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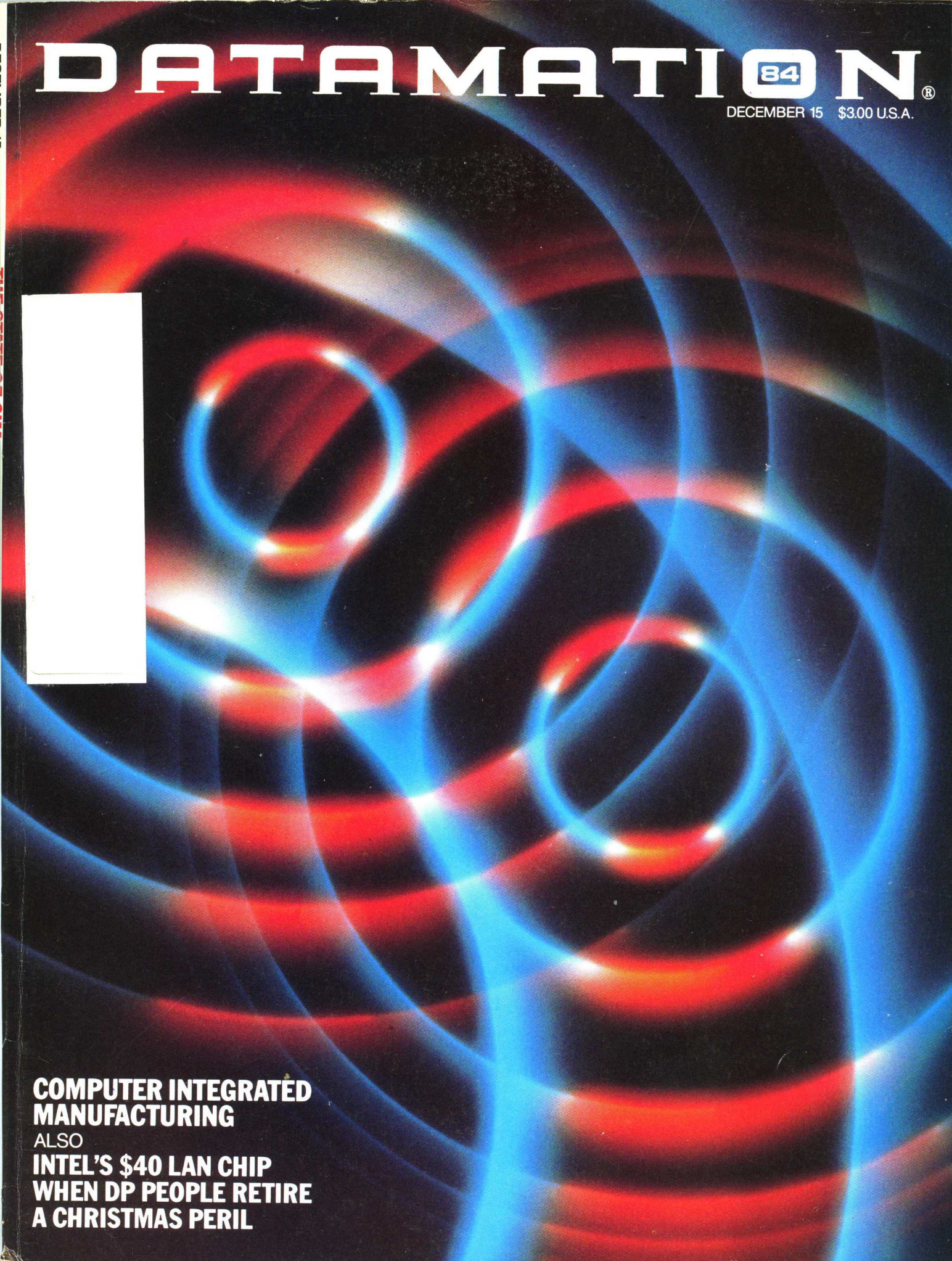

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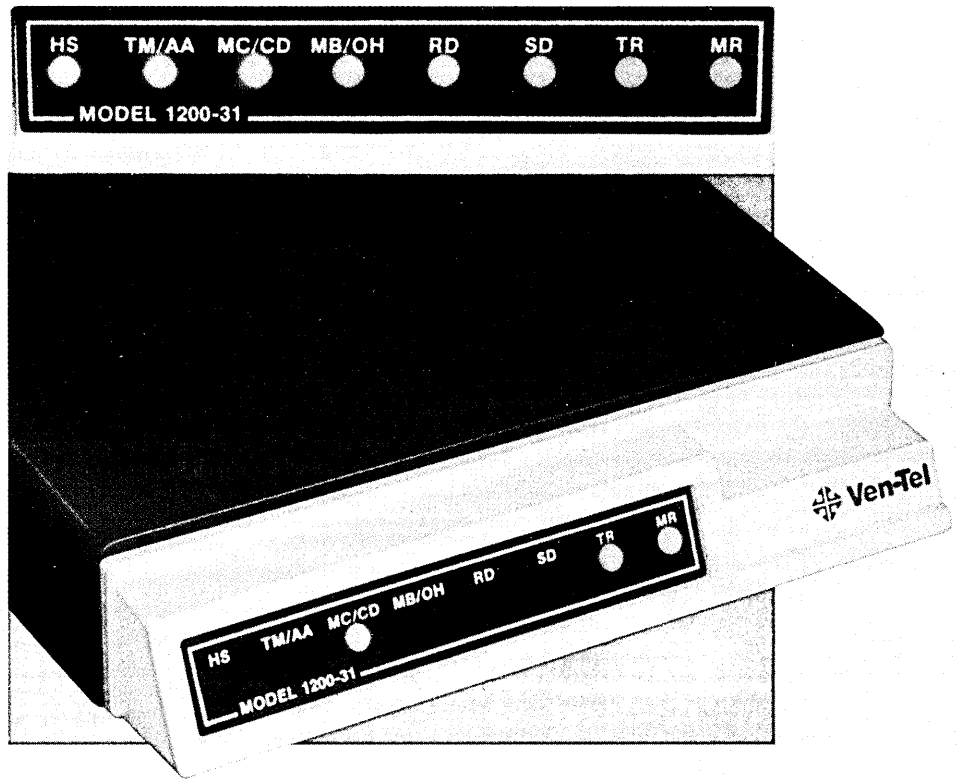

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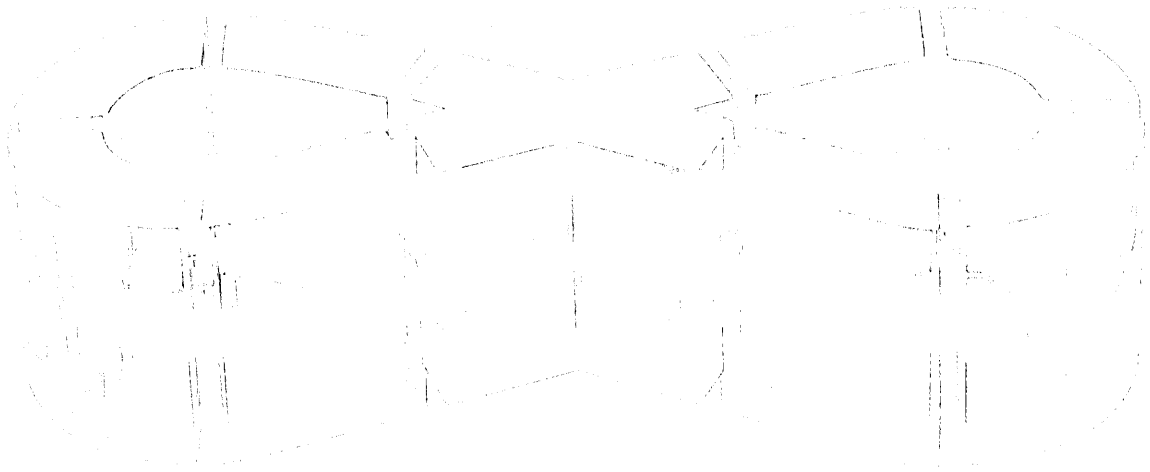

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NEWS IN PERSPECTIVE

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CIRCLE 6 ON READER CARD

Introducing connections for

With the new IBM Personal Computer AT/370, you can work with hundreds of VM programs and with mainframe data right at your desk. And only IBM offers a personal computer with VM capabilities.

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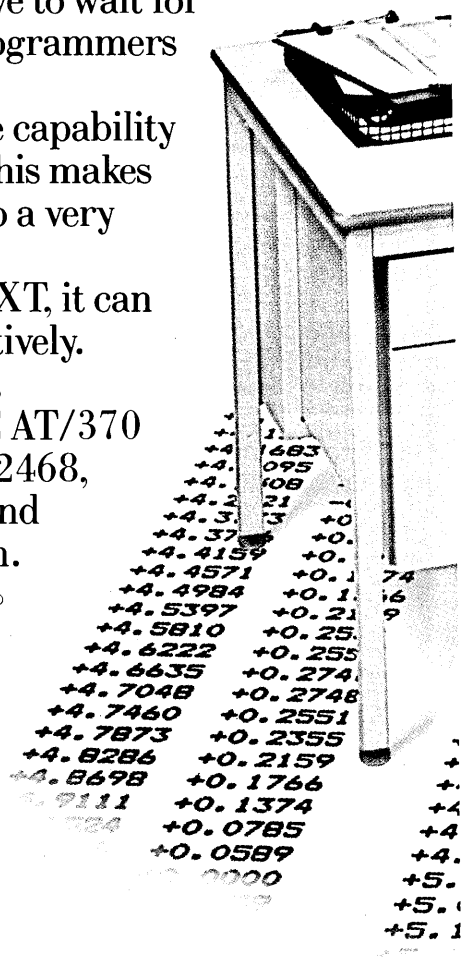
There is faster response time because you don't have to wait for the host. And there is greater data privacy because programmers only have access to the host data they need.

You also get 20 or 40 megabytes of storage plus the capability of running thousands of existing IBM PC programs. This makes the PC AT/370 not only a powerful connection but also a very versatile one.

One further point: If you already have a PC AT or XT, it can easily be upgraded to a PC AT/370 or XT/370 respectively. Ask your IBM marketing representative for the details.

And if you want to receive literature on how the PC AT/370 can turn your desk into a Smart Desk, call 1 800 IBM-2468, Ext. 82, or send in this coupon.



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The Smart Desk from IBM

more powerful high-level thinkers.

LOOKING BACK

BUYING SPREE

December 1964: Control Data Corp. and Computer Sciences Corp. (CSC) headed DATAMATION's Washington Report this month, as each made news by adding a new division.

CSC quadrupled its size in just a week's time by acquiring in an exchange of stock Documentation Inc., operator of NASA's Scientific and Technical Information Facility, as well as acquiring Communications Systems Inc. and Intelcom Inc., two orphaned divisions of International Telephone and Telegraph.

Documentation Inc. had estimated revenues of $6.5 million, and the two former ITT divisions together were reportedly worth $12 million a year, making CSC a "Goliath with annual revenues in excess of $23 million."

Control Data did its share in acquisitions by picking up Datatrol Corp. of Silver Spring, Md., fulfilling its long-burning desire for an East Coast software house. CDC was expected to put Datatrol to use in its government sales efforts, although it was reported the company would remain an independent, largely autonomous division.

DATAMATION observed that both acquisitions were made "under omens of continued favorable business prospects for Washington-area think-type firms."

THE MYTH GOES EVER ON

December 1974: In this month's issue, DATAMATION published an article that even now proves to be a popular reader request. That article was "The Mythical Man-Month," by Frederick P. Brooks.

Taken from his book, *The Mythical Man-Month: Essays on Software Engineering* (Addison-Wesley, 1975), Brooks's article offered his views on managing large software projects. He earned his say-so by being a part of the management team charged with the task of developing the hardware for the IBM 360 system and after that, becoming manager of the Operating System/360 project. Trial by fire, no doubt.

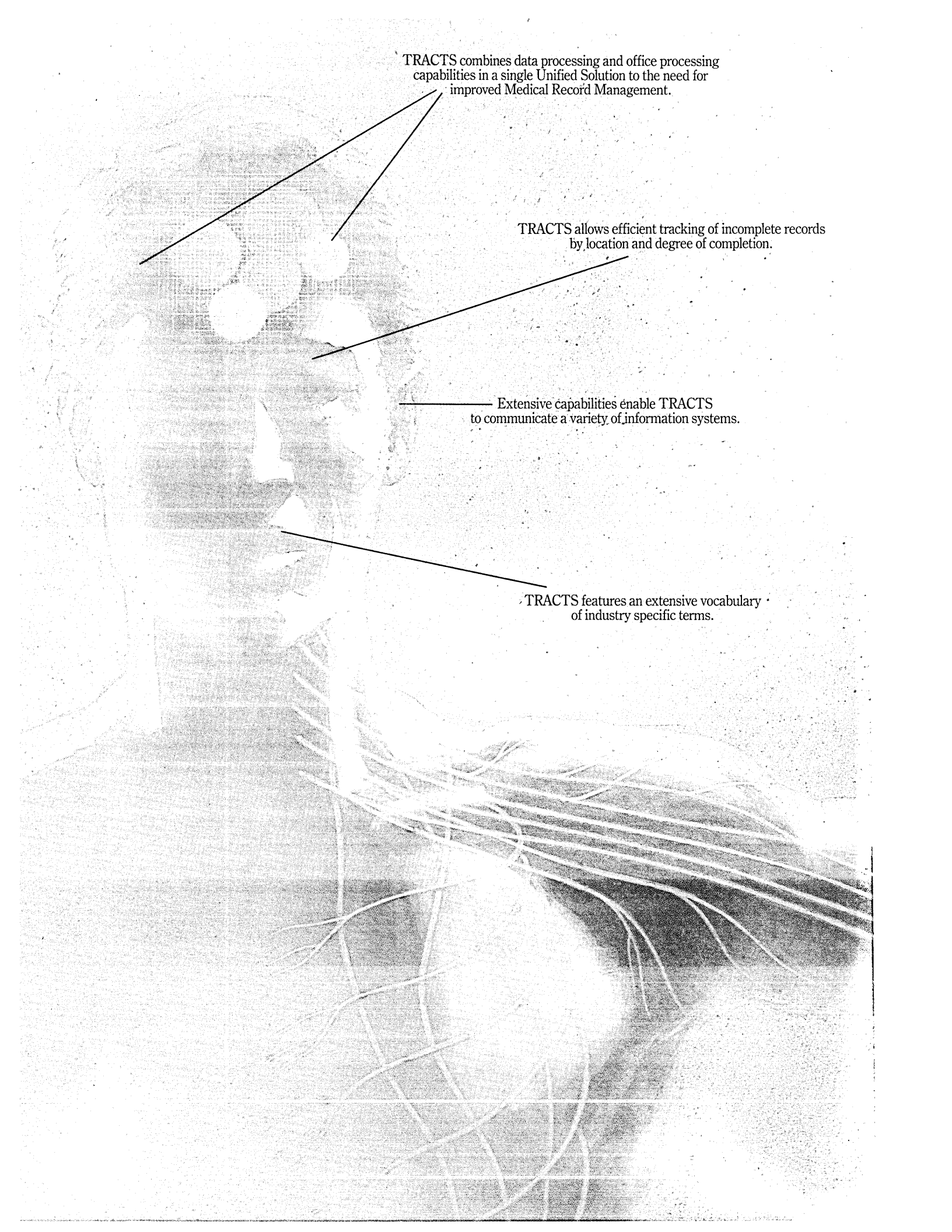
Software projects, be they large or small, said Brooks, are beset by any number of problems that of course contribute to their lateness. Often, the projects go awry more for lack of calendar time than for all other causes combined. Brooks gave five reasons why this could be so. First of all, he said, our techniques for estimating are poorly developed, and reflect the untrue assumption that all will go well. Second, our estimating techniques fallaciously confuse effort with progress, hiding the assumption that men and months are interchangeable. Third, because of the uncertainty of our efforts, "software managers often lack the courteous stubbornness required to make people wait for a good product." Fourth, schedule progress is poorly monitored. Fifth, when schedule slippage is recognized, the natural and traditional response is to add manpower. Brooks likened this technique to dousing a fire with gasoline: both make matters much worse.

As for the mythical man-month, Brooks said that while cost does vary as a product of the number of men and the number of months, progress does not. He claimed that men and months are only interchangeable commodities when tasks can be partitioned among many workers *with no communication among them.* When a task cannot be partioned due to sequential constraints, the application of more effort has no effect on the schedule. Moreover, he said, since a systems effort is an exercise in complex interrelationships, communication effort is great, and quickly dominates the decrease in individual task time. Adding more men then lengthens, not shortens, the task.

Brooks also offered solutions, as well as the insights of other knowledgeable people into accurate scheduling.

—Lauren D'Attilo

ANOTHER DIRECTED SOLUTION FROM HONEYWELL


TRACTS combines data processing and office processing capabilities in a single Unified Solution to the need for improved Medical Record Management.
TRACTS allows efficient tracking of incomplete records by location and degree of completion.
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The marvel of our central nervous system is that thousands of bits of information can be received, transmitted and stored all at the same time.

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TRACTS is built around Honeywell's Office Automation System (OAS), designed to free hospital staffs from redundant and time consuming tasks, while improving speed and accuracy at the same time.

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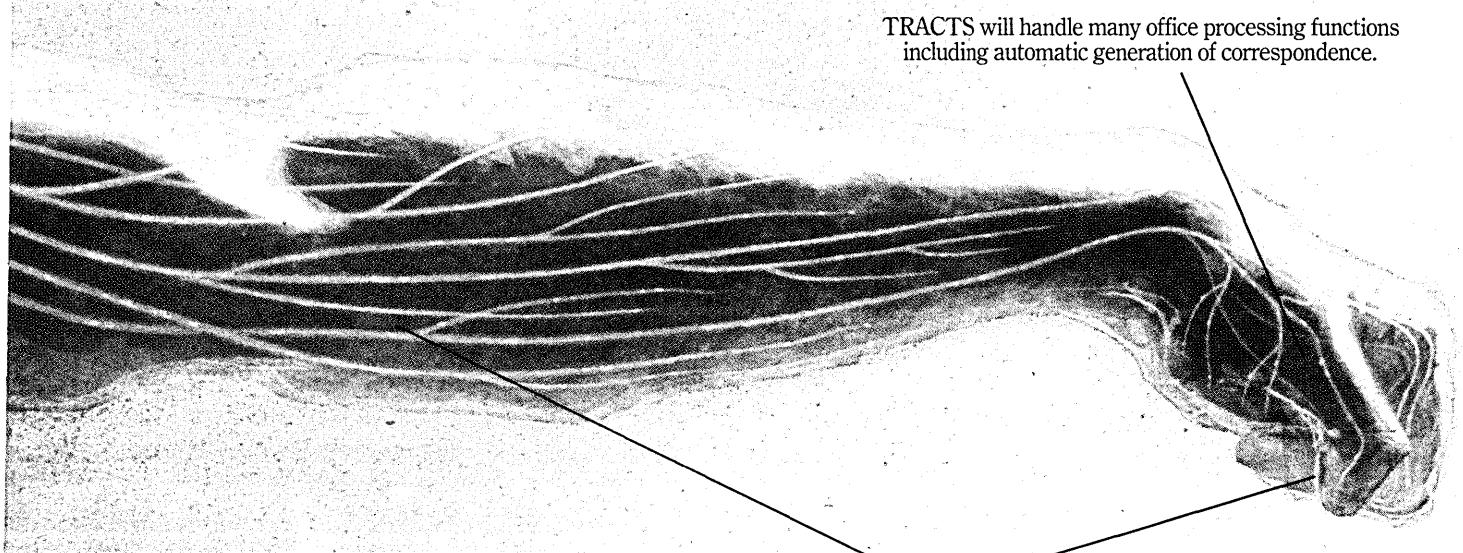
The system also supports electronic mail, InfoCalc, file tranfers and an array of other application programs. No other system is so complete.

And when hospitals can operate with that kind of precision, we all benefit from better health care.

Find out more about TRACTS today. Call us at 800-328-5111, Ext. 2747 (in Minnesota, call collect: 612-870-2140, Ext. 2747.) Or write to the Honeywell Inquiry Center, 200 Smith Street, Waltham, MA 02154. We'll be happy to send literature, discuss the system with you, and even arrange a demonstration.

Together, we can find the answers.

Honeywell



CIRCLE 7 ON READER CARD

WE'VE SOLD 500,000 TERMINALS

LOOK AHEAD

NEW XENIX PUSH BY MICROSOFT...

A major Xenix promotional and support effort will soon be under way by Microsoft. Insiders say that the company is already shipping PC ATs with Xenix development packages to independent software vendors in order to have a decent number of applications packages available when IBM begins selling the multitasking, multi-user operating system software next spring. Perhaps because of doubts about whether IBM is going to support an outside package like Xenix rather than develop its own multi-user system for micros, Microsoft intends to take the lead in pushing Xenix, even at the expense of MS/DOS. Officials of the Bellevue, Wash., firm are taking to heart internal IBM predictions it will ship 200,000 PC ATs in 1985.

...THOUGH PC AT HARD DISKS ARE DOA

Dealers are reporting that from 10% to 60% of their shipments of the PC AT are being delivered with faulty 20MB Winchester disk drives. The dead-on-arrival units are supposedly from Computer Memories Inc., Chatsworth, Calif., which only recently won its first high-volume contract from Big Blue. CMI acknowledges that the company is undergoing "growing pains" in gearing up for the PC AT order, but denies that problems are as serious as dealers contend. In any case, IBM is reportedly looking for a second source, while its Minnesota-based Independent Business Unit continues to develop a box. That's why IBM's primary supplier of 10MB drives for the XT, Seagate Technology, Scotts Valley, Calif., has a new product matching the CMI specs.

SHORT LIFE FOR S/2000?

