Lynch. "On the other hand, you can spend as little as $25,000 for a standalone workstation. But you are getting a different solution."

Generally, to calculate the hardware costs of CAD/CAM, you have to choose from three options—mainframe-based systems, minicomputer-based systems, and intelligent standalone systems.

A mainframe-based CAD/CAM system is the right one if a company runs more than 20 workstations. There will be less interference caused by peak loads. But there are drawbacks to using a mainframe CAD/CAM system. If the mainframe goes down, then the whole CAD/CAM system goes down; work comes to a standstill. Second, since few large mainframes are turnkey systems, no one company has taken the responsibility of installing a complete system and accepting all the maintenance responsibility.

The initial cost of installing a mainframe computer is high. Mainframe prices start at about $600,000, and can reach into the millions of dollars. The cost of a typical workstation is about $20,000. But once a company's CAD/CAM program expands beyond 20 workstations, the mainframe approach tends to be the least expensive; the incremental cost of additional workstations is lower than that of additional standalone systems.

CAD/CAM systems run on a minicomputer or supermini, such as a Digital Equipment VAX-11/780, or a similarly-powered machine from Data General, Hewlett-Packard, or Prime. A computer in this class can be incorporated in a turnkey system. Sub-mainframe systems require less participation from the corporate MIS department; engineering groups therefore have more control over their systems. The typical cost of a single-user supermini CAD/CAM set-up is about $300,000, while a typical four-workstation system costs about $500,000. When you need to support six to 20 workstations, you will find that a supermini is likely to be the best value. Consultants say that with the newer 32-bit machines, a company can run an 8-to-10 workstation configuration and expect good response time.

A final hardware alternative is to install a small standalone system. Its main advantage is lower initial cost; the typical price is about $100,000 for a complete workstation with storage. Because it runs in standalone mode, a failure in one workstation will not disturb other stations. A less expensive single-user system is an attractive alternative for a company just getting started with CAD/CAM. Once a company expands its installation beyond six workstations, the total cost will exceed that of multi-terminal machines.

You don't have to buy a CAD/CAM system of your own; you can use CAD/CAM programs on a timesharing service. If you do buy a system, you can purchase one ready to go—a turnkey system—or have one built to your specifications.

Timesharing is an easy and relatively inexpensive way to use CAD/CAM. There are two ways to share in a CAD/CAM application. In the first, the user contracts a general-purpose timesharing vendor with CAD/CAM software on his computer; in the second, he contracts a vendor with a turnkey CAD/CAM system. In either case, the user has access to the CAD/CAM software by way of a telecommunications network. The user pays only for computer resources used. Consultants agree that when a user's timesharing charges exceed $5,000 per month, the typical break-even point has been exceeded, and the company should consider an in-house CAD/CAM system.

Turnkey systems are the most popular way to implement CAD/CAM. Users deal with one vendor who supplies a complete ready-to-use system. A first-time CAD/CAM user generally must tailor the software a bit so that it matches the workload. Vendors will generally provide the hand-holding a user needs at this time. Most turnkey vendors provide maintenance for their hardware and software systems.

Using a custom system is very much like ordering a la carte; you take only what you want. Users can buy graphics terminals, plotters, digitizers, and software from one or more vendors who assemble the products into a package. Custom systems are expensive, but consultants say that with careful buying, a complete CAD/CAM system can be bought at a price below that of a comparable turnkey system. Offsetting these cost savings, however, is a measure of risk if no single vendor is responsible for the entire system. When a system goes down, there may be disputes over responsibility.

Writing your own CAD/CAM software is expensive. "Figure you will spend one dollar per line of software code," says CAD/CAM consultant Maddox, "and to get started you will need a half million lines just for a basic system. I would figure that within the first year alone, you'll spend a half million dollars just in writing software."

As a result, within the first year for typical startup of a mainframe CAD/CAM system, including workstations and software, a company could easily spend over $1 million. And there are additional costs as the program expands.

"It takes no talent to buy a CAD/CAM system," remarks Don Leake, manufacturing manager at Harris Graphics, which installed CAD/CAM in 1976, "but it does take talent to make it work." •

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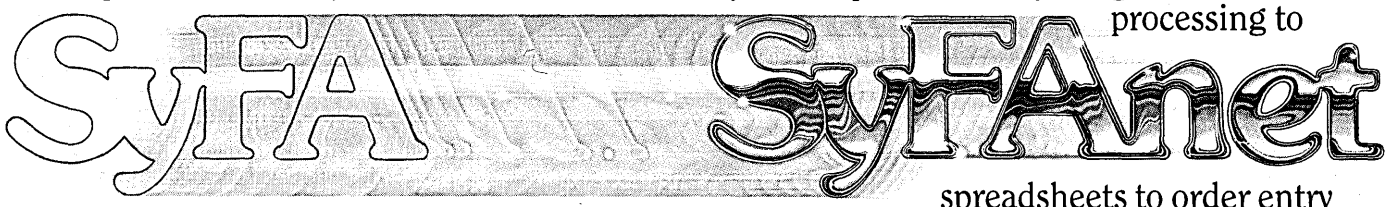

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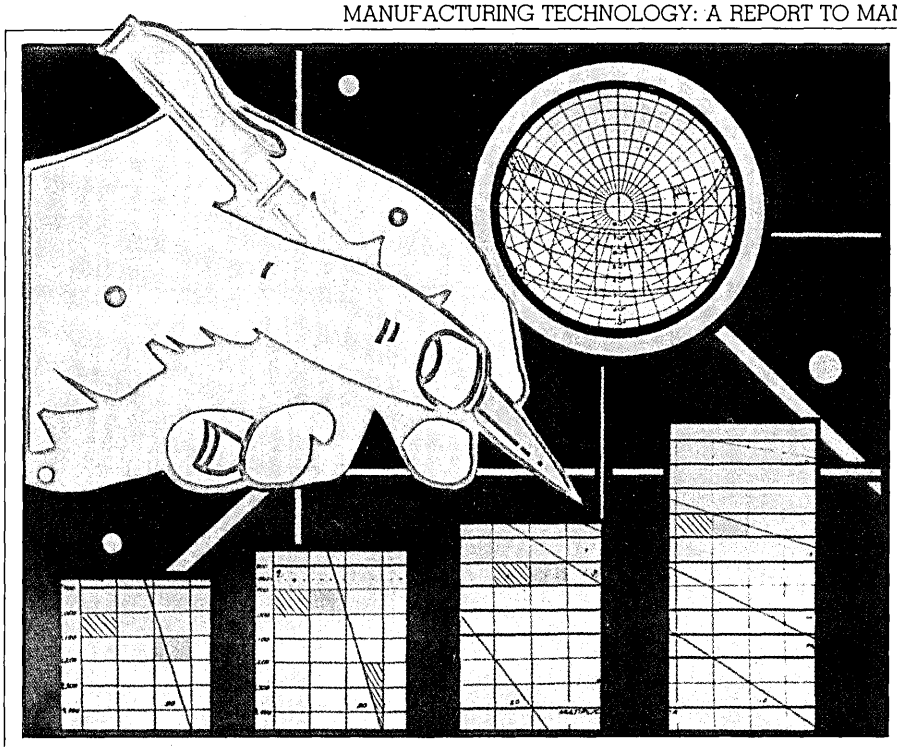

MRP II: A FRAMEWORK FOR FACTORY MANAGEMENT

Ask any senior foreman what it was like to work in a factory, say, 10 or 15 years ago, and he'd most likely tell you horror stories about parts shortages and panicky calls to suppliers for shipments long past due. He might tell you about jobs that went unfinished, buried in the stockroom, missing a part that may never arrive, perhaps because nobody remembered to order it. Or he may recall the embarrassment of shipping work several months late.

But talk to that factory foreman today and there's a good chance you'll hear a different story. Delivery has been on time for the past year. The pace of production has evened out; there's no longer an impossible end-of-month push. And seasonal peaks in demand are a lot easier to handle.

What brought about this abrupt change in so short a time? One thing, mainly—the current generation of computer systems used for manufacturing resource planning, generally called MRP II. MRP II is a way of managing manufacturing operations from loading dock to shipping dock. It uses stringent controls, planning aids and simulation techniques to create a framework for factory management. But MRP II affects more than manufacturing; it's also a way of working that impacts all corporate departments—engineering, finance, manufacturing and marketing—and links them, via computer, into a unified whole.

The test of any productivity improvement program is results. MRP II is a results-oriented approach, but the amount of productivity improvement it yields depends heavily on the extent to which management conscientiously runs it and users properly interpret the reports it produces.

If management uses MRP II correctly, it will produce improvements in almost every aspect of a manufacturing operation. Some benefits are considered typical—a user should get a one-fourth to one-third reduction in inventory, and consequent capital savings which free up money that allows management, if it desires, to reinvest in machines or tooling. Companies using MRP can expect more inventory turns each year. One manufacturing company had 2.3 inventory turns a year before it implemented MRP II. Now, with MRP, its inventory turns over nine times a year. Consistent, on-time customer delivery is another direct result of using MRP II, and that helps marketing establish credible lead times. One MRP user, the Steelcase company in Grand Rapids, Mich., went 116 weeks in its chair manufacturing plant without missing a delivery. And that was in a made-to-order plant with over 2,000 orders per week.

MRP is in part a planning system; it allows a manufacturer to purchase normally rather than expedite. Purchasing departments, freed from time-consuming expediting, typically experience a 5% savings in purchase costs. Chronic overtime, a result of erratic supply scheduling, can be eliminated or greatly reduced. The American Sterilizer Company, for example, cut its overtime by 50%.

By now, MRP II's effectiveness is well proven. Nonetheless, it may not be every company's solution to inventory or delivery woes. MRP II requires a substantial amount of money and attention from management, especially top management. Ultimately, MRP II demands undivided commitment. A system can stray off course if it's not closely watched, and it requires nearly perfect record accuracy. Given that kind of commitment, it can produce tremendous results. Efforts to install without a determined attitude will only end up producing heavy financial losses.

Perhaps the best description of MRP II is that offered by the late Oliver Wight, a pioneer in automated manufacturing management who was generally considered the guru of MRP. He described MRP II as an endless journey, one in which the traveler would never reach his destination. Instead, MRP II users steer a steady course, following the rules, and reaping benefits along the way.

MRP II grew out of the raw materials ordering techniques developed in the early 1970s. A decade ago, a typical manufacturer with a computer-based ordering system would calculate materials requirements each month and project them four months into the future. Each month, a newly projected month would be added to the forecast, but rarely did a user recalculate the first three months' projections, even if conditions had changed.

However, the quality of a production control system isn't determined by the way it works when everything goes as planned. Quite the contrary. A production system's strength comes from its ability to accommodate the unforeseen: an unexpected request from a customer, an engineering change, a missing part. A good MRP II system can reschedule production around the problem areas endemic to discrete manufacturing.

MRP II, properly implemented, allows changes in customer orders to be instantly distributed to every affected group in a plant. Engineering changes will be car-

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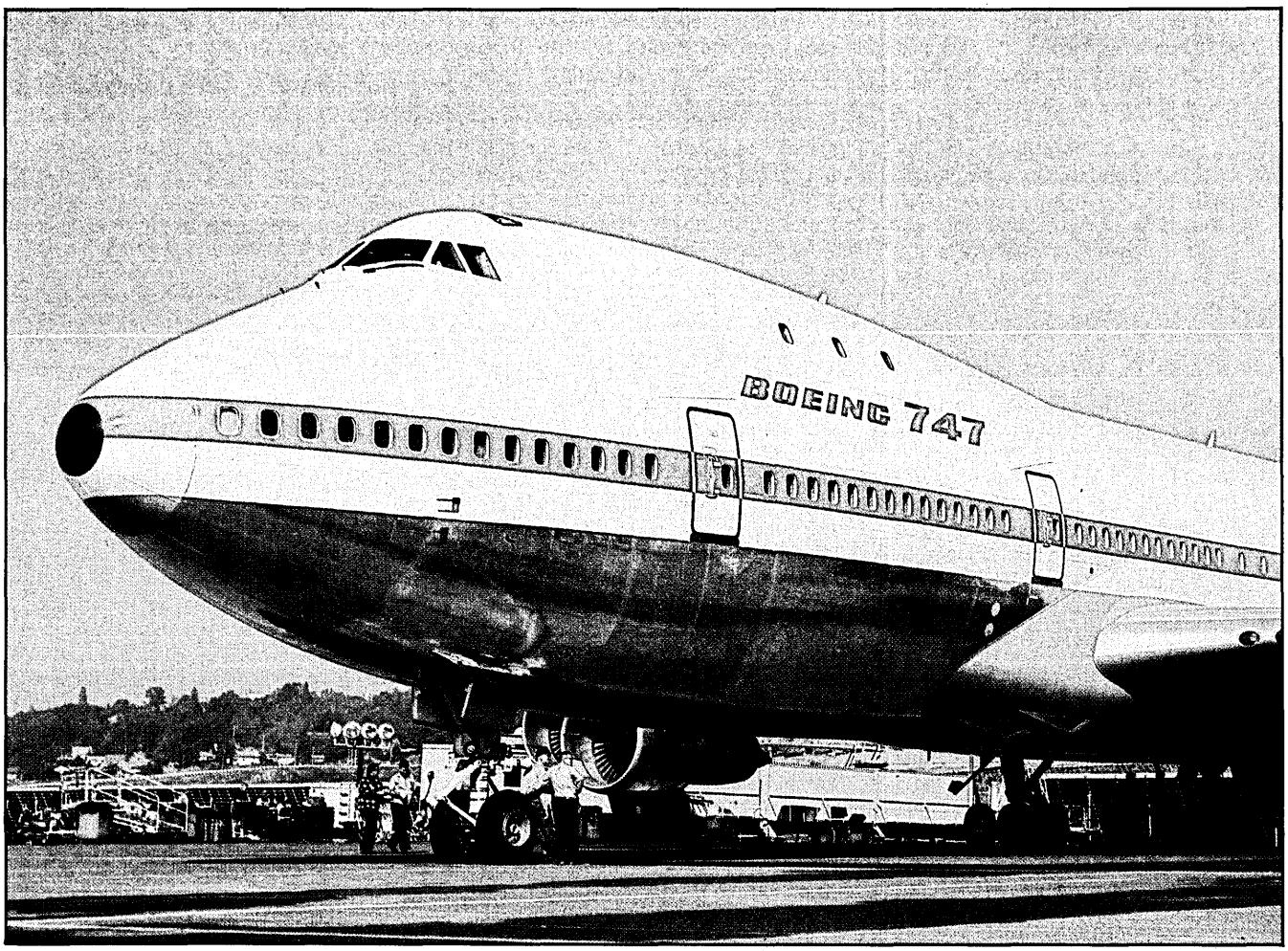

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MRP at Corning Glass Works

During the mid-1970s, executives at Corning Glass Works began hearing grumblings from two of its major retailers, Sears and K-Mart. The manufacturers' Corningware and Corelle dishware wasn't being delivered to customers on time. In fact, only 50% of the company's orders were shipped on schedule. Corning management began worrying that big retailers would discontinue carrying Corning products. As excuse followed excuse, with little improvement in performance, the grumblings were turning into growls.

Enter Epic (for Efficient Production and Inventory Control), the name Corning gave to the MRP II system it decided to use. They disguised its identity because, according to Daniel Hull, Corning's vice president of manufacturing, many employees didn't like the idea of using MRP. Some employees were so sure it would fail that they left the company rather than give Epic a chance.

The MRP II software that Corning chose has changed vendor hands several times. Originally, it was offered by a company called Arista, which sold the rights to Xerox, which then sold the rights to MSA. In any event, Corning now runs MSA's Manufacturing System on an IBM 3033 mainframe equipped with 16 megabytes of main memory, under the MVS operating system. A newer 3083 system, with 24 million bytes of main store, is coming in shortly. In addition, each Corning plant uses a minicomputer, most often a DEC VAX or IBM 8100 or 4300; they all communicate via a large SNA network, a de facto standard link developed by IBM.

Data storage is dispersed over three different disk drive systems. There are a total of 98 disk spindles used, 22 of them IBM 3330 drives, 60 IBM 3350s, and 16 IBM 3375s. The disk storage systems are being upgraded, too.

"You almost have to view the system as a timesharing service within Corning," says Hank Weiland, manager for corporate applications systems. He explains that Corning's computing facility includes communications, MRP systems, order processing systems, accounts payable and receivables, general ledger, and fixed assets.

Implementation of Epic began in 1979, when Corning had sales of $1.5 billion a year and a workforce of more than 30,000 in 61 plants around the world. Right from the beginning, MRP was introduced on a company-wide basis. It acted as a centralized scheduling system that tied many of the company's divisions into one system. And it allowed those divisions to communicate on a uniform basis.

Corning's management expected to achieve an $8 million to $10 million operating gain and a $30 million inventory reduction by 1982. But when that deadline arrived, Epic had produced only a $6 million gain and only a $20 million inventory reduction. Management was disappointed.

"Somehow, we were nowhere near our original projections," concedes manufacturing vice president David Hull, who confessed that Corning shelled out a million dollars a year for four years to get the program on track. Half of that expense was for the salaries of full-time project leaders, inventory accuracy clerks, and systems analysts. The software and the data processing support staff absorbed 35% of the MRP budget. Another 10% was spent on training. Hull says very few hardware purchases were made because Corning already had an installed base of IBM and DEC equipment.

One reason costs were in excess of budget, Hull believes, was the way Corning attempted to handle its implementation. Because the company was "cash-rich" when the project began, individual plants were not held responsible for the job.

"We felt at first that it would take eighteen months to two years for a successful Epic implementation," Hull explains. "However, our plant managers' interests were centered on gross margin improvements from year to year. They were reluctant to spend a lot of time and money on something that would show results further down the road."

So, Epic implementation was paid for by the parent corporation. That didn't mean the subsidized plants went unchecked; Corning had a 22-page self-rating questionnaire used in plant evaluations.

Nevertheless, the implementation ended up as a Catch-22 situation. Corning's goal was to reduce inventories and improve on-time delivery. Plant managers, reacting to the change, grew afraid that moving from the informal system to the Epic system would create problems. So, they called for and got increased inventories. In early 1983, Corning ran into a cash crunch and eliminated plant subsidies; ironically, that's when things got straightened out.

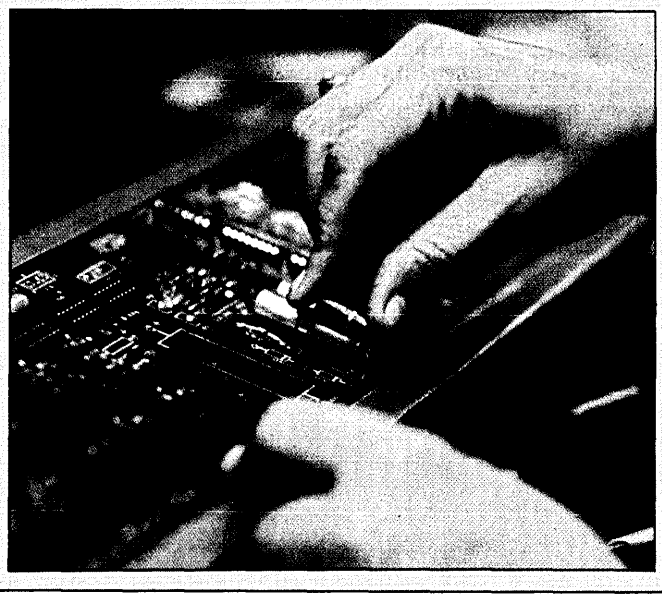
"The MRP program is alive and well because plant managers realized that the only way they would be able to fund capital improvements was by finding a large chunk of cash, and they found that chunk by reducing inventories," Hull relates.

One plant where MRP brought Corning reduced inventory and improved delivery is the company's Erwin ceramics plant located just a few miles from corporate headquarters. The Erwin processing plant is a manufacturer of ceramic substrates, glass-like honeycombs which serve as the base of catalytic converters used in automobile exhaust emission control systems.

The Erwin plant was a major supplier to Ford and Chrysler during the early 1970s. General Motors produced its own ceramic substrates in the form of beads. In 1979, the Japanese-based NGK-Locke Inc. ceramics division combined both the honeycomb and bead design and produced an improved product with twice the surface area per unit of volume. The greater the surface area, the more effective is the emission control device. NGK, which had held a 20% share of the market, grabbed another 10% with its improved design. It was enough to make the market leader, Corning, sit up and take notice.

The Erwin plant was forced to redesign its product to beat Japanese specifications, and it did so by setting up an improved quality control program. It also decided to improve on-time delivery.

"We cannot offer the same lead time as Corning," admits John Osada, NGK's ceramics manager. "Our product is produced overseas and it is shipped by boat.



THE KEY TO MRP II is "getting the right part to the right place at the right time," says Dave Morrison, production control manager at Gilford Instruments Labs, a subsidiary of Corning Glass Works. Gilford workers assemble 5,000 printed circuit boards a month.

The shipping, customs, and trucking slows delivery."

Corning zeroed in on its slight advantage, making sure it delivered on time. Nine months into 1983, the Erwin plant had handled 900 orders on which it missed delivery on only two, for a 99.8% delivery success rate. Management credits Epic. But that's not the whole story. Conditions inside the Erwin plant changed, too. Hull estimates that in 1982, the plant saved $59,000 in overtime, with no loss in productivity. Annual inventory savings have been in the $900,000 range; prior to Epic, special efforts at inventory savings topped out at $110,000. The Erwin plant had $80,000 in write-offs of excess inventory during 1982; since Epic was implemented, there have been no such write-offs.

There were other savings and improvements. Corning's raw materials are delivered to the Erwin plant via railway. In the past, because of poor scheduling, deliveries were often made when not needed, and Corning often detained freight cars beyond the allotted time for unloading. That increased demurrage costs. Managers estimate that Epic has saved over $30,000 in additional freight costs because it allows better scheduling. The freight cars come on time and are unloaded quickly; they arrive more frequently, too, increasing inventory turnover.

Epic has even reduced the amount of safety stock—a cushion against unforeseen problems. When the system was first implemented, the plant ran on a four week safety stock cushion, but now the plant has reduced that to a one week safety stock plan. And overall that's translated into an $895,000 inventory savings.

Late last year, Erwin was running at full capacity, 24 hours a day, in order to keep up with demand. During that time, Epic even helped Erwin's production supervisor, Bob Hoover. "In any processing plant, lead times have to be gotten down cold, and that means I've got to get the information rapidly. As the plant's overnight shift ends at 8 a.m., inventory and production data is entered into terminals, and by 8:20 a.m., Hoover can read stock reports from the previous night's shift.

But the Erwin plant is only one example of Corning's Epic success. In the 33 Corning plants using Epic, 12 are group 1 users, which means they take advantage of nearly all the system's capabilities. That's double the number of group 1 users in 1981. Corning has managed also to reduce its corporate inventory by some $20 million, so it is well on its way to the original goal of $30 million in inventory reduction.

Because of MRP, Corning's managers have enjoyed one other benefit: they don't hear customers growling anymore. ●

ried to every step in manufacturing they affect. Parts shortages will be largely eliminated through better requirements planning, and if they do occur through circumstances beyond the scope of planning, MRP II can help reduce the impact on everyone's schedules and allow workloads to be shifted so that the number of unfinished jobs awaiting a back-ordered part can be reduced.

This is accomplished by using the computer to set up and enforce a master production schedule. Bills of materials are entered into the system and tied to the appropriate items on the schedule. Inventory records are entered and tied to bills of materials. Then, usually once a week, the system produces adjusted schedules, ordering requirements, and, if necessary, warnings about problems that cannot be solved without unusual intervention by various departments. The further out in time the system forecasts needs, the easier it is for a purchasing department to get materials and the more accurately marketing and shipping departments can arrange customer deliveries.

All the information distilled by the system is reported to management at the department and plant levels, where it is translated into production reports and into key sections of financial reports—balance sheet items reflecting inventory, present and projected receivables, and present and projected payables covering parts.

Before the advent of sophisticated computer systems, it often took manufacturers from six to 13 weeks to calculate materials requirements for booked and anticipated business. The delays inherent in this process were turned into norms for work cycles. Purchasing, for instance, often worked on a 13-week or quarterly cycle.

Today, with MRP systems that can perform the same process for an entire plant in two days or less, and get it in the hands of everyone that's affected, purchasing can be done on a more frequent basis. This reduces swings in inventories, minimizes capital tied up in materials that may not be used for months, and allows purchasing departments to shop more carefully when prices for raw materials are volatile or vary considerably from supplier to supplier.

Even in a relatively simple MRP system, rescheduling of requirements can be done each week. As materials requirements are reviewed by the system, the required delivery dates for materials on open purchase orders are checked. If a "need date" changes, the system will note this for purchasers and other directly affected parties. The simplest MRP II systems process orders and control inventory; they cannot reorganize schedules based on experience on the factory floor without a lot of human intervention.

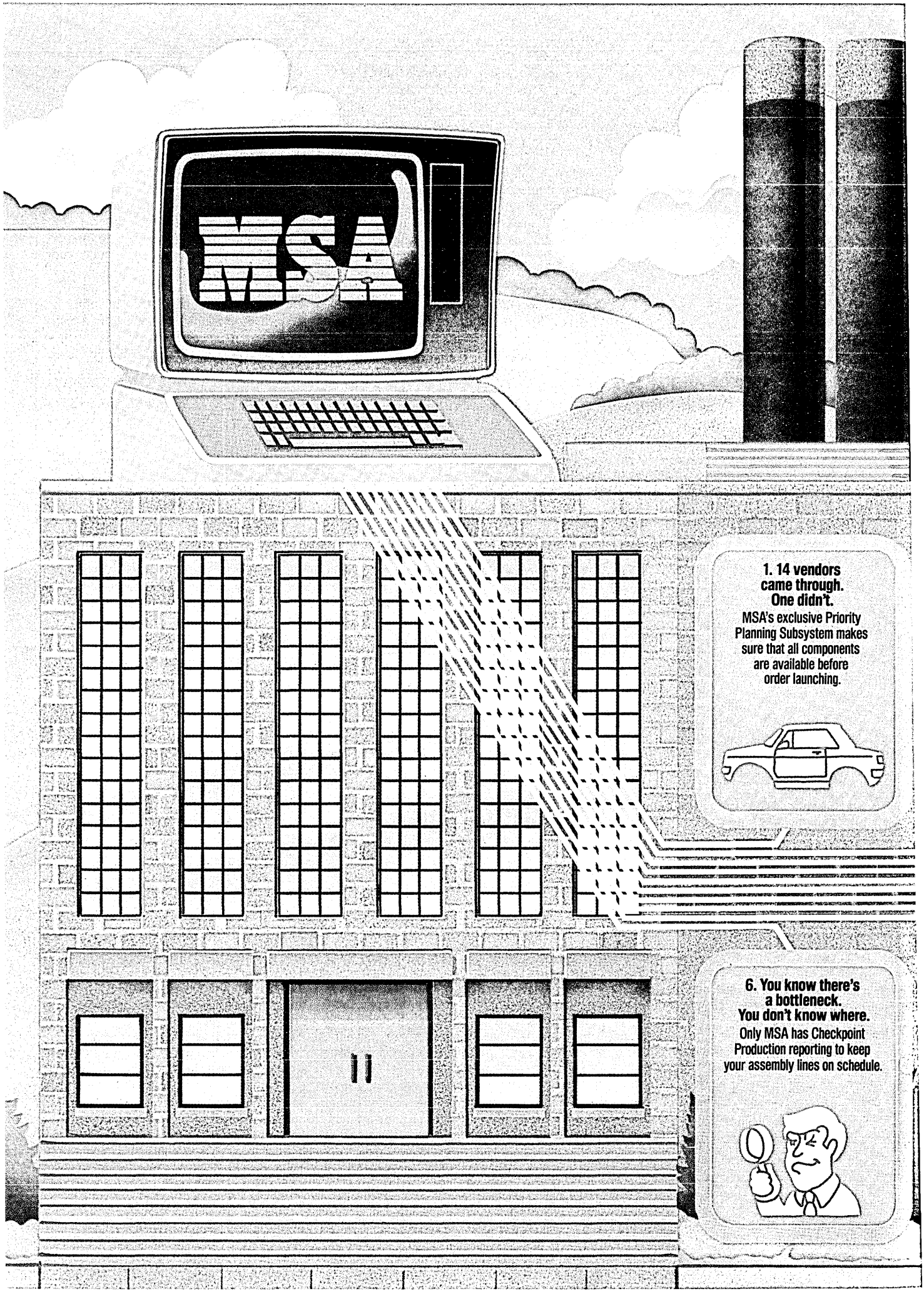
More sophisticated systems are called closed loop MRPs. Such systems go much farther in helping supervisors compare master schedules developed from the data they are fed with plant, department, and work station capacities. Unlike simpler, so-called open loop systems, closed loop MRP II programs will produce master schedules and generate detail reports that include information on production hours as well as physical units. Closed loop systems directly affect activity on the factory floor. The closed loop system includes two elements not in simpler MRP II systems—capacity planning and execution of work orders. Such a system requires accurate work records.

The summit of the MRP climb is termed MRP II, and from a technical point of view, it is not altogether different from the closed loop approach. MRP II uses the closed loop formula, but uses it on a large scale, company-wide basis. It standardizes the interdepartmental transactions using one set of numbers supplied by the computer. Where, in the past, each department had its own set of numbers, under MRP II, the entire company is supplied with a single set of figures. Thus, various departments within a company know what to expect from one another. The marketing department, for instance, can establish lead times based on the production department's current output, rather than on past output and estimates.

MRP II also simulates the daily operations of a company, using actual data entered into the computer each day. By simulating material requirements planning, the MRP system alerts the purchasing department to possible shortages months in advance. Thus alerted, the purchasing department knows exactly when it will need various parts. It can then arrange for the delivery of parts just in time—about two weeks before production begins.

The first step a manufacturer should take in implementing an MRP system, says Darryl Landvater, a top consultant with the Oliver Wight group and a specialist in software evaluations, is to evaluate its existing computer hardware before it evaluates any software. Landvater says that if a company's computer can handle the additional load of running an MRP system, the company does not need to buy a new computer. This does not mean that these potential MRP users necessarily have enough hardware. In many cases, their basic system must be augmented with additional disk and tape drives, terminals, and printers. Once the hardware requirements have been met, the company can then begin choosing from the MRP software offerings that run on its computer. In short order, the prospective MRP user can reduce the number of MRP software options from over 100 to just five or six.

Those five or six programs will be marketed as either modules or packages. The term "package" may give you the impression it is a complete turnkey system, but that's not the case. Software implemen-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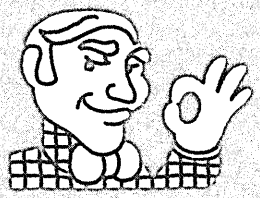

4. You spent 6 hours on production. And 8 on paperwork!

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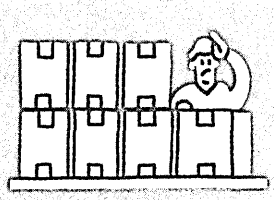
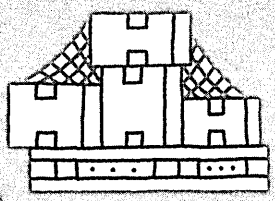


7. The line shut down. The part they need is on the dock.

MSA's realtime system provides constant updates in a rapidly changing environment.



8. Your cash cow became a loss leader. What happened?

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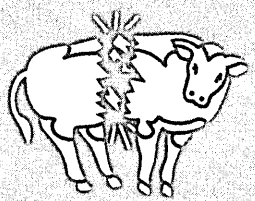

9. Manufacturing says "on target." Accounting says "losing money."

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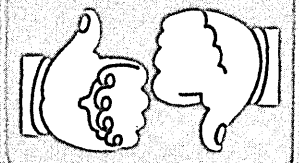


10. Everything's ready to roll. And the line breaks down.

The MSA Manufacturing System completely manages your equipment maintenance function.

tation, in general, is difficult, and MRP is no exception. In particular, there are four areas of MRP software that can pose problems, and should therefore be scrutinized by prospective MRP buyers—functionality, modification, bugs and interfacing.

Some packages may be functionally incomplete. A particular module, perhaps one that is needed by a specific type of business, may be missing. For example, some packages do a poor job of tying aggregate financial figures to operational details; without that function a company can't progress from simple MRP to full MRP II.

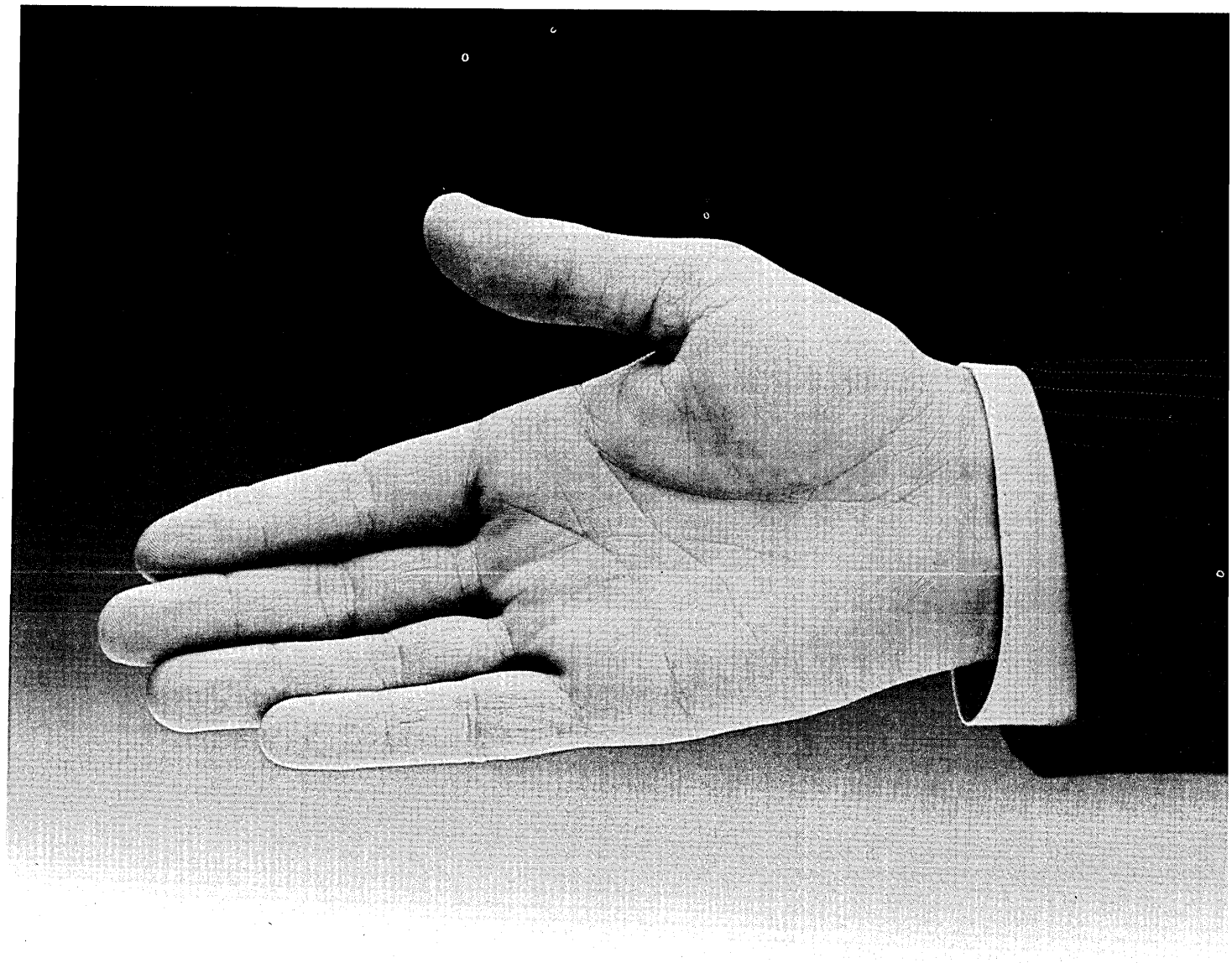
Incomplete packages are just one reason why MRP users sometimes modify their MRP systems. There are other reasons to modify—a user may want to customize reports or screen formats. But no matter what the reason, these modifications are usually time-consuming and expensive. So prospective MRP buyers must determine how easy a particular MRP software package is to modify . . . or how difficult. One way to do this is to consult with current users of a particular MRP software system who have made modifications to their packages.

The MRP software vendor should also be able to specify the extent to which his product can read data produced by other software. Many MRP software packages were not designed to allow interfacing of this kind. This is especially important for MRP software that will run on large mainframes; mainframe users already have a huge investment in applications software that they cannot afford to lose. With small systems users, however, the cost of converting to a single vendor's software is more easily justified. So MRP consultants advise mainframe users to look for MRP software that is easily interfaced.

Once a prospective MRP user has chosen the type of system that best suits his needs, the next question is, whom to buy from? The choices are many. There are hardware vendors who sell software. There are independent software suppliers. There are even user companies that choose to develop their own software in-house.

Home-grown systems is the least likely route. The average time spent developing an MRP software system is 90 man-years, a monumental effort for all but the biggest manufacturers. Few companies have the resources to invest in such an effort. Even if they do, most likely the results will not be cost-effective.

No matter what software system is selected, MRP is worthless unless a manufacturer's management and employees know how to use it. For this reason, education plays a large part in MRP implementation. As George Plossl, an MRP pioneer and consultant, says, "If you think education is expensive, try ignorance." An extensive and continual educational program is one



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CIRCLE 992 ON READER CARD

New Ways at Warren

Steve Speltz remembers 1979. That was the year when on-time customer delivery bottomed out at Warren Communications, a division of General Signal and a $10 million-a-year manufacturer of power supplies used in telephone systems. More than half of the Littleton, Mass., company's shipments were late, customers were furious, and costs were out of control.

"It was just the culmination of a series of problems that had developed. Eventually, it led to certain clients' cancelling business with the company," recalls Speltz, who was formerly Warren's president and is now president of another General Signal division.

The manufacturing problems and productivity lapses at Warren were typical of those at other manufacturing concerns, but their effect on the company was not. Because Warren issues a written guarantee to deliver, the company in 1980 alone was hit for $140,000 in late-charge penalties due to erratic shipping schedules. And that was just the tip of the iceberg, Speltz adds. He reckons that Warren's mediocre delivery performance brought about sales losses of as much as $3 million annually, big money for a plant that produces $10 million in equipment a year.

Worse, clients began closing their accounts with Warren. The governments of Taiwan and of Puerto Rico had each contracted with Warren for production and delivery of complete phone systems valued together at $3 million. They walked away when Warren's schedules kept slipping.

The outlook wasn't good. Only 47% of Warren's orders were getting to customers on time. Stockroom inventories were in a state of confusion—only 62% of bills of material were complete because Warren's stockroom was short parts. When certain parts were unavailable, shipments of finished products were stalled for as long as 15 weeks.

Nor was Warren Communications in a position that would permit it to get away with its inefficiencies. The company had a 12% share of its market, an industry led by Western Electric, a company several times Warren's size, and which includes five other major competitors. While Western Electric led the field because it supplied product to its parent company, AT&T, Warren fought for the business of smaller telecommunications companies like MCI and GTE, customers locked in battle with AT&T that could not afford to be patient when Warren's goods were late.

Early in 1980, Steve Speltz decided he had to abandon the informal system of individual expediting and end-of-month pushes that had been a way of life at Warren. He was determined to institute a significantly more formal system of scheduling and inventory control. Warren was going to Manufacturing Resource Planning, MRP II.

That's when Speltz brought in Mike Johnson as vice president for manufacturing and engineering. Johnson had been a leader in the successful implementation of MRP II at Instron Corporation, a neighbor in Massachusetts. Instron had achieved what is known in the trade as a Class A MRP rating, which means the company had tied all its main functions—engineering, finance, manufacturing, and marketing—into one computer system.

At Warren, Johnson focused on several specific problems. For instance, he saw that a lack of raw materials inventory control had forced Warren to buy in a hurry and to pressure vendors for fast delivery when stocks unexpectedly ran out.

"We couldn't take time to call around for the best price," says Jim Hunt, then materials manager and now vp of manufacturing, "so instead when we found a vendor with a part, we'd rush to buy. Usually, the vendor would raise the cost of the part in return for a guarantee of quick delivery. That's not the way purchasing should be done."

Even more serious was the problem of work-in-process inventories. As Johnson describes it, the Warren factory was "jammed to the gills" with unfinished products piled up in the aisles. By various means, Johnson reduced Warren's work in process (WIP) from $1.3 million to $300,000, or from a six to eight week accumulation down to three or four days' worth.

At first, Hunt and other managers had to do two jobs, because Warren kept its informal expediting system in place until its more formal MRP II could be trusted. In December 1981, after eight weeks of tandem running, Warren cut the first of its product lines over to MRP. Within six months, the company had moved all its production under MRP II control, and the old, inefficient system of inventory control and purchasing was phased out forever.

Pat Brule was hired as a purchasing agent just before Warren switched to MRP II. She remembers the disarray at the company. In those days, her job was basically expediting. She never had time for bargain hunting.

"There was no way of checking what was needed against what we had on hand," she says. "When we expedited a purchase, cost wasn't a factor as much as getting that part."

Now, with MRP II, Pat Brule's work is accessible to the other departments that are affected. Sitting at the purchasing department's terminal, she can key in a job order number and find out exactly where that particular order is, or what parts requirements changes have been made. She can also check through a set of printouts detailing Warren's inventory so that she can balance future requirements against current availability and planned demand. She even has a simulated shortage list, showing which parts have been hard to get in the past. Using this simulated list, she can anticipate which parts must be ordered relatively far in advance.

"These days, we don't expedite," she boasts. "We can call around looking for a competitive price and still we usually have that part at our plant two weeks or more before it's slated to be used."

If MRP II has been a help for planning and purchasing, it's been a bigger help for production. During Warren's pre-MRP II days, unfinished jobs were lined up along the Littleton factory's walls. This was spillover from a stockroom that had long since been filled. Those days are gone, and so are the days when production supervisor Dick Roiko had to ride herd on nearly every piece of work.

"We really didn't accomplish much in the past, but now we have guidelines to follow, we notify planners about any changes in production or about any parts or capacity problems," he says, adding, half in jest, "Before MRP we didn't even *have* planners. I wouldn't go back to the old system no matter what you paid me."

Each job travels through the Warren factory with a set of so-called guidelines attached to it. This is a packet of information containing a work order, a set of move tickets (also called routers), and a copy of the bill of materials. When a unit reaches a work station, the workers read the job order, and mark the move tickets so the job can go on to the next station. The manufacturing process is carefully detailed; even the specific length of work time allotted to each stage of manufacturing is included in the guidelines packet.

"If I have to find out where a job is at any time, I can just type its number into the tube. Bingo! Right away I find out where it's scheduled to be," says Roiko.

And, Roiko says, the MRP II system has helped eliminate the backlog of work that used to accumulate all over the factory. Before the new system went in, according to Roiko, the stockroom routed jobs regardless of the production department's load. Now, the production supervisor and the stockroom manager jointly decide on a date to release work.

The stockroom at Warren Communications is run differently now, too. According to manufacturing chief Jim Hunt, on a typical day the company's stockroom used to have 1,500 shortages. Now, when there's a shortage, it's an unusual event.

"The stockroom," Hunt explains,

"is the control center; everything starts there, where it's dispatched to a particular work center.

"If you've got a problem in the stockroom, you've got a problem in the whole system. Those stockroom people have to be accurate and they have to understand just how important they are."

Warren's stockroom has been running between 95% and 100% accurate in its ability to supply parts for the past year. One reason for this near-perfect performance, says Hunt, is that Warren takes cycle counts. This is done by selecting 50 parts at random from the physical inventory and comparing them to the recorded inventory.

In part because of Warren's conscientious checking of inventory, and in part because of the computerized gatekeeping system the company has installed, everyone at Warren has a lot of faith in the company's inventory reports. There's a terminal just inside the stockroom, which is now locked and gated. When inventory comes in, it's logged on the terminal. When goods move out of the stockroom, there's another logging procedure. Nothing goes past that gate without control.

While MRP II has simplified many jobs that are particularly important to Warren Communications and its people, it has shown its worth in a way any manager can appreciate, whether or not he's part of a job shop like Warren—MRP II's success comes to the bottom line.

In the two years Warren spent going from an idea to a working MRP II system, Jim Hunt estimates that Warren Communications spent between $130,000 and $160,000 for its MRP II software, MRPS-34/38. Warren bought the software from Data 3 of Santa Rosa, Calif. Data 3 modified the program as part of the deal. It runs on an IBM System/34, which Warren had processing payroll and writing the weekly hot sheet to expedite production.

In Hunt's view, the conversion has been a very wise investment. The way production runs nowadays has led Warren to plan an expansion of its plant capacity from $10 million a year up to the $15 million to $20 million range.

Along the way, the system has saved Warren money in numerous ways. For instance, Warren used to hire 15 people for an annual physical inventory. "It was a massive job," according to Hunt. "We had inexperienced people counting parts. We had to pay lots of double time. We used to start on a Thursday night and get finished on Sunday in time to start the work week on Monday. But last year, we did our inventory in just one hour!"

Manufacturing overtime has been cut, too. In 1980, before MRP II, Warren's overtime rose to 12% of its total payroll expense. In 1983, the peak overtime was in the second quarter, when it hit 3% as planned. By the third quarter it had settled back to 1.2%.

Mike Johnson, who had led an MRP implementation team, thinks that the system saved Warren $850,000 in the first year alone.

Jim Hunt says the best thing about the system is the way Warren has nearly eliminated the late-delivery penalties it used to pay and the way inventory is under control.

And, say the managers at Warren, former customers who had left Warren during the chaos of the pre-MRP days are beginning to come back. They can again trust Warren to deliver on time.

Warren Communications runs its MRP software on an IBM System/34 minicomputer, a 256K machine with four disk drives storing 256 megabytes of data. In addition, Warren has 14 terminals on-line, supplied by IBM and Decision Data, plus two matrix printers and a line printer. Data processing manager Frank Arcidiacono says the system is now running at capacity with MRP on line and if current files do expand, the company will be forced to buy a larger piece of hardware, specifically an IBM System/36.

Arcidiacono says Warren had a problem trying to buy software, because fewer vendors produce MRP software for smaller systems. So Warren executives traveled to Santa Rosa, Calif. and Data 3 Inc., at that time a new entry into the software market with only four employees. Warren visited the supplier's only user of their MRP software, the Los Angeles-based Grant Oil Tools, a part-time user of the system.

Satisfied with Grant's success in using MRPS-34/38, Warren struck a deal for the one-time purchase price of $49,000. It represented a considerable cost break, but then, Warren was Data 3's first full-time East Coast user.

Warren is glad that it gambled with the West Coast group. "In the past, everyone handed dp pieces of paper with their information, we put it into the system and when reports came back, everyone thought we were using black magic. Now, users are part of the system. They've acquired ownership and accountability, it's theirs," says Arcidiacono.

If he had to do it again, Arcidiacono says he would again take a chance with a young company.

"But," he warns, "you've got to have a feeling that the supplier knows manufacturing, and speaks it well, too. If there's one thing a company should do, it's sit down and actually work with the system before buying it." •

element that all successful MRP II users have in common. MRP education is expensive, but the most successful MRP users say it's mandatory.

Managers and executives aren't the only ones who need training. MRP consultants say that at least 90% of a company's employees should get some type of training in MRP II. For many employees, training may be as simple as a videotape presentation. Videotape courses are produced on nearly every aspect of using MRP II, including bills of materials, scheduling, and inventory accuracy.

Of course, all this costs money. Oliver Wight advised in his book, *MRP II, Unlocking America's Productivity Potential*, that about 7% of company personnel should attend live, professionally run classes. So, if a company has 1,000 employees, 70 people should attend classes. At Wight's estimate of $2,000 a person (including tuition, travel, and expenses), training for 70 students would cost a total of $140,000. In general, professionally taught classes run for three to five days, and cost between $500 and $1,500 a person (excluding travel and personal expenses).

In all, a manufacturer implementing MRP II can expect to spend about $150,000 on education during the first year alone. After that, the cost of MRP education drops significantly. MRP consultants generally advise budgeting for $20,000 a year in continuing educational costs. New employees, promoted employees, even old employees, need to be trained and retrained in order to get the most from MRP II. For successful users of MRP II, education is an ongoing process.

Of course, education is only one component of MRP II implementation. Similarly, it is not the only cost. At first glance, the total cost of MRP II implementation—which sometimes runs into the millions of dollars—seems high. But MRP users have to view this manufacturing system as a long-term investment, one for which the initial investment will be small compared to the eventual benefits.

MRP II implementation costs are generally divided into three categories: computer hardware and software, work record improvement and maintenance, and people. The first category, computer hardware and software, can be a large investment if a manufacturer does not have sufficient computer power already installed. But in many cases, all that's required is additional devices and the actual MRP software.

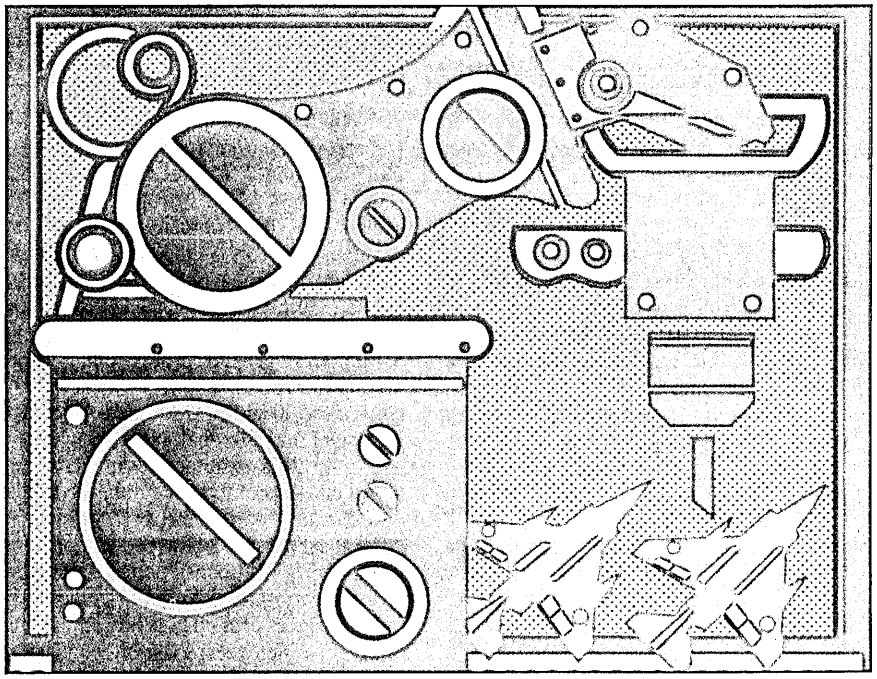
The second expense category, work record improvement and maintenance, is the price a manufacturer must pay to upgrade its operating records to MRP II standards. These records, which must be continually maintained, include bills of materi-

al, inventory records, and master production schedules. The cost of improving and maintaining these records is calculated to include the salaries and benefits of indirect labor used to bring the work records up to MRP II standards.

Lastly, the cost of implementing MRP II includes the payments made to people, such as fees for consultants, tuition for the education of employees, and salaries paid MRP implementation specialists. This last group includes MRP project leaders and inventory accuracy clerks.

The total cost of implementing MRP II can exceed $750,000 during the first year. Indeed, at least one manufacturer admits to spending over $4 million during the four years it took to get its MRP II system up and running. On the other hand, many smaller companies have accomplished MRP II implementation for as little as $250,000.

But even the best made plans can go awry. "A good rule of thumb," says conservative consultant George Plossl, "is to multiply your estimated costs by two; and when looking at benefits, divide by two." ●



INDUSTRIAL ROBOTS COME OF AGE

Some are run as independent machines; others are linked by wire into teams or systems. Some have huge hydraulic arms; others have small, delicate grippers. In a growing variety of shapes and sizes, industrial robots are being installed on factory floors. Since the first industrial robots were built nearly 25 years ago, these dream machines have become acceptable replacements for humans in hazardous and monotonous work. There's no R2D2 yet, but companies using robots are as enthusiastic as any *Star Wars* fans.

The growing size of the robot business tells part of the story. In 1972, a decade after robotic systems first arrived on the manufacturing scene, worldwide robot sales were only $6 million. Ten years later, in 1982, sales had climbed to $190 million. Looking at this thirty-fold increase, robotics industry analysts now predict robot sales will hit $700 million to $900 million by 1990, and the most optimistic projections place the business in a $1 billion to $2 billion range by the end of the decade. This is dramatic growth, but the total doesn't seem all that big when you talk to the dozen or so companies that are leading the field. They expect robots to be really big business before long, they expect new companies with new ideas to keep the automaton trade in rapid motion, and they say that the potential for their wares has barely been tapped by users. If they are right, we are only now at the dawn of the robotic era.

During the 1960s, robots were limited to basic spot welding and spray painting. At that time, most industrial robots in the U.S. were used by automobile manufacturing plants; the car companies already had huge factories with innumerable jobs suitable for robots. As tail fins began to look old hat, small, sturdy computers suitable for use in robots came on the industrial scene. These computers were expensive by today's standards, and so, consequently, were robots. But the auto industry, which had pioneered in manufacturing before, was determined to bring the robot into the mainstream of manufacturing. Things were changing then, 20 years ago, but the changes were not so visible at first.

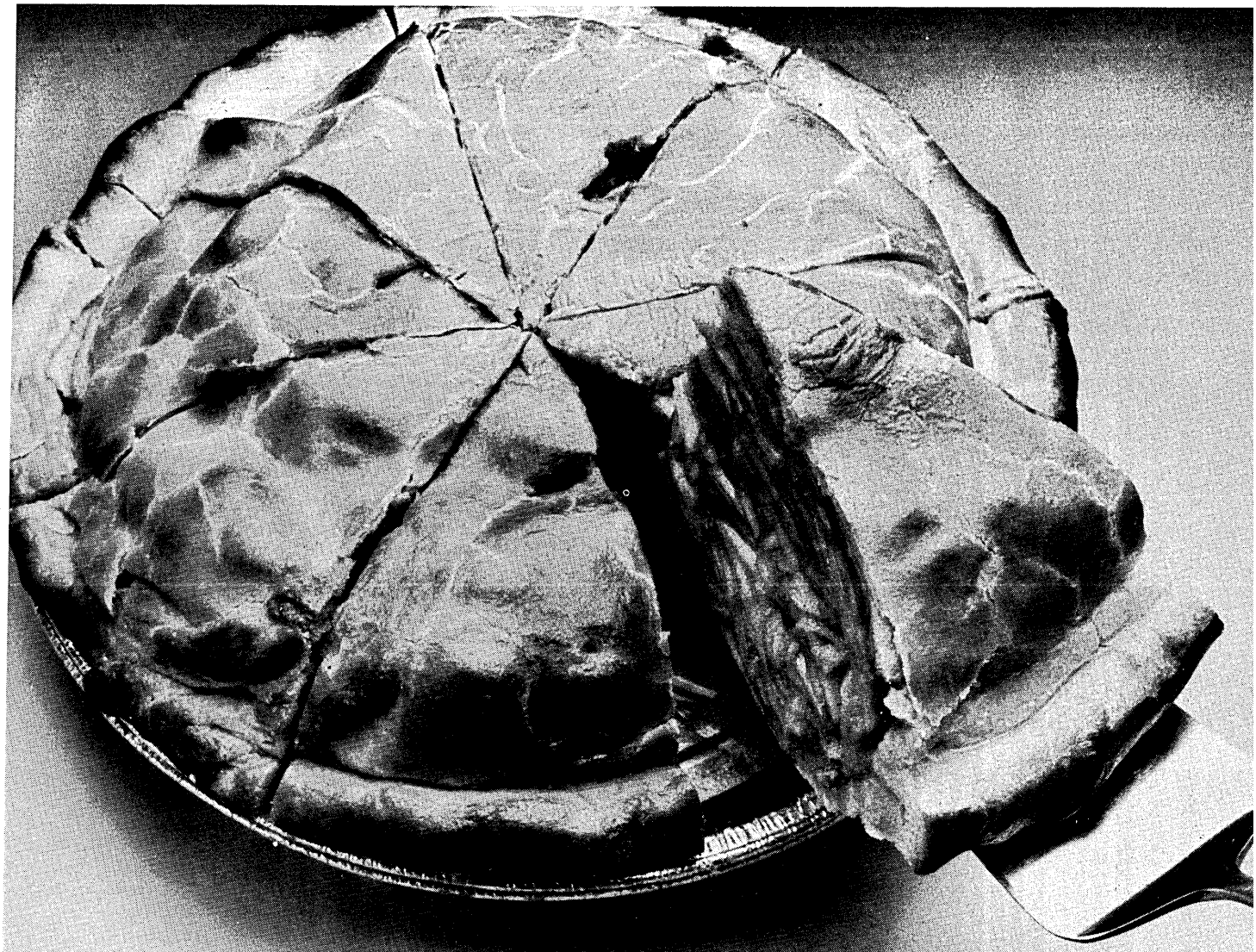
By the 1970s, things *had* changed. A combination of technological advances and new economic factors forced managers in a wide range of manufacturing companies to take a serious look at what industrial robots could do, and, in many instances, to try them out. Industrial robotic systems, through the advent and implementation of microprocessor circuitry, had gotten smaller, cheaper, and more versatile. New programming languages and techniques enabled robots to be easily trained for new tasks. Wages in America's factories had risen, while the prices of robots had not.

But the turning point came not from good times as much as from bad. Industrial companies around the world were taking a severe beating. A series of recessions, aging production equipment, and increased competition from Asia and elsewhere contributed to a vastly different industrial climate. For many manufacturing managers, industrial robots—and their promise of efficiency—were beginning to make sense. The alternative—further declines in profits and the possibility of outright industrial collapse—did not.

Inflation was the last straw, Gerald Michael of Arthur D. Little Inc., the Cambridge, Mass., consultancy, explains. "During the '60s and early '70s, despite some double-digit inflation, there was a wage freeze. The prime lending rate was 12%, which seemed very high at the time. Industrial robots, which tied up lots of capital, looked expensive compared to workers, whose wages were rising slowly, if at all, under government guidelines." But 10 years later, he continues, in the late '70s, blue-collar wages climbed rapidly and the robot became an attractive investment. As the introduction of the microprocessor chip made robotic systems smaller and cheaper, the resulting systems became more efficient. Robotics became affordable, while alternatives were eliminated, one by one.

As users of robots have discovered, saving money isn't the only reason for putting automata in the factory. Industrial robots can perform undesirable or dangerous work, and they can do it hour after hour. They aren't hurt by toxic materials and they don't lose interest in boring tasks.

ILLUSTRATIONS BY CRIS SPOLLEN



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But even in relatively safe jobs, sales of robots are being spurred by the desire to save money. As businesses change and grow, machines will increasingly do jobs now being performed by semi-skilled and skilled labor. Joseph Engelberger, president of Unimation, the largest U.S. robot manufacturer, in his book, *Robots in Practice*, says that "industrialists are mildly interested in shielding workers from hazardous working conditions, but a key motivator is the savings of labor cost by supplanting a human worker with a robot."

Robots can work around the clock, and people can't. An industrial robot is typically expected to be up and running about 97% of the time. This means that traditional patterns of shift work, shaped by

Flying High at General Dynamics

In 1976, robots helped General Dynamics Corp., of Forth Worth, Tex., lose a U.S. Air Force contract. Two years later, General Dynamics was using robots to win business and do so profitably. The company uses its robots to drill mounting holes in wings and other horizontal structures of the Air Force's F-16 jet fighter. It won its contract with the help of robots in late 1978.

General Dynamics lost the 1976 contract in part because the robots it was then using were relatively crude and untested. The company that won the award bid a package using a tried and true machine-tool set-up. The Air Force's choice was far from difficult.

Today, all that's changed. General Dynamics has continued its robotics efforts, and has proved, to the Air Force and others, that its wing-making robots work efficiently.

While drilling holes is not glamorous work, it is a critical, labor-intensive task. Each F-16 fighter plane has over 200,000 fasteners, and each of those fasteners needs a hole to fit in. The efficiency and speed with which General Dynamics's robots drill these holes has silenced many critics. Computer-controlled robot drills are contributing to productivity improvement of 3:1 over manual drilling methods.

"Wing drilling, which was a 30-hour task when done by hand, has now been reduced to a 3½-hour job," says Robert McMahon Jr., manager of manufacturing systems at General Dynamics. But McMahon adds that the robots offer other benefits as well; for one, greater accuracy.

"The robots work on a two-shift basis, and in that sense they are great time-savers," says McMahon. "But then it is the accuracy, which allows wings to be easily interchanged, that really pays off."

The F-16 requires interchangeable parts that can be instantly replaced, regardless of where and when the replacement part was manufactured. As a result, the mounting-hole tolerances must be accurate to within 0.002 inches.

The Cincinnati Milacron robot cannot position tools exactly. That is a job left to specialized "end effectors," mechanical hands at the end of the robot's arm. The technology for the end effector was developed within General Dynamics. The robot acts as a pick and place instrument, positioning the special drill head. The tool then operates under its own control system.

To drill a wing panel, the wing is guided through a permanently mounted fixture dock. A hydraulic-run robot, having been previously programmed, lifts its arm from a bench of different drills and begins its repetitious work.

"The work is tough on the bits," explains McMahon, "but the robot can sense when a bit is worn. It will stop drilling, move to the workbench, and change the drill tooling and resume the drilling process." In addition to automatic tool changing, the robot is also programmed for computer-controlled part positioning, mass storage of parts programs, and integrated station control.

The robots are programmed in a conventional teach-repeat mode. A human operator walks the robot through its intended routine, using a small, handheld program-entry terminal into which he keys x, y, and z coordinates of key positions.

General Dynamics currently uses a total of 13 industrial robots, 11 Cincinnati Milacron T-3 robots, and two from IBM. McMahon says his company chose Cincinnati Milacron because it is an American company that offers domestic support. McMahon admits that General Dynamics did consider some European robot manufacturers, but their bids were dismissed because they did not offer maintenance support in the U.S.

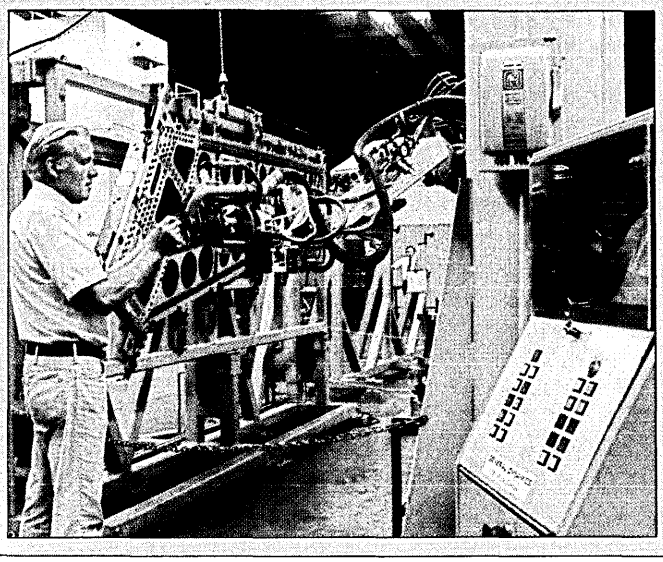
General Dynamics estimates that each robot costs about $150,000 per workstation, and that the usual payback period per robot is 2 to 2½ years.

The two other robots in use at General Dynamics are IBM RS-1 models. The RS-1 is a relatively small robot arm used primarily for lightweight industrial materials handling.

At the General Dynamics plant, the RS-1 works as a pick and place machine responsible for feeding various lengths of tubing into deburring machines; the job is extremely monotonous. According to Bill Grace, the general foreman in charge of the RS-1 robots, the boredom had its effect on workers who had previously handled the tubing. "I had nine people feeding deburring machines all day," he recalls. "It wasn't long before I realized people would call in sick or wander off to the restroom quite a bit."

Now the RS-1 has freed those workers for other tasks, and the RS-1 picks and places, without stopping for a run to the restroom. Instead of nine people working on the operation, there are now only three. The RS-1 robot deburrs between 600 to 1,000 tubes per shift, while its human counterparts handle from 150 to 300 per shift. Two production workers deburr parts of tubing that are too big for the RS-1, and a third worker supervises the RS-1.

The robot is expected to pay for itself within a year and a half. McMahon calls the IBM robots moneymakers. "You've got to remember, the presence of the robots is driven by the economics," he says. "We'd like a robot with a fifty-pound weight capacity and a large numerical control integration for about $100,000, but that's not possible yet. So we work with what is available that best suits our needs." ●



SKIN-DRILLING ROBOT: An operator replaces a drill on the Cincinnati-Milacron hydraulic vertical stabilizer skin-drilling robot at General Dynamics' Fort Worth Division.

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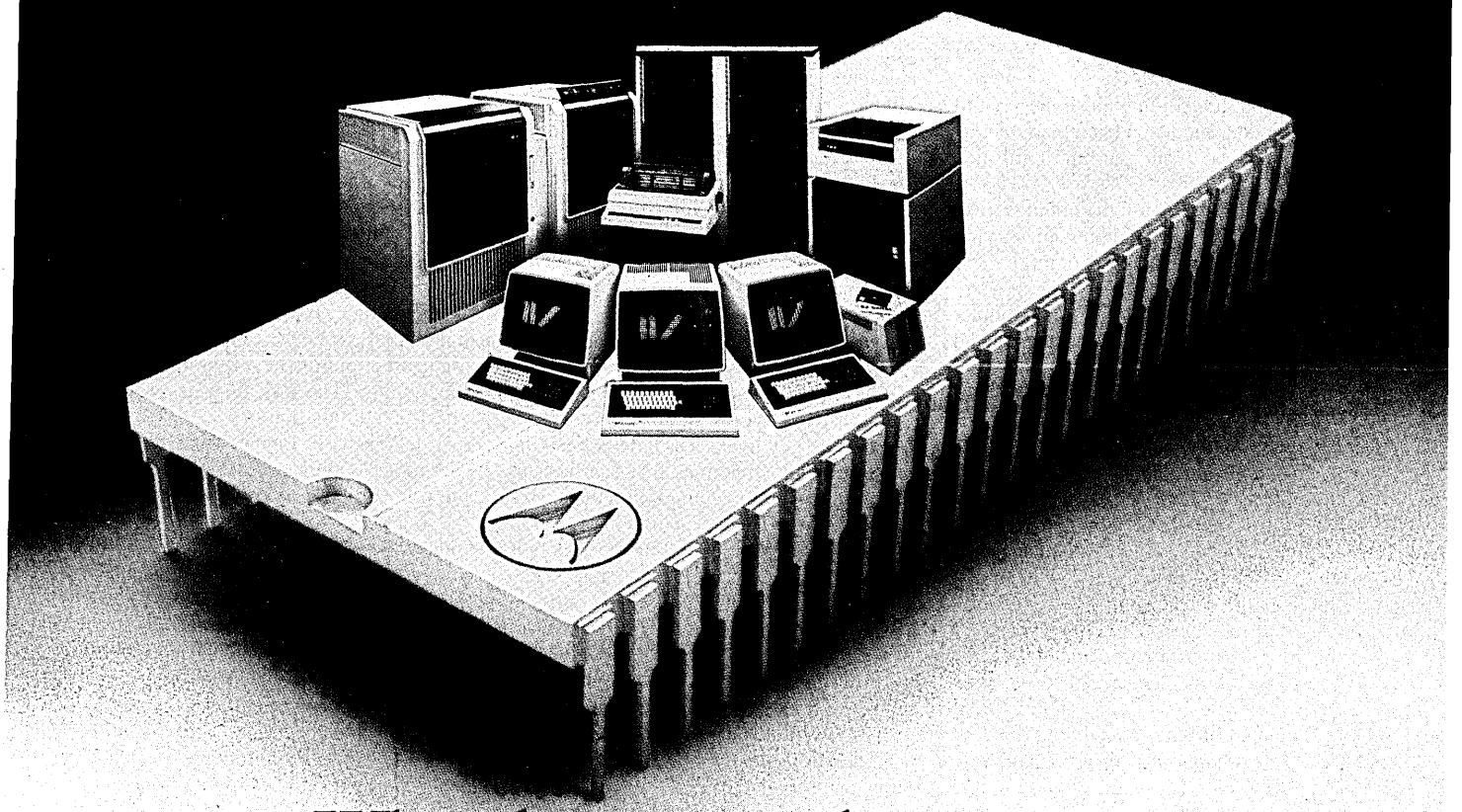

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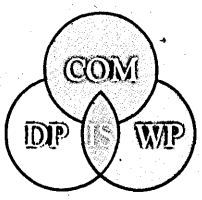

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wage incentives for night workers, are in flux. It also means that plant utilization is on the rise.

Robots can also improve the quality of the products they work on, which is very important to manufacturers whose reputations have been tarnished by the precision with which Japanese companies build products. In part because of improved robots, standards of quality are on the rise worldwide; purchasers feel they have the right to demand greater precision from manufacturers and the duty to shop around until they find it.

All this has brought about a rush into automation by many companies trying to catch up overnight. The intentions are laudable, but the haste with which they are sometimes carried out can lead to trouble. Buying a robot is serious business, and should not be done hastily. First and foremost, managers should study the effects of robots on their companies, and determine if robots can contribute to corporate goals.

According to Arthur D. Little's Gerald Michael, before a company buys robots, a feasibility study should be done by the company's managers. "You can avoid needless capital expenditure," he explains. "You should be looking for two situations—high-labor, cost-intensive areas of production where robot implementation can be easily justified, and critical production areas where you have work-quality problems amenable to automated solutions."

Consultants also urge managers to look beyond initial costs of robots. Indirect costs, for installation, integration, insurance, maintenance, special tool fabrication, and equipment depreciation, can total two to three times that of the robots themselves.

If the studies say Go!, and management is serious about installing robots, the next step is to buy some hardware, but not necessarily to install it in a factory. Michael warns companies not to bring industrial robots in on what he calls a critical path. That is, do not buy robots and install them on the factory floor until you have tested their performance in a laboratory.

"If you use them in R&D for two, three, maybe six months, you gain familiarity with their operation," he says. "At the same time you can confirm your operating costs before you have committed to buying a number of robots."

Buying robot hardware can be an ordeal. Companies must choose among three general patterns of robotic usage.

A company can install industrial robots that work on a one-to-one basis. This means one robot replaces one kind of worker. An example is an automated spot-welding line. This mode of robotics is an extension of industrial stations that have groups of single-function machines run by specialists. There may be several different jobs performed by one-function robots, but only one job is done at a time.

Alternatively, a company can set up its robotics application in a work cell, where one robot performs a process that would otherwise require several kinds of workers. For instance, a robot may pick and place a part onto a lathe, then place it onto a grinder, and so on. This is the robot age's answer to multimachine workstations, the kind found in many job shops and some large industries.

Both these approaches involve putting in one kind of robot at a time. But a user can also deploy industrial robots in groups. They become part of a large system with many integrated processes. Such configurations are commonly found in factories with large work flow lines, for example, in automobile factories. Work goes from one robot station to another. The robot becomes a section of an assembly line; groups of robots act like whole subassembly departments. The key to success here is breaking down jobs into functions that can be handled by groups of machines with the appropriate complement of arm motions and tooling payload capacities. Grouping robots is regarded as a more sophisticated approach to automation, and success generally requires some experience with simpler forms of automation.

The way today's robots look and operate is largely a function of what they are designed to do. Generally, robots consist of a single mechanized arm on a base that contains control electronics. The electronics may be linked to larger computers or other robots, or the robot may function independently of other machines in the factory.

A robot must have capabilities that can be used for the immediate problems at hand as well as those in the future. William Tanner, president of Michigan consultancy Productivity Systems, advises that a robot should be able to reach easily around an entire work area. It should have adequate dexterity, and it should have variable speeds to accommodate the needs of different jobs.

When a company selects robotic hardware, it's also selecting the type of programming applicable to the machine. That's because robot software is still relatively crude. Two levels of software are built into a robot—the base operating system, which controls the robot's computer, and the user software, which controls the robot's operating functioning. Users seldom make any changes to a robot's operating system, but they often write or modify applications programs to fit their specific needs.

Programming for robots does not require special personnel. With many of the robots currently on the market, programming is accomplished by the teach-repeat method, and consultants claim anyone from a production worker to an electrician can learn to key in the points that the arm must go to. To train the robot, the user keys in starting coordinates and then leads the robot arm through a sequence of motions. The robot's computer records the movements; then it can direct the mechanical arm to repeat the movements as many times as required.

"You actually have to go out, stop the operation, and park the robot arm in space as you insert the starting points," explains William Tanner, the robotics consultant. Then you go from spot to spot, telling the robot where to move and how long to stay there.

Another way to train a robot is off-line programming, available on many of the newer, high-precision industrial robots. With off-line programming, a terminal is linked to the robot's computer, and operating instructions are keyed while the robot is functioning. The task may have been devised in a simulation or written as a set of instructions based on mechanical drawings. The programming is quick, and debugging the robot's action is done with the help of the outboard computers. It doesn't take much of a machine to develop robot programs; IBM uses its Personal Computer for such jobs.

This newer method is a real improvement over teach-repeat programming, says robot consultant Frank Paul. "With off-line programming, you can look at the assembly process—this washer goes here, this bolt goes there. You can lay out the process and observe the logic flow," he explains. "There really isn't time for that with teach-repeat programming." Paul warns that users soon discover that there is no universal robot programming language; each manufacturer has its own off-line language.

"Because of that," he says, "a user may be unwilling to buy different makes of robots. If he buys a Puma, an IBM, and an Automatix, he'll have to learn three different languages. I don't think users have the people who are interested in doing that."

The cost of a robot depends on its mechanical drive mechanism. In the current generation of industrial robots, there are three main power drive types: pneumatic, with prices from $8,000 to $20,000; hydraulic, which range from $24,000 to $140,000; and electrical, costing $80,000 to more than $170,000. The greater the payload, the more expensive the robot's drive system will be.

Once management has found its way through the maze of robotics options, and has purchased what it feels is an appropriate system, it must then teach its employees how to make the most of the equipment.