Intel Corp.'s database management system, called System 2000, is essentially dead, according to users who have been informed by Intel that it will not support it much longer. Limited sales to date and dim prospects are behind the shift, sources say. Although the package, part of the MRI Corp. acquisition a few years ago, is profitable, the big problem is that S/2000 lacks a fourth generation language. Intel promises customers that they will have one "as soon as you can send in the order," skeptical customers note. Another source reported that Intel is trying to sell the business to its deep-pocketed number one investor, IBM.

VARS TO TAKE 20% OF BIZ?

The flurry of efforts by big and medium-sized computer vendors to sign up value-added resellers, dealers, and other third parties is gaining momentum. Prime Computers and Wang Laboratories are but the latest to launch new efforts,

LOOK AHEAD

	alongside rejuvenated var programs at Honeywell and Burroughs. These companies are hoping that their indirect distribution channels will comprise 20% or more of their total computer revenues within three years. Currently, the var channel is less than 5% of the industry's total take.
$20,000 UNIX SYSTEM WITH 50MB	The Unix bandwagon continues to roll, with a pioneer in the multi-user micro market joining the crowd. Ohio Scientific Computer Inc., the Aurora, Ohio, wunderkind in the late 1970s before a series of disastrous acquisitions killed off its promise, will soon ship a 50MB multi-user Unix system for less than $20,000. With funding from its newest parent, a Swedish investment firm called Isotron, OSCI will deliver its Unix system with seven applications modules developed by a British firm, Redwood Software.
750 PAGES TO MASTER SYMPHONY	It's no wonder sales of Lotus Development Corp.'s new integrated micro software package are not reaching the scorching rates set by 1-2-3. The new help manual from Sybex, called "Mastering Symphony" by Douglass Cobb, weighs in at almost three pounds and 750 pages. Even Lotus's own tome, "The Lotus Guide to Learning Symphony," is two pounds plus with more than 450 pages. Rumors that Ashton-Tate's integrated package, Framework, will be repackaged in smaller pieces may point the way for Lotus to make Symphony more palatable to those potential users lacking the days and nights needed to learn the program.
RUMORS AND RAW RANDOM DATA	We hear that General Electric is interested in buying the bankrupt Storage Technology Corp. While no one has yet to express interest in the disk or tape drive business other than the Japanese pcms, GE is reportedly interested in the massive storage capacity of StorageTek's laser technology. . . . While IBM continues to annoy its dealers with cutthroat pricing, Houston-based Compaq Computer keeps on trying to win over retailers. Big Blue's latest deal is an offer to pay for the dealers' Yellow Pages space in return for an additional listing, under the company's name, in the computer section of the phone book. . . .Will the assassination of India's prime minister, Indira Gandhi, derail the export of an Elbruf machine from the Soviet Union? The Indian nuclear regulatory agency has ordered the parallel processor with 12MFLOPS for around $15 million, but the new prime minister is purportedly much closer to the West and may cancel the deal.

Make Stat Magic

Statistics, reports and plots happen magically with SPSS/PC — *the Statistical Package for IBM PC/XTs.*

SPSS/PC is the most comprehensive statistical package for performing simple or complex tasks, regardless of data size. It maintains feature and language compatibility with mainframe SPSS while optimizing for the PC environment.

Statistics range from simple descriptive to complex multivariate, including Multiple Regression, ANOVA, Factor and Cluster analysis. Loglinear and nonparametric procedures are also included.

Simple facilities allow transfer of files between

SPSS/PC and programs like Lotus 1-2-3, dBase II and SAS. A complete Report Writer, Plotting facilities and a Communications program for mainframes round out a fully integrated product.

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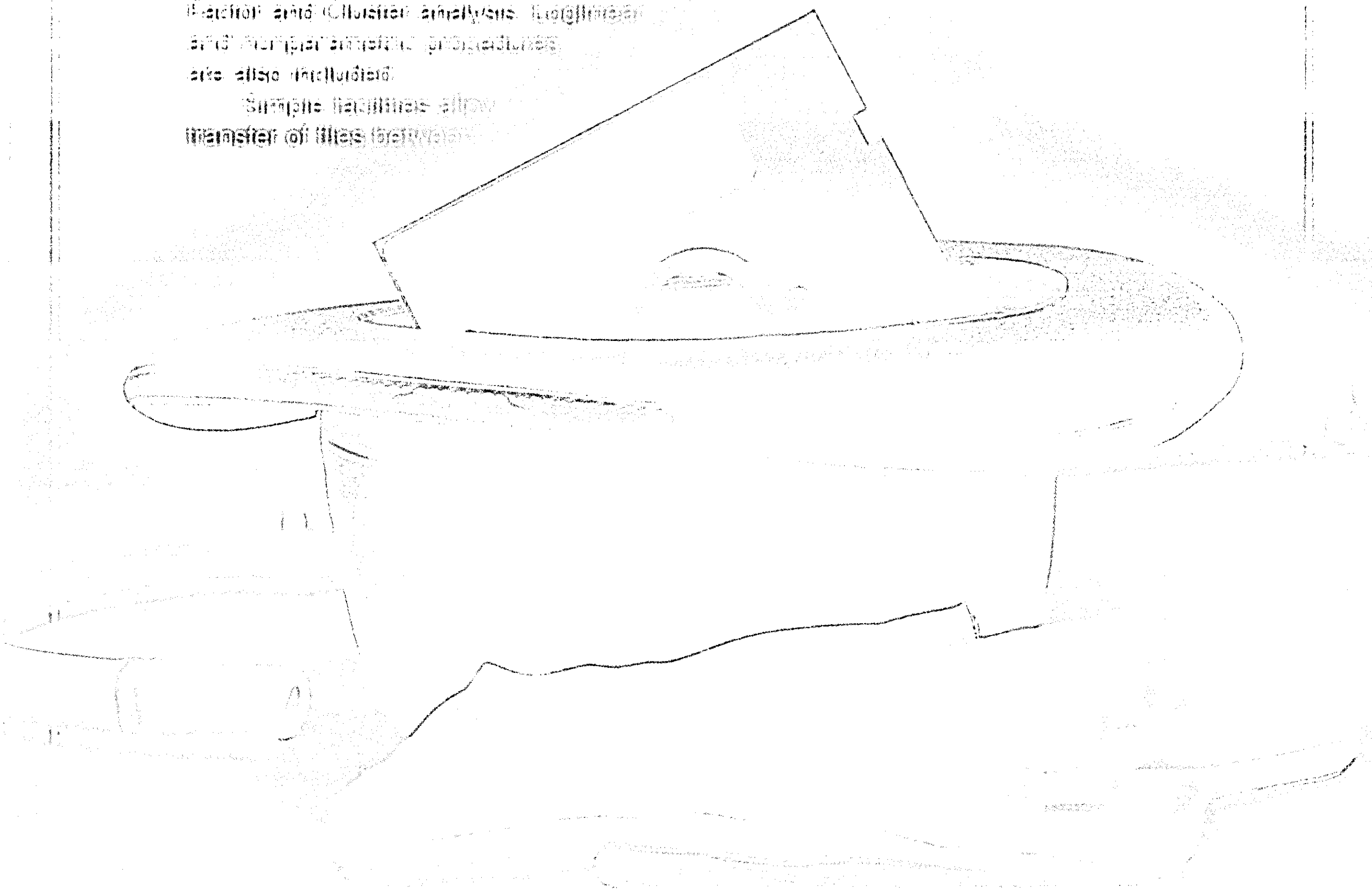
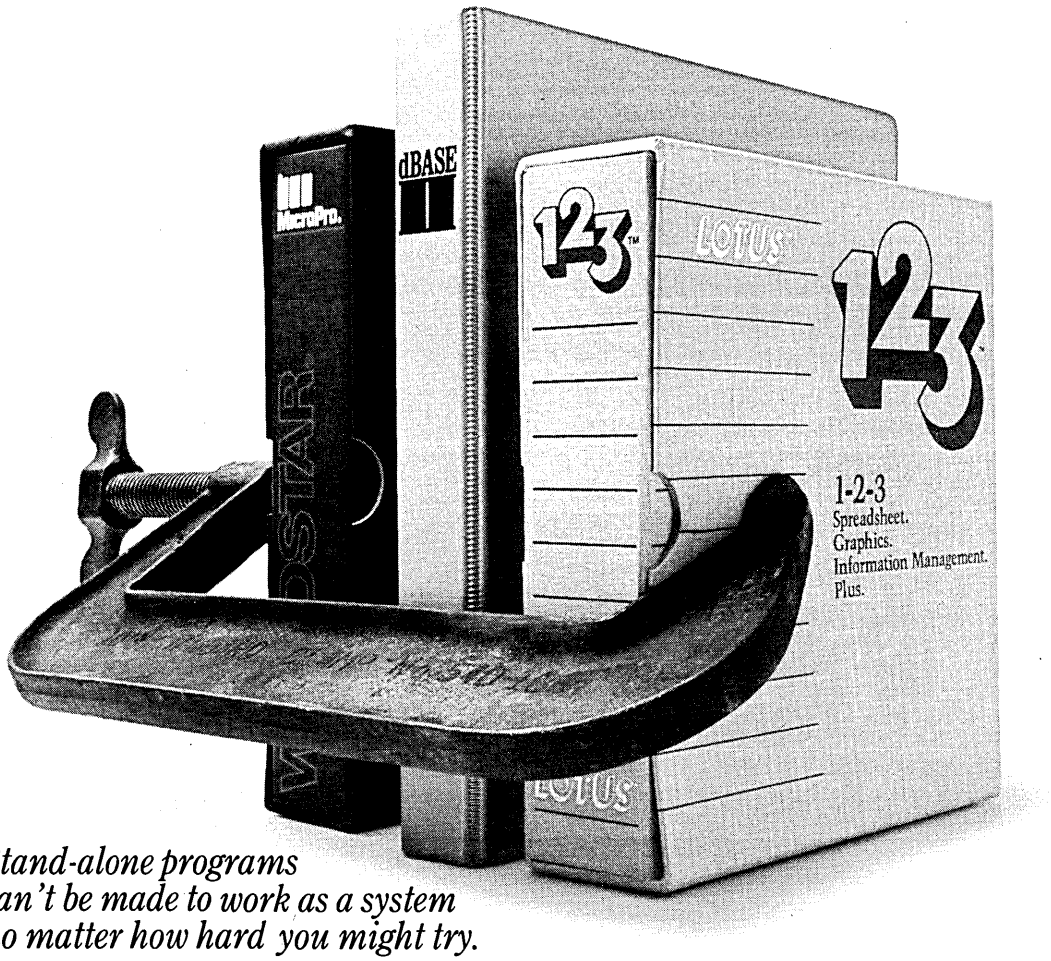


Dumb.



Stand-alone programs can't be made to work as a system no matter how hard you might try.

Stand-alone programs are fine. Unless, of course, you need them to work together. Because the sum of the parts will never equal a whole.

That's why even the highly touted WordStar,® dBase II™ and 1-2-3,™ programs don't make sense as a business system.

They were designed to perform very specific application functions only, and therefore, make miserable workmates.

Fortunately, there's a smart solution. It's the new Smart Software System.

Smart's unique "modular integration" is the key to productivity. It means that The Smart Word Processor, The Smart Data Manager

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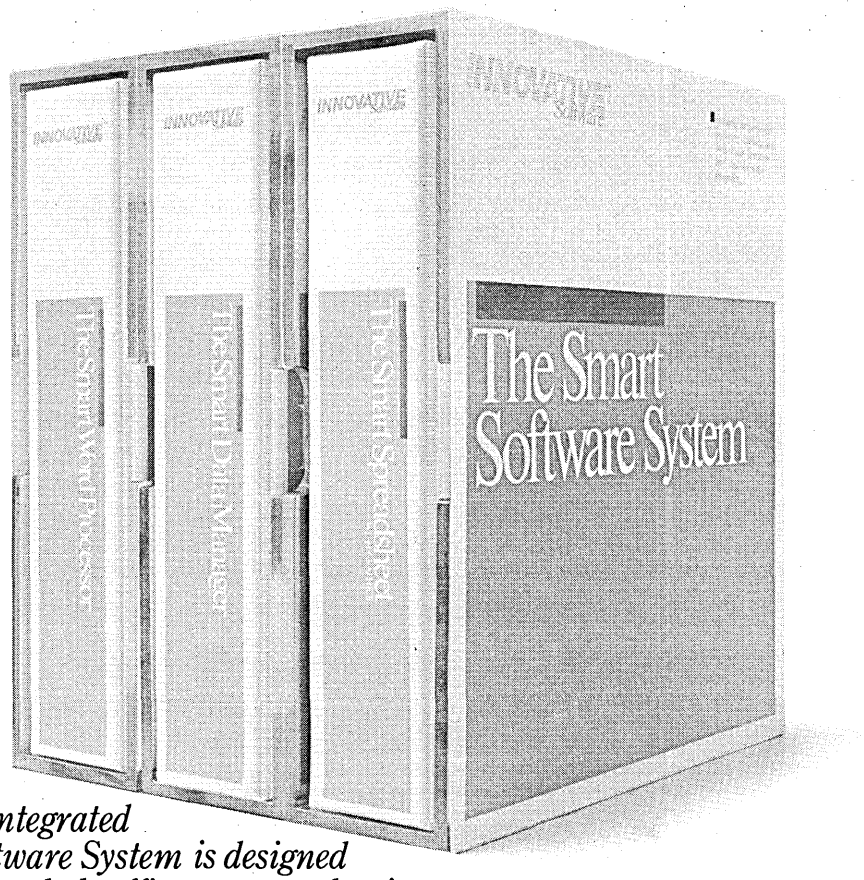

The fully integrated Smart Software System is designed to make the whole office more productive.

and The Smart Spreadsheet with Graphics not only have the uncompromising power and capacity of these leading stand-alone programs, but they also have the unprecedented capability to work brilliantly together.

So you can easily transfer data and pass commands from one to another. Which means that you can compile financial data, to be included in graph-form, within the text of a printed report, that's mailed to a list drawn from the data manager—automatically.

Don't short change your business by attempting to squeeze the impossible out of a makeshift software system. Get Smart, and the whole office will thank you.

Smart is available for the IBM PC, PC/XT, PC/AT, and compatibles. For information call, 800-GET-SMART. (In Kansas call, 913-383-1089).

Smart Software
from Innovative Software

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CALENDAR

JANUARY

PC FAB Expo.
Jan. 9-10, Orlando, Fla. Contact Frances Stewart, PMS Industries, 1790 Hembree Rd., Alpharetta, GA 30201, (404) 475-1818.

Asian Aerospace Expo & Conference.
Jan. 18-22, Singapore. Contact Gerlad Kallman, Kallman Associates, 5 Maple Court, Ridgewood, NJ 07450, (201) 652-7070.

Communication Networks Conference & Exposition.
Jan. 28-31, Washington, D.C. Contact William R. Leitch, General Manager, Commmunication Networks, P.O. Box 880, Framingham, MA 01701, (800) 225-4698 or (617) 879-0700.

Microcomputer '85.
Jan. 29-Feb. 3, Frankfurt, Germany. Contact Philippe Hans, German American Chamber of Commerce, 666 Fifth Ave., 21st fl., New York, NY 10103, (212) 974-8856.

FEBRUARY

1985 Office Automation Conference (OAC '85).
Feb. 4-6, Atlanta, Ga. Contact Marty Byrne, American Federation of Information Processing Societies Inc., 1899 Preston White Dr., Reston, VA 22091, (703) 620-8940.

Stride Faire.
Feb. 8-10, Reno, Nev. Contact Laura Smith, Stride Trade Show Manager, Burson-Marsteller, 2041 Mission College Blvd., Suite 245, Santa Clara, CA 95051, (702) 322-6868.

APAC '85.
Feb. 11-14, Riyadh, Saudi Arabia. Contact World Computer Graphics Association Inc., 2033 M St. NW, Suite 399, Washington, DC 20036, (202) 775-9556.

1985 IEEE International Solid-State Circuits Conference.
Feb. 13-14, New York. Contact Lewis Winner, 301 Almeria Ave., Coral Gables, FL 33134, (305) 446-8193.

AFIPS-ASIA '85.
Feb. 14-March 2, aboard the MV Worldwide Expo, to Japan, Taiwan, Hong Kong, Singapore. Contact AFIPS, 1899 Preston White Dr., Reston, VA 22091, (703) 620-8926.

International Computer Graphics Users Show and Conference (CGU '85).
Feb. 19-21, London, England. Contact World Computer Graphics Association Inc., 2033 M St. NW, Suite 399, Washington, DC 20036, (202) 775-9556.

INFO/Central.
Feb. 20-22, Chicago. Contact Show Manager, INFO/Central, 999 Summer St., Stamford, CT 06905, (203) 964-8287.

Computer Business Graphics.
Feb. 20-23, Fort Lauderdale, Fla. Contact Carol Every, Industry Representative, Frost & Sullivan, 106 Fulton St., New York, NY 10038, (212) 233-1080.

MACWORLD Exposition.
Feb. 21-23, San Francisco. Contact World Expositions, Mitch Hall Associates, P.O. Box 860, Westwood, MA 02090, (617) 329-7466.

MICAD'85.
Feb. 25-March 1, Paris, France. Contact World Computer Graphics Association Inc., 2033 M St. NW, Suite 399, Washington, DC 20036, (202) 775-9556.

MARCH

FOSE (Federal Office Systems Expo).
March 4-7, Washington, DC. Contact National Trade Productions, 2111 Eisenhower Ave., Suite 400, Alexandria, VA 22314, (800) 638-8510 or (703) 683-8500.

1985 Conference on EDP Performance Management.
March 11-14, Phoenix, Ariz. Contact Applied Computer Research Inc., P.O. Box 9280, Phoenix, AZ 85068-9280, (602) 995-5929.

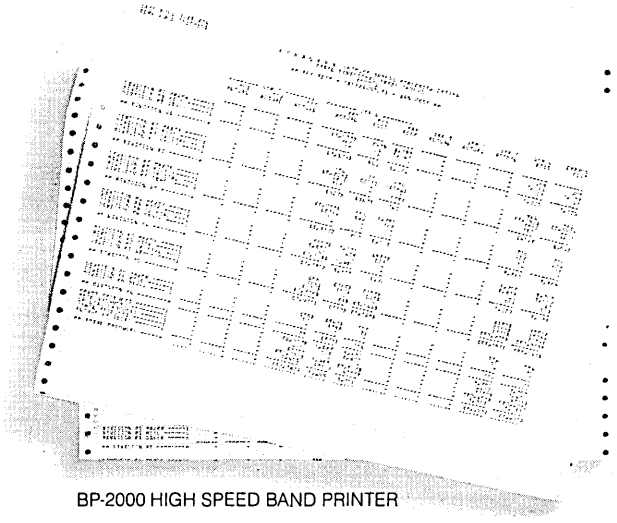
Seventh Annual National Office Exhibition & Conference.
March 12-14, Toronto, Ontario. Contact Jim Mahon, Show Manager, National Office Exhibition and Conference, 20 Butterick Rd., Toronto, Ont., Canada M8W 3Z8, (416) 252-7791.

COMTEL '85 (The International Computer and Telecommunications Conference).
March 18-20, Dallas. Contact Comtel '85, Director of Communications, International Computer & Telecommunications Conference, 5080 Spectrum Dr., Suite 707E, Box 17, Dallas, TX 75248, (214) 631-6482.

Intelligent Buildings & Information Systems Spring Conference (IBIS).
March 18-19, Fort Lauderdale, Fla. Contact Tom Cross, Cross Information Co., 943 Pearl, Suite C, Boulder, CO 80302, (303) 444-7799.

AIRCON 2 (The Second Annual International Conference on Artificial Intelligence for Robotics).
March 21-22, Arlington, Va. Contact IIT Research Institute, 10 West 35th St., Chicago, IL 60616, (312) 567-4025.

The Second Annual Computer & Electronics Furniture Show.
March 24-26, San Mateo, Calif. Contact National Fairs, 1902 Van Ness Ave., San Francisco, CA 94109, (415) 474-2300.