Many vendors offer some training when a company buys a robot. But the user will have to supplement this. •

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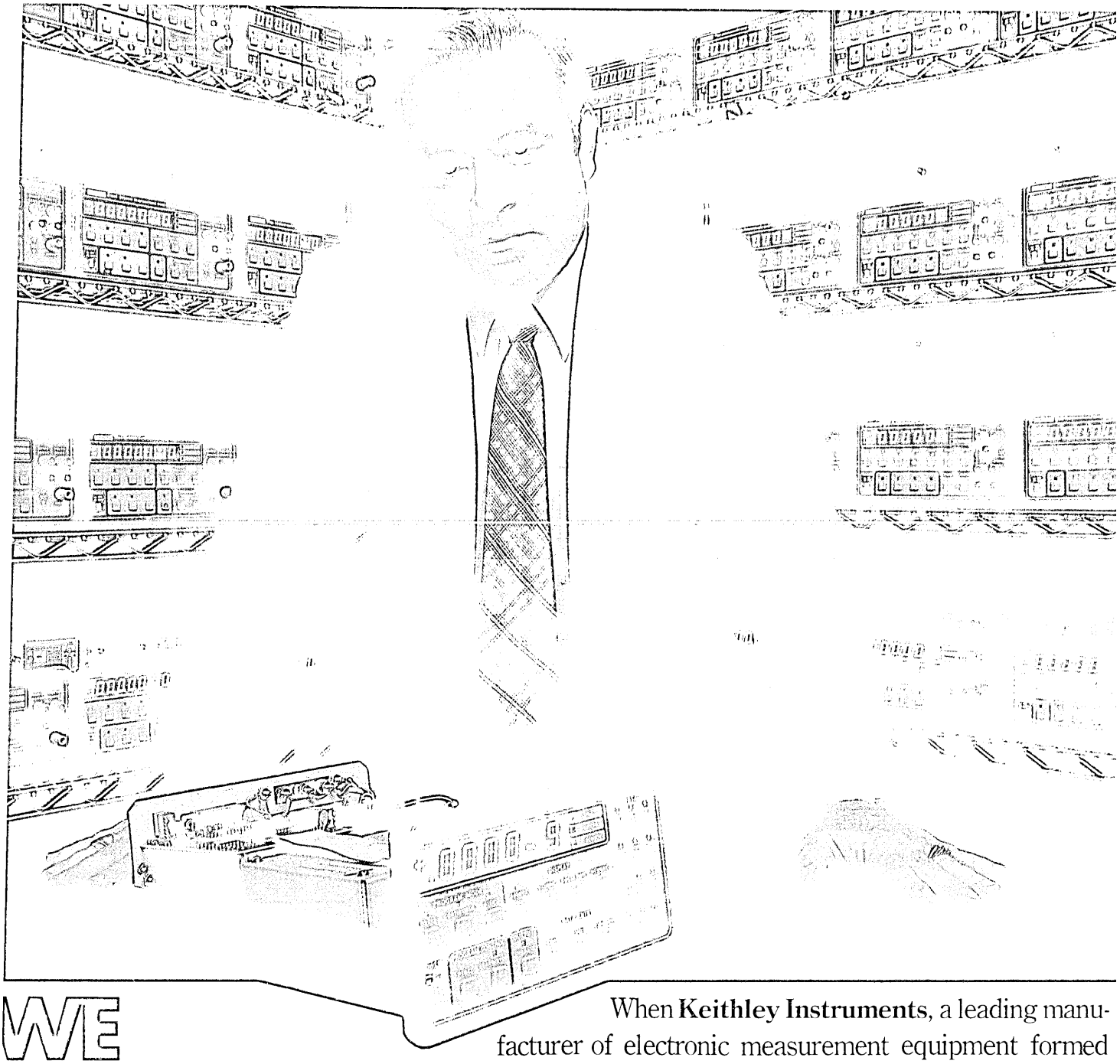

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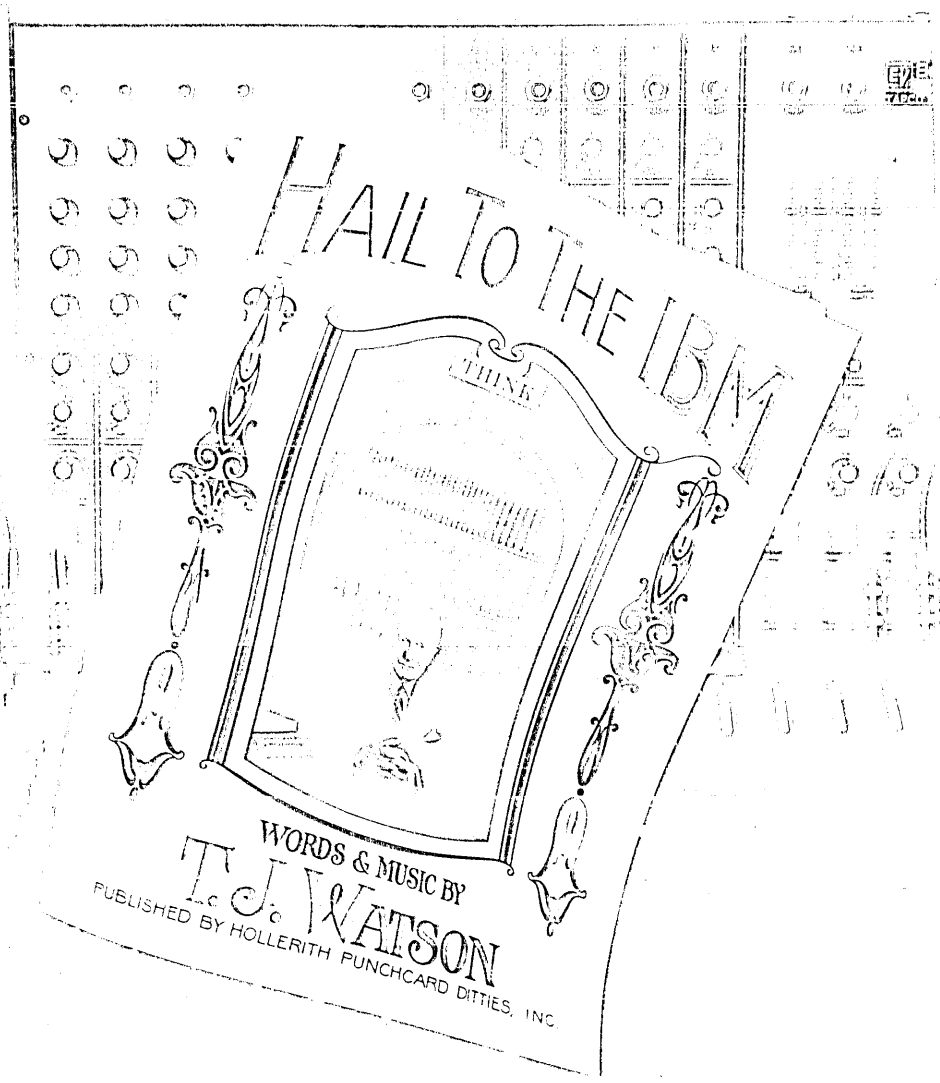
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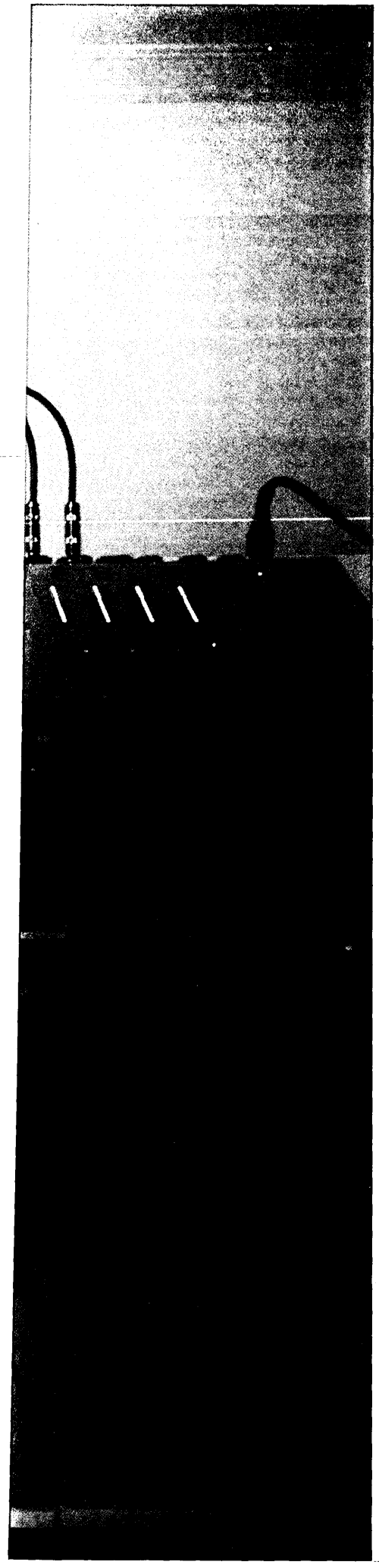


Today's IBM features new faces, new businesses, new methods. But certain underlying principles will never change.

THE SONG REMAINS THE SAME

by Philip H. Dorn

Call it by any name that appeals to you. Longtime favorites include "Itty-Bitty Machines" and "I've Been Moved." Time Inc. likes to talk about "The Colossus That Works" and the "Lean, Mean IBM." Well, IBM certainly does work, and it also looks pretty lean compared to the past. But mean? That doesn't sound very nice. It may not even be true.

By any name, the company has a single salient attribute. Almost alone among multibillion dollar multinationals, IBM is a hungry company not satisfied with what comes its way. There long ago circulated an apocryphal story usually attributed to T.V. Learson. "How much of the business do you want, Mr. Learson?" asked the innocent young reporter. "All of it!" thundered the giant-sized IBM president. It's a good story. It may even be true.

How many companies are there in today's data processing industry? A number of lawyers at the Department of Justice would say there is one and only one, IBM. IBM would tell you there are 3,500, with newcomers entering all the time.

Pushing aside legal definitions and economic theories of monopoly power, exercises at which IBM excels, there are probably 450 companies of meaningful stature in the business. In 1983, this group produced aggregate revenues of about $85 billion, plus or minus the odd billion or two. IBM's share? Probably in the range of 41%, or a cool $35 billion. Not too shabby.

Does IBM really want all of the business? Could even IBM marshal the financial resources to support an $85 billion industry on its own? Probably not, but there are a lot of people out there who might argue the point. Some of them once worked for General Electric, RCA, Scientific Data Systems, Itel, Osborne, Pitney Bowes, and other of our departed brethren.

What does IBM really want? The target numbers can be estimated reasonably well. How about a nice steady annual growth rate of 16% to 18%, with a pretax profit margin holding around 19%? That should be enough for IBM to keep its key accounts happy—not to mention the thousands of shareholders who enjoyed a very happy 1983.

The overall business called "information technology" actually is made up of a series of submarkets. The ones that attract most of the attention and bring in most of the money are mainframes, minicomputers, micro or personal computers, peripherals, and the catchall, services. How does IBM rate in each of these market sectors?

The mainframe business, particularly for general purpose commercial systems, is IBM's house, and woe unto anybody who tries to break in. IBM and its pcm followers, notably Amdahl Corporation and National Advanced Systems, have about 92% of this steadily growing market. That doesn't leave much for the BUNCH—Burroughs, Sperry (neé Univac), NCR, CDC, and Honeywell. While it is not generally recognized, the two primary pcm houses (to be joined in 1985 by Trilogy) have captured a larger share of the mainframe business than IBM's traditional competitors.

SQUEEZE TACTIC OR ACCIDENT?

The minicomputer world is being squeezed by microcomputers growing up and mainframes growing down. What's left is becoming a major battle in a shrinking arena. IBM has a share, a solid 15% to 20% with Series/1. DEC and Prime own most of the rest, but dominance in a dwindling market is not the path to prosperity. Is the squeeze an IBM tactic or did things just happen this way because of inevitable improvements in price/performance efficiencies? If anybody knows the answer, please call Mr. K. Olsen in Maynard, Mass.

Microcomputers have gone from dead zero to $5 billion in only five years. IBM, starting in the summer of 1981, has moved to a commanding position in the corporate market for what is now called personal computers. Even Tandy's Radio Shack has joined the IBM-compatible move. The world seems very simple. To penetrate the lush corporate markets your machine must look, smell, and taste like IBM's. Let's be charitable to the entire industry and say IBM has about 50% of the total revenues for micro-

PHOTOGRAPH BY ROBERTO BROSAN

In markets where IBM elects to compete, its power and control are increasingly plain.

computers, something on the order of $3 billion going to Armonk in 1983.

Once upon a time, there was a booming business in unplugging IBM peripherals. Today, that business has slipped. Only a handful of the aggressive pcm manufacturers survive and even fewer have any real market power. In today's systems, peripherals account for at least 50% of the total revenue and IBM has this all wrapped up.

Nobody builds and sells memory cheaper than IBM. If IBM had its problems with the 3380 disk, the independents had even more and were late delivering. Several small companies had a good run knocking out IBM terminals, but IBM's most recent product moves—3178, 3270 P.C., and XT/370—sent a chill in the direction of the crt makers.

Finally, there are services—a mixture of software, leasing, training and education, and remote processing. As a lump, this is about $4 billion to $5 billion for IBM, and they are leading the way. While others survive, by and large IBM dominates the marketing of services to major corporations.

The bottom line is simple. In markets where IBM elects to compete, its power and control are increasingly plain.

STRATEGY AND TACTICS

IBM is a company that moves from management to management with barely a ripple. One generation succeeds to power, its predecessor retires, but little changes. Why? Because there is a corporate culture, a way of looking at problems (originally defined by the elder Mr. Watson) that molds and shapes managers as they move up. By the time they reach Armonk, it can clearly be predicted how they will react to a management level problem.

The IBM style implies keeping control over key accounts, picking up whatever else is handy from the less critical customers and in "side issue" markets, and keeping the competition just a little off balance. The long-term strategy has not altered an iota in 50 years, but the various tactics have changed.

IBM keeps control over the top 250 accounts by making sure the dp manager is a friend. If not, IBM will be talking to the dp manager's boss. If there is still a problem, how about a bit of chairman-to-chairman conversation at the club?

After all these years, IBM's primary targets haven't changed. Look at such industry sectors as banking, insurance, diversified financial services, transportation, petrochemicals, and public utilities. IBM's market shares were, are now, and will continue to be, in the 95% range in these markets, here and overseas. If necessary, IBM will restructure its marketing force to suit these key customers. IBM knows if you sell the top group, all the others fall into line.

How does IBM sell these companies? By continuing to tie everything back to the mainframe, to the dp manager's turf. Were microcomputers starting to threaten the dp manager's control? Give him a 3270 P.C. to reconnect the control paths. Were the office automation people beginning to break away on their own? Give the dp people a Profs system and DISOSS. Everything is gradually slipping back from the distributed approaches of 1975 to a centralized approach in 1985. And who controls the central facility? IBM's oldest friend, the dp manager.

The strings for reconnecting in the '80s are DBMS, CICS, the 3270 P.C. and XT/370, and perhaps some communications products that have yet to appear. The reward being dangled? Well, Mr. Dp Manager, if you stay with IBM, you'll have one vendor end to end, won't have to waste your time trying to minimize your dollar expenses, and you know you'll be selecting something with which your management, the top bosses, is always comfortable. End of story.

Beyond the top 250 accounts, there are a lot of companies out there including smaller ones that expect to be large. IBM deals with them in many ways.

For a new IBM salesperson fresh out of school, a single System/34 order is a very big deal. String enough of these together and you, too, may be a branch manager some day. Your original customer will long since have migrated from System/34 to System/36. Did he want to take the other path? Start him with a 4331 and in time, it will be a 4381.

On these smaller accounts, one often sees salespeople burning with eagerness and bursting with smarts against a customer base with less than total understanding of dp. It's a mismatch. The same comment could be made about most of the IBM marketing force against the competition in these smaller arenas. IBM outtrains its people by 20 to 1, if not more.

Then there is the loose-ends revenue: typewriters, copiers, and one-off personal computers. IBM advertises heavily, and even uses direct mail. The phones ring, the retail business centers are full of eager buyers, and the money rolls in. These small, one-time purchasers walk in the door, a tribute to IBM's development of allegiance among customers. IBM electronic typewriters are high priced and have fewer features than the competition, but it does not matter a bit. Every secretary wants an IBM and that's the way it is.

Is there any competition? Certainly. But it seems increasingly scattered, ill-structured, helter-skelter in attack, and unable to focus on IBM's few weak spots. The other major U.S. computer vendors are running like crazy to stay in their current positions.

ANOTHER KIND OF CLOUT

The marketplace is not the only arena in which IBM wields great power. As the quintessential multinational corporation operating in a world where management by computer is being applied to virtually every sphere of life, IBM is a political force to be reckoned with.

Domestically, IBM has found favor with the Reagan administration, which suddenly dropped an antitrust suit that four previous administrations had pursued at great expense for more than a decade. It has also found a good friend in the FBI, which, with help from IBM, used "sting" tactics against some of the company's major competitors.

Abroad, IBM has gone to great lengths to influence national telecommunications policies. Its wholly owned foreign subsidiaries are generally cozy with local governments and work hard at maintaining an image of local control and demeanor.

The worldwide battle for information processing markets has caused IBM's political star to rise higher than ever. The company is apparently viewed by the current administration—and, no doubt, by many Democratic hopefuls—as America's samurai warrior. CIA chief William J. Casey came to IBM's defense in the closing months of the government antitrust trial, stating publicly that "Japan is taking dead aim, through government-subsidized research and government-influenced consolidations, to create more powerful competitors to take on IBM in the world market." Casey then linked the global preeminence of multinationals like IBM to "national security."

Because of IBM's enormous commercial successes over the years, its officers and directors have appealed to successive administrations, Republican and Democratic, as worthy bureaucrats. The revolving door between IBM and government reached peak rpms when Jimmy Carter took office and three IBM directors left the board to join his cabinet: Cyrus Vance as Secretary of State, Harold Brown as Secretary of Defense, and Patricia Harris as Secretary of Health, Education, and Welfare; Harris went on to become Secretary of Housing and Urban Development. In addition, several lower-level posts in the Carter administration went to IBMers and lawyers who had represented IBM, and later, Carter named the retired Thomas Watson Jr. ambassador to the Soviet Union.

Another measure of the industry leader's political clout is simply the number of shareholders it has, currently about 725,000. This number has grown substantially in recent years, as the firm split its stock and made it more attractive to small investors. Some analysts have suggested that one motivation for the split was IBM's desire to gain the kind of grass roots support enjoyed by the widely held AT&T. Since about 3 million people own pieces of AT&T, and IBM is still largely held by institutional investors, the computer giant has a long

way to go toward this goal.

Perhaps nowhere in the world are IBM's political savvy and desires put to the test more than in Western Europe, where it employs 100,000 people, runs some 25 manufacturing plants and R&D labs in nine countries, and generates close to $10 billion in annual revenues. IBM's actions on the Continent have come under close scrutiny lately as the result of a potentially damaging antitrust suit filed against the company 10 years ago by the European Economic Community (EEC). The suit has produced a glimpse of IBM's political clout in Europe and also provides evidence of the company's influence with the U.S. government.

IBM is accused of abusing its dominant position in the European marketplace in violation of Article 86 of the Treaty of Rome. While IBM finally got out from under the U.S. government's 1969 antitrust suit, it has been unsuccessful so far in totally evading the EEC. It has, however, had substantial help from U.S. government officials who have lobbied the Europeans on IBM's behalf. Those efforts are seen by most observers as the most overt political pressure IBM has been able to bring to bear on an opposing party.

IBM in Europe was initially accused of four abusive tactics in its marketing of mainframes. In the early stages of the action, which were overshadowed by the U.S. suit, IBM claimed it did not have to answer the European charges. It threatened to pull many of its assets out of Europe if the EEC went ahead with its case; it discredited EEC experts; and, finally, it got direct help from the Reagan administration.

That help came in the form of a note sent to the EEC by then Secretary of State Alexander Haig, who asked the organization to reconsider its claims against IBM. EEC officials were far from impressed. Massimo Bareato, the European director for National Advanced Systems (NAS) who worked for Memorex in Europe at the time, was at the EEC session when Haig's note was read aloud. "The European representatives were fuming," he recalls. IBM soon realized it had made a major tactical error and pulled in its horns.

Through its lawyer in Washington, Lloyd Cutler, IBM obtained the help of William Baxter, the chief of the Justice Department's antitrust division and the man who dropped the government's 13-year-old antitrust suit against IBM because it was "without merit." Baxter traveled to Europe to meet with EEC officials and ask that the proposed remedy for IBM's alleged abuse of its dominant position be dropped. That remedy, which is still being proposed, calls for IBM to reveal the interface specifications for new hardware at the time of product introduction rather than at first shipment. IBM, of course, is dead set against such a change and has fought it tooth and nail. The company is terribly concerned that early release of such specs would give Japanese and U.S. competitors a new edge in their production of plug-compatible components.

Baxter's European lobbying on behalf of IBM drew strong criticism, especially in light of his having dropped the government suit just weeks before wining and dining EEC officials. In fact, it was revealed by the *Wall Street Journal* that Baxter was reviewing the EEC suit at the same time he was considering dropping the U.S. suit. Nothing wrong with that, Baxter said, claiming he was not so concerned with the merits of the EEC suit as with the proposed remedy, which he and other high Reagan administration officials thought was too damaging to the company's world position.

Most of IBM's politicking in Europe, however, is at the national level. The strategies of IBM U.K. are a good example of the firm's quest for local political leverage. A current advertising campaign stresses the fact that IBM has two factories in Britain and employs 15,000 people there. These statistics are highly topical, given the country's 3 million unemployed and the Thatcher government's emphasis on stimulating the manufacturing sector.

Though IBM U.K. has traditionally promoted itself as a local, the company is now trying to turn its U.S. pedigree to advantage. "IBM. As British as Brunel?" asks a recent advertisement, referring to the famous engineer who put the "Great" in Great Britain during the industrial revolution. Brunel actually was the son of French parents, the ad points out. It goes on to explain: "You don't have to have British parents to contribute to Britain."

In France, IBM ads make great play of the company's 21,000-person employment roster there, and the fact that IBM has two French research centers and four manufacturing plants. Moreover, the ads claim, IBM is France's fifth largest exporter and one of its largest corporate taxpayers. The campaign seems to have been successful. NAS's Bareato says that in the large mainframe area particularly he has been told by the French government purchasing body that they "have received instructions not to buy from NAS but to buy from IBM."

It may also help that the French government's head of planning, Jean Le Garrec, was with IBM for 26 years before joining the government. Similarly, in Britain, IBM U.K. has appointed Lord Chalfont to its board. He was one of IBM's main political supporters during the bidding for a massive contract to automate the country's tax system in 1980. British computer maker ICL eventually won that contract, but not without strong objections from IBM about U.K.-owned companies benefiting from government patronage in Britain.

The contract for the tax system was in fact awarded just before the international General Agreement on Trade and Tariffs (GATT) regulations limiting national procurement policies came into effect in January 1981. Since then IBM U.K. has also caused a stir by taking one of the country's water authorities—Severn Trent—to court over an award of a major contract to ICL.

Moves such as these are perhaps intended to embarrass as much as reopen bidding; IBM eventually dropped the Severn Trent case once the publicity had done its work. "If IBM gets a chance to lobby and there is something to bitch about, then it will bitch about it," says Al Dunn, head of CIS Communications, a European consultancy.

On the Continent, much of IBM's current politicking is aimed at PTTs, the authorities that govern telecommunications networks within each country. These organizations, which all have monopoly status, are regarded by IBM as crucial to its continued success in Europe. IBM has been involved recently in obtaining a license from British Telecom to set up a value-added network service in the U.K.; developing an experimental telephone directory assistance system in the Paris region for the French Posts and Telecommunications Ministry; and working on a national videotex system for the West German government.

Apparently, IBM will use whatever forces it can to push the PTTs its own way. For example, in Germany, where an approval for a "foreign" telephone switch is the envy of the industry, IBM is reported to have virtually given away several 3750 PBX telephone switches to large German users. These users were then encouraged to put pressure on the Bundespost to approve the system for connection into the public network. The approval was obtained, by whatever means.

Industry reports circulating in Europe recently indicate that IBM has convinced several PTTs to adopt its SNA for their national datanets. If only one PTT supports SNA, it would be a major coup for IBM as it pushes hard in the telecom market.

Even in Australia, where IBM's market share is smaller than in most other countries, the company has had strong influence on policy making. As described in *The Phone Book* (Penguin, 1983), Ian Reinecke and Julianne Schultz's investigation of that country's moves towards deregulation of telecommunications, IBM Australia sales executive and board member Peter Holmes a'Court led a $2 million corporate lobbying effort that favored the dismantling of state-owned Telecom Australia's monopoly. According to the book, IBM in 1980 joined 11 other corporations in recommending that "enhanced," high-growth services be turned over to the private sector. It remains to be seen, however, if that policy, which was finally approved by a top government commission, will be carried out under the new Labor government.

—John W. Verity and Paul Tate

For all practical purposes, CDC and NCR are out of the mainframe business.

For all practical purposes, CDC and NCR are out of the mainframe business. Recent financial reports tell DEC's story (profits for the first three quarters of 1983 were down 37% from a year earlier). There is no need to mention (sob) Osborne or Itel. Strong competition does exist in some of the services areas, particularly remote processing (GEISCO and CDC), in leasing (Comdisco), in pure processing (ADP), and facilities management (EDS).

Lurking in the wings is one major competitor, maybe. The currently confused communications giant, AT&T, has the latent power to give IBM a go in many markets. But AT&T seems to have its hands full trying to explain things like access fees and bypass. The firm's hardest job is understanding this new world in which it finds itself. What is this marketing anyhow? Do we really have to produce products for a five-year life cycle and not 40 years? Do we, AT&T, have to price the product ourselves without a friendly public utility commission to guarantee a profit?

AT&T has the technology to compete, but it doesn't yet have the structure, the financing, the understanding of the marketplace, or the sales force to even bother IBM. The war between the giants, predicted for years in the trade press, is a very unequal contest. AT&T will soon find customers don't come to you just because your machine is a microsecond faster.

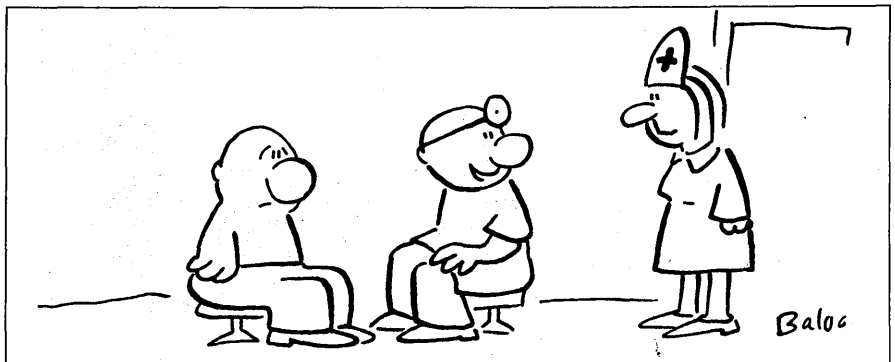
The last remaining big threat to IBM comes from Japan, a nation with gifted producers of high-volume, low-price products. Isn't that just what the computer business is becoming? For the moment, the pressure coming from Hitachi has been relieved; IBM is now empowered to look closely at everything it does. Fujitsu, which beats IBM in the Japanese home market, is facing heavy pressure there as IBM attacks on all fronts with joint ventures and products designed specifically for Japan. This is a short-term tactical war, and IBM has a good chance at winning. Finally there is Nippon Electric (NEC), which is seemingly about to give IBM some problems in the U.S. as it gradually takes over Honeywell's large systems marketing and support. Honeywell hasn't been a big factor in the mainframe business. It could become one with NEC's machines if it ever figures how to migrate the existing IBM base into a different architecture.

IBM's competition is weak and scattered. But IBM takes its competition seriously and regards losses, rare as they are, as major disasters for which somebody must pay. When orders are lost, marketing types suffer. It keeps the salespeople on their toes.

IBM is starting to change and spread into other business areas. Quietly, it is exploring scientific instrumentation. It's not a lot of money, but Hewlett-Packard stays very nervous. If you don't like IBM's P.C. line, there's another IBM personal computer based on Motorola M-68000 technology, sitting and waiting for you. (Incidentally, it can run some of DEC's PDP-11 programs.) There's also robotics, a field in which IBM has a natural advantage because it's one of the world's most efficient manufacturing firms.

What is herein demonstrated is IBM's newfound capacity for a quick move. IBM's reaction time had been slipping. The company was getting too big, too sluggish, too bureaucratic to compete in rapidly changing markets. The solution? Independent Business Units (IBUs) and Special Business Units (SBUs). These are small, operate almost totally independently, and are geared for these new businesses. Incidentally, the P.C. program came up from an SBU.

The IBU/SBU approach is evidence that IBM's management is not hidebound or tied to the solutions of the past. For a company that prided itself on a certain uniformity of view and attitude, worldwide and at all levels, to create autonomous units is a step worthy of study at the Harvard Business School. It does not augur well for the competition because it means IBM is able to respond quickly with products and services appropriate to special markets.



"Bring me Mr. Dunwood's medical file. It's the gold-embossed one bound in calfskin."

CARTOON BY REX F. MAY

The old IBM, the post–World War II company, is almost a thing of the past. The people who predate the computer era have all retired, or are on the verge of retiring. Today's IBM is managed by veterans of the Korean conflict. It's a break with the past. There are plenty of IBM managers at comparatively high levels who never knew Tom Watson Jr., and hardly any still active who knew Tom Senior, the founder. Some have died, others are in well-earned retirement. The Watson men—Spike Beitzel, Ralph Pfeiffer, Cap Cassani, Jacques Maison-rouge, Buck Rodgers, Bob Evans—are just about finished. At IBM, the retirement age is 60, and none of these men will be around much longer.

In power now are men such as Opel, Rizzo, Akers, and Krowe, a younger group that came to the fore after the computer decisions were made. Objectively, the new team has performed just as well as its predecessor, perhaps even better. Subjectively, it isn't as much fun anymore. Where is today's Vin Learson, whose normal tone of voice was a roar? Where is the "best-dressed man in IBM" to succeed Buck Rodgers? Is there a cultured, worldly-wise European who will replace Maison-rouge?

NEW GROUP FITS THE IBM MOLD

The new management is IBM to the core. They wear the blue suits and white shirts still in favor at Armonk. In a group portrait, there is an odd look-alike quality to these new managers: young, handsome, slim, neat, and tidy. The diversity of the past has given way to today's cookie-cutter look. The system works.

If the men have changed, and feminists will note they all are men in spite of an aggressive policy of seeking out capable female employees, what else is new?

The press policy hasn't changed much. IBM still wants to manage news about IBM, control the inquiries of reporters, channel and close off any questions to which the answers haven't been predetermined.

The policy toward consultants has improved 1,000%. Any consultant who needs a manual, a price, an availability decision can get a quick answer through a local contact. IBM understands now that consultants aren't their enemies but indeed help to sell IBM equipment—and they don't even charge a commission.

Advertising policy is new. Once upon a time, IBM hardly ever bothered to advertise anything. Now the little tramp dominates television screens, and hardly a day goes by without an IBM ad, usually full page, in the *Wall Street Journal*. Every business magazine is full of IBM ads proclaiming the virtues of the corporation at all levels. The company even has an ongoing campaign to squelch the

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The diversity of the past has given way to IBM's cookie-cutter look of today.

long cherished nonsense that IBM never invents any technology. To see these ads, you must read technical magazines. IBM doesn't want to bother business buyers with such nasty words as FORTRAN, relational database, or density of storage on magnetic media.

Through it all, the basic policy of being competitive all the time hasn't changed. The target and objectives remain as always: get the business, keep the business, keep the competitors a bit starved. Faces change and individuals retire, but the big blue machine rolls along. The transition from Frank Cary to John Opel was positively placid.

So IBM today is a company transforming itself while continuing to keep its businesses rolling along. This is not an easy feat, but to date it seems to have managed it well.

The old IBM was mainframe dominated, constantly being sued, apparently not interested in smaller sales, and almost monolithic in attitudes. Today's IBM sees the mainframe as the way to connect devices and keep everything together. It sues other people, cares about small systems and one-time sales, and seemingly has many faces.

UP THERE WITH THE LEADERS

In raw technology, today's IBM is doing very well. While numerous competitors always claim IBM lags, by and large IBM is right up there with the leaders. Trilogy's wafer scale integration may be impressive, but IBM gets out more memory for less money than anybody else, has a chip capacity the envy of Silicon Valley, and leads in revolving memories by a wide margin. In programming technology, IBM is certainly no worse off than anybody else.

To strengthen internal weaknesses, IBM is today willing to buy technology. Need a microprocessor for a personal computer? Go to Intel. Need a printer? Epson will supply one. This is new and shows a maturity and understanding sometimes lacking in the past. Want to stay on top of technology? Buy a piece of Intel and Mitel. Didn't work? Swap Mitel for Rolm. Need advanced circuitry for the '90s? Invest $200 million in Josephson junction research. Didn't work? Kill the project and concentrate on gallium arsenide and conventional semiconductors.

If the quest for technology continues apace, so, too, does IBM's effort to keep control of the key accounts in the key markets. The major banks, the big insurance companies, the airlines, all have IBM over them like the proverbial blanket. It hasn't changed a bit. The IBM account team is there every day, smiling a lot and seeking out new opportunities, encouraging end users to "need" new application systems, and educating the uninformed about computing, IBM-style.

Most recently, IBM has taken an inspired approach to the problem of microcomputer proliferation: on one hand, install a great many IBM Personal Computers (especially the new 3270 P.C. variety) to satisfy the immediate user demands; on the other, create the "Information Center," a thinly disguised bait-and-switch operation permitting the dp manager to deflect some of the user pressure for standalone microcomputing by making friendly gestures with prototype systems and equipment.

Finally, it must be noted that today's IBM isn't being sued by a score of companies and governments. Today, IBM does the suing. Of all the legal issues of the '70s, only the EEC matter remains open and it is, of course, a political rather than legal case. The EEC bureaucrats seem to think IBM is merely going to roll over and accept their vague notions of how computing in Europe might be structured if the European computer manufacturers were as smart, tough, and competitive as IBM. One suspects that no matter what IBM is "forced" to do, the competition will not benefit. IBM will still find a way to prosper.

Whom does IBM sue these days? Anybody who tries to lift technology, marketing plans, trade secrets, or anything else of value. Ask Hitachi how tough IBM can be when it feels wounded. The next target is National Advanced Systems. What becomes clear is the idea that in this new IBM, nobody is going to walk out with a file cabinet full of product plans.

The IBM of the mid- and late '80s will be a rich, prosperous company, still driven by the fear of losing an account. How rich? About five years ago, Gideon Gartner predicted IBM would reach $45 billion in 1984. He was conservative and never projected the explosion of business in the 1982–1983 period. If we take 1983's estimate of $41 billion and project it out five years at a mere 15% annual growth, we come up with the startling figure for 1988 of revenues of $82 billion. Taking a more optimistic 18%, it comes to $94 billion.

The problem with the prediction is the assumption of today's revenue pattern, when in fact the product mix is changing. For each 100 IBM Personal Computers installed at a company, there is a need for an additional mainframe computer of the 4341 class merely to store data and support the communications. There is a built-in doubling effect that cannot be safely predicted.

One point on which all the experts agree: the IBM of the near future will be built on two basic architectural approaches. The big machines, the 360-370-4300-308(X) line, will remain as the architectural standard. While IBM will juggle things here and there, in 1988 there will still be COBOL programs running that were first born on the 360/50. Secondly, the P.C. family will remain and spread to larger (and possibly smaller) systems. Today, the line contains PCjr, P.C., P.C. XT, 3270 P.C., and XT/370. Tomorrow, who knows?

It is already crystal clear that other architectures, no matter how good, have no chance of cracking the IBM world. The Japanese fifth generation may sound good on paper, but corporate buyers will wonder how to get the cash posted and the paychecks written. If these new panaceas don't stay IBM architecture–compatible, they haven't a chance.

THE MORE THINGS CHANGE . . .

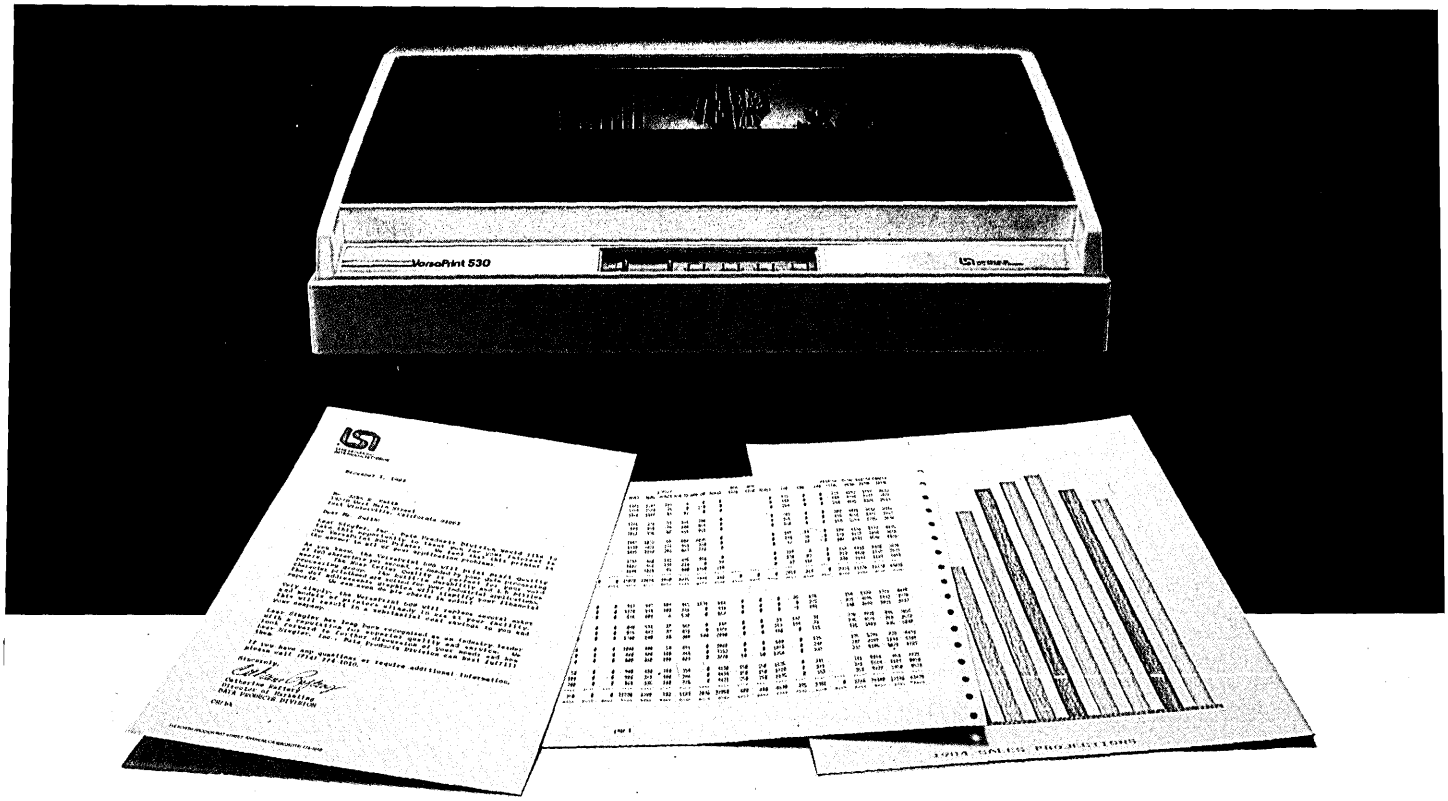
IBM both changes and doesn't change. Objectives remain the same year after year; day-to-day tactics vary only in the detail. The IBM sales force still swarms the major customers with an easy answer to every problem, real or apparent.

The faces change. Young, freshly hatched marketing people grow up and become branch managers. A Cary retires. An Opel appears. But nothing really changes. The long blue line moves on, the gaps are filled smoothly.

The customer base changes. The generation of dp managers who grew up with IBM, who once punched cards and wired the long-forgotten plugboards, are retired. New corporate managers appear, people from the post-360 era who hardly remember Burroughs or NCR. These are executives who care not about machines or architectures but about getting the work out the door. They aren't about to toss out IBM gear unless there is a hard cash price/performance advantage at no out-of-pocket cost. If a proposal requires conversion from IBM, forget it.

IBM does indeed work, maybe even well enough so that perhaps, by 1988, there will be no DATAMATION 100, just a DATAMATION 1. But as big and powerful as IBM may be, there are still gaps and opportunities. There is room for Compaq, Tandem, and TeleVideo. They've got to be smart, fast-moving, and willing to play the game according to IBM rules. But, if the ego isn't too big, IBM still leaves enough room for these suppliers to live long and prosper. IBM may want it all but hardly expects to get it. IBM is willing to share the wealth with those who aren't too greedy. But woe unto those who attack IBM head on in market areas IBM considers its own, and Chapter XI to any company brash enough to think being better is enough. It never was that way. It never will be. ❋

Philip H. Dorn is a New York–based consultant and a DATAMATION advisor.



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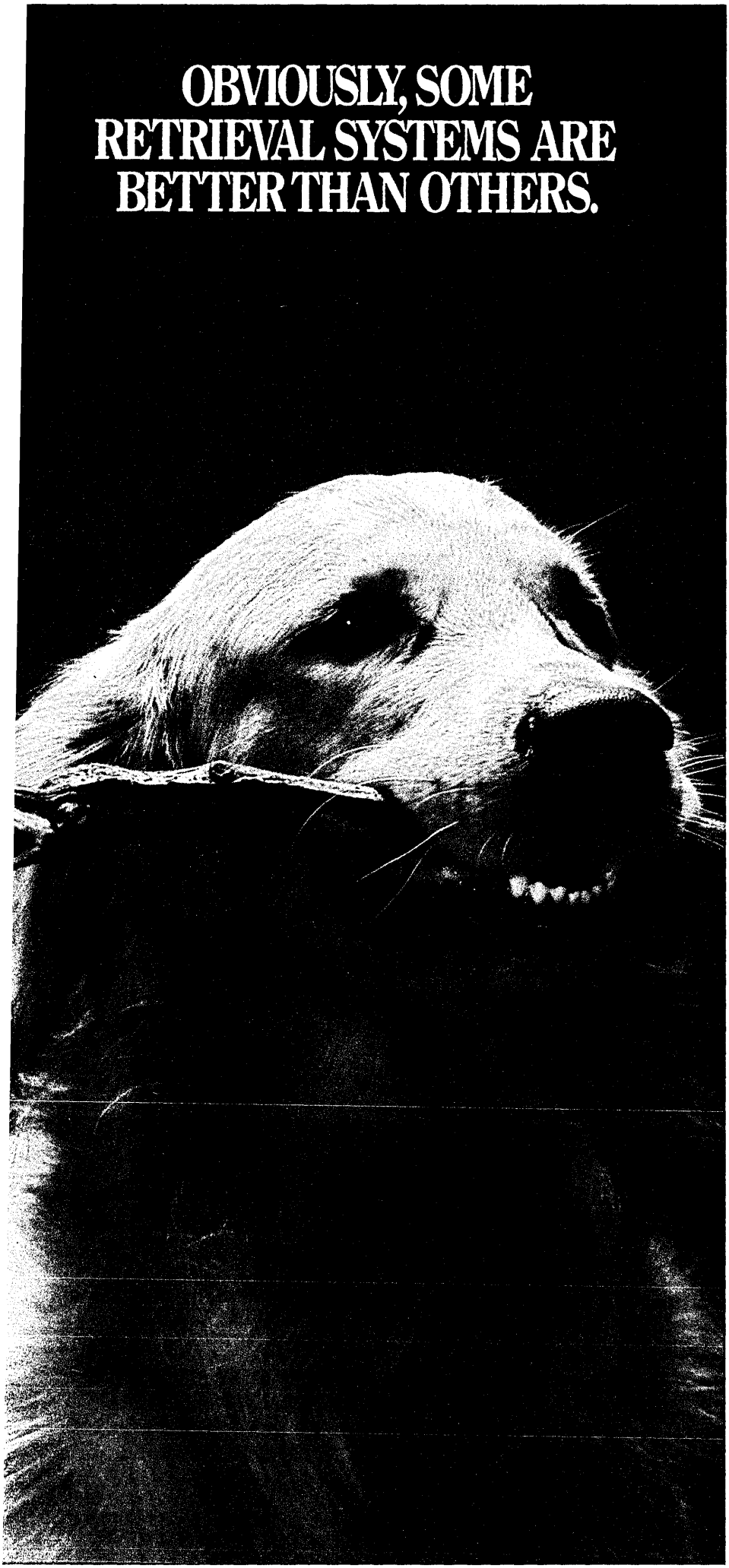

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CIRCLE 69 ON READER CARD

In the fight to put processing power on desktops, IBM appears to be its own main rival.

BATTLE OF THE BABY BLUE BOXES

by Michael Tyler

The battle for the desktop is already over, and yet it has hardly even begun. It has been just over two years since the first IBM Personal Computers started rolling off the assembly lines in Boca Raton, Fla., and only a half dozen years since Apples began growing with beige plastic rinds instead of red, edible skins. Two hundred companies have declared their intentions to enter the personal computer sweepstakes in corporate America, and no wonder: industry shipments, about 2 million units last year, are expected to reach 5.5 million units by next year, according to the Yankee Group, a market research firm in Boston.

Yet such growth is almost an anticlimax for many industry observers, who saw IBM's rapid success in the new market as the death knell for many vendors and a sure sign that the personal computer marketplace was about to become another area of routine IBM domination. A study by Cowen & Co. indicates that IBM will capture some 51% of all new corporate buyers of personal computers, and that some 56% of all large dp shops have standardized on the IBM P.C. for end-user computing. Analysts expect IBM to pump some 2 million P.C.-based products into the marketplace this year—and that leaves precious little room for others.

Hence, say the experts, the battle is already over; if you don't make a computer that is compatible with the IBM P.C. with some significant price or performance advantage, you're going to be dead very soon. Such an analysis, however, ignores what may turn out to be the more significant battle: IBM vs. IBM. The stunning success of the company's P.C. caught IBM itself by surprise and left it with some marketing dilemmas that could open the way for other vendors to score big gains.

When the P.C. was introduced, IBM's intent was clear: this was primarily a home computer. Although it used a 16-bit microprocessor, it was sold through retail channels and supported many games packages. Business uses were incidental—after all, IBM had its huge installed base to protect. Corporate users were humming away in 3270 networks, on Displaywriter word processors, on System/23 Datamaster micros, and on System/34 minicomputers. All of these lines could be affected by the influx of personal computers into the office. Nonetheless, businessmen began streaming through Macy's and Sears and bringing thousands of P.C.s into offices; the influx has been so vast that some observers predict that there will be more processing power, as measured in millions of instructions per second, on office desks than in computer rooms by 1986.

Therein lies the crux of IBM's problem: how do you simultaneously enter and dominate an emerging personal computer marketplace without dismembering overlapping markets? The problem is compounded by IBM's ability to ship 3270 terminals in large quantities at virtually no cost and with high margins, while the P.C.-based products provide thinner margins at present.

Up to now, IBM has approached the problem by providing a slew of products—both from the Communications Products Division in Raleigh, N.C., which makes 3270 products, and from the Entry Systems Division in Boca Raton, Fla., which makes P.C. products. The strategy, essentially, is to provide a different piece of hardware for every need, locking out many competitive niches.

On the 3270 side, there is the 3178 dumb terminal, which one IBM salesman classifies as "disposable. If it breaks, just throw it away." Somewhat more advanced are the traditional 3278 monochrome and 3279 color terminals, which historically have been IBM's key synchronous terminals. Some 1.5 million IBM 3278 or 3279 terminals are currently installed, says Kenneth G. Bosomworth, president of International Resource Development, a market research firm in Norwalk, Conn. Then there is the 3270 Personal Computing Attachment, an add-on to the 3278 or 3279 that provides P.C. capabilities. The product was originally conceived as IBM's answer to the micro-mainframe link question, but company sources privately admit that the product is an awkward solution at best and is only likely to be sold into current 3270 installations with no plans to buy new terminals.

AND THEN CAME THE 3270 P.C.

Finally, there is the 3270 Personal Computer, introduced last October. IBM is marketing this unit as the next generation 3270 terminal, predicting that it will eventually replace all 3278s and 3279s. It allows users to access four concurrent VM or MVS sessions and run standalone applications simultaneously, using a windowing architecture.

The Entry Systems Division in Florida has been no less productive in the past year, having brought forth the P.C. XT, the XT/370, and the PCjr. The P.C. is currently being sold to users who expect that they will never need to talk to a mainframe via a 3270-type link. The P.C. XT, a salesman notes, is only for P.C. users who are too lazy to load diskettes and have no need to talk to a host. IBM sources would like to convince prospective purchasers of either the P.C. or the P.C. XT to buy the 3270 P.C. in its place.

The XT/370 is IBM's personal computer for the dp shop. Because it can run VM applications by itself, it's suitable for program development, dp management, and other computer room activities, but not for end-user computing. It provides half the processing power of a 4331 model Group 1 computer, enough to whet the appetite of any VM aficionado.

At the low end, the Boca Raton organization recently unveiled the PCjr, which has several artificial constraints built in to prevent it from displacing the original P.C. As was the case with the original, IBM is targeting the unit at the home market but may find significant numbers flowing into business environments through both direct and retail channels.

The Entry Systems Division also produces and sells several desktop and small business systems it inherited from the General Systems Division; these include the Datamaster, the Displaywriter, the 5520 information distributor, and the 5280 data entry equipment. These are essentially incompatible with each other and with both the 3270 and P.C. lines; IBM is selling them primarily through vertical markets.

If you ask IBM, you'll find a computer for every need and a need for every computer.

If you ask IBM, then, you'll find a computer for every need and a need for every computer. "IBM has a clear strategy of product segmentation," notes Peter Labé, an analyst with Smith Barney in New York. "Over the intermediate term IBM is not going to merge any of these small systems. They continue to segregate primarily word processing from primarily personal computing from primarily terminal from primarily whatever. I see no reason to believe this strategy will be altered for some time."

Others disagree. Frank Gens, an analyst with the Yankee Group, believes "IBM has been following a bifurcated strategy, splitting its traditional product lines into a low-end, low-cost product and a high-end product. The low-end products are essentially dumb terminals, each of which supports only one protocol. But all of the high-end products eventually will be based on the Personal Computer. There's no question that there will be a convergence of all of the high-end terminal products, using the P.C. as a base and adding to it."

Either way, it is clear that IBM recognizes the fortune to be made in the desktop computer business and is putting into place many of the pieces needed to conquer it. The 3270 P.C. is seen as a key product because it replaces 3270 and personal computer products. "Personal computers will be brought into the mainstream of the IBM product line, and the [3270 P.C.] spells the beginning of the end for IBM's aging 3270 terminals," says Bob Djurdjevic, editor of the *Annex Computer Report* newsletter.

Bosomworth of IRD notes, "It is a computer, communications card, and software offering sold in one lump as a solution to the MIS director's problem of linking micros to mainframes. It's one machine where others must provide patchwork solutions." Yet he adds that the machine probably will not completely displace the 3270 terminals despite IBM's intentions. "IBM will probably follow a multiproduct strategy, beginning with a low-end line of terminals and moving all the way up beyond the 3270 P.C."

3178s BY THE ZILLION

Smith Barney's Labé goes even further, saying, "I don't think IBM will sell very many 3270 P.C.s. If you need a terminal, you'll buy a 3178 for $1,500; are you really going to pay $8,000 apiece so that every clerk or office worker can have PC capabilities? Instead of selling 3270 P.C.s, IBM will wind up selling 3178s by the million billion."

Esther Dyson, the editor of the *RELease 1.0* industry newsletter, agrees that buying droves of 3270 P.C.s would be illogical, but sees it happening anyway: "How many executives really need a 3270 on their desks? Probably not too many. But with the 3270 P.C. pushed by IBM, the software to make it into a useful end-user machine will appear, the installed base will grow, evoking further software efforts and greater usefulness."

According to Dyson, the most significant aspect of the 3270 P.C.—and the XT/370—is the fervor with which IBM is pursuing large corporate accounts. "Both these machines give added weight to the role of the P.C. in the big-business market and attest to IBM's continued efforts to drag this once-orphan item into the corporate mainstream," she says. The two products are IBM's first personal computers to be marketed exclusively through the firm's direct sales force; all previous products had substantial retail distribution. "Retailers are left in the cold by this move," she says.

Some retailers, such as Anthony P. Morris of Morris Decision Systems in New York City, say they don't expect to be hurt by the new distribution channels. "The 3270 P.C. to me is more of a terminal than a PC," Morris says, "and retailers have never sold many terminals." The XT/370, he adds, is essentially a vertical market machine intended strictly for dp professionals, to whom retailers have seldom sold.

Other retailers, however, are less sanguine about the implications of IBM's marketing decisions. "A lot of retailers are resentful, because they've spent a lot of time and effort developing a direct sales force into those companies, and now their best ticket is taken away from them," says James Hopkins, president of Lantech Systems Inc., a Dallas third-party software developer.

Juan Espada, president of Omnitech Systems Corp., a New York City retailing and consulting firm, says, "I'm alarmed and concerned about this trend. The end user wants to run Lotus 1-2-3 or dBASE II and every now and then access a corporate database. IBM now lets you do that from the same box, but retailers can't sell that box. How can they compete?" Espada notes that 50% of many retailers' revenues come from IBM products or from aftermarket sales, "and if he can't get the first sale, how can he even stick around?"

It may seem ironic, then, that the end user—in payroll or strategic planning or inventory control, but not in data processing—has long been perceived by IBM as the important decision maker in purchasing microcomputers. This perception is certainly justified in light of the swarms of PCs that have been bought by individuals within corporations bypassing their MIS departments. In fact, however, it makes sense that IBM is shifting to direct sales to MIS departments, and it ties in with the company's advertising and marketing plans. As Labé notes, "There was not a glaring or latent customer demand for personal computing, but rather there was a product available for which demand had to be generated." IBM's use of Charlie Chaplin images and its initial emphasis on retail distribution were designed, he says, to convince new computer users to buy IBM P.C.s and to buy them individually instead of through the dp department.

Now that the personal computer market has been well established, however, "IBM won't long be content to leave the increasingly lucrative Fortune 10× market in the hands of retailers," Dyson says. She believes that IBM is now moving to reassert control in its traditional province, the MIS department, by playing off the department's desire to control the influx of personal computers. Says Djurdjevic, "IBM went subtly over the head of the dp function, yet gave it a chance to save face in the end."

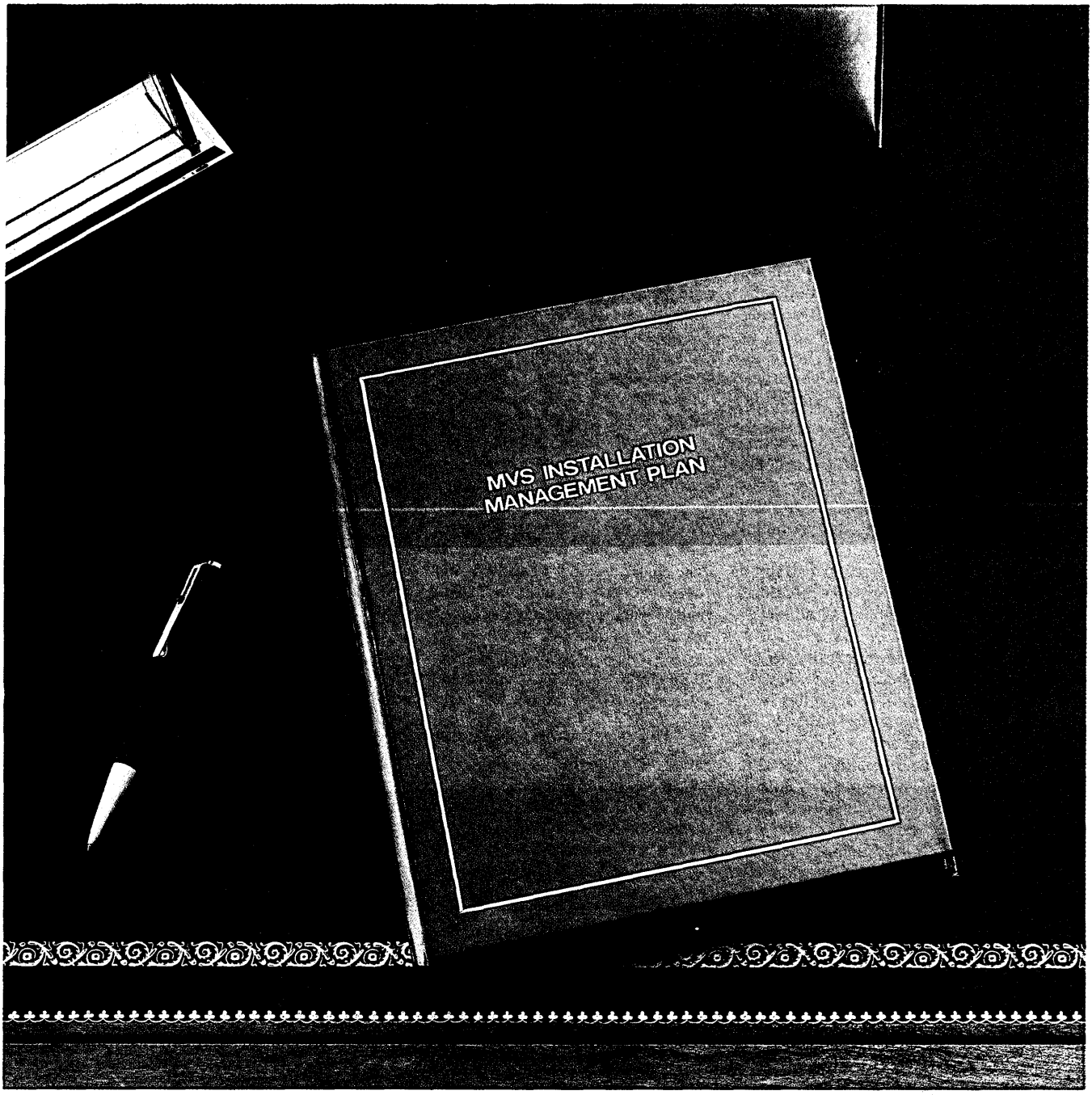
MOTIVES BEYOND ALTRUISM

IBM's motives go far beyond altruism, however; by selling personal computers—especially the 3270 P.C. and the XT/370—to large companies via its direct sales force, it increases the demand for IBM mainframes. "It's sort of paradoxical," the Yankee Group's Gens admits. "But the more micros you have, the more they will eventually need to be networked together, and networked to the corporate databases. You can't have other PCs controlling this complex network; it will always be controlled by very large mainframes. IBM is quite anxious to disseminate all the P.C.s it can into corporate environments, because that will create a grass roots demand for mainframes."

Moreover, if a dp department purchases a thousand or so IBM P.C.s, it becomes more likely to choose IBM the next time it needs a mainframe. Indeed, the Cowen & Co. study found that 58% of IBM mainframe users had standardized on the IBM P.C. if they had standardized at all, compared to 36% of users of non-IBM mainframes. And while personal computers will generate roughly $3 billion in revenues for IBM this year, that still hardly compares with the billions more it will claim from mainframe sales.

Espada warns that IBM's product and distribution moves, in catering to the MIS department, are harbingers of more drastic measures. "The P.C. and the P.C. XT won't be around in two years, and the new products to replace them may only be sold directly. The dealer will be totally eliminated."

And so, it would seem, will be most of IBM's personal computer competition: most PC manufacturers are far too small to



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CIRCLE 63 ON READER CARD

"IBM went subtly over the head of the dp function, yet gave it a chance to save face in the end."

mount any kind of direct sales effort and must of necessity go through dealer channels. Yet if the personal computer is bought in the boardroom rather than in the storefront, where does that leave the competition? Says Labé of Smith Barney, "The PC business by itself can probably support up to five main-line players. Surrounding this will be some of the people for whom the PC is more incremental, and some specialty or niche participants. More than 100 third-tier players are losers over the long term."

If there is so little room as a main-line player, however, there is significant room in the niche markets, Labé notes. "Competitors can offer small business systems, or IBM compatibility with something extra, or multi-function workstations. They can even slap together a 68000 micro with Unix and sell it in the minicomputer market, since IBM didn't give its P.C. any mini capabilities lest it interfere with the System/34/36 market."

Lantech's Hopkins has seized on the idea of using a P.C.-compatible micro, a board such as the Irma 3278 emulator from Digital Communications Associates in Atlanta, and adding proprietary networking software to fulfill the same functions as a 3270 P.C. but with added functionality. Such a product could conceivably allow users to integrate the Unix operating system into P.C. environments, with PC/DOS running in emulation. "While we haven't signed any contracts on such a system, we could provide one and sell it through dealers, giving them an inroad into the corporate environment," he says.

Similarly, Forte Data Systems of Santa Clara, Calif., provides a hardware/software package for the IBM P.C. that allows it to communicate in 3270 networks. Unlike the IBM products, it allows micro-to-mainframe connections to be controlled from within the PC/DOS operating system, by using a hypothetical Drive V—the mainframe acts as a virtual hard disk for file transfer applications.

North Star Computer, in San Leandro, Calif., saw IBM's lack of a multi-user capability in its P.C. line as its starting point; it recently announced a 12-user microcomputer that offers IBM P.C. compatibility, a local area network operating at bus speeds, and the ability to emulate a 3274 controller. And Tandy's TRS-80 model 2000 aims to provide significantly faster performance in a compatible machine for a similar price.

STRIKING AT WEAK SPOTS

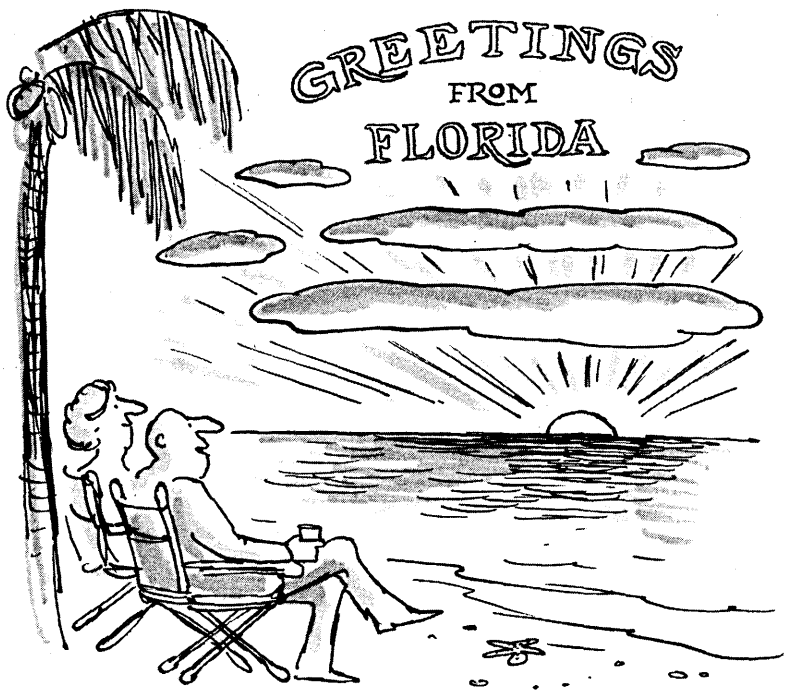
Other vendors have struck at other weaknesses in the IBM product line, such as telephone/terminal combinations and supermicrocomputers. Still others are selling turnkey vertical market systems based on the IBM P.C. The successful competitors share both the acceptance of the IBM P.C. and the MS/DOS operating system as dominant, standard products and the goal of providing a product for a niche left open by the P.C. "Competitors cannot be intimidated or paralyzed by an IBM announcement," says Thomas Meadows, vp of BPI Systems, a third-party software developer in Austin, Texas. "They need clear focus and a plan that is sensitive to IBM's market position."

The same is true for competitors in the terminals business. IBM controls about 50% of the 3270 terminal market, IRD's Bosomworth notes, and is likely to regain more market share with the advent of the 3270 P.C., the first intelligent 3270 terminal available. But Labé says that no significant changes are likely to take place in the terminal market. "Terminal manufacturers have a clear-cut charter, since the 3270 P.C. in effect dictates the standards in the huge IBM terminal market. Competitors in this market now will have to offer both personal computing and windowing as a minimum."

While competitors find their options limited and rather well-defined at this point, they face the additional obstacle of developing products for today's personal computer or terminal marketplace and finding that they may not be appropriate in tomorrow's environment. Labé of Smith Barney estimates that fully 75% of all microcomputer software development is currently devoted to the IBM P.C.-compatible marketplace, and virtually all of that is for the MS/DOS operating system rather than the CP/M-86 or p-System control programs. Yet the rumor persists that IBM may not maintain its relationship with Microsoft, the Bellevue, Wash., firm that wrote the PC/DOS version of MS/DOS for IBM.

Several reasons for this apparent rift have cropped up. IBM supports languages written by Digital Research, Pacific Grove, Calif., on the 3270 P.C., instead of the Microsoft languages supported on previous P.C. products, says Michael Kane, group marketing manager of Micro Focus, a software developer in Palo Alto, Calif. Hopkins of Lantech points to IBM's conspicuous absence on the list of hardware vendors supporting Microsoft's Windows operating environment and its early support of the competing VisiOn product from VisiCorp, in San Jose, Calif. "It looks like they are going to go their separate ways, Microsoft with Windows and IBM with the 3270 P.C.'s windows and with VisiOn." (Although IBM has not endorsed Microsoft's Windows, the product will run on IBM's personal computers.)

IBM and Microsoft may indeed be diverging in future operating system software releases. Microsoft's next major release of MS/DOS is widely expected to resemble its Xenix product, a Unix look-alike. IBM, however, has historically turned its back on Unix, supporting it only on the IBM Instruments CS 9000 micro and the Series/1 minicomputer.



"Now, there's a sunset, Alice, that's as pretty as a picture postcard."

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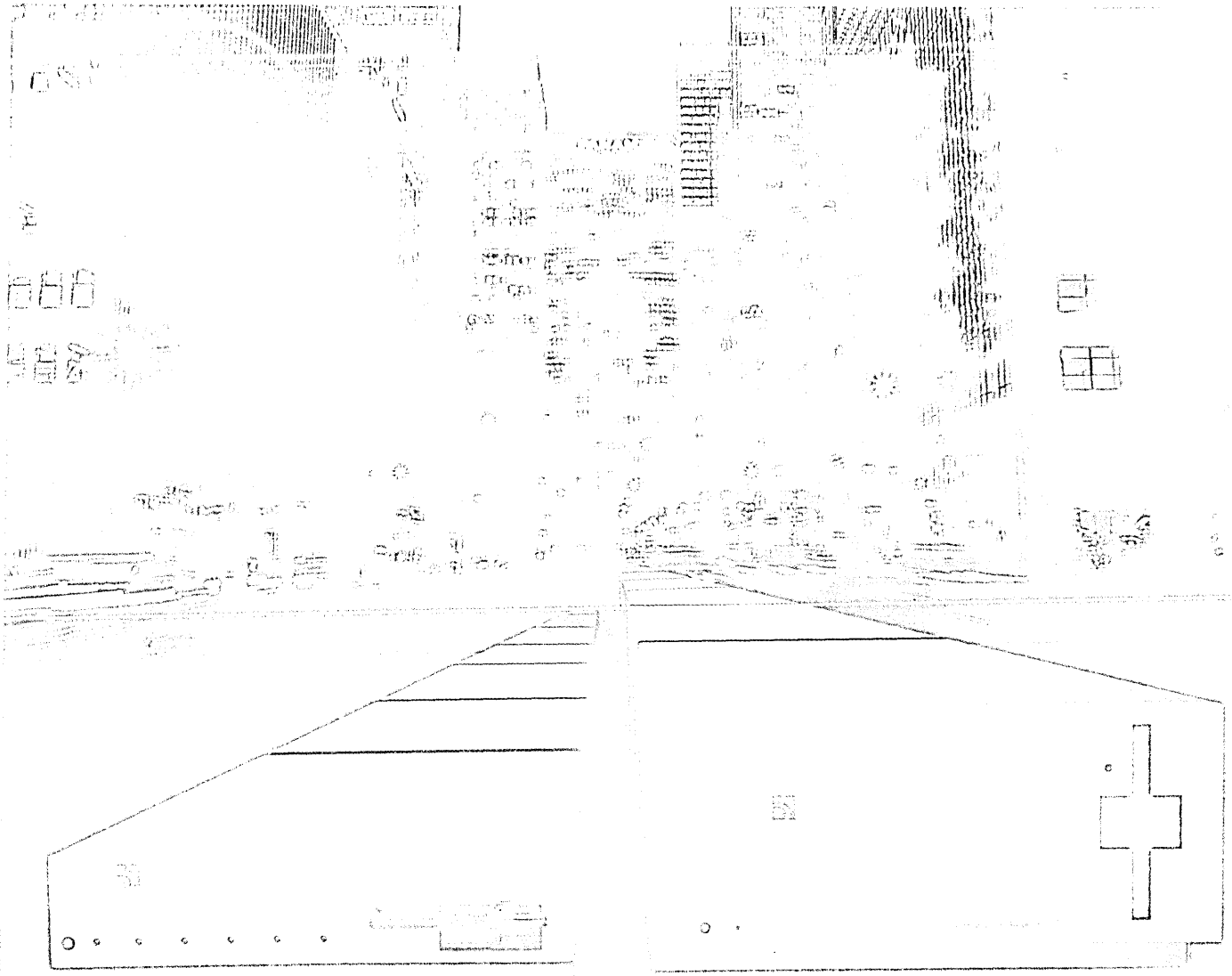

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Seventy-five percent of all micro software development is devoted to the IBM P.C.-compatible market.

Moreover, sources say, IBM may be working internally on its own update of PC/DOS, which may provide a multi-user capability or a local area networking scheme.

STRICTLY ONE-USER MACHINES

Currently, IBM's personal computers are strictly single-user machines, and their only communications capabilities blessed by IBM are ties to mainframes. Both Bosomworth of IRD and Dyson of *RELease 1.0* expect that IBM will soon provide one or several ways of linking personal computers to each other. One such connection might be through a PBX, Bosomworth suggests, since IBM owns 15% of Rolm Corp., a Santa Clara, Calif., PBX supplier. Another network product would follow a token passing architecture much like one described in several papers published by IBM. Several other networking ideas have surfaced throughout the industry as possible IBM products. If IBM does in fact offer several networking products, "Xerox may just as well hand Ethernet right to IBM," Bosomworth says. "Sooner or later, every user will be able to justify choosing an IBM network."

Whichever software or networking paths IBM chooses to follow with its personal computers, it is clear that the company sees the Personal Computer and its derivatives as the flagship products of the Entry Systems Division, on a par with the Communications Products Division's 3270 line. That leaves the Boca Raton group with several incompatible product lines that have uncertain futures. While Smith Barney's Labé sees IBM maintaining the Datamaster for small businesses, the Displaywriter for word processing, and the 5280 family for data entry, the Yankee Group's Gens sees IBM folding them all into one, based on the P.C. "Over the next two years, the Datamaster and the Displaywriter will be replaced by P.C. family products," he says. "The Displaywriter, for example, is software-based, so it is easy for IBM to port the software to the P.C. and then slap in a word processing keyboard. And the P.C. XT is already displacing the Datamaster."

Labé concedes that the Datamaster, an 8-bit micro, is IBM's weakest desktop offering and may be replaced by some new P.C. product. "The Datamaster is not a very good product. It's logical to expect IBM to do away with it at some time, possibly with the (as yet unannounced) Popcorn P.C. upgrade."

Already the industry is rife with unconfirmed reports concerning future P.C. products, mostly on the high end now that the PCjr anchors the low end. IBM has entered into agreements with several universities, including Brown, MIT, and Carnegie-Mellon, regarding the development of such a machine, although it will not say if any of these agreements will eventually yield a marketable product. Nor will it say in which ways these development contracts may improve on the extant P.C. family.

Faced with such a veil over new product directions and the current dominance of IBM Personal Computers, it is not surprising that many analysts—and competitors—have already ceded the personal computer battle to IBM and are now merely waiting for the mop-up operation to begin. But given the conflict within IBM, the volatile nature of the PC market, the growing number of competitive niches open to other players, and the spectacular growth rate of the demand for PCs, the mop-up may be even more interesting and more important than the battle itself. ✱

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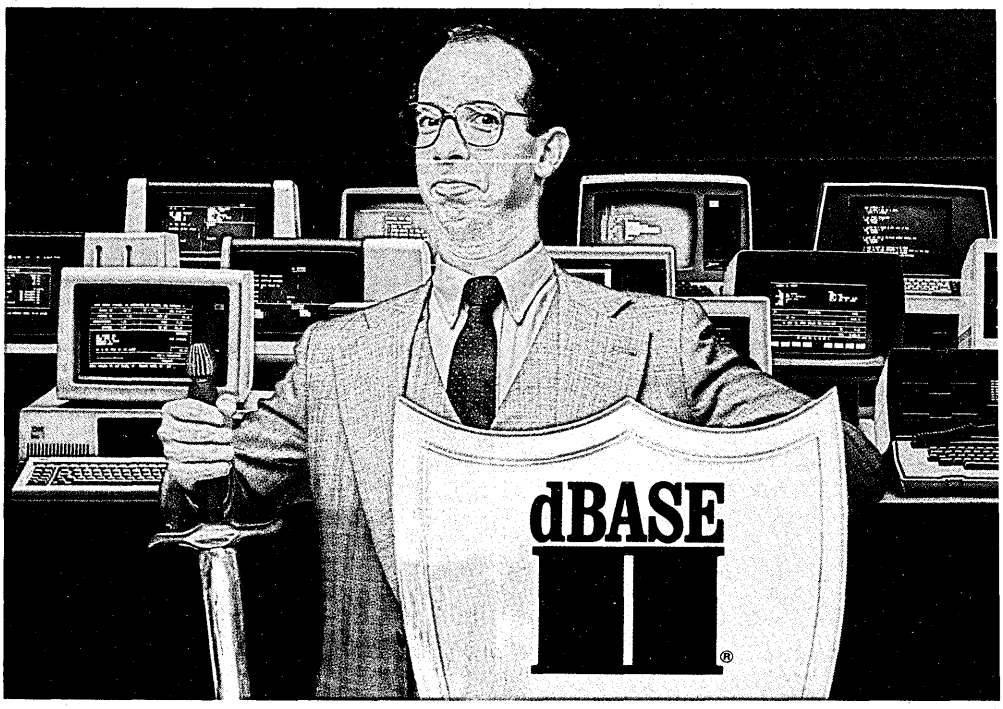

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The long wait for an IBM local network may have a surprise ending: the company appears poised to offer a pair of bright ideas.

IBM'S TWO-LAN PLAN

by Jan Johnson

"It is evident that the introduction of an IBM LAN will likely be, when it comes, the single most important development in the evolution of office systems in this decade."—Gartner Group Office Systems newsletter, Nov. 29, 1983.

Drum roll, as tension builds. The lights come up, and finally IBM steps to center stage and whips the cover off its networking strategy. Surprise! Not one, but two IBM local area network (LAN) schemes are revealed: a token passing ring developed at the company's research laboratories in Zurich, Switzerland, and Research Triangle Park, N.C.; and a CSMA/CD broadband system, compliments of Sytek Inc., Mountain View, Calif., working with IBM's Entry Systems Division, Boca Raton, Fla.

That is the belief of sources at Advanced Office Concepts, Bala Cynwyd, Pa.; Strategic Inc., San Jose, Calif.; International Technology Group, Palo Alto, Calif.; International Resource Development, Norwalk, Conn.; and Architecture Technology, the Minneapolis-based publisher of a newsletter called the *LocalNetter*.

Basing his report on "helpful hints from several large investors" and "conversations" with manufacturers in the network industry, *LocalNetter* editor Ken Thurber suggested in his October 1983 newsletter that there is a "contractual connection" between Sytek and the Boca group. "It is felt that Sytek is working on a PC broadband network for possible oem supply to IBM," says the newsletter. An unveiling is expected sometime between March and May of this year. As of early December, Sytek and IBM would not comment.

The question that immediately comes to mind, of course, is, why the second LAN? The short answer is, to give IBM a wide-area networking capability and a product suitable for multivendor shops. For a longer answer, it's necessary to examine some of the players, and see how the CSMA/CD (carrier sense multiple access/collision detection) scheme came to exist.

Even as late as November, Gartner Group was touting token ring as *the* IBM offering: "IBM's intentions have become indelibly clear," reported the Nov. 29 *Office Systems* newsletter. The article went on to explain and extol the virtues of the token ring, with nary a kind word for the CSMA/CD approach. Most other consultants concurred with this "solution of the decade" theory, primarily because they were watching IBM's National Accounts Division in Raleigh and overlooking the folks who brought you the P.C.—P.D. (Don) Estridge and his Entry Systems Division in Boca Raton. Last fall, however, word of a Sytek-Boca deal drifted through the industry, and the forecasters started to revise their IBM networking predictions.