BP-2000 HIGH SPEED BAND PRINTER

M-100L
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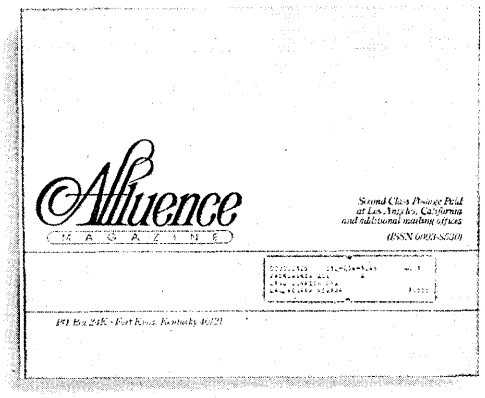
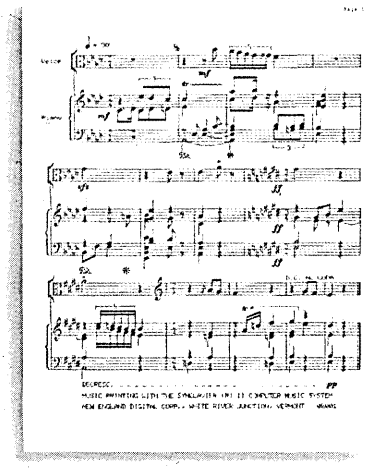
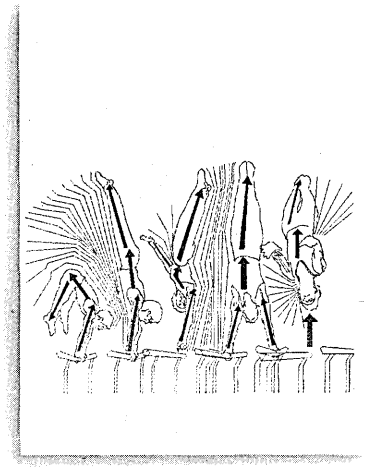


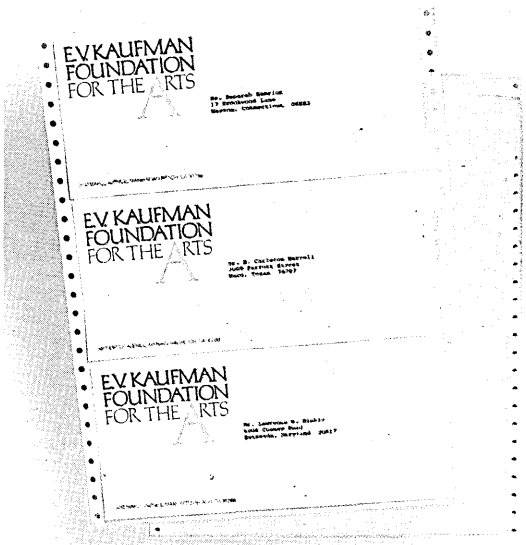
B-600 MEDIUM SPEED BAND PRINTER



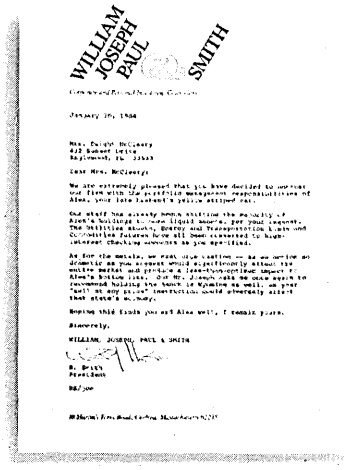
8010 MATRIX PRINTER



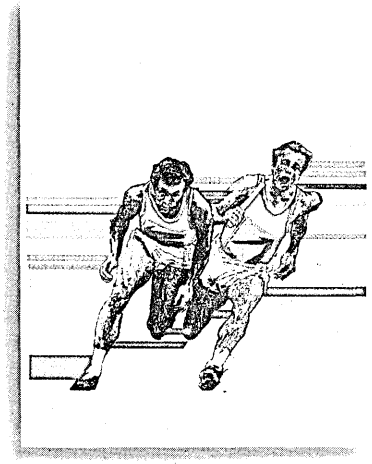
8020 MATRIX PRINTER



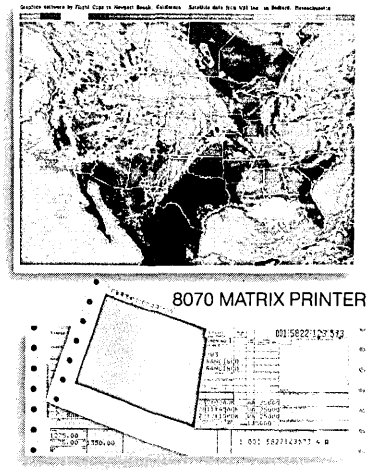
DP-55 DAISYWHEEL PRINTER



DP-35 DAISYWHEEL PRINTER



8050 MATRIX PRINTER



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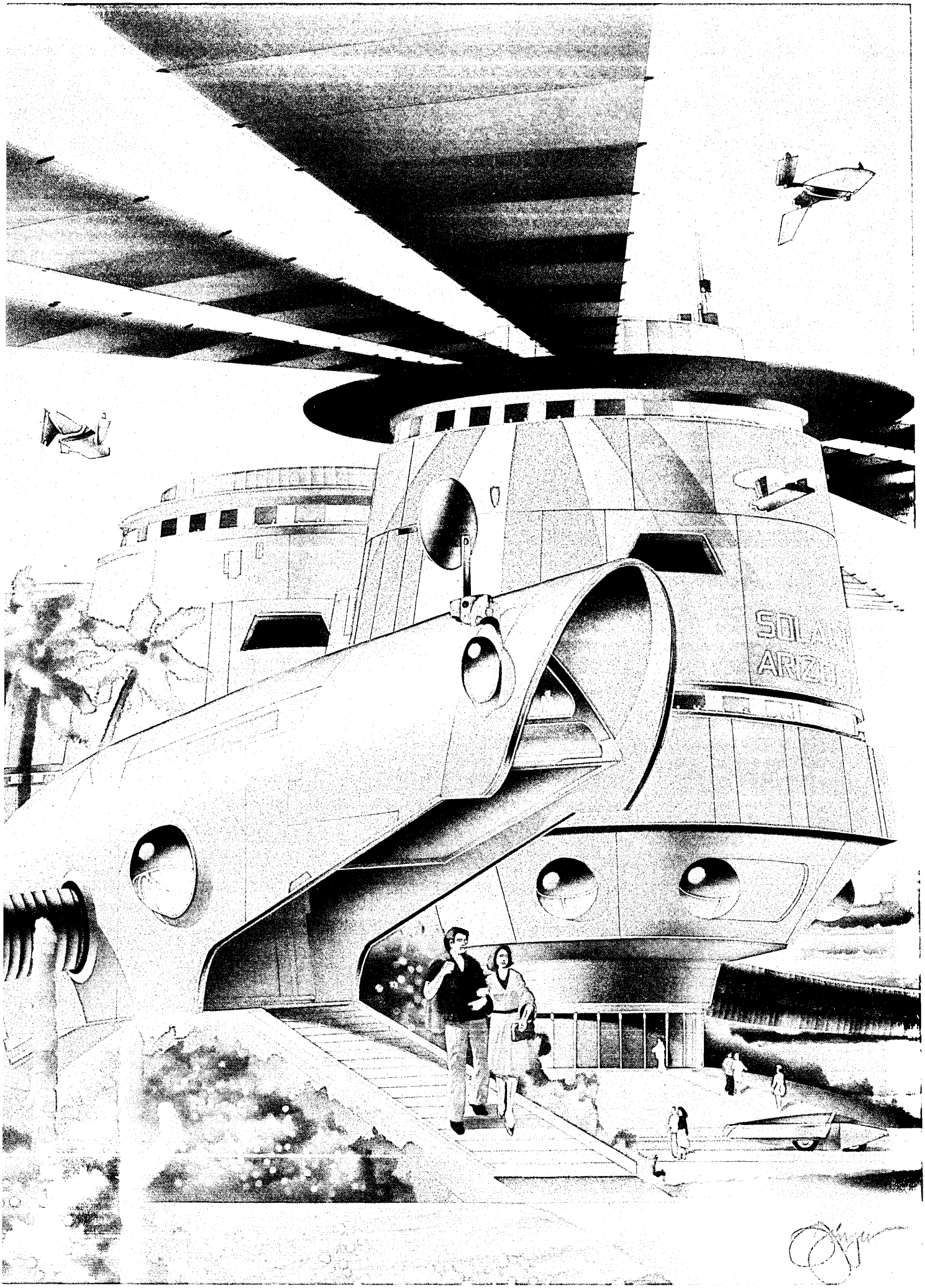

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CIRCLE 13 ON READER CARD

LETTERS

FIRST THINGS FIRST

In On the Job (Oct. 1, p. 168), you featured XXCAL, a dp recruiting firm that "claims to have originated the option to hire concept." While it may be true that they coined the phrase "option to hire," the concept of a front-end agreement providing for the conversion of contract employees to permanent or direct personnel is hardly a new trend.

IDI Corp., a Milwaukee-based contract engineering services firm, has been providing this "contract to direct" option to its clients and personnel since the 1960s. This approach was so well received by its customers and employees that IDI formed a technical permanent employment agency—Techni-Search Inc.—to facilitate the process and to meet various state regulations.

PHILIP C. HOPPERT
Techni-Search Inc.
Milwaukee, Wisconsin

MORE POISON

I read of your concern with the toxic waste resulting from semiconductor manufacturing operations ("Poison in Paradise," Aug. 15, p. 30).

Similar problems exist with printed circuit board manufacturers. The manufacturers tend to be smaller and to have more limited resources than the semiconductor industry, so that their interest in the proper environmental handling of their toxic chemicals is rudimentary.

EVELYN BEREZIN
Glen Cove, New York

INSECURITY

I was intrigued by the Benchmark (Oct. 1, p. 64) on DOD's plan to establish a Software Engineering Institute "... encouraging the use of advanced software environments in developing computer-intensive weaponry." On the facing page is an ad for Codercard that states in part, "you'll never achieve total invulnerability." This is referring to inability to maintain complete secrecy in any computer program.

This apparently random placement seems to tell how the U.S. has operated for years in regard to the "secret" development of any and all of its more sophisticated technology.

Even if unintentionally, you have made a very apt point.

LORRAINE KIEFER
St. Ann, Missouri

UNIX IS CHEAPER AND BETTER

I was surprised at some inconsistencies in your articles on Unix, and particularly the commentary presented by David Morris ("How Not to Worry About Unix," Aug. 1, p. 83). One example stands out: "The capabilities of existing pc operating systems are so sophisticated that they already do everything Unix can do—and often more—in a more user-friendly way."

Then, three paragraphs later: "Server processes would be easily handled by the multitasking Unix, which can run them as background tasks while application programs run in the foreground. MS/DOS isn't really geared to handle this chore."

He's right in the second case, and misleading in the first. Just as CP/M won the 8-bit market and MS/DOS the 16, Unix will be the operating system of choice for 32-bit systems. That's because ease of use requires large address spaces and powerful, multitasking, high-performance 32-bit machines (for example, the built-in features of systems like Lisa and Macintosh), and 8- and 16-bit systems running CP/M and MS/DOS simply cannot deliver it.

Granted, there is a big world of MS/DOS software that will keep IBM PC and AT systems popular for some time, but the direction of this type of powerful yet easy-to-use computing is to 32-bit multitasking and multi-user systems. I also disagree with Morris's belief that technology has passed multi-user personal computers by. Microprocessors like the Motorola 68020, which Charles River Data Systems and other computer manufacturers will incorporate into their systems, are state-of-the-art processors. In addition, the economics for multi-user systems vs. networked pcs is compelling; one has only to look at "Local Nets for Micros" in the same issue (p. 104). In Fig. 2 of that article, the authors estimate the true cost of a six-system LAN installation as somewhere between $22,365 (best case) and $45,515, excluding the cost of the hardware.

I submit that one can buy a more powerful and more responsive 32-bit microcomputer with six terminals for just the cost of the LAN. And when you add somewhere between $18,000 and $24,000 for pcs to the cost in the local nets article, it brings the price of six networked pcs to somewhere between $40,365 and $63,515. For the same amount of money you can buy a number of multi-user supermicrocomputer systems that can do a lot more computing in a shorter amount of time.

My point is that technology, in the form of extremely functional operating systems such as Unix and its derivatives and microprocessors such as the 68020, and economics as stated above favor multi-user systems. While it may take time for this to have a direct impact on dp managers (it addresses technical oems first), it's important to discuss this trend accurately.

JAMES D. ISAAK
Director of Product Marketing
Charles River Data Systems
Framingham, Massachusetts

MONEY IS THE ROOT

Your article, "The Big Wallet Era" (Sept. 15, p. 76), does a disservice to the dp industry by publishing average annual sala-

ry increases that are grossly inflated and not representative of the real world. You base your figures on .012% of the 60,000 computer sites from your subscriber list, hardly a representative sampling. In addition, most of the questionnaires were completed by data processing managers. We participated in your survey and our annual salary increases for 1984 and for 1985 are and will be 6%, considerably lower than the 7.9% you list for Chicago.

Our personnel department, when presented with a copy of your survey, flatly rejected it as information collected by data processing personnel for data processing personnel, and therefore little credence is given to it. Their opinion is that these surveys are skewed to make the profession appear more lucrative than one really finds in the business world.

Instead of publishing only your own surveys, why don't you try comparing them to other surveys with a more substantive sampling and then publishing the results of the comparison? You will find a picture not quite as rosy as you have painted.

J.D. BONDY
Year Book Medical Publishers
Chicago, Illinois

The response of more than 700 dp sites around the country is a pretty broad picture of conditions in the industry. While it may be a small percentage of the total number of sites, the mailing list and respondents were representative of the domestic audience of DATAMATION. Sampling techniques are standard for surveys of this type and follow traditional methodologies. Professional research organizations use the same methodology, and their results on dp salaries are similar to ours, even though in some cases their sample size is smaller. For example, The Wyatt Co.'s Executive Compensation Service included data from only 550 companies.—Ed.

CRIME IN CHICAGO

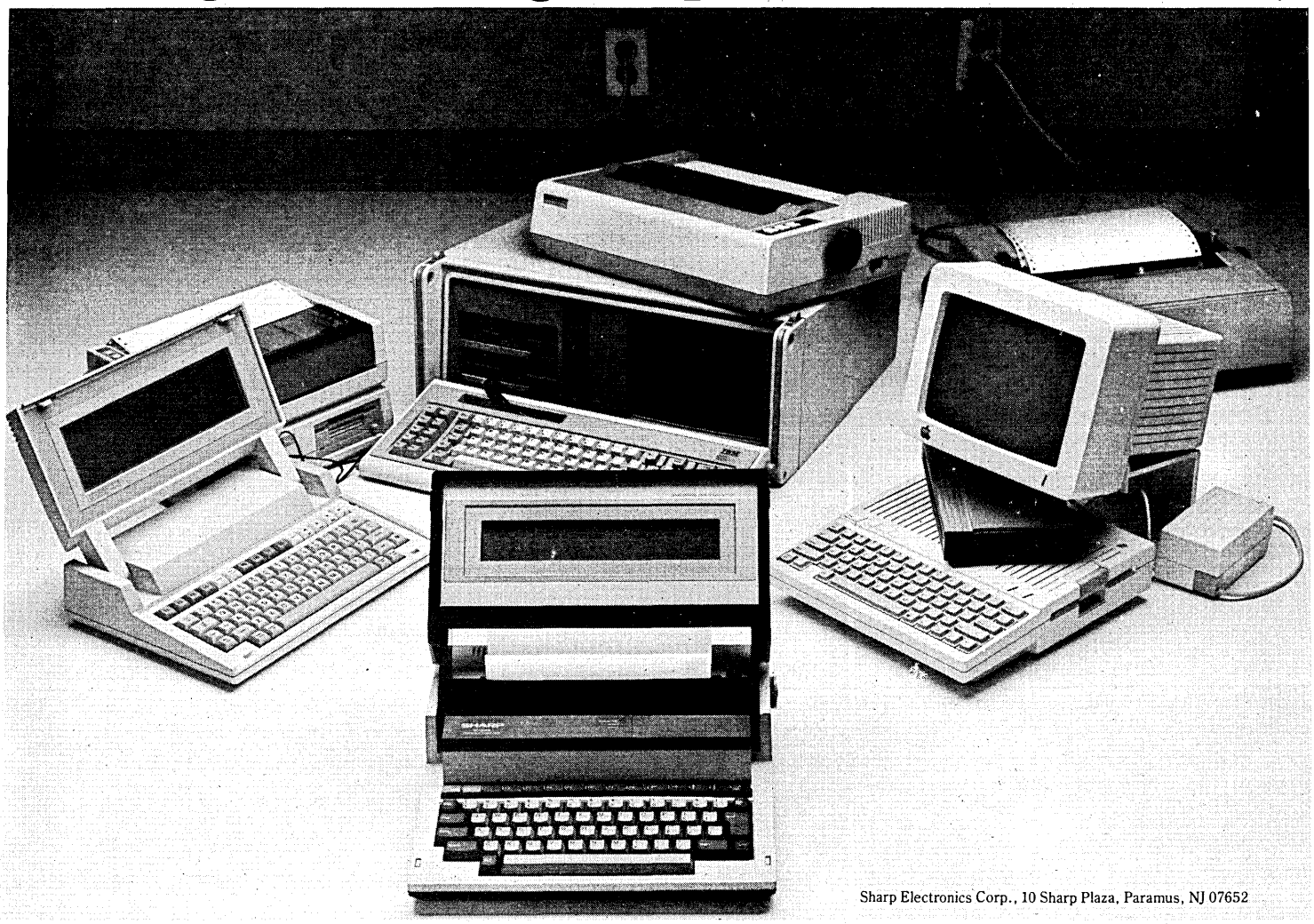
I was very interested in Bob Bemer's comments in the Sept. 15 Readers' Forum (p. 173). I, too, work at home as a programmer and have written educational games and business programs for quite a few of the major home computers. I am in complete agreement with Mr. Bemer about the advantages and disadvantages of working at home, but did you know that his work might be illegal if he lived in Chicago instead of Moon Mountain, Ariz.? Last summer the City of Chicago decided that the typing I do in my basement was violating its zoning laws. It is the position of the Chicago Department of Zoning that anything that makes money is a business, and no business can be conducted in a residential zone. My husband is a college professor, magazine columnist, and textbook author. He was told that if he gets paid for his writing, that is an illegal business too.

Everyone talks in glowing terms of telecommuting and high-tech cottages, but no one pays any attention to the zoning boards and labor unions that are trying to outlaw any form of working at home. I received a Cease and Desist order from the Chicago Zoning Board. I have been told that I will be taken to court, and possibly fined $100 per day, if I continue the horrendous crime of being paid for playing with my computers. When I try to tell other people about my problem, I almost always get the same response: "That couldn't happen to me."

A very serious problem exists. Zoning laws have been used against me to try to put me out of business. Labor unions are trying to make any form of computerized home work illegal and they may have the lobbying power to do it. The unions have already made sewing and knitting at home illegal; will computing be next?

LEAH R. O'CONNOR
Chicago, Illinois

WHAT THEY CALL A PORTABLE, WE CALL A LOAD.



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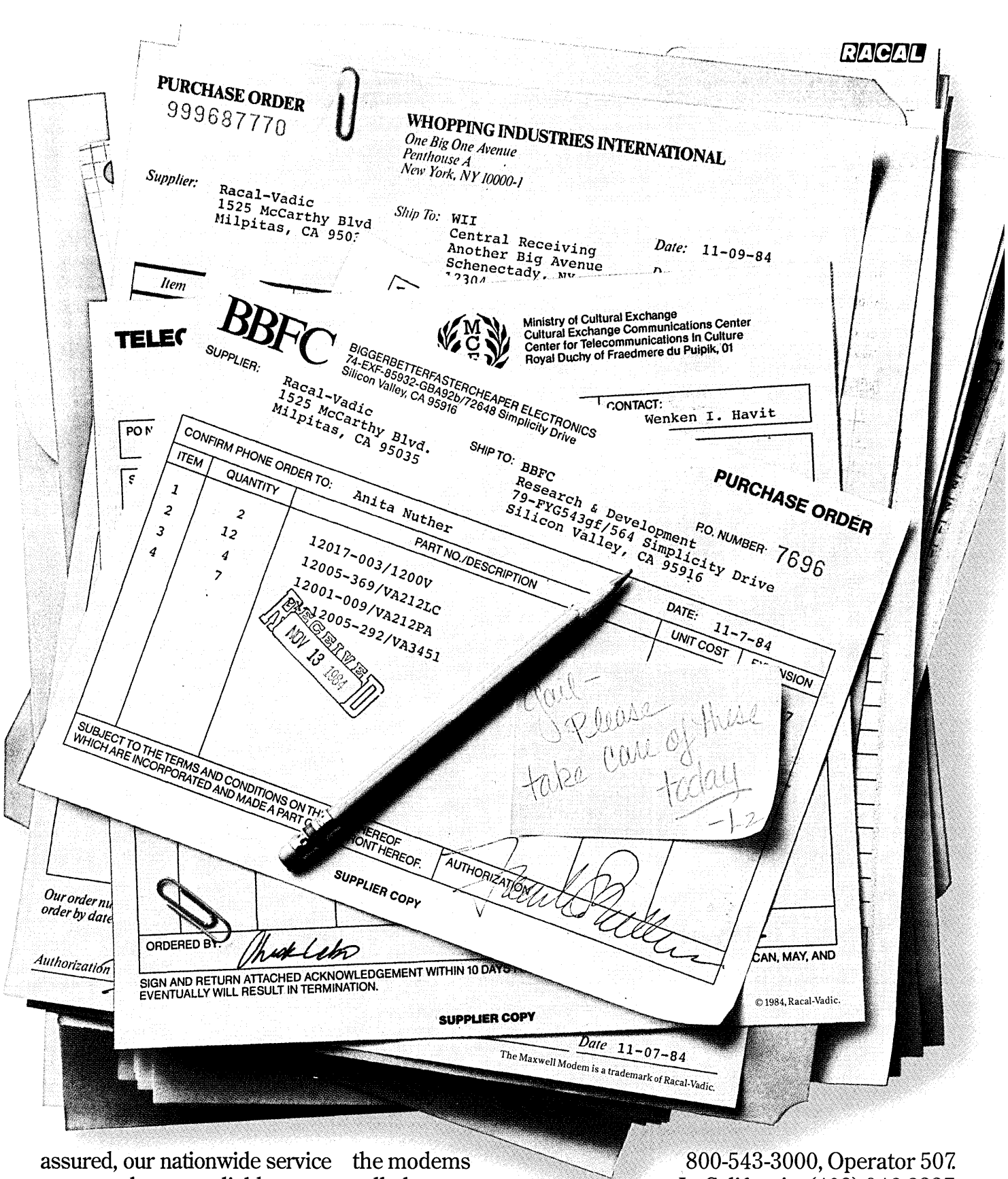

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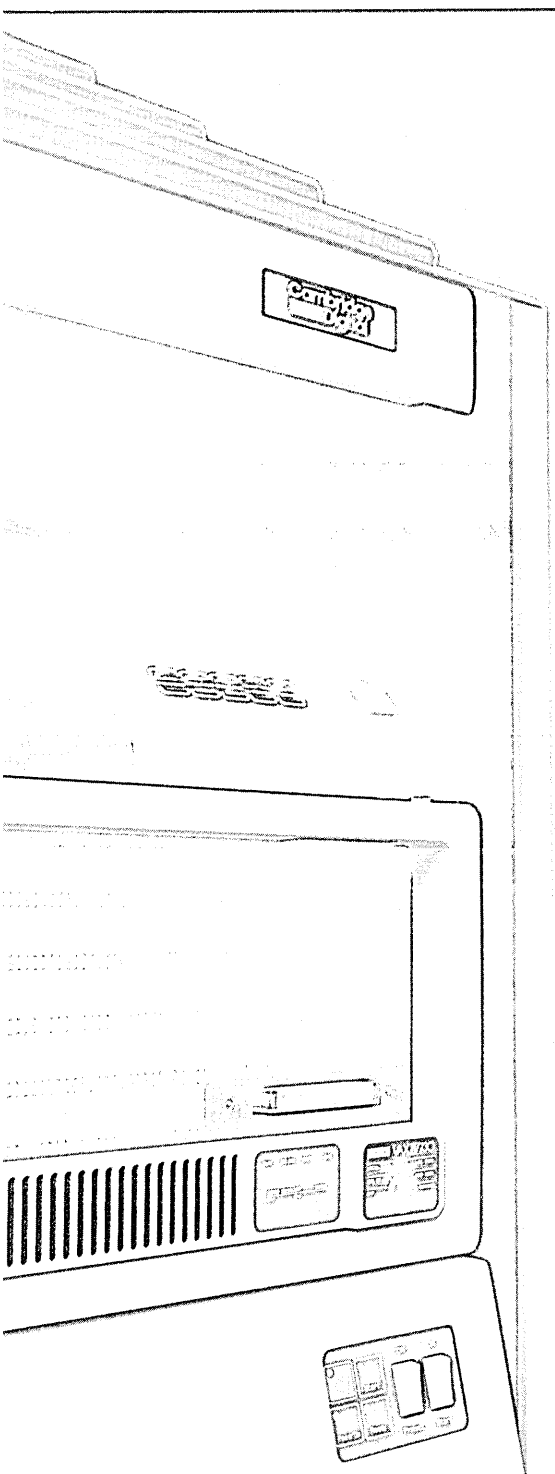

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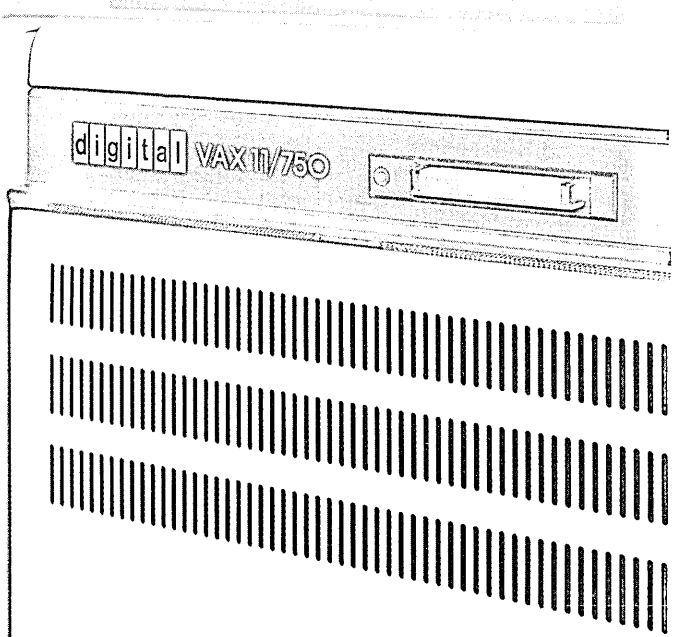

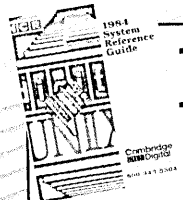

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CIRCLE 17 ON READER CARD

Rebecca S. Barna, Editor

EDITORIAL

GETTING THE NEWS FROM USERS

ILLUSTRATION BY DORIS ETTLINGER

Up from the southernmost blocks of Manhattan Island and directly into the columns of newspapers and magazines waft the quickly considered opinions of stock analysts. As surely as the Caribbean is mother to hurricanes in the autumn, Wall Street breeds instant punditry during product announcement seasons. How will a product behave? How will the market respond? What does the future hold? All is revealed. Or, at any rate, enough to make an article is revealed.

There's no great mystery here. These people are usually very good at what they do. (Though not always: an analyst once confidently told us Sony's Beta format would wipe up the floor with VHS challengers.) They are well paid to pay close attention to anything that will affect stock values, and nothing is more likely to do so than a company's new products. So, unless an epidemic of lockjaw strikes the nation's financial districts, you're likely to keep hearing the informed opinions of the stock analysts.

Yet a recent product announcement, reported in "Open Season on DEC" (p. 40) by DATAMATION's Boston bureau manager R. Emmett Carlyle, suggests that what pleases the analysts won't necessarily please anybody else.

Venus appeared in suburban Boston, riding not on a clamshell, but on the hopes of VAX users who've wanted a bigger machine than DEC has been able to supply. Stock analysts were delighted. One said, "DEC is finally postured to respond to IBM from a position of strength." Another said, "These flagship products should do a lot for DEC's image in the marketplace. . . ."

Well, begging the security industry's pardon, we hear different things. And we hear these different things from users. The view of the new machine isn't quite so rosy from the computer room: the people to whom Carlyle spoke find Venus more an admission of DEC's limitations than an inspiration for the future.

Granted, users haven't yet received production models of Venus; neither, however, has any analyst. And it is of course true that the judgment of Venus will be rendered by the marketplace. The point is this: no matter how expert their opinions, analysts aren't going to end up in computer rooms trying to get machines to behave. Users will.

It was word from computer rooms that convinced correspondent Carlyle that there was more to the story than the optimism of DEC officials and analysts might have suggested. Users, who say that the VAX architecture may have given as much as it can, convinced Carlyle that Venus could not be the final aim of DEC's high-end strategy. The reaction of users suggests that our sources who say that DEC will be developing a new high-end machine are right: DEC will put its new development money on the architectural promise of RISC, the reduced instruction set computer. Had we relied on analysts alone, we might have missed this story.

That's why this opportunity is being taken to renew our pledge that it is users' opinions that will count for most in DATAMATION. This doesn't mean we'll stop taking the advice of analysts and other experts. We've had reason to be mighty grateful to them. They've given us some of our best stories and news breaks, and we know there's more to come. But while it sometimes seems the opposite is true, the center of the dp world is not the trading floor, it is the computer room.

So, to paraphrase Tiny Tim—the real one, not the boozy Tim in this issue's Dickens spoof—"Users! God bless them every one!" ◉

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IN FOCUS

SHUCKING DP

Retirement opens a whole new world to data processing professionals.

by Deborah Sojka

When you were young, you'd hear older people say things like "I was in law" or "I was a railroad man," but no one ever said "I worked in computers." Well, times have changed.

The first wave of computer professionals has started to retire. They've given 20, 30, perhaps 40 years to the profession, and those who haven't yet retired are beginning to think about it.

Is there life after the gold watch? You bet there is: consulting, teaching, and entrepreneurship are just a few of the alternatives retirees can choose from. What's more, most of the people who decide to work after retirement say they're much happier now that they've left behind the restrictions imposed by everyday corporate life.

These retirees began computing in a world very different from the one we know now. Three decades ago there were few people in data processing, and those that were came from very diverse occupations. They were engineers, scientists, mathematicians, accountants, and people from various other walks of life who had one thing in common—they all worked with vast amounts of numbers and needed quick access to them.

In the early days, all computers were number crunchers; the end users never operated the computers, and there was no such thing as an information center. Thoughts of word processing and executive and personal computing had not yet sparked a glimmer of hope in the eyes of any managers or entrepreneurs. Perhaps worst of all for the data processing people, there was no machine or software compatibility—upgrading meant starting over again.

Today's common practice of arriving at the prospective employer's doorstep with a computer science degree in hand was impossible then because no dp courses existed. Some of the people who fell into data processing in the early years fell in love with it. They are the ones who tend to stay in the business long after retirement.

Orvington Fielding, 71, a retiree since 1976, is such a person. He was "an accountant who fell into data processing by accident. When the company's dp manager, who was flighty to begin with, took a sabbatical and decided to quit rather than return to work, they asked me to take over his department."

He quickly learned what a tough place the computer room was to work in. Fielding calls it a close shop because "there were only a few people in it, and everyone was totally dedicated. It was a very demanding job. The technology of the times—vacuum tubes—was quite unreliable, so you were often called out of bed in the middle of the night. Dp was a 24 hours a day, seven days a week profession."

Fielding entered the business in 1946, when it was still in its infancy. Shortly thereafter, just a handful of pioneers, virtually unknown outside their own professional circle, changed forever the way the world would add, subtract, multiply, and divide.

They were truly pioneers. Their world was one in which they broke new ground every day, forging their way through territory that had never been explored before. They had no guidelines or maps to go by—they made the maps we take for granted today. Dp was a free-wheeling business back then. T.R. Young, a 64-year-old dp veteran from Shell Oil, Houston, reminisces about the '50s and '60s, the days when "there weren't many managers who knew what a computer could do. One by one, they'd begin to understand.

"Those were the happy days—you created something that cured the users' problems. That doesn't really happen so much now. Users expect a perfect performance. Programmers have become galley slaves. They get the short end of the stick when it comes to resources, too. Dp is constantly told to cut costs while being required to meet growing demands."

Is there life after the gold watch? You bet. Most of the people who decided to work after retirement say they're much happier now that they've left behind the restrictions of corporate life.

Many of Young's peers seem to agree with him. John Gummerman, a 58-year-old retiree from Hughes Aircraft Co., Culver City, Calif., says that years ago you did more work on your own, and dp was more of a one-man show. Late in his career, Gummerman started to look forward to some kind of change in his working life, which he didn't find till retirement. These days, as far as the individual dp professional is concerned, he says, "you're just a part of the bureaucracy."

Because this industry has grown so large in so little time, things had to change. Some rules and structure had to

PHOTOGRAPH BY TOGASHI

be established and adhered to in order to keep the entire data processing scene from becoming chaotic. The old timers realized this, but were none too tickled about it toward the end of their corporate careers.

As a matter of fact, some say the business has gotten pretty stifling in the last 10 years. Another Shell Oil retiree, 58-year-old John Nichols, is glad he joined dp early on because "it was much more fun to work without all the discipline. You wanted to get the job done for your own pride or sense of achievement. Today, it's just a job; you must stick to the standards and rules that make accountability easier. This is probably the way it should be, but I liked the other approach better." Nichols was getting a little bored during his latter years with Shell, and figured he could make his way without the paycheck.

"Everything I've learned in dp will go with me, and since you can't take it anyway, I'd rather put it into the minds of these youngsters."

So, too, did Harry Brough, a 60-year-old retiree who started in the computer industry during the late 1940s. "Years ago," he says, "people attracted to the computing business found excitement and challenge there; it was fun to get up in the morning and go to work." But Brough, like Nichols, found his last few years stalemated within a major corporation. "There seemed to be more milling around than anything being done," he comments. His feeling is that when the fun goes out of your work, you should get out of your work.

And that's just what Brough did.

By the time he retired, he had seen his profession evolve into something quite different and not nearly as rewarding as the profession he had originally joined. His feelings are understandable, especially if you consider the open-ended environment Brough and his peers had entered years before. No one was around then to say, "No, don't do it that way, *this* is the way we always do it."

Robert Mathews spent 29 years with one company. By 1983, he was a senior staff systems analyst with 28 people working under him, and he too had grown rather tired of the large corporation's stultifying environment. He claims he doesn't miss the organization. "I had a good career, I liked the people I worked with, but I realized I wasn't going to keep moving up. I had come to a standstill."

Now, you wouldn't think coming to a standstill after 29 years would leave you too many options, would you? Wrong. Mathews had plenty of possibilities from which to choose. He decided to look into becoming a contract consultant with Spectrum International, the Culver City, Calif., firm that creates methodologies to standardize the systems development process for its clients. He had become familiar with Spectrum when his company bought one of its products, and Mathews was involved in its selection and installation.

Mathews never pictured himself as an entrepreneur; he thought he was psychologically dependent on a steady paycheck. His company was "offering early retirement incentives, and a lot of my friends had retired the year before me. My youngest daughter was already through college, my wife was employed, and so, with my meager pension [lowered because of his early retirement] and savings, I thought I'd try my hand at consulting for a couple of years."

His advice to anyone considering retirement in the near future, early or otherwise, is to build up your savings, and try to develop a close tie-in with a well-established organization before you make any moves. Mathews received no guarantees from Spectrum, but at least he didn't have to knock on doors for clients.

Some folks who elect to become consultants needn't even change firms to find their postretirement affiliation. Since 1953, Bill Chaplin has worked for Hughes Aircraft. As of January 1983, at 69 years of age, he retired and became a part-time consultant for the company. Chaplin did not want to retire, but he did because the Hughes benefit plan structure made it better for his wife financially should anything happen to him. Chaplin believes it's better to remain active. He says working keeps people more alert and allows them to enjoy life more. "You feel a sense of responsibility. Us older folks need that. There are just so many things you can tell your wife you're responsible for. By now the kids are gone, so you've got to stay involved." In other words, unless you have a hobby or something to do that occupies the hours and is fulfilling, you're best off staying employed, at least on a part-time basis.

The other Hughes retiree mentioned earlier, John Gummerman, has also opted to stay with the company on a part-time consultant basis. He now does support work for the payroll department, acting as liason to data processing, based on his expertise in the payroll system, which he helped install. In general, Gummerman prefers the work he's doing now to what he did full-time for Hughes (his last full-time position was as systems analyst). Perhaps his present position reminds him of the freedom he felt in days gone by. Working part-time instead of full-time makes a big difference, plus his work these days is far more diversified. He also works primarily on the users' side of the fence now, and he finds that a refreshing change.

Consulting is probably the most popular route for dp retirees to take. They can either go into it independently with a new company or opt to stay with their former employers. There are also many other avenues open to those who wish to continue working. Retirement is by no means the end of the line because knowledge of computers is invaluable today. Retirees are at the peak of their earning ability and interest and experience levels. Another option is volunteer work, for those retirees who, after all those years of unpaid overtime, still don't mind doing a little something for nothing.

Orvington Fielding, the accountant who "fell" into data processing, found that retirement afforded him the opportunity to give a little back to society. He does some part-time accounting work and is a member of the New Bedford, Mass., chapter of the Service Corps of Retired Executives (SCORE), where he does quite a bit of volunteer consulting about computers, mostly with small business owners. "We give them literature, talk to them. We basically help them to help themselves," he says.

He and many other SCORE members across the country are helping clients make sense of the current gold rush mentality regarding personal computers. Years before he retired, Fielding had heard about SCORE and made the decision to join its ranks as a volunteer later. "Retired people can't just sit in a chair, smoke a pipe, and watch television. We need to stay active," he says.

Some people say that sharing what you've learned over the years is one of the most gratifying feelings on earth. Another SCORE member, 63-year-old Martin J. Neduchal, who works in the San Francisco chapter's office, retired from the military in 1960. Dp was his second career, and by 1969 he had already gone for and received his CDP certificate. Neduchal's most recent position was as systems analyst for the San Francisco Unified School District, doing mostly what he refers to as fire fighting.

In teaching, "there's a sense of achievement when they finish a course and feel they've really learned something."

Many of the clients Neduchal sees at SCORE seek to open their own software companies. They're looking for straight business advice. Others come asking for help on how to automate their small businesses. One of Neduchals' most important tasks is to rid his clients of any fear of

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or resistance to technology, he says. Only then can he begin to address their problems.

Neduchal talks of one client, the owner of a chain of liquor stores in Oakland, Calif., who knew what his problem was but needed some advice and direction before he could solve it. Neduchal says the owner wanted a point-of-sale device to eliminate the crowds and confusion that existed in some of his stores. "We went to the library together and looked over several business publications that covered bar code devices," he recalls. "He then knew which vendors to talk to before making his purchase decisions." It had never occurred to the client that he could use the same systems he'd seen operating in grocery stores.

Neduchal's rationale for doing volunteer work is simple: "Everything I've learned in dp will go with me, and since you can't take it anyway, I'd rather put it into the minds of these youngsters. They're up and running, and I walk out feeling great." Neduchal is fortunate to have two pension plans, and this affords him the opportunity to do volunteer work.

But, alas, most of humanity prefers more than gratitude for their labors. Besides consulting for dollars, there are plenty of other employment opportunities for retirees. To name just a few, there's teaching, free-lance writing, contract programming, starting your own company, or using your dp skills to do completely different work.

An example is Harry Brough, the man whose disappointment during his latter days in dp left him feeling lukewarm toward the business. For about 10 months after his retirement, Brough did some part-time computer consulting work, but then he left the business completely. He now spends most of his time doing independent trading in the stock market. Brough seems to have warmed up a bit since retirement, however, because he says that if the right offer came along in the computing business, he'd be open to it.

Former Shell Oil employee John Nichols had intended to drop out of computing upon retirement. Shortly after he retired in 1982, though, the Houston Baptist University called and asked him to teach some computer science courses; he agreed and has been teaching for them ever since.

Nichols enjoys teaching. He had taught computer skills of varying levels to Shell employees during his earlier days with the company, but when he was promoted to a supervisory capacity he stopped teaching.

In the good old days, dpers solved user problems. Now they're galley slaves, says one retiree.

He prefers teaching computing to people who have no experience in it because "there's a sense of achievement when they finish a course and feel they've really learned something. It's a demonstrable skill and it's easy to assess your results."

All of these retirees claim to be happier since they left their respective companies. Perhaps the major ingredient contributing to that happiness is their sense of increased independence. As T.R. Young says, "It's exciting. I'm picking what I'm working on, and that makes all the difference in the world." Since he left Shell Oil, Young has been working harder than ever. Besides being a free-lance writer for DATAMATION and other industry and consumer periodicals, Young is a computer and business consultant to the Brown Book Store in Houston; is involved in marketing James T. Jefferson's Pipeline Power Optimization program, which is written in FORTRAN and runs on a wide variety of mainframes and minis (this is a power cost optimization program that determines a pumping schedule for minimum power costs); and is currently creating his own organization theory-based model program that would assist management consultants in getting client companies to run smoothly.

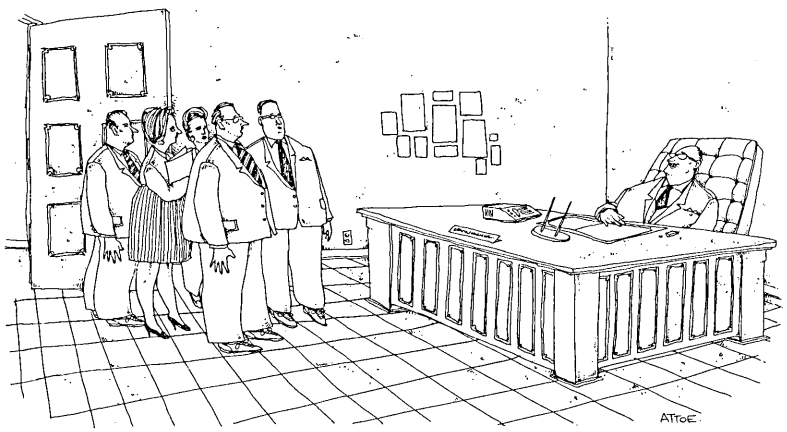
Young is the kind of person who embraces new technology, rather than lamenting the passage of the good old days. Although he never worked on microcomputers at Shell Oil, he's been highly interested in them since his retirement. He's taken courses given by Hewlett-Packard and Commodore to learn more about the small machines, and he spends quite a bit of time researching and writing about them. In what little spare time Young has, he uses a Hewlett-Packard pc at home for innumerable tasks, like tracking the landscaping requirements of the 151 tenants who live his townhouse complex.

In retrospect, Young feels his retirement has taught him an important lesson that may benefit those still operating in the corporate world. He's annoyed that he wasn't more of a maverick or an independent thinker in that environment (not rude or ill-mannered, just more independent). Now, on his own, the sky's the limit, and such an attitude would have made his later years with Shell far more enjoyable.

Regardless of the lessons learned late, a well-planned retirement can still be far more rewarding than life with the corporation. After 30 years with a major company, Edwin L. Jacks seems to have finally found his niche as an entrepreneur.

He joined General Motors Research Laboratories, Detroit, straight out of college in 1952. By the time he went into early retirement in 1982 at age 55, he had worked his way up to general director of information systems security. He had gone to the corporate level, and as he says, "that wasn't my kind of work." He preferred the work he'd done earlier with the research lab.