As a project team that grew into a division in less than two years, the Entry Systems Division stands apart from the traditional IBM culture. The division's product line now includes the P.C. XT, PCjr, Displaywriter, System 23 Datamaster, and the 5520. One of the reasons the division could go so far so fast is the fact that it's free to look around for the best in new technology. Division president Estridge can take an open systems approach to product design; he doesn't have to drag 20 years of IBM history behind him.

That freedom helps to explain why, when faced with doubts about the token ring scheme, the division would link arms with an outside vendor. Like other IBM vendors, Sytek is a leader in its field—CSMA/CD broadband networks. The private company is 51% owned by General Instruments, a leading CATV cable supplier and VLSI chip maker. It isn't clear when the Sytek-Boca deal was struck, but Brian Jeffery, director of research at International Technology Group, believes it may have happened around January 1983.

There were at least two reasons for the Boca group to make this move. First of all, the division lives in the fast lane of desktop computing, and may have been unwilling to pin its future to a token ring scheme that looks to be an extension of IBM's 10-year-old Systems Network Architecture. Given a choice, why not go for something newer, more efficient, more elegant, and potentially less expensive?

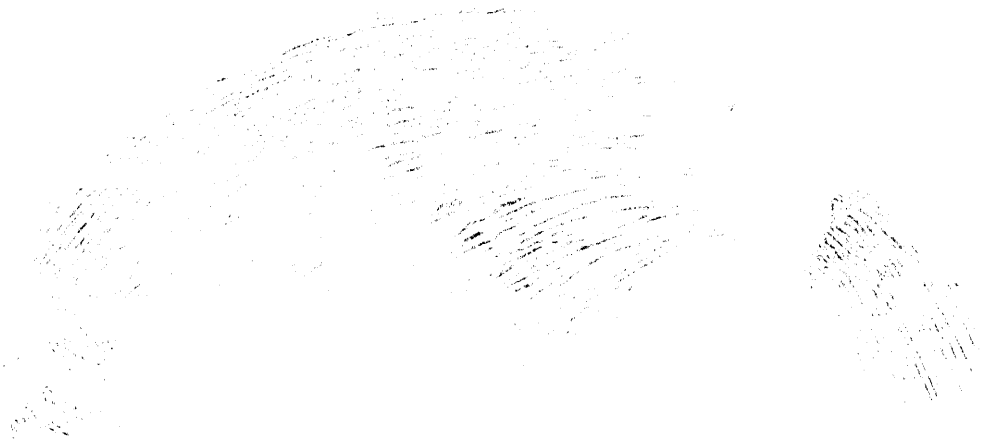
Second, sources say that the token ring project has been riddled with uncertainty and delays. Texas Instruments is known to have hit production snags in getting the token ring interface chip out. "Doing a token ring chip is far more complex than doing CSMA/CD," notes an Intel source. TI has since solved the problems and moved into production, it is believed.

Another story has it that TI was also to build a token ring bridge, a device that connects two or more token rings (see Fig. 1). That project may since have been reassigned to Ungermann-Bass, Santa Clara, Calif., a local network generalist whose products cover the gamut of LAN standards. Thurber at *LocalNetter* reports that UB is also developing a bridge to link a token ring to a broadband bus. "Whether this is an IBM-related development," he writes, "has not as yet been ascertained." UB would not comment on the IBM matter.

AT A DELIRIOUS PACE

In any event, the writing seems to be on the wall: don't look to IBM for a single, surefire networking solution. The company is off in several directions at once, moving at a delirious pace to establish a dominant position in integrated office systems before the dread AT&T onslaught begins. Users who want to make sense of it all will have to contend with the several components of local networking, IBM-style: ESD and its Sytek-based broadband system; Raleigh-Zurich with the token ring twisted pair approach; and the connection of the latter with the PBX world IBM entered when it bought into Rolm.

PHOTOGRAPHS BY STEVE COOPER



Sources say that the token ring project has been riddled with uncertainty and delays.

Let's start with the Rolm relationship. "Buying Rolm was a great move, extremely well suited to the token ring philosophy," observes Gartner Group analyst Bob Fleming. The way he sees it, Rolm's CBX II fits nicely in the token ring scheme. When IBM is ready to make token ring a commercial product—probably in the second quarter of 1984—he expects Rolm to follow with a product enhancement for the CBX II that would allow it to function as a bridge or gateway (or both) on the token ring (see Fig. 1).

There are other, more subtle, strategic advantages to having Rolm on the IBM team, suggest industry consultants. Rolm's installed base, roughly 13,000 customers including a healthy number of small- to medium-sized companies, may or may not be IBM customers. By aligning itself with Rolm, IBM swiftly extends its sphere of influence. A neat strategic move, for he who goes Rolm is potentially locked out from AT&T, or anyone else for that matter.

Modern PBX applications, such as the sophisticated message management system offered by Rolm, require an "application processor." In Rolm's message management system, that application processor happens to be an IBM Series 1. Now, suppose Rolm comes out with more applications to expand the scope of its Cypress desktop terminal, or offers general business applications that also run on the application processor. The original Series 1 is outgrown, and in comes a 4300.

"It's a classic migration game," observes George Pfister, president, Perspective Telecommunications Group, Paramus, N.J. It also puts IBM in a position of control. Through Rolm, IBM has indirect control of a network and devices attached to that network. And it has direct control of the application processor. That Series 1 could easily become a gateway into the IBM world. So who needs DEC, Wang, or even AT&T?

So, the PBX connection is an important piece of IBM's overall local networking strategy. Despite such ancillary developments, however, the long-awaited token ring net remains crucial. This is evidenced by the amount of ink the scheme has gotten in internal IBM journals (see, for example, the September 1983 *IBM Journal of Research and Development*). Quite simply, the token ring appears to be IBM's strategy for protecting its big-system SNA users.

NO LAN FOR ALL REASONS

"IBM, like others, recognizes that separate pieces of equipment performing dedicated functions are not adequate to meet the needs of the future," says Gartner Group's Fleming. While there may not be a LAN for all reasons, many IBM users are looking for a workstation for all reasons. They are frustrated by keyboard overload. There is a Displaywriter for word processing, a 3270 for data entry and access to the corporate database, and a Personal Computer and a VT 100 for access to all those applications the MIS shop couldn't get to. If IBM doesn't come in and clean up this carnival of keyboards, maybe AT&T and some incarnation of Net 1000 will.

It appears IBM has started on the long and tortuous task of rationalizing years of incompatibility. It is said to have efforts going in operating systems and document exchange software, and a new multipurpose workstation is expected as well.

The token ring, like any network, is merely the glue that sticks all those efforts together. It just happens that IBM's network glue sticks especially well to SNA. By adding the bottom layers to the SNA communications scheme, IBM has an end-to-end SNA local area solution. "The token ring is coming out of Raleigh—the SNA group—targeted at the traditional IBM world, solving IBM's product integration problems," says Jeffery of International Technology. "For the Fortune 1,500 accounts, token ring simply represents a high speed node-to-node communications system under SNA. IBM is selling LANs not as a separate product, but as an infrastructure for communications. It is a solution, not a product."

Remember, IBM's business is selling boxes—the bigger the better, the more the better. Inefficient, cpu hog SNA has always assisted IBM in that prime pursuit, agree communication experts. To have SNA spread everywhere—to those doing word processing or using personal computers, and into the network processors as well—could only make IBM happy and make competitors quake.

STRATEGIC MANEUVER FOR SALES

"We believe that IBM will view the networking equipment as a strategic maneuver to enhance the opportunity for the sale of its attached devices," wrote Merrill Lynch industry analyst Greg Lewin and vice president Daniel Mandresh in a Merrill Lynch local area network report dated Nov. 2, 1983. The Merrill Lynch researchers expect "the initial network offerings to decentralize communication processing to distributed controllers which would manage communications among a cluster of attached devices. These controllers would be attached in a ring topology. . . ."

A 3274-type device or an 8100 processor are proposed as controller candidates. A "more interesting possibility" as a controller, they wrote, would be the new high-performance 8150. It can handle up to 80 devices in a distributed loop. Imagine a department of 3270 P.C.s, XT 370s, or advanced workstations. It would seem logical and cost-effective to share SNA network intelligence stored in an intelligent network controller. The controller would act as the entry node to the network.

What does IBM have to say? Norman Strole, an IBM staff engineer at Research Triangle Park, N.C., was the author of that September *IBM Journal* piece. He wrote that a LAN is "a basic transport mechanism for data transfer among nodes within a network. The same higher-level communication protocols [SNA] that are implemented to control data transfer across public data networks are also applicable to data transfer across a LAN."

One of the missing ingredients in the SNA LAN concept was an access scheme. IBM settled on token passing, a decision that appears to be tied to its choice of data grade twisted pair, the link between nodes and their bridge on a single ring.

By going with a baseband approach, IBM gave itself only a single channel for moving voice, data, etc. Synchronous terminals—3270s or 3780s—and real-time digitized voice, which is also a synchronous operation, require careful timing controls. A token access control protocol is deterministic, whereas CSMA/CD is probabilistic. Obviously, deterministic implies more control; token access, in conjunction with a priority reservation scheme, is apparently the best way to deal with digitized voice and old IBM synchronous terminals.

It works like this: a token circulates around a ring. A node can determine when to send its message by looking at the passing token. If the token is busy, the node waits. If not, the node grabs the token, attaches its message and sends the token out on the network.

(In CSMA/CD, by contrast, a node listens for conversation on the network. If none is detected, the node sends its message. If another node transmits at the same time, a collision is detected and everyone regroups. During heavy traffic on a single channel the CSMA/CD scheme is likely to bog down in collision detection and retransmissions, say experts.)

Migration to IBM's token ring LAN will be easy, assures the Gartner Group's newsletter. "Simple, inexpensive cable converters" will be needed to connect existing devices to the LAN. The data grade twisted pair cable will run from a node to a wiring closet, which can handle several nodes. Twisted pair will also connect several wiring closets to a bridge. That configuration represents one ring. Several rings will terminate in one bridge, the device that handles communications between rings, as well as communication to other bridges. IBM suggests optical fiber as the backbone link between bridges

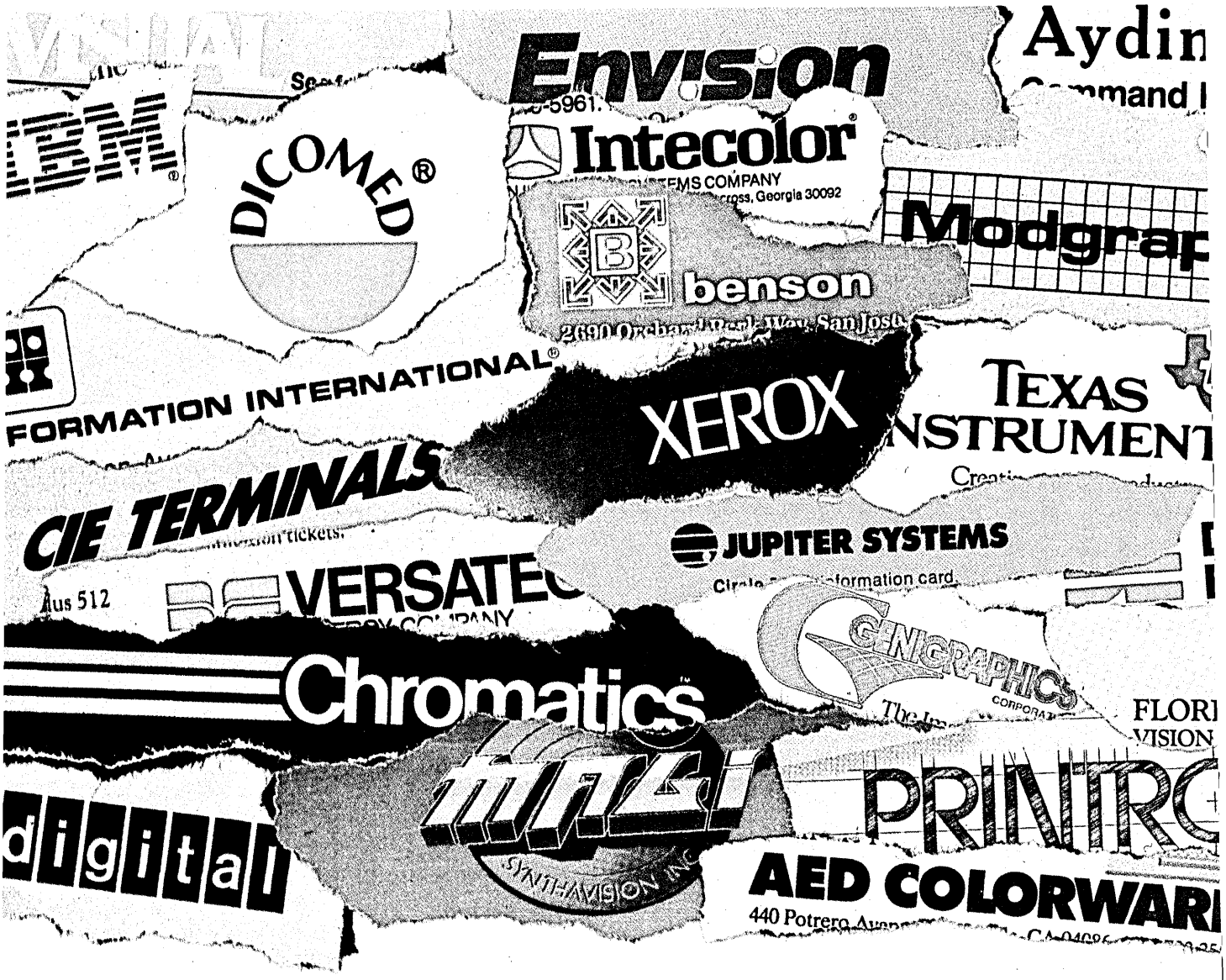


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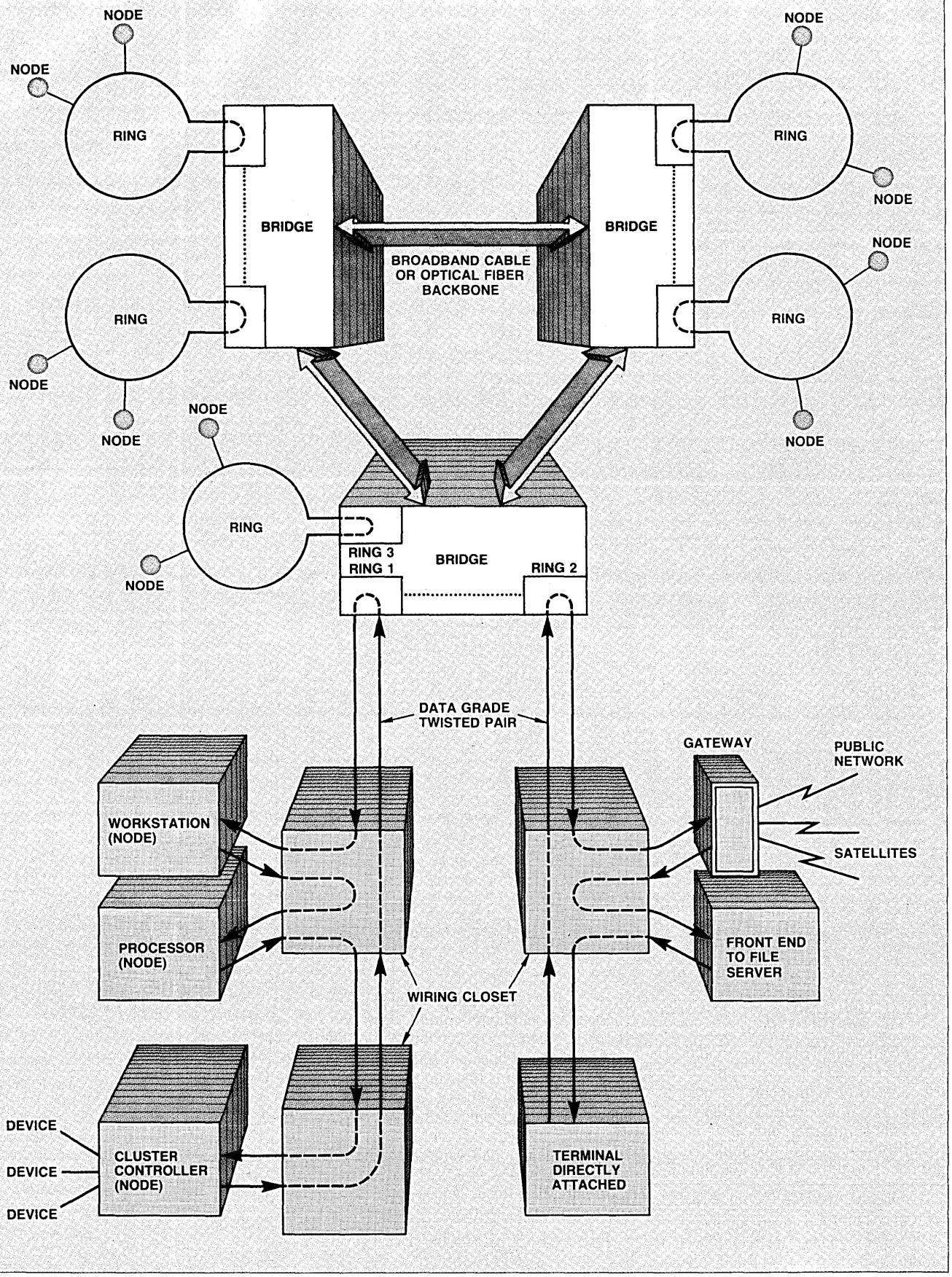
FIG. 1

IBM's HIERARCHICAL RING CONCEPT



If IBM doesn't come in and clean up this carnival of keyboards, maybe AT&T and some incarnation of Net 1000 will.

(see Fig. 1).

And there you have it: the end-to-end SNA LAN for all IBM gear—and voice—in an office, in a building, or between buildings, and, of course, to the corporate mainframe, either local or remote.

PROTECTING EXPOSED FLANK

IBM has effectively closed the loop and protected an exposed flank. Otherwise, AT&T could have waltzed in to an IBM customer site under the guise of offering a Rolm-type voice network. Then AT&T would be positioned to pull the same little migration trick IBM appears poised to do through Rolm.

But what about the mixed environment, where IBM and someone else live? DEC has infiltrated many an IBM site. So has Wang. Soon, so may AT&T desktop computers. They all are working on LAN strategies and links to the SNA world. IBM wants control, for, as one analyst puts it, he who controls the network ultimately controls the future. IBM needs a wedge, something that could slip into a mixed environment and solve the customer's problem of connecting everyone to the IBM corporate mainframe.

"To maintain its competitive momentum in the personal computer market we believe IBM's Entry Systems Division . . . will introduce an open access personal computer/workstation network," wrote Lewin and Mandresh in the Merrill Lynch report. "The rationale supporting IBM's introduction of an open access PC network also supports the possibility that they may choose to license currently available PC LAN technology."

The SNA token network is not friendly to mixed environments and, as noted, its delivery date wasn't clear back in early 1983. Also, the IBM token ring may not be the most cost-effective solution for small- to medium-sized businesses. And what about bringing IBM into homes and schools? Again, an SNA LAN solution is like taking in a buffalo as a pet—it's too big, too clumsy, too expensive to feed. Why not go with a puppy?

Enter Sytek. Its technology is young, in tune with the new age of desktop distributed processing, and has the potential to grow. Besides, it appears a Sytek network could be a lot less expensive to feed.

So, it seems IBM will split the market in two. Raleigh's SNA token ring serves the IBM world, while "the rest of the world belongs to Estridge and ESD," observes industry analyst Jeffery. Simply put, Boca and the Sytek network appear to be targeted at everything that is non-IBM dominated, especially non-IBM shops with IBM P.C.s and workstations. That is a market segment "whose existence IBM has started to acknowledge of late," adds Jeffery.

CHARTS BY PAUL GOODFRIEND

The marketing rationale seems simple: if IBM gets there first with a network that supports both IBM and brand X, IBM is in control. Suppose IBM comes out with a VAX 780 equivalent. At a mixed site, an IBM-supplied network "could be a way of breaking down the distinctiveness between DEC and IBM," speculates Jeffery. Conversely, if DEC controls the LAN there's an incentive for the customer to go on buying DEC equipment. "Perhaps IBM has recognized that people with large installed bases of DEC equipment are possibly going to make a choice in favor of DEC, if it ever comes to an either/or situation," suggests Jeffery.

Meanwhile, DEC and Sytek also have an agreement, it is reported. Sytek is to produce a host-to-host network—a new market for the company, which has been making terminal-to-host networks. The new net is rumored to be a version of Sytek's LocalNet 40. "DEC offers Ethernet systems at the local, limited distance level and DECnet at the geographically distributed level. A broadband offering will tie these two areas together and offer a complete systems approach from a single vendor," suggested Thurber's October 1983 *LocalNetter*.

HOST-TO-HOST NETWORK

Sytek's LocalNet 40 is aimed at host-to-host traffic, whereas LocalNet 20 is better suited for terminal/workstation-to-host traffic (see Fig. 2). The two main differences are that LN 40 runs faster (2Mbps channels) but spans shorter distances, measured in the thousands of meters. LN 20 runs at 128Kbps, and can span a campus.

According to Greg Ennis, Sytek's network technology manager, the company is also developing a CATV city-wide broadband cable system, called MetroNet. It is a low-speed network, based on the LocalNet 20 equipment and is targeted at the home. Meanwhile, 2Mbps for Local Net 40 is only a starting point for its host-to-host high-end product family, hints Ennis.

To accommodate the two applications of CSMA/CD, Ennis predicts there will be two broadband CSMA/CD standards. One standard will be oriented toward the high data-rate, short distance, DEC-type application, the other toward the low data-rate, long distance applications. "The two are complementary and coexist on the same cable system," he adds.

Although details on the IBM-Sytek project are not known, Boca's target markets appear to be small businesses, the mass market, and large non-IBM accounts. With ESD's marketing targets in mind, speculation is that Boca wants a multivendor network capable of spanning a large campus with several thousand terminals at a connect cost of around $100 per port. The product may be a version of LocalNet 20 that can support SNA and multiterminal/workstation to multihost communications. "SNA is more complex than other higher-level protocol architectures," notes Ennis. "I don't see us implementing SNA verbatim. Our first sorts of products are geared toward gatewaying between non-SNA and SNA systems. It doesn't involve putting SNA in every device."

Because Sytek takes a broadband multichannel approach, different devices with different access schemes can be routed onto separate channels in the same broadband cable. Strole's *IBM Journal* article, for instance, showed a network scheme in which token ring bridges communicate to other bridges via an interface modem and a broadband backbone cable. PBX traffic can also be routed onto a broadband cable, but this time the interface takes place through a gateway device. It adjusts for network speeds and maps one protocol onto the other.

BROADBAND GLUE FOR NETWORK

Suddenly, broadband becomes the network glue for sticking together all of IBM's networking schemes. "It's not an either/or thing for IBM," suggests Jeffery. "IBM will support them all." It is not clear that Sytek has been formally called upon to play that role, but the company appears to have the resources to do it.

Sytek's Ennis said that voice could be implemented in one of two ways on broadband cable. "You could do PBX-based voice by using individual frequency channels of very narrow bandwidth for each voice conversation." Or, voice could be implemented using separate channels "and some sort of access method or protocol specifically geared toward voice, such as high bandwidth TDMA [time division multiple access]." Users have begun to show a lot of interest in voice, confirms Ennis. He expects Sytek will offer something within the next two years.

Sytek is also evolving out of the office and into the home with its MetroNet project. As LocalNet 40, host-to-host broadband, appears to be DEC's missing link, MetroNet technology appears to be Boca's.

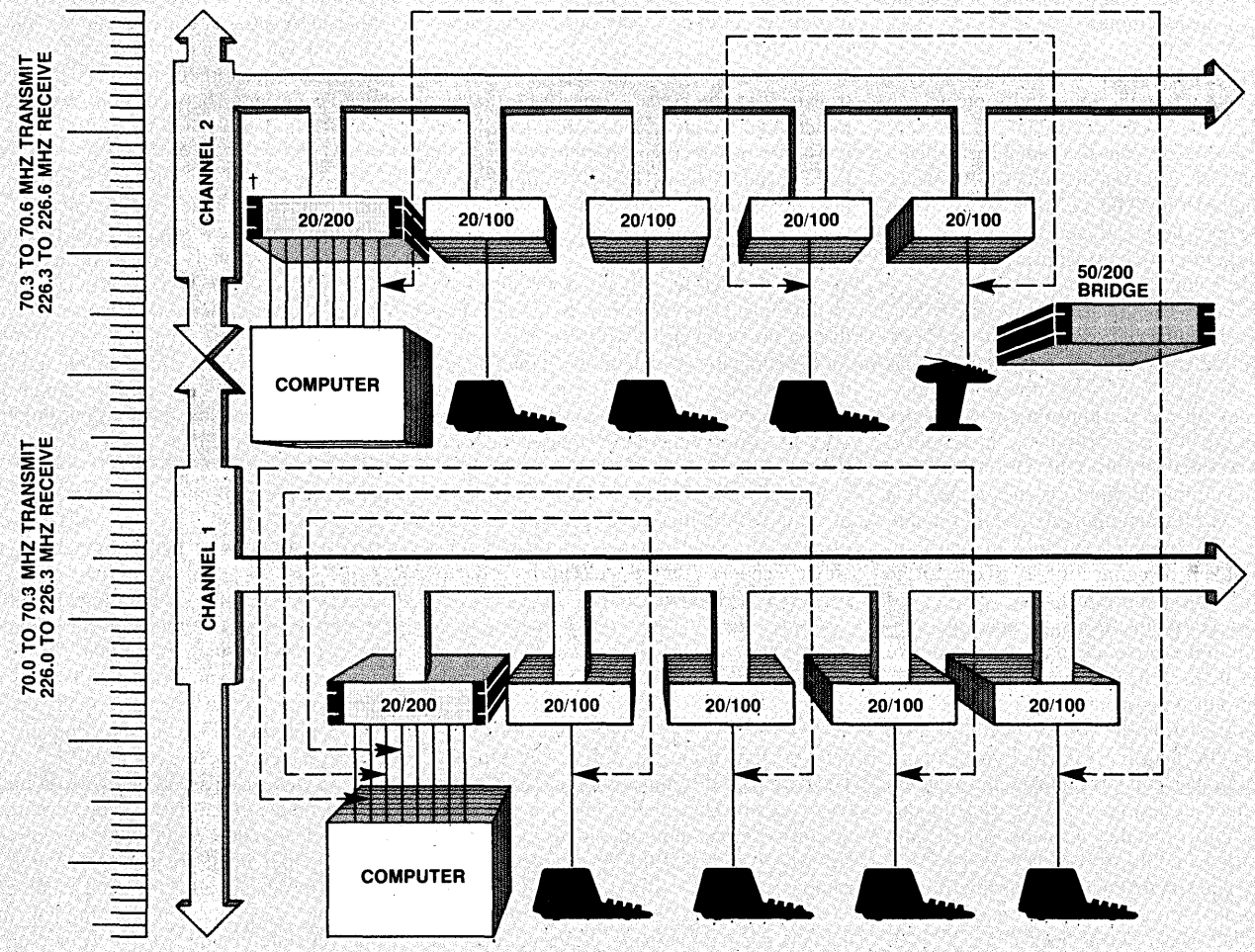
Without Sytek, IBM has most of the networking pieces: PBX LANs and token ring LANs for the working environment, satellite links for the long haul. With Sytek, IBM has a double-edged sword. It has a wedge into the non-IBM workplace environment through some version of LocalNet 20, plus access to technology that can take it into homes, into schools, into all those little nooks and crannies ESD hopes to penetrate with the low end of its PC family.

Think about it for a minute. IBM intro-

One of the missing ingredients in the SNA LAN concept was an access scheme.

FIG. 2

SYTEK'S LOCALNET 20 LOGICAL LAYOUT



*Packet-mode network interface unit, which includes the RF modem

†Packet-mode network interface unit, which includes the RF transceiver

The interchannel bridge allows devices on different channels to communicate.

duces a shell of a machine called the PCjr. It is known that the PCjr is targeted for the home and the education market. It also appears that the shell is perfect for filling with videotex technology. Meanwhile, IBM is experimenting with videotex/electronic publishing projects in West Germany, in France, in Japan, and in England.

Sytek, too, happens to be in Japan and at British Telecom in England with its low-speed, long distance LAN. Sytek is also wiring several schools together in Dallas, which is home to an ESD facility. Sytek says it had a breakthrough within the past year in developing the encryption technology necessary to prevent theft of bandwidth and unwanted network intruders. It is also developing sophisticated network control software for tracking data and billing customers.

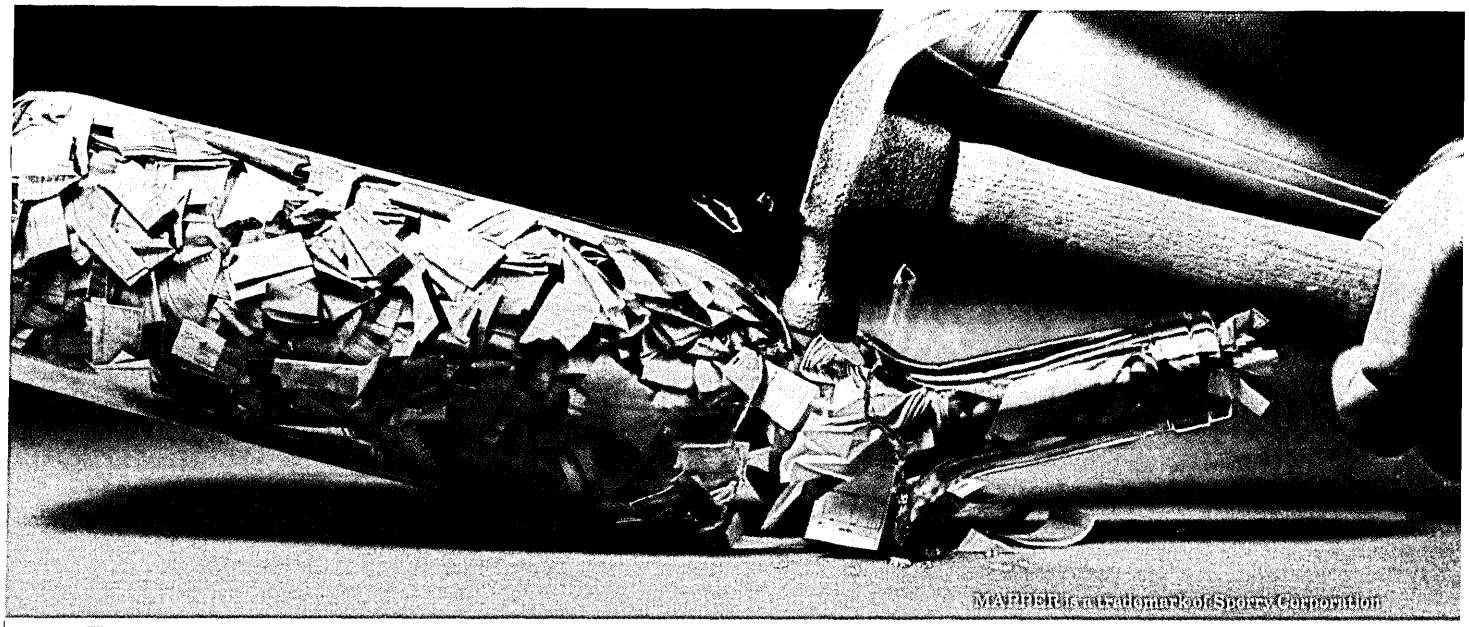
CRACKING HOME INFO MARKET

The final point in this network argument is AT&T. It is well-known that the telecom giant has its heart set on cracking the huge home information market with a twisted pair approach. It seems that Sytek and its CATV cable-based MetroNet system offers a made-to-order, up-and-running competitor to AT&T.

Sytek insists it is only coincidental, and IBM, of course, won't comment. But the fit is too good, too tight, too recurring to ignore. Boca working with Sytek on a wide-area network to connect the home market is a perfect match.

IBM provides the processing power for the home as well as for the databases on the network. Sytek provides the network management intelligence. Together they could pull off what the CATV companies have been promising for years, but could never produce: the vehicle that will bring us videotex, home banking/shopping, electronic publishing. It's the opening act of "the wired world."

Now, that's all supposition. But if these two aren't matched up, well, maybe they should be. ✱



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CIRCLE 68 ON READER CARD

By 1988, IBM's annual revenues will hit $88 billion, or 1.8% of the GNP. Net profits will exceed $25,000 per minute.

BIG BLUE'S BIG BUCKS

by Marc G. Schulman

Over the past year or so, many new computer companies with revenues of about $20 million have, through a sale of stock, made the transition from private to public ownership. In 1984, it will take IBM only four hours to produce its first $20 million of revenues. When the remaining hours of 1984 have passed, IBM will have generated revenues of close to $47 billion. That's about eight times the revenues of Digital Equipment, its largest competitor.

Big Blue's revenues come from the sale, rental, and service of both data processing and non-data processing equipment and the licensing of software products. Equipment sales will account for a majority of IBM's revenues in 1984. Sales of dp equipment should be around $23 billion, while sales of non-dp equipment, such as typewriters, should be about $4.5 billion. Within the dp equipment category, the 308X mainframe computer line and personal computers will each contribute about $6 billion, the 3380 disk drives about $1.8 billion, the new System/36 about $1.2 billion, and midrange products, such as the 43XXs, about $9.5 billion. Adding it up, sales revenue from equipment shipped in 1984 should reach $27 billion. After throwing in another $4 billion from the purchase of equipment that had previously been placed on lease, IBM's 1984 sales revenue will be over $31 billion.

IBM's rental revenues will continue to decline in 1984, falling to $6.7 billion. This isn't an accident—the company has been encouraging sales and discouraging rentals.

For the first time ever, IBM's service revenues will exceed its rental revenues in 1984. (IBM includes revenue from the sale of software in the service category.) Software revenues are probably growing at about 40% per year and may amount to $3.75 billion in 1984. Revenues from the service of hardware should be about $5.5 billion. Total service revenues, then, will be around $8.8 billion.

A big top line is impressive, but what really counts is the size of the bottom line—profits. In 1984, IBM's profit after taxes will be about $6.3 billion. Its operating income—profits before taxes and interest income—will be $10.7 billion, or 23.1% of revenues. While IBM doesn't provide information regarding the profitability of individual product lines, it's pretty clear that the most profitable products are 308Xs and 3380s. The gross profit (revenues less manufacturing costs) margins of these products are probably 75% or so. Low-end products like PCs have lower gross and operating margins but higher returns on assets. The gross margin on lease-purchase conversion sales is about the same as the gross margins on 308Xs and 3380s.

To put all that into perspective, in 1983, IBM's revenues were about 1.25% of the $3.2 trillion U.S. gross national product (GNP). By 1988, IBM's revenues will probably be around $88 billion, so if the GNP grows at an annual rate of 8% (including inflation), IBM's revenues will be 1.8% of the GNP. IBM's after-tax profits in 1988 should be nearly $13 billion. That's about $35 million per day, $1.5 million per hour, or $25,000 per minute.

Based on the 1984 estimates, a crystal ball projection of IBM's revenue stream in 1988 looks like this: mainframe computer revenues will hit $18 billion, displaying a 25% annual growth rate; midrange systems will amount to a $16.5 billion business, with a 15% growth rate; personal computers will soar at a 40% annual rate, amounting to a $23 billion business (see Fig. 1).

Service revenues will continue to show a strong growth rate, hitting $17 billion in 1988. Rental revenues will continue to decline, to $5 billion in 1988 from $6.7 billion this year.

If this crystal ball doesn't develop any major cracks, IBM will be a vastly different corporation as this decade ends.

Outright sales will account for a much higher percentage of revenues in 1988 than in 1984—73% vs. 59%. This will happen because IBM's management wants it to happen. We know this because purchase/rental multipliers, the ratio of a product's purchase price to its monthly lease charge, have been lowered to levels that make leasing financially unattractive. A number of products, most notably, the personal computer, are for sale only, and because of IBM's growing emphasis on large unit volume, are discounted to oems and systems houses.

RENTALS CONTINUE TO FALL

The flip side of the coin is that rental revenues, which have recently been falling, will continue to fall. They've been falling because fewer machines have been going into the rental base and because IBM has been making it attractive for customers to convert their rented machines into purchased machines.

The other big change will be in the composition of dp equipment sales: personal computers will rise to 40% of total dp revenue in 1988 from 26% in 1984, while mainframes will dip slightly to 31% of the total in 1988 from 33% in 1984, and midrange systems will plunge to 29% in 1988 from 41% in 1984.

This change will come about for two fundamental reasons. First, IBM has learned that the best way to stimulate demand for mainframes is to rapidly proliferate personal computers. The use of products like the 3270-PC and the XT/370 means that mainframes will increasingly be called upon to transfer files to and from personal computers. This will chew up mainframe time, stimulating migration to ever more powerful cpus.

Second, it's unlikely that IBM will find it in its best interests to price its midrange systems very aggressively relative to its mainframes. If it did, customers would have too much of an incentive to use midrange systems, rather than mainframes, as file servers. IBM's midrange systems aren't as profitable as its mainframes.

The change in the composition of IBM's outright sales has and will continue to have a significant impact on its expense structure. Gross margins are falling; selling and administrative expenses are falling as a percent of revenues; but research and development spending is rising as a percent of revenues. It's not that IBM is lowering its profit targets; rather, it is reducing its marketing costs.

Gross margins are falling for two reasons. First, low-end products such as person-

IBM has learned that the best way to stimulate mainframe demand is for PCs to proliferate.

al computers account for a growing proportion of outright sales, and low-end products have less favorable selling price-to-manufacturing cost ratios. Consumer products have lower markups than industrial goods. Second, the shift toward outright sale and away from rental, by reducing the size of the rental base, reduces the revenue contribution of high gross-margined conversion sales.

Selling and administrative costs are declining as a percent of revenues because IBM is making greater use of new, and less expensive, distribution channels. Historically, virtually all of IBM's sales were made to end users by its direct sales force. Now, a steadily growing proportion of IBM's shipments are going through lower-selling cost channels. Examples include the use of retail stores to sell Personal Computers and large unit volume sales of 43XX processors to original equipment manufacturers, which IBM calls value-added resellers.

Another reason is the shift toward outright sale. A decade ago, almost all of IBM's mainframes were rented, and it took about four years of rental payments to equal the purchase price of the mainframe. If a mainframe was sold in January, first-year revenues would equal one fourth of its selling price. If a mainframe is sold (80% of 308Xs are sold, not rented), first-year revenues equal the total selling price. Expenses related to selling a mainframe are the same as in renting one. So, by increasing current-year revenues, the shift toward outright sales reduces selling and administrative costs as a percent of revenue.

Research and development spending has been trending upward as a percent of revenues because IBM's strategic shift—creating incentives for purchase rather than rental—means that it is in IBM's interest to shorten product cycles.

1988 will mark the silver anniversary of the introduction of the System/360, the product line that resulted in IBM's rise as the dominant supplier of mainframe computers. The System/360 represented a sharp break with the past because it was incompatible with IBM's previous computers and, even more important, because it represented the first time that a computer manufacturer had introduced a broad range of processors sharing a common operating system. The compatibility of the various System/360 models introduced the concept of migration paths to the world's computer users. A user might start off with a low-end machine like the Model 20. As his data processing workload grew, he could migrate upward to a more powerful Model 40. All of the application software he developed on the Model 20 would run, and run faster, on the Model 40 because the two machines used the same operating system. The ability to preserve investments in application software was a persuasive selling point and, because IBM was the first to offer that feature, it was able to establish account control.

FIG. 1

THE IBM REVENUE OUTLOOK

(All dollar figures are in billions; parentheses denote declines.)

	1984	1988	Growth Rate
DP Equipment Sales			
Mainframes	$7.5	$18.0	25%
Midrange Systems	9.5	16.5	15
Personal Computers	6.0	23.0	40
	$23.0	$57.5	26%
Non-DP Equipment Sales	4.5	6.5	10
	$27.5	$64.0	24%
Conversion Sales	4.0	2.0	(16)
SALES REVENUE	$31.5	$66.0	20%
Rental Revenue	6.7	5.0	(7)
Service Revenue	8.8	17.0	18
TOTAL REVENUE	$47.0	$88.0	17%

FIG. 2

THE NUMBERS BEHIND IBM'S DEPRECIATION GAME

Year	Depreciation Expense	Rental Revenues	Profit	Profit Margin
1	$400,000	$600,000	$200,000	33.3%
2	320,000	600,000	280,000	46.7
3	240,000	600,000	360,000	60.0
4	160,000	600,000	440,000	73.3
5	80,000	600,000	520,000	86.7
TOTAL	$1,200,000	$3,000,000	$1,800,000	60.0%

BETTER TO RENT THAN SELL

Intrinsic to the migration path strategy was IBM's conclusion that it was better to rent than to sell computers. In those early days, IBM made sure that most of its computers would be rented by establishing very high purchase/rental multipliers. A high multiplier meant that it might take four or five years of rental payments to equal the purchase price of a computer. If a computer's purchase price was $1 million and the purchase/rental multiplier was 50, the monthly rental would be $20,000. Rental was more financially attractive than it would have been if the purchase/rental multiplier was 25, in which case the monthly rental would be $40,000.

Utilization of a pricing strategy that encouraged rental made sense for IBM because the incidence of upgrade activity could be maximized if users' investments in their current equipment were minimized—they would buy more equipment if their sunk costs were low.

IBM's product and pricing strategies were tremendously successful for many years. In 1968, the peak year of System/360 shipments, IBM's revenues grew by 29%, to reach $6.9 billion, and its pretax margin was 27.1%. Then the developing recession, a shakeout in the computer leasing industry, and the product cycle transition to the System/370 resulted in revenue growth of less than 5% in both 1969 and 1970. Despite the growth slowdown, IBM's pretax margin in 1970 was only .4% lower than in 1968.

The 1970s were far less kind to IBM, as technological change, the emergence of new competitors that took advantage of that change, and IBM's own reluctance to change contributed to a sharp slowdown in its growth.

IBM's problems began to surface in the early 1970s, when despite a booming world economy and the buildup of System/370 shipments, IBM's revenue growth never

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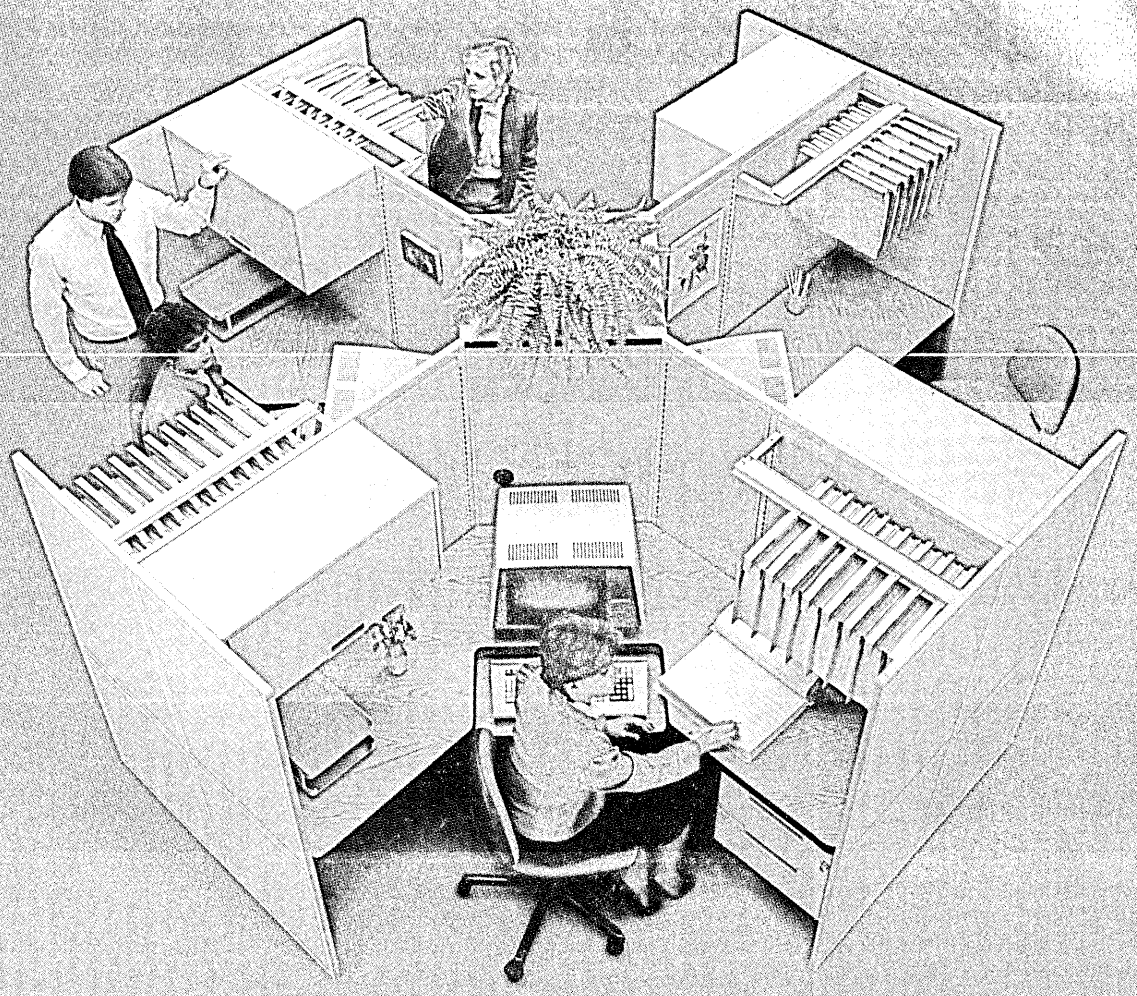

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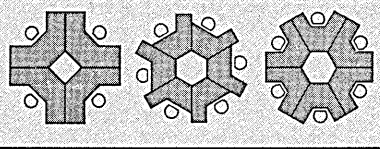

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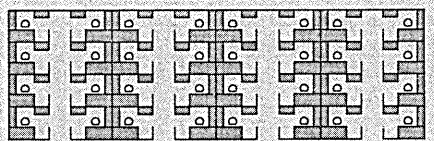
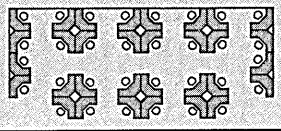


Old fashioned arrangement of 32 workstations (above) compared to same number in TAB Clustered Workcenters (below).



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CIRCLE 70 ON READER CARD

IBM's problems began to surface in the early 1970s—revenue growth never exceeded 15% in any one year.

exceeded 15% in any year. Slower growth didn't mean less profitability, however, as IBM's 1974 pretax margin of 27.1% was the same as its pretax margin in the boom year of 1968. The numbers say that there was a trade-off between growth and profitability and that IBM's management concluded that profitability was more important.

Progress in semiconductor technology accelerated in the early to mid-1970s. Faster technological progress meant a more rapid rate of decline in semiconductor prices. In 1973–1974, a seminal event occurred—the price per bit of semiconductor memory dropped below the price per bit of core memory. The rapid decline in memory and logic prices changed the economics of computers and led to the creation of new competitors, led by Digital Equipment Corporation, that used this acceleration in the rate of technological change as the cornerstone of their strategies. The shortening of product life cycles and steadily declining prices for computers are trends that began a decade ago, and they represented a real threat to IBM and its way of doing business.

For example, IBM's rental base strategy was established at a time when product cycles were long and product prices were stable, part of a conscious plan to maximize profits through leasing. A computer that was traded in on a larger computer was refurbished and remarketed. The longer a computer stays on rent, the more profitable it is.

Here's how IBM played the game. An on-rent computer is a depreciable asset. When it is placed on rent, the cost of manufacturing it becomes an asset on the computer company's balance sheet. As the machine ages, it is worth less. The declining value of the asset is accounted for as depreciation expense. Each year, the depreciation expense is listed on the balance sheet as a cost that flows to the company's income statement. Since depreciation is front-end loaded, meaning that the amount charged against the income statement is greater in the first year than in the second, the longer a computer stays on rent, the more profitable it is.

Suppose, for example, a computer's purchase price is $2.5 million, that the monthly rental is $50,000, that its manufacturing cost is $1.2 million, and that this cost is depreciated over five years. If the computer stays on rent for five years, revenues will total $3 million, expenses will total $1.2 million, profits will total $1.8 million, and the profit margin will be 60%.

In the first year, depreciation would be $400,000 with a $200,000 profit. By the fifth year, the annual depreciation would be $80,000, but the profit would be $520,000. This analysis also shows that almost one third of the profit from such a five-year lease comes in the last year.

FIG. 3

EFFECT ON DEPRECIATION IF IBM ACCELERATED NEW PRODUCT CYCLES

YEAR	DEPRECIATION EXPENSE	RENTAL REVENUES	PROFIT (LOSS)	PROFIT MARGIN
1	$400,000	$600,000	$200,000	33.3%
2	320,000	600,000	280,000	46.7
3	240,000	600,000	360,000	60.0
4	160,000	0	(160,000)	(100.0)
5	80,000	0	(80,000)	(100.0)
Total	$1,200,000	$1,800,000	$600,000	33.3%

FIG. 4

OUTCOME OF CUTTING DEPRECIATION CYCLES

YEAR	DEPRECIATION EXPENSE	RENTAL REVENUES	PROFIT	PROFIT MARGIN
1	$600,000	$600,000	$0	0.0%
2	400,000	600,000	200,000	33.3
3	200,000	600,000	400,000	66.7
Total	$1,200,000	$1,800,000	$600,000	33.3%

If, however, IBM had chosen to accelerate the rate at which it inserted new technology in its products, its users wouldn't have kept their current machines as long. Returns of less than fully depreciated rental machines would have increased sharply and IBM's profit margins would have shrunk. In the example, a machine returned after three years would have generated a profit margin of only 33.3%, because the depreciation in years four and five becomes a loss without the rental income to offset it.

If, in acknowledging that product cycles were only three years long, IBM had shortened the depreciable life of its computers to three years, its profit margin would, using our example, still have been only 33.3%. Rental revenues for three years, $1.8 million, would have been only $600,000 more than the $1.2 million depreciation charges.

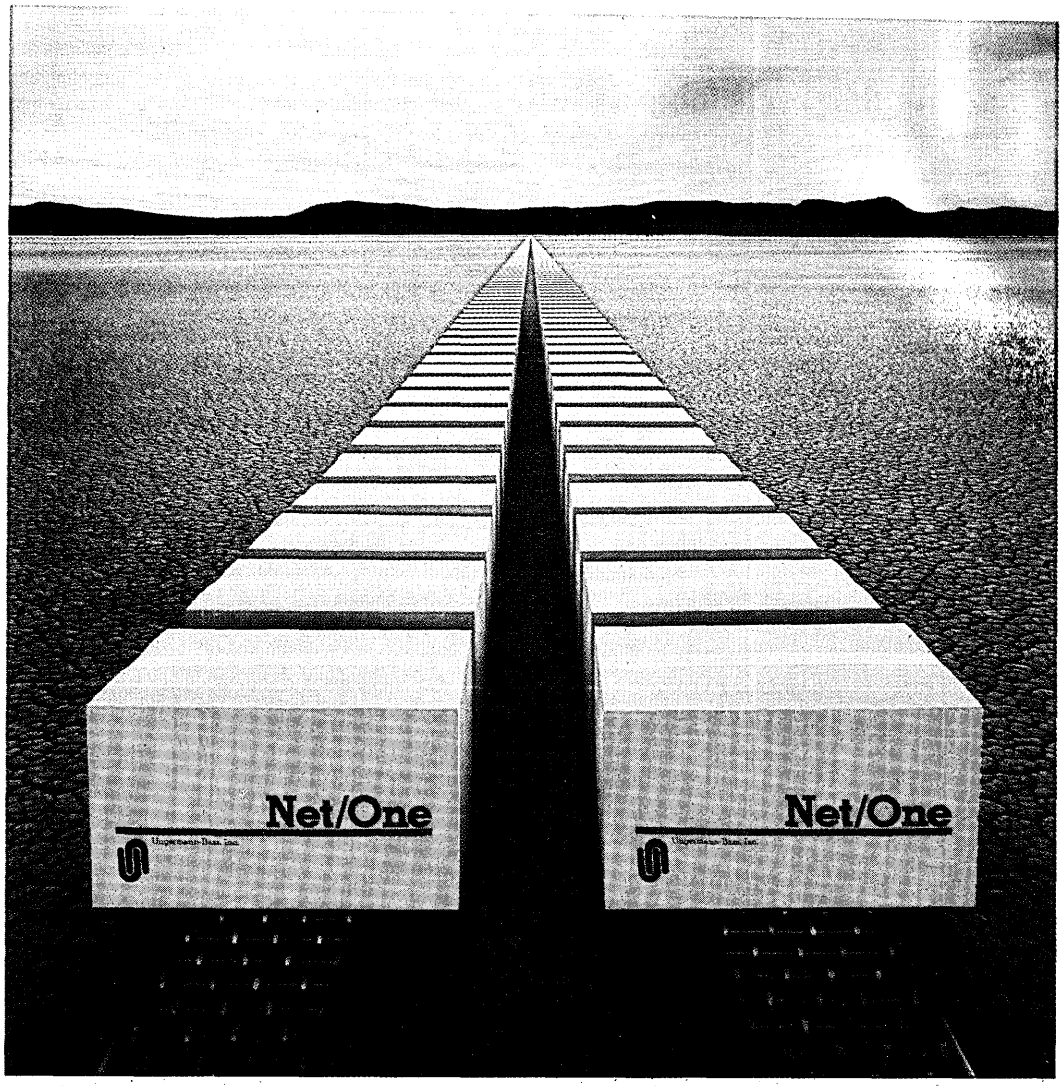
CHALLENGE BY OTHER VENDORS

The combination of shortening product cycles and a rental base strategy put IBM between a rock and a hard place. Meanwhile, DEC and the other minicomputer vendors, unencumbered by the dictates of a rental base, rode the technological progress curve and announced products with substantially better price-performance characteristics than IBM's. The seepage of revenues away from IBM to the minicomputer vendors had begun.

The seepage took the form of undermining IBM's migration strategy. Instead of upgrading to a larger mainframe, a user could now offload certain functions, such as terminal control, to a minicomputer and save money in the process.

Management's challenge in the mid-1970s was to find a way to get out from under the rock without destroying the corporation's profit margins. Two things could be done to spur revenue growth. The first possibility—sharply reducing prices—was ruled out because it would hurt profit margins, the maintenance of which was still considered sacrosanct in Armonk. The second possibility—reducing purchase/rental multipliers to encourage a shift toward purchase—was deemed far more desirable because it wouldn't hurt profit margins and because it would reduce the growth of the rental base, and it was the rental base that was the problem, anyway.

The shift began on June 30, 1976. IBM announced System/370 Models 138 and 148 as replacements for Models 135 and 145. The purchase/rental multipliers of the new machines, 36 were sharply lower than the multipliers of the old machines, 53. These and other pricing actions were partially successful. The sales content of revenues for IBM rose to 39.1% in 1977 from 30.2% in 1972. IBM's pretax margin in 1977 was 28.1%, a full percentage point higher than in 1968.



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A shortening product cycle and a rental base strategy put IBM between a rock and a hard place.

There was only one problem—annual revenue growth was still slowing. In 1977, it was only 11%.

Management decided that it didn't want an IBM that was very profitable but wasn't growing. This decision meant that profit margin maintenance was no longer sacrosanct. Boosting revenue growth meant that new computers with sharply improved price/performance ratios had to be introduced, even at the cost of lower profit margins.

An example of the actions taken by IBM is the October 1977 announcement of the Models 3031 and 3032 mainframes. The 3031, which was intended as a migration path for System 370 Model 148 users, offered an 80% price/performance improvement. The 148 had been announced only 16 months earlier; product cycles were starting to get shorter. The 3032, a migration path for System 370 Model 158 users, offered a 130% price/performance improvement.

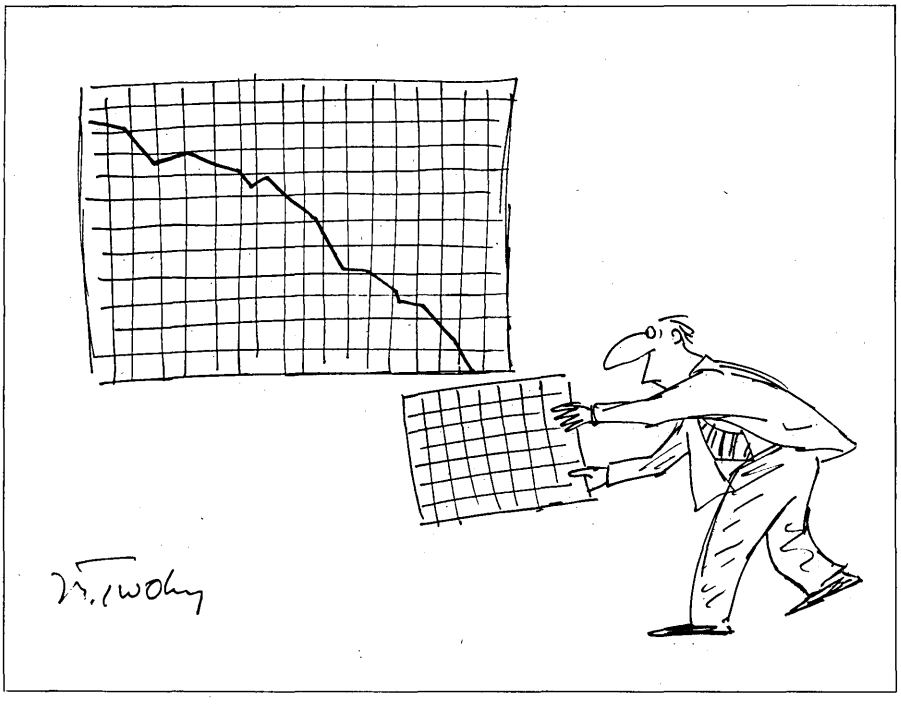
IBM's greater aggressiveness worked. The 3031 and the 3032, along with the larger 3033, were primarily responsible for an acceleration in revenue growth to 16% in 1978, the fastest growth in any year since 1968. This increase in revenue growth was accompanied by small declines in both sales and rental gross margins—the first indication that revenue growth was becoming more important than profit margin maintenance. Unlike past instances, an increase in the sales content of revenues (to 41.5%) did not result in higher margins.

The four-year decline in IBM's sales and rental gross margins persisted through the end of 1981. During the last year of the period, the sales gross margin dipped below the rental and service gross margin; the gap between the two has steadily widened to this day because of more aggressive purchase prices.

The sales content of revenue was no higher at the end of 1980 than at the end of 1978. The slowdown in revenue growth to 8.5% in 1979 was largely of IBM's own making. Impressed by the price elasticity of demand unleashed by the sharp price/performance improvements embodied in the 303X product line, IBM decided to price the 4300 Series of small- to medium-sized System/370-compatible mainframes very aggressively when they were announced in early 1979. But the 4300s were so much more aggressively priced than the 303Xs that they induced a shift toward rental by possessors of 303Xs, who were anticipating substantial 303X price cuts. Instead of shrinking the rental base, the 4300 pricing increased it. By 1980, this problem with expectations was resolved and revenue growth increased to 14.7%.

In 1981, revenue growth slowed to 10.9% because of a weakening of the world economy and a strengthening dollar. The sales content of revenues, however, began to rise again, reaching 44.4%, as IBM announced more aggressive volume discounts, put greater emphasis through its Value-Added Reseller program on selling to oems, and began to introduce purchase-only products, best exemplified by the Personal Computer.

In addition, IBM increasingly availed itself of financing arrangements, through third parties and IBM Credit Corporation, that would allow it to offer leasing arrangements that would not constrain its ability to compete in a world of ever shorter product cycles. In many respects, IBM had adopted the pricing and product strategies that it had viewed as a threat a decade earlier.



CARTOON BY MIKE TWOHY

NEW STRATEGIES PAY OFF

The payoff from the policies implemented by management beginning in 1978 became readily apparent in 1982. At a time when the full force of the worst economic slump in 50 years was being felt throughout the computer industry, IBM's revenue growth spurted to 18%, its pretax profits jumped by 27%, and its after-tax profits climbed by 22%; indeed, 1982 was IBM's best year since 1968. The slumbering giant had awakened.

Its newfound alertness was carried into 1983, when revenues increased by more than 16%, pretax profits moved up by almost 23%, and after-tax profits surged by close to 26%. Who ever said that a $40 billion company can't grow fast?

The product cycle and pricing strategies transformed IBM from a manufacturer of overpriced products designed to be rented to a manufacturer of aggressively priced products designed to be sold. The ideological baggage shed by management goes beyond the embracing of technological change and alternative distribution channels as positive forces.

No longer is IBM subject to the not-invented-here syndrome, as its investments in Rolm and Intel attest. No longer is IBM vulnerable to the paralysis of overcentralization, as the creation of 20 independent business units, one of which was responsible for the Personal Computer, attests. No longer is IBM inclined to follow a go-it-alone philosophy, as evidenced by the open architecture of the P.C.

The new ideology at IBM is simple: to compete in all segments of the information processing industry, and to do so as the low-cost producer. Becoming the low-cost producer costs a lot of money. So over the past five years IBM spent more than $10 billion on new plant and equipment, of which over 60% has been put into service since 1979. The competition will be feeling the heat for a long time to come. *

Marc G. Schulman is a vice president of equity research for the securities brokerage firm First Boston Corp., New York. He was recently selected as the top office automation analyst on Wall Street in a poll of pension fund managers.

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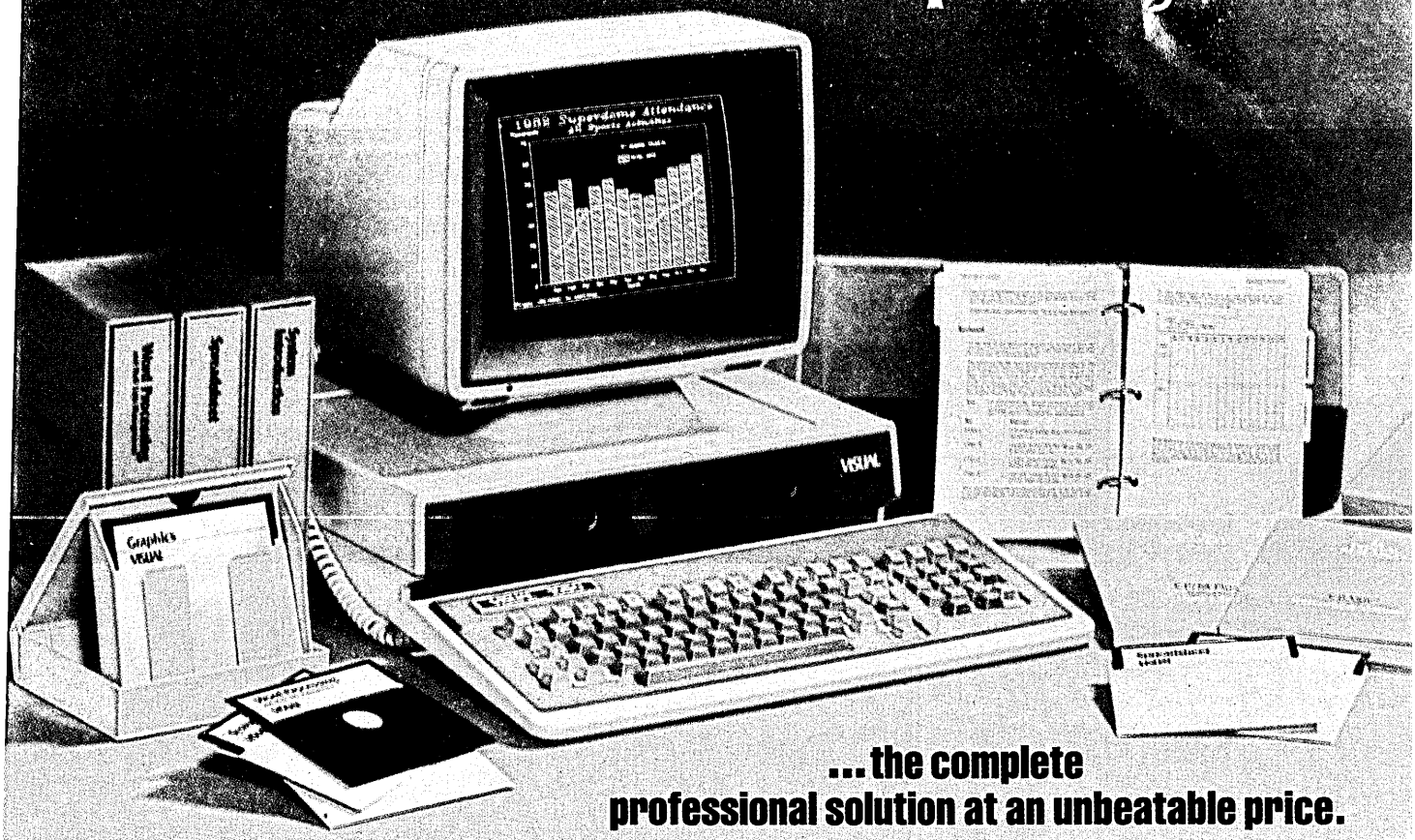

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	VISUAL 1050	IBM™ PC	Apple™ IIe	TRS-80™ Model 12	DEC Rainbow™
Base System Price[1]	$2,695	$2,750	$2,390	$3,999	$3,495
Serial Port (RS232)	STANDARD	$119	$195	2 STANDARD	2 STANDARD
Parallel Port	2 STANDARD	$119	$180	2 STANDARD	STANDARD
Bit-Mapped Graphics	STANDARD	$240	STANDARD	$499	$845
Word Processing Software	STANDARD	$200-$500	$200-$500	$399	$200-$500
Spreadsheet Software	STANDARD	$200-$300	$200-$300	$299	$200-$300
Business Graphics Software	STANDARD	$200-$400	$200-$400	$200	$200-$400
Communications Software	STANDARD	$100-$200	$100-$200	$100	STANDARD
COMPLETE SOLUTION PRICE	$2,695	$3,928-$4,628	$3,455-$4,155	$5,495	$4,990-$5,690
Dual Drive Capacity	800 KB	640 KB	280 KB	2.5 MB	800 KB
Graphics Resolution	640 x 300	640 x 200	280 x 192	640 x 240	800 x 240
Keys on Keyboard	93	83	63	82	105
Expandable Memory	YES	YES	YES	YES	YES
Optional Winchester	YES	YES	YES	YES	YES
Tilt and Swivel Display	YES	NO	NO	NO	NO

1—Includes CPU, 64K User Memory, Keyboard, Display, Two Disc Drives, and Operating System.
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IBM, in its low-cost producer mode, is shifting service onto users' shoulders.

AN END TO HANDHOLDING

by R. Emmett Carlyle

The meetings, so the story goes, took place at the "Crow's Nest," an old country house nestled near the grounds of IBM's Armonk, N.Y., headquarters. This was an unusual place for IBM's elite management committee to meet, since the "Nest" was normally used for training sessions and other more mundane affairs. However, on a symbolic level, the Crow's Nest venue proved unusually appropriate. For it was here at this lookout point above the IBM "ship" that its management in the fall of 1976 took the sightings that enabled the company to chart its way through some very stormy seas.

As one would expect at an IBM summit, the main topic under discussion was profit—or, more precisely, how to maintain profits amid a flood of rising costs. During the previous year, 1975, sales and support costs had risen to 51% of total revenues. During one pivotal meeting in the Nest, IBM's steering committee discovered to its horror that if it didn't change its current course, the cost of selling and support would climb to 75% of revenues by the mid '80s.

From their lofty perch, the IBM scouts saw that their currently customized solutions to selling and support—the company's legendary (and labor-intensive) handholding—was becoming a drag on manufacturing efficiencies. "They saw a new world on the horizon—a world of VLSI, CAD/CAM, and of low-cost, mass-produced options," says consultant George Harmon, a former IBM vp for field engineering. "It was clear that to remain top dog, IBM had to offer the best technology at the lowest cost and with the greatest reliability in a variety of end-user markets. It had to become the low-cost producer, not just the low-cost manufacturer. It had to become the low-cost seller and servicer as well."

According to Harmon, IBM has plowed over $10 billion into the creation of new automated plant and equipment since 1977. "It can now churn out computers like other people mass produce cookies."

Those cookies could have crumbled if IBM hadn't found new distribution avenues. "Once the value of a customer's system comes down, so does the vendor's ability to cost-justify sending a salesman out to make a call," explains Harmon. "The requirement, thus, is to distribute through others: dealers, independent systems houses, value-added resellers/remarketers, and so on."

Not surprisingly, distribution—a euphemism within IBM for anything other than direct marketing—was a major point of discussion at the Nest meetings. IBM subsequently addressed this problem by forming an army of middlemen, ranging from oems to computer stores and mass retailers such as Sears. "It's like a self-fulfilling prophecy," declares Harmon. "IBM has the volume to drive the prices down. It sets up the best distribution channels and creates pull on the user by clever marketing. The result is that the product flows, and flows."

One cloud, however, still remains on the horizon, marring IBM's low-cost producer scenario. That cloud is service. Harmon asks the questions that bring this problem down to earth. "If IBM couldn't cost-justify the continuance of direct end-user selling alone, could it by the same token continue to maintain only a direct field support approach once the product did flow? Is it inevitable that new distribution channels and mass marketing must emerge here, too? And if so, what stands in the way of their successful implementation?"

According to the Technology Analysis Group of New York, the price per unit of performance (i.e., MIPS) has declined from $900,000 on the original 3033 mainframe in 1978 to around $250,000 on today's 308X family. Extrapolating from these numbers, TAG estimated that IBM had to ship four times as many products between 1981 to 1984 merely to maintain its revenue and profit growth. "But how," TAG wants to know, "can IBM ship, install, and maintain four times as much product without hiring and training four times as many hardware and software engineers?" The problem is even more acute now that IBM is offering a desktop 370 ranging in performance from 0.1MIPS to 0.3MIPS (depending on application) for just $10,000.

The cost of simply maintaining, never mind expanding, IBM's huge field service force—over 30,000 strong in the U.S.—has escalated dramatically over the years. Knowledgeable sources maintain that in IBM's halcyon days for service during the '60s and early '70s, pretax margins often ran at around 45%. Current performance has dwindled to between 30% to 35% pretax and 17% after taxes. IBM declined to offer its own more exact figures.

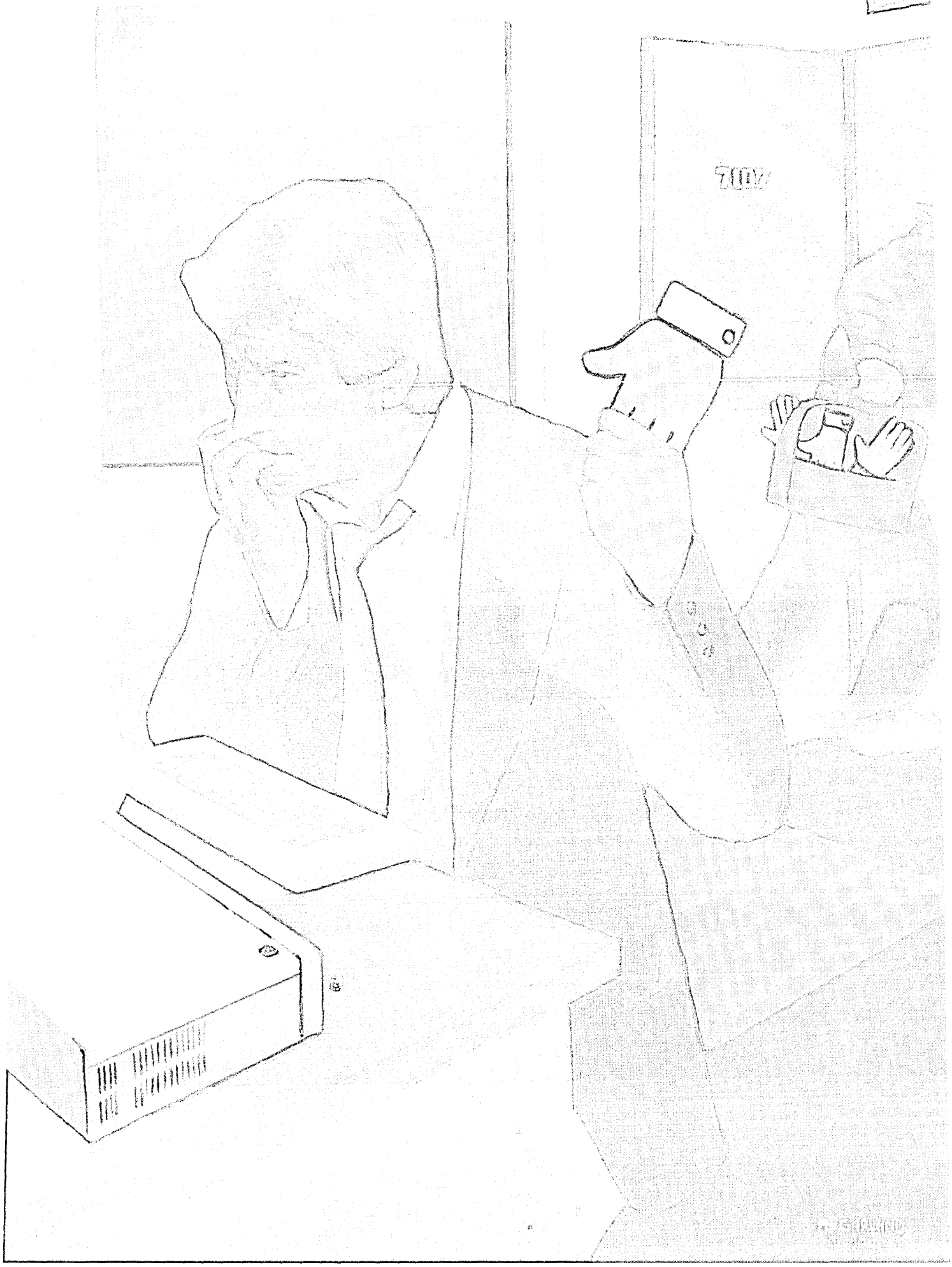
HIGH-PAID NONDEGREE WORKERS

One observer, a former IBM field engineering manager, described IBM's field engineers as "the highest-paid bunch of nondegree workers in the world." Average salaries, which often exceed $32,000 a year (with 12% overtime), can soar to $80,000 and beyond, he claims. "Many of the field engineers [FEs] have been with IBM for an average of 15 to 20 years, whereas the corporate average is more like 10 to 15 years. Like many of us, they get older and less productive, but their salaries keep on increasing along with their seniority. And all the time they've been secure in the knowledge that their jobs have been as safe as Fort Knox because of IBM's no-layoff policy."

It seems, then, from the numbers, that IBM would be hard pressed to cost-justify a purely labor-intensive solution to its expanding maintenance burden. IBM management knew this fact very well. It also knew in the fall of '76 that if it wanted to adopt a profit center approach to field service as part of its low-cost producer strategy, it would have to come up with a new tack. "To IBM's way of thinking, that could only mean two things: diagnose and fix problems from remote centers, and push more of the maintenance load onto the customer," Harmon explained.

The concepts of "going remote" and "do it yourself" have been nurtured inside IBM since the late 1960s, but, as Prime Computer's vp for field service, John Maske, puts it: "They have never been fully unleashed upon the customer." IBM's earliest efforts were poorly conceived. The granddaddy of them all, circa 1968, was a device for the remote interrogation of tape drives. Known

ILLUSTRATION BY MICHAEL GARLAND



"Much of the software FE's on-site work could be handled at less cost over the phone."

as the Electric Table, this multimillion dollar development was such a failure that critics dubbed it the "Electric Boat Anchor."

Though the anchor didn't prove to be a cost-effective solution, its best features were carried forward to its descendents. These were all tossed into a melting pot known as the Maryland Project, an ambitious attempt to produce a remote worldwide service and support nucleus for IBM's ill-fated Future System (FS). The new FS portable operating system was both novel and incompatible with IBM's existing 360/370 base—a lethal combination when preparing a business case for migration. The project, which ran for four years under the direction of Maske, then a top field service vp, died in the mid '70s when FS was killed.

Maske doesn't see much point in reflecting on what might have been. He believes that the Maryland prototype was an invaluable testbed for his own work at Prime and for IBM's current remote support centers in Chicago, Tampa, and Boulder. "The project played a pivotal part in a painful but exciting learning process that is still going on within IBM, and within me," he declares.

PROMOTING CUSTOMER AUTONOMY

Coupled with the emphasis on remote services has been the idea that customers should be encouraged to do more for themselves. In 1975 the company departed from its usual procedure of installing the 3270 terminal by offering its users a Customer Set-Up (CSU) option. Customers would install their own machines, which would be connected to a remote center for help. IBM's idea, of course, was to conserve precious field service manpower and reduce the number of on-site visits. IBM, which was already anticipating the heavier maintenance requirements of such upcoming products as the 4300 and MVS mainframes, wanted, as one source put it, to "get its users in a helpful frame of mind." While this trend was resisted by leading marketing executives, who were worried about how customers would react to less handholding, it did have some very powerful advocates. One of those staunch supporters was John Akers, then a division president and now the overall company president and likeliest successor to John Opel as IBM chairman and ceo.

At Akers' urging, the company was ready to set up in Chicago the first of its three regional support centers devoted to remote software services. Using an 800 number, customers could place remote software calls for installation help and for such things as diagnostics and error fixes. Irv Maloney, a former field service vp at IBM remembers how these service centers operated. "It quickly became apparent that 85% of a customer's problem could be solved within one 24-minute telephone call. We were so proud of ourselves," chuckled Maloney, who was one of the most senior executives ever to leave the company when he joined Harris as a senior vp and general manager two years ago.

"We'd known for some time that much of the work that a software field engineer did on-site could be handled at less cost if he was on the other end of a telephone," Maloney confides. "Possibly less than 5% of the errors he uncovers on-site are ever original problems. Usually he is just gathering symptoms of errors that have been discovered 40 times before by others. He knows," Maloney stressed, "that somewhere in a database at his regional center there is a temporary or permanent fix for the customer's problem. [The databases carry what are known within IBM as PTFs, or program temporary fixes.] He simply calls in his symptoms to the center until he gets his PTF."

When the engineer uncovered an original error, he sent what is known as an Authorized Program Analysis Report (APAR) to a central source, which wrote the fix, Maloney explains.

IBM clearly believes that in the majority of cases it would not be difficult for the customer to act as such a relay point. "The whole remote operation worked so well from our perspective that we thought we'd sold the customer on the whole idea. But," recalls Maloney, "we were in for a shock because when the customer satisfaction surveys came through in 1981, many of them were plainly not happy with IBM's software support."

Maloney, along with his marketing colleagues at IBM, had worried that support was getting less and less visible to the customer and more fractionalized. Recounts Maloney: "I'd developed the idea that there were two perceived worlds—the IBM or real world and the customer-perceived world. I learned with a bang that there is only one world—the one seen through the eyes of the customer. And that's the message I took to Harris."

It was clear then, in 1981, that IBM would have to learn how to tell its story if it wanted to entice customers with the full range of its new service techniques. Unfortunately, in developing its enviable field service reputation, "IBM conditioned its users too well," as Harmon puts it. An IBM customer in the insurance industry explains this conditioned mentality: "We've gotten used to having our machines fixed in the environment in which they break down. It's only human nature. When things go wrong we like somebody there to beat on."

A recent study of the European marketplace by one of the top field service research companies, Input, confirmed the power of human nature. Of the five service categories offered by IBM and other vendors, Input found that users were hesitant to embrace remote diagnostics and carry-in services, where the onus and the initiative are placed squarely on the customer. The more traditional central dispatch and mail-in services were more palatable to customers, according to the Input survey. (When asked if the picture were any brighter in the U.S., IBM claimed that its customers were happy with its range of service techniques and had the figures to prove it. The company, however, refused to be interviewed at any level on the subject of remote or field service.)

The reason, according to Input, that customers are "yawning at new service techniques" is not because they're bad, but because they haven't been properly marketed. "Generally, vendors have performed admirably in developing them [new service methods], but have not been as successful in implementing them," the study concludes.

The root of the problem may lie in the divergent nature of field service and sales. As Input cogently suggests: "Service and sales are made up of entirely different motivations and personalities, which result in various degrees of misunderstanding and even animosity between them." This rivalry and resentment between sales and service has certainly been true within IBM, according to former employees. Declares one ex-IBMer: "Marketing carries the power and glamor within IBM. And though field service has been the rock that supported the company, marketing types have always looked down on FEs as an inferior breed. The picture they paint is of a plodding character with dirty fingernails, white socks, a pocket protector, and a dull expression on his face. FEs, in turn, see marketers as flashy, shallow, superficial, impractical, and undependable characters in wing-tipped shoes."

Nevertheless, field service personnel will have to bite the bullet and become more sales-oriented. "In spite of the service group's resistance to selling, it is essential that they do so to survive," explains Input.

To be an effective salesperson, FEs will have to have much more than technical expertise. Indeed, in describing the ideal field service person of today, Harris exec Maloney is quick to point out that "technical skills are only third on my list. First, we look for a high-quality person with a good image and personality. And second, we seek strong communication skills. Because before the benefits of remote techniques can accrue, they have to be communicated."

Harris, along with other companies staffed with former IBMers who have learned the same lessons, have all set out to create a new corporate hybrid: a marketing-oriented

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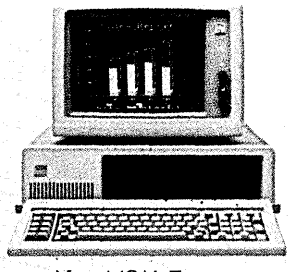

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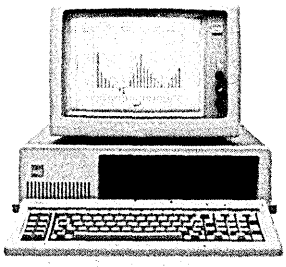

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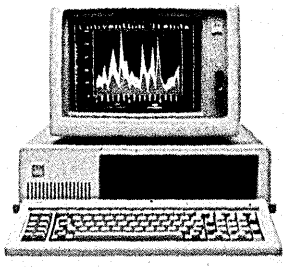

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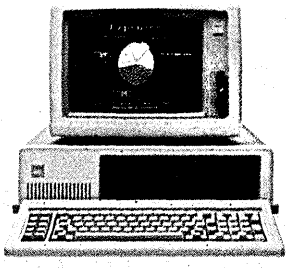
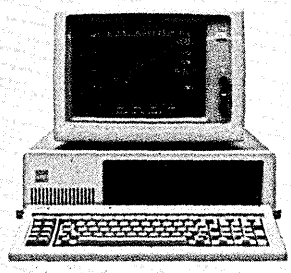
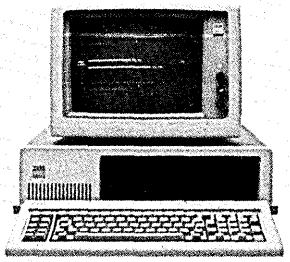


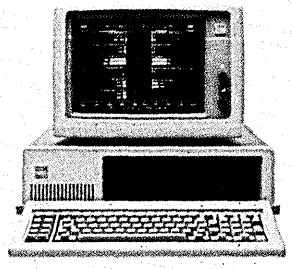
4. Choose the exact mainframe information you need, as much as you need, in the form you need.



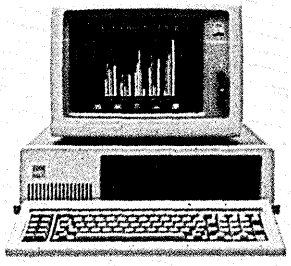
5. Use it with Peachtree Software, 1-2-3™ from Lotus, DIF,™ VisiCalc™, or other micro software.



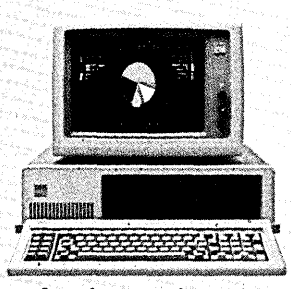
6. Replace terminals with PCs at about the same cost–with many more capabilities.



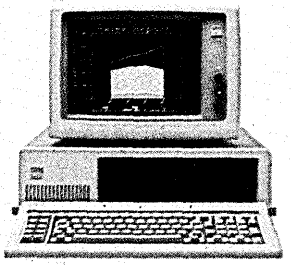
7. Plug PCs directly into your existing online network.



8. Or establish dial-up access with regular telephone lines.



9. Interface mainframe data directly to typewriters, graphics plotters, and printers.



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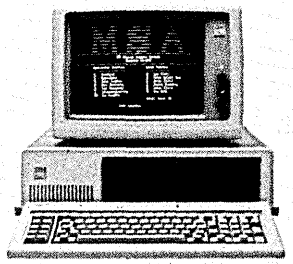

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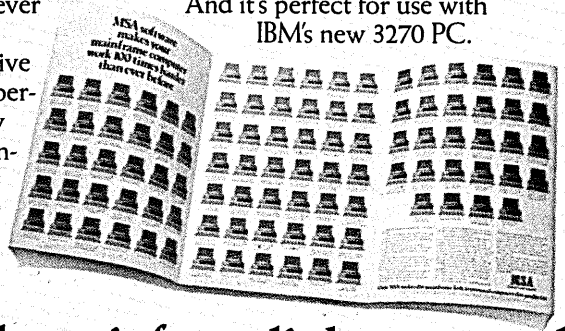

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"IBM has been slow in training its engineers to handle software as well as hardware."

engineer who can carry the company's message and culture to the customer. NBI, in particular, has been scoring some notable points using this approach, according to surveys by California-based Prognostics. NBI's field engineering manager, Phil Struve, claims IBM is missing more than the marketing link. "IBM doesn't just have a problem adding a marketing dimension to its field engineers. It has yet to add an effective software dimension."

To back up his contention, Struve went back to the basic architecture of an IBM cpu, which has always been divided into hardware and software. "From a service perspective, you can't look at both at the same time. You must first look at one and then the other. As the dominant half in profit terms, IBM has focused on the hardware half, and the software part hasn't evolved properly," he maintains.

"Today," he argues, "the onus has swung from boxes to systems, and IBM has been slow in cross-training its engineers to handle software as well as hardware." This deficiency, according to Struve, is reflected in IBM's mixed system mindset: "In a mixed systems environment, [IBM feels] the customer determines the problem and invokes the tools." The result, as one customer puts it, "is that IBM is not at its best in a mixed environment."

IBM HAS MAINFRAME MENTALITY

It is, on the other hand, at its best in the mainframe mode. IBM's continuing mainframe mentality is reflected in the company's approach to pricing. To move IBM into the "remote age," Akers knew the company would need more than the customers' goodwill. "As a result," revealed one well-placed source, "IBM between 1979 and 1982 raised the hourly rate 10% every six months for an FE visit. It wanted to make those bodies as expensive as gold," the source quipped.

IBM typically divides its service into three hardware categories: terminals, medium systems, and large systems. What is incredible is that the hourly rate (Monday to Friday, 8 a.m. to 5 p.m.) for terminal repair runs around $106 an hour—not much less than a mammoth 3084 at $130 an hour. This has given IBM's rivals an opportunity to service the smaller and less powerful customers as third-party independents.

These facets of IBM's service character are very apparent to its larger and more powerful customers, who remain loyal because they know the deck is stacked in their favor. The root of their power lies in IBM's National Average Workload (NAW) concept, which, by its very nature, favors larger users over smaller ones. IBM uses NAW to estimate how much service time a system will require across its five service categories.

For example, IBM might estimate that the 4300 would require 20 hours a month of FE time, while a 3270 terminal would get 0.2 hours a year. Thus, an FE could service a handful of 4300s or a horde of terminals during a 125-hour or 130-hour work week. In reality, the FE would fix a mixed bag in any week. But since the NAW levels on the newer and larger mainframes are clocked at hundreds of hours per month, the users of these systems tend to monopolize the engineers' time.

The pricing discrepancy becomes even greater when you consider the hourly rate for a 3270. The $106-an-hour service charge for a 3270 is almost as high as the $130-per-hour fee for a mainframe. Yet, be-

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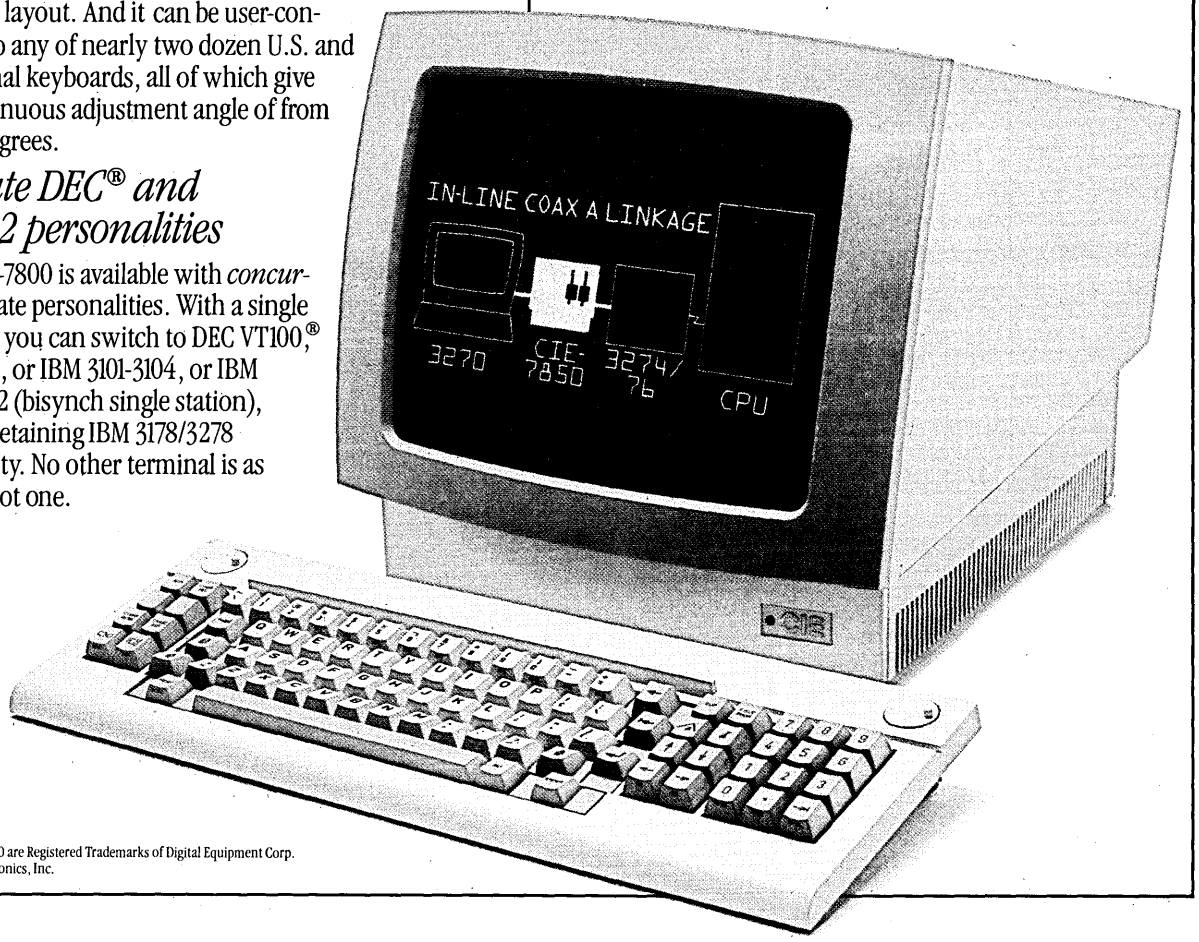

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Users were hesitant to embrace remote diagnostics and carry-in services. Central dispatch and mail-in services were more palatable.

cause of the NAW rating, a 3270 customer never gets a dedicated field engineer. Furthermore, when IBM's large customers are unhappy, the company invokes what the service divisions know internally as a "code 48," which dispatches extra field engineers to a user installation. In essence the customer is given free NAW, and IBM (or a clever user) can use the principle to get what it wants.

The NAW concept, an essential ingredient in IBM's low-cost producer strategy, is routinely cranked down 5% each year, according to industry insiders, who see customers subsequently saddled with more of their support chores. By the same token, NAW is usually inextricably tied to the processor—not the person. "But in a software environment," reminds Struve, "it's the customer that breaks, not the machine. And most new business is increasingly end-user/manager software business. Are you, for example, going to tell the IBM P.C. user that he can't have a dedicated field engineer? Or that his on-site repair would cost him $106 an hour?"

IBM has not addressed but merely skirted this problem, according to new survey material from the Ledgeway Group of Lexington, Mass. "When you buy an IBM P.C. and you don't have an IBM service contract, you're offered 60 days worth of unlimited call privileges on an 800 number, and then left on your own. So far IBM has only offered a mail-in and carry-in service for the P.C. You can get on-site, but only if you dig deep into your pocket," says Ledgeway Group founder Dick Munn.

CARRY-IN SERVICE REJECTED

IBM insiders claim that the company's carry-in service, which has been reorganized at least "three or four times," has been a disaster. "Our surveys confirm that the service has secured little market penetration," reports Munn. "IBM's small customers are much more demanding than its large ones. They want more pampering and an on-site presence at a reasonable price."

Although mum on the matter, IBM is known to be concerned about the P.C. service setup. "Back in the spring it formed a new Special Services Unit [SSU] under field service vp George Keller," reveals one source, who went on to describe IBM's P.C. service scenario: "The mission seems to be to create a courier service for P.C. users, and if that fails, maybe more handholding, though only as a last resort." (IBM, which confirmed the existence of the SSU, declined to spell out the specifics.)

Industry watchers are betting IBM will end up subcontracting out for services on all of its machines (including the P.C.) that incur service costs that don't square with its low-cost producer strategy. In doing so, IBM may be bucking a trend back to on-site support—a trend that third-party companies can take advantage of as long as IBM persists in staying aloof in the services realm. Xerox, for example, has formed a venture called Americare to service both IBM and DEC personal computers. Other new service schemes are also in the works.

Meanwhile, IBM is still refining its reasoning, trying to find feasible ways to adopt its profit center approach to support. Maybe IBM will find the formula by returning, as some industry experts counsel, to its old guideline that the best service makes the most money. ✱

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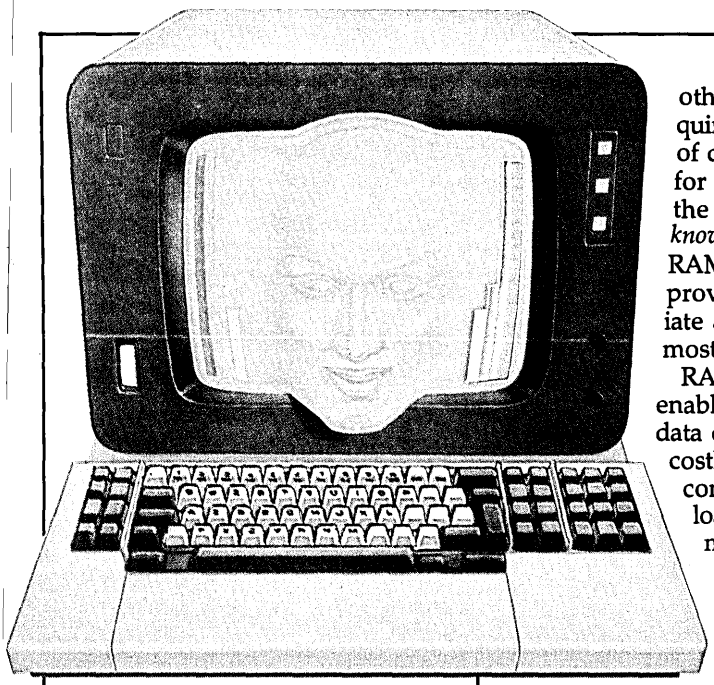

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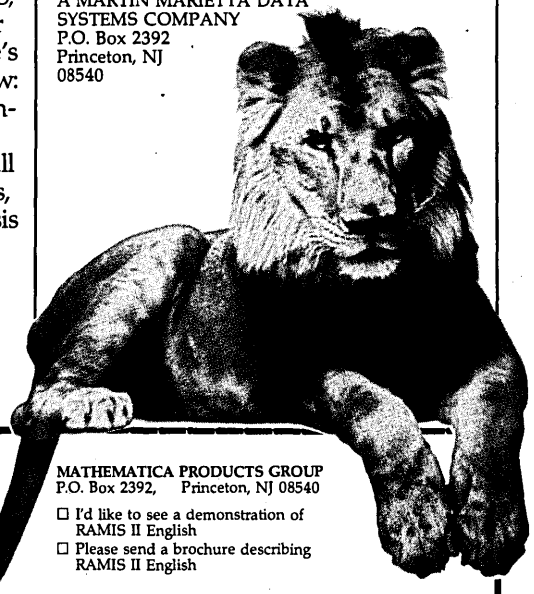

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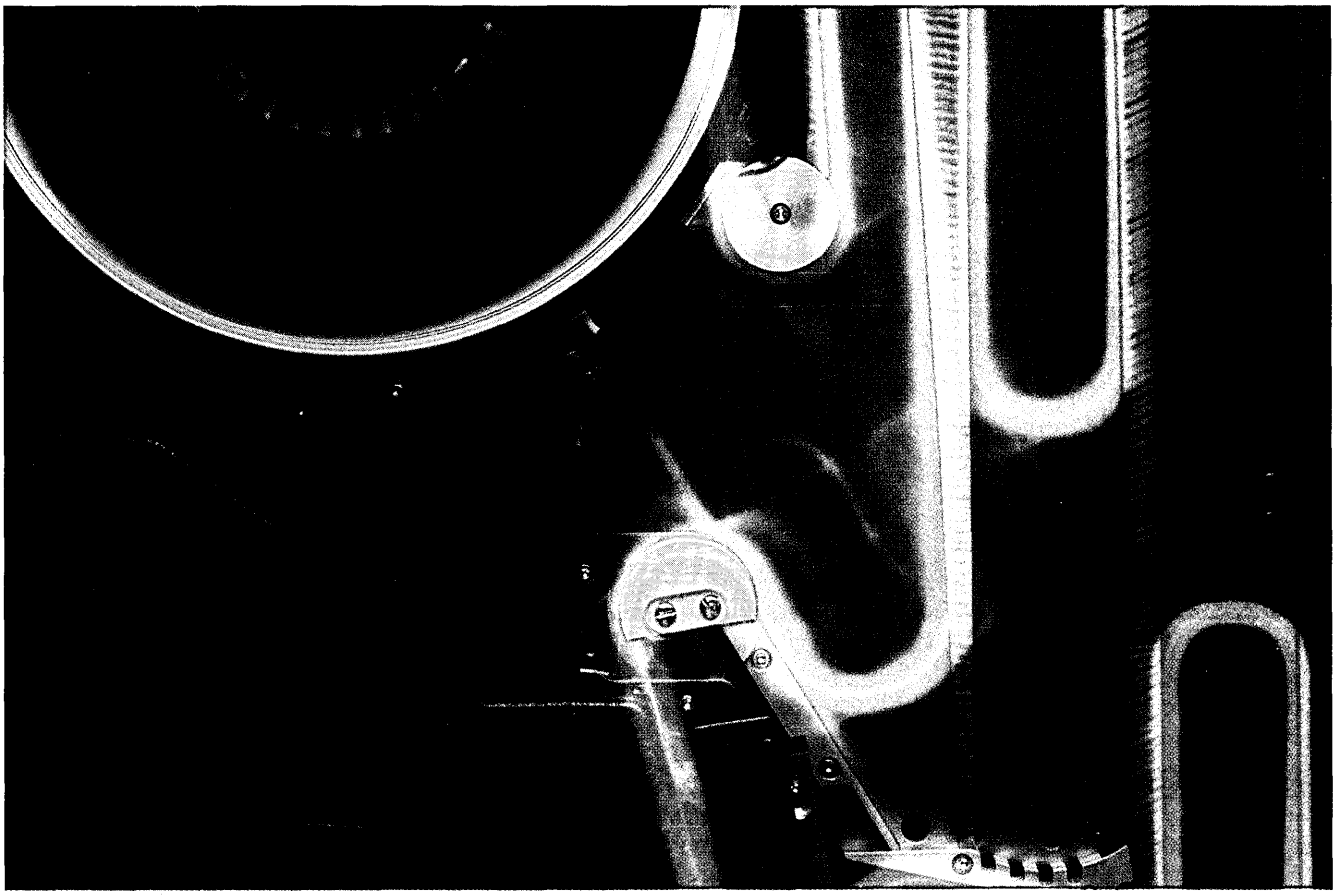

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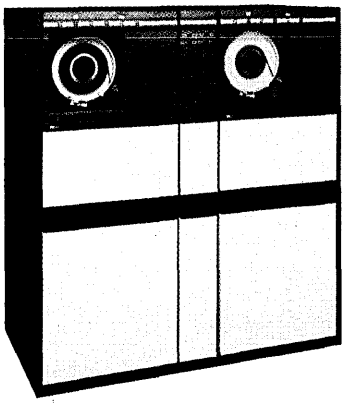


Storage Technology

CIRCLE 77 ON READER CARD

IBM used to work in solitary majesty, at its own stately pace. Now it teams up with other firms to move fast in new markets.

WITH A LITTLE HELP FROM SOME FRIENDS

by Brian Jeffery

IBM's tactics have changed in recent years. The company has shown a new aggressiveness in its marketing, has diversified extensively, and—perhaps the biggest change—has made extensive use of cooperative agreements with other companies. IBM has used third parties for product development and distribution; as oem suppliers and sources of software; as subcontractors and component suppliers; as joint venture partners and affiliates; as suppliers of third-party leasing programs; indeed, as contributors to just about every aspect of its business, both domestic and international.

This is in marked contrast to the IBM of the 1970s, with its concern to do everything in-house and its (deserved) reputation as a bastion of the not invented here attitude. The change can be dated to 1979–80, when the company began laying the groundwork for its October 1981 reorganization and subsequent new products, marketing programs, and corporate policies.

Prior to this time there had been few moves outside. In 1964, IBM acquired Science Research Associates (SRA), a Chicago-based educational publisher; in 1974–75 it diversified into satellite communications via CML (later Satellite Business Systems, a joint venture); and in 1977 it made an entry in the CAD/CAM market with the Lockheed CADAM system and 3250 graphics terminals supplied by Sanders Associates. But it was not until the end of the decade that a pattern became apparent.

During 1983, the International Technology group undertook a survey of IBM third-party relationships as part of a larger study of the company. The results indicated that IBM's outside relationships (publicized and otherwise) are more common than is generally recognized, and that in most cases IBM's moves relate to well-defined strategic goals. Also striking is the fact that most of IBM's outside relationships have been concluded since mid-1981; clearly, the process is in an early stage.

At present, IBM is involved in seven joint ventures in the U.S. and abroad. It is minority owner of seven companies, and its third-party distributors include some 650 value-added remarketers, 40 value-added dealers, 800 retailers, and 10 industrial electronic distributors. In Japan, more than 40 dealers handle IBM's small systems lines. Worldwide, IBM runs at least 20 distinct third-party distribution programs, ranging from the VARs to specialized arrangements.

Some idea of the scale of IBM's outside relationships, and the speed with which they developed, can be given by a simple chronology (see box). All in all the performance is rather astounding. And because 1980 was probably the start date for the new strategies, and the company works on a seven-year strategic planning cycle, the probability is that there is more to come. In November 1983, for example, IBM and France's Compagnie Générale d'Électricité announced preliminary talks for "joint manufacturing and marketing ventures in information processing." And in December 1983, as this article went to press, IBM and British Telecom submitted a joint proposal to U.K. banks for a nationwide EFT system.

Space does not allow for a lengthy discussion of individual tie-ups. However, some useful summaries of IBM's goals and the type of partners it is looking for can perhaps be given. We have divided IBM's outside relationships into four main groups: strategic positioning, outside sourcing, distribution, and financing.

Strategic positioning. These are tie-ups with companies that possess a particular technological or market strength judged to be of exceptional strategic significance to IBM. Strategic technologies include satellite communications (in which IBM gained a stake via SBS); high-end PBXs (addressed via hookups with Mitel and later Rolm); and micro architecture (hence the Intel connection).

IBM has also moved to secure ongoing access to markets for value-added communications services, which are expected to grow rapidly in the next few years. Examples are value-added networks, videotext, CATV services, telefinance, and—a Japanese specialty—mass-facsimile. To date, most of the action has been in Japan and Europe, where IBM's local operations have been encouraged to work with leading national companies and PTTs. IBM needs access to appropriate communications infrastructures, and doesn't want to be excluded on nationalistic grounds.

Neither the technological nor the marketing positioning seems complete; over the next few years we expect IBM to buy into leading-edge firms in a number of fields, and to form tie-ups with suppliers of communications equipment and services in the U.S., Japan, and Europe.

In the longer term, a return to the consumer electronics field is also a possibility. IBM made an effort here in the late 1970s with Discovision Associates. (Via Universal Pioneer, DA was briefly the world's largest producer of consumer videodisc products. It now exists only in vestigial form.) Its relationship with Matsushita covers comparable products for the Japanese market.

Outside sourcing. IBM uses third parties for development and supply of components, subassemblies, software, and entire products. This has been an area of major expansion since 1981, indicating a change in IBM's old preference for vertical integration.

IBM has used oem procurement to provide low-end, relatively low-cost entries in broad product lines (for example, the 7535 robot, 3101 terminal, 102 copier, facsimile machines, dictation equipment, modems, the "Crackerjack" device, etc.). It has also gone outside for specialized equipment it lacked the skills to manufacture, or in cases where demand was too limited to justify an in-house operation. Examples are most of the product lines of IBM Instruments and Biomedical Systems, the 3250 CAD workstation (from Sanders), the 3200 Kanji laser printer (from Hitachi), and other specialized peripherals for large systems. In other cases, IBM has used the specialist skills of other companies to develop components or systems. Examples are the use of Itel, Motorola, and numerous software companies for microcomputer systems, and the use of the Bruker/Spectrospin group for various products.

IBM's relationships with outside suppliers and assemblers have grown considerably since 1981.

THIRD-PARTY PROJECTS

Less visible are the numerous development contracts IBM has been handing out since 1981 to smaller, leading-edge companies. These contracts cover the implementation of a wide variety of technologies in IBM environments. The company's policy is to run multiple development projects in areas where standards have not yet emerged, or where multiple standards are likely to find acceptance. Thus, IBM has run third-party projects in just about all the major operating systems, including Unix, which at least three companies and a couple of universities have been working on. There have also been efforts in CATV-based and conventional videotext systems, and in broadband, baseband, and optical fiber LAN systems. Presumably IBM feels that these are worthwhile investments; the sums involved are typically small, and it gets the option to select one, several, or none of the various solutions in a given field as market requirements evolve.

IBM has taken a particular interest in educational institutions, and already markets a number of software products developed at universities. There have been giveaways (such as bulk donations of microcomputers), special development programs (at Carnegie-Mellon, MIT, and elsewhere), and other activities to encourage development of useful products. In Japan, IBM has teamed up with Cosmo-80 and Mitsubishi to establish its own "university," where engineers will be trained in software development.

Overall, these activities are a useful supplement to IBM's in-house R&D and product development efforts. They offer the same kinds of advantages in cost-effectiveness and flexibility as do comparable relationships in manufacturing and distribution.

IBM's relationships with outside suppliers and assemblers have grown considerably since 1981. The growth has come mostly in the microcomputer lines, where IBM has subcontracted the supply of virtually all components, peripherals, and software, and has also typically farmed out all except final assembly. (For the PCjr, even final assembly has been moved out of house.) In most cases, IBM's role has been little more than design and quality control, token assembly, and marketing. For the P.C. this was true, it appears, because of the need to get to market fast, but it has since become broader policy, with subsequent micro lines and 3270 workstation products being largely farmed out. The main benefits of the practice would appear to be lower costs and greater flexibility; outsiders can pay lower wages, lay off and hire workers as necessary, etc.

Drawbacks include the danger of dependence on a particular supplier. After several production shortfalls on its microcomputer lines, IBM found it necessary to increase its number of suppliers. But this may in turn create problems in quality control and in assuring long-term supply; by diversifying procurement and thus limiting average order size, IBM inevitably discourages long-term capacity commitments.

That concern has led IBM to identify key suppliers and form substantial tie-ups with them, which typically involve providing assistance and incentives in building up capacity. This can be done by means of buy-ins (for example, Intel), supply of capital equipment (Xebec, Teledyne), joint ventures (several are under consideration with key component and materials suppliers), or broader contractual relationships (such as those with Motorola and Matsushita). The result will likely resemble the Japanese "Keiretsu" system, with a set of "first rank" suppliers enjoying favored procurement relationships but obliged to meet stringent delivery and quality requirements, and a "second rank" used for overflow and nonstrategic items.

Distribution. Prior to 1981, IBM's use of outside distributors was largely restricted to office equipment dealers carrying the old OPD line, and a handful of specialist distributors for the Series/1 under the recently established VAR program. Since then, third-party distribution activities have greatly expanded.

Value-added distribution for the Series/1 was first introduced after direct marketing efforts for the product had failed. It rapidly became an important channel. The VAR program (and its counterpart for the P.C., the VAD) provides for the supply of IBM systems to distributors on condition that they add "significant value" to the product, usually in the form of specialized software. Over 1981–83 the program was extended to virtually all of IBM's small and midrange systems, with new products in this bracket (such as the S/36 and 4361) being included at an early date. Many of these products had not been meeting sales targets, and it was recognized that a major structural shift was occurring in the market.

VAR HELPS TO TARGET MARKET

With the VAR program, moreover, IBM found it could use carefully selected specialist distributors to aim specific products at specific market segments. That was important for a company that had suffered from internal competition within its product lines during the 1970s. IBM was able to field a range of theoretically competing products without significant market overlap. An added plus was that the VAR technique allowed the small and midrange products to be channeled away from the large accounts, where they had done so much damage during the DPD-GSD-OPD office automa-

COOPERATING COLOSSUS

In recent years, IBM, once a bastion of vertical integration, has made extensive use of cooperative agreements with other companies. Following is a chronological listing (complete as of December 1983) of these outside tie-ups in R&D, manufacturing, distribution, and financing.

1964
Acquires Science Research Associates, a Chicago-based educational publisher.

1974–75
Attempts to form joint venture with COMSAT General for development and marketing of satellite communications services. Following FCC intervention, Satellite Business Systems (SBS) is formed in 1975 as a joint venture between IBM, COMSAT General, and Aetna Life & Casualty. IBM is restricted to minority holding (currently one third) and joint marketing activities are prohibited by the FCC.

1977
Enters CAD/CAM market with Lockheed CADAM software and 3250 terminals supplied by Sanders Associates.

1979
Forms Discovision Associates, a joint venture with MCA, to develop, produce, and market consumer videodisk products.

1980
Introduces value-added reseller (VAR) program, initially for the Series/1. Forms IBM Instruments Inc. Acquires minority holdings in four instrumentation companies: Spectrospin AG and Bruker-Spectrospin AG (Switzerland), Bruker Physik GmbH (Germany), and Bruker Instruments Inc. (U.S.A.).

1981
February—Introduces 102 copier, an oem product supplied by Minolta.

August—Introduces IBM Personal Computer, developed in cooperation with Intel and Microsoft. Virtually all software, components, and peripherals are sourced externally; subassembly is contracted out, and distribution is largely via third parties.

September—Introduces oem program for 680 disk drive, later expanded to include 676 and 341 drives. Introduces third-party distribution program for 3101 and 3232 ASCII peripherals.

November—Concludes cross-licensing agreement with Nippon Telegraph and Telephone (NTT), covering a wide range of products and technologies. Obtains a $22.5

million contract from the West German PTT (Deutsche Bundepost) to supply 4300 series and Series/1 systems and software using the British Prestel technology for the German public videotext network. Subsequent contracts for this network are also awarded over 1982–83. Introduces a Series/1–based videotext controller using Prestel technology in the U.K.

1982

January—SRA integrated into mainstream IBM operations with responsibility for development of training materials for other IBM groups and support of marketing activities to educational institutions.

March—Introduces third-party leasing plan in conjunction with U.S. Leasing and Citicorp Industrial Credit. The plan is extended over 1982–83 to cover a wide range of IBM products and systems.

Introduces 7535 robot, a product supplied by Sanyo Seiki.

In Japan, introduces 3200 Kanji laser printer, a product supplied by Hitachi.

April—In Japan, concludes cooperative marketing agreement with Omron Tateishi for the latter's automatic teller machines.

May—Adds System/23 small business system to VAR program.

IBM Instruments introduces product line that includes oem products from the Bruker-Spectrospin group and Laboratory Data Control, and the CS-9000, a 68000-based microcomputer system.

Introduces third-party distribution program for the 3851.

June—Concludes agreement with Carnegie-Mellon for joint development of local networks and systems software for future IBM microcomputers. Donates 500 machines to the project.

Introduces third-party distribution program for 4700 series banking terminals.

July—Concludes agreement with Mitel for joint development of networking systems based on Mitel's SX-2000 PBX.

IBM Credit Corp. forms leasing partnership with Merrill Lynch.

Negotiates for purchase of Irex Medical Systems.

August—Applies to participate in Nippon Telephone & Telegraph (NTT)–sponsored program for development and implementation of national high-speed facsimile system; subsequently turned down. Also investigates participating in Japanese fifth generation and other national development projects, but eventually declines.

September—Purchases tapes and process technology from Intel for the latter's 64K RAM chips after finding home-produced chips unsatisfactory.

Reaches agreement with Texas Instruments for development of VLSI interfaces for future local networking products.

Forms Nippon Office Systems Ltd., a joint venture with Kanematsu-Gosho Ltd. (which holds controlling 65% interest) to market small business systems, Displaywriter, and typewriter products in Japan. This represents IBM Japan's first joint venture. Meanwhile, Japan Sales Co., a holding company owned by IBM Japan, oversees some 60 dealers with 200 outlets.

Introduces third-party distribution program for supplies in U.S.

October—Introduces third-party distribution program for POS systems.

November—Introduces Scanmaster facsimile system.

December—Purchases 12% of Intel Corp. (1982 revenues of $899 million) for $250 million. Gains option to increase stake in Intel to 30%; as of December 1983, open market stock purchases by IBM had raised stake to 16.28%.

Introduces plasma display panel and 5217 printer as oem products.

Adds System/34 and Displaywriter to VAR program. Third-party distribution of CS-9000 and 4300 systems begins.

Introduces CPIX, a Unix-based operating system for the Series/1; software was developed at Cleveland State University and University of Delaware.

IBM Japan forms joint venture with Orient Leasing (35%) and Morgan Guaranty International Finance (29%). Venture is called Computer Systems Leasing Ltd. and provides leveraged lease plans for mainstream IBM products.

1983

February—IBM Japan introduces 5550 MultiStation, a combination personal computer, 3270 terminal, and word processor. Product is developed in Japan and manufactured by Matsushita Electric, Oki Electric, and other Japanese firms. Chinese version subsequently introduced and English expected shortly.

Introduces value-added dealer (VAD) program for P.C.

Satellite Business Systems files with FCC for removal of restrictions on its relationship with IBM.

American Express begins catalog marketing of IBM Typewriter.

In Japan, announces agreement with Matsushita for further development and production of "low-cost, high-volume information processing products."

Negotiating for participation in DARPA Supercomputer program.

March—Introduces PC XT, hard disk version of original P.C.

Concludes agreement with Motorola for development and manufacture of proprietary IBM cellular radio system.

May—Introduces System 36, enters in VAR program.

June—Acquires 15% of Rolm Corp. (1982 revenues of $448 million) for $228 million, with option to increase this to 30%. As of December, IBM had increased its stake to 19% via open-market stock purchases.

In Japan, agrees to acquire 35% of Japan Business Computer Ltd. (1982 revenues of $47 million).

Announces donation of $40 million in hardware and software to 20 U.S. colleges for development of IBM-compatible CAD/CAM software.

Enters CS-9000 in VAR program.

Donates 500 Personal Computers to MIT, with a further 500 of a second generation product to follow, for development of networking systems.

August—IBM Japan forms joint venture with Mitsubishi Shoji and Cosmo 80, two Japanese companies, to develop and market products and services relating to Japan's forthcoming national network, INS. Venture includes two companies: Advanced Systems Technology for planning and marketing, and Advanced Systems Technology Development for product development and customer training. IBM maintains 42% and 34% stakes, respectively. Several Japanese banks also fund the two companies.

September—Introduces 4361 and enters it in value-added reseller (VAR) program.

October—Introduces XT/370, with custom cpus developed by Intel (8087-based) and Motorola (68000-based).

Introduces 5080 Graphics system, and also PCjr. Begins oem marketing of P.C.

November—In Japan, announces cooperation with NTT in development of networking systems software for mutual connection.

Announces funding of R&D center at Brown University for development of Unix systems and IBM micro-based products.

December—Enters 4250 printer as oem product.

—B.J.

IBM has reorganized itself into a number of distinct businesses.

tion wars. The use of different channels for different products also overcame the danger of new items eroding sales of older but still marketable systems. The S/23 and Displaywriter, for example, were threatened by the XT, but they were off and running in the VAR program well before the latter was introduced.

Another form of outside distribution has been a source of some trouble for IBM. This is the use of third-party retailers—mainly independent computer stores or chains. The tactic was chosen only after preliminary studies indicated it was a necessary part of selling microcomputers to Fortune 500 purchasers. Subsequently, every effort was made to reduce dependence on this group. A separate, directly marketed micro line for large accounts was introduced, and IBM tried to boost retail sales at its own outlets via advertising, direct mail, and new pricing and service terms. Although a program was begun in early 1983 to allow authorized independents to resell small lots of P.C.s to other outlets, IBM clearly intends to expand direct sales of its micro lines.

Yet another method of outside distribution—via systems houses—has been used mainly for products that are aging, or were developed for other purposes but are seen as having broader sales potential.

Finally, there are various special arrangements, involving mainstream products that were not meeting sales targets but which IBM did not want to make available for large-scale third-party distribution. Typically, only a limited number of companies are used, and they sell in markets that don't offer IBM a significant business opportunity. Examples are programs for the 4700 Series, POS systems, and supplies. IBM also does occasional favors for friends (for example, Aetna and State Farm with a special Series/1 distribution program).

Financing. IBM's use of third parties for financing involves a two-tier system. Primary collaborators (Merrill Lynch in the U.S. and Orient Leasing and Morgan Guaranty International Finance in Japan) provide long-term leveraged financing, expertise, and credibility for financing plans for mainstream IBM products. Secondary collaborators (US Leasing and Citicorp Industrial Credit in the U.S. and some 13 firms in Japan) provide financing for small and midrange systems and for large account products scheduled to be replaced or sidelined.

This, then, is the "new" IBM, with its still-expanding sets of outside relationships. Their number and diversity would undoubtedly pose severe management problems were it not for the 1981 reorganization, which resulted in much more autonomy for the various functional and geographic units. These groups were thus able to go out and fill their respective shopping lists of products, technologies, manufacturing capabilities, and market coverage. The result, ironically, is something like the old Justice Department plan for breaking up IBM—it has, itself, reorganized as a number of distinct businesses.

MANY CHANGES AHEAD

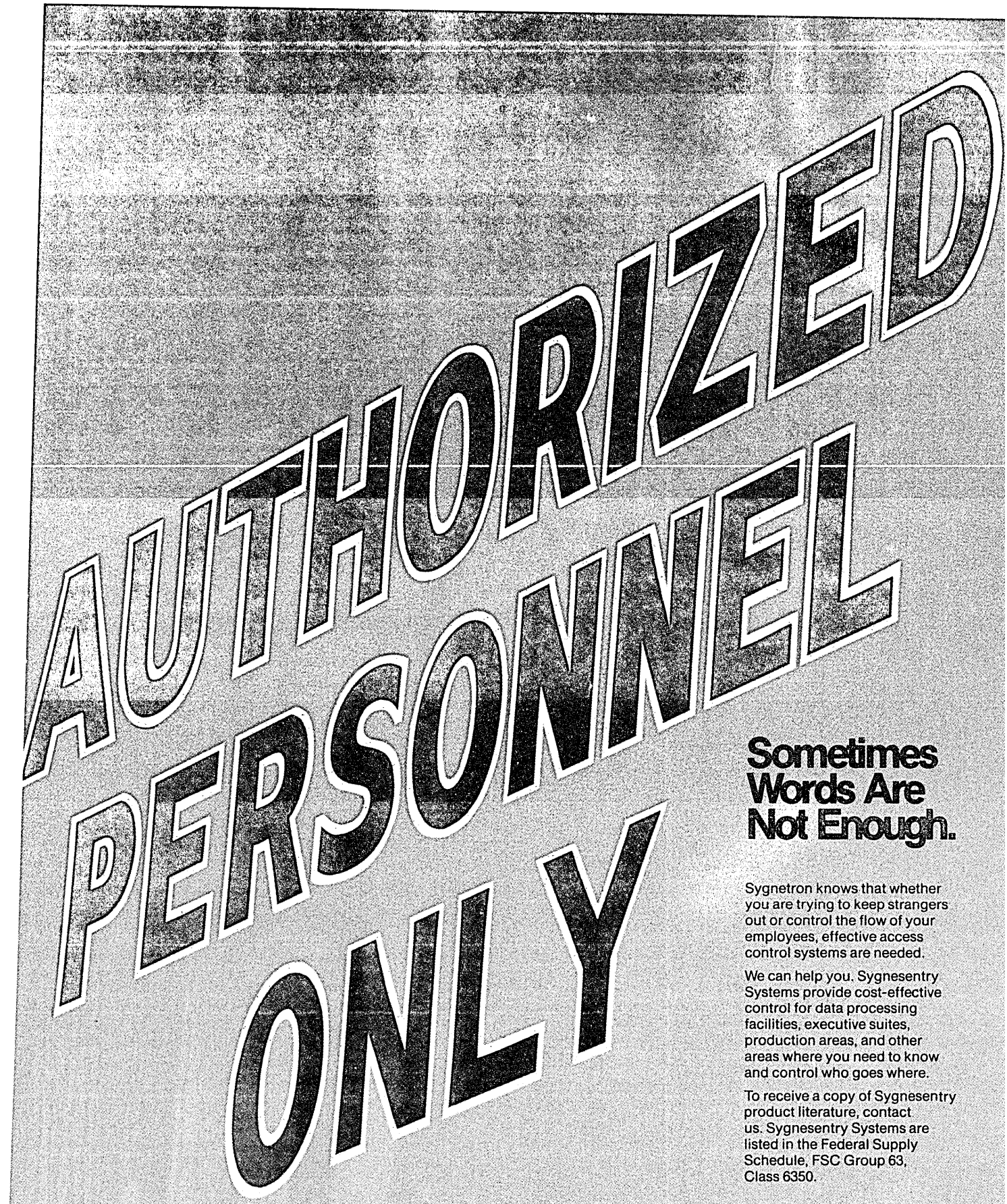
IBM currently appears to be in a state of transition. Its many cooperative undertakings may have caused it to concede more control to outside collaborators than was originally envisioned. By 1987, we are likely to see some consolidation, with more equity positions taken and stability resulting from substantial reciprocal commitments. IBM direct marketing and the more easily controlled value-added distributors will likely be emphasized, and the company will probably complete a few shopping lists with connections in the communications field in the U.S. and overseas.

The result? Circa 1987, we will be seeing not just IBM but a family of companies, covering most of the information processing market and linked to IBM itself by means of equity holdings, interlocking directorships, supplier and development relationships, cross-licensing, and distribution and finance arrangements. It will not be an exclusive group; its members will do business with companies outside the fold. But they will nevertheless be each others' primary customers, and all will benefit from the visibility and credibility of an IBM association. It's going to be interesting: nothing quite like it has ever happened in U.S. industrial history. ❋

"That should take care of any more brilliant ideas emanating from the right side of your brain!"

CARTOON BY FRANK COTHAM

Brian Jeffery is director of research for the International Technology Group, a research and consulting company operating in the U.S., Japan, and Europe. He is currently project manager for "IBM Inc.," an international study of IBM strategies, positioning, organization, and product lines. Data used in this article are excerpted from the study, which may be obtained from The International Technology Group, 2465 East Bayshore Road, Palo Alto, CA 94301.



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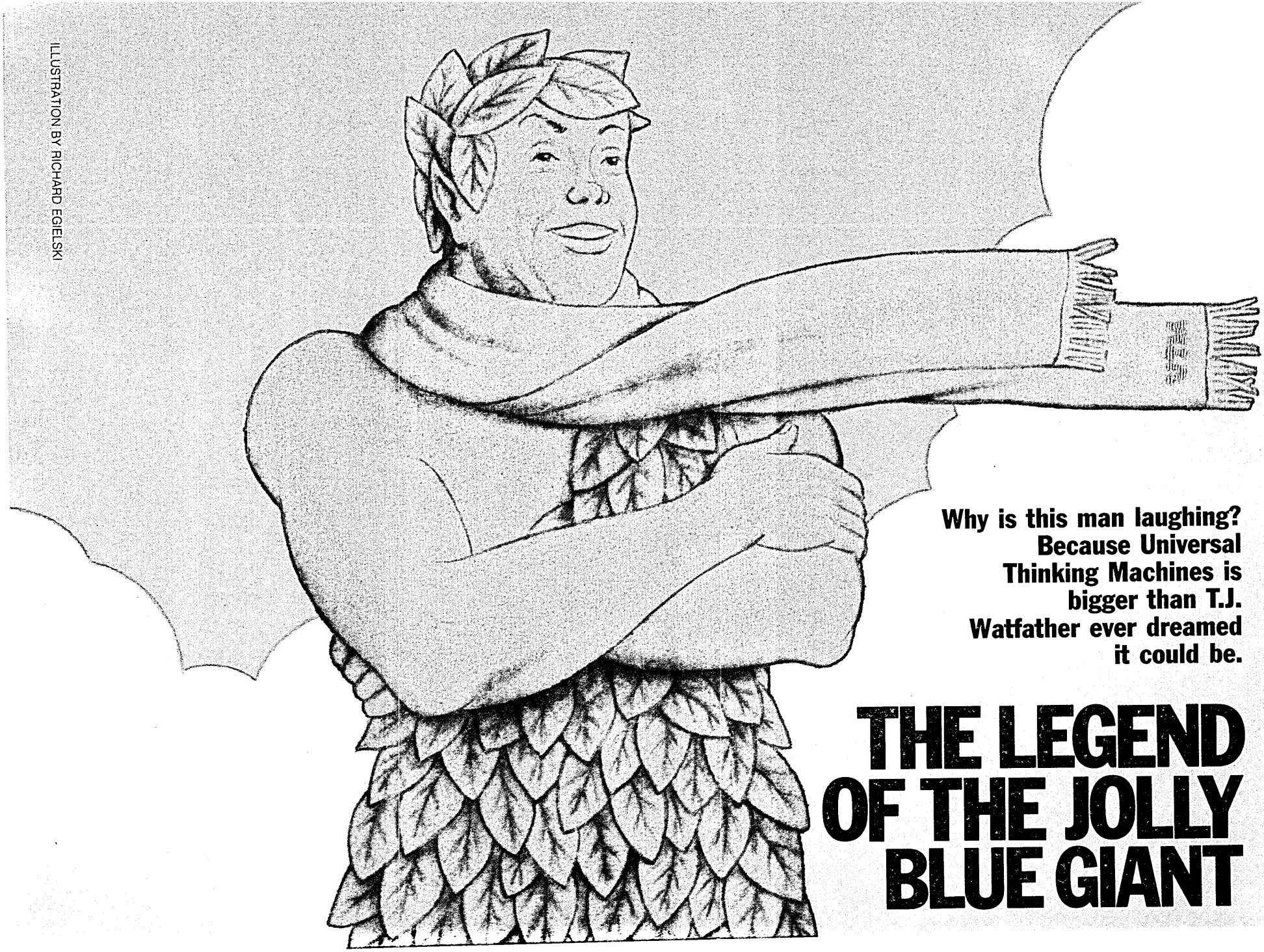
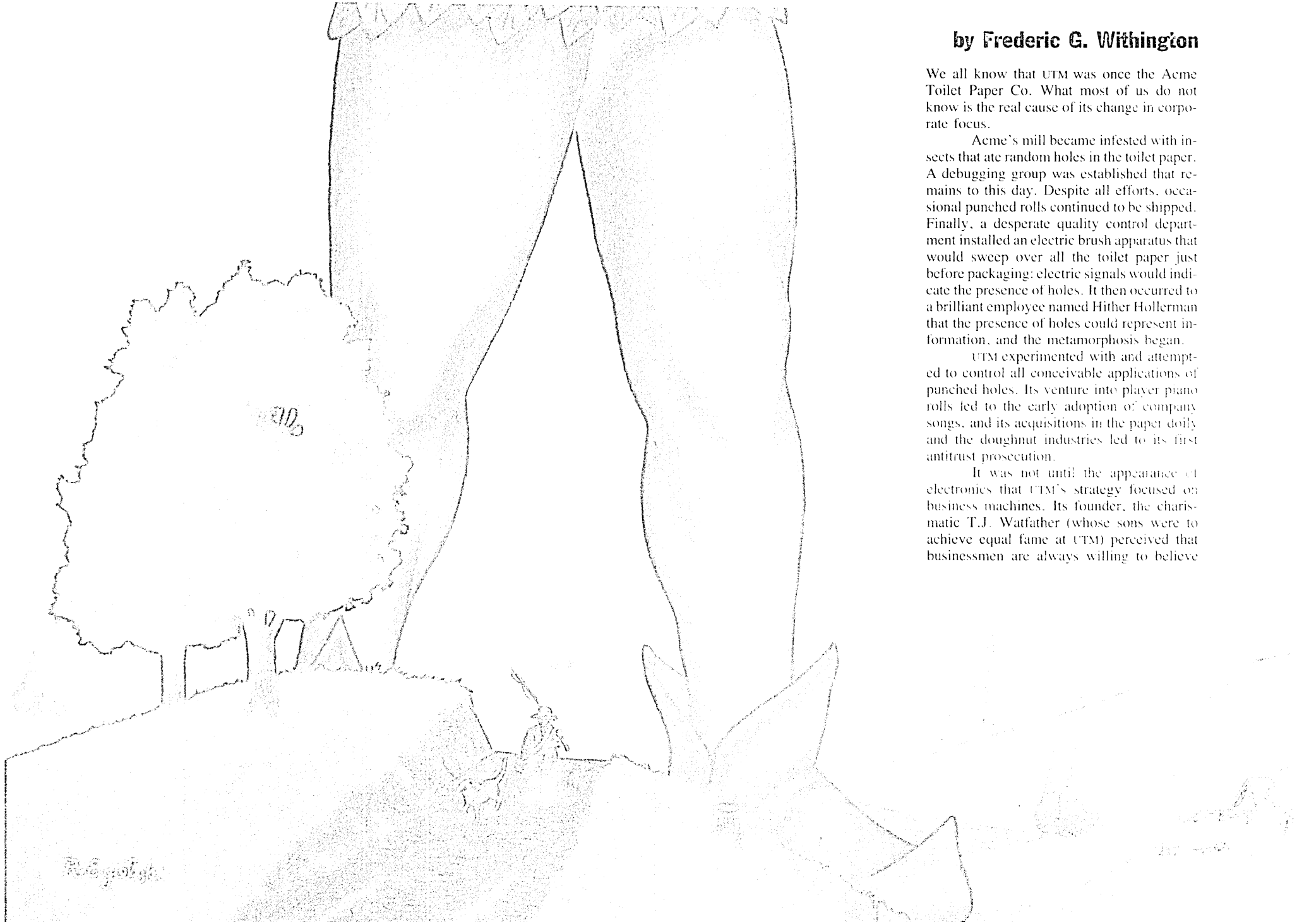


ILLUSTRATION BY RICHARD EGIELSKI

Why is this man laughing? Because Universal Thinking Machines is bigger than T.J. Watfather ever dreamed it could be.

THE LEGEND OF THE JOLLY BLUE GIANT



by Frederic G. Withington

We all know that UTM was once the Acme Toilet Paper Co. What most of us do not know is the real cause of its change in corporate focus.

Acme's mill became infested with insects that ate random holes in the toilet paper. A debugging group was established that remains to this day. Despite all efforts, occasional punched rolls continued to be shipped. Finally, a desperate quality control department installed an electric brush apparatus that would sweep over all the toilet paper just before packaging: electric signals would indicate the presence of holes. It then occurred to a brilliant employee named Hither Hollerman that the presence of holes could represent information, and the metamorphosis began.

UTM experimented with and attempted to control all conceivable applications of punched holes. Its venture into player piano rolls led to the early adoption of company songs, and its acquisitions in the paper doily and the doughnut industries led to its first antitrust prosecution.

It was not until the appearance of electronics that UTM's strategy focused on business machines. Its founder, the charismatic T.J. Watfather (whose sons were to achieve equal fame at UTM) perceived that businessmen are always willing to believe

In the works: a pressure-sensitive terminal that will scream and beg for mercy when the user hits it.

their activities are sufficiently rational for programmed machines to perform them. The slogan "Think" was adopted to imply that the customers actually could.

Shortly before World War II, UTM personnel developed true multinational attitudes for the first time, as they competed to collect Think signs in as many languages as possible. The company also adopted its early motto: "World Peace Through World Trade."

Mr. Watfather also reasoned that if UTM products were as obscure and difficult to understand as possible, a "priesthood" of customer employees would become necessary. This priesthood, dependent on ever-larger UTM products for their career growth, would then help sell them to bemused employers. His search for complex products naturally led Mr. Watfather to add computers to UTM's product line. He then undertook to increase their obscurity, with the assistance of Arthur Cronym (UTM's director of product nomenclature). Cronym spent his long and illustrious career helping achieve Mr. Watfather's objective. Starting with software terminology such as SPOOL, FORTRAN, and OS, Cronym advanced to MVS/XA, VM/SP-CMS, SNA/AF, and many others.

Cronym also worked on hardware products. UTM's earliest computers included the EDPM (electronic data processing machine), MDDPM (magnetic drum data processing machine), and RAMAC (random access memory accounting computer). Enraged customers reacted to these names much as their fathers had to the holey toilet paper, and Cronym was forced to use a simpler numbering system: these three computers became the 702, 650, and 305. Down but not out, Cronym was subsequently able to complicate even this simple numbering scheme, as witness the System/370 Model 3084 Q96. And he is still trying to slip in examples of the original alphabetic obscurity (e.g., PCjr).

These early computers evolved into three highly successful product lines of medium, large, and giant business computers. (UTM has three lines of business computers today, in much the same price ranges.) As successive models attracted more and more customers, UTM pulled ahead in the competitive race, and customers built large libraries of programs committed to UTM computers. The stage was set for continuing growth.

Then UTM introduced The System/Infinity, so named because it was to meet an infinity of customer needs with a single, compatible product line. But it was not compatible with any existing UTM products. Angry customers defected, particularly to the first program-compatible computer (the Syrupsump 200), which was designed to exploit UTM's difficulty. Key models of the System/Infinity were late, specifications were changed, the system programs (greatly expanded for the System/Infinity) never did appear in the original form, and there was administrative chaos. Indeed, as we now know the very concept of an all-inclusive compatible product line was wrong.

The result, of course, was one of the greatest business successes ever recorded. Mr. Watfather's perceptions about market rationality and the virtues of product obscurity were triumphantly validated.

WRETCHS AND PHANTOMS

UTM's earliest large computer was the scientifically oriented 701. It was the first in an illustrious line of supercomputers, leading to the WRETCH and the Phantom. But two things went wrong: only a few WRETCHs were delivered, performing below spec, and the Phantom changed its name and nature several times and, in the end, was never delivered. UTM thereupon declared the supercomputer market nonexistent and abandoned it.

Dr. Gene Damahl (UTM's supercomputer designer) then left UTM. He became the first PCM (pernicious competitive maggot, as defined by UTM) to offer a fully plug-compatible computer. PCM disk drives, tape drives, printers, and memory were already on the market; PCM software of every kind also evolved. It became possible for a UTM-dedicated customer to buy nothing from UTM; the holes had wiped out the toilet paper.

UTM reacted by becoming plug-compatible with itself. It undercut existing products with lower-priced successors, started procuring subassemblies and complete products from outsiders whose costs were lower, and experimented with changes in virtually every price and policy. This upset the PCMs, who considered it unfair of UTM to copy them, so they filed antitrust suits.

UTM settled the first suit with substantial profit to the plaintiff; dozens of suits were then filed against UTM during the "golden age of antitrust," as the lawyers called it. The suits took different forms, but all came down to the same thing. The PCMs wanted to define the market narrowly (just UTM and them), so UTM would be considered a monopoly, while UTM wanted the market defined broadly (including every artifact ever made by humans), so it could look small and meek.

Every suit was settled the same way: somebody gave up. Sometimes the plaintiff got tired and withdrew. Sometimes the courts got tired of endless quibbles about interchangeable products and dismissed the suits. UTM gave in in the first suit, but never again (its opponents came to think of it as Uncompromising, Tenacious, and Maddening). The fun went out of the game, and people stopped filing antitrust suits against UTM. To this day, though, no one knows for sure what a general purpose computer is.

One of UTM's reactions to PCMs was to make its systems harder to be PC with. UTM buried system functions in trade secret microcode. It also accelerated its pace of introducing standards and then changing them. It is not generally realized, for instance, that the acronyms SNA and DISOSS really refer to policies, not products. SNA means standards never arrive; DISOSS means distracting obfuscation and system softness.

In its early years UTM enjoyed a normal financial history: reasonable growth, reasonable cash balances, reasonable debt. But when it entered the computer business, it needed more money to pay for the new facilities and the rental base (in those days almost all computers were rented). So UTM went heavily into debt.

Slowly the rental cash flow built up. One generation of machines paid for the next, and some equipment, particularly peripherals, stayed on rent at full price far beyond their depreciation periods. Twenty years after entering the computer business UTM had built up a multibillion dollar cash pile. Embarrassed, UTM began using the money to buy up its own stock.

But already the tide was turning. PCM competition forced price cuts, leasing companies eliminated the long-term flow of short-term rental payments, and new plants were needed to build the new, smaller products. UTM stopped buying its stock, used up its cash, and went into debt again, twice as deeply as before.

PCM CHALLENGE DECREASES

The new manufacturing facilities began to pour out low-cost products. These were generally sold rather than rented (partly thanks to leasing companies). PCM competition shrank. The tide turned again, and 10 years after the earlier multibillion dollar peak another one occurred that was twice as high. UTM again turned to buying stock, but in attractive vendor and partner companies, this time.

So UTM's cash tides have ebbed and flowed, but each cycle has taken half the time of the previous cycle and has reached peaks twice as high. If this continues (and there is no reason why it shouldn't, given UTM's financial management), there will be dramatic results. The fourth cycle from now will swing from valley to peak inside one year, and the magnitude of the swing will exceed the national debts of most countries. Such a violent cash movement might destabilize the entire free world banking system. UTM management is reviewing the competitive possibilities.

Having outgrown its priesthood, UTM

has now decided that its systems should be user friendly. For instance, it was the first to develop a furry PC. Its engineers have also noted that users obtain little satisfaction from swearing at terminals when there is no response. They are incorporating simple voice input-output systems that will recognize swear words and respond by apologizing and sobbing. They are also experimenting with adding pressure sensors to the terminals, so that when the user hits the terminal it will scream and beg for mercy. UTM will then have achieved the objective of providing systems that suffer along with the user.

UTM's researchers are also active in the artificial intelligence field (since UTM's founder observed that the real thing was in short supply). The first result will be a reappearance of Think signs, but this time they'll be inside the machines instead of outside.

UTM continues to develop ever-smaller computers. Company researchers are working on one so small that it has less than no size at all. When it is brought into a room, the room will expand. The machine has one drawback, however; it acts as a black hole by sucking in all the data in the vicinity and never letting any out.

The firm has also resumed supercomputer research. It is working on one machine that is so fast that results appear in less than no time at all.

There is one problem, though. Since there is no opportunity to provide inputs, the results are always zero.

Despite these minor problems, UTM is committed to an ever-accelerating pace of new product introduction. The customers, realizing this, are increasingly reluctant to commit to any particular generation of computers. UTM will counter their reluctance by reducing prices to below zero levels: it will pay customers to take the machines. UTM is not worried about any negative effect on earnings, however. Because of obsolescence, its machines will lose value so fast that no one will take the used ones. To obtain a new UTM machine, the customer will have to trade it in to UTM at a (negative) trade-in price set by UTM. This will more than cover the (negative) price of the new machine.

By controlling its acceptance of trade-ins, UTM will control most of the systems used worldwide, in government and industry alike. Favored customers will receive new machines; those of whom UTM disapproves will not. UTM will finally be able to achieve its founder's proud motto, though in slightly modified form: "World Peace Through World Trade-in." *

Frederic G. Withington, a vice president with Arthur D. Little Inc., Burlington, Mass., is the world's foremost authority on Universal Thinking Machines Inc.

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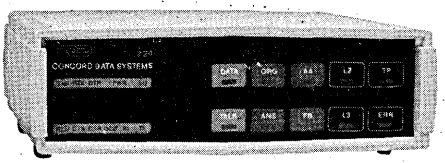

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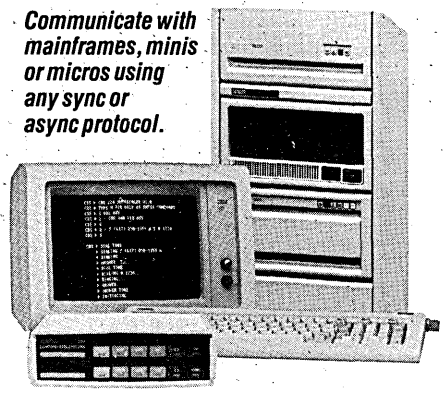

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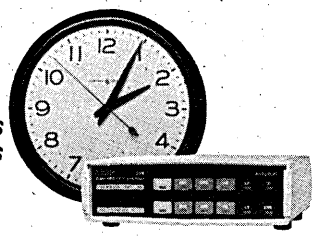

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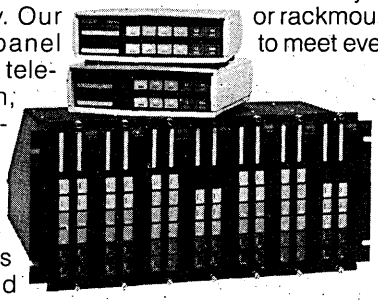

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IBM's strategy blends business acumen, power, and responsibility; these days, the mixture is working better than ever.

MAINFRAME MANEUVERS

by Hesh Wiener

The purpose of IBM's mainframe strategy is to establish and maintain a franchise among companies, governments, and other organizations worldwide. This franchise includes, but is not limited to, providing the means for collecting, processing, storing, and disseminating information. As this relationship between company and customer is voluntary, intimate, and perishable, it requires constant attention. If lost, such a franchise is difficult to regain. It is rare and precious, and no party is more aware of its value than IBM.

Collectively, the tactics used by IBM to perpetuate its franchise are called, by competitors, by users, and even by IBM, account control. This is not a pretty term, nor is it fair or complete. But account control describes the cutting edge of IBM's sales effort, and it can serve as a mnemonic for various aspects of the computing function in an organization. At its core, business computing provides the user with control over accounting. Computing tasks can be grossly divided between those based on counting (run in system time) and those based on control (run in real time). Should the data processing function fail, the managers in control will be held accountable.

IBM's strategy, at least the portion of its strategy that can be adduced from the company's overt behavior, involves aggressive marketing of successive generations of mainframe systems to users at a rate commensurate with the users' information processing needs and budgets. Carrying out its strategy requires IBM to continually foster demand for data processing while maintaining its position as the favored supplier of goods and services to meet that demand.

As a company responsible to its shareholders—over the long haul, if not over short time periods—IBM must do this in a way that increases its revenue and profit. The progress of computer technology is quite rapid. The potential demand for the fruits of computing is without apparent limit. Consequently, IBM's strategy may well succeed, despite the ardent efforts of competitors. Investors, among others, seem to think so. The company's shares have moved to consecutively higher price levels during the past 18 months, increasing the worth of pension funds and other institutional investment pools. Investors have made IBM their favorite expression of faith in the future of American industry.

There is a lot more to IBM's strategy than enticing users to continually do more things with more computers. Users have grown dependent on their systems and, therefore, upon IBM. Should equipment or providers fail, the users' businesses may fail, too. Any slip by IBM may be, in the eyes of the user, a serious breach of trust and an invitation to change suppliers. Among the immediate alternatives for IBM users are vendors that cleave to IBM's standards of machine design and wait for disappointed IBM users to leave the fold.

Despite its best efforts to satisfy customers, IBM does slip from time to time. At each customer account, IBM tries to build a reservoir of good will, on which it hopes never to draw, against a time when it cannot perform. Thus, IBM's strategy includes provisions for coping with the inevitable problems that arise when dealing with users.

As the dominant producer of mainframes worldwide, IBM has generally been careful not to overplay its hand. If it did, its customers would quickly grow resentful and its rivals vicious. IBM's strategy involves brute force and finesse, applied, in turn, with almost uncanny wisdom. Today's mainframe shop can no more disregard the move to XA systems than yesterday's could ignore virtual memory. Tomorrow's user will find migration to IBM's next generation of systems just as compelling.

PERSEVERANCE PAYS OFF

Not all the developments in IBM's mainframe strategy resulted from management's planning. While one may examine the company's financial reports and find ample evidence that IBM's success is the result of design and not accident, these same reports, along with the press and, most important, the real world from which accounting and journalistic accounts are drawn, also show that IBM's forward thrusts are often deflected or frustrated. Yet IBM succeeds, because the company perseveres after encountering an obstacle.

Some recent strategy changes at IBM have involved adjustments to political imperatives. Antitrust considerations at home and abroad have influenced IBM's behavior and will continue to do so in the future. The relationship between business and government will always include some adversary aspects. Conflicts and resolutions alike alter IBM's situation, shape the actions of users, and, consequently, the posture IBM assumes to achieve its goals.

The computer business is now truly international, involving nations with cultures very different from America's and subsuming manufacturers with corporate cultures very different from IBM's. Such countries and companies, notably those on the western edge of the Pacific, have become both good partners and tough competitors.

European business conditions have also made an impact on IBM's activities, locally and in America. In addition to the way Western Europe's economic climate affects IBM's financial condition, overseas price and product availability shape and are shaped by U.S. equipment markets. Mainframes and peripherals, both new and used, are routinely shuttled across the Atlantic when price differences justify the cost of transnational installation. European attitudes toward rental versus purchase are also generally different from those prevailing simultaneously in the U.S.

As if this were not enough, IBM must also deal with independent dealers and lessors at home. The independents' ability to fight IBM's marketing force with equipment originating at IBM is evidenced by the number, size, and prosperity of organizations in the so-called third market.

Thus, in developing and implementing a strategy for its most important customers, mainframe users, IBM cannot operate as if it were in a vacuum or in a world shared only with its user base. The company cannot afford to confine its thinking to labs and factories inside, and to the state of users' operations outside. To carry out any plan it makes, IBM must be tough and fair, supremely sensitive to customers' needs, and aware at all times of its liabilities and limitations. IBM must do this while under steady critical ob-

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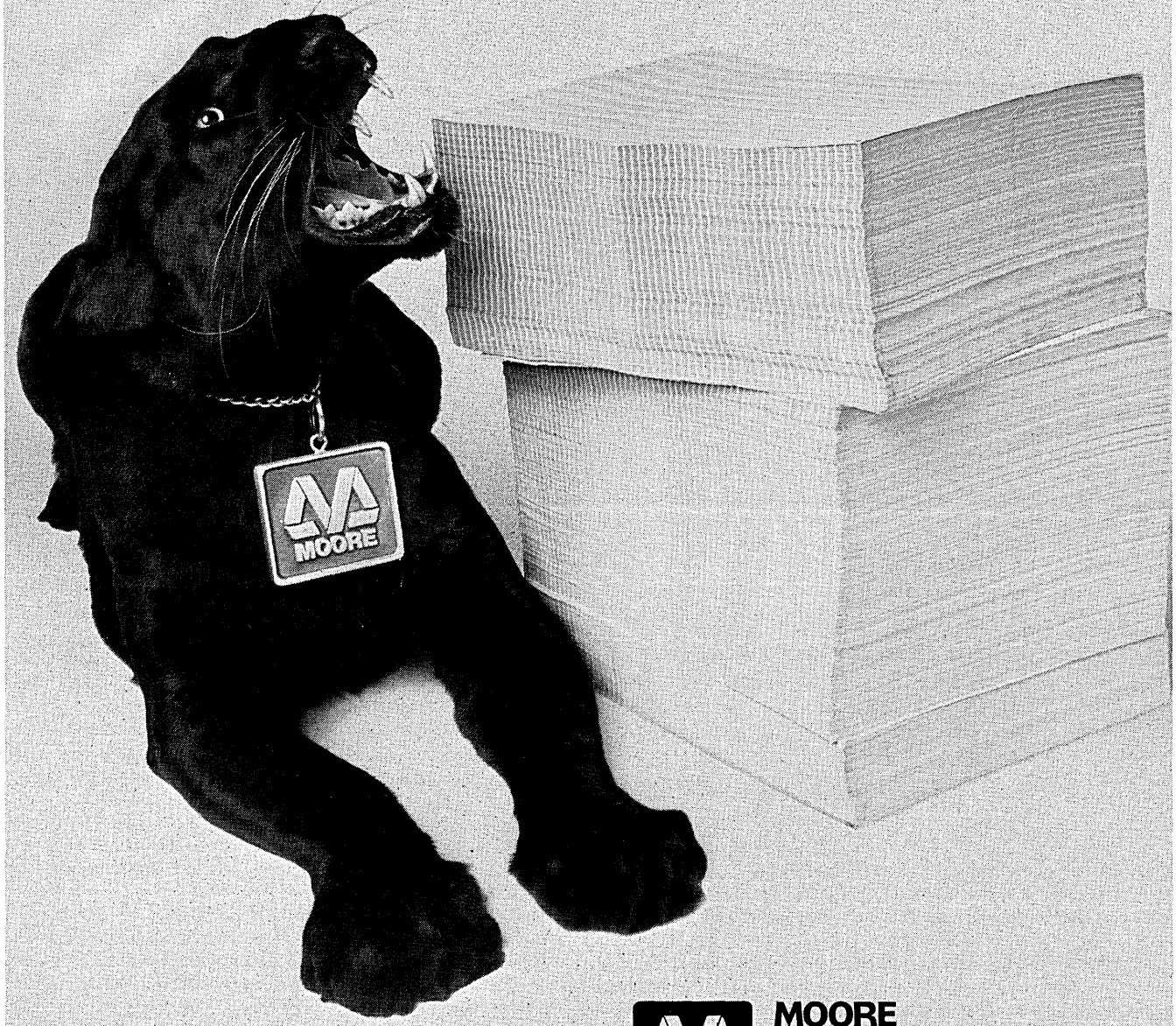

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CIRCLE 82 ON READER CARD

In developing a strategy for its most important customers, mainframe users, IBM cannot operate as if it were in a vacuum.