Meanwhile, for nearly 15 years, Jacks had been toying with a product idea, and after his retirement he founded Robot Vision Associates, Bloomfield Hills, Mich., with his personal funds and began work on vision system products. He says he's much happier now as an independent, doing development work once again but for his own company this time. Jacks usually puts in a 12-hour day, and he says one of the nice things about running a one-man operation is that "my board of directors and I always agree."◉



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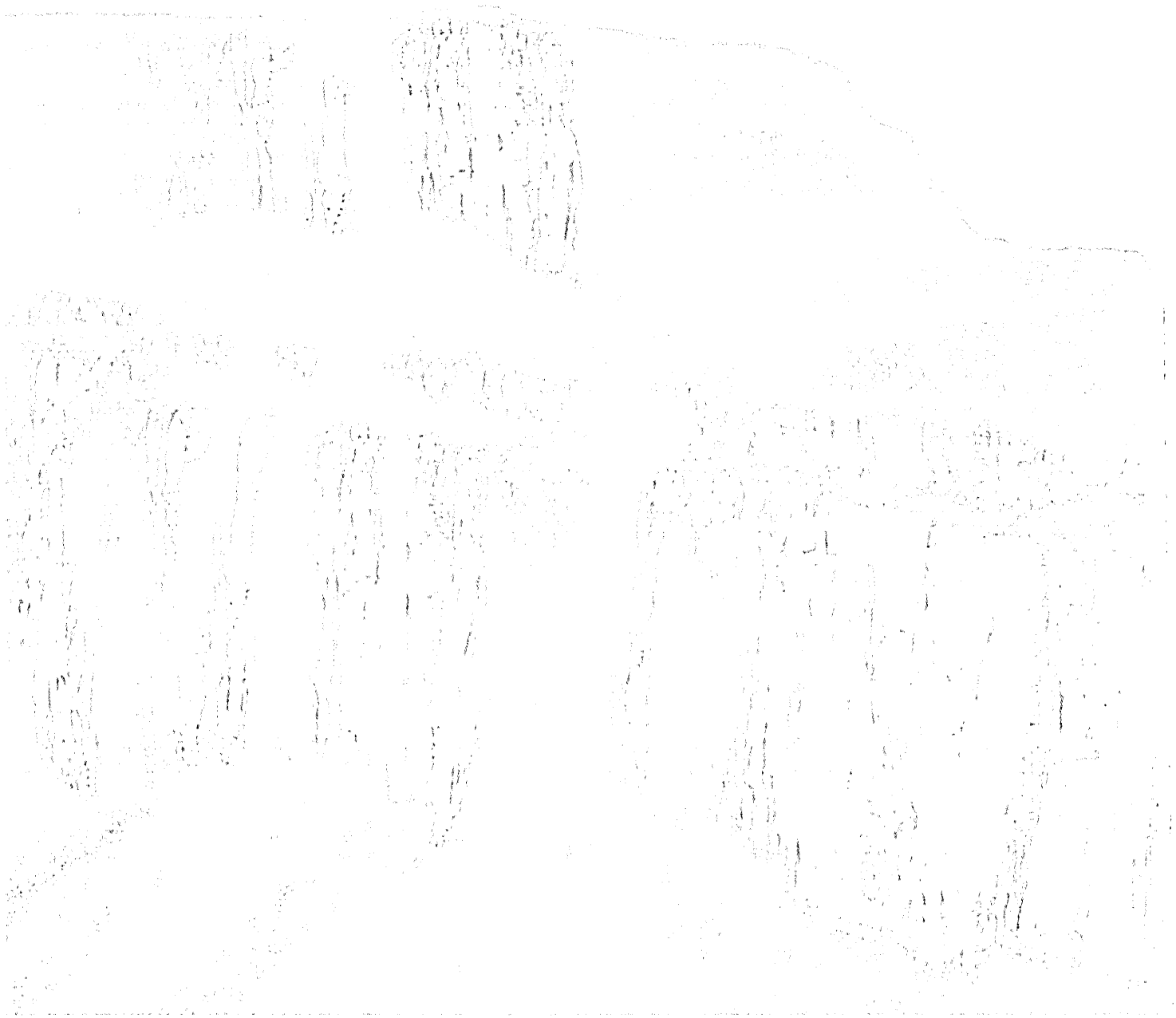

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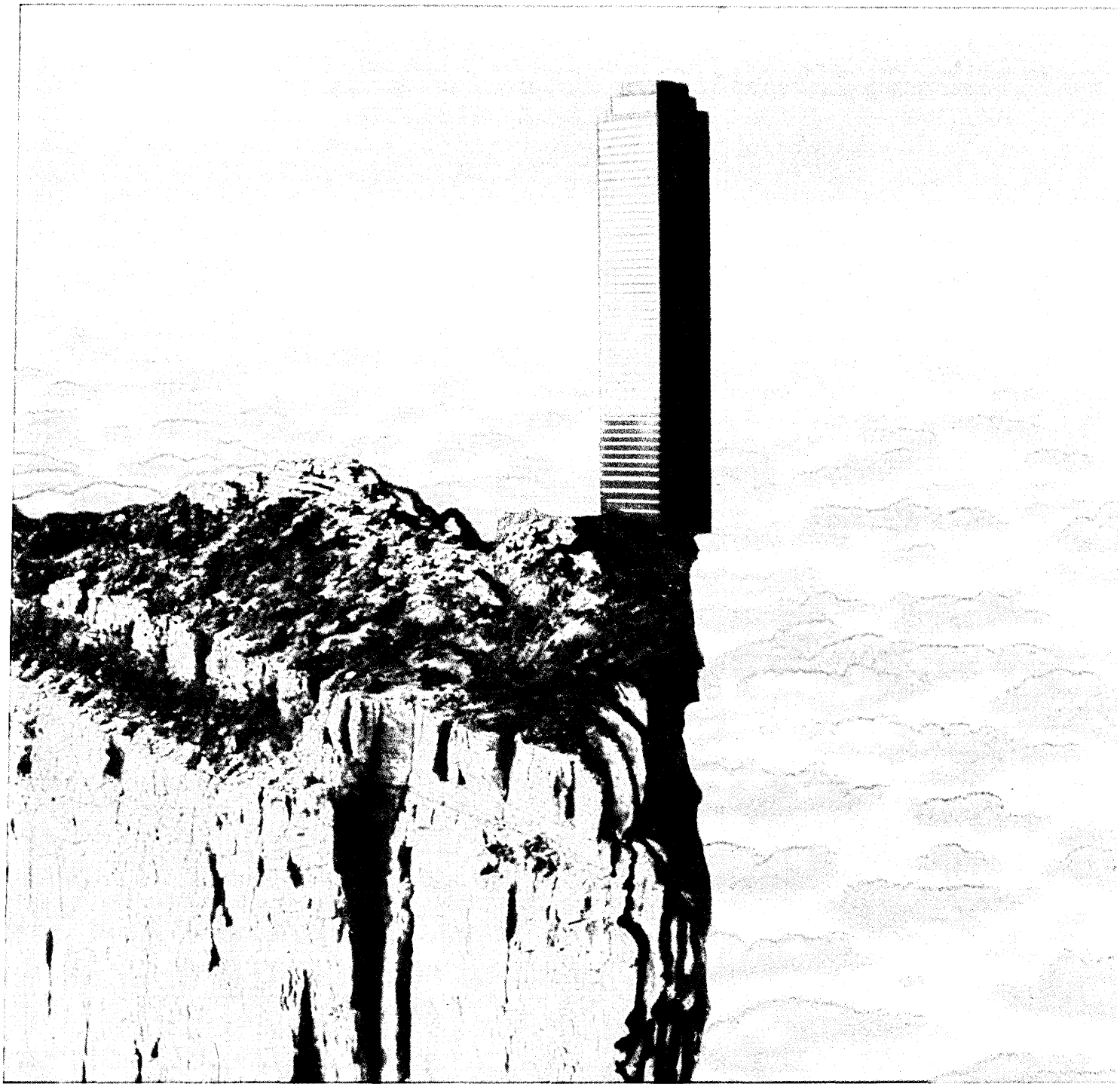

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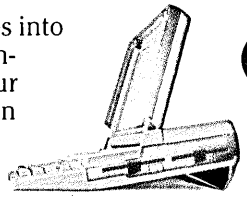

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NEWS IN PERSPECTIVE

SUPERMINIS

OPEN SEASON ON DEC

Is Venus too little, too late?

by R. Emmett Carlyle

Now that all the hoopla over Digital Equipment Corp.'s announcement of its new high-end supermini, the VAX 8600 or Venus, has died down, a painful truth has emerged for the thousands of VAX users around the world. The processor may be too little too late.

Recognizing this, sources say DEC is developing a new high-end computer architecture for its traditional base of scientific, engineering, and research customers. The architecture, based on reduced instruction set computer (RISC) hardware and a tightly integrated vector processor, is taken by sources at DEC customer sites and elsewhere as a tacit admission that the company's VAX architecture is "topping out" through a combination of age, complexity, and the weight of its own success.

It's been clear for some time that DEC is having trouble building a mainframe-class machine. Attempts to build a 10MIPS upgrade for the DECsystem-20, the so-called Jupiter, were terminated after a four-year effort. And the new VAX line topper, the 4.5MIPS Venus, will reach customers in April, two years late.

"It looks like DEC's solar system is shrinking rather than expanding," quips one VAX user in the university sector; but behind the humorous reference to DEC's penchant for naming projects after the planets, lies a real and growing fear.

"One must ask whether the VAX instruction set is capable of delivering substantially more performance," says Vinton Goff, section manager, computing systems, at United Technologies' Microelectronics Research Division, Colorado Springs, "or whether it's grown too rich and too complex."

Over the years, DEC has tried to serve both worlds of computing, technical and commercial, with one VAX instruction set. "Originally, it was optimized around FORTRAN for our traditional customers," explains David Schanoux, a VAX manager, "and more recently around COBOL and Pascal in the business area. Today, a record 15 programming languages run under the instruction set."

Adds Schanoux, "As long as we have a base of these programs that customers want to run faster, there'll be a market for VAX upgrades."

As it turns out, a DEC user's FORTRAN programs, for example, would run a lot faster if the VAX instruction set were optimized just around FORTRAN, and all the commercial instruction stripped out. This is at least part of the logic behind the RISC approach, and it is also the signal for an open season on DEC's VAX base for any new venture with RISC technology.

One of these companies has just emerged, brandishing a design by Steve Wallach, who was immortalized in Tracy Kidder's *Soul Of A New Machine* as the principal engineer of Data General's Eagle supermini. Convex Computer (see following story) essentially has produced a RISC version of VAX optimized around FORTRAN, and has delivered a spectacular array of hardware. "We offer not only a 4MIPS scalar processor equivalent to Venus, but a 50MOPS [millions of operations per second] vector processor as well," claims Robert Paluck, the young company's president.

The age of the VAX line is another factor, according to Paluck. "When DEC committed to Venus in 1979, the only forward moving chip technology available to it was ECL. We have been able to adopt leading-edge 2.5-micron CMOS chips and, soon, 1.2-micron devices."

Another factor DEC couldn't hope to foresee, according to Convex, was the industry's wide scale adoption of the Unix operating system—especially on VAX systems. Amdahl, for example, is gearing up to produce 100MIPS Unix vector systems for VAX customers by 1990 (see "Amdahl Pushes Unix," Nov. 1, p. 46). United Technologies' Goff says it seems likely that many more users of the VAX's VMS operating system will also adopt Unix if DEC can't deliver the performance they need.

"We had an early demonstration of the Convex C1 over a year ago," says Goff, who admitted being "intrigued" by the machine. "But we'd obviously prefer

Convex essentially has produced a RISC version of VAX optimized around FORTRAN.

to get our extra computational power from VAX if at all possible."

Sources reveal that DEC has begun the development of a 32-bit RISC architecture using fixed point instructions and advanced ECL technology that could deliver processing power in the 10MIPS to 20MIPS range. The company could fail in its attempt, however, because of problems in mounting VMS on the architecture to ensure continuity with its "one architecture, one operating system" theme. While DEC

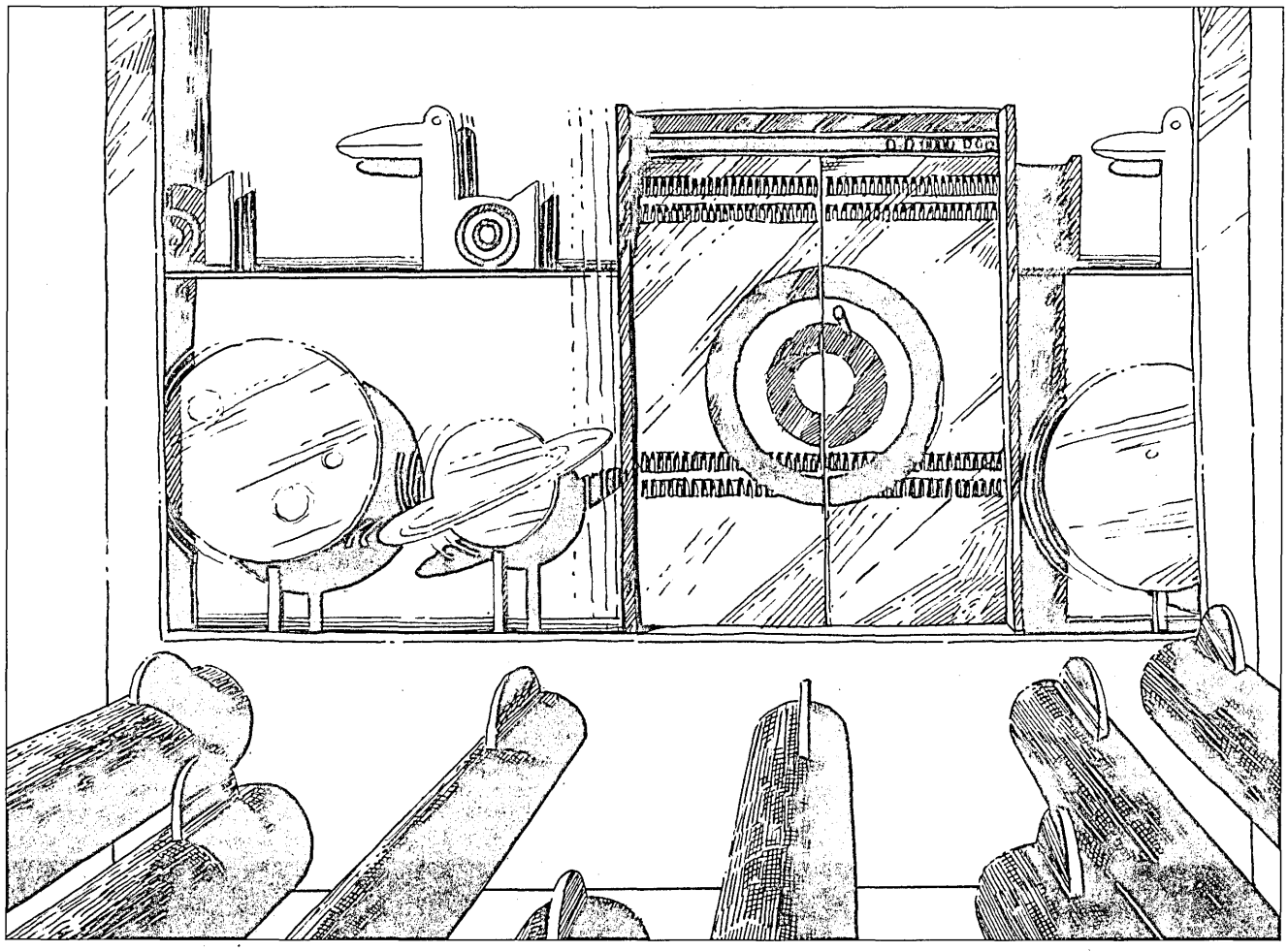

ILLUSTRATION BY JAMES R. JONES

executives privately speak of the desirability of such an architecture, the only on-the-record comment from the company is, "No comment."

Such an architecture could be some way off—late 1986 and beyond, say sources. DEC is also known to have a dyadic version of Venus under development at the 7MIPS to 8MIPS level, and hopes to ship Nautilus in 1986. But DEC's biggest fear, according to outside sources, is the 1988 time frame. DEC engineers believe it will be tough to get more than 8MIPS out of ECL.

For the foreseeable future, DEC is trying to reassure customers that their large scale computing needs will be met by the ability to cluster VAXs. It may not be adequate. "In the past, we used to worry about long lead times and late deliveries," says Michael Howard, director of systems programming at Republic National Bank in New York, "but now these are the least of our fears. DEC will deliver, late as usual, but the technology will work and so will their field support. Our real fear is whether the VAX will meet our computational needs in the years ahead."

Howard and other large VAX users are pressing DEC to allay fears that the VAX clusters won't "peak out" too early, and the fast 70MBps bus that links VAXs and HSC-50 storage controllers won't saturate to produce bottlenecks. Bob Brentripp, a senior programmer at Lotus Development Corp., Cambridge, Mass., which uses VAXs for software development, says it's an illusion that you can keep adding VAXs to a cluster and get linear increases in performance. "You reach a point where adding a Venus gets you no increase in performance whatsoever." Brentripp adds that there is always something lost in the communications throughout the cluster. "And that something grows as you add more devices."

"Our real fear is whether the VAX will meet our computational needs in the years ahead."

When pressed on the issue, DEC claims there was no way of knowing if or when such a peak point would occur. "We clustered seven Venus processors with a 780 and two HSC-50s to achieve a 30MIPS performance. There was no saturation of the bandwidth at this point," says DEC's Schanoux. "We haven't yet tried the same experiment with a greater number of machines, but we've no reason to believe a bottleneck will materialize."

This is only partly soothing to users, Goff of United Technologies, for one. His division is toying with the idea of replacing four VAX 780s, two 750s, and one 730 with three Venus systems. "But supposing it was eight. What would happen then if we clustered them?"

The answer to this question is especially vital to DEC's large customers because the VAX cluster is their only migration vehicle. "You can't even upgrade from a 780 or 785 to a Venus if you wanted to," says Dan Ary, a VAX manager at General Research, Santa Barbara, Calif. "The processor and memory on the Venus are completely different. So if you want more power, you have to move to the cluster."

Ary says his company has the classic VAX cluster application: shared research across a number of equal peer systems, with no computer intensive node, no single user hogging a VAX. Not all DEC customers are that fortunate, and some will need to satisfy the sporadic needs of the "10MIPS-for-10-minutes type of men."

DEC's clustering strategy also raises other issues that even a fast RISC architecture won't solve. "The clusters are a proprietary solution in an increasingly generic age," says Randy Snodgrass, a

systems architect at Citibank, New York. "Large customers, even ones like us with lots of VAX systems, are maturing and gaining more experience. Increasingly, they would rather build their networks from off-the-shelf components and not have any vendor—even IBM itself—lock them into proprietary solutions."

This sentiment was echoed by George Hvisden, vp of corporate dp at W.R. Grace & Co., New York, who says he found himself on the wrong end of a locked in system—the doomed DECsystem-20—and ended up with a machine on "death row," as he puts it. "We'll cluster our DEC 20s for a while, but we shan't be migrating to VAX. Maybe in three years we'll move to Unix."

One unsavory aspect of the "mainframe VAX" issue from DEC's point of view is that the company must devote more time to improving its architecture and systems software than it would wish. This can only intensify as more young startups swing over to the fat and prosperous base of VAX customers with their more up-to-date technology. ◉

LANS

INTEL'S LAN ON A CHIP

With a new VLSI network controller, pcs can communicate over twisted pairs using a standard scheme.

by Charles L. Howe

Ulysses User recently had a dream about the ideal local area network for his microcomputers. The wiring was already laid in, meaning practically no expenses for cabling. The network also had the solid endorsement of such power players as AT&T, Intel, Burroughs, and Wang. Thus, a standard was virtually assured. Best of all, the cost of the VLSI chip to serve as controller was less than $20. Naturally, Ulysses awoke in tears, as most of us do when we perceive the gap between reality and fantasy.

Relief may be on the way, however. Consider Intel Corp.'s recent announcement of its 82588 Personal Workstation LAN Controller. The chip is an enhanced—but direct—heir and assign of Intel's 82586 LAN coprocessor, which supports the 10Mbps Ethernet LAN. The 82588 comes with a variety of networking bells and whistles, however, that would amaze and delight even Niccolò Machiavelli, whose thoughts on seizing and holding power are well known.

Intel and 20 other industry giants are pushing a new local area networking standard called Starlan in a way that amounts to squeezing maximum value out of a low-cost investment. Others supporting the standard include Advanced Micro Devices, Bell Labs, Corvus, Data General, Digital Equipment Corp., Mostek, Olivetti, Rockwell, Tandem, Tektronix, Toshiba, Texas Instruments, and Xerox.

Indeed, several major dp vendors with extremely close ties to Intel are expected to announce 82588-based Starlan products at the February office automation show. In many cases the Starlan package will be the new low-priced entry in their product lines.

Intel's chip is destined to be a big player in the Starlan movement. An internal Intel document tells the story.

"Personal workstations don't have the high data throughput requirements of Tier Two devices," the document notes. "It's a case of overkill at a very high cost to have a 10Mbps connection between a word processing workstation and a hard disk when the two devices will only be occasionally exchanging short text files."

The document from Intel—part of the Digital Equipment Corp./Xerox troika that brought the world the 10Mbps Ethernet standard—continues:

"A much better answer to this design problem is a 1Mbps system. Indeed, early efforts at this sort of network, such as Omninet, have shown the inherent logic as well as favorable market response to this approach. What is missing from the picture to date, however, is a clearly delineated set of standards as exist for Ethernet. To remedy this, Intel, AT&T, NCR, and a number of other interested companies are actively working together to create a standard that encompasses a 1Mbps baseband system within the IEEE 802.3 subcommittee."

Starlan went before IEEE last year, several years after Intel began work on the 82588. The network employs a Carrier Sense Multiple Access/Collision Detection Scheme, a la Ethernet. The standard calls for linking up personal computers by twisted pair wire or coaxial cable.

"There are millions and millions of phones out there with extra wiring," explains Bob Dahlberg, product marketing representative for Intel's data communications products division in Santa Clara, Calif. "So why not make the computer room as easy to use as the phone room?"

In fact, up to 25 extra sets of twisted pair wires are installed in millions of offices by various telephone companies across the nation on the theory that it would be easier to connect them to a phone if a break occurred than it would be to pipe in a new set of wires. All of these wires eventually go into a wiring closet, where repairmen routinely make new attachments as phones are added or moved around. And this is the basis for Starlan, which is now in the early stage of study by the IEEE.

Intel's networking scheme uses AT&T's recently announced LAN star topology. Users connect their machines via four wires to a very long cable, which in turn connects to a very short bus. Intel says that this scheme is totally compatible with IBM's token ring star topology layout for wiring closets. In fact, the scheme may not be totally compatible, and users may find this asserted compatibility as elusive as Sam Spade found the Maltese Falcon.

"It's overkill at a very high cost to have a 10Mbps connection between a workstation and a hard disk when the two devices will only occasionally exchange short files."

The AT&T/Intel LAN scheme calls for unshielded twisted pair wiring, while the IBM scheme calls for shielded wires. Why? The Intel scheme is for data only, while IBM's 4Mbps token ring moves voice as well as data. At speeds above 1Mbps, IBM apparently feels that voice would corrupt data traveling along adjacent twisted pairs. AT&T, sources say, may agree belatedly. If so, then IBM is once again off on its own technological direction; if not, IBM will simply remain one of the most prominent firms not to endorse Starlan.

Aside from the new chip, which Intel expects to sell to oems for around $40 apiece in quantities of 1,000 starting late next year, all Starlan needs are low-cost RS422 receiver/drivers, which cost around a dollar or two apiece, to connect up each machine.

"With a very short bus," Dahlberg adds, "you don't have the problems of signal attenuation that you get in Ethernet, which has a long bus and a short drop cable." The Starlan baseband scheme will not, of course, support voice or such frills as video teleconferencing. "We are not in the voice business," Dahlberg explains. "AT&T does that very well."

Using an existing telephone wiring closet as a hub for each office department, with about 20 users per hub, Dahlberg hypothesizes that the 1Mbps baseband network could support up to 8,000 connections. The network could be substantially longer than Cheapernet, another

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baseband standard being considered by the IEEE and which is 185 meters, or Ethernet, which is some 500 meters. Indeed, Dahlberg claims that when Starlan is up and running it can operate at distances up to 1,000 meters without using repeaters to amplify weakened signals.

As a bit of lagniappe, Dahlberg adds that the 82588 chip also operates at 2Mbps in the broadband mode, and is entirely compatible with IBM's new PC Net.

Intel claims that the chip integrates layers one and two, the physical and data link layers, of the International Standards Organization's seven-layer Open Systems Interconnect model. On this chip interested oems will find the CSMA/CD controller functions of the 82586, except the coprocessor portions. Also included in the new chip are the data encoder functions of the 82501 Ethernet Serial Interface and the collision detection functions of a transceiver. Because of the lower 1Mbps data rates on the 82588, the circuitry is greatly simplified.

The chip supports two kinds of collision detection as part of its physical link functions. The first method checks if incoming bits violate encoded Manchester or NRZI (binary) schemes. In the second method, the chip performs a bit comparison on its transmitted message as it returns on the receive channel. This method is used in networks with separate transmit and receive channels, such as broadband applications.

Both methods permit a collision to be detected while the message is still being transmitted, allowing the 82588 to perform a back-off and retry immediately, a technique that substantially increases data throughput.

Up to 25 extra sets of twisted pairs are installed in offices by telephone companies across the nation, providing the basis for Starlan.

Intel says the chip has on-chip clock recovery circuitry, which means it can recover data encoded in the Manchester, differential Manchester, and NRZI formats. It can handle NRZI while operating at up to 2Mbps and Manchester at up to 1Mbps. "No other chip is able to handle all three of these formats—much less a chip with all of the additional features of the 82588," Intel says.

The 82588 has most of the same network maintenance and diagnostic features found in the higher-speed 82586, and it comes in a 28-pin package that requires little board space.

If users flock to the pending standard, Intel hypothesizes that the cost to oems of the 82588 may in time be driven down to less than $20. ◉

WORKSTATIONS

FEW RAVE ABOUT PC/FONES

Limited functionality and high prices deter potential users of the combination telephone and pc.

by Ellie Winninghoff

Several corporations, mostly in the financial community, are subverting overseas common carrier regulations prohibiting the use of third-party equipment.

They are transmitting time-sensitive data worldwide with a new piece of desktop hardware, the computer/telephone combination. These pieces of equipment were not designed to thwart regulations of the European telecommunications monopolies, but to mate the computational ability of a personal computer to the communications network acccessible by telephone. Explains a pc/fone user, "It's cheaper than fax and telex when you combine all the time involved, and you can schedule it off-hours."

Such unusual uses of pc/fones are typical these days. A flurry of recent product announcements brings to 25 the number of born-again telephones, or integrated voice data terminals (IVDTs), introduced in the past two years—despite minuscule market acceptance to date and the less than thrilling response given the first IVDT to hit the market, Displayphone by Northern Telecom, Nashville. According to Greg Carlsted, an analyst with Dataquest, San Jose, Calif., businesses bought 30,000 IVDTs in 1983, and the Displayphone accounted for half of those; in 1982 NT predicted sales of 100,000 units. In 1984, Carlsted projects industry sales of 90,000 units, representing $90 million.

The growing list of competitors includes about a dozen independent IVDT manufacturers in addition to cooperative ventures between independents, office automation, telephony, and interconnect partners. The pace of involvement of major dp vendors quickened in the past few weeks, with Houston-based Zaisan Corp. signing oem agreements with ITT, TIE Communications, Lee Data, and Sonecor Systems, a division of Southern New England Bell. Cygnet Technology Inc., Sunnyvale, Calif., teamed up with Philips Information Systems USA, a subsidiary of the Netherlands-based N.V. Philips. Several Japanese firms, including NEC Corp., Oki Electric, and Nippon Telegraph and Telephone Public Corp., are looking at such offerings for their domestic and export markets. Northern has even refurbished Displayphone, trying to regain some market momentum.

Laura Peck, an analyst at L.F. Rothschild, Unterberg, Towbin in San Francisco, projects Zaisan's 1984 sales at $6 million and 1985 sales at $30 million She anticipates that Cygnet's sales of its Co-System telephone add-on to pcs will hit $5 million in 1984 and $15 million in 1985. The firms decline to comment.

These new partnerships supplement a growing list of heavyweight competitors in the pc/fone game, such as IBM/Rolm, InteCom/Wang, and GTE/Sydis, (see "A PC and a Phone in One," Nov. 1, p. 34). Furthermore, AT&T and Convergent Technologies are rumored to be ready to announce early next year a new offering considered especially impressive compared to others already being hawked by retailers and oems. "I am familiar with the AT&T product on a nondisclosure basis," a midwestern MIS executive of a retailing company gushes. "My guess is that it will blow everybody away. And that's on human engineering, too."

"I am familiar with the AT&T product on a nondisclosure basis. It will blow everybody away."

Does all the hoopla and minimal sales indicate the technologists have created another solution in search of a problem? After two years of market experience, the answer seems to be a firm maybe. The boxes and add-ons have attracted user advocates in certain specific applications niches, but have failed to appeal to a widespread audience due to a combination of high price, complexity, and lack of key features, according to users contacted by DATAMATION in an informal straw poll.

IVDTs range from semidumb terminals to intelligent telephones, and from simple pc add-ons to sophisticated multiuser computer systems. Typically, they include in one box a crt screen, telephone (often speaker phones), ASCII keyboard, a modem, communications software (incorporating last number retries, call-detail recording, calendaring, and other functions usually found on smart telephones), access to databases, and electronic mail. Typically a microprocessor and RAM are built into the add-on devices to switch the pc and telephone functions so that users speaking to each other could converse about data transmitted from one to the other. Prices range from $995 to $6,500.

From a marketing standpoint,

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there is a fundamental need for the type of voice/data integration touted by the vendors, but their products promise more than they deliver. "These terminals allow for voice/data cooperation, not integration," a dp manager notes, echoing comments made by others. They say that the technology just isn't yet where they would like to see it.

"IVDTs are a case of throwing technology at a problem instead of defining the problem and then using technology to follow it," contends the MIS executive at a large midwestern medical equipment supplier. "The emphasis is on the wrong thing."

A more fundamental technology issue further clouds the role of IVDTs. It is moot to even consider voice and data at the terminal when data communications alone are still a problem. Says Carl Reynolds, MIS vice president at Hughes Aircraft, Long Beach, Calif., "At the moment, we're not integrating data with data very well yet."

Adds Tom Kieffer, vice president at Mainstream Software, a telecommunications consulting firm in Minneapolis, "One percent of the installed population have effectively transported data from mainframes to pcs. They are primarily interested in solving their data problems. People know that if they mix voice and data, they will slow both down. Corporate America is still trying to justify its pc purchases."

Lurking behind these concerns is the big one—confidentiality. Complains Terry Glasgow, a controller at the Ford Aerospace facility in Colorado Springs and an otherwise enthusiastic Co-System user, "There's no way to tell if the message you send is received confidentially. If that terminal has a password, it will [be received confidentially]. But there's a real discipline involved in using passwords. You could get around it with technology, but it's complicated. I'm sending information around the world, and I just can't know for sure."

The other barrier to widespread acceptance of the new generation of IVDTs is price, what users get for the money. One observer says that IVDTs constitute an amalgam of "bells and whistles," not a market unto themselves. Costs range from $1,000 for some products up to $20,000 for a workstation that does everything but make coffee. Sums up an MIS executive in the insurance industry who beta tested the Displayfone, "We've been rather underwhelmed. The phone's cheaper. What function is this delivering to the desk?"

"We've been rather underwhelmed. The phone's cheaper. What function is this delivering?"

Dale Kutnick, executive director of the Yankee Group, Cambridge, Mass., points out that the full price of the voice/data combination terminals isn't usually included in the cost of the box—most IVDTs contain two lines, one for voice and one for data. "A phone on a crt is only physical integration," adds the market researcher and consultant. "To users, that is trivial. You can integrate voice and data into a PBX across the board, but it ranges in price from $400 to $1,000 per terminal—for the PBX. That's twice what we suggest."

What Kutnick and others are saying is that the total price of implementing a room full of IVDTs may not be cost-effective. There are other ways to solve the problem, at lower cost. "Integration doesn't have to be contained in one box to be successful," notes an MIS manager from a Minneapolis Fortune 500 company. He distinguishes three separate voice/data integration approaches—individual workstations, switches that transport

voice and data traffic outside the building, or external networks between geographic sites—and claims the biggest potential savings lie in merging voice and data on the same circuit for long-haul traffic. In other words, not at the workstation. That is why many MIS executives and telecommunications managers focus on PBX purchases rather than IVDTs.

Even the add-on boards, which convert a personal computer into a IVDT, have a higher cost penalty than most potential users are willing to pay. The extra $1,400 and up for some products, like Cygnet's Co-System, is considered too pricey for the market.

Quips a Minneapolis retailer, "What does it do? You can buy a phone for $39.95 that stores numbers. There isn't even an alphabetic search through a phone directory." Adds Reynolds at Hughes Aircraft, "I don't get too excited about having a $2,000 automatic dialer. Most of the numbers I use, I know by heart. The ones I don't know, I have to look up anyhow."

Manufacturers and others counter that the current products enhance white-collar productivity mostly by saving time. And, according to users, there is no doubt that IVDT features do save time. Speed dial features, for example, benefit people who make many long distance phone calls, especially when they use carriers other than AT&T. "I am a fumble dialer," says Toni Delacorte, a PR account supervisor at an advertising agency, Hoefer-Amidei, San Francisco, who beta tested Cygnet's Co-System when she worked at another agency. "Before, I had to dial 25 digits just to reach San Jose, and I usually made mistakes. The Co-System saved me hours."

"The Cygnet system is quite responsible for our success."

According to Chris Culbreath, a telecommunications consultant at AT&T IS, the most important advantage of Zaisan's ES-1 is that it is an integrated ASCII terminal for mainframes that also has sophisticated phone features. "It has saved time, although not necessarily a lot," Culbreath says, adding that any time saved is good. "Time is one of the most valuable resources." After beta testing one Zaisan, his division opted to lease six more.

The narrow niche kind of user is typified by the trust department of a Minneapolis bank. Its biggest corporate customers can obtain up-to-the-minute quotes on the value of their portfolios via Displayphones. When these customers call every morning, bank employees aren't disturbed. "We just had to take some precautions on security of other data," says an officer there.

Asked whether he can cost-justify it, Martin Zitter, an account executive in partnership with two other brokers at Merrill Lynch, jeers, "What's an $800 phone for $1 million in additional brokerage commissions? Most brokers are seat-of-the-pants. They keep their books in their laps. We automate and track calls, and graph our time spent vs. dollar production. The Cygnet system is quite responsible for our success."

In certain applications the pc/fone combinations can save a dp manager money. Says Dave Levin, a telecommunications manager at Procter and Gamble, "We took out the IBM 3278 terminal and 3274 controller and replaced the controller with a PCI protocol converter and a Zaisan terminal. . . . Cygnet costs $1,000 to $2,000 on top of a PC, and Zaisan ES-3 costs $1,000 less than a PC." He won't buy the ES-3 for heavy data users because the screen is small—nine inches—and there are too many keystroke conversions when accessing a mainframe. It's ideal, however, for telephony-based people with

light data needs, he says.

For heavy data users, Levin and others point out that pcs with Hayes modems and communications software satisfy requirements for enhanced telephony features—at a cost less prohibitive than IVDTs. "We are not integrating just to integrate," Levin adds. "A lot of people will continue to have just pcs and phones." ◉

TELECOMMUNICATIONS

DIGITAL DIALING DOLDRUMS

Next April Japanese telecom will open up to competition. Don't expect things to change.

by Tom Murtha

In most other developed countries, it's possible to use an American-made 1,200-baud auto dial/auto answer modem for microcomputer data communications. Not so in Japan. Nippon Telegraph and Telephone Public Corp. won't allow it. A tightly regulated telecommunications market bottlenecks the availability and use of imported telecommunications equipment.

Theoretically, all of that is about to change. Following the recommendations of a special government committee, legislation to liberalize Japan's telecommunications market is the subject of a special Japanese Diet session this month. If the legislation is passed as expected, NTT will lose its monopoly next April, creating new opportunities for Japanese and foreign firms competing in the deregulated environment. Even the most optimistic American vendor, though, is not expecting the success that Commodore Perry experienced in Japan more than a century ago.

NTT has monopolized the maintenance and installation of telecommunications systems in Japan just as AT&T long dominated telephony in the U.S. Because NTT does not manufacture its own equipment, it used to rely almost exclusively on four major Japanese firms and some 200 subsidiaries and affiliates—the NTT Family—to supply the bulk of its needs. The principal family members are well-known successes in an increasingly open international electronics market: Fujitsu, Hitachi, NEC, and Oki Electric.

As Japanese successes in consumer and industrial products in the U.S. grew, the federal government was prodded to seek concessions from Japan to open up her home markets. The U.S.-Japan NTT Procurement Agreement created in 1981 a three-level purchasing system to provide foreign access to much of NTT's procurement.

Although progress in attracting NTT procurement orders has been slower than expected, most concerned American companies supported the recent extension of the agreement; NTT procurement of equipment from American firms increased to about $131 million in 1983 from $17 million in 1981. American companies' concern about the lack of progress led to significant changes, such as including new NTT research and development projects and annual reviews of compliance.

As part of the review process, the U.S. Embassy in Tokyo just surveyed 35 American companies vying for a share of the NTT market. "Most companies are quite satisfied with the direction of NTT procurement practices, but the pace of implementation could be faster," says Richard May of the U.S. Commerce Dept.

That's an understatement. The fact is most American firms are reluctant to criticize openly NTT's procurement policies for fear of poisoning the well. "NTT isn't bending over backward to provide assistance to foreign competitors. Selling to NTT is a very slow, tedious bureaucratic process that applies to Japanese and foreigners alike," says an executive in charge of Japan operations for an American firm that has successfully tendered contracts worth millions of dollars with NTT. "Success requires a substantial up-front investment, persistence, and a long-term orientation."

Even NTT officials admit foreigners have a tough time. "Although we now have an open and nondiscriminatory procurement policy, it's still difficult for American and other foreign firms to participate on the same level as Japanese firms," says Ichio Kata, director general of NTT's International Procurement Department. "Over the past three and a half years we have been trying to help foreign manufacturers understand our product requirements and have equal access to our procurement process."

That's hard to believe, considering the facts. Compared with Japan's success in the U.S. telecommunications market, U.S. firms competing in Japan have shown a dismal performance. In fiscal 1983, according to a system whose categories differ from those used for U.S. estimates, the Electronics Industry Association of Japan (EIAJ) estimates Japan imported telecommunications equipment worth $21.6 million from the U.S. During the same period, Japan exported telecommunications equipment worth $404.5 million to the U.S. In telecommunications alone, Japan is exporting to the U.S. 18.7 times more than it imports.

To make matters worse for the U.S. balance of trade, the EIAJ estimates that for July 1984, Japan's telecommunications exports were up by 88.8% over the same period in 1983. "The NTT Procurement agreement is a step in the right direction, but the road will not end until we wipe out the great disparity in telecommunications trade," says John Stern, senior representative of the American Electronics Association in Tokyo.

"The NTT monopoly has stifled some areas of technological innovation in Japan," comments a former NTT employee now comfortably pursuing his second career at an NTT family member firm—a common practice in Japan. "Many domestic users were unhappy with NTT's reliance on outdated technologies, high rates, and refusal to allow other organizations to offer services over the NTT network. There has been considerable pressure from Japanese firms for the government to reorganize the telecommunications industry. The technology is rapidly changing. To remain internationally competitive, Japanese firms require an innovative domestic market."

The Ministry of Posts and Telecommunications (MPT), the Japanese version of the American Federal Communications Commission, has the awkward responsibility of drafting and enforcing regulations that will implement the new telecommunications environment. Industry sources and U.S. Embassy officials are uncertain that opportunities for foreign firms will increase as Japan's private telecommunications sector continues to expand.

Most American firms are reluctant to criticize NTT for fear of poisoning the well.

"We are deeply concerned about the proposed system for approving telecommunications interconnect equipment for use in Japan," states Herbert A. Cochran, commercial attaché of the U.S. Embassy in Tokyo, who is playing a major role in efforts to streamline standards and certification procedures for U.S. products. "The proposed product approval system is not as open or efficient as the NTT procurement system. This is a return to the same type of product approval problems we had with metal baseball bats. We have already expressed these concerns to MPT."

Unofficial reports have mentioned several specific problems with the proposed system. First, in many cases all data required for product approval must

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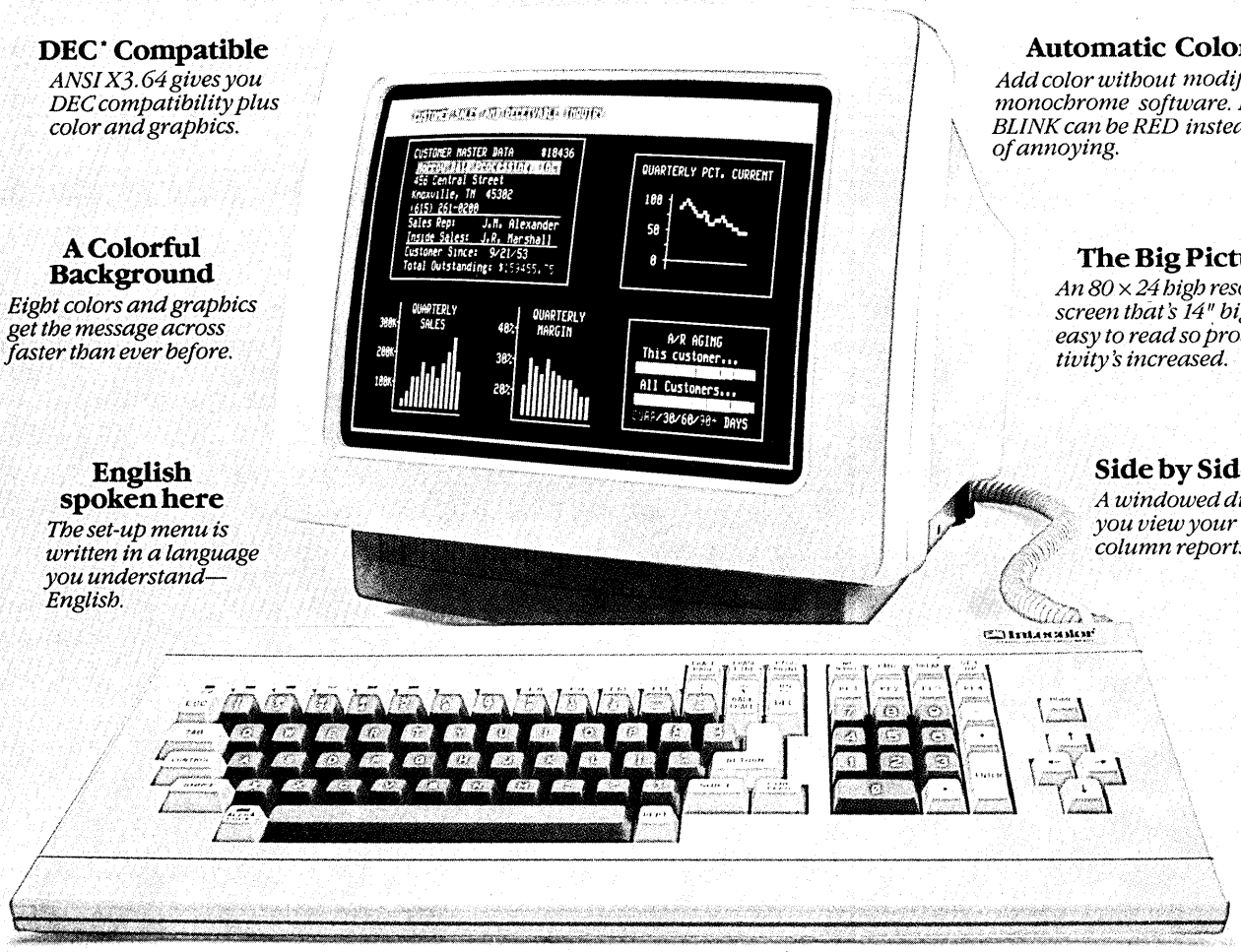

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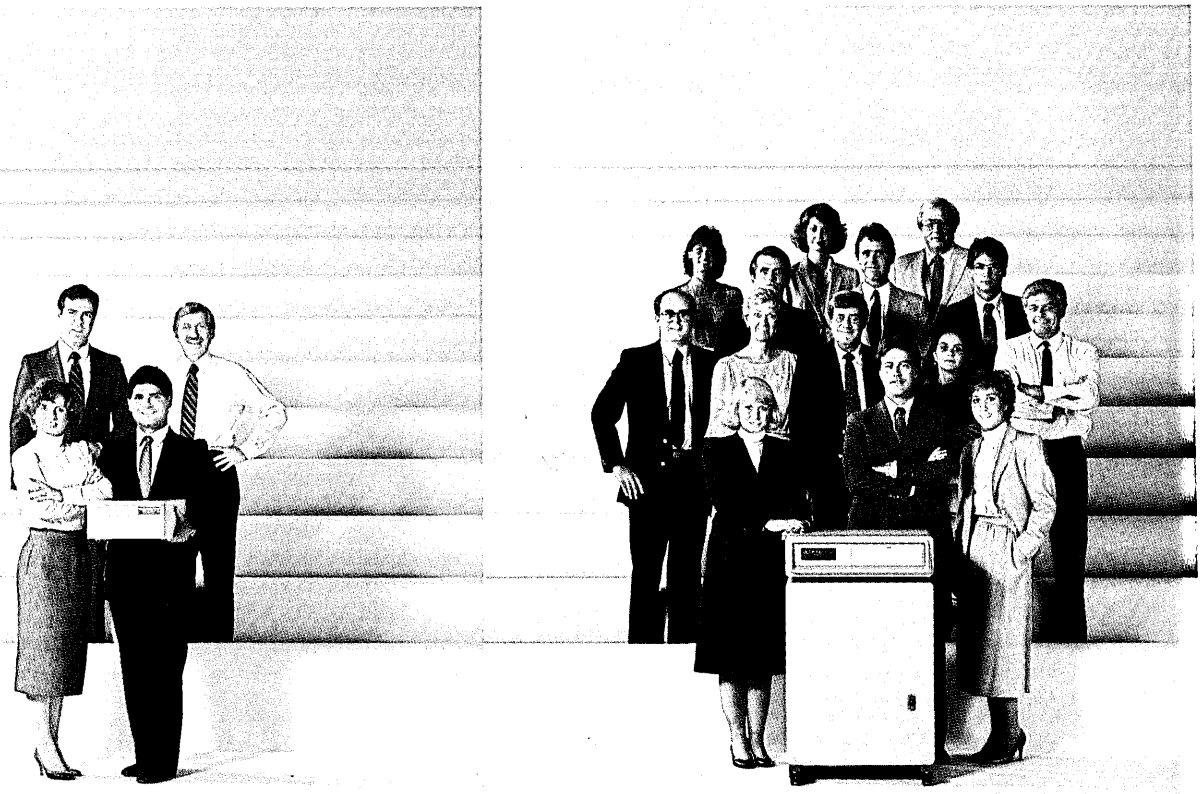