MAINFRAME MILESTONES

Over the years, IBM's mainframes have almost always been pacesetters in the industry. While most of today's users remember the 370 series (IBM's bridge to virtual memory systems) and the 360 line (which provided a growth path aimed at preserving users' software investments), IBM's earlier offerings also included features that set industry standards. Here are some highlights of past IBM product announcements.

701. IBM told the world it would build 18 of its model 701 electronic calculators during the first year of production. All 18 were aimed at government and defense industry users. As Lucky Strike Green had done in past wars, IBM Blue was on the move in Korea. On March 27, 1953, the big news, along with the system's floating-point math and germanium diode components was . . . the fishbowl. In the very same glass-enclosed room that housed the earlier SSEC, the 701 would be displayed "smartly housed between serrated walls of soft-finished aluminum." Present-day peripherals were also on the scene.

604 Drum Machine. A revolution in data processing, the use of a 20,000-character magnetic drum for storage was announced on Bastille Day, 1953. Touted as the small shop's answer to the mighty model 701, the 604 combined the functions formerly performed by a diverse group of card machines. This was perhaps the inspiration for Lotus 1-2-3 and other integrated packages rushed to market only 30 years later.

RAMAC 305. On Sept. 4, 1956, IBM began marketing a disk-based system with a DASD capacity of 20 million characters. This is the same size rotating memory as is found in a fully loaded XT. The XT is faster, but it can't punch cards. The system was available on rental only.

1401. It was the Big Broadcast of 1959, emceed by Thomas J. Watson Jr. On Oct. 5, IBM set up a teleconference that reached 92 sites in the U.S., plus three in Canada, to unveil the 1401 system. A year earlier, IBM had used tv and interactive audio to kick off the 7070, and that show had been a hit, too. When the 1401 was announced, theologians didn't recognize this computer as the machine most likely to live on in limbo, but its spirit still haunts the emulators of more modern machines. On that same day, IBM enhanced its RAMAC 305 and began a push into computer-integrated manufacturing with its model 357 data collection system.

7094. The world was getting ready for IBM's first timesharing system on Jan. 19, 1962, although it probably didn't know it. That day, IBM announced the 7094, which became the basis of Project MAC at MIT. Well, almost. The MAC system had an extra bank of main memory and some special registers, since the plain vanilla '94 didn't have what it took to handle concurrent interactive jobs.

360/20. While IBM's large accounts were contemplating large 360s in 1964, shops that had not yet outgrown their accounting machines couldn't afford the bigger boxes. Until Nov. 20, that is, when IBM announced a kind of 360jr—not quite a regular 360 but still a general purpose system that rented for $1,280 a month and sold for as little as $62,710 in a 4K configuration. While the 360/20 couldn't handle VisiCalc, chances are your PC can't accept a thousand punch cards a minute, either.

The 370 Line. With what has been called a top-down strategy, IBM announced its 370 series on June 30, 1970, models 155 and 165 first. The 3330 disks and 3211 printers announced at the same time are still in use. IBM's designs made cache memory a standard part of mainframes.

Virtual 370s. On Aug. 2, 1972, IBM announced that for $7.3 million a user could get a four-megabyte 370/168, which featured virtual storage and the early obsolescence of the flagships of the first 370 series. At the same time, the company announced the 158, virtual upgrades for the 135 and 145, plus the mysterious DAT (Dynamic Address Translation) boxes for real memory 155s and 165s. The 158 and 168 machines used silicon RAM, and signaled IBM's abandonment of magnetic core memories for its mainframes. Jay Forrester, whose core memory patents (assigned to MIT) were suddenly worth a lot less, struck back a few years later with his Club of Rome Report.

servation, a surveillance that befits so important a citizen of the corporate world.

One constant that helps IBM maintain a coherent marketing strategy has been its assumption that customers will exhibit economic rationality—most of the time—and in the aggregate if not singularly. IBM's sales reps use economic arguments to encourage users to migrate to new systems, to adopt new peripherals, or to select particular financing alternatives. (IBM's use of pricing and of value analysis in its marketing mirrors the use of similar techniques, embodied in its compensation plan, to steer its sales force in directions consistent with the company's goals and policies.)

Users, however, do not make decisions solely on the basis of economic factors. When IBM's customers are moved by intangible considerations, more often than not it is to IBM's benefit, particularly when IBM has taken an active role in shaping its users' attitudes. But there have been notable exceptions, unsettling to IBM and, perhaps more important, disturbing to users.

IBM has not always been able to completely control users' choice of financing alternatives—rental, leasing, and purchase. Nevertheless, IBM has taken steps to avoid a repeat of 1979. During that year, 303X users swung toward rental rather than purchase. The impetus behind this change was the widespread expectation that IBM's large systems would soon be repriced or replaced to match the price/performance of the 4300 line. Users' resistance to outright purchase of new or installed machines brought IBM a year of declining profits that stood in stark contrast to its past performance and swollen order book. IBM Credit Corporation will now shield its parent from some fluctuations in users' buying habits while permitting IBM more freedom in the pricing of products.

PCM THREAT DECLINES

In 1981, IBM's failure to produce model 3380 disk drives when promised, combined with the effects of an earlier decision to wind down production of model 3350 disks, threw users into a tizzy. It also drove prices of used model 3350 disks to nearly one and one half times their list price.

If IBM's errors were not echoed and compounded by rivals in the plug-compatible business, the company might irretrievably have lost some of the respect it commands among users, leading to widespread interest in second-sourcing of key data processing components. But only the largest shops now protect themselves against IBM's potential mistakes by cultivating long-term relationships with makers of compatible equipment. (An exception to this pattern is the general acceptance of IBM-compatible reel-to-reel tapes made by Storage Technology Corp.) There are now unmistakable signs that the market share of IBM's direct rivals in the disk business has not only declined substantially but that the weakened condition of pcms may be chronic, not acute.

A similar situation appears to be developing in the central processor market, where users have elected to stay with or return to the IBM world. This is a response to IBM's reduction of equipment costs while increasing performance.

The recent court events centering on the misappropriation of IBM's XA mainframe architecture documents—the so-called Adir-

Repricing is the neutron bomb of IBM's marketing arsenal.

ondack Workbooks—have jeopardized the relationship of Hitachi and its agent National Advanced Systems with mainframe users. By (strictly speaking, unwarranted) implication, it may have hurt, and could not have helped, users' views of Amdahl and its key supplier and shareholder, Fujitsu. At the same time, IBM's unfortunate episode as the object of intrigue and industrial lust have reinforced the loyalty and respect of users.

The importance of XA, underscored by the Spy-B-M caper, is not to be measured merely in technical terms. XA is the basis for the migration of IBM's larger users from uniprocessors in the 5 million instructions per second (MIPS) class and multiprocessors with capacities under 10 MIPS to current and future systems that will range beyond 40 MIPS and perhaps past 100 MIPS. The total cost of just one of IBM's largest systems is likely to rise above the $20 million range when mainframe peripherals are counted in; the total value of these systems when extended to the thousands of workstations they will support, many with their own software and peripherals, cannot even be estimated. Such systems are widely believed to be on the horizon, as IBM tries to meet users' seemingly limitless appetites for timely information presented at the touch of a button.

Yet IBM knows that many users do not require the largest central processors; their needs can be met by systems IBM has made, no longer owns, and has vowed to support. These are systems of recent vintage that IBM may render obsolete but which it cannot treat with disdain. If anything, IBM must cultivate positive attitudes among users toward equipment that it has now pared from the cutting edge of its product line. To disparage such machinery would amount to a tacit admission that its current products are dangerously perishable, and could undermine their perceived worth. IBM instead changes its prices, its technology, and its sales tactics to get users to embrace new products before abandoning old ones.

Running counter to IBM's interest in selling its newest developments are the concerns of the owners of aging equipment, including users, lessors (and their investor partners), dealers, and makers of compatible equipment that most closely resembles IBM's past offerings. Each supporter of older IBM models has his own reason to promote the demand for machines IBM no longer depends on for its success. But, like IBM itself, each must live with the active, unregulated market of used IBM gear.

Used IBM equipment has come to resemble commodity items. A user will accept one specific unit as easily as another of the same type, as long as it has been properly maintained and can continue to be maintained at standard cost in the future. The market in popular items with prices high enough to permit profitable trading is large and, most of the time, orderly. There are hundreds of brokers, dealers, and lessors in the used IBM equipment market and thousands of users who deal with them. IBM's strategy must account for these competitors while avoiding tactics that could suddenly undermine the value of this gear, for the principal investors in the future of IBM's machines are IBM's best customers. This condition, more important today than ever in the past, arises in large measure from IBM's decision to sell outright nearly all the mainframe equipment it makes.

IBM has clearly stated its intention to sell mainframe products rather than finance them under rental or operating lease plans. Users can get economical financing from IBM's Credit Corp., but when they do, the parent company sells the equipment to its subsidiary. The leases offered by IBM Credit resemble some financing offered by independent lessors; the users' payments cover all or most of the cost of the leased equipment.

By selling its products outright, IBM shifts the risk of early obsolescence or sudden value decline to the owner (which may be its credit arm), to investors in its credit operations such as Metropolitan Life or Merrill Lynch, to leasing companies and their investors, and to users. Without such risks, IBM has more freedom to respond to competition, new technologies, and shifting patterns of computer use in its customer base. As it has changed direction, IBM has offset, to a degree, the risks taken by owners in two ways: reduced prices and volume purchase discounts.

PURCHASE PRICES PLUMMET

IBM's purchase prices for many classes of equipment have come down sharply during the past few years, as rental charges have risen to levels that have discouraged rental. (Users who acquire IBM gear but anticipate a price cut have taken to renting for short periods as they await the expected cost adjustment. IBM's policies, however, impel users to purchase within six months of installing equipment or lose investment tax credit.) Today's IBM mainframes can be bought for a fraction of the price charged for comparable machines only a decade ago. IBM has a setup for special bids that was, for a while, aimed at purchasers but that is now confined to users who wish to lease their large systems from IBM Credit Corp. All machines in the 308X line and any other systems worth more than $1 million become subject to individually quoted financing rates.

In addition, IBM has instituted volume purchase agreement (VPA) discounts that ap-

TOP 10 SYSTEMS

Computer Intelligence Corp., La Jolla, Calif., periodically publishes a list of the top computers in the U.S. based on the total rent paid by all system users. Purchased systems are converted to equivalent rental based on actual market conditions. Here are the CI Top 10 rankings as of Jan. 1 for the years 1978 through 1983. 1984 numbers, unfortunately, were not available in time for this issue.

1978	*1980*	*1982*
1. IBM 370/158	1. IBM 3033	1. IBM 3033
2. IBM 370/168	2. IBM 370/158	2. IBM System/34
3. IBM 370/145	3. IBM 370/168	3. IBM 4341
4. IBM 370/135	4. IBM 3031	4. IBM 4331
5. IBM System/3-10	5. IBM System/34	5. IBM 370/158
6. IBM 360/30	6. IBM 370/148	6. IBM 3031
7. IBM 370/148	7. IBM 370/138	7. IBM System/3 (all)
8. IBM 370/138	8. IBM 3032	8. IBM 370/168
9. IBM 360/40	9. IBM 370/145	9. IBM HP 3000
10. IBM System/3-15	10. IBM System/3-15	10. IBM System/38
1979	*1981*	*1983*
1. IBM 370/158	1. IBM 3033	1. IBM 4341
2. IBM 370/168	2. IBM System/34	2. IBM System/34
3. IBM 3033	3. IBM 370/158	3. IBM 3033
4. IBM 370/148	4. IBM 3031	4. IBM 3081
5. IBM 370/138	5. IBM 370/168	5. IBM 4331
6. IBM 370/145	6. IBM 4331	6. IBM System/38
7. IBM System/3-10	7. IBM 3033N	7. IBM HP 3000
8. IBM System/3-15	8. IBM 3032	8. IBM 8100
9. IBM System/32	9. IBM System/3-15	9. IBM 370/158
10. IBM 370/135	10. IBM 4341	10. DEC VAX 11/780

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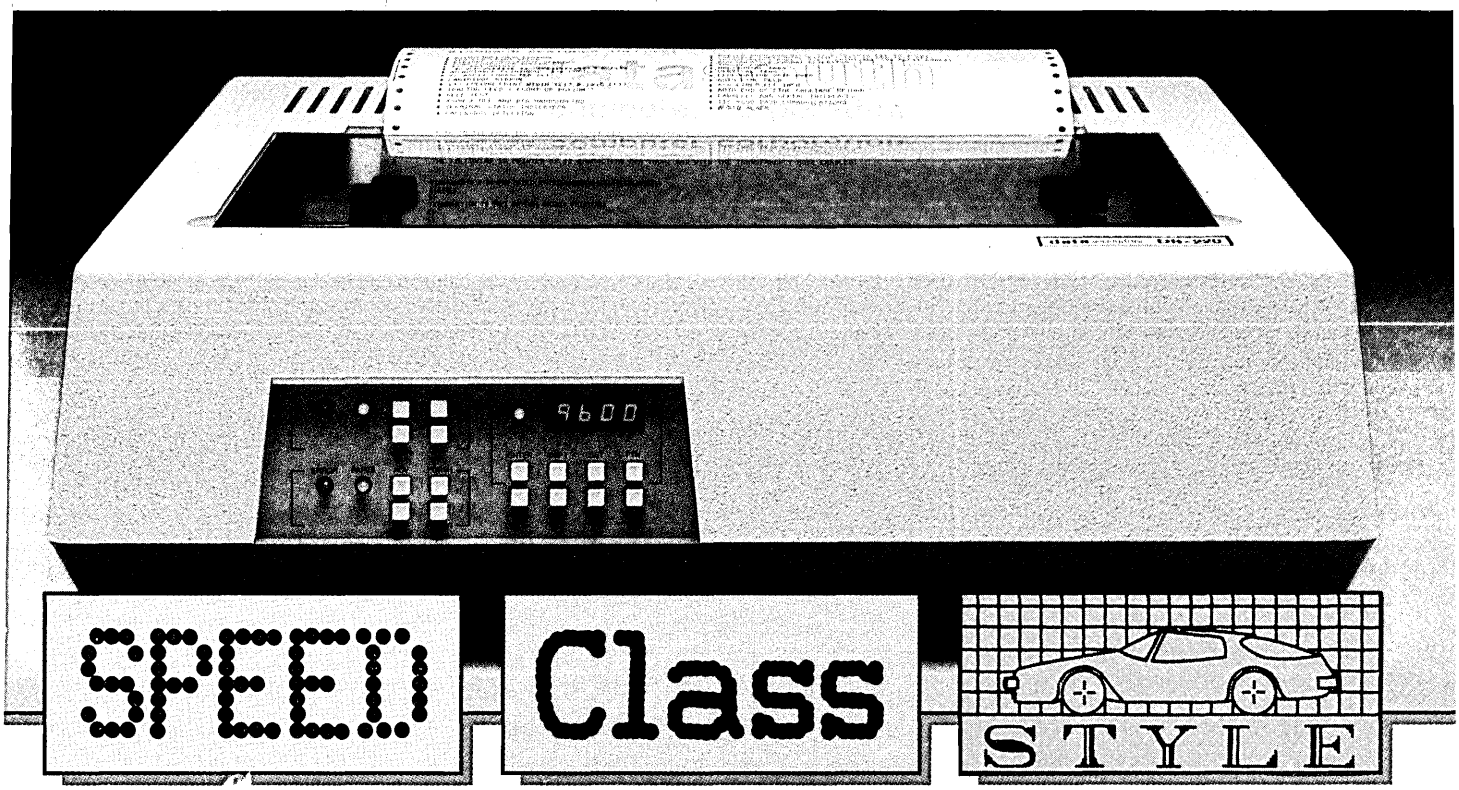

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CIRCLE 83 ON READER CARD

Used IBM equipment has come to resemble commodity items.

ply, at varying rates, to nearly all its products. These discounts are not available to third-party lessors but are offered under a related program to value-added remarketers of selected products. Discounts require the user to commit to particular products in volume over a period that is 12 or 24 months in length. Depending on the product and the number of units a user will accept, discounts can run up to 30 % of list price and more. The higher discounts apply to terminals and workstations; lower discounts apply to disk drives and controllers, printers, and even mainframes.

These discounts offset some instabilities that might arise as a result of IBM's purchase-only policy. While IBM's revenues could be severely affected by any circumstances that encourage users to halt their purchases of one generation of machines as they await another, the VPAs permit IBM and its customers to think in longer spans. IBM's cyclical sales downturns, which follow the introduction of a new product and precede its widespread availability, have generally been of much shorter duration than the terms of VPAs. By scheduling production more accurately, IBM can achieve economies that it passes along to users in the form of lower prices and to shareholders as higher profit margins. The degree to which VPAs decrease the volatility of IBM's income has not been revealed yet, however, and will not be for some time. Users who commit to volume procurements early in the life cycle of a product may shy away from similar commitments as they come to believe successor products are ripe for announcement. For its part, IBM may alter its VPA terms and conditions as products age, providing steeper discounts or adding third-party lessors and dealers to eligible buyers of some equipment, to maintain production levels despite market resistance.

Even before IBM swung its weight behind the purchase-only policy, the company had used pricing to herd users toward either rental or purchase; this helps IBM meet financial and production targets and clear its inventory of one generation's machinery before another generation makes it unsalable.

REPRICING IS KEY STRATEGY

IBM's purchase price changes during the past decade, nearly all of them downward, also help keep IBM competitive. Used properly, repricing is the neutron bomb of IBM's marketing arsenal: it can destroy a competitor's profit margins while leaving users intact, for users are generally better off when IBM changes prices rather than architecture to maintain its leadership position. While price changes affect budgets and balance sheets of equipment owners, new systems may jeopardize users' investments in software and know-how that far exceed the worth of installed equipment.

IBM's willingness to adjust mainframe prices in response to business conditions—those it creates as well as those it does not—becomes apparent as one examines the price history of any current system. The 3033, although it is now out of new production, is still widely used and serves as an example.

With a processing capacity of approximately 5 million instructions per second, the 3033-U was announced in March 1977 and was first delivered to customers at the end of the first quarter of 1978. Later that year, IBM increased the maximum main memory size of the system to 16 million bytes. Such a substantial memory, configured with 16 channels, went for roughly $5 million when the console and power and cooling distribution boxes were added. At first, users, acting through third-party lessors and dealers, scrambled to get their hands on these machines. They paid premiums, in the form of higher lease rates or purchase prices above IBM list, to acquire systems scheduled for delivery to others if their position in IBM's shipping schedule was unacceptable. According to dealers who watched the market at that time, overpayments in excess of 10% of the machine's list price—$500,000 and up—were not unheard of. IBM, which could not have missed rumors about the premiums, must have sensed that its planned production schedule was on the light side. But the earliest machines suffered from the gremlins endemic to computer manufacturing, and bugs in the channel director had to be worked out before IBM would commit to full-scale manufacturing. The upshot was a bubble in the market for used 370/168s, IBM's largest machines in the 31X8 group that preceded the 303X models.

About 18 months after 3033 deliveries began, on November 1, 1979, IBM cut purchase prices by 20%, reducing a 16-megabyte, 16-channel (16 × 16) 3033 system to $3.8 million. The price cuts included reductions on a naked processor (no memory) from about $3.1 million to $2.4 million. (IBM does not actually sell naked 3033 processors, but subtracting the memory value in a minimum configuration price leaves the price of the processor.) There was also a drop in main memory costs from $75,000 a megabyte to $50,000 a megabyte. At the time, used 3033s were selling for about the same 80% of original list, and they were available on short notice. But they did not bring the buyer the tax benefits associated with a new machine, which were worth 10% of the list price. Used 370/168s, with half the performance of 3033s and essentially the same list price, had fallen to one third of IBM's nominal list (nominal because IBM was no longer building new ones).

According to Computer Intelligence Corp., La Jolla, Calif., between 650 and 700 3033s of all sizes had been installed in the U.S. at the time of this price cut (which was followed by a rental increase). IBM had sold outright to users and third-party lessors, 85% of the 3033s it shipped before announcing the 4300 line in January 1979. As '79 wore on, IBM found that it was renting or leasing an increasingly large portion of its biggest machines. Users expected the 3033 or a successor to be offered at the substantially better price/performance of the 4300s and sat tight, renting rather than buying. The price cuts helped to reverse this trend, but not without pinching IBM's bottom line.

By November 1980, some 30 months after the initial 3033 shipments, IBM again lowered 3033 memory prices, this time to $35,000 a megabyte. Other component prices were cut, too, and users buying 3033-U16s from IBM as that year drew to a close paid only $3.1 million, or about 60% of original list. The adjustment came at the time the

MAINFRAME MIPS

There's no question that IBM's mainframes have gotten more powerful with each generation of technology. Paul Raynault, president of Computer Leasing Inc., Hackensack, N.J., has been watching IBM carefully for years, first from the inside and now from the outside. He developed the following data on the approximate capacity of IBM mainframes in millions of instructions per second (MIPS). The introduction dates are courtesy of IBM.

MODEL	INTRODUCED	MIPS
650 (disk)	9/4/56	.001
7070	9/2/58	.022
1401	10/5/59	.0074
1410	10/11/62	.0154
360/30	4/7/64	.037
360/50	4/7/64	.178
360/65	4/22/65	.680
360/85	1/30/68	2.4
370/155	6/30/70	.670
370/165	6/30/70	1.89
370/145	9/23/70	.32
370/158	8/2/72	.870
370/168	8/2/72	2.3
370/168-3	3/25/75	2.7
3033	3/25/77	4.7
3031	6/10/77	1.14
4331-1	1/30/79	.22
4341-1	1/30/79	.77
4341-2	9/15/80	1.1
3081-D	11/12/80	10.0
3081-K	10/21/81	14.0
3084-Q	9/3/82	26.0

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CIRCLE 84 ON READER CARD

The short history of the 3081-D demonstrates that IBM's initial moves into a new product line may be tentative.

3801-D and 3033-S were announced. The demand for 3033s rose in the wake of price cuts and the announcement of a successor that would not be available to most users in the short term, and used prices approximated IBM's adjusted list price. The 360/168 had fallen to about 14% of current list and was still sinking.

A premium market began to develop around the 3081 delivery positions, much the way it did after the 3033 shipping schedule was announced. IBM tried to discourage trading in delivery positions but did not succeed, as measured by payments in the range of $1 million for 3081 slots early in the shipment cycle. Users, fearing the inevitable loss of equity in their 3033s, were trying to beat the clock. They offered premiums to avoid taking the sudden write-offs on balance sheets associated with selling a computer, amortized according to the rules of accounting, at a price determined by the harsh rules of the marketplace.

By this time, nearly 900 machines were in the U.S. base, and IBM still rented or leased about a quarter of them. The unsold systems represented a potential profit of perhaps $1 billion to IBM.

PRICE CUTS CONTINUE

Another year passed, and in October 1981, IBM announced the 3081-K, still more models of the 3033-S, and its willingness to upgrade 3081-Ds to -Ks in the field. It cut cpu prices again and lowered the cost of channels. The 3033-U16 could now be purchased for $2.8 million, a 10% reduction from the prior level, or a little more than half its original list price. Users renting the machines who had fully accrued credits toward purchase could get the machine with an additional payment of $1.4 million. Used 3033s were selling for 75% of IBM's current list price (or something like $2.4 million) going into the cuts, but the combination of IBM's price reduction and the growing availability of 3081s brokered the used market; used 16 × 16 IBM 3033s fell to the range of $1.5 million in January 1982. At this time, IBM shipped more than 1,500 3033s to American users.

By the end of March 1982, four years after IBM started shipping the 3033, it cut the 16 × 16's list price to $2.4 million. Used 16 × 16 3033s were trading for about $1 million, or more than 40% of IBM's current list or 20% of original list price. Six months later, the price dropped to $2.2 million. The 3033 base in the U.S. had been growing more slowly, and had peaked in the vicinity of 1,750 machines, according to user surveys conducted by Computer Intelligence.

Currently, 3033-U16s with 16 channels are trading below $300,000. At the end of 1983 there had been an upturn in prices caused by IBM's decision to halt delivery improvements of 3083s in the fourth quarter once it was clear that the company had met its targets. By putting more hardware deliveries—perhaps $50 million to $100 million—into the first quarter of this year, the company can smooth production and balance financial results. Whatever the reason, 3083 deliveries were scarce and small premiums were being paid for the machines. Some users, lacking the patience to wait until New Year's Day to press for (and most probably get) rapid delivery of 3083s, chose to stick with 3033s to the delight of used computer dealers, lessors, and other users who were lucky enough to be selling unneeded 3033s into the spot market.

During this five-year period (except just before a price cut), a user would find that IBM and the used-equipment market were more or less in agreement about the worth of a 3033 system. The IBM financing plan, TLP, with rental credits figured in, would have cost a user somewhat more than outright purchase or a third-party lease, a reasonable enough situation considering the flexibility of IBM's former terms and the comfort many users experience when leasing from IBM. On the other hand, a user with an early delivery on a 3033 that also got a good position on a 3081 and sold the 3033 at that time might have come out ahead of the pack. A user buying a 3033 just before price cuts went into effect and still sitting on that 3033 might find the system's cost somewhat high.

The short history of the 3081-D demonstrates that IBM's initial moves into a new product line may be tentative. The product was announced on November 12, 1980, joined by the model K on Oct. 21, 1981, and replaced by the model G on Sept. 3, 1982 (at which time the 3084-Q upgrade for the 3081-K was also announced). While most purchasers of 3081-Ds have upgraded their systems to Ks—IBM made this easier by slashing the upgrade price to $400,000 if done during 1983—the Ds that have not been converted are losing value at a pace comparable to that of other machines, such as the 3033. The list price of the 3081-D, initially about $4 million in a 16 × 16 configuration, dropped to $3.5 million when the G was introduced. It is currently about $3.1 million because of price cuts made in August 1983. Used machines have fallen below $2.5 million and will continue to drop, while used 3081-Gs have not been part of the steady trading that characterizes a maturing used-equipment market in a particular machine. By the end of 1984, the D, in its fourth year of shipment, will probably be worth less than half its initial price of $4 million. Depending on IBM's announcements of successors to some of the 308X group, the D may be falling at the faster rate that characterizes a mainframe perceived as old hat. A similar fate is in store for other 308X processors; the only uncertainty surrounds the timing of events that will render the machines obsolete.

ALERT TO ITS OWN INTERESTS

The decline in systems' values and the prediction that their economic ends will be swift and sure is not a condemnation of IBM's strategy but an affirmation of the work going on in and out of IBM's labs that is aimed at building a better computing engine. IBM may be most directly affected by progress at Trilogy, Amdahl, Hitachi, and Fujitsu, but the company is also stirred by developments elsewhere. IBM keeps an eye on groups that have no apparent interest in harvesting the fruits of IBM's research or that don't care to market copies of the mainframes that set world standards. However insular the company may appear at times, it participates with vigor in academic conferences, professional associations, regulatory proceedings, and every other conceivable forum that might bear on its present and future interests.

Among the various sources of influence over IBM's mainframe strategy, none has the power of its own sales force. That group's mission is to monitor conditions in IBM's customer base and so determine the extent to which the company's customer service is satisfactory. This attention to users' needs, to the limitations of various systems as use changes, and to an assessment of the value users may put on system capabilities has been the hallmark of IBM and will doubtless remain so. Thus, to a very large extent, IBM's mainframe strategy is in fact not its own; it is the strategy of the user base.

The users are not unaware of this. They vote with their budgets, and they have now voted to acquire IBM mainframe systems at an unprecedented rate. They remember the effects of their actions in 1979, and IBM's response in the form of noticeably lower prices and improved performance. While the decision to stop buying was made by users acting individually, it might as well have been an organized strike.

The real test of IBM's ability to maintain momentum will occur when the next generation of mainframe systems is announced. If IBM can manage to make the transition with grace, the company's strategy will be praised by users, investors, and the third-party companies that create markets in older IBM equipment. But if IBM cannot act with finesse, a very disruptive era may well ensue.

Hesh Wiener is a contributing editor of DATAMATION and publisher of *Technology News of America*.

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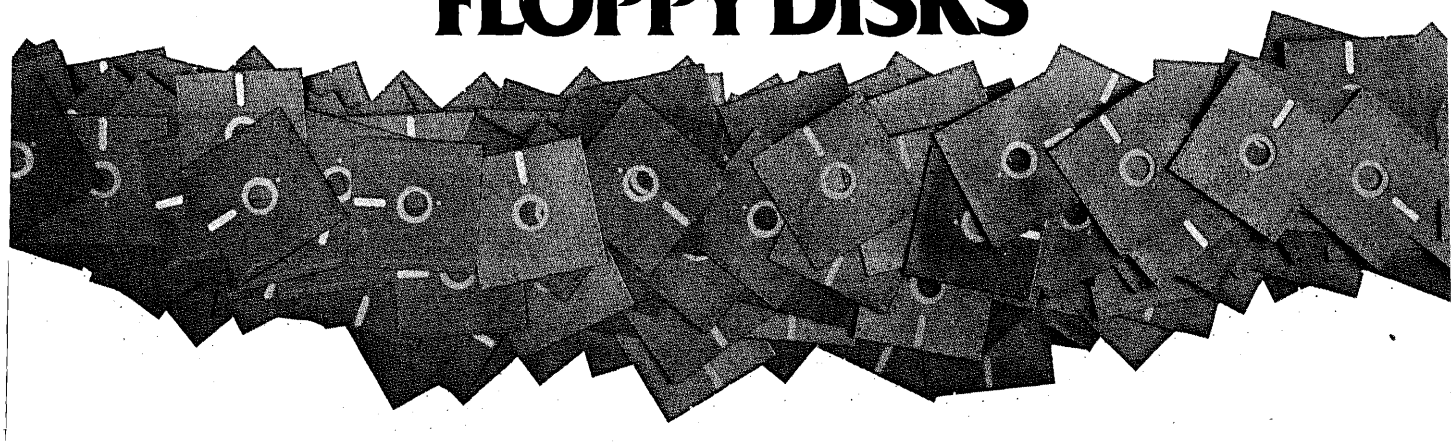

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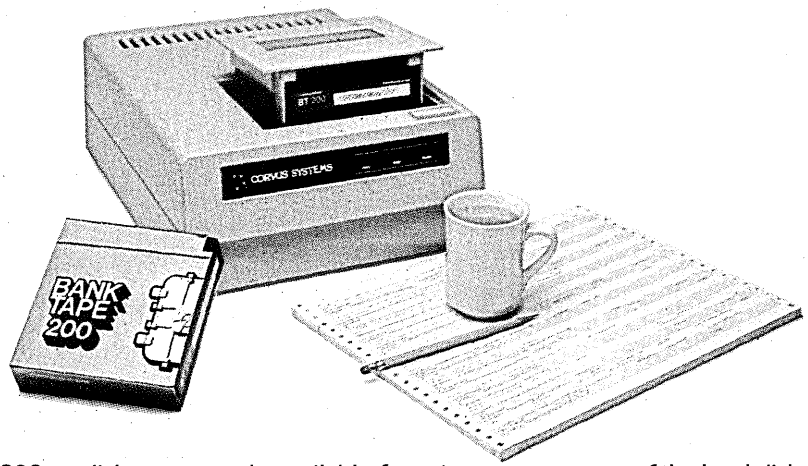

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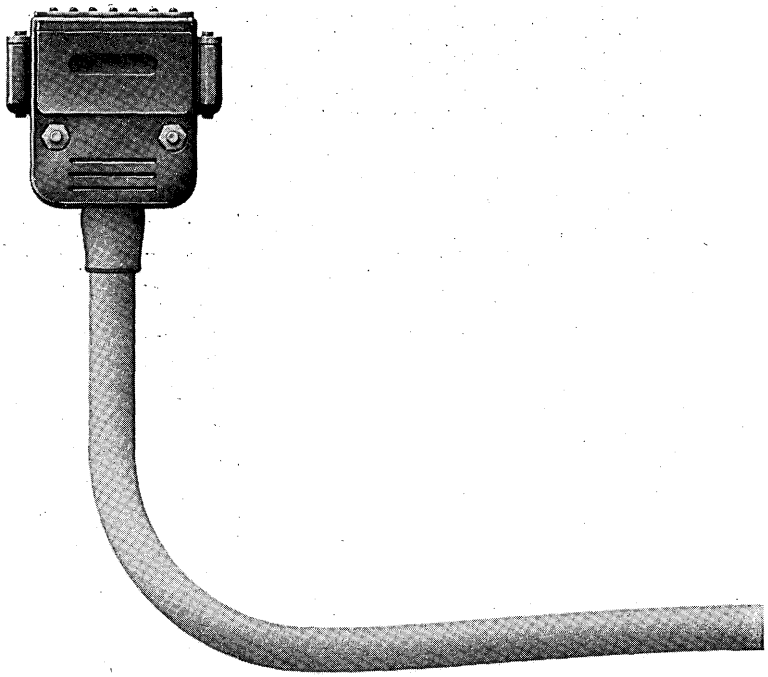

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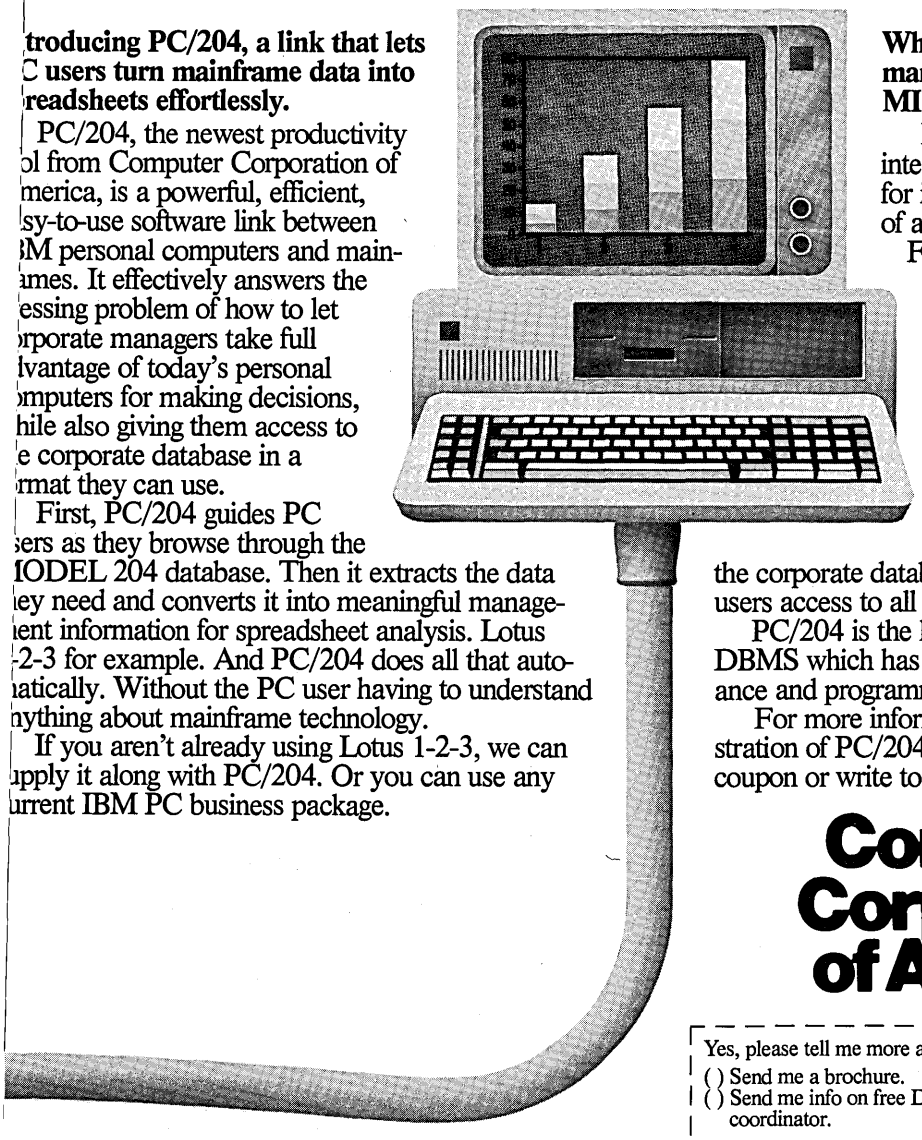

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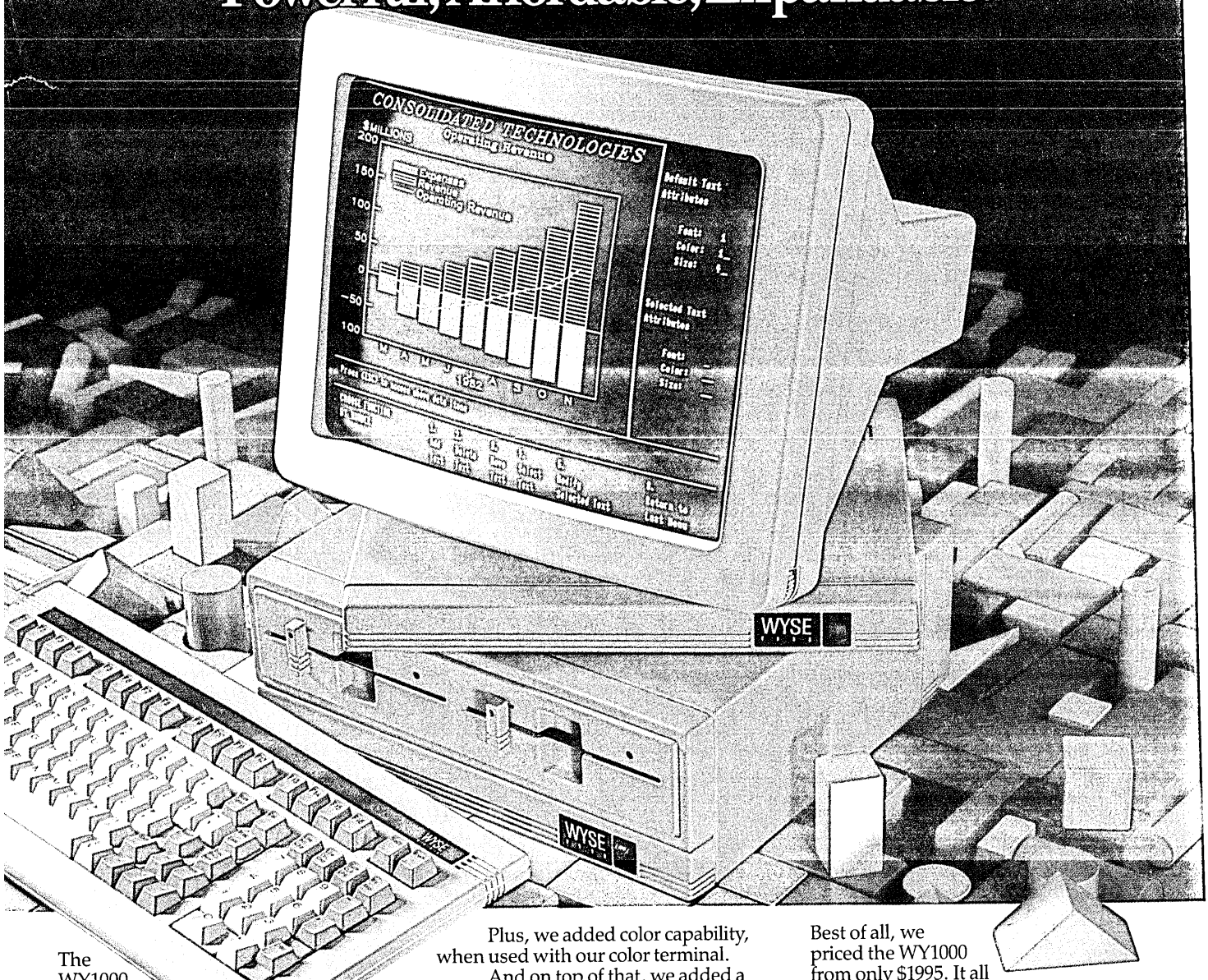

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Although IBM is taking steps to strengthen its position in the mainframe software market, it's still a hardware company at heart.

SOFTWARE STRATEGIES

by Curt Monash

IBM is clearly the dominant force in mainframe hardware. With an estimated 65% market share—75%, counting plug-compatibles (PCMs)—the 370 operating environment is the de facto industry standard. IBM's power to set new standards has recently been demonstrated in the PC market, with the IBM-backed MS/DOS operating system reportedly capturing 95% of the 16-bit microcomputer world.

With this sort of market position, IBM would appear a cinch to dominate in software as well. Indeed, the raw numbers suggest that this is the case: IBM's 1982 packaged software revenues of about $2 billion represent a third or more of all packaged software business, and a substantially higher fraction of all IBM-compatible software.

The IBM environment, however, offering 75% of the marketplace, is an irresistible lure to major independent software houses as well; Paine Webber Mitchell Hutchins estimates that the 10 largest independent vendors in 1982 received at least 85% of their business from IBM mainframe sites. While the aggregate revenue of these companies at most matches that of IBM in comparable businesses, their rapid growth and market leadership give them an importance far outweighing their size.

After watching various degrees of misfortune befall such IBM competitors as the plug-compatibles (Memorex, Storage Technology, Magnuson, and so forth), the BUNCH, and, most recently, much of the microcomputer industry, the question naturally arises, how will the software industry fare? No longer hampered by antitrust litigation, IBM chairman John Opel has publicly stated that IBM intends to compete vigorously in all computer markets, including software.

In 1982, IBM established an Independent Business Unit, called Information Programming Services (IPS), to compete in all software and computer service markets (excluding conflicts with other IBM divisions), in all industries, with products from all sources (in-house, customer, or third-party development), through a number of distribution channels. Other IBM divisions have also made threatening moves, introducing dangerous-looking products like DB2 and the 3270 P.C., and withholding source code to key programs.

Nonetheless, software vendors also see a number of encouraging signs, like the annual "love-ins," during which IBM executives express their eagerness to have application—but not system—software vendors work on IBM gear. Martin Goetz, senior vice president and a founder of Applied Data Research (ADR), points out that "Software companies help IBM in at least two ways. We sell hardware directly, by providing applications that create the need for more hardware. We also make IBM hardware popular in general, because of the availability of our programs in the IBM environment." Although he believes that IBM recognizes its symbiosis with the software industry, Goetz is concerned that IBM might "inadvertently" endanger this relationship by anticompetitive moves directed primarily against the Japanese.

IBM also shows its support of the software industry through a series of joint marketing relationships. When IBM distributes a software company's product, it's a mixed blessing for the overall industry, because a major advantage for one firm can be a disadvantage for its competitors. A clear plus for the software industry, however, is IBM's push to recruit more value-added resellers (VARs), who buy IBM hardware at a discount and resell it at list price, with software, into a specific industry. Walter Bauer, chairman of Informatics General Corporation, one of IBM's (and Wang's) largest VARs, believes that "IBM is trying very, very hard to create an environment where VARs make profits."

SOFTWARE INDUSTRY HISTORY

To analyze the future of the software industry it is necessary to first consider its past. In the beginning, the systems engineers who installed a new computer also developed the software to get it up and running. Later, in-house programming staffs took over most of the development work.

By the mid-'60s, some entrepreneurs realized that developing a program once and selling it to many users was an economically favorable alternative. IBM resisted this concept and provided software bundled into the hardware purchase price, if it was provided at all. A lawsuit, pursued by ADR and the Justice Department, forced IBM to unbundle prices in 1969, thereby ratifying the existence of software as a viable business product.

IBM's software activity has always involved an immense range of systems. The areas where IBM acts most emphatically are those that affect its account control, especially technical systems software such as operating systems and languages, or anything that directly affects the hardware environment. On the other hand, IBM's performance in the applications area has been quite erratic. Some IBM applications are generally acknowledged to be of high quality, such as the airline reservation system. More typical, however, are field-developed programs, which are often incomplete or poorly maintained. The COPICS manufacturing system is often cited as a worthy product but one that requires a great deal of custom work by the buyer (so why buy the application?). Finally, in some areas, such as mainframe general ledgers, IBM has virtually no presence at all.

The fundamental mystery is why IBM software is so bad in such broad areas, and whether it is likely to stay that way. The most common explanation is the glib assertion that IBM has a "hardware mentality," which is somehow different from a "software mentality." Like many clichés, this one is at least half true. Obviously, with the majority of its revenue derived from hardware sales and only 6% from software, IBM people are much more attuned to and expert in hardware. (As one IBM salesperson put it, "I don't know what DB2 is, and I don't really care.") Indeed, many software products make much more money for IBM by selling hardware than they do from software revenue. Software often requires a different sort of sales technique, especially when it is sold to end users, as are most applications and some data manipulation tools. IBM is much better at dealing

The fundamental mystery is why IBM software is so bad in such broad areas, and whether it is likely to stay that way.

with data processing management than with end users, although in some cases it simply deals at the ceo level.

Hardware and software companies differ even more acutely in the area of support. IBM owes its greatness to its superb, virtually all-encompassing customer support; it simply does whatever is necessary to make an installation work. With software, however, not only must the system work, but people have to use it well. Consequently, it is not economically feasible to offer IBM-quality support for most software products. More technical bit-twiddling areas are an exception; like hardware, they either work or they don't, and in any case, there are relatively few users to support. But an application development tool on which hundreds of programmers are trying to gain proficiency, or a financial system used by dozens of clerks who cannot tell a debit from a credit and call the bug-fixing hot line to learn the difference, may not be profitable for IBM to support at any price.

Even so, many people remain puzzled by the fact that IBM, with all its resources, doesn't offer better software. For example, there are several thousand programmers at Santa Theresa working on database management systems (DBMS). But when asked to name two movie stars and a dog, many observers still answer "Rin-Tin-Tin, Benji, and IMS."

We can see several structural reasons why IBM might have difficulty deploying its resources to develop first-rate software. First is the incredible breadth of IBM's audience; in trying to be all things to all people, it can easily offer little to any. By this reasoning, IBM systems are often semicustom because no one package could conceivably fit all possible customer needs. Meanwhile, independent software companies, content to address 80%, 50%, or even 20% of the available market, suffer from no such constraint. Similarly, IBM offers two nonintegrated DBMS families (DL/1-IMS and SQL-DB2), as well as VSAM, because it believes no one could have the performance and ease-of-use features to meet all needs.

In addition, IBM is often paralyzed by the need to protect its customer base. Thousands of DL/1 and COPICS users are locked in to those systems; IBM won't abandon them, and it even demurs from introducing competitive products. Finally, and perhaps most important, financial and human resources do not necessarily generate good software. John Cullinane, chairman of Cullinet Software, believes that the optimal development team for any software product is "four super systems programmers and one documenter." This technique has produced products that, in some surveys, exceed IBM in buying intentions and market share.

FEAR A SINISTER APPROACH

After its decision to step up activity in the software business, IBM introduced some potentially landmark products, including DB2 and the 3270 P.C. package, and announced the distribution of independently developed software for the P.C., large and medium systems, and the expansion of VAR and similar programs.

Some users fear that IBM is taking a more sinister approach to software competition—namely, making it technically difficult, if not impossible, for third-party software to run on IBM systems. This perennial concern was reinforced by a recent IBM decision to restrict availability of the source code for certain key systems products. Despite vigorous complaints from ADAPSO, the computer service industry's feisty trade association, this concern has little basis. Prudent software companies interface to the operating system and similar programs in the same way that ordinary applications do, so IBM's system changes will cause them no more anguish than they do IBM's coddled customers.

Computer Associates, a leading vendor of technical utility products, carries this approach one step further. It plans to interface all of its products to the various IBM operating systems through a universal "systems adapter." President Charles Wang states that it required only two weeks to convert the adapter, and consequently all of Computer Associates' software, to run under the MVS/XA operating system. Furthermore, while IBM has not stated this publicly, it is generally understood that software companies will access source code on a "need to know" basis. Therefore, the disadvantage of not receiving source code appears limited to the difficulty of anticipating IBM's software developments; the situations in which this could give IBM a competitive advantage seem to be precisely in the highly technical sort of product market that IBM has always dominated anyway.

IBM and other hardware manufacturers have hardly satisfied the market demand for software, so independent software companies have had a fertile field. In the mid-'60s, a number of small companies noticed that modifying a package to work at many computer sites was cheaper than redeveloping it at each site; these economies seemed to offer a business opportunity. Among the small companies that jumped in were custom software houses (such as ADR), startup developers (such as Cincom Systems), and organizations formed explicitly to acquire and remarket software (like Cullinane Corp., now Cullinet Software). Early products included systems, utilities, and applications, especially basic accounting, such as those sold by University Computing Co. and by Management Science Atlanta (MSA, which now stands for Management Science America).

The initial business issues facing these ventures were similar to those faced by software firms. But because the startups' main concern is survival, these firms took just about any business, including lots of customization, adaptation to a broad range of operating environments, and often an odd mixture of products. Sales and marketing were keys to initial expansion, closely followed by reputation and support. Reference selling was also emphasized, since a large and satisfied customer base created the impression that the vendor had the financial stability to support its products for a long time.

SOME EMPHASES CHANGED

As the industry grew and matured, some of these emphases changed. Sales, marketing, and customer support continued to be critical, but as buyers grew more sophisticated and the industry more competitive, product quality became more significant. As the companies grew, financial management was also increasingly important. One key decision often made was to prune and focus the product line by reducing the range of hardware environments. For example, MSA, which used to sell software on Burroughs and Honeywell mainframes, now markets only on IBM; Cincom Systems, whose DBMS TOTAL has been ported to several dozen mainframe and mini systems, is offering its new family of DBMS (TIS and ULTRA) only on IBM, DEC, and Wang equipment.

Product lines were also rationalized by function, which led to a sharp distinction between systems and applications software companies. These businesses can have very different characteristics and cultures; they hardly ever coexist successfully in one company. Systems software products are typically sold to technical people, often with a clear cost/benefit justification in terms of hardware or personnel. Depending on the type, systems products often compete head-on with IBM. IBM competes most vigorously in technical "bit-twiddling" areas, especially those with account control implications. According to Richard Currier, president of Walker Interactive Products, one of the earliest victims was GRASP, a spooler for DOS sold by Software Design Inc., San Mateo, Calif. Essentially an extension of the operating system, GRASP was apparently perceived as an account control threat by IBM. Not for long, however; it was soon demolished by a competitive IBM product called TOWER.

Another bloody example is the once-thriving TP monitor market, with such products as Shadow, Intercom, and Taskmaster.

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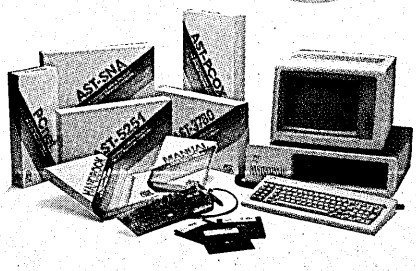

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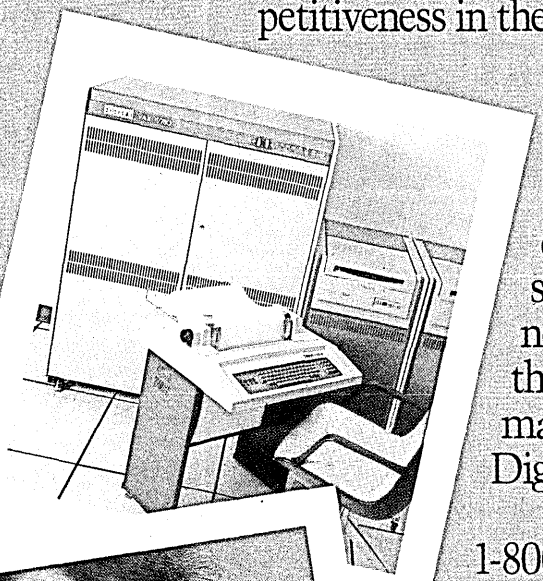
Larry believes that VAX information management software is integrated around the operating system better than any other vendor's. "It's a tremendous foundation to build on," he says. "It presents no limits on our ability to tailor services on an individual basis. This may very well be the key to our competitiveness in the future."



The nine Land Banks asked Digital to look into the future. "We tried to look ahead as far as twenty years," Larry recalls. "We imagined a day when this network could be used to offer farmers full financial services—right in their hometowns. We needed a vendor who would be there when that day came. I don't think there will be many. But with products like VAX, I'm sure Digital will be one of them."

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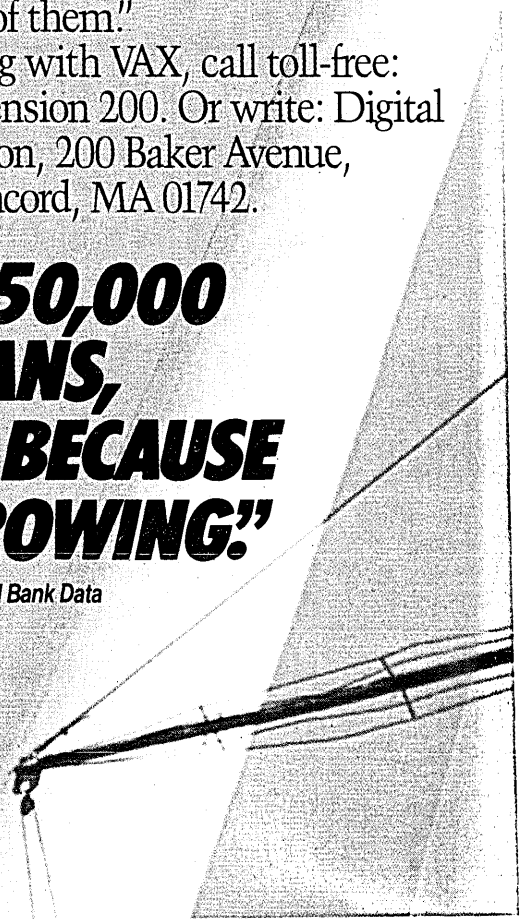
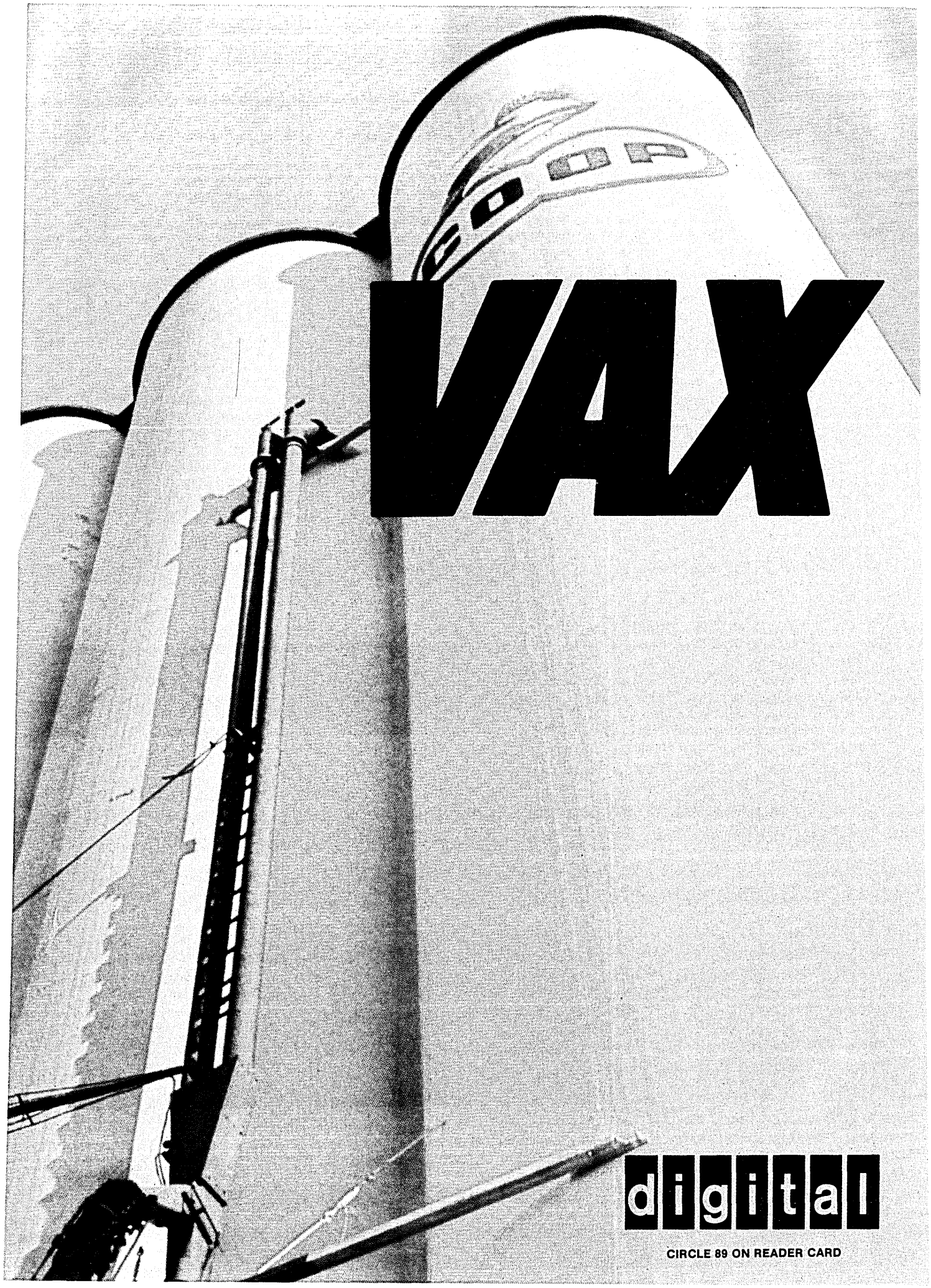
—Larry Wergin, Director, The Land Bank Data Processing Center

Nine of the regional Land Banks of the nation's largest agricultural real estate lender, the Farm Credit System, are building a VAX-11/780-based network to link up with their National Data Processing Center. The network's first task is to improve services to the borrower by providing up-to-date information to hundreds of associations across the country.





Some of the most vigorous competition between IBM and the independents is in the area of DBMS.

Independently supplied TP monitors clearly have potential account control implications, because they affect which terminals work with the system. What they do not have anymore is market share; that was utterly blown away by IBM's CICS. The only remaining competitors of note are tied into DBMS installations, including products from Cullinet, Software AG, and IBM's own IMS DB/DC. Modern utility software vendors are playing it safe by avoiding products that may raise IBM's hackles. Computer Associates' System Adapter is just one of the more elegant efforts. One of Wyly's products, UCC2, is so pleasing to IBM that it is among the first independently developed mainframe products IBM ever distributed.

Some of the most vigorous competition between IBM and the independents is in the area of database management systems. IBM is one of the key DBMS pioneers, starting with BOMP and DBOMP, and later DL/1-IMS. Even more significant was E. F. Codd's theoretical breakthrough for IBM with the relational model, although it did take quite some time to implement at commercial performance levels.

Independent software vendors have always prided themselves—correctly, according to users—on offering systems that are substantially easier to use than IBM's, but of comparable or identical performance. This created fierce competition between them and IBM, as well as among themselves. According to John Cullinane, the independents have come a long way; whereas IBM once beat Cullinane in four out of five DBMS sales, chiefly through its ability to influence high-level management, it now loses by the same percentage. (Please note that IBM gets a large number of software sales, especially in conjunction with first-time hardware purchases, that independents never hear about.) Cullinane attributes this reversal to the independents' establishment of greater credibility, bolstered by track record and effective marketing, and to the continued development of innovative products.

Despite the successes of Cullinet, Software AG, and others, IBM still has a strong position in the DBMS market. Its share of the installed base is about 50%, or closer to 75% if VSAM users are counted. IBM has also established a technical standard with the SQL family of products.

IBM is committed to recapturing the market. The independents, however, are also very well positioned. Several have a clear product advantage over IBM, offering one DBMS for both production and end-user data, versus IBM's bifurcated approach. More important, the leaders, especially Cullinet and ADR, offer integrated product families, consisting of a DBMS, data dictionary, tools for data description, end-user query, report writing, application building, and so forth.

The importance of this theme—integrated families of products—can hardly be overemphasized. Besides offering significant benefits to customers, integration enhances a vendor's competitive position by enabling it to focus on a rival's weaker product areas.

FAMILIES PROVIDE ADVANTAGE

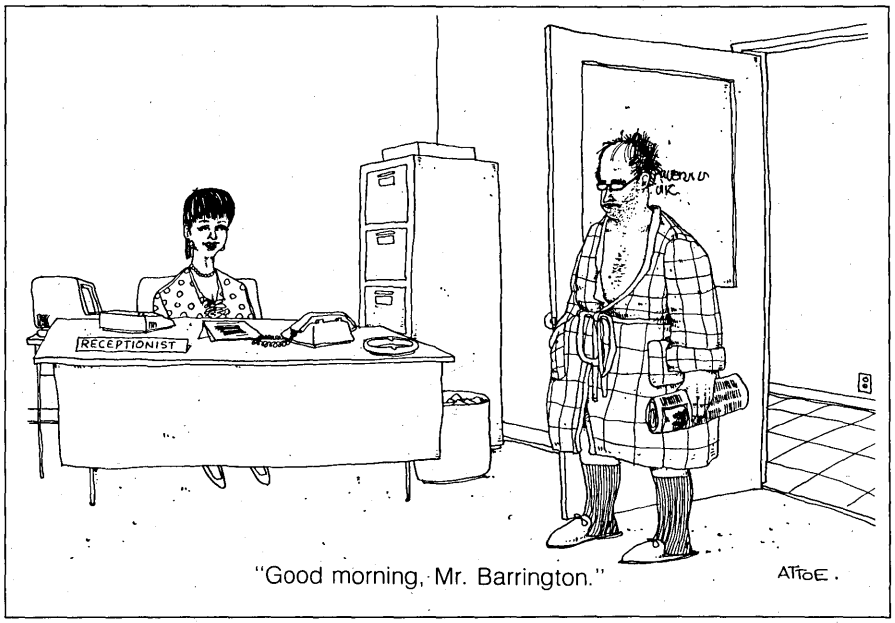
Product families also provide economic advantages; the cost of selling a $300,000 product family is typically less than half that of a $150,000 product. Similarly, a vendor can fight price competition in one product by cutting the price of another. Finally, integrated product families are the best way for software vendors to get account control, in a context which may well be unthreatening or even pleasing to IBM, if it locks the customer into IBM hardware.

Unlike systems software, applications products are typically sold to end users. As discussed earlier, this is not the primary IBM market, so it often competes ineffectively here. IBM is not well structured for end-user support, which is the application industry's stock in trade. MSA's chairman John Imlay goes so far as to call MSA "more like a Big Eight accounting firm than a computer software firm. That expertise, not the IBM label, makes a successful installation." Application software vendors must offer highly reliable products, perhaps more so than systems vendors, since customers may base their entire day-to-day operations on the acquired packages. Beyond that, application vendors, especially small ones pioneering in new areas, often face a not-invented-here syndrome; everybody has a general ledger, or thinks he knows how to build one, and everybody thinks his business is unique and cannot use a standard package. In both cases, the key to startup success is the same: sell, sell, sell.

Once established, application vendors typically follow one of two tracks to expand their businesses. One is to become an industry specialist, with sales, marketing, and product development knowledge of the specific needs of their target market. Examples of such vendors include Policy Management Systems and Informatics in insurance, and Hogan Systems in banking. Under the right circumstances, industry-specific software is a very good market; by selling total solutions, vendors build up strong product families and achieve comfortable account control.

Industry-specific software vendors also enjoy IBM's good graces. While addressing markets that IBM might have difficulty focusing on, they can create new hardware customers more visibly than any other type of vendor. One sign of IBM's endorsement is the structure of its VAR program, which creates VARs only on an industry-by-industry basis. Even the 4300 series has seven VARs, including Policy Management Systems, the dominant vendor of software property and casualty insurers. The fact that these companies have the option of endorsing non-IBM hardware probably further endears them to IBM. In a similar vein, a number of IBM's hardware competitors seem to be evolving industry-oriented strategies—as are HP in manufacturing and NCR in banking—and industry-specific software vendors may be very valuable IBM allies in the battles ahead.

The second sort of application ven-



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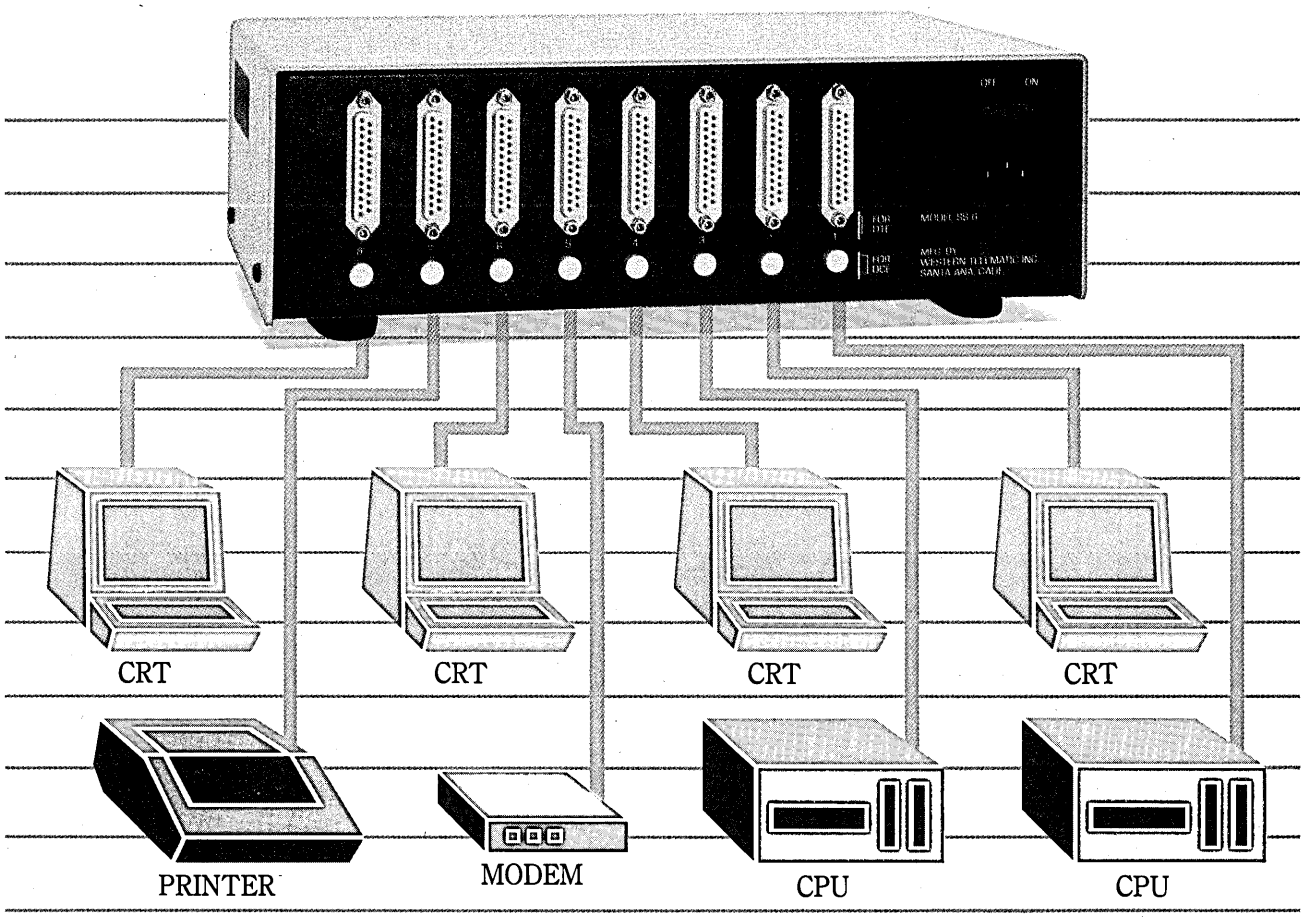

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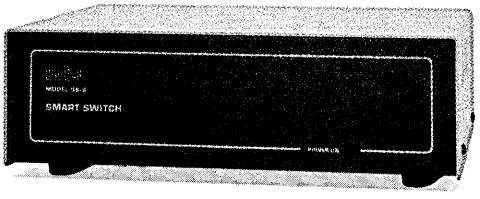

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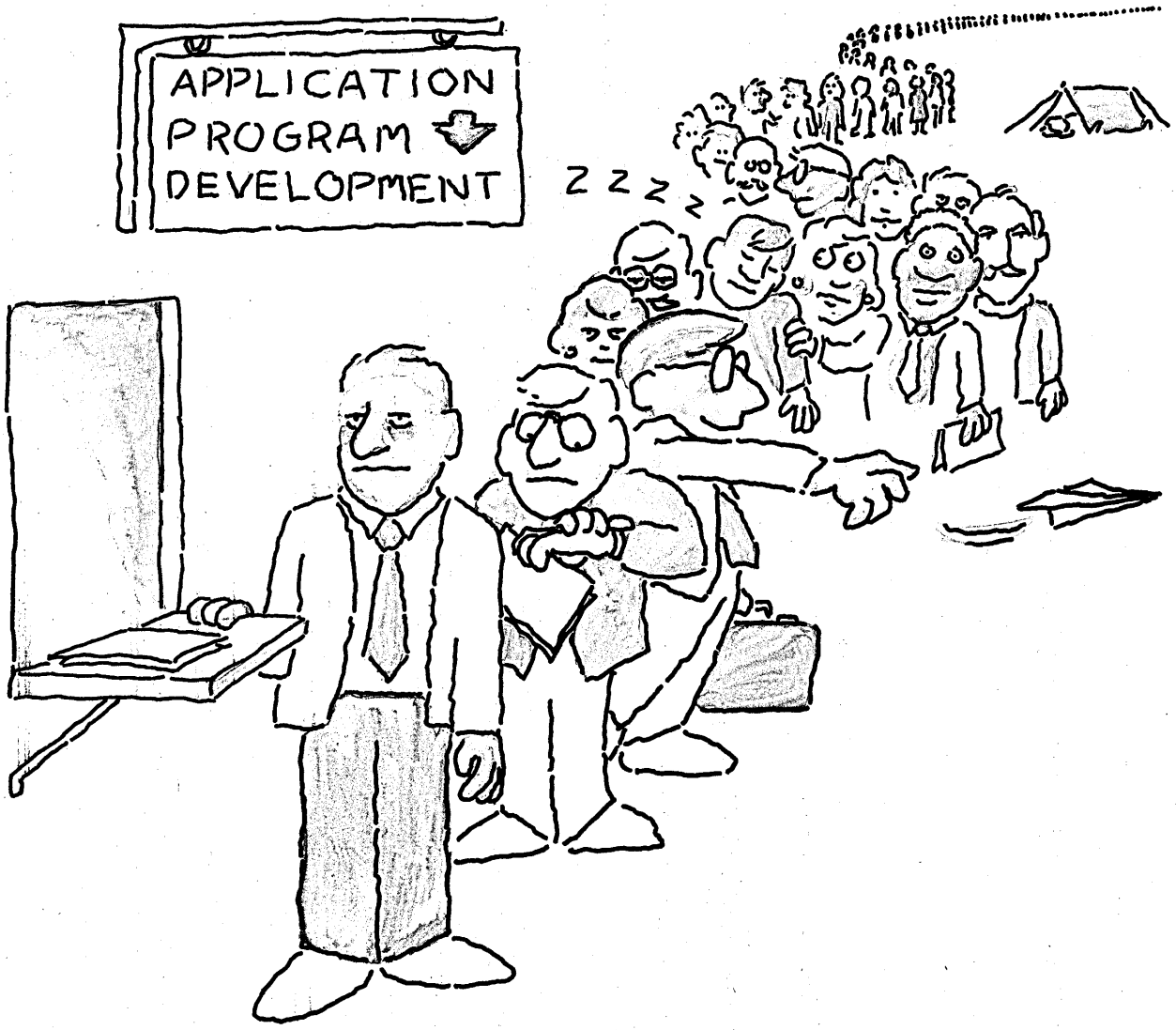

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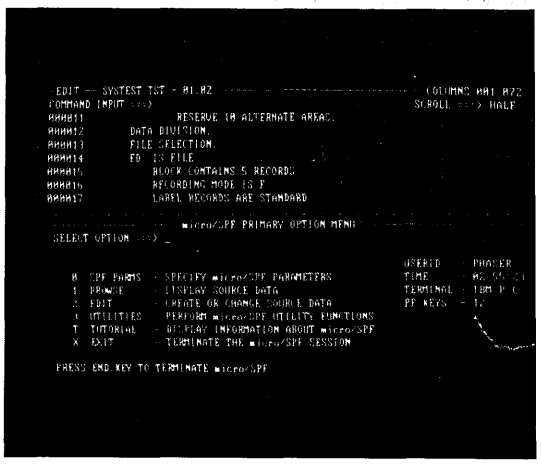

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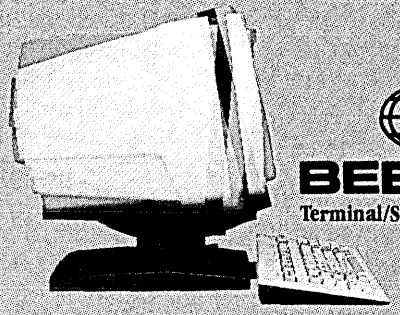

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CIRCLE 92 ON READER CARD

Because they help create new hardware customers, industry-specific software vendors enjoy IBM's good graces.

dor, which includes some of the largest of this species, is the cross-industry generalist that typically sells accounting and/or human resources packages. MSA, McCormack & Dodge, and Information Sciences are examples of this breed. These companies are usually sales-driven, intensely competitive, and a little bit more price-sensitive than other software vendors. Consequently, some of the leaders recognize the need to evolve into other areas, above and beyond the normal benefits of product line expansion.

MOVING IN SIMILAR MARKETS

In addition, a number of separate branches of the software industry are moving into similar markets. These include: DBMS, environment-independent productivity tools, cross-industry application software, manufacturing software, and microcomputer productivity software. A recurring theme is the broadening of product lines into integrated product families, for the competitive and economic reasons cited above. More specific reasons include:

- IBM will likely recapture the DBMS market by creating a relational standard. This is not so catastrophic for the DBMS vendors as it sounds, because most of their revenue and product appeal comes from other parts of their product families. Furthermore, as virtually all of the independents are becoming relational or relational-like, the technical transition will probably be straightforward. But it suggests that all IBM-based application development tools will run in essentially the same environments, instead of being differentiated by the underlying DBMS as they are today.
- There are excellent technical reasons for offering application development tools and applications tools together. After all, the ultimate application productivity aid is to deliver a predeveloped application. But many customers will want to modify or add to purchased applications; this can best be done with the same tools that were used to develop the applications. Of course, this presupposes that application developers use tools that are at least as good as the best available to end users. Until recently, this was a questionable assumption, but Cullinet, Walker, McCormack & Dodge, and Hogan seem to be setting a trend in that direction.
- Manufacturing software is largely a cross-industry market, representing about a third of the IBM hardware and software base. Market subdivisions include job shop assembly, and repetitive and process manufacturing. Two examples of manufacturing subspecialties are government contractor job shops and semiconductor processing. Both MSA and Cullinet chose manufacturing for their first major foray into a specific industry market.
- Microcomputers will be the end user's window into the mainframe. MSA, Cullinet, McCormack & Dodge, Informatics, and Wyly, among others, announced micro-mainframe links even before the P.C. 3270 unveiling. These announcements encompass all the software areas covered above.