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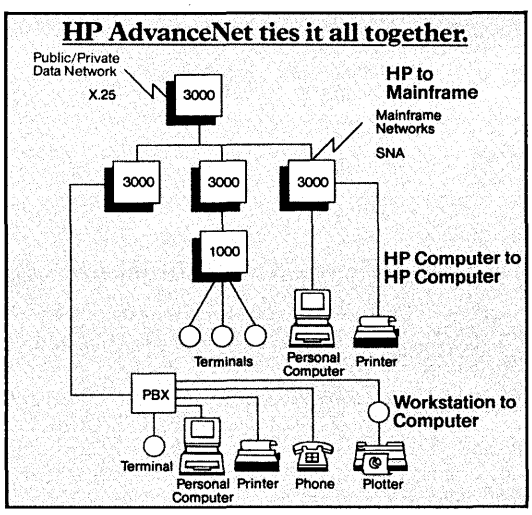

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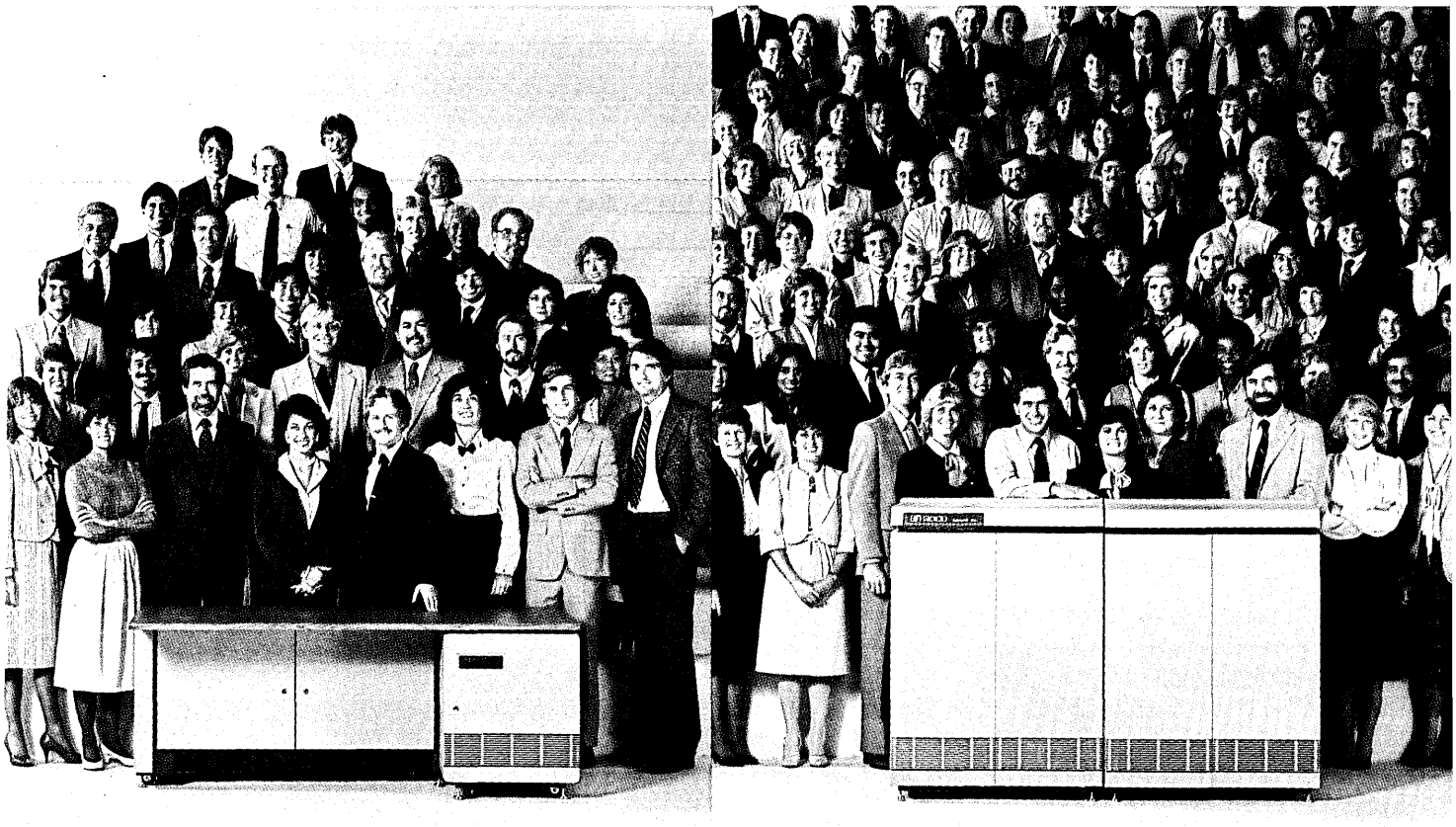

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NEWS IN PERSPECTIVE

THE FEDS TALK TOUGH

Government and industry aren't having nightmares over Nippon Telephone and Telegraph becoming privatized. Then again, they're not getting a solid eight hours, either.

"Whether they'll continue to observe the trade agreement is a serious issue for the government," says David Shark, director of international procurement in the Office of the U.S. Trade Representative.

"I'm sure it's a serious issue for the high-tech industry as well. If the NTT agreement is abrogated, it will have a very, very serious impact on U.S.-Japanese trade," he adds.

Indeed. If, as expected, the Japanese Diet passes a bill allowing NTT to become a private company, there is some fear and loathing in Washington that last January's agreement will become history. That agreement, achieved after tortuous negotiations, officially opened the Japanese telecommunications market to U.S. firms for the first time. Granted, we're not talking major fissures here. It's just a crack. But, having at least gotten its big toe in the door, the U.S. is doing its damnedest to make sure it's not slammed shut.

"The Japanese director of procurement told me in June that policies won't change with privatization," says Ed Speivack, president of the North American Telecommunications Association. "It's a fairly hot issue, but not as hot with U.S. manufacturers as it seems.

"Actually, not a lot of manufacturers are making the effort to get into Japan. So while I expect NTT to follow the agreement, that doesn't necessarily mean a lot of procurement for U.S. firms. It hasn't meant much so far."

That depends on your definition. According to Shark, U.S. firms did $40 million worth of business in Japan's FY '82. That's not much, under any definition. By 1983, the figure had risen to $131 million. Hardly megabucks, but a sight better than 1981. Still, that's less than 5% of the Japanese market.

"That's obviously not as much as we'd hoped," Shark says. "We think U.S. firms could do better both in quality and quantity. But they haven't bid on the bulk of contracts that NTT has let. It takes a lot of money to put in a bid, and most of them seem to think it's not worth it. I know that in fiber optics, industry feels it definitely got the runaround. All the contract specifications favored NTT's current customers."

At least four U.S. companies are willing to endure the trials and tribulations that come with the Japanese territory. The four, all heavyweights whose names Shark would not reveal, have put in unsolicited bids to sell central switching equipment. They're still waiting to see if NTT is buying. One of the proposals has been in limbo for more than a year.

So, will the privatization of NTT be a boom or more of the same old bust?

"That depends on how they do it," says Bill Krist, manager of international affairs for the American Electronics Association, which has been particularly active in prying open the Japanese market. "Deregulation could be good. But if they make the standards and the certification process too unacceptable to U.S. manufacturers, that could be a real problem."

"The existing manufacturers doing business there will make more money," Speivack says. "Whether more manufacturers will make more money is questionable."

What is not questionable, although much of Washington is talking about it, is the Japanese government's duty—make that sacred honor—to keep its word. Should it not, Japan may find itself in dire straits.

"The theory that the successor entity isn't bound by a previous agreement just doesn't hold water," Krist says. "It's a fairly hot issue, but it's going to get red-hot if the Japanese government doesn't follow its commitment. You can bet they'll hear about it. Adverse publicity is going to be the least of what they'll suffer."

What the Japanese could suffer includes being prohibited from selling to the U.S. government and losing its waiver of the provisions of the Buy American Act. And if you think protectionist sentiment is running high now, you ain't seen nothing yet.

"If this agreement is abrogated, no one will accept that the Japanese market will continue to be open, even though that's what NTT may say," Shark warns. "I don't even want to think about the consequences for U.S.-Japanese trade if that happens."

—Willie Schatz

be generated in Japanese laboratories. Second, MPT may decide not to accept testing data from manufacturers' laboratories. Finally, MPT may subject each shipment of interconnect equipment to dockside inspection. The result would be an effective set of nontariff barriers that would substantially reduce the ability of foreign firms to compete. These rumored obstacles should not be a surprise—they have been used with great success in France and elsewhere to protect domestic vendors from Japanese companies.

Another dramatic change in the worldwide telecommunications landscape is the upcoming privitization of NTT, similar to the divestiture of AT&T. "The NTT family is already strongly positioned to compete against a privatized NTT in a rapidly expanding Japanese market for communications and data processing equipment," says Bernard Key, senior analyst at Jardine Fleming Securities in Tokyo. "Foreign firms that aren't well established in Japan are going to find this market a real tough nut to crack."

Japanese output of communications equipment should expand to almost $7 billion in fiscal 1986 from $2.3 billion in fiscal 1983. Jardine Fleming's Key estimates the export share will remain at 44%. The AT&T divestiture accounts for a substantial portion of expanded Japanese exports, with NEC winning a number of major contracts from AT&T's former operating companies.

In contrast, many industry observers see the privatization of NTT as an opportunity for Japan to wiggle out of a commitment to open its telecommunications market. When the NTT procurement agreement was renewed last January, Japanese Foreign Minister Shintaro Abe stated in a letter to U.S. trade representative Bill Brock,"My government is not in a position to prejudge the effects that possible future change of NTT's form of management may have on the present arrangements. When required by circumstances . . . consultations will take place between our two governments, at the request of either, on the effects on the present arrangements." At the time of this writing, no consultations had taken place.

"Many domestic users were unhappy with NTT's reliance on outdated technologies."

Concern in Washington over the delays in opening up NTT—no doubt prodded by frustrated vendors—led to the inevitable legislation. Sen. John C. Danforth (R-Mo.) contends that voluntary efforts by the Japanese to open their telecommunications market are unlikely to occur, and the Telecommunications Trade Act of 1984 he proposed last spring was aimed at forcing some reciprocity of access. "In trade terms, AT&T divestiture is nothing less than the unilateral giveaway of the U.S. market to foreign suppliers," he said earlier this year. "Moreover, since most foreign markets are effectively closed to U.S. telecommunications exports, divestiture also represents a giveaway of the only leverage that might ever be used by our trade negotiators to gain access to those markets." While most of the bill died in Congress, one portion will make it easier for U.S. officials to track

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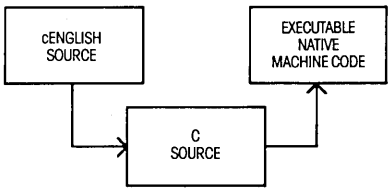

C source can be embedded in cENGLISH source.

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SAMPLE cENGLISH PROGRAM

```
IDENTIFICATIONS
  MODULE:  Mininame
  AUTHOR:  bcs
  DATE:    8/29/84
  REMARKS: Sample cENGLISH program that adds first
           names to a file
END IDENTIFICATIONS

GLOBALS
  FIXED LENGTH 1 ans
  FIXED LENGTH 15 Fname
END GLOBALS

MAIN PROGRAM
  BEGIN
    CLEAR SCREEN
    SET ECHO OFF

    USE "NAMES"
    VIEW BY "ID_FNAME" ASCENDING

    AT 23,1 SAY "Add a record? Y or N"
    AT 23,25 ENTER ans USING "!"

    WHILE ans EQ "Y"
      CLEAR GETS
      AT 6,1 SAY "Enter first name"
      AT 6,20 GET Fname
      READ SCREEN

      INSERT
        Fname = Fname
      END INSERT

      AT 12,10 SAY "Welcome to cENGLISH," & Fname
      WAIT
      AT 14,10 SAY "HIT ANY KEY TO CONTINUE"
      STORE "                    " TO Fname
      STORE "  " TO ans
      AT 23,1 SAY "Add another record? Y or N"
      AT 23,30 ENTER ans USING "!"
      CLEAR ROW 1 THRU 23

    END WHILE

    AT 12,10 SAY "That's all for now!"
    UNUSE "NAMES"
    SET ECHO ON

END PROGRAM
```


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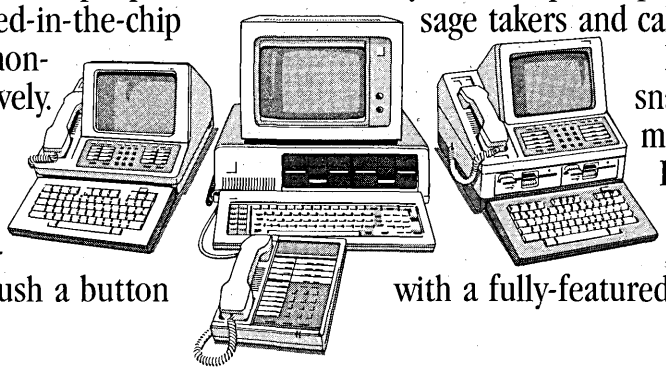

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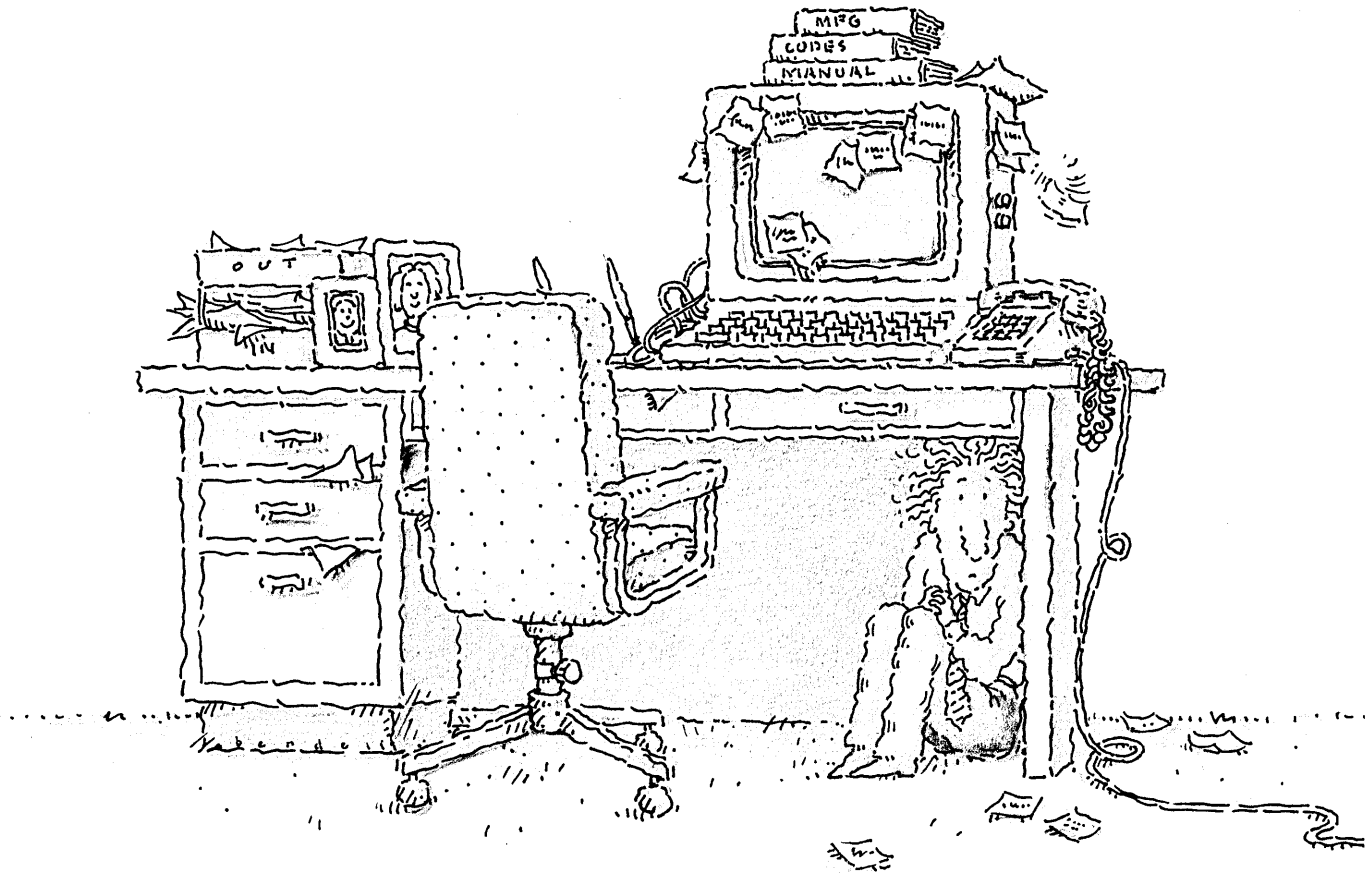

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CIRCLE 36 ON READER CARD

telecom trade and another sets up a panel to study trade issues.

Following meetings with NTT officials in Tokyo last October, Susan C. Schwab, Danforth's legislative assistant and a negotiator during the discussions that led to the original NTT agreement, was less than sanguine about improvements in interconnection policies for users and possible opportunities for U.S. telecommunications sales if privatization occurs in April. "In terms of open-mindedness about trade, the bureaucrats at NTT are still back in the Dark Ages," says Schwab. "These are the people who will be running the show. NTT has been bending over backward to favor U.S. competitors. A privatized NTT competing for market share will not be able to afford such a luxury."

U.S. firms now selling to NTT (see box) say a requirement for success is a long-term commitment to the Japanese market. Most American telecom companies have failed to establish a critical mass of sales and support in Japan. "It's a tight market with few participants," says Darrel E. Whitten of Prudential-Bache Securities in Tokyo. "Those unwilling to forego short-term profits can't expect to get on the inside track."

Despite all this, the folks at Hayes Microcomputer Products Inc. of Norcross, Ga., are eagerly looking to the Japanese market. Company officials say they are preparing the paperwork to get a presence there, after earlier successes in Hong Kong and the People's Republic of China. So personal computer users in Japan will someday be able to use an auto dial/auto answer modem. Someday. But don't send a modem as a Christmas present to friends in Tokyo this year. By the time they can use it, it may be an antique. ◉

U.K. BANS IBM/BT VAN PLAN

British users are angered at the British government's killing of a VAN proposed by IBM and British Telecom.

by John Lamb

British IBM customers were divided and angry following the British government's decision to kill a proposed national value added network (VAN) based on SNA. The Thatcher government grounded Europe's first effort at a national SNA VAN following pressure from local suppliers and users, who complained that such a network would create a monopoly.

The project, which was proposed as a joint venture between IBM and British Telecom (the United Kingdom's government-owned PTT), would have provided a managed network for the U.K.'s IBM mainframe users. Instead, its failure has cast a shadow over IBM's prospects for similar deals with other European PTTs. It also leaves British Telecom (BT) without a presence in an important U.K. telecommunications market.

IBM and British Telecom were planning to spend "tens of millions of pounds" on a network centered on IBM's service bureau in Warwick, England. The network was to have supplied security, customer access control, service level monitoring, electronic mail, and accounting to U.K. IBM users.

To avoid charges of monopolizing the U.K. VAN market, the two giant partners planned to run the network at arm's length. But the government concluded that the dynamic duo's scheme "would be a significant deterrent to market entry to others."

British suppliers like International Computers Ltd. (ICL), which is in the process of setting up a VAN of its own in partnership with AT&T, are jubilant about the ban, but IBM users are despondent. "Those of us who want networking want it to be available as soon as possible and as cheaply as possible," says Neville Boothroyd, secretary of the IBM Computer Users Association (CUA). "And we saw that the cheapest and quickest way of getting a network up and running was via the IBM and British Telecom route."

IBMers who can afford to take a long-term view are more sanguine. At Tesco, one of Britain's biggest supermarket chains and a major IBM account, technical services manager Michael Martin talks of lost opportunities. "The joint venture network may not have offered what we wanted, since we are committed to open systems interconnection (OSI), but we are disappointed about the government's decision because it narrows the choice we have."

Both U.K. services companies and some users—particularly those committed to OSI—were bitterly opposed to the idea of the common carrier jumping into bed with Big Blue. One key submission to the Department of Trade and Industry, which regulates telecom in the U.K., came from the National Computer Users Forum (NCUF). The NCUF, which represents all users, had "serious reservations" about the whole deal on the grounds that it would sap manpower and impetus from the British OSI effort and create a "monopolistic service" by combining VANs with common carrier services.