Of the three types of software vendor identified above—techie systems, industry-specific applications, and generalist—only the latter need be seriously concerned about future IBM moves. Systems vendors have been dealing with a secretive and competitive IBM for years, so the survivors are canny enough and sufficiently well diversified to withstand any likely shocks. Industry-specific application vendors are relatively immune to IBM-generated problems, even if IBM's current fondness for them withers; in the worst case, they can transfer their affections to another hardware vendor, even an IBM-compatible manufacturer. Thus, only the generalists need be seriously concerned about IBM policies. On the other hand, the top 10 or 15 independent software companies, with the partial exception of Informatics, are all in that group, so it is hardly surprising that they should have the most interesting outlook.

RESULTS OF NEW PRODUCTS

The consequences of possible new IBM product developments, and the influence of the company's IPS and third-party marketing relationships in general, are both worth examining.

According to product marketing manager Bruce La Page, IPS is first and foremost in business to make a profit by selling software, rather than by encouraging hardware sales. Only secondarily is IPS a "good corporate citizen"; it will not offer any products that interface to non-IBM DBMS.

IPS's charter is "developing, acquiring, packaging, supporting, and servicing applications, in the areas of industry, cross-industry, user interface, application development, and productivity tools"—in other words, virtually everything except what IBM calls "system software," ranging from languages and operating systems through DBMS. La Page indicates that slightly over half of IPS's business comes from small- and medium-sized systems (though very little from the P.C., whose software is still largely distributed by the Entry Systems Division). By comparison, Paine Webber believes that more than half of IBM's non-P.C. hardware business comes from large computers. La Page confirms that IBM is "very successful" selling complete accounting systems to first-time users of small business computers. He believes the mainframe marketplace offers more opportunity to sell productivity tools than cross-industry applications. This is consistent with IPS's first choice of mainframe products remarketed from independent vendors—Artificial Intelligence Corporation's English language query product Intellect, followed by Wyly's DOS to OS conversion aid UCC2. But, because these products have no effective competition, it is probably inappropriate to draw far-reaching conclusions from them alone.

The reasons cited above for IBM's disappointing performance as a software vendor will continue to remain valid. Consequently, IPS is more likely to achieve significant impact by pursuing marketing agreements with independent software vendors than by attempting to go it alone. An agreement with IBM, such as the marketing arrangements for Intellect and UCC2, or IBM's agreement to recommend Baxter-Travenol's hospital software for medium-sized computers, or even a VAR arrangement, can strengthen the lucky signatory, at the expense of its competitors. Even when aligned with established software vendors, IBM appears to lack the market presence in mainframe or midrange software to enforce a standard, unless it acquires a leading software supplier (which is still unlikely for antitrust reasons), or there are perceived technological "hooks" justifying an FUD (fear, uncertainty, and doubt) sell.

Software vendors are, by and large, insulating themselves very effectively from changes in the operating system or other base technology. One advantage of packaged software is the portability it often gives users, at least between operating systems (DOS, OS, and often VM), and even between database and file managers (VSAM, DL/1, and independent products such as IDMS). Thus, the main FUD threat to the software industry would occur if IBM added another layer to the area of software it wants to control—as it seems intent on doing with database management. After DBMS, the next plausible layer would be the province of the "generalists": application development, query, financial applications, and the like. The emergence of standards in this area, while potentially killing off many of the largest software vendors whose support currently strengthens IBM, would also benefit industry-specific suppliers, by making life easier for them.

Actually, such a move would not seem to make any sense for IBM. To begin with, the generalists are, in an increasing number of cases, also the industry-specific suppliers. Secondly, they have sufficient installed bases (1,500 largely locked-in IDMS users are just one example) that IBM has a strong motivation to keep them in the fold. Third, like the industry-specific vendors, these vendors have the very real option of attempting to assert account control, full or partial, and steering their customers to non-IBM (if IBM-compatible) hardware.

IBM appears to lack the market presence in mainframe or midrange software to enforce a standard.

WHY IBM KEEPS COSTS LOW

A more compelling argument is that if users write more applications, or present more queries to the computer, IBM sells more hardware. Therefore, it is in IBM's interest to keep nonhardware costs as low as possible and to encourage the most rapid possible development of productivity aids. This would hardly be accomplished by wiping out the independent vendors of such tools. Consequently, while IBM could compete with the generalists, it appears unlikely they will try to dominate that portion of the software market.

IBM's effect on the software industry will continue to be much more pronounced in its hardware strategies than in its efforts to compete directly in software. Again, we believe that the details of IBM's decisions will not seriously affect the software industry. The 370 series has been established as the worldwide standard for mainframe products, and no power on earth seems likely to threaten that standard in the near future. There is little IBM could do to its mainframe products to change the outlook for the software industry. More portentous for the software world are entirely new product lines: the IBM P.C., the Unix-based mini IBM is expected to introduce soon, and downward expansion of the 370 line, with products beyond the XT/370 and the SSX operating system.

With the introduction of the P.C., IBM accomplished two things. First, it captured a large share of the exploding personal computer market and established a standard for the rest; secondly, it confirmed the mainframe/workstation model of computing. In this way, it not only provided standards for the software market for standalone microcomputers, but created one for micros tied to mainframes. With the 3270 P.C., IBM enlarged the micro/mainframe link market, by introducing a communications link, but omitting a truly usable interface. As a result, mainframe software companies have a potentially lucrative add-on market, which MSA, Cullinet, ADR, Informatics, and many others are racing to address. The XT/370, by offering very similar software environments on mainframes and micros, further increases the mainframe software vendors' potential micro market.

With the mainframe market well under control, and the microcomputer market evolving favorably, we expect IBM's most important follow-up announcements to be in the medium range. One is generally accepted as imminent: an eight- to 16-user Unix workstation. Along with the expected IBM support for Unix on other systems, ranging from the P.C. to the 4300, we expect this announcement to establish Unix as a major standard; even though the Unix momentum is such that IBM's blessing is hardly needed. Such a standard would be a strong encouragement to software vendors, especially in various forms of systems software, which could be transportable to a wide range of systems.

More interesting will be the effect on the application software industry for medium-sized computers. This business is highly fragmented, consisting largely of local consultants and systems houses selling software on a broad range of machines. The sales and support costs are sufficiently forbidding to keep any national software company from really figuring out how to address this market profitably. On the low end (or the high end of the micro market), the solution seems to be heavy emphasis on telemarketing and seminar selling, possibly from a retail-like location. Informatics is moving rather aggressively in this direction. The higher-end, supermini market is more perplexing. Vendors consistently report that sales cycles are as long and costly as with mainframe software, but for much less revenue. The only exceptions seem to be industry-specific, often turnkey vendors, such as ASK and NCA in the manufacturing market. By selling very complete sets of software, these companies can get as much revenue per sale as most of their mainframe-based compatriots.

As the medium-range software market evolves, the economics can be expected to continue to force it into a total-solution pattern, rather than the onesy-twosy sales usually seen on the mainframe. It is not at all clear, however, whether the industry-specific vendors or the generalists will dominate. On the one hand, as previously noted, the specialists are already there. The same forces working in favor of the generalists—essentially, the favorable economics of a much larger target market—apply as well.

The matter will most likely be determined by IBM's decision on how low to extend the 370 instruction set. Below the 370 world, the existing players are mostly industry specialists, whether relatively large national companies or local systems houses. The large Unix software vendors (as the most likely example) will arise from such a base, as the dominant mainframe vendors stick to their 370 knitting. Insofar as the 370 instruction set is extended down, whether through an upgraded XT/370, a rejuvenated SSX, or some new system, the large software companies will probably follow, if only to lock in customers while they are still uncommitted. These vendors, almost all generalists, are committed to IBM; hence expansion of the 370 world is the more favorable and more likely route for IBM to follow. ❋

CARTOON BY HENRY MARTIN

Curt Monash is a vice president of Paine Webber Mitchell Hutchins Inc., where he follows the computer software and services industry.

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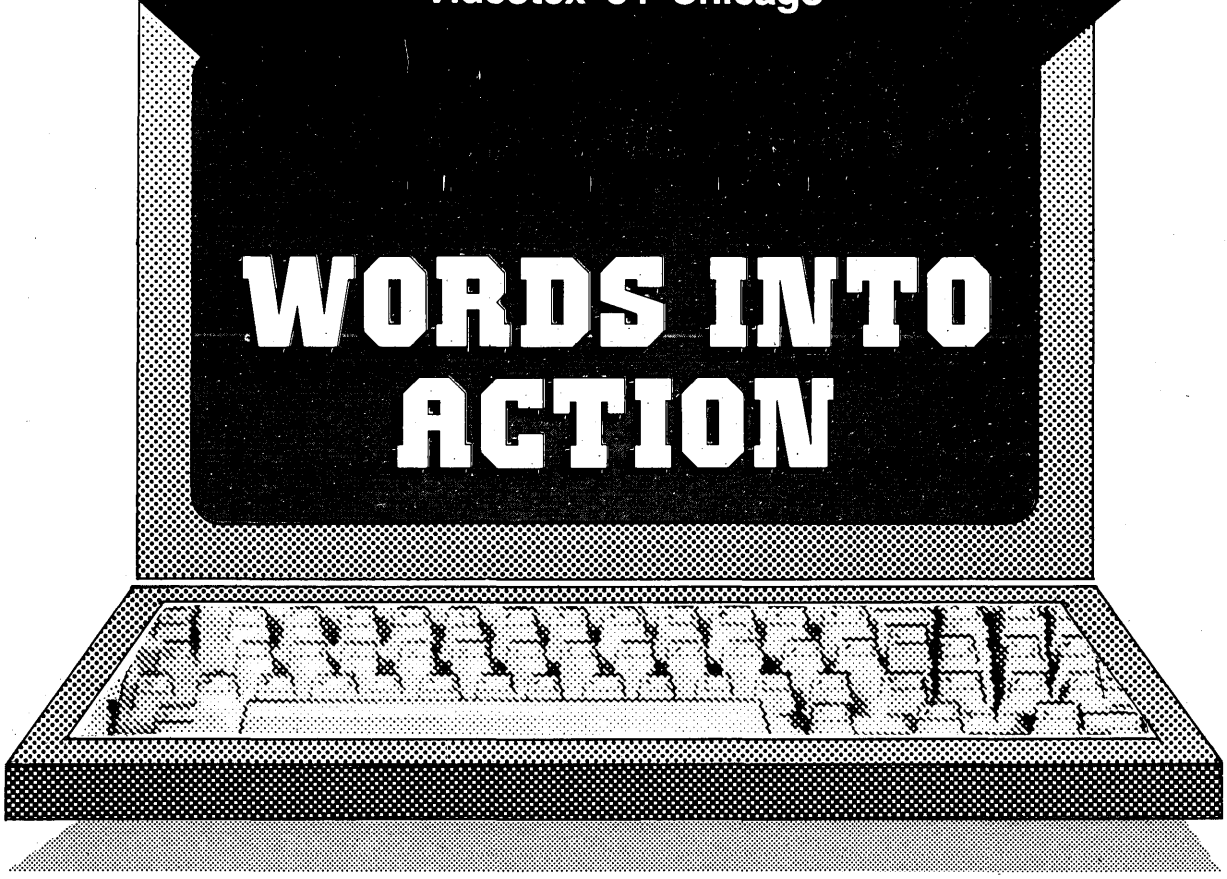

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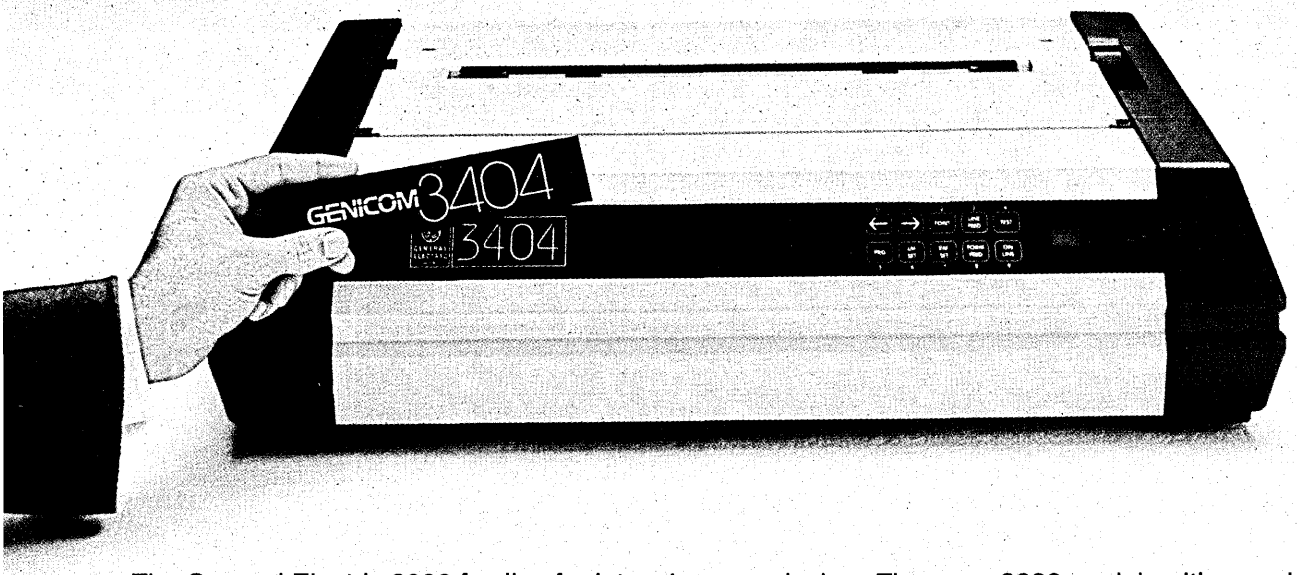

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IBM wants the dp manager in charge of office automation, and the Professional Office System is central to that strategy.

ASSESSING PROFS

by Linda O'Keeffe

Visions change. Five years ago, proponents of office automation had a lofty, if unquantifiable, goal—the comprehensive application of computer technology to improve the productivity of white collar workers. Obviously, this definition left a lot to your imagination, particularly if you were trying to produce financial justification for implementing pilots or full-scale projects of the emerging technologies: electronic mail, sophisticated word processing, or decision support systems.

More important, though, deciding who would supply you with these office automation tools was relatively easy since no one was really offering comprehensive, much less integrated, systems. The key vendors were leading suppliers of word processing equipment (Wang, NBI, CPT, etc.). IBM loomed as an inevitable threat, but its product line was thin in the word processing and OA areas, and besides, it did not seem to be paying much attention to other office applications. Minicomputer vendors were trying to decide how to leverage their installed bases, and concerns about communications incompatibility were concentrated on hardware links, mostly among larger systems.

What typically happened when firms introduced OA in the late '70s was that they focused on a particular technology type (word processing or timesharing, for example) and systematically introduced it to people who were relatively unaccustomed to operating equipment. A number of "value added" applications were tacked on to create interest and excitement, chiefly time management aids and electronic mail. Emphasis was on "shared" systems that could be used by several people at the same time. Firms developed comprehensive training that included a conceptual understanding as well as a procedural approach to getting the system to do real work for you. A user constituency was established.

Things were going nicely—at least until 1981, when IBM's P.C. entered the arena, redefined OA, and produced a new set of rules for suppliers. At about the same time, the minicomputer vendors (DEC, Data General, Prime, et al) began to see that office systems could be a way to leverage their existing product lines. The phone connection became a factor as well, as major suppliers of communication equipment (Rolm and Northern Telecom) worked out agreements to ensure compatibility and a more open environment for information exchange in the office. Finally there's the AT&T divestiture, the full consequences of which will not be felt for some time.

And while the mad dash to populate the desktops of America with standalone systems in the form of PCs has not yet run out of steam (both DEC and IBM are pushing "desktop mainframes"), a growing uneasiness over the creation of information islands exists, particularly among data processing professionals who recognize that theirs will be the task of providing hardware and software links to merge these desktop devices into the corporate information network.

By now the OA vision has begun to seem like a mirage. The closer we get to understanding the requirements, the more they seem to vanish into a cloud of infinitely more complex issues. The list of key players has also changed. Some, like AM International, have ceased to be contenders. Others, like Xerox, NBI, and CPT, may ultimately be relegated to the ranks of niche suppliers. The role that AT&T will play remains uncertain, although in terms of resources, AT&T became a major force in the industry on Jan. 1.

Despite the confusion, however, there are product offerings that might provide the basis for implementing large-scale, organization-wide office systems. The focus is on systems with datacom and networking that will permit information sharing with the existing management information system and that will interface serenely with managerial and professional desktop tools.

Key applications have been identified: word processing, electronic mail, database and financial modeling capabilities, and personal support such as calendars, on-line scheduling, and tickler files. Other capabilities might include either voice or image processing. On the output side, there is a need to combine multiple type styles and formats (including graphs) on a page.

Besides a generic set of software tools, several other components are necessary for a system that, one day, will form the backbone of an office systems network supporting hundreds (or thousands) of users:

- Does the underlying structure of the system appear appropriate for an office system?
- How inherently flexible is the system? How easy is it to interrupt one task and pick up another? How much does the system remember about a task that may have been suspended in midstream?
- How customizable is it? Can an organization, a department, or a user tailor the system functions and the user interface to suit it?
- Finally, knowing that the crucial element in making an office system acceptable is the user interface, how does the system handle its exchange with people? Are there different ways to interact with the system? Is response time consistently good?

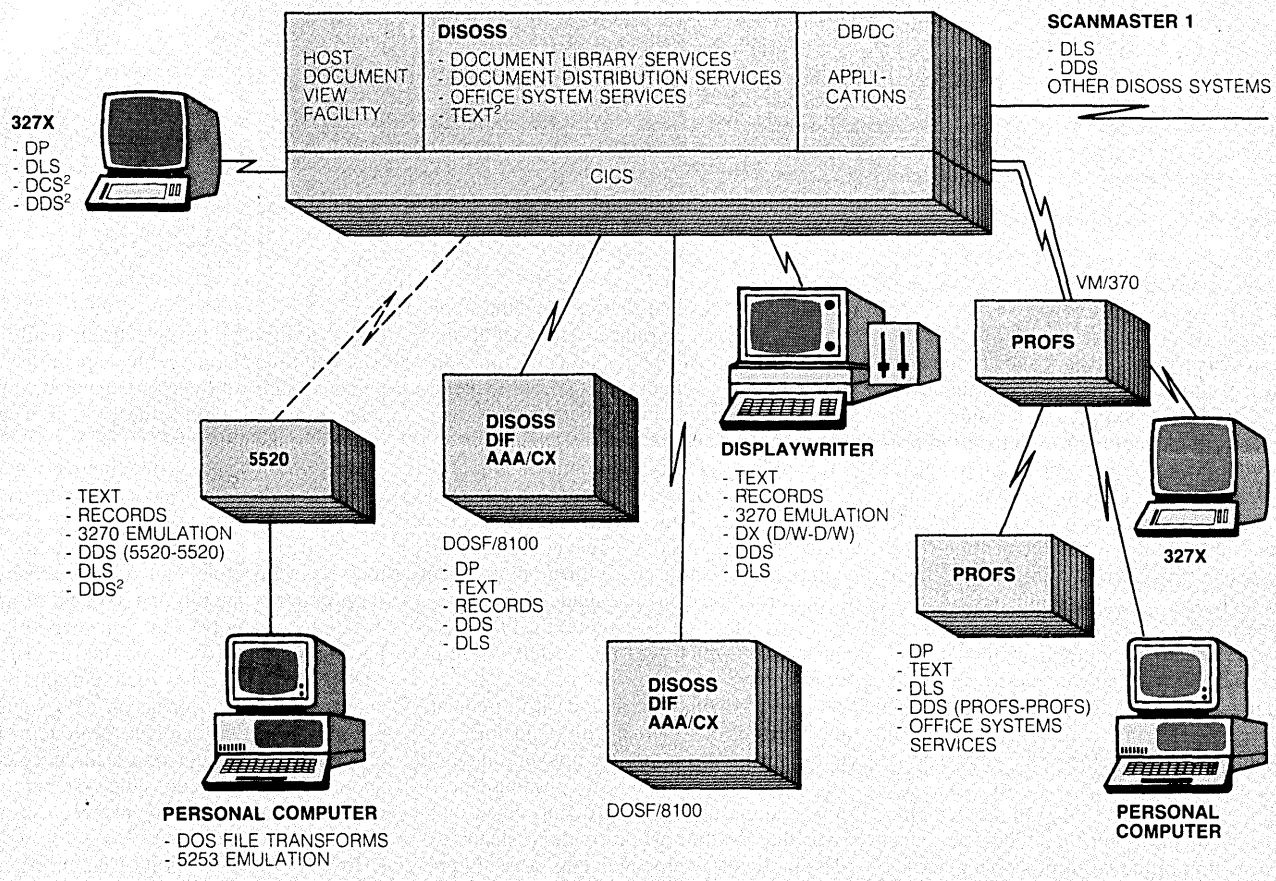
CAPTURING HEARTS AND MINDS

IBM is currently the leading vendor of desktop workstations by virtue of having sold well over half a million P.C.s in 1983. The corporate world has enthusiastically embraced this product, partly because the P.C. provided instant credibility and a quick way to meet the pent-up demand for ad hoc computing. Now it looks as though IBM has set out to capture the hearts and minds of our children—the next generation of corporate decision makers—with PCjr. Should other vendors just declare it the winner and figure out how to live profitably in its shadow? A close inspection of its current OA product offerings suggests otherwise.

For those of you hoping for a single-product office automation solution from IBM, the news is not good.

FIG.1

THE IBM SCENARIO FOR MARKETING OFFICE SYSTEMS



1. IBM has formally announced its intention to support this link in a statement of direction.
2. These are the missing links: products that need to be developed and introduced in order for generic office support and personal services to become standard offerings in all computing systems.

DDS - DOCUMENT DISTRIBUTION SERVICES
DIF - DOCUMENT INTERCHANGE FACILITY
DLS - DOCUMENT LIBRARY SERVICES
DP - DATA PROCESSING

For those of you hoping for a single-product OA solution from IBM, the news is not good. IBM plans to have everyman's answer eventually by providing some level of OA functionality on all systems, and by using a combination of architectural elements and network functions to provide the integration. The direction is clear: office systems have been and will continue to be evolutionary products. The effect of this strategy is that IBM has thrown a wet blanket over a significant portion of the market by focusing on P.C.s for individual processing and the mainframe for access to shared information. Customers with other vendors' departmental systems serving the middle area (a departmental solution) are in an uncomfortable situation.

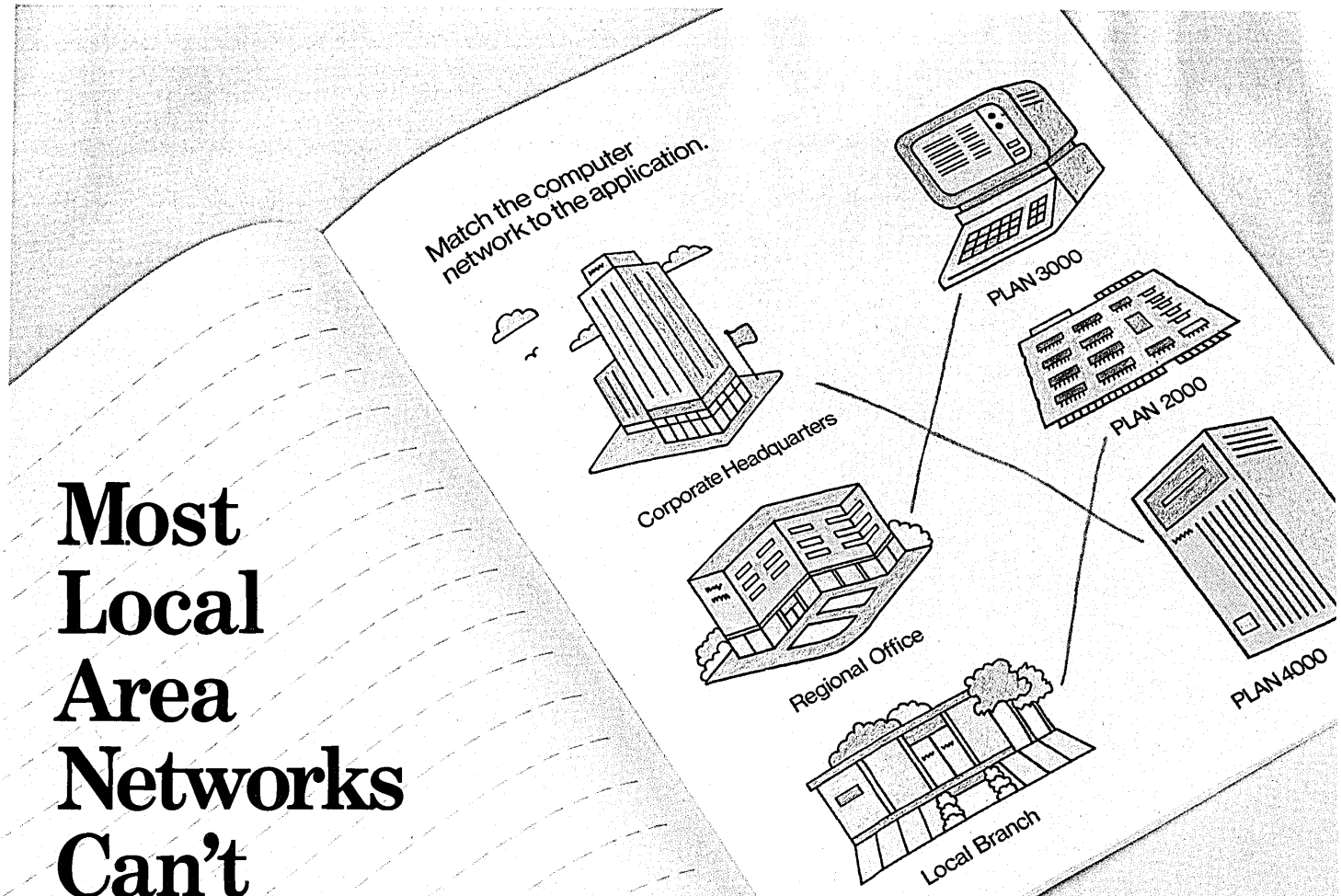
It remains to be seen how well IBM's approach will be accepted by the corporate decision maker. Will it perpetuate the confusion of IBM's multiple, overlapping product lines? How will the dp manager know whether the 8100/DOSF, 5520 Administrative System, or the VM solution, PROFS, is appropriate? IBM is particularly vulnerable to its OA competition in the area of midrange multipurpose, multiterminal systems. Neither the 5520 nor the 8100/DOSF has been as popular as comparable systems from DEC (All-In-1) or Wang (OIS and VS).

IBM has used "direction statements" to inform its customers and competitors that it is taking the long-range approach of trying to meld its existing hardware and software products into a solution for each of the key user groups: dp professionals, business professionals, engineering and scientific users, clerical people, secretarial staff, and production workers. IBM has, for example, made good on its June 1980 direction statements that:

- DISOSS[1] will support 8100/DOSF document distribution,
- DISOSS will support filing and retrieval for 5520 and Displaywriter,
- 5520 and the Displaywriter will interchange editable documents,

[1] DISOSS (Distributed Office Support System) is a host-based (MVS/VSE) program product that uses IBM's Systems Network Architecture (SNA) and provides automated document filing and document distribution systems for the Displaywriter, Scanmaster, 5520, and 8100/DOSF products. These services are not available to PROFS users, but DISOSS was recently enhanced with minimal office functions so that final form (print image) documents can be filed, searched, retrieved, and distributed whether they were created on a 3270 terminal, on the Displaywriter, or on the 5520 system.

CHART BY PAUL GOODFRIEND



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PLAN Series model	PLAN 2000	PLAN 3000	PLAN 4000
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Maximum number of users	255	255	255
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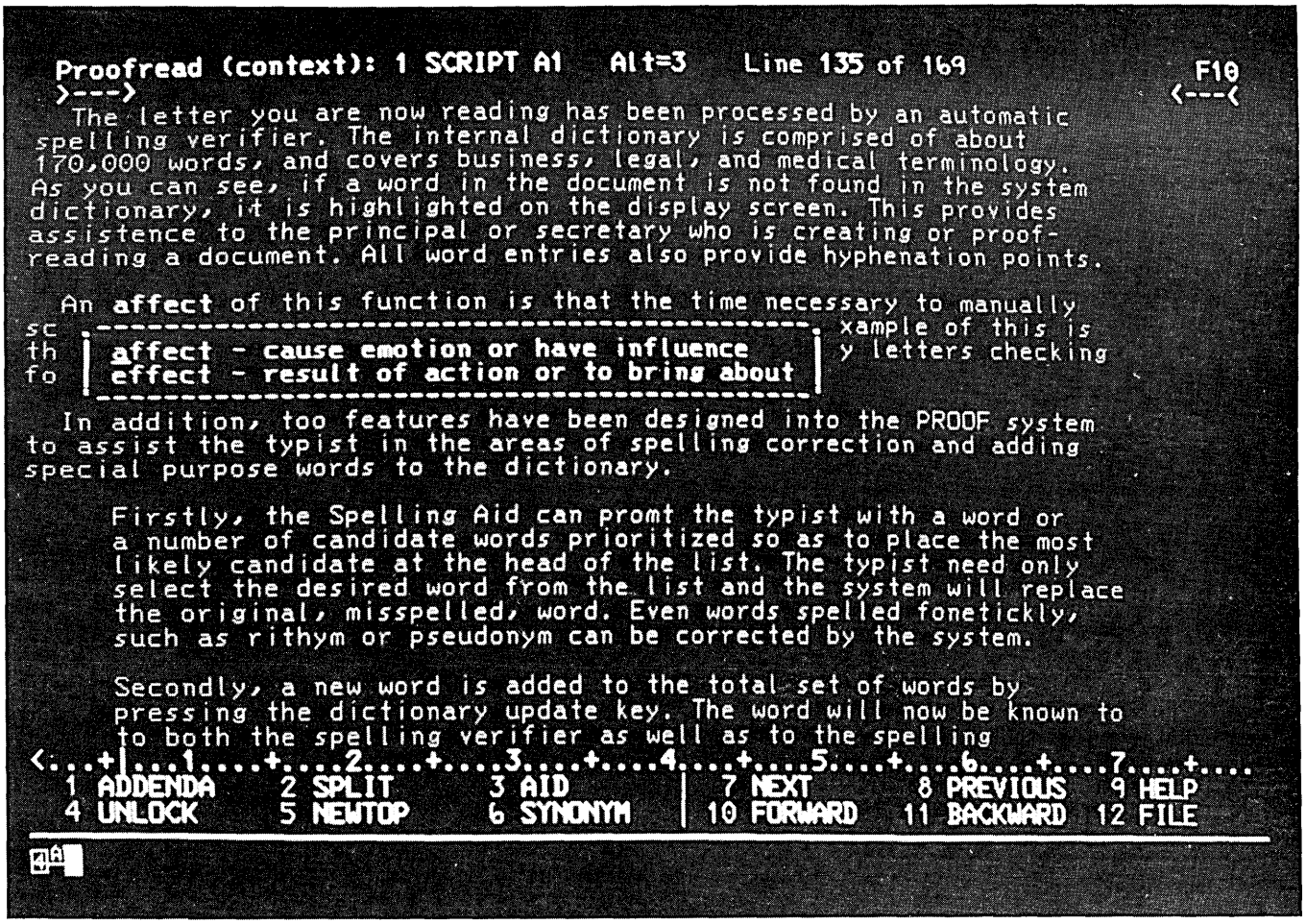
Maximum distance	22,000 ft.	22,000 ft.	22,000 ft.
Minimum file server cost	$500	$9,995	$15,995

NESTAR

Alphabet soup will not be tolerated well by people who have little interest in learning computer-speak.



PROFS can check spelling in context, find synonyms, and identify awkward phrases.

- 5520 and the Displaywriter will emulate the 3270-type terminal,
- DOSF and 5520 will support the 6670 as a system printer,
- 8775 will support text entry and editing under DOSF.

What is not clear to the customer (and often to the sales force) is what the selection criteria are for each of these products.

Additional commitments made by IBM in 1983 constitute follow-on types of activities designed to keep customers in the fold and prevent competitors with a sizable installed base from encroaching further into IBM territory:

- SNA support for VM/SP (the PROFS environment),
- Document interchange architecture and document content architecture support on System/36 and System/38,
- DISOSS/Professional Support consistent with PROFS,
- Final form document interchange between PROFS and DISOSS.

However IBM's office automation offerings evolve, one thing is clear. The Professional Office System (PROFS) is an important bridge product. PROFS was developed in the mid-1970s by a group of system engineers at Amoco in Tulsa, Okla., and some IBM programmers in Poughkeepsie. IBM initially had no intention of making PROFS available as a broad product offering. But customers began asking about it, and PROFS was marketed on a limited basis beginning in January 1981. Response was good, and in June 1983 IBM began shipping PROFS in quantity. There are now some 300 customer installations in the U.S.

Although not exactly as user friendly as IBM thinks (extensive use of menus does not automatically ensure ease of use), PROFS also provides time management functions and the ability to access files created by other VM application programs like databases, graphics, and modeling. By running in a mainframe environment (4300, 303x, or 308x) using 3270-type terminals, it addresses a huge installed base of users and allows a dp manager to leverage an existing hardware base. PROFS provides a skeleton set of tools for a small incremental expense, putting the administrative manager at a clear disadvantage vis-à-vis his dp counterpart in the struggle for dominion over end-user computing.

The most likely PROFS installation scenario is as a value-added application for an existing VM user base. As such, PROFS is a good product for sensitizing the organization to the need for providing a different type and level of support for an application product.

PROFS also offers a taste of office automation functionality (proofreading, word processing, personal time management tools) to dp people who, for the most part, have not benefited greatly from that type of service, even if it is being offered elsewhere in the organization.

NONTECH USER SUPPORT

The basic PROFS package requires that customers do a good deal of preinstallation tailoring. This lets each organization set up its own formats, customize menus and perhaps even program some Execs—a procedure of routines that you might want to group together and execute in a series—to ease in the transition from PROFS to other VM applications. To a large

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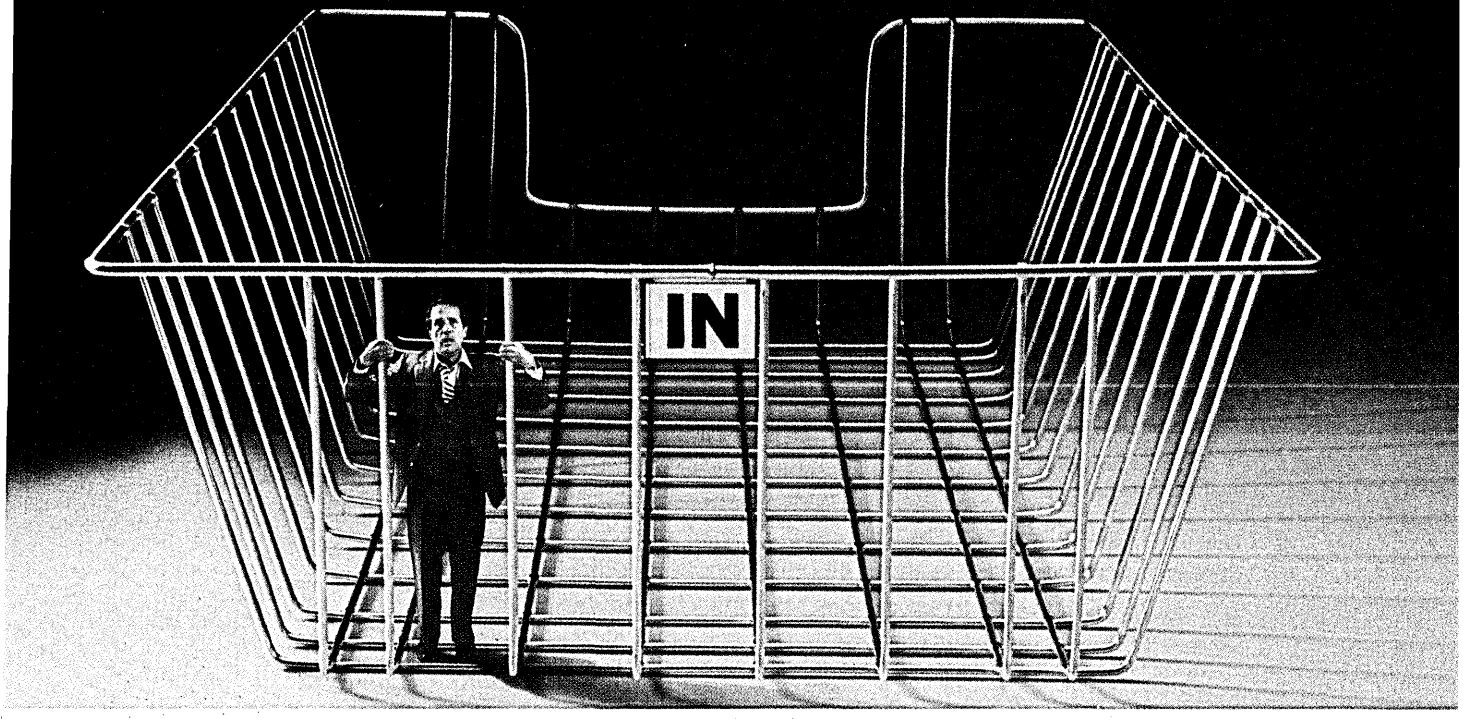

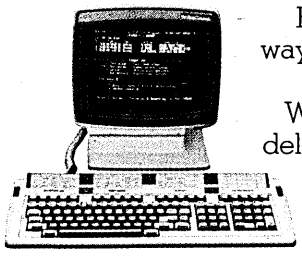

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CIRCLE 96 ON READER CARD

Alphabet soup will not be tolerated by people with little interest in learning computer-speak.

extent, the skill with which the customization is done will determine the quality of the user's experience with PROFS. Ongoing support—in the form of establishing new users, changing existing users, creating Execs to handle the rough edges between PROFS and VM/CMS, and monitoring system performance—will require the services of an administrator and a programmer. But perhaps more important than the technical skill of the support people will be their ability to bring a business outlook, rather than a technical one, to the job of supporting nontechnical users.

Alphabet soup will not be tolerated well by people who have little interest in learning computer-speak and even less interest in what it will take to get the computer to do the particular high-priority ad hoc job they want done. The user's attitude toward PROFS will be significantly different from the same user's attitude toward a micro. PROFS functions are highly structured and set up ahead of time by various profiles and system defaults, so the naive user has less ability to customize the system on the fly (as is possible, for example in DEC's All-In-1 or in Computer Consoles Inc.'s OfficePower) than he or she may expect. The user will need support from the PROFS staff, including application development and customized Execs.

PROFS' time management functions, including the ability to set up personal calendars, to establish meetings and schedule meeting rooms and equipment, and to send personal reminders, are useful and well integrated. They take on even more importance as the critical mass of users is reached and the system is relied upon to take over time-consuming scheduling tasks. IBM has dealt well with privacy issues in this area. A user is able to choose from a variety of authorization levels for access to a personal schedule that includes view only, no access, and look at/change authority.

Electronic mail is the core function in PROFS. Informal communications, which PROFS defines as messages and notes, are easy to compose and send. Message length is not limited. The user interface is consistent and offers an orderly sequence for handling incoming mail and for processing each type of mail: a note, draft document, final document, or other electronic or hardcopy mail. You can handle pieces of mail individually, or you can deal with the entire in-box at once.

The mail function makes extensive use of function keys and fill-in-the-blanks screens that are self-explanatory. The power of the mail system has to do with the large number of users that can be supported on the mainframe and the fact that a number of PROFS/VM systems can be linked. Mail can be sent to individuals or to groups. Distribution lists can be set up and maintained by each individual and "mapped" against the system-wide user base.

A powerful search capability augments the electronic mail system. One benefit of PROFS' extensive use of structured formats is the ability to make the search process very flexible. For example, you can search for a document with any date, today's date, a particular quarter (1Q84), or a time span (month, or mm/dd/yy). To increase the power of the search, you can add codes for action (10 characters), identifier (three characters), and type (one character) to distinguish document characteristics. An action might be "urgent" or "pending," identifier could indicate whose responsibility it is to follow up, and so on. Finally, all search criteria can be

linked using "and"; a PF key selection will change the "and" to "or."

Once PROFS completes the search, you are notified how many many documents were found, and a screen lists activities you might want to perform at that point. You can choose to work with the documents one at a time or all at once.

The document processing capability is the least impressive part of PROFS, primarily because of the clumsy editors, CMS/XEDIT and DCF (SCRIPT). GML tags must be embedded for formatting, so what you see on the screen is not what you get on output. IBM's response to this criticism is that managers and professionals do not require sophisticated text editing capabilities because their secretaries will take care of those tasks using Displaywriters.

There is procedural consistency within the document processing function, and the structure surrounding the document (author profiles and document style) does force you into a logical evaluation of the subject matter and contents of the document from the outset. Professionals and managers accustomed to a more fluid editing environment, however, will not be satisfied with PROFS tools for document creation and editing.

Proofreading capabilities in PROFS are both extensive and fun to use. Author assistance tools probably have more immediate value and greater potential for saving time that the flashier office automation features like calendars and tickler files. The spelling checker is unique because of its ability to check spelling in context (affect vs. effect, for example), to find a synonym for any word in the text, and to point out awkward or wordy phrases. If you are interested in finding other ways to say "an example of this is," by using the phrase checking, PROFS will offer "thus" and "for example."

CAN BE LINKED IN A NET

PROFS will most likely be acquired by the established IBM data processing organization as a value-added application, which is the way office automation is currently being viewed by many businesses. At the same time, there may well be pressure from other areas in the organization to grow non-IBM departmental computers (some of which may be word processing systems) into OA systems. What strength does PROFS bring to that particular approach? It can be linked in a networking scheme (SNA or bisynchronous) that will permit users in widely dispersed areas to send and receive notes and documents. Primary access to PROFS will probably be via the 3270 terminal, although both the Displaywriter and IBM P.C. can serve as PROFS terminals.

Those familiar with other IBM products will find the PROFS interface comfortable. Others accustomed to a freer editing environment will be constrained by the rigid data-entry-screen-type orientation and the need to know extraneous command lingo to navigate within some PROFS features and between PROFS and the VM environment.

For PROFS to be considered a robust OA product, some pieces need to be added. Chief among these is spreadsheet capabilities. With the wide use of integrated spreadsheet software by PC users, there is a need to provide consolidation for user-created spreadsheet data. Significant processing power and access to large-scale storage are required for this, making it a natural for mainframes, but PC users are not likely to give up their own spreadsheet programs; a

PROFS may well crystallize IBM's thinking about office functions.

method for two-way data exchange needs to be available. It would also be nice to have a graphics capability built into PROFS so that you could make a graph part of a PROFS document and view it on the screen. (The current connection with ADRS/BG does not allow you to see the graph that is transferred to a PROFS file.) Ideally, the graphics capability would be linked with the spreadsheet function.

The long-range importance of PROFS may well be to crystallize IBM's thinking about office functions. Prior to PROFS, IBM had not focused its thinking on the requirements for a personalized set of support tools for the nontechnical user. Two opposing camps existed: the dp types promoting the 8100/DOSF approach to distributed processing and the wp types offering administrative support with the 5520, neither of which have been very enthusiastically received. We see in PROFS a middle ground emerging, and there is evidence that PROFS functionality is migrating to other products.

IBM, however, is taking its time integrating these products. It is still unclear how IBM will resolve the PROFS-DISOSS inconsistency, although it has pledged to do so. Will the same functions be accessible on each system? Will there be a common command structure and user interface? How will the dissimilarity of keyboard layouts be resolved in the user interface? How will the implementation of IBM's announced document interchange architecture and document content architecture affect users, particularly those who must exist in a multivendor environment? Finally, will implementation of DIA/DCA improve the ability of users to send and receive editable documents among systems?

CONSIDER SOME KEY ISSUES

If you are seriously considering taking this incremental approach to OA, you might want to consider the following key issues: how long do you think users will be content with 3270-type terminals? Have you considered the cost implications of equipping them all with more expensive intelligent devices, including IBM's P.C. family?

How much will PROFS really cost you, once you have it rolling (additional memory, disk storage, mainframes, high-quality printers, terminals, and other resources)?

Do you have the full-time technical support staff to commit to tailoring PROFS, writing Execs, and supporting users?

How important do you think good word processing is for an office system to be used by a broad community of users?

Making personal services and office support capabilities available across a broad line of computers has a great deal of marketing appeal. Business is wary of high-end, dedicated OA systems, so it has been seeking a "retail" solution to productivity bottlenecks by installing large numbers of PCs. We are on the threshold of management's discovering that the ability to link these devices and to provide needed functionality (not just physical linkages) will greatly leverage its investments. PROFS may be just the vehicle to provide a low-risk, relatively low-cost way to test that theory. *

Linda O'Keeffe is a contributing editor for the Seybold Reports on office systems and professional computing, and a member of the Seybold Consulting Group, Boston, Mass.

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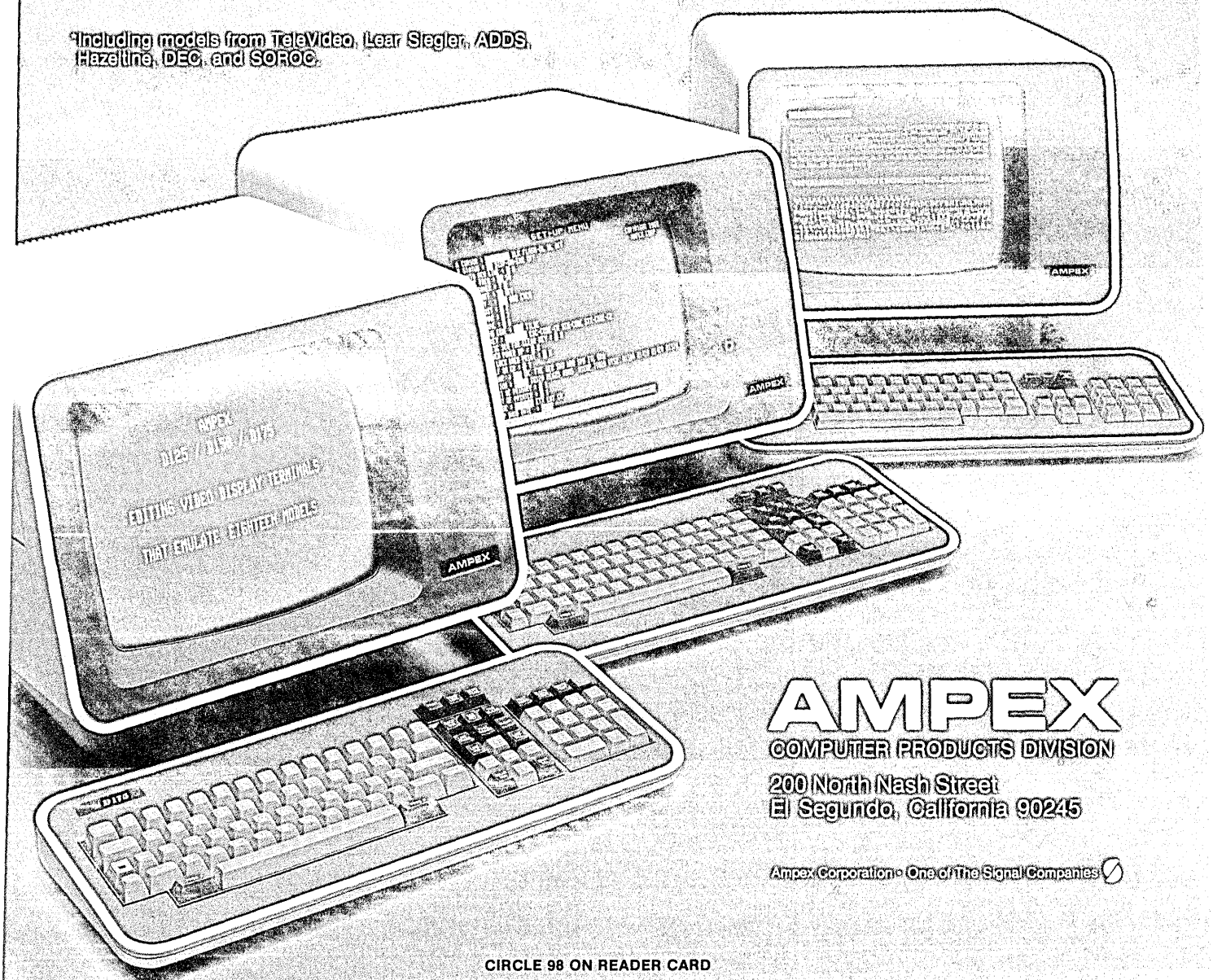

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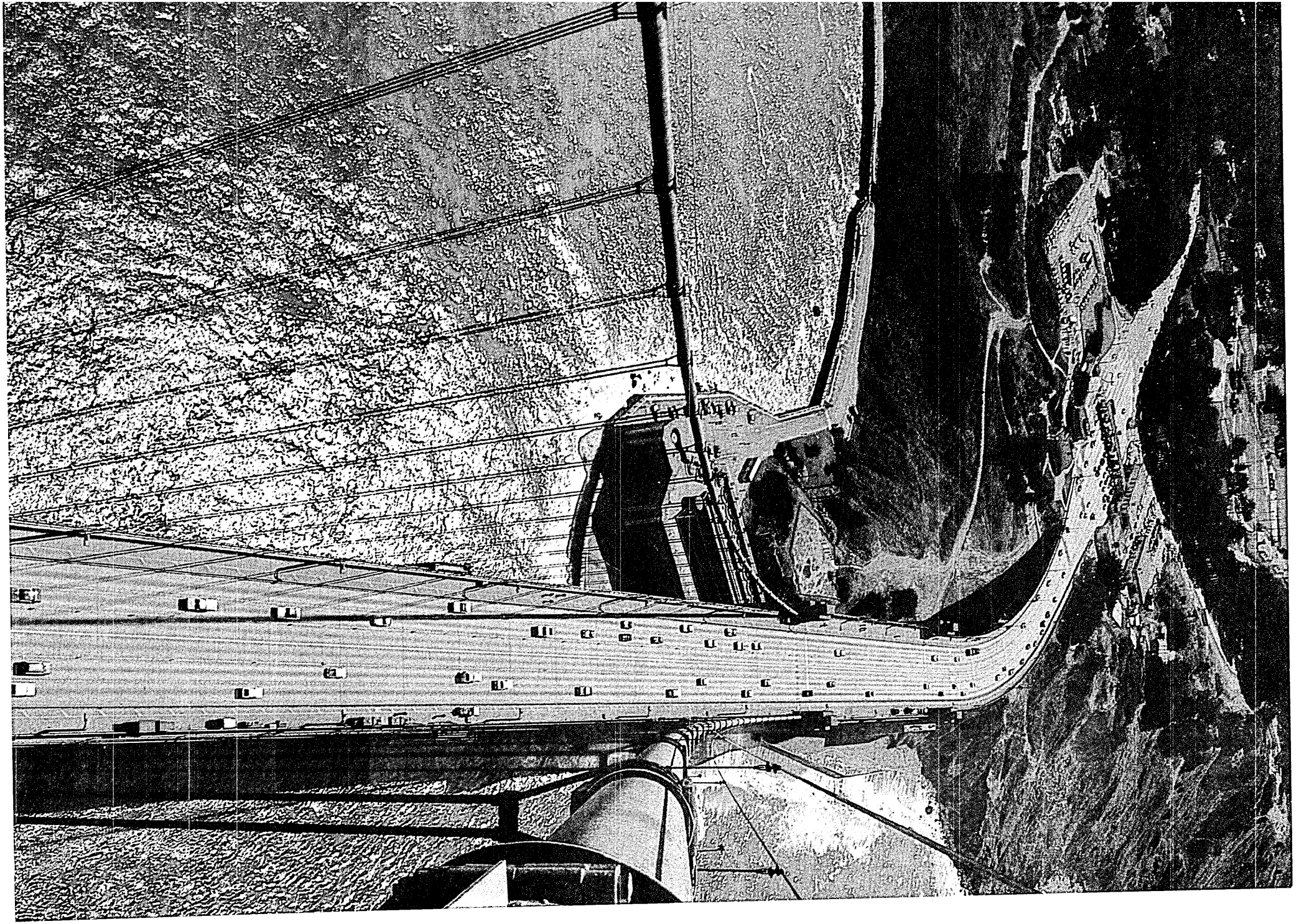

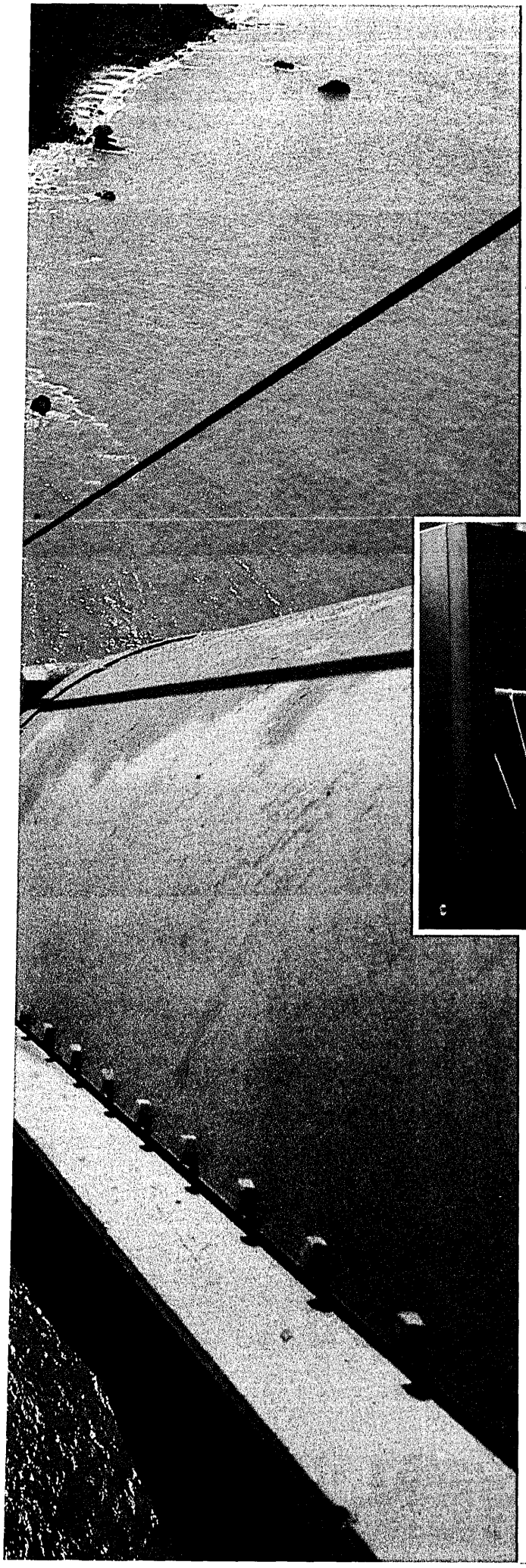

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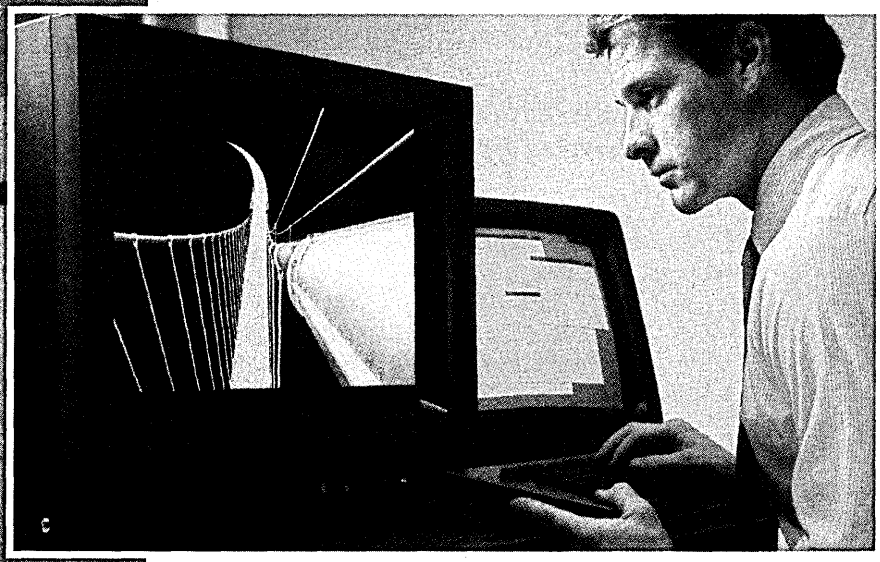

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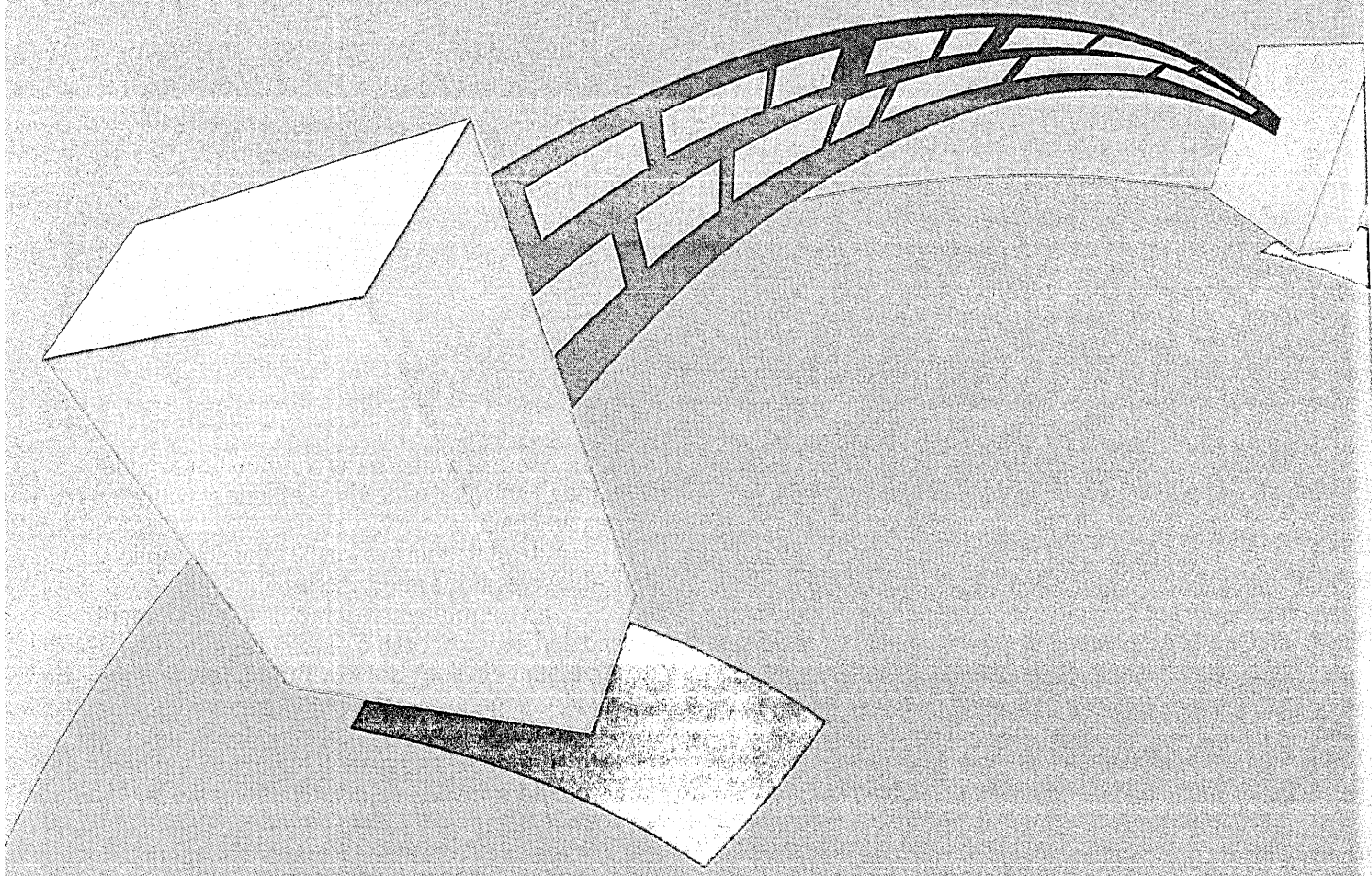

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PEOPLE

MAKING A PAPER SWITCH

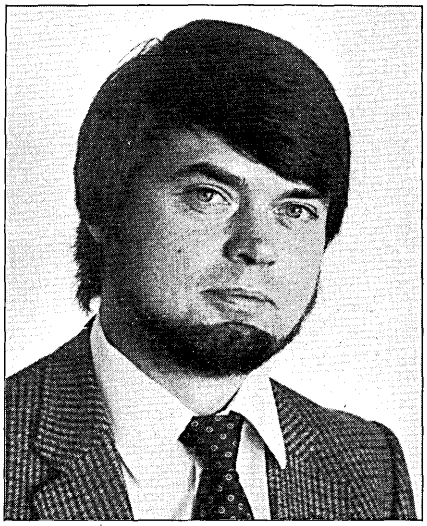
Because of a widely used mortgage credit system that helps finance private housing, the Danish securities market has been awash in paper. Some 50 million certificates worth about $80 million are held by Danish citizens, who make about 16,000 transactions a day.

Recently, however, Denmark became the first country to fully automate its securities trading, completely eliminating the need for paper bond certificates and coupon books. The switch from paper to electronics was made last April under the cautious but proud eye of H. Dines Hansen, who as project leader and vice president of the Vaerdipapircentralen clearinghouse was primarily responsible for the new system's development.

As he recalls, the changeover went surprisingly smoothly, despite the need for half a million lines of PL/1 code written by a team of some 40 programmers and analysts. Hansen has documented the conversion in *Up & Running*, to be published by Yourdon Press, New York.

The move to eliminate paper trading began in the early 1970s when the Danish government foresaw that the volumes of transactions would soon outstrip the then current system's abilities. In 1975, the Ministry of Housing appointed a commission to propose alternatives to the paper system. Hansen was named project advisor and led the commission to recommend a national data processing center for securities processing. Hansen was then asked to direct the formulation of standards for developing an electronic system.

In 1978 he became a member of a four-person team that began strategic preparations for the dp center, which eventually became known as VP-Centralen. A 10-month analysis was made of requirements that led to choosing software first and then hardware, according to Hansen. The software selection came down to a runoff between Intel's System 2000 and Software ag's Adabas database packages, he recalls, adding that IBM's IMS would have required between three and four times more extra coding than the other dbms packages. Eventually, System 2000 was chosen.



H. DINES HANSEN: Helping Denmark's securities trading move from paper to electronics.

Nevertheless, IBM was a strong contender for supplying hardware. Indeed, testing of the full software was performed in IBM's Munich, West Germany, facility on what Hansen recalls was only the sixth 4300 processor IBM had shipped. IBM bid a 4300 and 303X machine for the securities network against National Advanced Systems, which offered its 6600 model. Ultimately, each company won a piece of the hardware contest, with IBM installing a 3083E and National an 8040 cpu. The 4300s and 6600s were ruled out; they were found unable to handle the 300 transaction-per-minute load because of insufficient I/O capacity.

Additional Intel gear was installed, including a 3825 semiconductor disk that speeds up processing of on-line transactions, and the firm's database information system (Idis), which is a microcomputer programmed to manipulate small sections of the System 2000 database away from the host mainframe. The latter is first being used by bank auditors, Hansen explains.

VP-Centralen has been set up as a private, nonprofit institution that clears the daily volume of securities transactions generated by its members—the Mortgage-Credit Council, the Copenhagen Stock Exchange, the Danish Banks Association (commercial banks), and the Association of Danish Savings Banks, among others. VP-Centralen acts only as an accounts library, keeping track of who owns what; it does not move any cash and has no financial involvement with the market itself.

On a busy day, the system handles 50,000 trading transactions, and over the course of a year 5 million to 6 million dividend payments are made. The total number of terminals with access to VP-Centralen's files exceeds 10,000, according to Hansen, who notes that IBM's SNA forms the basis of the wide-ranging network.

Under the new system, Hansen explains, the investor obtains his securities the usual way, except instead of receiving a paper bond he gets a receipt detailing his claim as registered in the data files of VP-Centralen. Transfer of securities becomes valid only when the transaction is registered on the computer. Legal rights and implications remain unaltered and correspond exactly to the traditional paper bond or share, according to Hansen. The ordinary investor may at any time demand a printed statement of his account at his local bank.

—J.W.V.

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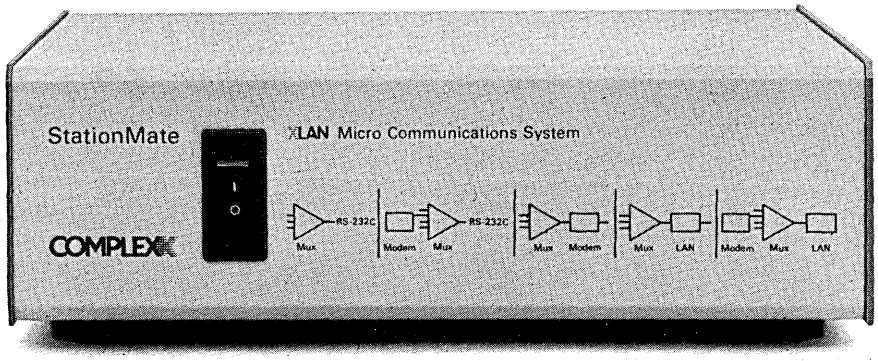

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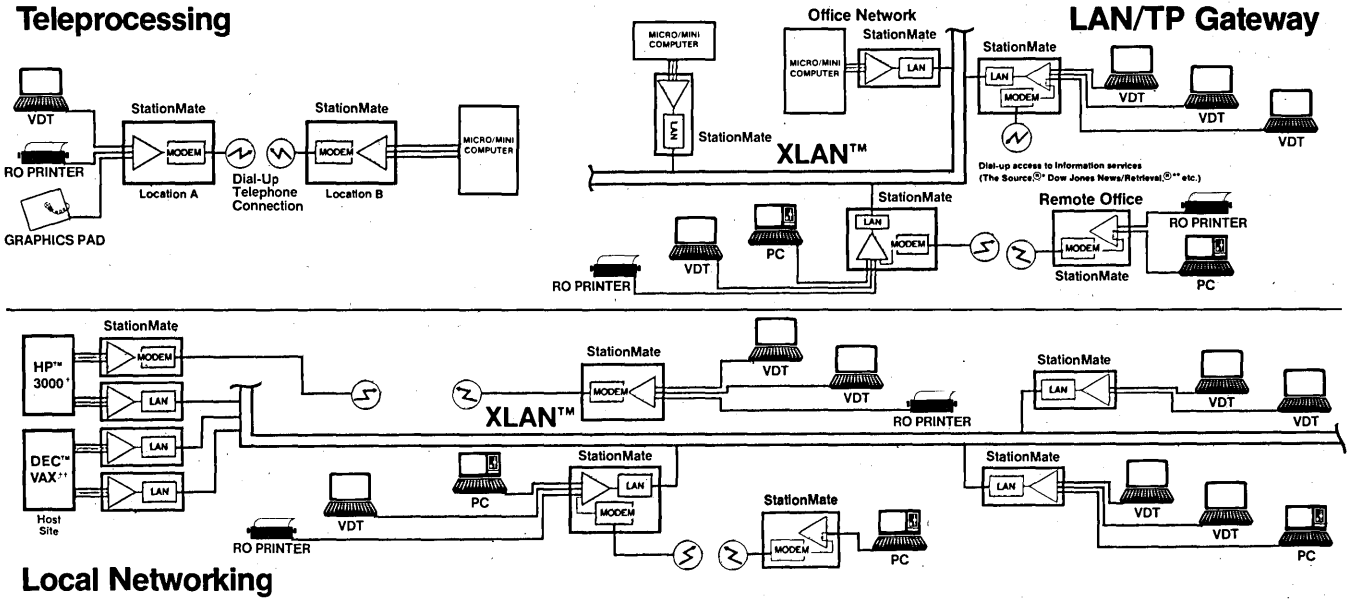

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CIRCLE 101 ON READER CARD

HARDWARE

OFF-LINE

"When our customers talk, we listen," IBM executive James T. Boyle told a Hammer/Seybold forum recently. And what customers want most of all, it seems, are "optimized solutions for diverse environments ... integrated into a single solution." Boyle's comments offer an intriguing glimpse into IBM's direction for the next decade. Of course, "this is not a list of soon-to-be-announced products; it's input from our customers." But given that disclaimer, IBM has been listening to customer demands for "a new user interface architecture that would aid users as they move between departments or between machines in the same department. There should be similar menus, prompts, and commands for similar functions."

The company also "envisions directories that will provide network information, like names of individuals, terminal addresses, and terminal types." Other network management functions foreseen include dynamic network reconfiguration to keep changes from rippling through a network; data collection on problems to help deter hard failures; and performance features such as load balancing and response time monitoring. Boyle left no doubt that IBM sees SNA as the basic architecture on which these functions will be built, although other protocols will still be used.

Boyle also mentioned 32-bit chips and linguistic software, such as cliche tracking and grammar checking, as "technologies we are experimenting with." Another is a terminal incorporating data and telephony features. The touch-sensitive device would support free-form graphics and text entry. "You can take notes on it by writing on the screen with an ordinary pen, and then distribute them throughout the network using DISOSS." Despite the detail of these visions, try to remember that "the talk does not speculate on future product plans."

IBM may see SNA as the network of the future, but DECnet users may not agree. Yet you can tie an MVS system into DECnet with the System 3711, a hardware/software combination introduced recently by Interlink Computer Sciences, of Fremont, Calif. The $98,500 product uses proprietary IBM host-resident software that functions at the highest level of the ISO network architecture to provide dynamic file access to the record level without entering batch mode or using JCL. The product's hardware component, a front-end processor, links the IBM host to DECnet at any speed supported by DECnet. The product is geared to office systems users who have substantial investments in both DEC and IBM hardware.

IBM has taken another firm step beyond the office systems arena with its introduction of the 5080 color graphics system, which can produce 256 simultaneous colors over a million addressable points. The product is compatible with the 3250 graphics system, but only in a limited way. Programs written for the 3250 cannot take advantage of any of the hardware advancements in the 5080, and so will not run any faster than on the 3250. Neither IBM nor any competitor has yet brought out any significant software for the machine, so its full potential cannot yet be realized. A notable exception is Precision Visuals, the Boulder, Colo., firm that has promised a 5080-based device driver for its DI-3000 graphics tool kit that would use all of the unit's power. Another potential drawback to the 5080 is its lack of support of any interfaces save direct channel attachment.

CONVERTIBLE

The Omni Convertible multimicroprocessor system uses a variable processor architecture that is designed to allow easy conversion from one microprocessor configuration to another by means of plug-in boards. The variable processor architecture will permit the unit to operate concurrently with up to three different microprocessors employing any combination of the CP/M Plus, MS/DOS, Xenix, UCSD p-System, Unix, or Omni-DOS operating systems.

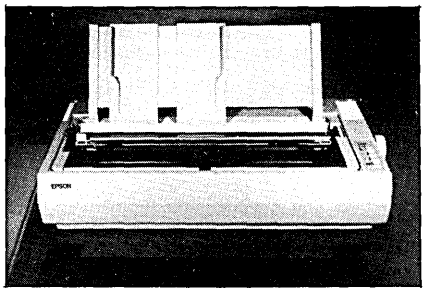
The product comes with the Z80H and TI 9995 microprocessors, and can be expanded to include the 80186, 80286, and MC68000 microprocessors. Future chips can also be accommodated, the vendor says. The product supports a proprietary local area network and several telecommunications protocols, including 2780/3780, 3270, and tty emulations.

The nucleus of the product is a high-speed shared memory that is dual-ported to a pair of 16-bit and 8-bit buses. These buses support an array of plug-in microprocessor and I/O peripheral controller boards. The basic memory can be expanded from 128KB to 1MB, and can store and retrieve information at the rate of 5MBps. The Z80H runs 8-bit applications programs and the 8-bit bus. The TI 9995 runs the proprietary word processing software, the system keyboard, the parallel printer port, and RS232C port, as well as a four-slot Multibus card cage. One slot is occupied by the TI 9995, another by any other cpu board, a third by a crt controller, and the fourth by an optional graphics controller. Prices start at $6,000 for a Z80H, TI 9995, 128KB RAM, diskette drive, crt, keyboard, and printer. OMNIDATA, Westlake Village, Calif.

FOR DATA CIRCLE 304 ON READER CARD

PRINTER

The LQ-1500 dot matrix printer is intended for applications including letter-quality correspondence, high-speed drafts, and graphics. It uses a 24-pin printhead and can operate at 60cps in letter-quality mode or 200 cps in draft mode.



The 136-column printer has a 96-character ASCII set, 13 international sets, and 96 italic characters, as well as up to 128 downloadable characters. The unit has a 15Kb print line image buffer so that users can create any character or symbol within a 37 × 24 matrix.

For character resolution, the printhead forms characters with matrices ranging from 9 × 17 dots to 37 × 17 dots. For graphics printing, resolution ranges from 60 to 240 dots per inch, using 8-pin and 24-pin configurations. The product comes with 45 font styles, including Pica and Elite spacing in regular, enlarged, emphasized, and condensed formats; proportional spacing in regular and enlarged formats; and regular and enlarged superscripts and subscripts.

The printer works bidirectionally, with software controlling intercharacter spacing, print size and pitch, and horizontal and vertical tab settings. Available interfaces are 8-bit parallel, RS232, and IEEE 488/GPIB. MTBF is rated at 6,300 hours. The printer costs about $1,500. EPSON AMERICA, Torrance, Calif.

FOR DATA CIRCLE 307 ON READER CARD

FILE SERVER

The PLAN 3000 file server is designed to be a midrange, desktop networking system that allows Apple and IBM-compatible microcomputers to share information and peripherals. Priced at $10,000 for a 10MB version with a tape streamer for backup, the PLAN 3000 (Personal Local Area Network) can support any combination of Apple II or III or IBM P.C. or XT workstations, with a maximum of 255 workstations and servers per network. Individual stations linked to the network may be placed up to 22,000 feet apart.

The product manages access to backup facilities and a shared storage of 10MB or 15MB for the networked stations, and performs such functions as password protection, error-checking, integrated backup, and multi-user controlled access to files. The file server software performs file management, with functions ranging from listing the network directory hierarchy to copying real or virtual diskettes. For critical applications, an optional shadow file server provides workstations with transparent file server backup when the primary file server is unavailable.

The PLAN series uses baseband serial transmission at a data rate of 2.5Mbps, with station access to the network controlled by a token passing protocol. NESTAR SYSTEMS INC., Palo Alto, Calif.

FOR DATA CIRCLE 305 ON READER CARD

HARD DISK

The QuadDisk is an integral hard disk drive for the IBM Personal Computer that requires no external power supply. It is available in capacities ranging from 6MB to 72MB, with access times ranging from 30 msec to 50 msec. The product uses a menu-driven operating system that insulates the user from PC/DOS disk access commands.

Software included with the system allows the user to place the monitor's cursor at the program or utility desired and then call it from the disk. All programs and files can be erased, renamed, copied, backed up, and reviewed through the main menu. A cache buffering feature allows the disk drive's microprocessor to access programs in RAM without searching through the disk's directory.

Alternate versions of the product include a removable hard disk cartridge model, which uses 6MB disks. The product allows nine programs or jobs to run concur-

HARDWARE SPOTLIGHT

PORTABLE COMPUTERS

The Commuter is a 16-pound, IBM P.C.–compatible portable computer that contains 128KB of RAM on a single multilayer board, an 83-key full travel keyboard with a layout identical to the IBM model, a 360KB 5¼-inch floppy disk drive, parallel and serial ports, RGB direct drive output for monochrome or color monitors, power-up diagnostics, and a connector for integral IBM expansion chassis support.

The unit comes with the MS/DOS 2.1 operating system and can expand to 512KB of RAM with two disk drives. Other options include a 16 × 80 liquid crystal display and asynch, bisynch, SDLC, and HDLC protocol support. While no screen or printer is provided with the basic package, support logic is included for 25 × 80 and 25 × 40 displays.

The basic product costs $2,000. The LCD display costs $500, and a second disk drive costs $300. VISUAL COMPUTER INC., Marlboro, Mass.

FOR DATA CIRCLE 300 ON READER CARD

The TI Portable Professional Computer is nearly twice the size of the Commuter. Essentially, it is this vendor's Professional Computer condensed to fit into a transportable package. It offers the same graphics, color, memory expansion to 768KB, internal modems, and keyboard as the Professional Computer, and runs all the software that runs on the desktop model.

The detachable keyboard can be hooked to the central system unit, which contains the cpu, video display, and diskette drive. A storage compartment holds the cables and electric cords during transportation. The unit comes with the 8088 cpu, 64KB RAM, five expansion slots, and a single 5¼-inch disk drive. Either a color or monochrome display can be incorporated into the system. Both use a 25 × 80 format with a 720 × 300 pixel resolution, and programs operate identically on each.

The keyboard is the same as on the desktop model, and the 12-inch or 13-inch monitors used on the desktop product can be driven by the portable unit. A basic system, with 64KB of RAM, a single disk drive, and a monochrome display, costs $2,400. The same configuration with a color display costs an additional $600. TEXAS INSTRUMENTS INC., Dallas, Texas.

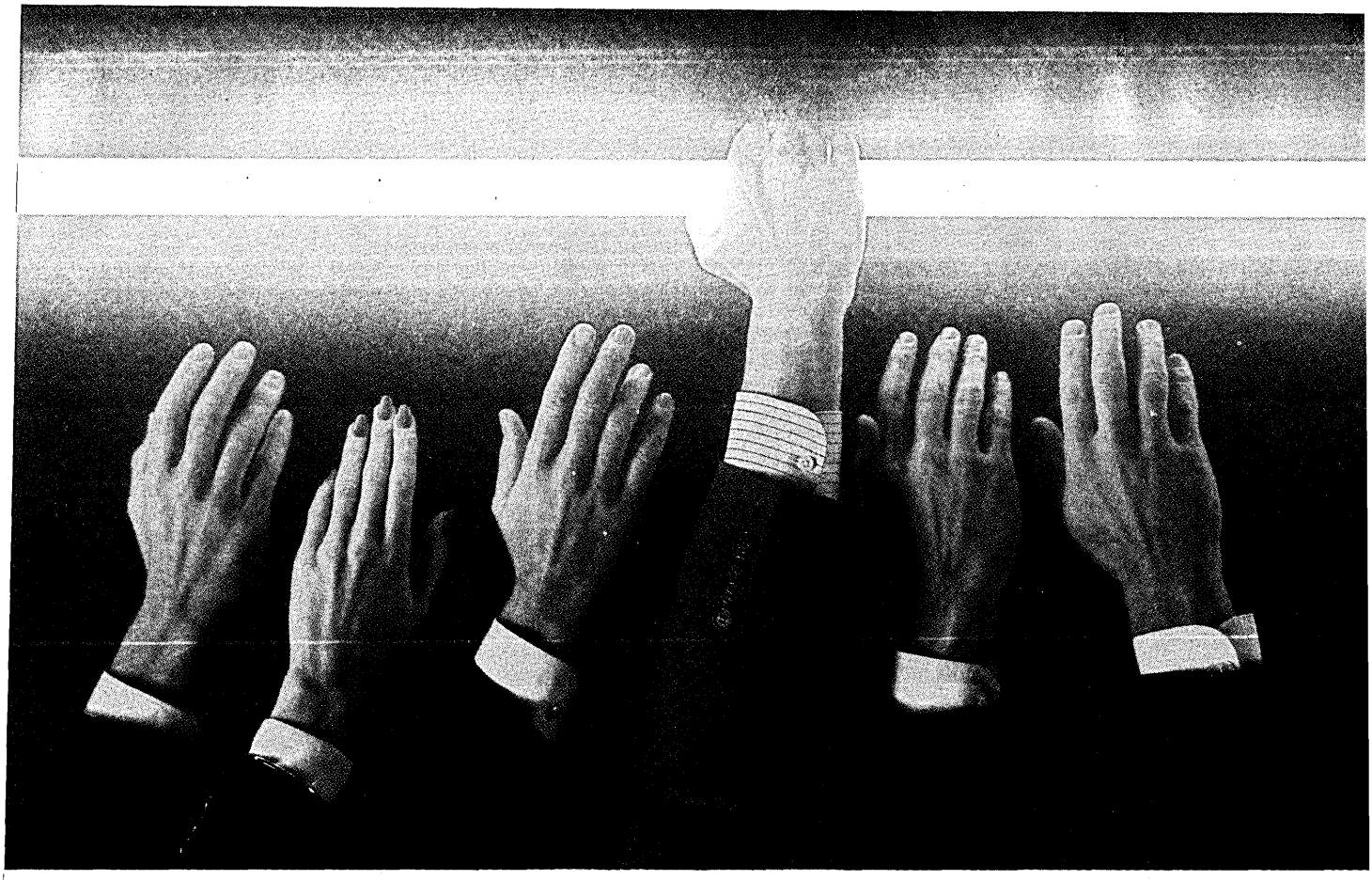
FOR DATA CIRCLE 301 ON READER CARD

The PC Traveler is designed to be a high-end portable system. The unit incorporates an AC gas plasma display with a 25 × 80 format on a 9¼-inch screen. It is based on dual 80186 microprocessors, and is compatible with the IBM Personal Computer. It integrates an 80- or 132-column, full-function thermal printer capable of printing on letterhead and fanfold paper. It supports multiple fonts and character sets, and provides dot addressable graphics.

The PC Traveler comes with a 6.2MB cartridge disk drive, although conventional

half-height disk drives that are data compatible with the IBM P.C. are also provided. It uses a custom-designed keyboard with key-initiated, ROM-based diagnostics. Up to 1MB of RAM can be provided, as can telecommunications capabilities. The product lists for $4,500. STRATEGIC TECHNOLOGIES INC., Norcross, Ga.

FOR DATA CIRCLE 303 ON READER CARD



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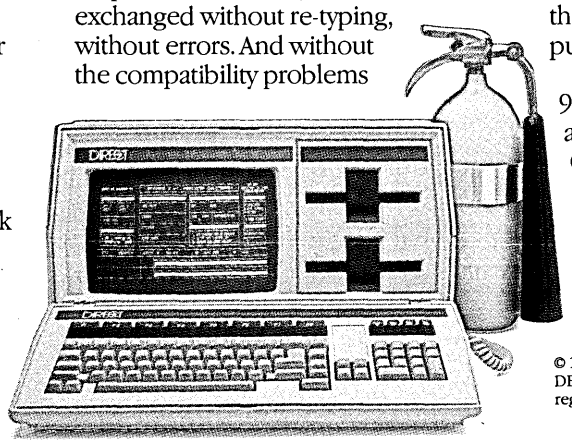

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rently and simultaneously on a P.C. The capability also allows a P.C. to connect with nine dumb terminals through serial ports if the P.C. has the ports available.

Partitions can be between 16KB and 256KB in size. A multi-user, multitasking feature allows users to access the P.C. remotely. Prices range from $2,000 for a 6MB fixed drive to $6,500 for a 72MB drive. QUADRAM CORP., Norcross, Ga.

FOR DATA CIRCLE 306 ON READER CARD

DISK CONTROLLER

The Maverick SMD PC-80 provides an SMD interface and the capability of using 8-inch or larger disks with fixed or removable cartridges to IBM Personal Computer users. The product will run with any P.C. or look-alike, without any hardware or software modifications.

The product supports two SMD disk drives on any P.C., with storage capacities ranging from 16MB to 800MB per disk drive. The product occupies a single slot in the P.C. card cage and is compatible with the PC/DOS 2.0 and UNETix operating systems. The vendor will supply a BIOS to interface to other operating systems.

The Maverick uses a buffered architecture with a bipolar state machine managing the data stream. A CMOS processor, external to the data stream, serves to regulate activity on the board. Transfers across the bus can be supported through DMA or programmed I/O. Dual porting and fully programmable sector sizes up to 960 bytes are supported. The product also provides automatic error correction with 32-bit ECC, bad track and sector replacement, and overlapped seeks. The Maverick SMD PC-80 costs $1,900. INTERPHASE CORP., Dallas, Texas.

FOR DATA CIRCLE 308 ON READER CARD

STREAMING TAPE

The JetStream 16 streaming cartridge tape subsystem can read and write as both a 9-track and a 16-track tape drive, with QIC 02 and QIC 24 compatibility. Designed to provide backup storage for Winchester disks in 30MB and higher ranges, the unit provides up to 80MB of formatted data, using a 16-track format, on a standard DC 300XL data cartridge. The streamer provides a capacity of 45MB on the same cartridge using the 9-track format. Burst transfers of up to 400KBps are possible, and an average transfer rate of 72KBps is required to maintain streaming.

The drive mechanism has a separate erase bar and uses a two-channel bidirectional tape head to record data on either track format. The drive's logic ensures media interchangeability by detecting and locating a reference burst and then moving the head to the corresponding track location. Error detection and retry algorithms in the controller software are designed to assure the accurate recording and recovery of data.

Up to five buffers keep track of data integrity during all operations. Block lengths are fixed at 512 bytes. During a write/retry sequence, data is rewritten farther down the tape, rather than stopping the tape, in order to maintain streaming speeds. The tape drive, including controller, costs $1,450 in single unit quantities. QANTEX DIV., NORTH ATLANTIC INDUSTRIES INC., Hauppauge, N.Y.

FOR DATA CIRCLE 309 ON READER CARD

SUPERMINICOMPUTER

The System 6400 superminicomputer is designed to support interactive, real-time, and computation-intensive applications. It is available in several configurations, ranging in processing power from 4 to 40 MIPS. The product can be configured with from one to 10 64-bit cpus, and includes the Gigabus central bus, which can transfer data at 320MBps. Each basic system also includes a memory system, input/output processors, and a service processor. The system supports Pascal, C, COBOL, and FORTRAN compilers, under the proprietary EMBOS operating system.

The ECL cpu is contained on three cards. Up to five cpus, eight I/O controllers, and 64MB of RAM can be contained in a single cabinet with air cooling. Two such cabinets can be combined. All of the cpus and other controllers communicate along the 64-bit Gigabus. The cpus support IEEE floating point arithmetic, integer, and decimal operations. They operate on 50nsec cycle times with some 64-bit instructions completed in two cycles. Each cpu contains 16KB of cache memory, 16 sets of translation look-aside buffers, and 16 sets of 16 × 64-bit general purpose registers.

Other hardware features include internal array interleaving; single-bit, double-bit, and multiple-bit error detection; single-bit error correction; demand paged memory management; and 32-bit addresses. Prices range from $600,000 for a basic system to $4,000,000 for a 10 cpu model. ELXSI, San Jose, Calif.

FOR DATA CIRCLE 310 ON READER CARD

DATA SWITCH

The Robin desktop data switch is designed to link terminals, microcomputers, mainframes, and peripherals without requiring centralized controllers, switchers, file servers, or print servers. Each unit contains 64KB of memory (including 2KB of nonvolatile system memory), configuration control, a cable connector for attachment to other Robins, four RS232 ports, and one parallel port. Each port can be locally or remotely configured for a specific device.

Multiple ports can be assigned to a single device, with a maximum distance of one kilometer between any device and the switch. A cable can support 225 Robins with 900 serial ports and 225 serial ports, operating at an aggregate signaling data rate of 2Mbps and aggregate user data rate of 1.8Mbps. The vendor says that any device in the network can connect to any other device.

The product uses a variable time division multiplex protocol, with a scheduling facility that requires no timing marks or tokens. Configuration for various devices on the network is performed entirely through menu selection, the vendor says; each port can be individually configured from any location in the network. A multilevel addressing capability permits multiple name identification of any port. A single name can be given to multiple ports to reduce contention. A single Robin costs $2,000. METAPATH, Foster City, Calif.

FOR DATA CIRCLE 311 ON READER CARD

VOICE/DATA TERMINAL

The AmbiSet combines a two-line voice/data PBX with an MS/DOS-compatible personal computing capability in a 6½-pound unit. The product uses a full typewriter-style keyboard with an 8 × 80 liquid crystal display, and runs off of the 8088 microprocessor. Expansion capability is included for disk storage and for a full-sized crt.

The product is compatible with existing pulse or rotary telephone lines and includes a 300 to 1,200 baud smart modem. It has 128KB of RAM for general purpose messaging functions, 64KB of CMOS RAM supporting a 250 entry "fast dial" directory, and 45KB of EPROM "personality modules." These modules allow the unit's 10 function keys to be custom programmed by the individual user. It is then possible to create any combination of speed, code, protocol, or command sequence and have it reside in a single function key.

The AmbiSet can emulate a programmable calculator and includes a clock/calendar/alarm function for appointments. A message capability allows a remote terminal on a secretary's desk to transmit incoming messages and information directly into the AmbiSet's memory. An electronic calendar divides a 30-day period into 15-minute increments for activities management; this can be accessed by a remote terminal. The product comes with a standard RS232 port for connecting to local area networks or to printers. Each terminal costs $2,500. AMBI CORP., Stamford, Conn.

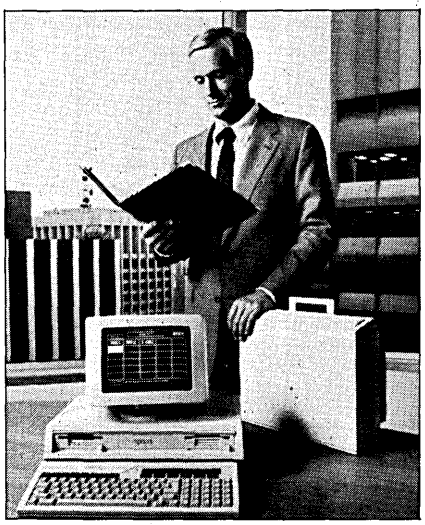
FOR DATA CIRCLE 312 ON READER CARD

BRITISH MICRO

The Apricot microcomputer is based on the 8086 microprocessor and comes with a standard 256KB of main memory and a choice of three operating systems. It uses 3.5-inch floppy disk drives, each of which can store 315KB on a diskette. The unit has a 2 × 40 "microscreen" built into the keyboard, which can serve as a window

into the full crt screen. Six touch-sensitive keys are available with the microscreen to simplify operation.

Bundled software presents the user with a menu of options when the machine is first turned on. These include the available application packages, operating system utilities, disk copying routines, and a font generator for customized screen text. Other bundled software include the SuperCalc electronic spreadsheet, the SuperPlanner calendar, Microsoft BASIC, Personal BASIC, an asynchronous communications package, and a transfer utility to download software from the IBM P.C. The operating systems



supported are MS/DOS, CP/M-86, and Concurrent CP/M-86.

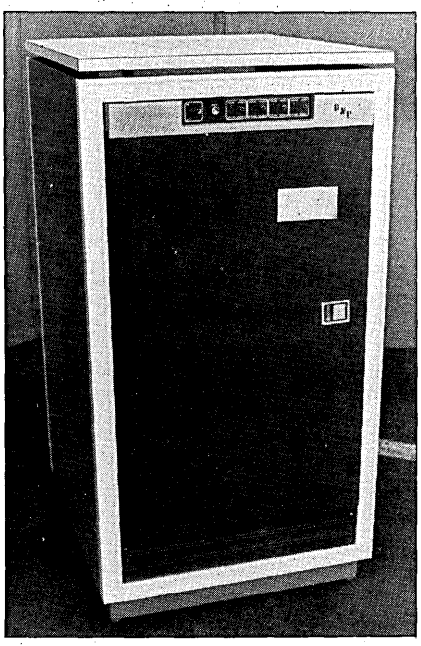
The product comes with an integral calculator and calendar; a built-in, auto-dial modem; parallel and serial ports; and a connection for a mouse. A 48KB cache is used to speed disk accesses, and an 8089 chip for I/O management and an 8087 numeric coprocessor can be added. The 9-inch crt offers 800 × 400 graphics resolution. The Apricot costs $3,200 and is imported from Britain. ACT NORTH AMERICA INC., Santa Clara, Calif.

FOR DATA CIRCLE 313 ON READER CARD

FRONT-END PROCESSOR

The DNP distributed network processor provides a front-end processor capability for users with investments in non-SNA terminals and NCP-like functions with 2780/3780 compatibility. The product provides dynamic application selection for 3270, RJE, and tty terminals; remote concentration; front-end polling for SDAII; automatic baud rate detection for tty; multiple concurrent host operation; and on-line monitoring capability.

The application selection facility permits a user to select any application in one or more hosts from any terminal. The feature is available for multidropped 3270s and nonpolled point-to-point 2780s, 3780s, 2740s, and ttys. The remote concentration



capability provides a distributed architecture wherein multiple terminal protocols and data are concentrated over a full-duplex network link using the X.25 LAPB protocol.

A pollmatic capability allows the DNP to capture an IBM SDAII poll list automatically; under an algorithm, most subsequent polls are initiated by the DNP rather than the host. The pollmatic can be located in a remote concentrator to reduce traffic over long distance lines.

Terminals can communicate with any number of host processors concurrently. Internal diagnostics and on-line tracing are provided in the $20,000 product. LEMCOM SYSTEMS INC., Phoenix, Ariz.

FOR DATA CIRCLE 314 ON READER CARD

TELEPHONE MANAGER

The PC Phone Manager is a hardware/software peripheral system that provides telephone automation capabilities. PBX automation, integration of personal directories, an on-screen "scratch pad," and display and printout of telephone records. The menu-driven product consists of a dialing circuit board, software, and documentation, and connects to the user's P.C. and telephone.

The product runs on the IBM Personal Computer under MS/DOS. It includes directory information on name, telephone number, alternate number, relationship with the caller, personal notes, address, long distance access codes, and account number or other special information. Once installed and loaded with the directory, the user needs to select a name and depress a single key, and the call is dialed, the vendor says. Features include audio input of answer, PBX call forwarding by name, call transfer by name, call waiting, and call again/redial.

A report capability is included, providing information on the number of calls made, the duration of calls, and a display of the elapsed time of a call in progress. A daily call/automatic call list lets users set up calls at any point in the day and have the unit automatically place the calls at that time. The unit costs $300. MOUNTAIN COMPUTER INC., Scotts Valley, Calif.

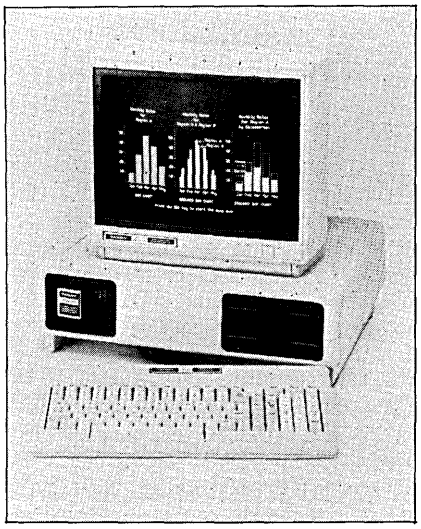
FOR DATA CIRCLE 315 ON READER CARD

MICROCOMPUTER

The TRS-80 model 2000 personal computer is an MS/DOS-based system powered by the 80186 microprocessor. It is available in two configurations, each of which is expandable to 768KB of internal memory. A basic system contains 128KB of RAM and two 5¼-inch floppy disk drives with 1.4MB of storage; it costs $2,750. The model 2000 HD system starts with 256KB of RAM and includes one floppy and one 10MB hard disk, and costs $4,250.

The product is not IBM P.C.-compatible, although it will run many programs written for the IBM model. It comes with a 640 × 400 bit addressable, eight-color monitor; a DIN-spec keyboard; and an optional mouse for data input. The color monitor measures 14 inches diagonal, and a 12-inch monochrome monitor is also available. In the typical desktop configuration, the keyboard slides under the computer when not in use.

The unit's thin-line disk drives use 96tpi formats. Expansion slots in the rear of the machine can accommodate a graphics card, the mouse controller, and RAM upgrades. A low resolution 320 × 200 graph-



ics option for television sets or monitors includes a joystick support and a sound generator. Four expansion slots are provided. TANDY CORP./RADIO SHACK, Fort Worth, Texas.

FOR DATA CIRCLE 316 ON READER CARD

GRAPHICS STATIONS

The Sun-2 family of desk-side and rack-mountable workstations is designed for applications in software development, docu-

ment preparation, and CAD/CAM. A local area networking capability is included, and a hardware floating point processor is available as an option.

Operating in a distributed network, each SunStation provides a 32-bit cpu, demand paged virtual memory, and a 640 × 480 color or 1,152 × 900 monochrome display. The color display can show 256 simultaneous colors, from a palette of 16 million. The products are available with or without disk storage; diskless stations use the network to perform demand paging and routine file I/O, while other workstations can control large disk or tape drives.

The product is based on the MC68010 processor running the Unix operating system with the 4.2bsd enhancements. The desk-side model can be configured either as a network node or as a standalone system. The rack-mountable model is intended to act as a file server. Each model uses a Multibus card cage, with nine slots in the desk-side model and 15 slots in the larger model. The memory management design supports up to 4MB of physical memory with no wait states. The processor also implements DMA for up to 16MB of virtual address space per processor. The desk-side model, with cpu, 1MB of RAM, bit-mapped display, keyboard, mouse, and Ethernet interface and system software, costs $16,900. The rack-mountable model, with processor, 2MB of memory, and Ethernet interface and software, costs $20,900. SUN MICROSYSTEMS INC., Mountain View, Calif.

FOR DATA CIRCLE 317 ON READER CARD

NETWORK SERVER

The CYB/Unite-16i is a desktop or rack-mounted supermicro network server that is designed for use as a central node in a network of up to 16 IBM Personal Computers or look-alikes. Multiple clusters can optionally be connected via Ethernet to form larger networks. The unit includes a Multibus card cage to allow for future expansion on a board-by-board basis.

The product consists of an MC68000-based Sun Microsystems processor with 256KB of on-board memory, 256KB of expansion memory, a megabyte of Multibus memory expandable to 8MB, and 18 serial I/O ports. It also includes three 54MB Winchester disk drives, any of which can be replaced with a 474MB Fujitsu Eagle drive under an SMD controller. The product also includes a floppy disk drive and controller, and two cooling fans. Both half-inch streaming and quarter-inch cartridge tape drives are available as options.

The 16i runs the Unix System V operating system with the Berkeley 4.1bsd enhancements, although the RM/COS operating system can also be used. Personal computers attached to the network server can emulate VT52 terminals. The 16i costs $40,000 in a basic configuration.

The vendor also announced the CYB/Unite-4i, a stripped-down version with two serial ports, for $12,000. CYB SYSTEMS INC., Austin, Texas.

FOR DATA CIRCLE 318 ON READER CARD

PORTABLE TERMINALS

The T-5000 battery-operated terminal has up to 256KB in nonvolatile bubble memory and a 16-line by 80-column LCD screen. The $2,500 terminal weighs ten pounds. The T-4000 unit has an 8-line by 80-column LCD and weighs nine pounds; it, too, runs on batteries, has up to 256KB of nonvolatile memory, and costs $2,000.

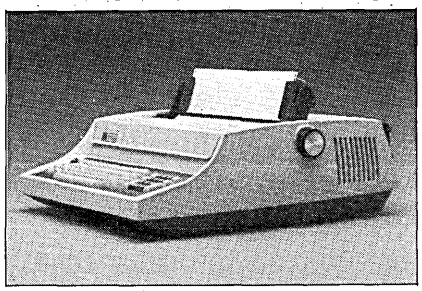
The units have complete alphanumeric keyboards with 16 programmable function keys. Based on the Z80L microprocessor, both models run subsets of the CP/M-80 or UCSD p-System operating systems, and are IBM P.C. file-compatible. In addition to the bubble memory, both units include 64KB of RAM and 4KB of ROM. They can be used with a modem, acoustic coupler, or direct connection to communicate with in-house computers, timesharing devices, or other microcomputers.

The products come with several systems utilities. A TeleTalk telecommunications program allows error-free file transfer via an RS232C port; the KeyDef utility allows the user to define up to 51 function keys to fit each applications program as well as CP/M; a Default program allows modification of the keyboard, communications, and I/O byte parameters; an Assign utility provides I/O redirection, allowing modification of a compiled device table; and a Format program allows for formatting disks in an IBM P.C. CP/M-86 format. TELERAM COMMUNICATIONS CORP., White Plains, N.Y.

FOR DATA CIRCLE 319 ON READER CARD

TELEPRINTER

The AJ 864A dot matrix printer terminal is designed for APL users who require 180cps printing. It includes an APL character set and a keyboard with full overstrike and underscore capability to enable users to print



the full APL symbol set. All overstrike and underscore characters are printed in a single pass of the printhead.

The product uses a nine-wire printhead with a five-dot-wide character. The entire typewriter-style keyboard is programmable by the user so that frequently used keys in certain applications can be placed in convenient locations. Seven function keys can be programmed with multikey sequences of up to 31 characters for such functions as log-on.

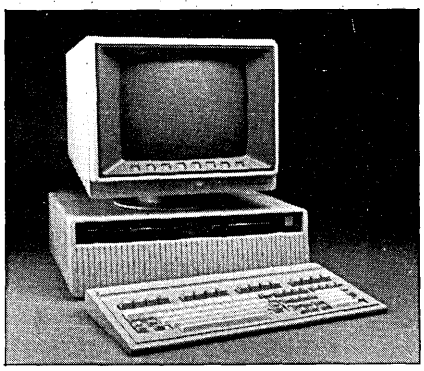
Standard features include a 16KB extended buffer memory, double-width characters, automatic line centering, and right margin justification. Individual units cost $3,250, or can be leased for $148 per month for 12 months. ANDERSON JACOBSON, San Jose, Calif.

FOR DATA CIRCLE 320 ON READER CARD

WORKSTATION

The 7350 multifunction workstation is based on the MC68000 microprocessor and runs the UniPlus operating system, a derivative of Unix System III. It uses the same software as the vendor's series 3200 superminicomputers, and applications written in C or FORTRAN can be migrated among the two product lines.

The unit comes standard with 320KB of user memory and 15MB of hard disk storage. It is designed primarily for software development, although it can also



be used to execute application programs.

A color graphics configuration provides the same performance as the standard model, with the addition of a 16-color graphics display. This version has 448KB of user memory. A third model, a cluster console version, includes an additional megabyte of RAM and allows the attachment of up to three terminals to form a four-user cluster configuration. The attached terminals have complete access to all 7350 programming facilities and applications, except graphics. The basic single-user model can be upgraded to become a cluster controller.

A single-user version of UniPlus comes with the product; optional extensions are available for multi-user operation, text processing, and software development. The single-user model costs $8,400, the color graphics version costs $10,400, and the cluster console version costs $11,750. The multi-user UniPlus extension costs $500, and a full UniPlus development system costs $1,000. PERKIN-ELMER CORP., Oceanport, N.J.

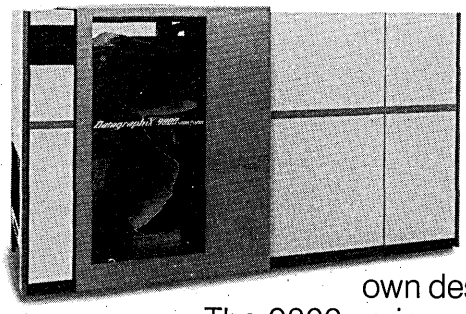
FOR DATA CIRCLE 322 ON READER CARD

—Michael Tyler

OUR 21,000 LPM PRINTER TAKES MANY FORMS.

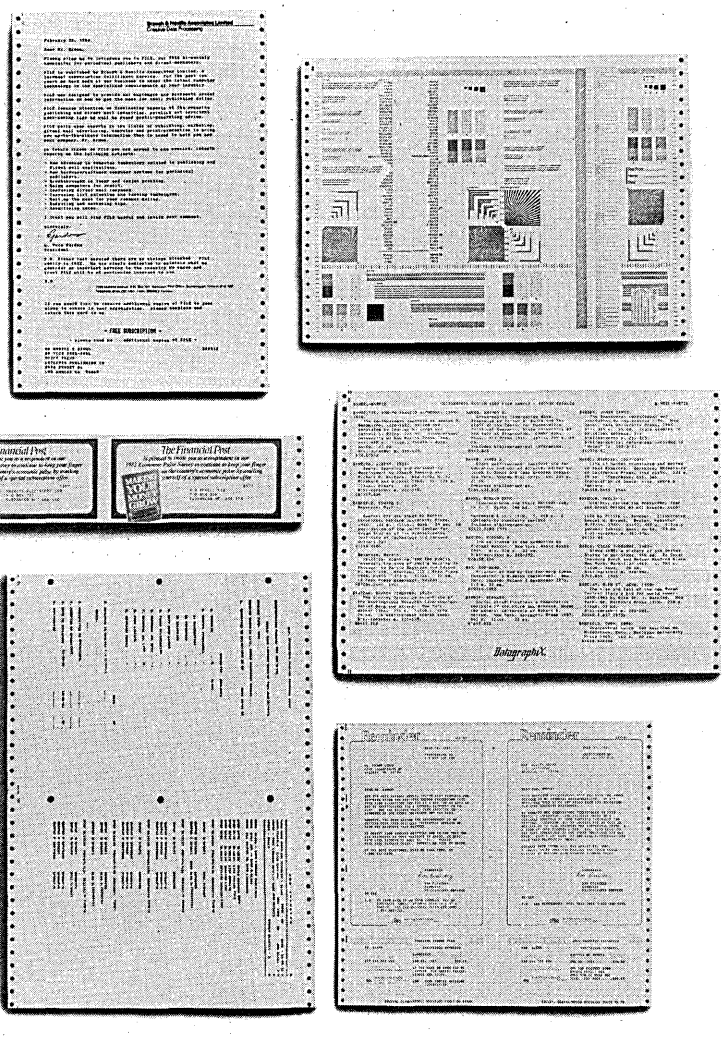
If you need high volume and flexibility, you should know that the DatagraphiX 9800 isn't just a 21,000 LPM laser printer. It also accepts the widest variety of paper form sizes of any non-impact printer, with form widths of 6.5" to 16" and a length range of 3.5" to 14." And all 9800 printers feature perf-to-perf printing on paper weights of 16 to 110 pounds, depending on paper type.

The 9800 series is an entirely new generation of non-impact, high speed laser printers—with more functions, features, and reliability. It offers up to 34 standard character sets, with a font editor that helps you create a nearly unlimited variety of fonts, logos or signatures of your own design.



The 9800 series comes in a variety of on-line, off-line, or on-line/off-line configurations compatible with a broad selection of CPUs. Off-line models offer user-oriented menu-driven software, hard copy log, 6250 BPI tape drives with ping-ponging capability and more. On-line models offer full IBM 3800 compatibility, in addition to the advantages of DatagraphiX's advanced engineering.

Combine these advanced features with excellent print quality and unmatchable reliability, and you begin to see why DatagraphiX is recognized as a supplier of superior computer output management products. The full-featured 9800 printers are available now, setting industry standards for up-time in customer sites throughout the U.S. and Canada.



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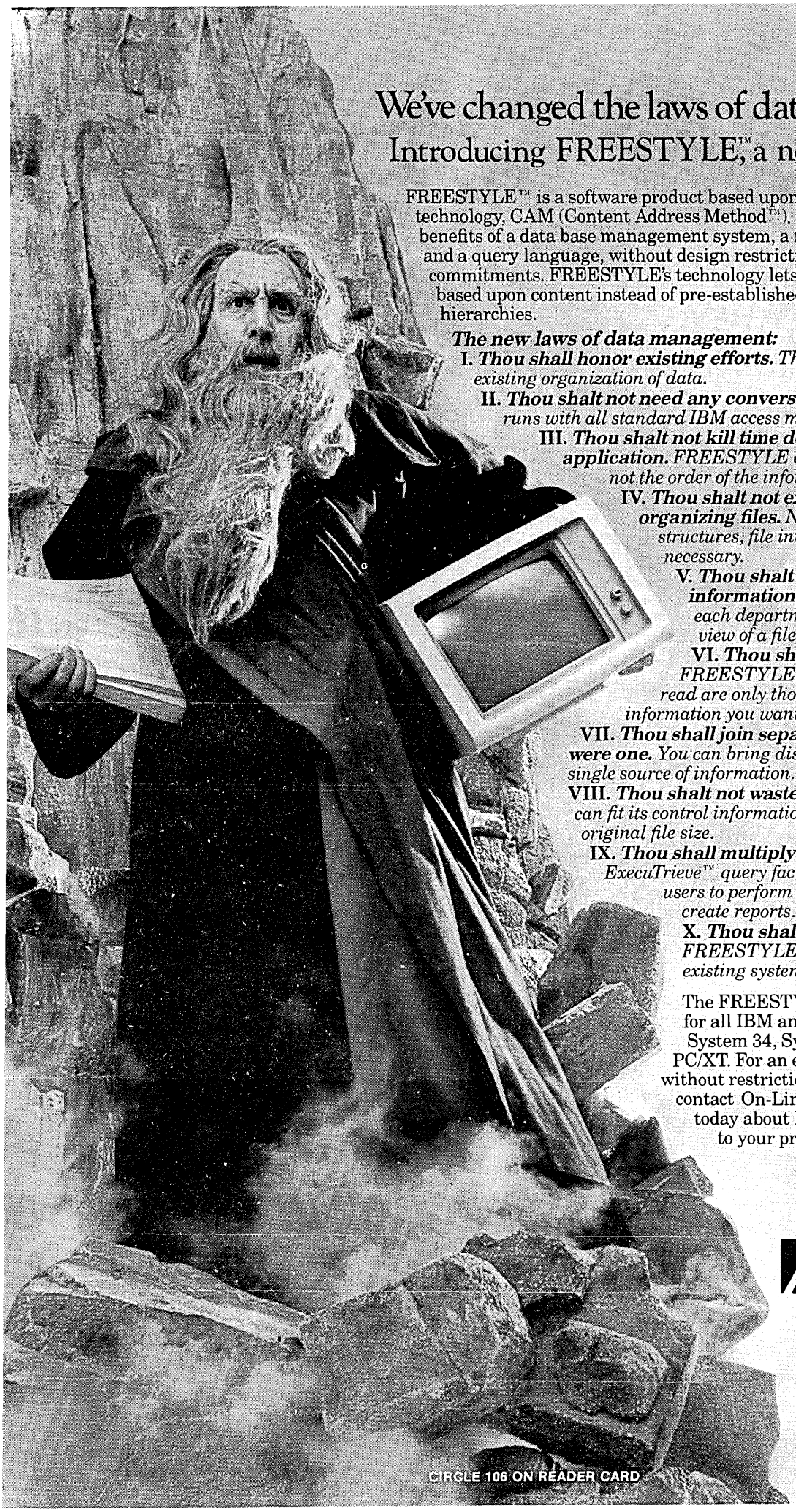
CIRCLE 105 ON READER CARD



We've changed the laws of data management.

Introducing FREESTYLE™, a new technology.

FREESTYLE™ is a software product based upon On-Line Software's new technology, CAM (Content Address Method™). FREESTYLE offers all the benefits of a data base management system, a file management system and a query language, without design restrictions or major corporate commitments. FREESTYLE's technology lets you locate information based upon content instead of pre-established keys or data base hierarchies.

The new laws of data management:

I. ***Thou shall honor existing efforts.*** *There is no need to change the existing organization of data.*

II. ***Thou shalt not need any conversion efforts.*** *FREESTYLE runs with all standard IBM access methods.*

III. ***Thou shalt not kill time designing files for each application.*** *FREESTYLE depends only on content, not the order of the information.*

IV. ***Thou shalt not expend computer time re-organizing files.*** *No specific ordering of data, tree structures, file inversions or related indices is necessary.*

V. ***Thou shalt not covet thy neighbors' information.*** *FREESTYLE lets you give each department or user their own unique view of a file.*

VI. ***Thou shall reduce I/O overhead.*** *FREESTYLE assures you that the records read are only those that contain the information you want.*

VII. ***Thou shall join separate files as if they were one.*** *You can bring disjointed files together as a single source of information.*

VIII. ***Thou shalt not waste disk space.*** *FREESTYLE can fit its control information in less than 25% of the original file size.*

IX. ***Thou shall multiply productivity.*** *The ExecuTrieve™ query facility, allows nontechnical users to perform ad hoc queries, sorts and create reports.*

X. ***Thou shall labor fruitfully.*** *FREESTYLE can be incorporated into an existing system in a matter of hours.*

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CIRCLE 106 ON READER CARD

SOFTWARE AND SERVICES

UPDATES

Even immediately after it became available, Apple's Lisa did not generate the demand its makers expected. And with new window products from Microsoft and VisiCorp on the way and its own Mackintosh computer in the wings, Apple had many incentives to give Lisa some fancier capabilities. Chief among them is the LisaTerminal software, which includes VT100, VT52, TTY and 3270 terminal emulation, and access to remote services. The 3270 package uses a cluster controller the Cupertino, Calif., vendor introduced. It is a protocol converter that can emulate an IBM 3274 or 3276 controller. Apple also introduced Lisa versions of Ryan-McFarland Corp.'s RM/COBOL and RM/FORTRAN compilers, which should go a long way toward providing proven applications for the software-starved Lisa. The company also signed an agreement with Yourdon Inc. that will result in systems analysis software for Lisa. Both the Ryan-McFarland and Yourdon offerings are geared to increasing Lisa's attractiveness to dp users -- traditionally IBM's domain and especially so with the advent of the P.C. XT/370 system.

Other vendors are also beginning to provide software for Lisa. One, Business & Professional Software of Cambridge, Mass., is selling the $150 Art Department set of 300 illustrations and figures for use with LisaDraw. While BPS has concentrated on Apple products from its inception, this is its first Lisa product. It is also the first manifestation of the hand of BPS's new corporate parent, BPI Systems of Austin, Texas. That company specializes in making a wide variety of software available on a wide variety of machines, rather than in going after a particular application or machine. It was one of the first vendors to provide specialized software for Hewlett-Packard's touch-sensitive HP 150 computer.

While Apple did not stir demand for Lisa, it did help catalyze the development of integrated software and user interfaces based on windows. Some notable products in this vein have been listed in these pages in the past year. Others include Propel, a recently introduced package from Pro Computing that provides telephone, word processing, and number crunching applications with a common user interface. The New York City firm's $1,200 package offers four levels of user sophistication but no windows. Another package comes from Mosaic Software, in Cambridge, Mass. Its Integrated-6 product combines a relational file management facility, graphics, a spreadsheet, P.C.-to-P.C. communications, and terminal emulation capabilities. It costs $500 and runs on the IBM P.C. And the WindowMaster, from Structured Systems Group in Oakland, Calif., provides a window management facility plus graphics, word processing, file management, directory, and sorting functions, for $1,510. Not all of these, of course, necessarily integrate their functions equally smoothly, so try before you buy.

Harris Corp. has solved its own integration problem, that of interconnecting its products and those of its new subsidiary, Lanier Business Products. The Lanier 5000 can now incorporate the first five layers of the Harris local network architecture. Many Lanier products can talk to the 5000, and all of Harris's can talk to HarrisNet. Additional connections are supported between the Lanier 1000 and the Harris 9000, MIND, and 800/1000 product lines. The integration protects both companies' product lines from obsolescence.

ENERGY ENGINEERING

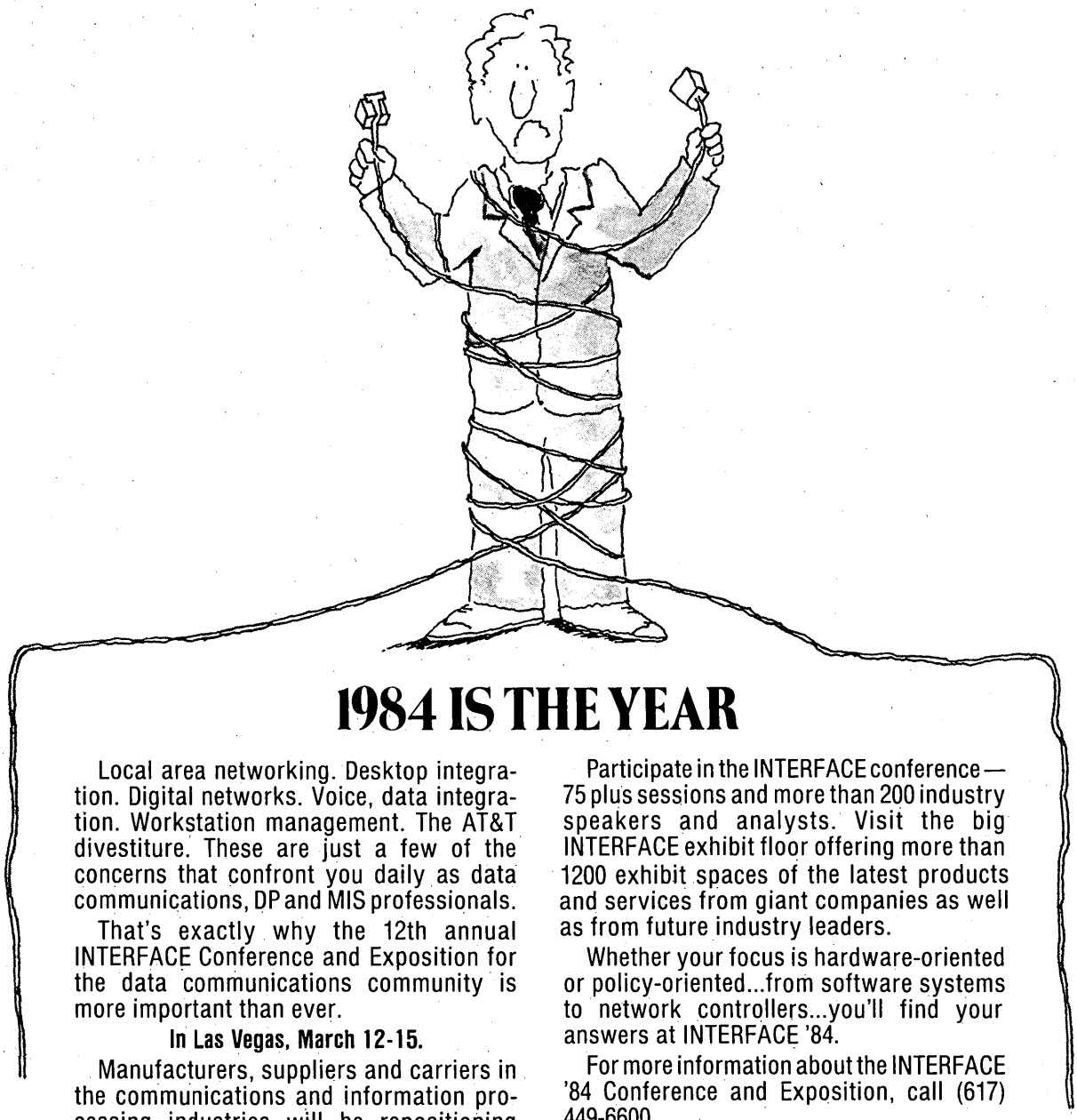
These six products are intended to help engineers involved in design and analysis of energy systems. They run on the IBM P.C. under MS/DOS and MBASIC, and require 64K RAM. The Datafit program performs a regression analysis on user-supplied data to determine the best equation for exponential, square root, power, inverse, linear, logarithmic, and polynomial distributions. It analyzes data sets as large as 500 points and allows users to perform any number of interpolations. It costs $245.

The Steamcalc program computes individual values of thermodynamic steam properties over a range of temperatures and pressures for subcooled, saturated, and superheated conditions. It also costs $245. The Combustion program computes combustion efficiency of industrial and utility boilers based on the molal method, and is equipped with data to handle systems using all standard fuels. Other fuels can be handled by entering their specific chemical and thermal characteristics. Flue gas losses are listed with both sensible and latent heat loss components, as well as losses associated with unburned combustibles. The program is tagged at $490.

Heatflo computes heat loss from pipes and other surfaces, in both convective and radiative measures. The $370 program incorporates correlations of thermal conductivity as a function of temperature for five types of commercial insulation. The Fluidflo program computes the pressure loss and power consumption for a series of up to 70 sections of pipe, using the Darcy-Weisbach pressure loss equation and the Colebrook equation for friction factors. It costs $330. Finally, the Cogen program performs a thermodynamic and financial analysis to evaluate the economic benefits of installing an in-plant cogeneration system. The $735 program is designed to be used as a tool for determining the optimum size turbine generator for the energy demand characteristics of the plant. SOFTWARE SYSTEMS CORP., Austin, Texas.

FOR DATA CIRCLE 327 ON READER CARD

IF EVER THERE WAS A YEAR YOU SHOULD ATTEND INTERFACE...



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CIRCLE 107 ON READER CARD

SOFTWARE & SERVICES

MICRO-MINI LINK

The Personal Computer Access Method (PCAM) allows the transfer of files and records between IBM Personal Computers and the IBM Series/1 minicomputer. PCAM allows the data transfer to be made over a telephone link or through a local attachment, and may be initiated by either the mini or the Personal Computer. Any EDL, PXS, or IAM file I/O operating to a dataset on the Series/1 is available from the P.C., and the Get, Put, Open, Close, and Kill instructions of PC BASIC are available from the Series/1.

A PCAM utility is provided on both the Series/1 and the P.C. XT to copy datasets or parts of datasets. The utility can be used to save P.C. data files on the Series/1, pass data to an application program on the other machine, or retrieve data from the other machine. PCAM supports the conversion of binary fields within the transmitted data. Use of a record format allows PCAM to identify those fields which are true binary value fields and to convert them to the proper order for the receiving machine.

All data transmitted is compressed and checked for errors. PCAM automatically retransmits when it detects a transmission error. P.C.s using PCAM require 96KB of RAM and an asynchronous communications adapter. The system runs in compiled BASIC under MS/DOS 1.1 or 2.0. The Series/1 must be running under EDX version 3 or 4 and have an asynchronous attachment card. PCAM costs $900 for the Series/1 and $100 for each P.C. A corporate license costs $2,500 and allows unlimited use of PCAM within the organization. H&A COMPUTER SYSTEMS INC., San Francisco, Calif.

FOR DATA CIRCLE 328 ON READER CARD

DISSERTATION ABSTRACTS

Dissertation Abstracts Online is a computerized version of the Dissertation Abstracts International index of postgraduate work performed at many universities worldwide. A keyword search conducted on-line will scan the dissertation title and the body of each abstract, allowing users to conduct more thorough searches. Citations can also be located using three other search elements, separately or in combination with the keywords. These are subject field, the degree-granting institution, and the date the degree was awarded.

Each dissertation citation includes the following bibliographic information: title, author, degree awarded, degree date, degree granting institution, number of pages, a reference to the abstract in the printed edition, and an order number for a microfilmed copy. An author-prepared abstract of about 350 words is also included, describing the original research project on which the dissertation is based.

The database currently contains bibliographic citations to some 750,000 dissertations, dating from 1861. About 2,500 new citations are added each month, the vendor says. The database is available through the Dialog and BRS services. UNIVERSITY MICROFILMS INTERNATIONAL, Ann Arbor, Mich.

FOR DATA CIRCLE 329 ON READER CARD

SOFTWARE SPOTLIGHT

FENESTRA REDUX

Here are a pair of windowing packages that provide similar functions on different machines for different purposes.

The 5620 DMD package was developed by Bell Laboratories to enable programmers, engineers, and editors to carry out six jobs simultaneously on a single terminal. The package creates several windows on the Teletype 5620 terminal and exploits the Unix operating system's multiple programming capabilities. The software runs on both the Unix System V host and the terminal.

The software consists of a core package of several basic programs, which creates the six windows and regulates the dataflow between the host and the terminal. Firmware controls the placement of the windows on the screen. Processes running in a window may be communicating with processes running in the host, whether the window is visible on the screen or not.

Other software makes the terminal—or one of its windows—look like a high resolution graphics terminal for CAD applications.

A text editor is designed to work with the terminal's mouse. An optional applications development package consists of tool kits to write specific programs for CAD/CAM or office automation. An optional text processing package has an interactive picture drawing program and a proofreading program. AT&T WESTERN ELECTRIC SOFTWARE SALES, Greensboro, N.C.

FOR DATA CIRCLE 325 ON READER CARD

While the 5620 DMD package is designed for program developers using the Unix operating system on large computer systems, the Windows package from this vendor is an extension of the microcomputer MS/DOS operating system intended for use by independent software developers. The central feature of the package is a window management capability that allows a user to view unrelated application programs simultaneously, and to transfer data from one application program to another. The Windows product also extends MS/DOS by managing bit-mapped screen graphics and mouse hardware.

Application programs that are activated by Windows will appear as one or more windows on the display. Any number of application programs can be displayed on the screen, and the user can alternate among applications without deactivating any. The product does not overlap the different application windows; instead, applications are automatically positioned to fill the entire screen. These full-screen "tiles" can then be moved about.

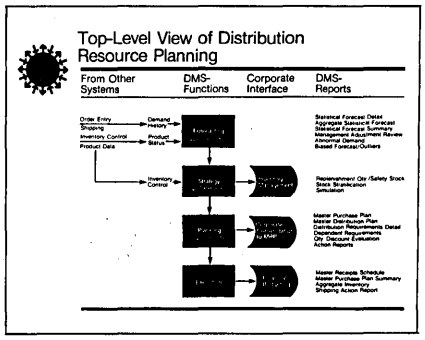
The product will run all existing MS/DOS 2.0 application programs, although these programs will not be able to take advantage of the window interface or data exchange capabilities. The operating software can recognize that the program is not based on Windows, save the state of the Windows environment, and release control of the screen and hardware to the application program being started. When the non-Windows program is completed, Windows restores its environment. The product requires 192KB of RAM, a mouse, two floppy disk drives, and a bit-mapped display. It is available only to oems. MICROSOFT CORP., Bellevue, Wash.

FOR DATA CIRCLE 326 ON READER CARD

DISTRIBUTION PLANNING

The DMS-1800 distribution resource planning package is written in ANSI COBOL and is designed to run on IBM mainframes. It is intended to improve the demand forecasting, purchasing, production planning, finished goods inventory management, and transportation scheduling operations of large manufacturing and distribution companies.

The product consists of modules for



forecasting, strategy, planning, and execution. The forecasting module establishes estimates of product demand at each level of a distribution structure, based on historical order data. It then monitors actual versus forecast demand, and can adjust forecasts in reaction to deviations from predictions. The strategy module uses product information and historical demand data to control safety stock and replenishment quantities at all locations in the distribution chain. It includes a simulation capability for testing changes in safety stock levels or other variables.

The planning module can generate overall production and distribution plans based on the data developed by the previous two modules. Areas covered by the module include master purchasing, MRP, and trans-

portation scheduling. The Execution module provides a flow of information to management on the effectiveness of the production and distribution activities that have been generated by the other modules.

The complete system, with on-line capability, costs $182,000. The forecasting module can be purchased separately for $67,000 for batch or $75,000 for on-line; the other three modules can be purchased together for $115,000. DISTRIBUTION MANAGEMENT SYSTEMS INC., Lexington, Mass.

FOR DATA CIRCLE 330 ON READER CARD

DEVELOPMENT AID

The CA-Flexiscreen development aid is intended for use by OS/VS1, MVS, and DOS/VS(E) users. It is designed to provide end users with on-line query and update functions and programmers with a full applications development system. The product provides access to files not previously defined to CICS by allowing users to define files dynamically to CICS without changing or recompiling the CICS File Control Table. Once a file has been defined to the FCT in this manner, any CICS user can immediately access it, and it will remain available until CICS is terminated. The product includes screen building capabilities that allow the user to format screens for menus, data, and multiple records.

The system contains seven major functions. A data record definition facility is used to describe a file and data record. The screen builder handles the formatting of screens, the editing of attributes and delimiters, the creation of menus and user documentation screens, and all file maintenance on screens. The screen print utility is designed to aid the documentation process and provide hardcopy of all user screens. A validation table facility defines tables using an on-line table definition. The DL/1 database facility works like an I/O exit and describes flat records. The file handler performs all the processing tasks on screens, such as data collection, file maintenance, field validation, and user exit processing. A batch extract facility processes all data collection records for users.

The menu-driven product includes an on-line tutorial. CA-Flexiscreen uses conventional programming languages and supports BDAM, SAM, and VSAM files. It costs $17,500 for DOS/VS(E) users and $23,000 for OS/VS1 and MVS users. COMPUTER ASSOCIATES INTERNATIONAL INC., Jericho, N.Y.

FOR DATA CIRCLE 331 ON READER CARD

FORM LETTERS

The Letterform 1000 package contains 1,000 letters and forms on a diskette. The prewritten forms are designed to be read, personalized, and printed using most word processing packages.

The product can be used by both good and poor letter writers, the vendor says. It is designed to be a reference for the frequent, proficient writer, and a learning aid for the infrequent writer. The letters and forms cover many situations, including accounting and collection, employees/employers, general business, goodwill and sales, legal, ordering and shipping, personal, schools, charities, and other organizations. All of the letters are categorized and indexed in a documentation manual.

The manual also contains abbreviations, proper headings, titles, and forms of address; academic degrees; abbreviations for government agencies; state abbreviations; Canadian provinces and their abbreviations; complimentary closings; and appropriate anniversary gifts. It has Roman numerals, the metric system, long measure, and a punctuation guide. Parcel shipping information and UPS and Federal Express rates are included, as is a glossary of computer terms.

The letters are provided in standard ASCII text files; the user reads a letter with his word processor the same way he would read one from his personal diskettes. The product is available for use on the IBM Personal Computer with MS/DOS 1.1 or 2.0. The $95 product comes with a 700-page manual. PBL CORP., Wayzata, Minn.

FOR DATA CIRCLE 332 ON READER CARD

MANUFACTURING

The Univisa manufacturing system is designed for operating in an interactive mode, and is composed of five main modules: Bill of Material/Inventory Control; Scheduled Receipts; Material Requirements Planning; Product Costing; and Shop Floor Control. The package leases for $350 per month and runs under the OS/3 operating system on the vendor's System 80 mainframes with 512KB memory expansion, one local workstation, a diskette subsystem, a 132-character line printer, and an 8419 disk subsystem unit.

The Bill of Material/Inventory Control module maintains parent-component relationships in product structures. Among the reports available are single-level, indented, and summarized bill of material explosions and where-used lists. These reports contain component use quantities, standard costs, scrap factors, and extended gross requirements for components of a parent assembly. The inventory control function keeps stock balances by providing individual transaction identities that match the different kinds of inventory movements, such as receipts into stock, issues to production, returns to stock, and scrap.

The Scheduled Receipts module provides control over replenishment orders for manufactured or purchased components, assemblies, and finished goods. It also provides control of purchase orders and establishes quantities on order according to due dates. Order status data are available in several report formats.

The Materials Requirement Planning module explodes a time phased master schedule of end products and spares through the bill of material. During the explosion, requirements are netted against the stock and on-order information. Net requirements can then be consolidated and offset by the lead time for the part.

The Product Costing module maintains current standard costs and financial "frozen" costs for every item in the part master file. The Shop Floor Control module maintains routing files, routing and work-center retrievals, standard costing, shop packet preparation, work in process labor and material control, long-term capacity planning, shop floor dispatching, and lead time generation. SPERRY COMPUTER SYSTEMS. Blue Bell, Pa.

FOR DATA CIRCLE 333 ON READER CARD

MICRO SQL

The 10-Base relational data management software provides a query system based on IBM's mainframe SQL for IBM Personal Computers. It requires the MS/DOS 2.0 operating system, 192KB of RAM, a cursor-addressable 25 × 80 crt, and a disk drive. It can exchange information with 1-2-3, WordStar, and other application packages.

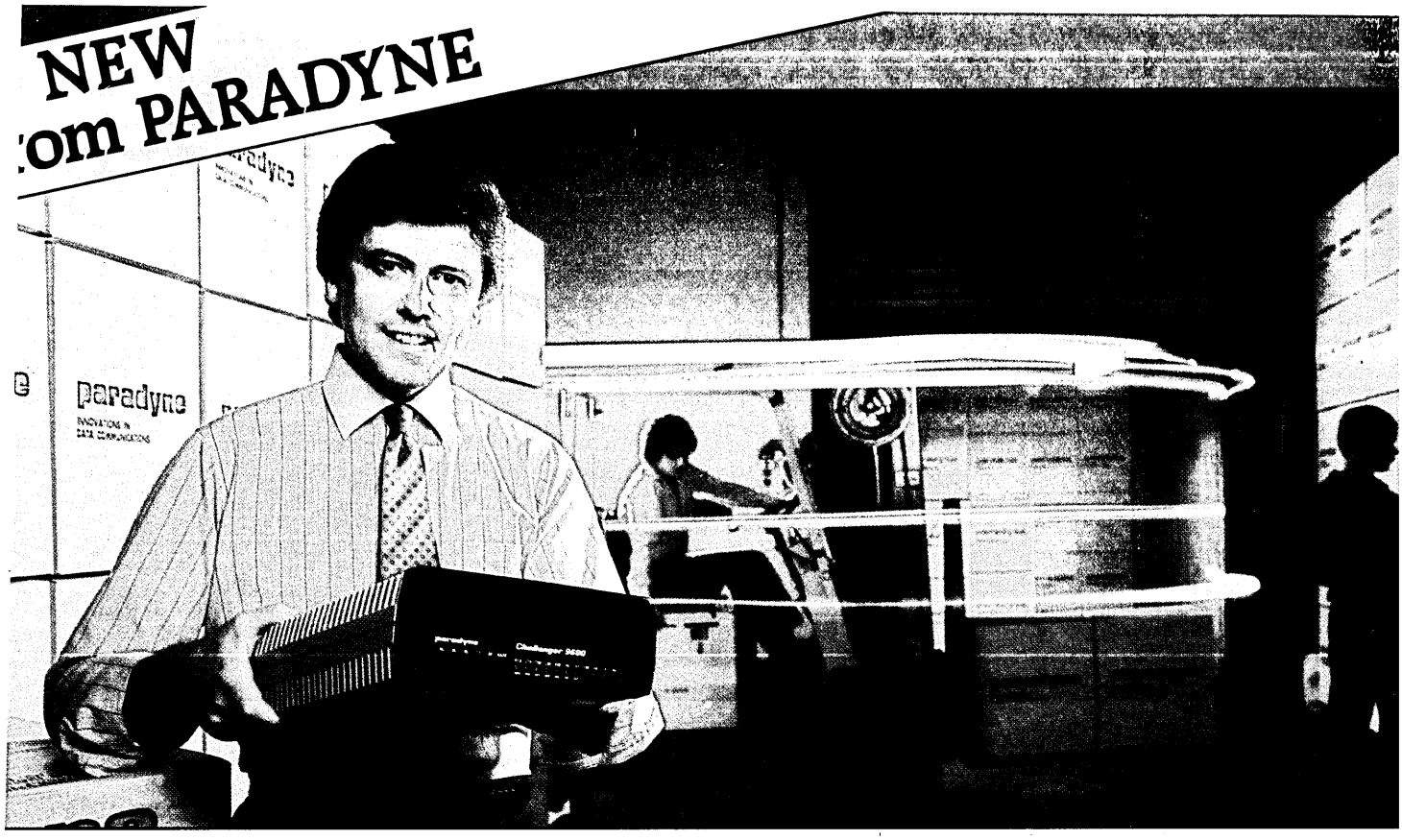
The product is written in C and provides the exact syntax of SQL, the vendor says. It is a full implementation of SQL except for the DBMS mapping data in SQL, which is not pertinent to microcomputer database systems. The product allows users to create and organize tables; edit, delete, modify, and query the database; and display or print all or part of an information file. A single 10-Base command can draw information from up to 16 separate files.

The product uses B-tree indexing and a logical view capability that lets users build new files or select information from a variety of existing files without duplicating data. Users can store the definition of the logical view so that they can retrieve the same information later, without having to re-create the view. The product compiles a data dictionary as users work, so that they can skim file names and field values more efficiently. 10-Base costs $500. FOX RESEARCH, Dayton, Ohio.

FOR DATA CIRCLE 334 ON READER CARD

TEXT RETRIEVAL

The Text Retrieval System/On-Line package runs under CICS on all IBM operating systems and allows for the retrieval of unformatted textual data based on any word found in the text. The text may be searched for combinations of words using and/or logic, and it may be indexed by words that do not appear in it. The system automatically searches for synonyms of the keywords and will handle generic search words. Menu



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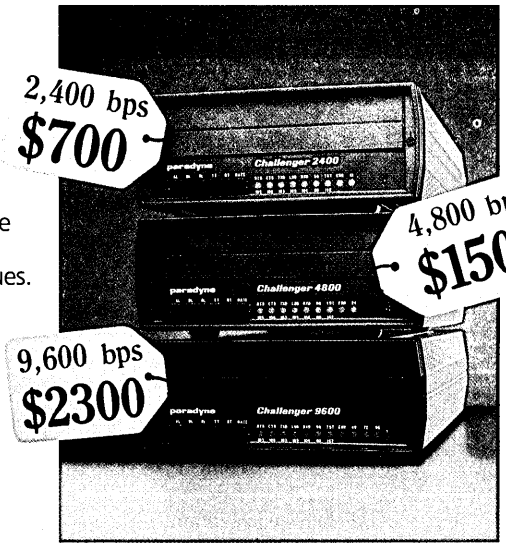

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paradyne

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8550 Ulmerton Road, Largo, FL 33540

CIRCLE 108 ON READER CARD

screens are designed to guide the user through the various functions.

The system can handle over 1,000 text files, each of which can contain up to four billion books. The package has 100 separate security codes for each text file, the vendor says. High-speed lookup is made possible by the package's combination of index file structure and table handling logic. The text file may be updated on-line or in batch, and portions of the text may be printed on terminal printers if CICS/Spooler is installed. A batch utility is also provided for printing on system printers. The Text Retrieval System/On-Line costs $5,000, and the CICS/Spooler costs $1,300. MACKINNEY SYSTEMS, Fair Grove, Mo.

FOR DATA CIRCLE 335 ON READER CARD

OPERATING SYSTEM

The SuperDOS operating system is designed to convert the IBM Personal Computer into a multi-user system. The product allows up to 10 terminals to be linked to the P.C., and lets MS/DOS programs run concurrently with SuperDOS programs. A typical three-user system would cost $1,200, including a required Z80-based add-on board.

The multitasking system allows users to run any job from any terminal at any time. Instead of using program switching, the product uses a feature of the Z80 processor called bank switching, which is designed to allow full simultaneous use of all peripherals with no loss in performance. The product supports up to 32 memory banks, each of which can be loaded with one or more Business BASIC programs. When a user interrupt requests a specific Business BASIC program, SuperDOS automatically switches control to the right memory bank without program swapping.

SuperDOS uses a multikeyed sequential access method, allowing users to set up an unlimited number of keys for any data file and to retrieve data by any key in ascending or descending sequence. The product includes a record locking feature that prevents one user from updating a record while another user is accessing it. Other records in the same file as the locked record can be accessed, however. Several security levels are provided. BLUEBIRD SYSTEMS, Carlsbad, Calif.

FOR DATA CIRCLE 336 ON READER CARD

PERFORMANCE MONITOR

Mort measures actual response times at an IBM 3278 terminal. Monitoring intelligence is located at the terminal site, and work session scripts are locally executed. In this way, the product does not affect the performance of the host processor.

The package operates on an IBM Personal Computer, and connects to the host as a 3278 terminal. The tool works independently of any system application, application software, or line protocol. Reports can be generated for think time, data entry time, response time, elapsed time, key count, and number of transactions monitored. These items are reported by total, minimum, maximum, and average. The product costs $2,500. AUTOMATION DESIGN INC., Chicago, Ill.

FOR DATA CIRCLE 337 ON READER CARD

LINEAR PROGRAMMING

Cope is designed to aid users in solving optimization problems using linear and integer programming. The menu-driven system uses narratives, prompts, and a self-teaching tutor session to aid users. The product runs on the Sage microcomputer under the CP/M-68K operating system.

Cope can solve linear and integer optimization problems ranging in sizes from 80 to 300 variables and 40 to 150 constraints. Names up to 16 characters long can be assigned to each variable or constraint, and unit names—dollars, years, etc.—can be appended to each.

In solving each problem, users are provided with data showing how much of each resource is left over, areas where additional resources could improve the profit or the effectiveness of the solution and by how much, and situations where the user is trying to do more than the resources can allow. Each program can be reloaded, modified, and saved, so that users can work with more than one problem at a time. Upper and lower bounds for each variable can be specified so that users can fix variables at specific values without having to restructure or reformulate the problem.

Cope is configured in three levels: the 40 constraints by 80 variables version costs $335, the 80 × 200 version costs $465, and the 150 × 300 version costs $685. MANAGEMENT ANALYTIC SUPPORT INC., McLean, Va.

FOR DATA CIRCLE 338 ON READER CARD

RELATIONAL DBMS

Personal Informix was created as a subset of the vendor's Informix relational database management system for Unix-based computer systems. The micro version of the product was designed as an interactive database management environment for novice users.

Instructions for using Personal Informix are embedded in the software. As the product displays each command, it also displays an explanation of the effect of the command. After the command is executed, new information is displayed to aid the user in choosing the next step. Help screens describe where the user is within the program and the courses of action available. Screen prompts help users build databases, create and use transaction screens, and generate reports. Users can maintain mailing lists, telephone logs, or directories.

The product allows users to define an unlimited number of indexes to categorize data. Audit trails are built in to protect against lost data, and files and fields are secured from unauthorized manipulation. The product is fully upgradable to the Informix system and costs $500. It is available for most Unix-based 16-bit microcomputers. RELATIONAL DATABASE SYSTEMS INC., Palo Alto, Calif.

FOR DATA CIRCLE 339 ON READER CARD

UTILITIES

V/TEMP provides a command by which a user can obtain temporary disk space within the VM operating system on IBM mainframes. It gives a "link" to one of a pool of permanent "temporary" disks, if available, so that the channel programs and system overhead associated with the DEFINE and FORMAT process are avoided. If a linked disk is used, it can normally be reacquired after a system failure, the vendor says, so that the chance of losing files is reduced. The TEMP command replaces a sequence of four other commands and responses, the vendor says. It costs $2,050 for a three-year license, with maintenance included for the first year.

The V/FIND command gives the systems or assembler programmer a CP command that searches either virtual or real memory for a specified hexadecimal or EBCDIC character string. The response to the command is either the address at which the string begins, or "string not found." A range of addresses to be searched may be given. When used to search virtual address space, V/FIND may reduce the need to refer to listings by locating a sequence of instructions or the text of a message, the vendor says. The V/FIND CP command, available to privileged users, can be employed to locate the source of a memory overlay during testing or debugging. The product costs $1,370 for a three-year license, with maintenance included for the first year. VM SYSTEMS GROUP INC., Arlington, Va.

FOR DATA CIRCLE 340 ON READER CARD

SALES MANAGEMENT

The SMS/3000 sales management system is designed to be used by both sales representatives and sales managers to help manage prospects from identification through close of sale. The package, which runs on the HP 3000 computer system, allows users to set up unique company sales cycles with automated scheduling of prospect activity.

Sales progress can be monitored by individual, by district, by region, or by entire sales area. The product can handle territory assignment and control, immediate lead identification and tracking, lead source analysis, client purchase patterns and profiles, sales cycle scheduling, customer files, and mailing list management. It also includes an electronic mail capability and a word processing package. Sales representa-

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Partial Table of Contents
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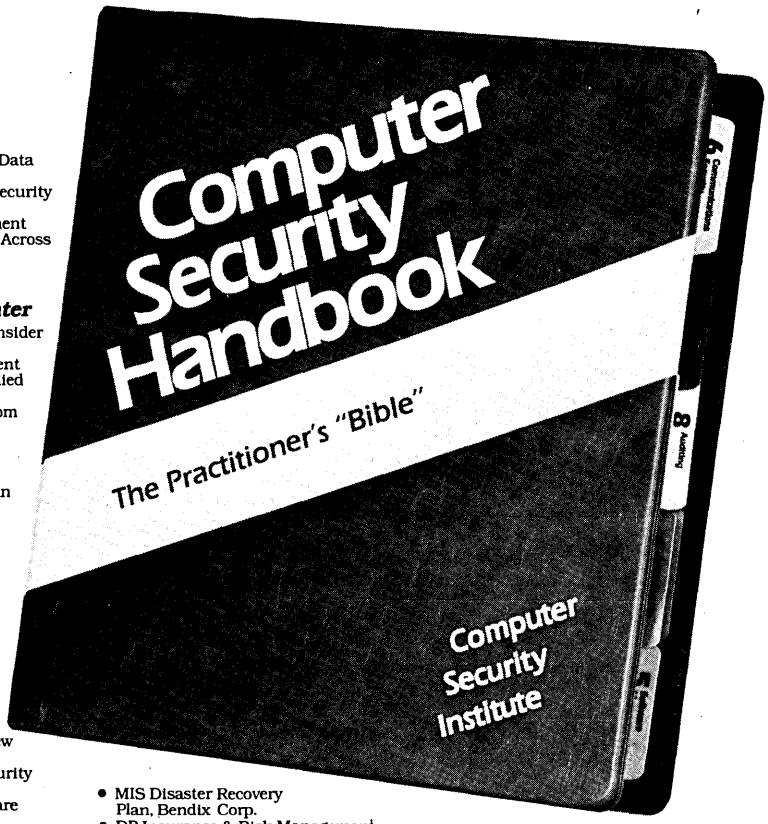

Introduction
- Computer Security: A Management Blindspot
- Security in the EDP Environment

Managing EDP Security
- Data Security Program Development: An Overview
- Managing Computer Security
- Establishing and Managing an EDP Security Function
- Privacy and Data Security, IBM Corporate Policy
- Data Security Policy, Third National Bank
- Sample Statement of Objectives & Policy for a Corporate Information Systems Security Program
- Sample Data Security Policy, Practices, and Procedures
- New York City Mayoral Directive on Computer Security
- Data Security Policy at The Hartford
- DEC's EDP Audit Charter
- The Importance of Properly Naming Security's Role
- Security vs. Operational Expediency
- Making the Security Proposal an Effective Tool
- Job Descriptions: Manager, Data Security; Data Security Officer; Data Security Programmer/Analyst Data Security Administrator (Banking)
- Overview of Risk Analysis
- Assessing Risks in a "Deconcentrated" Computing Environment
- Risk Analysis of Software Systems
- Data Processing Asset Protection Within IBM
- Information Security & Control Guidelines
- City of New York System Security Standards (Excerpts)
- Productive Security Standards: A Contradiction in Terms?
- Checklist for Documenting Security Policies and Standards
- Documenting Data Security Procedures
- Designing Secure Application Systems
- Security Reviews in a Data Base Environment
- Security in Distributed Processing: Working with the Vendors
- Testing...Testing...Testing...The Critical Tool that Computer Security Practitioners Don't Use
- Controlling the Systems Programmer
- Developing a Non-Disclosure Statement
- Developing a Strategy for Records Retention
- Checklist for Handling Sensitive Data
- Goals and Criteria for the Move of the H-P Data Center
- The Interstate Relocation of a Data Processing Library
- People Make Your Computer Security Program Work
- Tips for Better Time Management
- Getting Your Written Message Across ...Effectively
- A Personal Guide

Protecting the Data Center
- Physical Security: When to Consider "Doing It Yourself"
- Little Things—Safety Equipment
- An Ounce of Prevention...Applied to Environmental Control
- Controlling Physical Access from a Central Location
- Fire Protection Systems
- Another Look at Fire Safety
- The Effects of Electrical Power Variations Upon Computers: An Overview. U.S. Dept. of Commerce
- Uninterruptible Power Supply (UPS) Planning Guide
- Process Cooling for the Data Center
- Start a DP Environmental Protection Agency
- Static Electricity: Planning Its Protection

Software Management
- Software: An Important Security Tool
- Application Source Code Review
- Controlling Program Changes
- MVS Preventive/Detective Security Features
- Selecting Data Security Software
- Security Software Packages: Comparison of the "Big 3"
- Implementing ACF2 at Rutgers
- Implementing RACF at the Bank of California
- Implementing SECURE at Borden
- Access Control Facilities Available with DOS/VSE

Communications Security
- Who, What, & Where in Communications Security
- An Encryption Primer
- Cryptography: A Security Tool

Disaster Recovery Planning
- Contingency Planning: An Opportunity for DP Management
- Basics of Contingency Planning
- Automating Disaster Recovery Plan Documentation
- Testing the Recoverability of Application Systems
- A Checklist for Keeping Your Disaster Recovery Plan Up-To-Date
- MIS Disaster Recovery Plan, Bendix Corp.
- DP Insurance & Risk Management
- The First Data Disaster...From an Insurance Perspective

Auditing
- Auditing and Controls in a Database Environment
- EDP Audit: Making It Happen
- Guidelines for Establishing the EDP Audit Function
- "Bridging the Gap" Between DP Professionals and Auditors
- Data Security & EDP Auditing: Partners in Control

Contemporary Issues
- Protecting Software: An Overlooked Responsibility
- A Strategy for Dealing With Computer Fraud and Abuse: A Case Study
- EDP Fraud Prevention: A "Separation of Duties" Checklist
- Security Issues in Transborder Data Flow
- Where Do You Stand on Computer Ethics?
- Security Risks in the Automated Office Environment
- Auditing Word Processing Security
- Controlling Micros and Distributed Data Processing
- Putting Information Assets on the Balance Sheet

Information Sources
- Computer Security Magazines, Journals, Newsletters, etc.
- CBEMA Privacy and Security Bibliography
- Associations
- Directory of Special Interest Groups
- Establishing a Computer Security Interest Group
- How to Get Involved in a Local Special Interest Group
- Free Computer Security Literature

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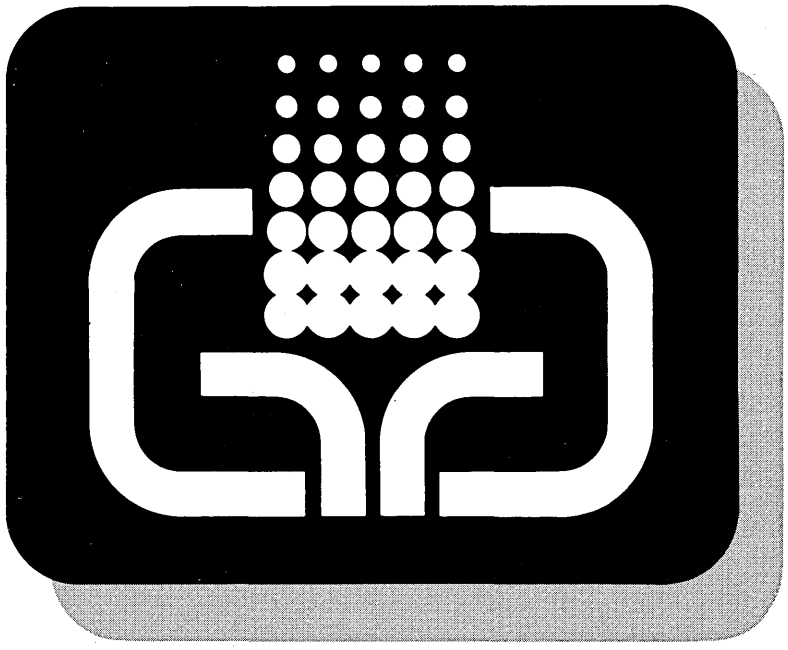

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CIRCLE 111 ON READER CARD

tives can create customized mailing lists with the package.

A "pipeline report" can be produced, which identifies prospects as they move through the sales cycle. A sales forecast report shows potential sales revenues for future time periods by individual, district, region, or total sales area. A prospect rating feature provides percentage rating estimates of the likelihood of sales closings. An activity calendar is also included in the package. SMS/3000 uses VIEW/3000 screen forms and is written in COBOL II. BUSINESS SYSTEMS ASSOCIATES, Canoga Park, Calif.

FOR DATA CIRCLE 341 ON READER CARD

EXPORT STATISTICS

The Profile service is designed to provide export statistics for the computer and peripherals industry. The service comes in three levels, each of which includes an Export Market Brief. The Brief has selected tables on the industry's leading export items and markets over the last five years. These tables include overall export growth, leading export items, fastest growing items, leading foreign markets, fastest growing markets, U.S. market share, leading foreign competitors, and "best prospect countries."

The Level One service, which costs $30, provides three additional reports, each of which ranks products by thousands of dollars and by percent of dollar value. The three reports are an analysis of U.S. exports of a user's products by industry subgroup, top markets for exports of a user's products, and top exports of a user's products by individual product.

The Level Two service, which costs $70, includes the same three reports, as well as two additional reports. They are top exports of a user's products to each of the leading ten markets, and U.S. exports of a user's products to each country. The Level Three service provides the basic three reports, plus rankings in three additional formats: quantity of units, percent of total quantity, and unit value. It also provides a quarterly report on U.S. exports of a user's products by individual product to each country. U.S. DEPARTMENT OF COMMERCE, INTERNATIONAL TRADE ADMINISTRATION, Washington, D.C.

FOR DATA CIRCLE 342 ON READER CARD

IMAGE MONITOR

The IMON Image Monitoring utility is designed for VAX/VMS systems. It analyzes where a running program is spending its time by gathering samples from the program and producing a bar graph display of the results. The display indicates the specific routine names and the program line numbers within those routines.

The package can also display the time a specific running program spends in the various scheduling states and processor modes. To run the package from any terminal, the user needs to specify the process ID, the process name, and the image name. After IMON is started, the user is free to change many of the sampling and display parameters dynamically.

The user does not need to modify the program under examination. A target program does not need to be recompiled or relinked, and programs without available source code can be analyzed. Routine names and line numbers will be displayed as long as the program was not built with "no trace" options. The product can be used with programs written in FORTRAN, C, BASIC, COBOL, PL/1, BLISS, and MACRO.

A terminal independent screen package is used to support nonstandard terminals or VT100-compatible displays. A window mechanism is used with help facilities so that the most recent display will remain on the screen even when further help information is requested. Hardcopy and file storage of raw data and displays is available for off-line study and analysis of performance data. IMON costs $2,500. MIDCOM CORP., Orange, Calif.

FOR DATA CIRCLE 343 ON READER CARD

MEDICAL SYSTEM

The Advanced Medical System (AMS) is designed to provide a medical management application with general ledger, accounts payable, and payroll applications. It is written in Microsoft BASIC and runs under TurboDOS, CP/M, CP/M-86, or MS/DOS, and costs $3,000.

The package provides patient access and registration by name or by account number. It handles family accounts with multiple dependents, and can bill by individual, by group, or for all accounts. It generates forms for Medicare and Blue Cross/Blue Shield, as well as third-party insurers. Up to 99 dependents can be listed for any responsible party, under a single account or under multiple accounts.

The AMS product maintains multiple doctor practices, and has an appointment minder capability. It maintains ailment histories by patient, with unlimited procedure and diagnosis codes. It also handles most of the business management functions of a medical practice, such as automatic receivable aging by patient and by insurance company; general ledger reports such as profit and loss, income statements, and balance sheets; payables, receivables, and payroll reports such as aging, vendor's list, W-2 generation, and referral reports. It budgets by ledger accounts. ADVANCED COMPUTER TECHNOLOGY INC., San Diego, Calif.

FOR DATA CIRCLE 346 ON READER CARD

SNA TESTING

TestSNA provides a series of 115 scenarios to test all functions of an IBM SNA 3274/3276-compatible product. The package provides a development group with a documented system for quality assurance or product verification. It runs on the vendor's Chameleon simulator/analyzer, which is directly connected to the cluster controller. No host or front-end processor is needed.

The program tests each layer of SNA individually. Testing proceeds from the bottom up, so that higher layers are tested with the assurance of a secure foundation, the vendor says. The product tests the protocol as it is implemented in the controller and validates its strict adherence to the PU type 2 version of SNA. Abnormal or negative testing is performed in addition to the normal, functional testing. Fourteen scenarios are provided for SDLC, six for path control, nine for connection point manager, eight for session control, 17 for dataflow control, and 61 for presentation services/data.

The product costs $10,000, or can be purchased together with the Chameleon for $27,000.

The Replay program provides the Chameleon user with a method of simulating a particular problem or event without having to mimic it in software. It takes a prerecorded Chameleon analyzer file and replays either the DTE or DCE side, and compares the response to that on the disk. It costs $50. TEKELEC INC., Santa Monica, Calif.

FOR DATA CIRCLE 345 ON READER CARD

GENERAL LEDGER

The BMS/General Ledger package is designed to integrate directly into the Business Modeler financial planning and control system on IBM Systems/34, 36, and 38 computers. The product has an autoprocessing feature that is designed to simplify management reporting, and uses menus to guide the user through the applications.

Users can retain, alter, or expand existing account structures, using account numbers up to 24 digits long within six entry levels. The multi-user package provides for automatic double entries, and accommodates multiple close periods for companies within a group. Different charts of accounts and models may exist for such groups of companies.

The system can post to any period, even if the period is closed. It provides year-end closes with trial balances, and screen and report inquiry of posting files. Full audit trails are provided, and account descriptions are held in a model line description file.

The general ledger package costs $5,000 for System/34 or System/36 installations, and $7,200 for System/38. A combination of the Business Modeler and General Ledger packages costs $11,600 for System/34 or System/36, and $16,950 for System/38. BUSINESS MODEL SYSTEMS INC., Oak Brook, Ill.

FOR DATA CIRCLE 344 ON READER CARD

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An example of UFO/COBOL commands.

In COBOL	In Command level	In UFO/COBOL
DISPLAY (SCREEN-NAME)	EXEC CICS SEND MAP ('XDFHCMA') MAPONLY ERASE END-EXEC.	DISPLAY (SCREEN-NAME)
READ (FILE-NAME)	EXEC CICS READ DATASET ('FILE-NAME') INTO (FILE-NAME) RIDFLD (KEYNUM) END-EXEC.	READ (FILE-NAME)

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In addition to extending the capabilities of your programmers, you'll find that UFO/COBOL is a powerful new method to speed-up the CICS application process dramatically. Built into UFO/COBOL is an interactive screen painting facility that lets you design CICS 3270 screens on-line. UFO/PAINT allows you to build or modify screens without writing one line of code. You design the screen simply by positioning fields where you desire. Then COBOL data descriptions are *automatically* generated from the screen.

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SOURCE DATA

BOOKS

NEW FRONTIERS FOR BUSINESS LEADERSHIP
by William C. Norris
edited by Harold F. Williamson

This small volume contains a collection of articles never written, based on speeches never given. What is actually printed is a clever editing of six or seven speeches by William Norris, the founder, chairman, and ceo of Control Data Corp. The editor, Prof. Williamson, has gone through some comparatively recent Norris speeches, pulled out selected segments on a series of interesting topics, and repackaged them into short essays. One hopes Prof. Williamson had a word processor at his disposal.

The book's title is somewhat misleading. The word "business" should be struck because what Norris describes is a quality of leadership that far transcends any single segment of the population, a willingness to define goals and take risks—the right and proper role of any leader.

To illustrate his points, Norris speaks boldly on such subjects as urban and rural renewal, education, worker productivity, the role of small business, and corporate mergers. But the book lacks discussion of the often quoted Norris positions against doing business with the Japanese or allowing overseas researchers free runs at American technology. While in a strict sense these are purely business topics and possibly outside the scope of this volume, they are quite interesting and would add to the portrait of Norris and his goals for CDC.

Norris comes from a rural Nebraska background but he is not, and probably never was, a farmer. What he was during his early years was a gifted engineer and even better engineering manager. A founder of Engineering Research Associates Inc. (ERA), he watched the gradual deterioration of a spirited company after its acquisition by Remington-Rand. In 1957, the same year Ken Olsen founded Digital Equipment Corp. and Frank Thompson started DATAMATION, Norris fled the stifling bureaucracy and founded Control Data Corp.

This is not the sort of background conducive to the evolution of a social conscience. Yet Norris's company (and make no mistake, CDC is his company) invests millions in seemingly idealistic schemes.

Trying to improve their companies' images, most businessmen lend their names to various noble causes. Norris gives his name, hard cash, and new organizational entities, plus a willingness to stay for the long pull. He and CDC take risks. Building a plant in an urban ghetto calls for more nerve and dedication than running interesting advertisements. It also does a lot more good for the community it is designed to serve.

Norris touts many social concepts alien to the American business community. His ideas are even stranger to the professional welfare experts. He has repeatedly pressed for more jobs and better education, instead of merely tearing down slums and rebuilding them. Without jobs and skills, it all falls apart rapidly.

His ideas for rural revitalization sound even stranger. In a nation that gives lip service to small farms but vast subsidies to giant agricultural factories, Norris firmly believes a productive role still exists for the small, 160-acre farm that is more efficient, can near self-sufficiency, minimizes the use of traditional fossil fuels, and most important, provides a viable way of life. While urban America may reject the Norris arguments, the viewpoint is at least clearly defined and worthy of serious consideration.

Norris has a good deal to say about education, most of which is highly uncomplimentary. His remark that "200 years went by after the book came into being before it was commonly used by teachers," seems to suggest a certain skepticism about professional educators.

One problem with this book's construction is repetition. For instance, PLATO, CDC's adventure in learning systems, appears over and over again as if it were a panacea. It is a useful tool but not even Norris would claim it the be-all and end-all. But the way the essays have been pieced together, there is necessarily some overlap.

The most serious criticism one can make about this volume is reserved not for the ideas of Norris but for the effusive, elaborate, overly long, and totally self-serving introduction by Prof. James C. Worthy, a CDC director. His view of CDC's history is little better than a whitewash of the sort one is accustomed to in commissioned corporate histories. His view of Norris is so groveling that one must believe even the subject would find it hard to accept. While it is understandable that Prof. Worthy does not wish to offend the person who controls his CDC board seat—the fees are easy money for an academic—the book would be better without this introduction.

William Norris is a unique individual. His capacity for sparking new ideas and suggesting new directions appears unlimited. At an age at which most businessmen are contemplating nothing more serious than their golf clubs, Norris continues to throw out challenges. He never seems bothered by critics of CDC's corporate social programs, nor of being rapped by the media. Witness the way he anticipated criticism earlier this year when he questioned the viability of opening American research facilities to foreign scientists.

While this is a short book, and only 150 pages are Norris thoughts, there is plenty of meat for corporate philosophers. Perhaps it would be useful for MBA students to devote more time to Norris and less to their spreadsheets. Even 100 VisiCalc runs don't help you understand a corporation that generates social impact analysis statements when considering an acquisition. Dorn Books, a division of Dorn Communications Inc., Minneapolis, Minn. (1983, 192 pp., $15).

—Philip H. Dorn

Note: The reviewer has no relationship to Dorn Books or Dorn Communications Inc., though he admits to curiosity over the possibility of having long lost relatives in Minneapolis.

FIGHTING COMPUTER CRIME
by Donn B. Parker

In reviewing a book that has both good and bad points, one walks a narrow wire to present a balanced picture of the work. *Fighting Computer Crime* contains this mix of good and bad, in a blend that is ultimately dissatisfying.

This is not Parker's first effort; he has written other works. Most notable among them is *Computer Crime* (1976). Replete with horror stories, this volume has often been referred to in efforts to enact "computer crime" legislation. As in his previous book, Parker has again resorted to the device of horror stories and raised the specter of rampant crime.

While such tactics can be effective in maintaining reader interest, in this book they detract from the overall effort. *Fighting Computer Crime* includes many tales that appeared in Parker's earlier book, though in somewhat different form. Parker also repeats many of these very same stories a couple of times within his latest book. For example, most of the horror stories used in the section "Computer Crime Methods" have an encore appearance in the next section, "New Criminals." These sections could easily have been combined. This repetition, both between and within written works has the same effect as a joke or story twice told; whatever interest is generated at the first telling is quickly dissipated the second time around.

The major problem, however, with using horror stories is the undue emphasis these stories give to themselves. They stress the vulnerabilities of computers instead of examining the risks this technology creates for our society. How much computer technology is needed? What impact will it have? Who should decide what is even worth questioning? When a job has been eliminated by computerized robots, the consequent existence of a disgruntled, displaced employee does not merely pose a security threat to one company. Society as a whole is affected by the predicament of this displaced human being. Reviewing this problem only (or largely) from the perspective of a security concern invites too narrow a scope of inquiry. There is much more at stake than just industrial security.

While Parker does examine the social issues, he still relies too heavily on scare tactics. More weight is given to issues such as the possible peril of wiretapping, the danger from remote terminal accessing, and the risk of physical sabotage. The author seems to have overlooked the media's recent attention to criminal uses of computers. Movies such as *War Games* and the abundance of press coverage on remote accessing of mainframes have hammered home the point that problematic uses of this technology exist.

The repetitive use of horror stories clouds the book's focus. Parker needn't keep pounding his point; he already has the audience. His work in the area of computer-related crime is certainly regarded as seminal. Yet, one senses Parker's energy has been misdirected. The problem is no longer a lack of public awareness of these problematic uses. What the public doesn't understand is the origin of the problems and how to solve them.

Parker devotes a section to "Ethical Conflicts in Computing," which is divided into chapters. Each chapter describes narrowly defined scenarios and then examines the broader social and ethical issues embodied in each case.

Such issues as responsibility for computer applications, responsibility owed to the public and decision makers, the limits of personal morality and organizational loyalty, confidentiality of data, disputes of rights over a product, and the limits of implied contractual obligations are reviewed. But ethical issues are of paramount importance to the computer industry. The speed of transactions, the ability to manipulate information assets, the relative ease of transborder removal of assets, the increased complexity of functions, and, most important, the growing reliance upon computers are all elements of computer technology that beg for the establishment of ethical standards. Unlike the legal or medical professions, this industry is relatively young, so few practices and standards of conduct have been agreed upon.

If standards are not established to protect the public, this industry may be faced with standards imposed from without. Such regulation usually means government involvement.

In this regard, some legislative action has already been taken. As Parker notes, several states have enacted broad computer-related crime statutes. The scope of these state statutes varies, and to some degree they reflect how well computer crime is understood. Several attempts have also been made to enact a broad federal statute. Thus, the likelihood that government will attempt to help establish standards is more than just a possibility.

In his earlier book, Parker reported that a biased sample of 374 computer crime cases existed, with an average loss of $450,000 per incident. These figures, along with later updated ones, provided the basis for incident statistics that were espoused in various legislative debates.

Parker makes a surprising apology here. He admits that his prior statement incorrectly described the research findings of SRI International; the figures cited research on computer abuse, not computer crime. Civil suits, errors resulting from deliberate or inadvertent actions, future vulnerability studies, and select criminal actions all constitute the entity "computer abuse."

The term computer crime, on the other hand, is more properly limited to criminal acts using computer technology. The difference between computer crime and abuse is not just a question of semantics in describing research done at SRI.

We must question the integrity of the legislative process when research on abuse is used as a basis for establishing computer crime laws. Alas, in spite of his apology, Parker continues to substitute the term crime for the term abuse. This book should have been titled *Fighting Computer Abuse*.

Like all books on computer technology, this one may quickly be outdated. An example of how fast events move is demonstrated in the two sections on the public key encryption system. This system is touted as a near-perfect way to protect transmitted information. But someone has already found a way to break this encryption system. As the book notes, establishing a standard of performance assures that something will come along to outdate the established standard.

Parker never gets to the bottom of these technological problems. The underlying ethical issues and social policy questions are touched upon in only a limited way. Furthermore, extensive coverage of possible solutions is also needed. The audience was there, the knowledge was there, and the opportunity to inform was there. Unfortunately, the book fell short of its mark. Charles Scribner's Sons, New York (1983, 352 pp., $17.95).

—Kenny T. Hayashi

REPORTS & REFERENCES

MRP II

Manufacturing Software Systems (MSS), an Oliver Wight Company, has announced publication of an updated version of its research report on Manufacturing Resource Planning (MRP II). Entitled "MRP II Standard System," the report embodies an updated version of the company's industry-wide accepted guidelines for a closed loop MRP system. It contains the additional functions of MRP II: production planning, financial planning interfaces, simulation, performance measurement, tool planning and scheduling, vendor scheduling, distribution resources planning, and final assembly scheduling. Christopher Gray, vice president of MSS, claims that "the existing Standard System was already the single most comprehensive description of closed loop MRP available anywhere. We simply made it more complete by incorporating the last four years of experience in making an MRP II system work." The report is available for $800 to new customers, while customers who own the older version can get the update for $125. For more information, contact Manufacturing Software Systems Inc.,

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PCM REPORT

Two new reports on the plug-compatible industry are available from Annex Research Company. Entitled "Amdahl Corporation: A Minefield Below the Revenue Line?" and "Trilogy: To Be or Not To Be?" the reports claim to provide valuable insight into the two companies as well as their primary competitor, IBM. The reports cost $597 each or $997 for both copies. For more information, contact Annex Research, 3020 East Camelback Rd., Suite 200, Phoenix, AZ 85016, (602) 956-8586.

UNIX TOME

If you're interested in understanding how the UNIX operating system works, Howard W. Sams & Co. Inc. is offering a complete, start-from-scratch guide to the system. The book, *Unix Primer Plus*, written by Mitchell Waite, Donald Martin, and Stephen Prata, is a 288-page tutorial and reference guide to the Bell Labs operating system. It is written clearly and has plenty of illustrations, anecdotes, and analogies to help explain the concepts covered. The nontechnical introductory chapters explain fundamental UNIX concepts and commands, while later chapters deal with the more powerful commands and features available as the user's understanding increases. It's packaged in a loose-leaf binder and costs $19.95. For more information, contact Howard W. Sams & Co. Inc., 4300 West 62nd St., Indianapolis, IN 46268, (317) 298-5400.

DATA LIBRARY

If your company library lacks information on the data processing field, Management Information Corp. has a set of nine textbooks designed to give readers an accurate picture of dp products and management. The topics covered are *Pathways Through Data Processing: Small Business Systems, Data Entry, and Distributed Processing Systems; Computer Operations Guide: Evaluating Your System; Packaged Software Buyer's Guide; How Small Businesses Use Computers; People Side of Data Entry; People Side of Officemation;* and *Datacomm for the Businessman.* The MIC Data Processing Textbook Library costs $145 ($190 outside the U.S.). For more information, contact MIC, 140 Barclay Center, Cherry Hill, NJ 08034, (609) 428-1020.

LATA GAIN?

As of Jan. 1, LATAs (Local Access and Transport Areas) form the new telephone service boundaries for the nation. Each LATA is a separate operating area with its own exchanges and services. AT&T and other common carriers provide service from LATA to LATA, as operating companies handle local service within LATA boundaries. The people at Economics and Technology Inc. have published a 384-page guide that maps the official LATAs in the 48 states in the continental U.S., and the District of Columbia. It also includes the vertical and horizontal (V&H) coordinates for every telephone exchange in the U.S. The ETI LATA *Handbook* costs $300 a copy (postpaid), and is available on a nine-track magnetic tape for $1,000. For more information, contact Economics and Technology Inc., 101 Tremont St., Boston, MA 02108, (617) 423-3780.

FINANCIAL AID FOR MICROS

If you're having a hard time finding financial services software, *The Buyer's Guide to Financial Services Software* may be just what you need. The directory contains over 400 listings for banking, insurance, stocks and bonds brokerage, financial planning, commodities trading, and real estate. Longman Financial Services Publishing, the people who put this guide together, claims it is "the single source for financial software." There are more than 25 hardware and operating systems listed, and it has vendor profiles for easy comparison of vendors' experience in financial services and micro software. Geared to bankers, insurance agents, real estate brokers, commodities traders, stock brokers, and financial planners, the directory is available for $75 plus $2 postage from Longman Financial Services Publishing, Dept. PSM, 500 North Dearborn St., Chicago, IL 60610. Mastercard and Visa cardholders can call toll-free (800) 621-9621. In Illinois, call (800) 572-9510.

TOMORROW'S WORK FORCE

What evil lurks in the hearts of men? What changes await office workers in the year 1990? Dr. Harold T. Smith has written *The Office Revolution: Strategies for Managing Tomorrow's Workforce*, which explores changes in the white collar work force and how office automation will affect that work force. The book, extensively researched, begins by outlining the major trends that will have an impact on the white collar work place. It describes new types of office careers and personnel, the movement toward alternative work schedules, and the computer-on-every-desk concept. It then deals with 49 problem areas, which were gleaned from a survey of management and office automation authorities. Readers learn about the challenges involved in an office automation effort, such as employees' fear of automation, cost-justifying new systems, gaining top management's support, and identifying specific information needs. Finally, the book outlines ways to overcome these problem areas, create meaningful jobs in an automated setting, ensure maximum return from an OA investment, and boost employee productivity and morale. The 132-page book is available in hard- and softcover for $14.95 from the Administrative Management Society Foundation, 2360 Maryland Rd., Willow Grove, PA 19090, (215) 659-4300.

COMPUTER CENTER DESIGN

BEK Press has published a comprehensive guide to the design and construction of an efficient, well-organized mainframe computer center. The company claims that because billions of dollars worth of equipment is going to be installed this year alone, dpers need a book to guide them in the selection of a site, room design, building, furnishings, and equipment for the center. The 429-page book has all kinds of money-saving tips on how to avoid the "seven most common computer center mistakes." The publisher has also set up a hot line number to call for the names of qualified suppliers and subcontractors in your locale. *Computer Center Construction* costs $79.95 and can be ordered from BEK Press, 40 Clubhouse Dr., Woodbury, CT 06798, (203) 263-4389.

DSS PERSPECTIVE

Dr. William C. House has gathered a number of diverse viewpoints on the nature, purpose, characteristics, and applications of decision support systems (DSS). House hopes to provide a clear-cut, comprehensive, and contrasting perspective on the concept of DSS. *Decision Support Systems*, a databased, model-oriented user discipline, is available in both hardcover ($39.95) and paperback editions ($20). For more information, contact Mary Ann Tamasi, Petrocelli Book News, 1101 State Rd., Princeton, NJ 08540, (609) 924-5851.

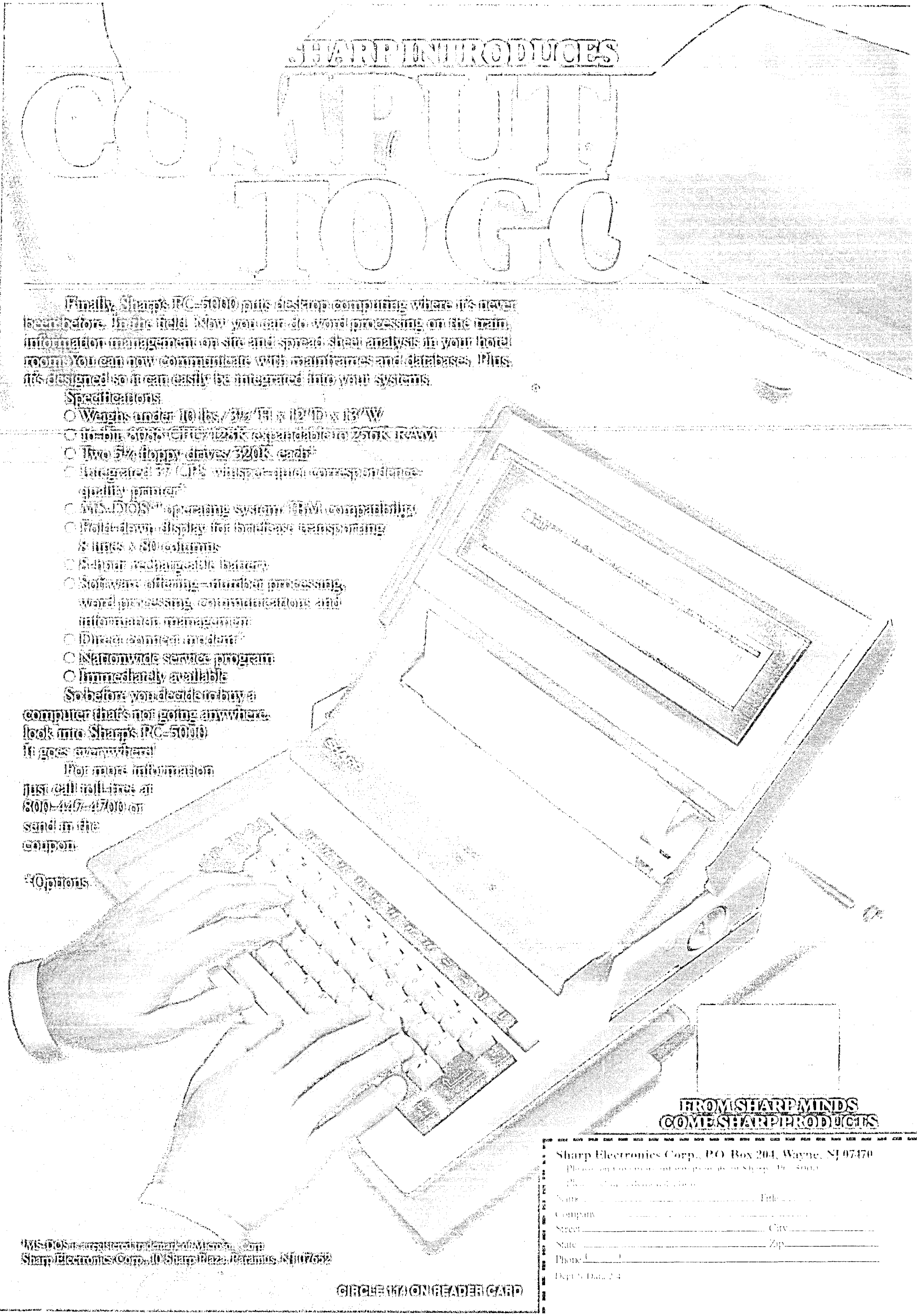
PERIODICALS

LITERACY LETTER

The EDUCOM Computer Literacy Project is publishing a newsletter that reports on computer literacy topics of interest to the higher education community. Among other topics, it will include articles on computer literacy programs for faculty, progress notes on the Computer Literacy Project, and a calendar of key conferences and events. The newsletter will act as a forum for the exchange of information about computer literacy programs. For more information about the project, contact Ms. Kristie Shipley, EDUCOM Computer Literacy Project, P.O. Box 364, Princeton, NJ 08540, (609) 734-1768.

CRTS AND WORKERS' HEALTH

Concern over suspected health hazards from video display terminals and their crt tubes has increased in recent months. The issue is one that office labor organizers are exploiting, while manufacturers oppose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state legislation that they claim is overprotective of terminal operators. Whether or not crts do indeed radiate dangerous emissions, the crt terminal has become the focus of much debate. *VDT News*, a bimonthly newsletter, plans to cover the debate from many perspectives: as a labor-management debate, as a scientific issue, and as a focal point of legislation. One-year subscriptions are $18 for individuals and $35 for institutions. P.O. Box 1799, Grand Central Station, New York, NY 10163.

MIS-MANAGING

To help bridge the gap between technical knowledge and management techniques, Auerbach Publishers has launched a quarterly publication entitled *The Journal of Information Systems Management*. J. Kevin Reger, president of Auerbach, said the journal was "created to help dp people become better and more efficient managers . . . by offering in-depth practical advice on management issues and providing workable solutions for those special problems the MIS manager encounters daily." The journal has no advertising and is not academic. All articles and columns are written by experts in the field of MIS management who hope to offer practical, sound advice with realistic solutions to today's problems. The 90-page quarterly periodical is available for a $60 subscription fee. For more information, contact Auerbach Publishers, 6560 North Park Dr., Pennsauken, NJ 08109, (609) 662-2070.

ROBOTICS NEWS

A British publication entitled *Robotics Technology Abstracts* can now be obtained in North America through Tech Tran Corp., Naperville, Ill. The journal, published by Britain's Cranfield Institute of Technology, provides summaries of important robotics information contained in technical and professional journals, trade publications, business magazines, conference proceedings, new product announcements, and special reports. Each issue of the monthly publication contains about 100 abstracts, which are organized by category for easy reference. The publisher claims the journal is unique because in addition to being the first abstract journal devoted exclusively to the subject of robotics, it is the only journal to provide worldwide coverage of important developments and key literature. A yearly subscription costs $160. For more information, contact Tech Tran Corp., 134 N. Washington St., Naperville, IL 60540, (312) 369-9232.

SEMINARS

LONG-RANGE PLANNING

Dr. Robert Keston of Keston Associates will be teaching a series of five-day workshops on "How to Develop an Effective Long-Range Data Processing Plan." The workshops are formulated to take a positive approach to "establishing a viable strategic planning mechanism." The course includes a series of interactive exercises, based on a case study. Classes are limited to a maximum of 25 students and will be conducted in the following cities: Las Vegas, Feb. 6–10 and June 25–29; Ft. Lauderdale, March 12–16; Washington, D.C., April 2–6; San Francisco, April 23–27; Annapolis, May 7–11 and July 16–20. The course costs $995. For more information, call Keston Associates, 11317 Old Club Rd., Rockville, MD 20852, (301) 881-7666.

ADDRESS FOR SUCCESS

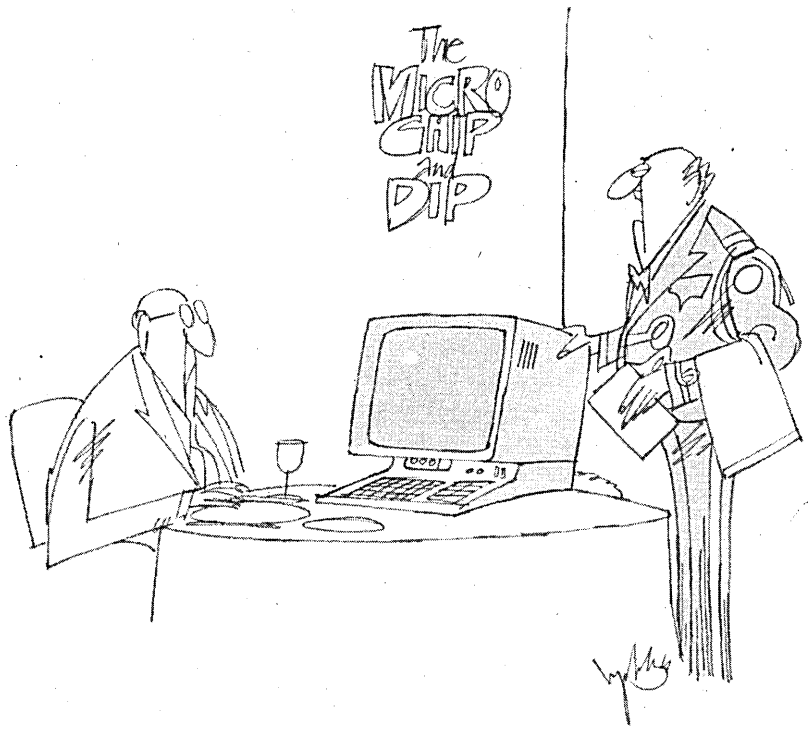
Another seminar offered by Keston Associates is "How to Establish a Successful Edp-User Coordination Function." Recognizing the dp installation's need to establish formal user coordination services, the workshop presents alternative approaches to developing such a function. Attendees will be shown what form user-dp communications should take, how it should be organized, and who should participate. The seminar will cover such topics as formal communications channels, meaningful user involvement in systems development, capabilities for rapid implementation, greater flexibility and maintainability, and improved responsiveness to user performance expectations. The five-day seminar costs $995 and will be held in Las Vegas, Feb. 13–17 and June 18–22; Ft. Lauderdale, March 5–9; Washington, D.C., March 26–30; Annapolis, May 14–18 and July 9–13; Atlantic City, Aug. 13–17; and Lake Tahoe, Sept. 17–21. For more information, contact Keston Associates, 11317 Old Club Rd., Rockville, MD 20852, (301) 881-7666.

INSTRUMENTATION INTERFACING

The University of Missouri–Rolla is offering an introductory level short course on interfacing computers to electronic instrumentation. The course is geared to technical personnel who want a deeper understanding of the instruments and data acquisition systems that are interfaced to computers. It will cover the computer fundamentals related to instrumentation control, analog signal acquisition, processing and conversion to digital form, and interconnecting computers and instrumentation using the IEEE-488 parallel and RS-232 serial interfaces. The course costs $550 and will be held April 4–6 on campus. For more information, contact Bill Kratzer, Engineering Continuing Education, University of Missouri–Rolla, Rolla, MO 65401, (314) 341-4200.

CIPS TIPS

The Canadian Information Processing Society (CIPS) claims that anyone taking its course on "Data Resource Management—Solution or Sorcery" will finish the class with "an understanding of the need for an integrated approach to information management and what data resource management can do to answer that need." Among



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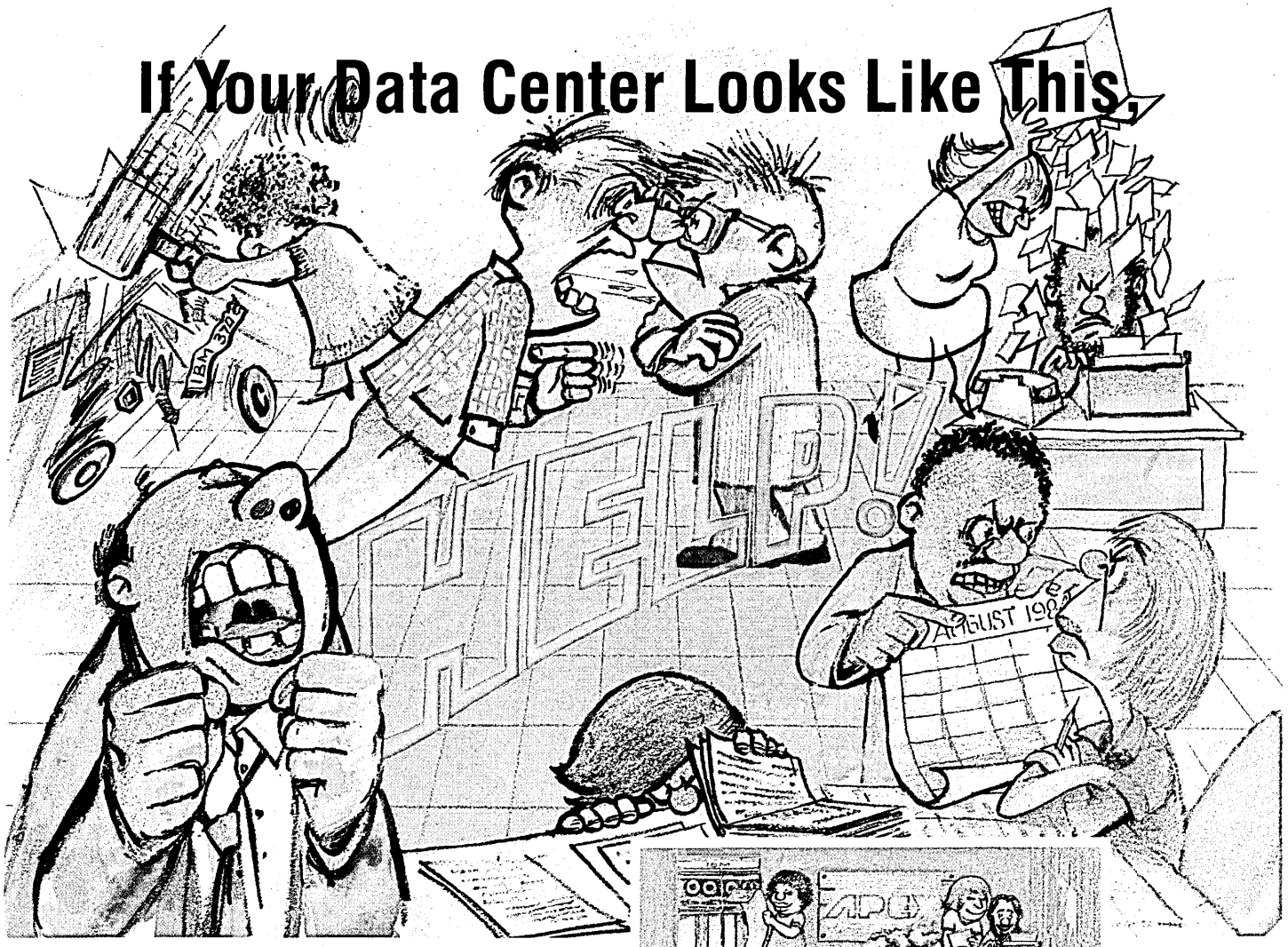

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other topics, the seminar will define the components of data resource management (DRM); delineate the benefits of such an approach, both long and short term; identify management issues; discuss DRM's impact on systems development; identify common problems in its implementation; and provide a "road map" to begin the effective implementation of DRM. The course will be held in various Canadian locations throughout February and March. Early registration fees (two weeks prior to presentation) are $190 for CIPS members and $230 for non-members. Late or on-site registration is $210 for CIPS members and $250 for non-members. For more information, contact Cathy Tashos, CIPS National Office, 243 College St., Toronto, Ontario M5T 2Y1, Canada, (416) 593-4040.

PC FEVER

Personal computers are turning up everywhere. The National Institute for Management Research is holding a three-day conference to help attendees learn how others are dealing with the PC explosion in industry and government. This fourth annual conference includes experienced users, consultants, and vendors who will show how PCs are used successfully in office automation, financial applications, and data processing. Attendees will examine the PC's impact on existing dp departments and user organizations, as well as its effect on jobs, careers, and companies. The conference will be held Feb. 13–15 at the Sheraton National Hotel in Washington, D.C. The cost is $595. For more information, contact the National Institute for Management Research, P.O. Box 3727, Santa Monica, CA 90403, (213) 450-0500.

VIDEO TRAINING

Cullinet Software has a video-based training series that complements the courses taught at its National Education Center in Framingham, Mass. The course offering includes the basic components of the Integrated Database Management System (IDMS); Integrated Data Dictionary; Application Development System/On-line; Integrated Database Management System–Data Communications/Universal Communications Facility (IDMS-DC/UCF); and the (IDMS-DC/UCF) Mapping Facility. Each course consists of video modules, a student text, and exercises. The company claims the product overview will be beneficial for both executives and non-data processing professionals, while programmers can benefit from the entire course. For more information, contact John Donnelly, Director of Investor and Public Relations, Cullinet, 400 Blue Hill Dr., Westwood, MA 02090, (617) 329-7700.

IMS DATA MANAGEMENT

The Center for Advanced Professional Education (CAPE) is offering a three-day seminar, "IMS: Successful Data Management in a Changing Environment," to help guide participants in the implementation or improvement of an IMS environment. The course is targeted for project managers, analysts, and programmers, as well as others who support the database environment, such as database administrators and users. Participants can earn 2.1 continuing education units at the sessions, which cost $645. For information on where courses will be held, contact Herb Stern, CAPE, 1820 East Garry St., Suite 110, Santa Ana, CA 92705, (714) 261-0240.

VENDOR LITERATURE

POWER PLAY

Power Up! is a direct mail consumer catalog that features personal computer software available through Software Publishing Corp. The catalog contains more than 30 personal computer software products and accessories that supplement existing software. The prices of the products range from $19.95 to $99.95 and carry

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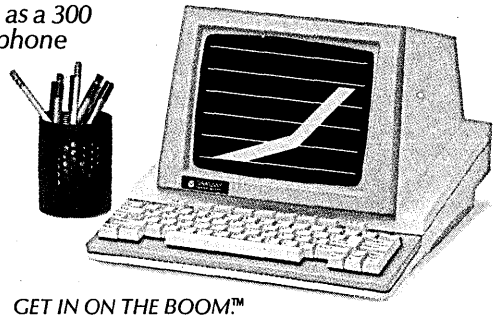

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SOURCE DATA

a no-risk guarantee, so you can try the product out and return it for a full refund within 10 days. Software Publishing also has a toll-free number to call for support and a one-year disk guarantee. SOFTWARE PUBLISHING CORP., Half Moon Bay, Calif.
FOR DATA CIRCLE 360 ON READER CARD.

SOFTSELL?

Softsource, the software division of Continental Resources Inc., has issued a second volume of its *1983 Dealer Software Catalog*. The guide features over 200 individual software packages from approximately 30 manufacturers. Included are products from Digital Research, Microsoft, Sorcim, Ashton-Tate, and Micropro. The guide is formatted to organize available software packages under hardware manufacturer/machine/operating system categories. CONTINENTAL RESOURCES INC., Bedford, Mass.
FOR DATA CIRCLE 361 ON READER CARD.

NET WORTH

Infotron Systems has a new brochure available that describes its Advanced Network Integration (ANI) product. ANI is an approach to data communications that permits interconnection of nodes, transmission speeds, protocols, interfaces, and formats. Infotron says it transforms a collection of diverse network elements into a single cohesive network. INFOTRON SYSTEMS CORP., Cherry Hill, N.J.
FOR DATA CIRCLE 362 ON READER CARD.

OPT OPTICAL

Storage Tech is offering an eight-page, four-color brochure on its 7600 Optical Storage Subsystem, which was introduced in September. The system uses laser technology to store information on optical recording disks. It is designed for users who require large amounts of archival storage; the system stores 4 gigabytes of nonerasable data on the surface of a single optical platter "at a fraction of the cost per megabyte of other storage devices." STORAGE TECHNOLOGY CORP., Denver, Co.
FOR DATA CIRCLE 363 ON READER CARD.

CRANK CASE

Facit Inc. has new literature available that describes its Generation III line of crank-adjustable computer workstation furniture. The attractive 12-page brochure describes the new line's features, which were designed to offer maximum flexibility for today's workstation operator. FACIT INC., Nashua, N.H.
FOR DATA CIRCLE 365 ON READER CARD.

BOSS A NOVA

Nova Robotics has a new robot system called ARIES that is all-electric and highly modular. Installations and I/O specifications as well as illustrations are included in a six-page brochure offered by NOVA ROBOTICS INC., East Hartford, Conn.
FOR DATA CIRCLE 364 ON READER CARD.

LAN REPORT

Harris Corp. has published a 20-page booklet that reviews local area network markets and techniques. "Local Area Networks: A Harris Prospective" reports on the market characteristics and growth forecasts for local networking; the status of the various forms of networking; network architecture and technology; and network standards. HARRIS CORP., Melbourne, Fla.
FOR DATA CIRCLE 366 ON READER CARD.

NO-FAULTS?

Autech Corp. offers a new brochure that describes the faultproof extension of fault-tolerance for hostile industrial automation applications. It includes information on the company's DACMASTER data acquisition and control system, which is designed to operate on the production floor without benefit of a control room. AUTECH, Pompano Beach, Fla.
FOR DATA CIRCLE 367 ON READER CARD.

ADVERTISERS' INDEX

**International Edition
* OEM Edition

ON THE JOB

THE GRASS IS KELLY GREENER

In 1946, William Russell Kelly founded a company that offered to fill the personnel gaps that occur when employees are ill, on vacation, hired, or fired. Because of increasing salary expenses and fluctuating economic conditions, the temp is now also used as a tool to ease workload pressures during peak periods.

Today, Kelly Services Inc. (formerly Kelly Girl Service), Troy, Mich., has temporary help for hire in over 100 categories in 450 branch locations in the U.S., Canada, Puerto Rico, England, and France. One of the company's more recent projects was training temporary personnel to use word processing equipment. Originally, the company tried to train operators on the various manufacturers' different machines, but soon decided this method was too costly and time consuming. The answer proved to be a "generic" program developed by Universal Training Systems, Wilmette, Ill.

After paying a $100,000 license fee to use the Universal program, Kelly invested another $1 million to produce the training material and test it in eight regions: Los Angeles; Chicago; Detroit; Orlando; Ventura, Calif.; Madison, Wis.; and northern New Jersey. The testing proved successful and the company began training people nationwide.

This "one size fits all" training technique enables temps to work on different machines with rapid progression in the initial learning stage. And of course, the trainees are usually pleased to gain experience on a variety of machines. Kelly's temps are trained in this program at no charge. Client companies do not pay for the initial training stage, which Kelly generally figures at about two hours to get the temp going on the customer's equipment. The agency stays in constant contact with the client to "gauge the operator's progress."

Kelly keeps up to date on happenings in the modern automated office by conducting surveys; it publishes its findings in such studies as "The Kelly Report on People in the Electronic Office," distributed free.

The company is so confident of its training techniques and expertise that satisfaction is guaranteed 100%—or the client firm pays nothing.

CLASS ACT

In 1967, a group of computer industry executives got together and started the Computer Learning Center (CLC) in Falls Church, Va. Acquired by the AIRCO division of BOC Inc. in 1976, the center is now based in Springfield, Va.

Catering to people who wish to be computer programmers or operators, the center tries to keep class attendance between 15 and 18 students to see that they get the individual attention they need.

Programming students master FORTRAN, COBOL, and assembler languages, and develop techniques for solving problems and completing tasks through the use of computers. Those interested in becoming computer operators learn how to run computer systems and not just monitor them.

Enrollment in the center's programs is on a full- or part-time basis. Full-time students attend classes five times a week while part-time evening classes meet three times a week. The programs run six months and 11 months, respectively. New classes start every two months.

The center claims that in the past three years, 87% of its graduates seeking employment in dp have found it, often with the help of the center's career placement service. New graduates can be hired through the service without employers having to pay search fees, while former graduates who now have field experience can return to the placement center and use it as a regular employment agency where the search fee is paid by prospective employers. CLC boasts that Washington area firms such as Boeing Computer Services, Burroughs, Honeywell, and IBM are among the 600 businesses and government agencies that have hired CLC graduates.

The standard course fee is $4,600, which includes "everything except pencils," and a $25 application fee.

—Lauren D'Attilo

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COMPARISON CHART

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The Marketplace... SOFTWARE SERVICES

ADVERTISERS' INDEX

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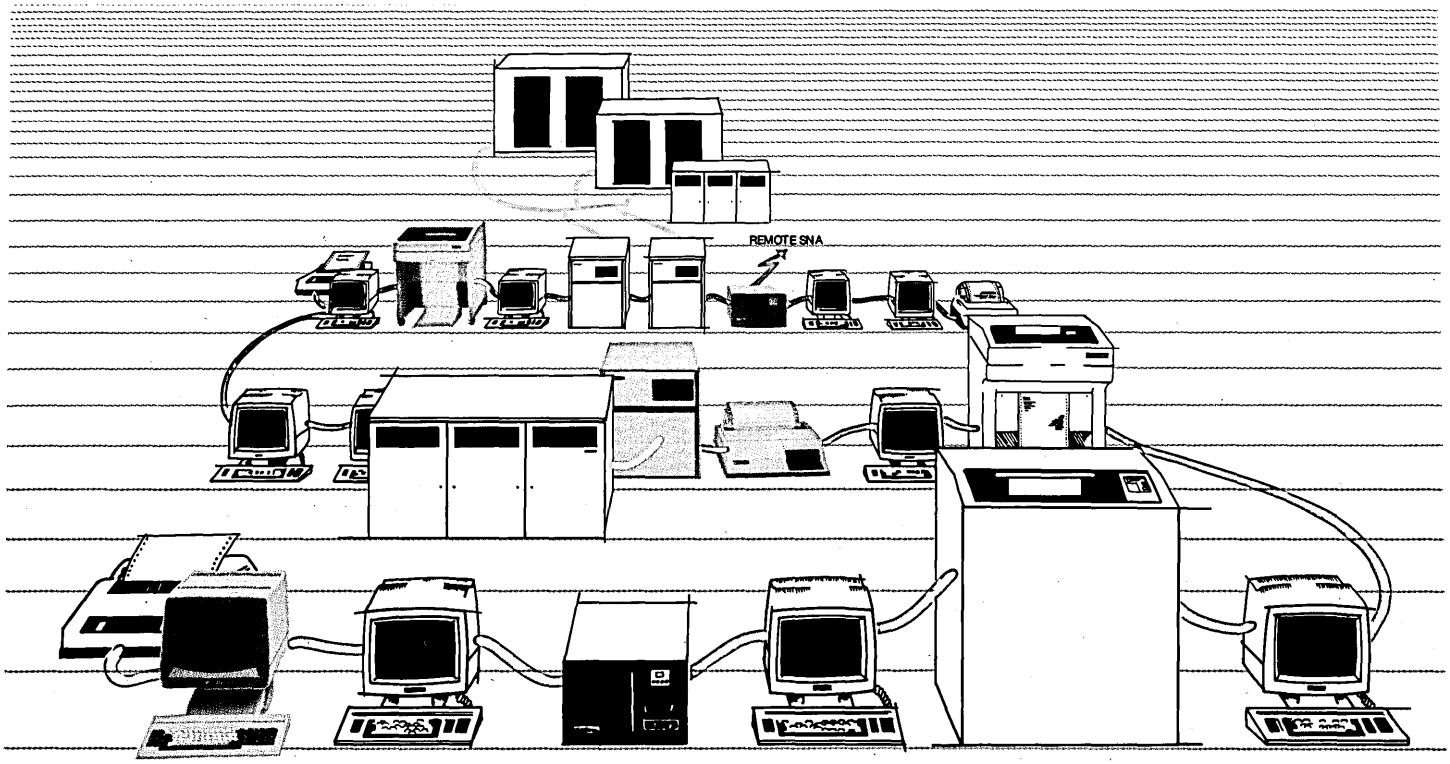

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CIRCLE 120 ON READER CARD

READERS' FORUM

THE PC'S IMPACT ON DATABASE

Most people expect the increasing popularity of personal computers to visibly alter MIS. It's likely that, after a few false starts, we'll see a perceptible shift in MIS emphasis from selling services (system design and programming) to selling products (reliably accurate, downloadable data about the firm).

I suspect this will happen when we realize that the man/machine systems that collect and maintain data are quite different from those that interpret and present information thence derived. The former lend themselves to that meticulous but ponderous mill of tradition, the systems and programming shop. The latter are better suited to the shoot-from-the-hip style of user-run PCs.

First, let's remember that we've survived repeated waves of changing fashions. I'm skeptical of anything that claims to alter MIS as we know it, be it query languages, databases, PCs, or anything else. Like the distributed processing wave of six years past, much of today's PC enthusiasm is a transitory fad. It more truly reflects people's eternal concern with power and control than any meaningful organizational change midwifed by technology.

In such cases, the most common concern within MIS is loss of control. Though usually expressed more tactfully, the underlying fear is that once users can program their computers, they'll give us the cold shoulder and go their own way. The unspoken sentiment, deep in the MIS manager's heart, is that technical arguments are just smoke screens to enable captive customers to escape.

He's right. They are. The more aggressive users are pursuing PCs precisely in hopes of freeing themselves from the glacially slow MIS shop. Why should they wait six months to get a report when, with their own equipment, they can have it now? Relax. It won't happen that way. Both sides of the issue are overstated.

Do you recall that COBOL was supposed to permit businessfolk to program computers themselves, thus avoiding the need for programmers? What happened to COBOL, the 3790, and the 8100 will happen to PCs. The limiting factor, as ever, is people, not machinery. Programmers are in short supply. The mix of mental discipline and masochism that enables one to program a mainframe, a PC, or even a calculator simply doesn't exist in most of the population.

A war story: our shop offers a high-level, on-line query language to users. One recently called to complain that the package was broken, because he couldn't get meaningful results. He wanted to see the customers located in Ohio and Indiana, and the system kept replying "none found." After watching him go through the request, I pointed out that there really aren't any customers in Ohio *and* in Indiana; what he really means was in Ohio *or* in Indiana.

"Don't tell me what I really want!" he roared with flawless reasoning. "I know exactly what I want! I want everybody in Ohio *and* everybody in Indiana."

People think in People Language (English, Spanish, French), not in Boolean. People Language is wonderfully rich in ambiguities. It's beautiful, but we can't program in it yet. Consequently, though a few PCs will be programmed by users, most will fall into one of three categories. They will either: run canned packages (spreadsheets, graphers, databasers) against company data downloaded from the mainframe; be programmed by the folks in MIS; or gather dust, once the novelty has worn off.

In light of these possibilities, let's consider four approaches to dealing with the PC impact.

1. The Edict.
2. The Nesbit ("Move it to a Micro" by Irene Nesbit, October, p. 188).
3. The Kirkley (Editorial by John L. Kirkley, October).
4. The Charter.

The Edict says nobody's allowed to buy a PC without MIS approval. This approach doesn't deserve more than a paragraph. It is mentioned only because it's become an obligatory straw man in discussions on this topic. Not that we'd hesitate, if we thought we could pull if off, but we all recognize King Canute commanding the Channel tide not to come in.

Nesbit says to migrate mainframe systems to PCs. She points out that many mainframe applications could be more efficiently and controllably run on PCs. Why not assign some programmers to the task of migrating them? This is a grand idea that would undoubtedly work well in many shops. But it's less useful to those shops with a large, unwanted legacy.

Most shops are burdened with obsolete applications. Those that grew from S/3 in the last few years do much of their work in RPG. Others are still running PL/I or assembler. One large tobacco company still runs the bulk of its applications emulating 1401/1410 autocoder (does anyone else remember if a WM-GM stops an MRCM?).

These people are desperately trying to maintain those systems. They know there is a better way, but they lack the necessary resources. If they had the people or the time, they'd have put those monsters on-line under COBOL or under one of the new applications generators (ADS/OnLine, UFO) long ago.

It's hard to imagine where they could pull the resources from to make the mainframe-to-PC conversion. Not from maintenance, surely. The dream of getting users to adhere to a moratorium on maintenance is just that, a dream. Nor can they squeeze the resources from the currently funded, 80% finished conversion now under way. (Everybody has a conversion of some sort under way—to COBOL, MVS, IDMS, or whatever.) Career suicide lies in that direction.

Timesharing applications will undoubtedly be converted to PCs. This applies to outside-purchased timesharing as well as in-house (CMS, APL, ADRS, TSO FORTRAN, and the like). But timesharing, in-house or out, isn't where most of MIS is organizationally aimed.

Although Nesbit's approach is viable for some, it cannot be used by many.

The Kirkley approach is to have MIS program the PCs. Mag-

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1. The Millennium environment is borderless.

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CIRCLE 121 ON READER CARD

azine editors seem to have the gift of prophesy—must be in their job specs or something. I'm willing to bet Kirkley's advice is right on the money, for two major reasons.

First, as stated above, programmers are in short supply. No organization, outside of MIS, has been able to attract and hold computer programmers. And nobody else is as good at this type of work; if you weren't good at it, you wouldn't be around. So, if you believe someone will program those PCs, chances are it'll be you.

Second, it's fun. The same people who put Star Trek, the Colossal Cave, and Mugwump on your mainframe are starting to play with PCs. Encourage them? Lord, I doubt it's in our power to stop them!

The one strike against Kirkley's approach is management's uneasiness with the entire PC idea. MIS still daydreams about The Edict now and then, and users continue to hope for Freedom at Last. Neither dream can survive because they're grounded on hope and fear instead of reality.

But Kirkley simply tells how the change will be implemented, not what it will look like. In other words, if PCs are programmed by MIS, how will this impact the organization?

Charter's IRM is building an in-house PC consulting service center. The Charter Company is a Fortune 100 firm in Jacksonville, Fla. Our MIS unit (Information Resource Management) is organizing to provide PC services. The idea is based on the premise that PC vendors cannot give extended support as economically as in-house dp staff. Hence, we're preparing to provide:

- cash discounts from local vendors if MIS acts as purchasing agent,
- a training room where prospective users can experiment with PCs and PC software to decide if they really want to take the plunge,
- software and hardware reviews and recommendations,
- a troubleshooting staff on call to help with problems.

The strength of this approach lies in its realistic assessment of the microcomputer phenomenon's growth (if you can't lick 'em...). And, so far, it seems to be profitable for all three parties.

Users benefit in two ways: first, we dpers know the firm's computerized business files and how to get at them. Therefore, it's easier for us to make data available for downloading. Left on their own, users would probably rekey it. Second, don't forget the cash discount.

MIS has the opportunity to establish a close working relationship with PC users when their interest first awakens. Optimally, the aggressive, self-starting PC user and the aggressive self-starting programmer/analyst will come to see each other as colleagues, not competitors.

The local PC businessman is guaranteed to have all business steered his way by MIS, but he won't have to deal with any of the support headaches. The terms are specific: in return for a significant discount, MIS provides all consultation and support while his store just sells the stuff.

But the initial premise is weak. Can we, a high-overhead, traditional dp shop, provide competitive services and prices? Our success depends on how we measure up when compared to local small businesses.

At best, this new MIS strategy will be in addition to, not instead of, its traditional roles. We're still left with the question, "What, if any, will be the impact of PCs on today's systems and programming shops?"

Notice that the things you must do to collect and maintain accurate, timely data on 5,000 employees differ from those needed to tabulate, spreadsheet, cross-reference, or graph that data.

Data collection and maintenance requires that data be collected from the firm's day-to-day activities. It can and must be tailored to use many media, such as forms, VDTs, and even phone calls. It must function at the lowest levels of detail (one employee's records, for example) in the firm. Accuracy, reliability, and disaster-recovery are stressed since all else is downstream.

On the other hand, data interpretation and presentation assumes that bulk data are available and can be manipulated into useful information. Whatever mode is most attractive to the end user can be used; graphs, spreadsheets, and what-if questions are all possibilities. The executive is the target for this type of data so it deals with exceptions, summaries, and trends instead of individual details. It stresses ease of comprehension and trend-detection but assumes the raw data can be downloaded again for a second look from a different perspective.

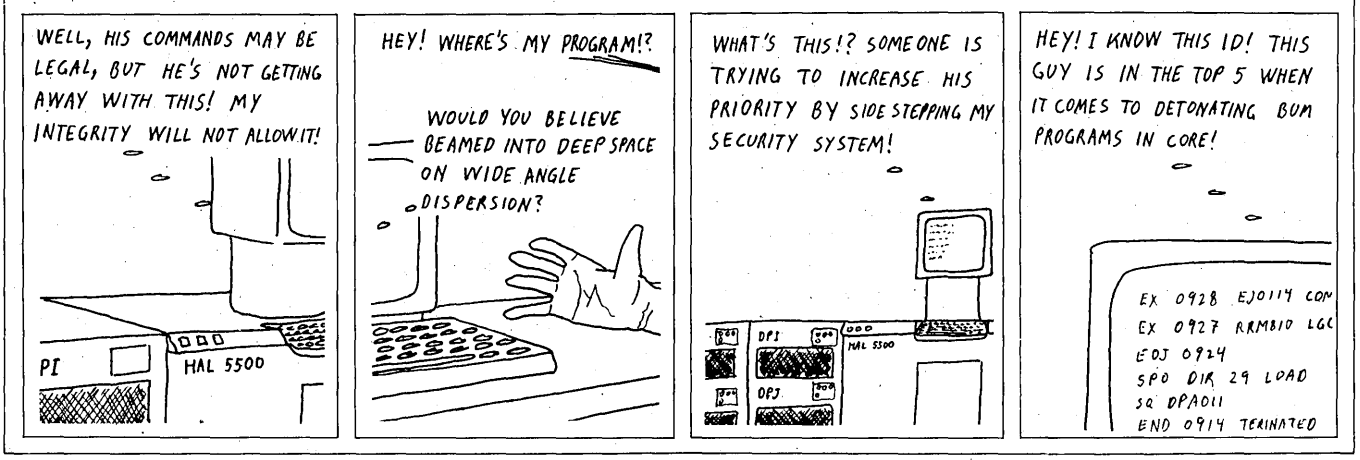
Both functions are necessary. The first cannot be handled by PCs running off-the-shelf packages. Its success depends on the extent to which large volumes of detailed data can be shared among a multitude of scattered users. Dispersed PCs cannot compete economically with central mainframe facilities in making shared bulk data available to all. Therefore, I predict that the role of MIS will shift to providing bulk database systems.

Why am I convinced that selling the product (data) is economically viable? Because several profitable firms, like Compuserve and The Source, are doing it today. The main difference between your MIS shop in the future and these data utilities is that you'll be offering a product that no one else can supply: confidential data about your own company.

As someone who makes a living by fretting over shared data (I'm a DBA), I see a semantic twist to this story. For years now, I've been explaining to people that there are two equally legitimate yet very different definitions of the word database. The first is the set of master files shared among applications in an MIS shop. The second is a commercially accessible library of machine-readable data that a user can download to inspect and interpret at leisure. The twist is that these two definitions are merging!

—Frank Sweet
Jacksonville, Florida

DIGITS BY ROY MENGOT



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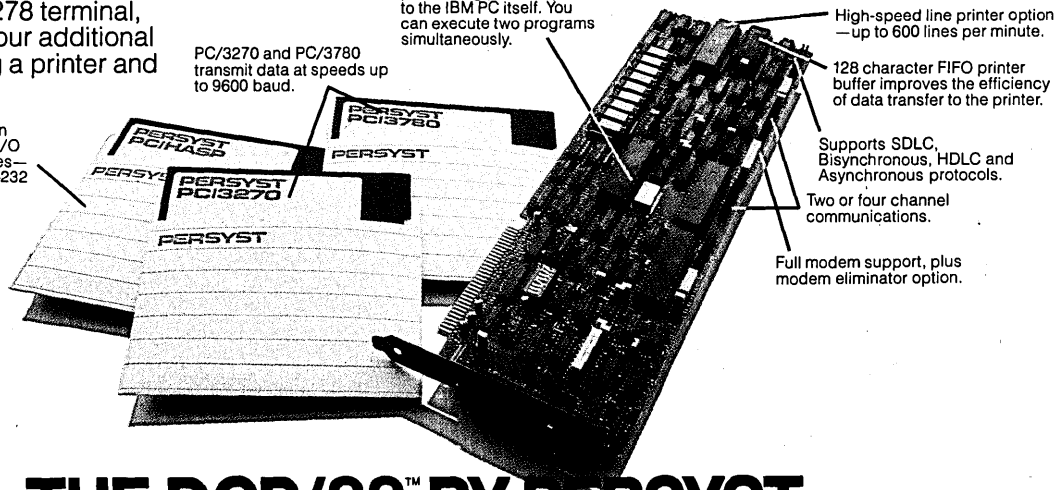

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CIRCLE 122 ON READER CARD

A DAY AT THE RACES

People carry many objects to the racetrack: binoculars, bottles, newspapers. But I first eyeballed Murphy lugging a heavy crate that looked like a drummer's sample case. Here's a dedicated sort, I think, as I see him listing toward the exit gate at Keeneland. You see many unusual things at the track, as a matter of course. So I was not alarmed at the curious nature of the grim-faced Murphy.

But Murphy sits across the aisle from me during a flight from Kentucky to LaGuardia. On airplanes, sorts such as Murphy tend to be more conspicuous. Being the inquisitive type, I watch him closely. He is wearing a Pittsburgh Pirates baseball cap and chews on a dime store panatela, but this in itself does not faze me. What fazes me is his burden, which I earlier figure to be a sample case, but which turns out to be a Kaypro II portable computer. The thing is stuffed uselessly beneath his seat, but Murphy mutters throughout the flight. When he gets up to leave the plane, I see that Murphy is palming a batch of dead totalizator tickets like some rummy backroom gambler. Here indeed, I figure, is the dedicated chump I have pegged earlier.

Imagine my interest when I see Murphy again a few weeks later at Aqueduct racetrack. He is the same grumbling guy, without his computer. I see him standing at the rail after the fourth race. His face is hollow, as if he has just received some horrible news. The fourth is a seven-furlong race for maiden fillies, and is a particularly bad race to play on account of the dearth of performance information. I have bet on a nice chestnut filly named Full Song, because the trainer is Johnny Campo. The horse obliges, and I am on my way to collecting $9.20. But I am sorry for Murphy, as I am reluctant to see my fellow man suffer so much.

"I figure on My Dearest Love," Murphy says to me, referring to a horse which is scratched. "I play Ivy," he says, referring to a horse which does not acquit itself too well on the oval. Generally, a handicapper does only slightly better than a weatherman at predicting future events. So I am not too dismayed at Murphy's inability to figure which filly will pay money. Besides, I am already looking forward to Real Twister in the fifth, so I am willing to forget about Murphy's plight.

A horse race is simple: at the most there are 12 horses, two at the fewest. It ought to be a simple task to pluck the winning horse. A baby can eliminate at least three horses from a field of 12, if only by the most rudimentary of efforts, like forsaking horses bearing undue resemblance to glue pots or dog food. Even an occultist can toss out a couple more, by conferring with the planets or whatever. This leaves a choice among eight horses. Some of these remaining plugs are better suited to different tasks. Sprint horses might lag behind in a longer race. Some spirited ponies prefer the mud or a certain post position.

What this means, usually, is that a player is left with three or four horses to choose from, a decision which should not appear too arduous. This does not make the actual selection of winners any easier. It is the apparent simplicity of the problem which unnerves so many.

A Hispanic guy stands behind me and waves his arms excitedly while screeching like a madman as Sea Hippie fades down the stretch. He raises a bottle of Bacardi to his parched lips as Walk-in-the-Water noses across the finish line. A unified groan comes from the crowd, punctuated by a doglike howling, which turns out to be emanating from Murphy, who leans over the paddock.

I am feeling unusually expansive after this race, so I proffer a beer to Murphy in the grandstand. "Choose the best and hope for the best," he says with a shrug. I have never seen a man so sad-looking as Murphy. He is clutching a sheath of printouts desperately, as if he could squeeze some earnings from the folded paper.

I know that certain players of a rationalist bent rely on handicapping by consideration of speed. If Cheating Arthur works out at five furlongs in 1:01 4/5, he stands a good chance of beating Rosy Walt, who breezed at 1:05 3/5. If Brainless Wonder wins by a length at Keystone in 1:14 at six furlongs, then it looks good to beat a horse that last ran a similar course in 1:15 1/5.

Of course, this is not always the case. Racetracks across America are littered with pari-mutuel tickets that demonstrate the impurity of choosing a winner on speed alone.

Murphy, it turns out, is a rationalist. He is such a rationalist that he believes he can figure which way the sun will peek out of the clouds by reflecting on his printouts. He is such a rationalist that every time he goes to the track, he's certain he has selected nine winners. But there are too many variables to mess up Murphy. There are drugs, and batteries, and crooked jockeys, and nefarious trainers.

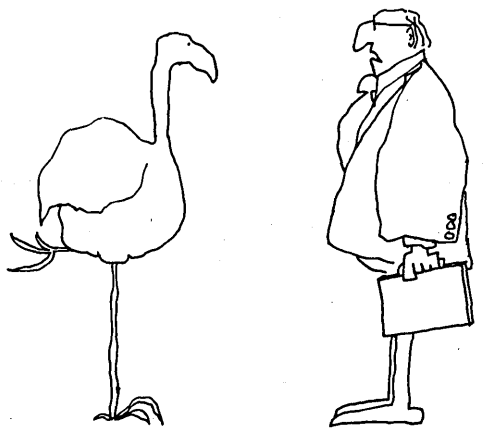
All that is wagered is not returned to the betting populace. The track takes a percentage out of the handle. "You are talking a 15 or 16 point differential," Murphy says to me solemnly. "All you gotta be is smarter than 85% of the dopes putting their hard-earned on some pale horse. Then you make the cash."

It reckons that this elite 15% would win with some regularity because of their enhanced knowledge of the thoroughbreds. But there are plenty of frayed collars at the racetrack and no shortage of long faces on the bus ride back. Even at the $50 windows, there are plenty more who buy than sell.

Sometimes, it is true, the long shot wins, like Daniel in the lion's den. This is cause for rejoicing in some quarters, but it is mostly a source of distress to the rational bettor. Murphy is a rational bettor, if nothing else.

I ask Murphy how he works. "I go home and figure," he says. "I input past performances out every night. Usually the horse my system picks is scratched at dawn, or is bested by a bum horse wearing mud caulks." Why, then, does Murphy stick by his system to the exclusion of other factors, like dumb luck? "That's for novices like yourself," he says with a tremor of spitefulness. "I'm in it for the perfectability of it all."

But picking a winner in a horse race is a way of solving a problem, and there are many ways to approach problems, especially answerable ones. "Horse races are computers themselves," says Murphy. "They solve the question of which horse will cross the finish line first. They are systems in themselves, discrete and mostly irrefutable, which process a flurry of data concerning the likelihood of finish." So, I ask, does this mean your system is incomplete? "The races demonstrate the efficacy of any given handicapping method," he says while crushing a cigarette beneath his foot.



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CARTOON BY MICHAEL ARTELL

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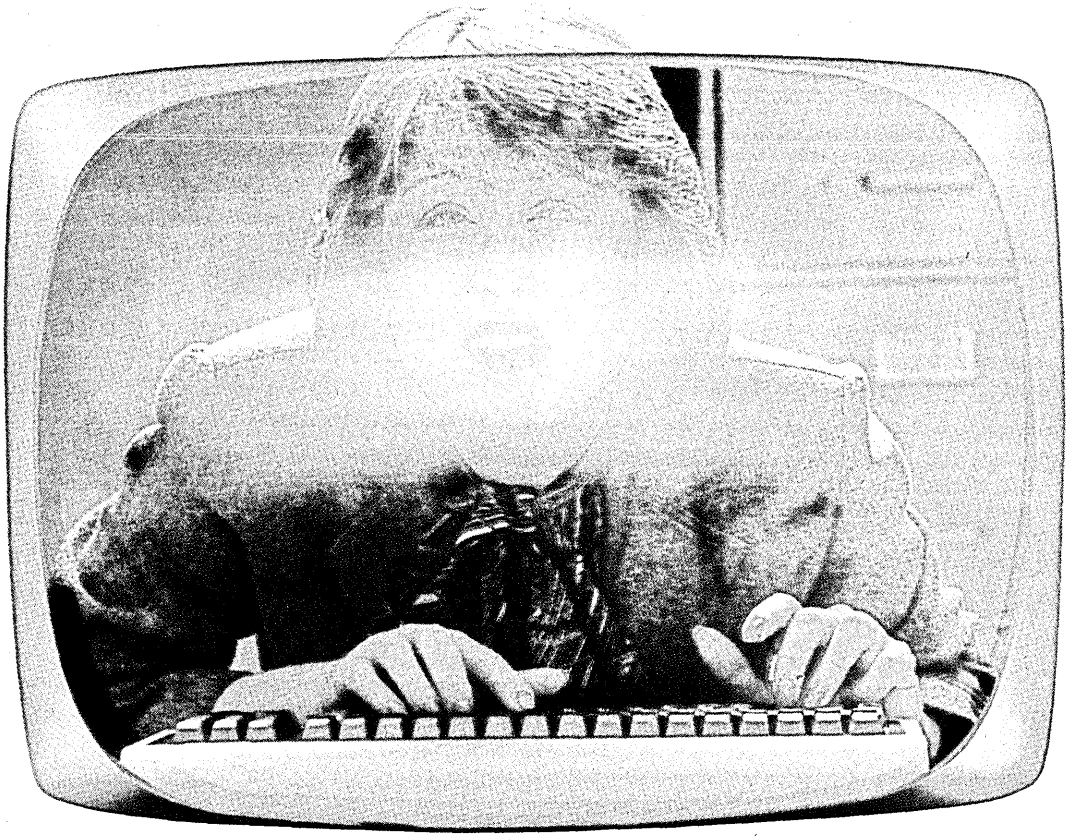

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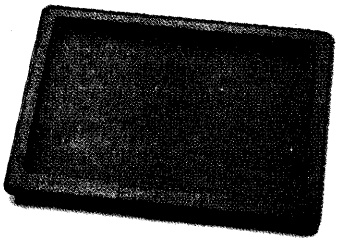

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READERS' FORUM

"The more comprehensive the method, that is, the more variables the handicapping method can embrace, the more likely it will succeed."

But how to embrace, in a methodical fashion, those factors like rainfall or track biases that are not easily quantified? "Damned if I know," says Murphy.

I like Grecian Comedy in the eighth race, for a variety of reasons, but Murphy is pinning his hopes on Medieval Moon, a chestnut filly ridden by Antonio Graell. "Surest thing I've seen today," Murphy tells me. It's a seven furlong race, and the sun is going down, making the track a cold and unfriendly place to be. Some guys stand behind us and cheer for Angel Cordero as he rides by on a bay mare. Murphy rubs his hands together, partly on account of the cold and partly in anticipation of demonstrating the rewards of his Kaypro-reckoned system. Grecian Comedy, never far behind, rallies from the outside in the final furlong and prevails over Medieval Moon in a drive. She pays $12. The judges award a trophy to Grecian Comedy, but I am reluctant to confide to Murphy that I am holding a winning ticket. I walk back inside with him, and when I turn toward the betting window he brusquely mutters something about luck.

I see Murphy at the track on other occasions, but that is the last time I talk to him. We both look longingly at the swells in the clubhouse, the ones who seem to do nothing but win and win big. We both stare enviously at the sleek cars brought forth by the valet. It is a vale of tears, but I at least am protected by my ignorance. Murphy enjoys no similar defense. He is wide open, as susceptible as a fawn among wolves. I often think of him with his Kaypro process: the hundreds of factors that must be weighed and considered, the fatiguing search for a handicapping touchstone. There is nothing so fleeting as luck, or so indefinable as intuition. Yet Murphy persists like the hermeticist. It is an alarmingly simple chore: pick the winner from three or four likely candidates. Be smarter than 85% of the people. Condition or present form may vary, but class is fundamental.

But Murphy is encumbered with more than his Kaypro. He carries more than the draft horse. He seeks to eliminate the guesswork, to gain the advantage in the long-shot play. By hoping to evaluate the past quantitatively in order to predict an essentially qualitative event in the future, he is forgetting what makes horse races—guesswork, and hunches, and a startling variety of opinion. One bettor notes the kidney sweat on an otherwise promising roan gelding, while another overhears two men looking at their *Racing Forms*. Another hears at the last minute that Eastern Witch is running with blinkers for the first time, or that Eddie Maple has replaced Michael Venezia on a puzzling mount. The impromptu decisions, those perhaps only partially based on some rational method, are the ones that seem to pan out most often.

No one could ever convince Murphy of this. He succeeds intermittently, and then fails, and then jimmies his system one way or another until he briefly succeeds again. He faults factors other than his system and cannot figure how bettors like myself can occasionally see past the obvious winners to the proverbial dark horses.

As I last leave the track I hear this Dominican guy singing a song which is capricious. It reminds me that all is not gloom at the track, and that some people manage to come out ahead. The Dominican maybe places his bets because he likes the jockey, or because he likes the name of a certain pony. It is his song that Murphy's software can never hear, and it is his song that is perhaps heard by the 20-to-1 filly as she moves toward the gate.

—Raymond Onion
Lexington, Kentucky

If you'd like to share your opinions, gripes, or experiences with other readers, send them to the Forum Editor, DATAMATION, 875 Third Ave., New York, NY 10022. We welcome essays, poems, humorous pieces, or short stories.

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