The NCUF was particularly worried about electronic mail, arguing that by implementing the service on the proposed VAN, called Jove, IBM and BT would be forcing users to commit themselves to a proprietary system at an early stage of its development. The group reasons that Britain would then be out of step with the rest of the European Community, which is committed to an open electronic mail standard.

"Electronic mail standards in Europe are three years off and we were worried that the SNA network would lock users into a proprietary network," explains NCUF chairman Stuart Goold. He regards electronic mail as the crucial VAN application from which all other applications flow.

Users were also upset about how little time they were given to register their points of view with the British government.

Users were also upset about how little time they were given to register their points of view with the British government. The IBM CUA, which Boothroyd says was overwhelmingly in favor of the scheme, was not invited to participate in the government's decision-making process. Goold of the NCUF says he was disappointed that he had only heard of the proposals at a late stage.

But many users see the government's decision not to grant Jove a license as a victory over manufacturers. "It's the thin end of the wedge," says Dr. Frank Taylor, a consultant to the NCUF. "Users and governments are beginning to win against the manufacturers who for too long have had the attitude that their customers should take what they have to offer."

This is not the view of those who prefer to live with the inescapable fact that IBM controls some 60% of the European computer market. "We have missed a chance to take SNA out of the hands of IBM and ensure that it is a de facto standard," says Victor Driessens, network manager of the SHARE European Association.

Driessens has little faith in the ability of PTTs to press forward with OSI, and sees SNA as the natural standard. "What we need is OSI, but experience has taught us that when PTTs try to produce a standard it is more or less imperfect, like X.25 or teletex," he says. "SNA is only at the transport level [the third most basic of the seven layers in the OSI model], with no definition of the applications protocols. The use of SNA in Britain would have inspired software manufacturers to align themselves with OSI at these higher levels."

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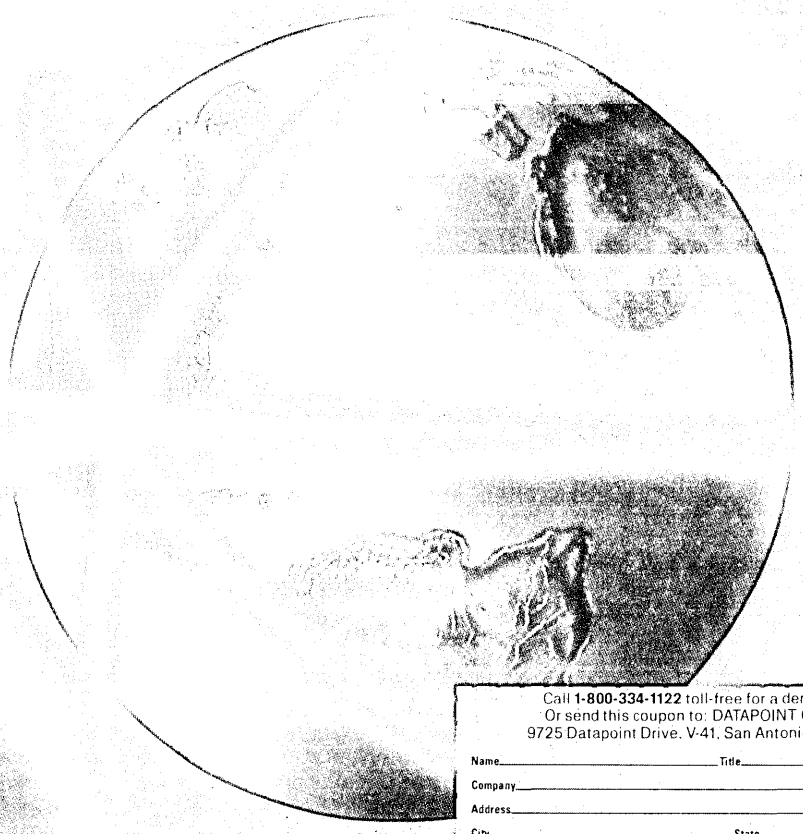

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IBM U.K. says it is disappointed by the government's decision. The company has already had one rebuff in France, where an approach on a similar deal was also turned down. But all is not lost in Britain. The Jove scheme was originally the brainchild of IBM back in 1982 and was only put forward as a joint venture after British Telecom had approached the company, so IBM may proceed on its own.

The British government says it would welcome individual proposals for VANs from either British Telecom or IBM. It is unlikely, however, that IBM will act immediately. Before the government's decision to stop the venture, IBM said the money earmarked for it would be spent on other projects and any decision to proceed alone would depend on the conditions of a new VAN license currently being drawn up by the British Department of Industry. The redrafted license may include conditions relating to OSI standards.

Some observers think IBM may make the U.K. its center for European database services.

Neither partner is short of offers from U.K. industry. Within days of the decision, BT had received seven proposals for joint ventures and IBM had received 30. British Telecom needs a partner with both data processing and applications experience, while IBM could do with a mate that has network facilities in place.

Opinion is divided as to whether the setback in Britain will affect IBM's chances of setting up VANs in other European countries. The company is currently in discussions with both the Italian and German PTTs. "The U.K. is one of the most advanced countries in Europe, so far as VANs are concerned," says Driessens of SHARE European Association. "Since the scheme has failed there, I don't think its chances are good in other countries."

On the contrary, the scheme's failure will have little effect in the long run, says market researcher Allen Porter of Associates in Information Technology. "PTTs may be influenced a notch, but in the end these guys make up their own minds," he says.

Some observers believe that IBM will not only press ahead with its own VAN in the U.K., but will also make the country its center for European database services, servicing customers from its Warwick bureau center. "Since Britain is the first to liberalize its telecommunications, it will be the center for IBM's network services," says a noted European IBM watcher. He believes that the British hiatus will set IBM back no more than two months in its bid to get into the European VAN business.

Driving this push into network services are recent improvements that IBM has made to SNA, in particular the number of elements (network controllers or terminals) that can be supported on an SNA network. A so-called subarea in an SNA network can now support 32,767 elements, compared to a previous capacity of 2,000 elements. What is more, the maximum number of subareas in a single SNA network has been increased from 32 to 255.

Driessens says that this uprating of SNA is crucial to IBM's pitch in Germany, where the company has already blotted its copybook over delays in supplying the country's PTT with a national videotex system.

IBM's would-be bedfellow, British Telecom, which has been floated as a public company (see box), desperately needs another partner if it is to compete in the VAN business in a big way. Originally, British Telecom had proposed to back two horses in the VAN business: Jove and its own packet switching network, PSS. British Telecom plans to plow $70 million into upgrading its packet switched network to give more U.K. users local access to the service. PSS is basically a transmission service, however, and provides little in the way of value-added services to users.

British Telecom has been worried about the commercial success of PSS and has launched a sales drive to increase revenue from the service, which it sees as crucial to its VAN effort. At present the service has some 4,000 users. The NCUF, however, is concerned that British Telecom is not committed to introducing the higher-level OSI standards into the PSS service, a charge that British Telecom hotly denies. "We are absolutely committed to OSI," a corporate spokesman says.

As the dust settles from the Jove debate, it is clear that the publicity campaign mounted by British Telecom and IBM has paid off. As one observer says, "Even if they don't have a use for one, everyone knows about VANs now." ◉

BRITISH TELECOM FOR SALE

They called it the biggest sale of public assets in the world: around $4.4 billion worth of the U.K. PTT, British Telecom (BT), was being offered to the general public. Representing 51% of the public corporation, the share sale was preceded by a $10 million advertising campaign promoting BT as the "power behind the button."

As stockbrokers began counting the share applications last week, the British government has been calculating how successful it had been in persuading individual investors to put their money into telephones. With inducements like rebates on their telephone bills, BT hoped investors would jump at the chance of returns of 17% or more on their investments. The British government even went so far as to limit the purchases of corporate investors to 10%, although it seems unlikely that many investors would want to spend $440 million or so on BT anyway.

The selling of British Telecom is just the latest, although riskiest, step in a long process of deregulation and privatization of British telecommunications. First, BT was split from the postal services in the late 1970s. Then, with the election of a Conservative government in 1979, began the long process of what the British call liberalization.

The government introduced competition into U.K. telecommunications, allowing outsiders to break the state monopoly over both the supply of end-user equipment and the provision of lines. For the moment, though, the U.K. government has confined itself to allowing just one competing carrier, Mercury, and that firm has not made much of a dent in BT's revenues to date.

British Telecom, once a government department, has reacted surprisingly quickly to the changes. Substituting profits for civil service protocol, the PTT has set about taking on the companies that until recently were its suppliers rather than its commercial rivals. Selling products at significant price discounts, BT has cornered around half the PBX market and launched itself into network services, small computers, and satellite communications.

Although the massive internal reorganization has brought growing pains for British Telecom, the more aggressive PTT has hurt its competition as well. BT's suppliers have complained to the Office of Fair Trading, a watchdog body that oversees U.K. business practices, about unfair business practices by BT salesmen.

Liberalization has also changed BT's attitudes about overseas business. On transatlantic lines, for example, it has recently completed arrangements with two American carriers—MCI and GTE Sprint—which will share the lucrative international business with AT&T.

British Telecom is widely regarded as a model for the rest of Europe, although there is little sign yet that governments are responding to pleas from the European Commission to open up their telecommunications businesses. John Butcher, a junior British industry minister, was recently prompted to tell an audience in Germany that it was easier for Britain to sell communications equipment in Detroit than it was in many European capitals.

—J.L.

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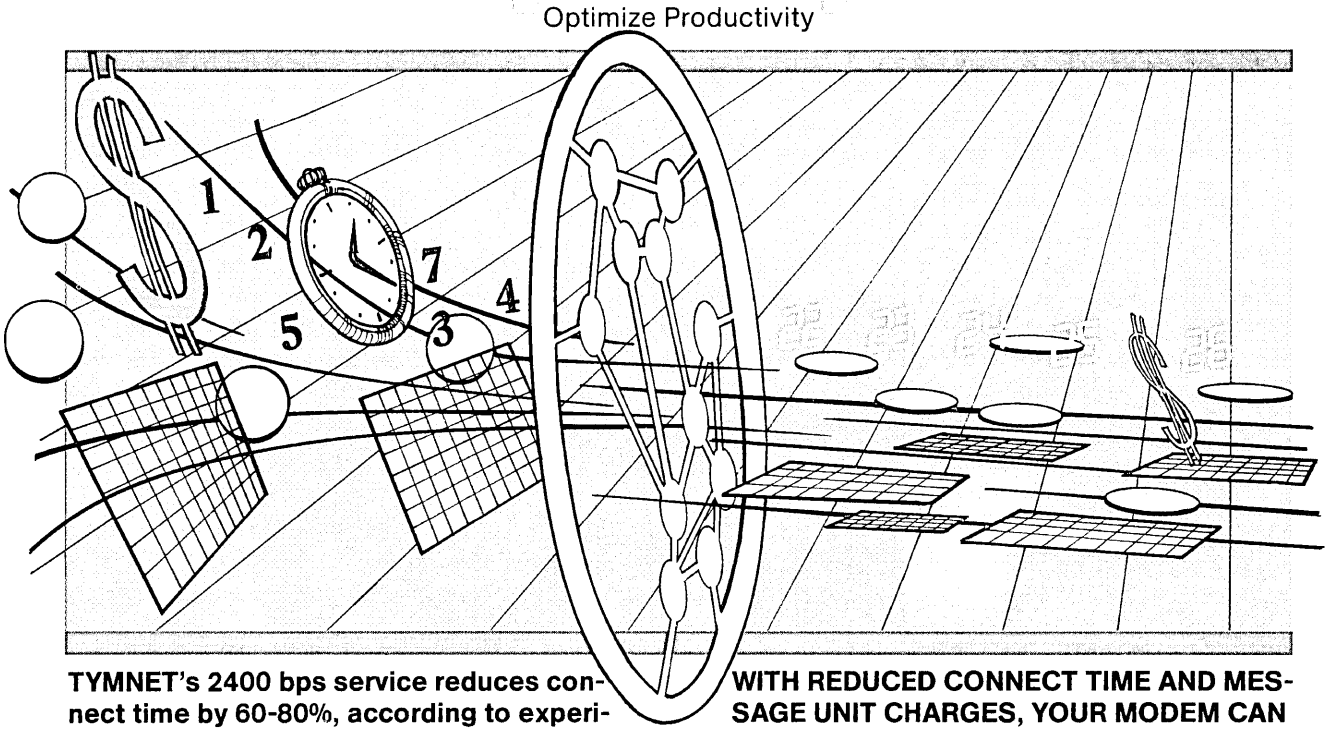

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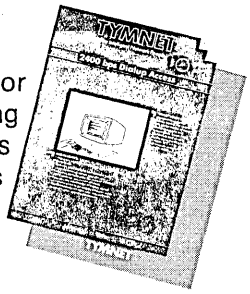

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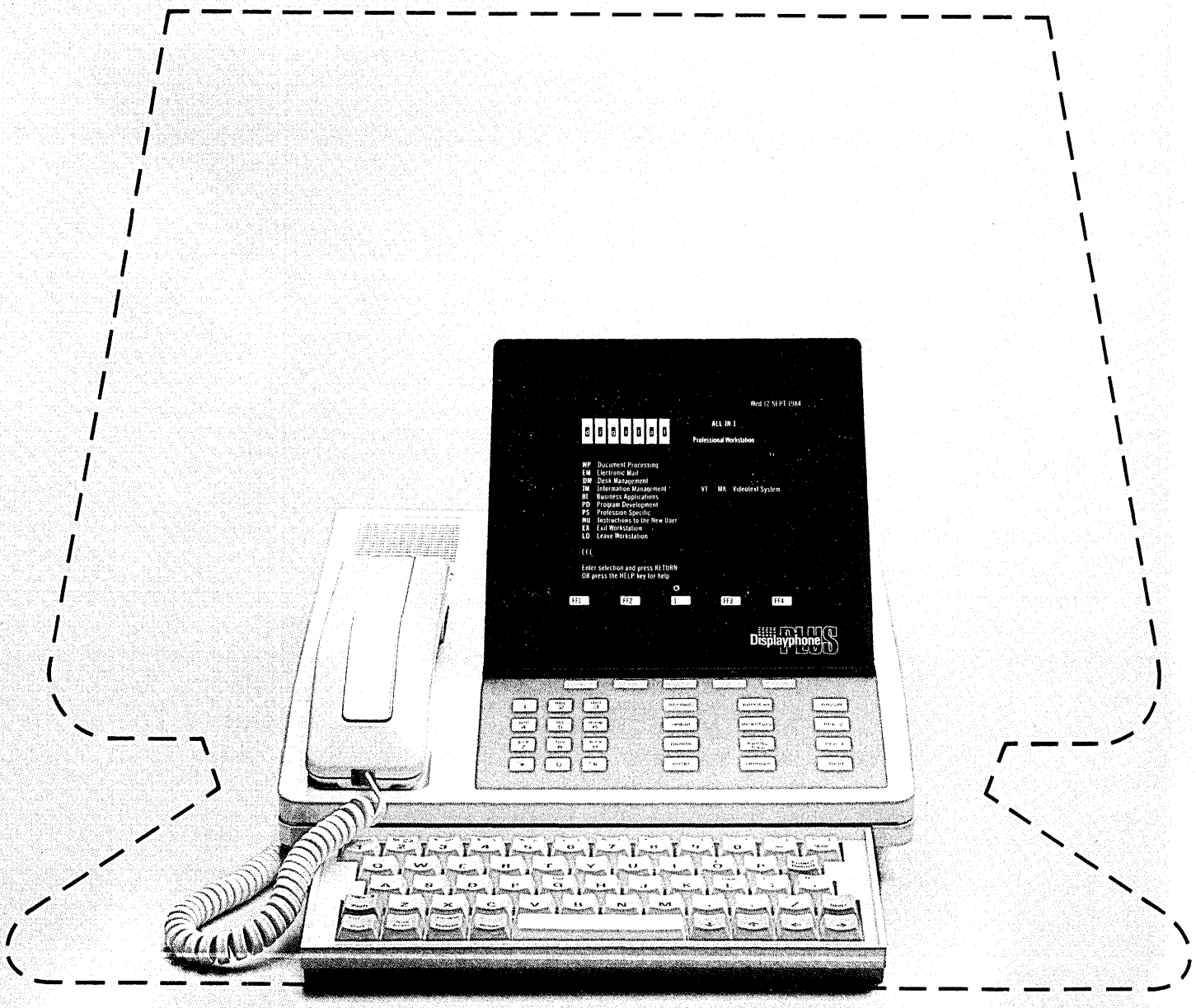

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CIRCLE 28 ON READER CARD

NEWS IN PERSPECTIVE

BENCHMARKS

SMITES FEMA: The San Francisco-based Bay Area Lawyers Alliance for Nuclear Arms Control is no longer the only organization angry at the Federal Emergency Management Agency's plans for a military takeover of the nation's computer industry in the event of a national emergency (see "The Disaster Dossier," Oct. 15, p. 50). A letter uncovered in a second round of court appearances by the lawyers reveals that even the Reagan administration, in the persona of Attorney General William French Smith, is deeply concerned about some of the practices and policies of the emergency agency. The letter reads in part, "I believe the role assigned to FEMA . . . exceeds its proper function as a coordinating agency for emergency preparedness. . . . FEMA has promulgated numerous plans and proposals that are in sharp contrast to the concept of utilizing the existing decision-making structure of the executive branch for emergency planning and response." Smith's letter, which was dated Aug. 2 and released by federal judge Robert Aguilar in November, raises several specific points, arguing that in assigning itself the role of "emergency czar," FEMA has co-opted the responsibilities of other government departments, including Justice, Defense, Transportation, Commerce, and the Interstate Commerce Commission.

The Presidential Emergency Act Document 21, which established FEMA's mandate, falls permanently in the realm of national security, Aguilar said. Indeed, he told the lawyers, a federal security officer stood watch outside his chambers even as he read it. "I have cause for concern and alarm that certain new documents should have been turned over to you that were not turned over," he said, adding that he did not think that this apparent oversight was intentional.

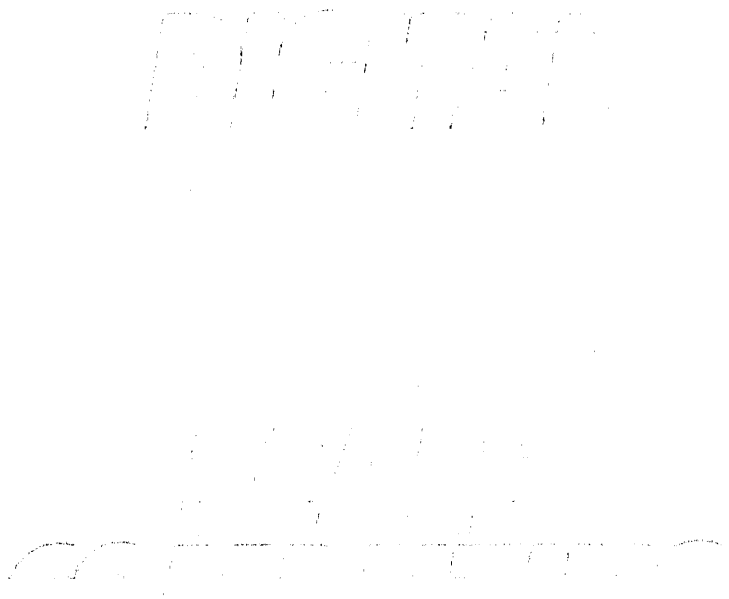
A sought-after list of Justice Department titles cataloging other sensitive documents will remain under wraps at least until Aguilar studies it further.

FEMA was created in 1979, and its duties include everything from flood relief to civil defense. Recent figures show that FEMA has 2,600 employees and a budget of $560 million.

JOINT VENTURE: Telex Computer Products introduced a new liquid plasma display terminal, the first product from Plasmagraphic Corp., a Tulsa, Okla., joint venture between Telex and Burroughs Corp. The unit has a 24-line by 80-character orange display on a black background, and measures 4 by 7 by 1½ inches. Telex president George Bragg said that the unit replaces Telex's 078 model and offers full IBM 3278 compatibility for $2,100 to $2,200, or about $600 more than the 078. Telex owns 20% of the new venture, Burroughs the remaining 80%. Telex said that the Plasmagraphic venture may also oem the product, but not immediately. Separately, Bragg said that Telex has been negotiating with the Australian government to set up a new manufacturing plant there, the company's first outside the U.S. Currently, Telex products are sold down under by Amalgamated Wireless Australia, a domestic distributor. Telex said the distribution contract is being discontinued. Telex is also taking over the Raytheon Data Systems terminal and controller manufacturing facilities in Australia and is renaming them Telex Data Systems.

NAMES PRESIDENT: In an effort to stem a recent stream of red ink, Miniscribe Corp. tapped Roger Gower for its presidency, ending a six-month search. Gower, who had been president of ITT Qume, took over from company founder Terry Johnson, who said he wanted to step aside to pursue strategic planning and new product development for the company. Gower's first task is to bring Miniscribe's current operations back to profitability; it had been running in the red in the third quarter, although on the year it is still profitable, the company says. The Longmont, Colo., firm also introduced a family of half-height 5¼-inch Winchester drives. Qume, meanwhile, has not announced a successor to Gower, whose resignation took the company by surprise. Qume founder and ITT vice president David Lee assumed Gower's responsibilities in the interim.

ASHES TO ASHES: Franklin Computer Corp., the embattled Pennsauken, N.J., microcomputer manufacturer, is liquidating its assets and closing its doors for good, following an unsuccessful attempt to find a buyer for the company. The firm filed for protection from its creditors under Chapter 11 of the bankruptcy code last August. Company founder and president Joel Shusterman, who left the company for several months early this year, resigned for a second time in the wake of the company's decision to close. Franklin listed assets of $33.9 million and liabilities of $22.8 million in its bankruptcy filing in Philadelphia. Separately, Vector Graphic cut its work force by two thirds, down to 50 employees. The Woodland Hills, Calif., firm has suffered losses for nine straight quarters, and its revenues have dipped from a high of $36 million in 1982 to $15.2 million in FY '84, which ended in June. At that time, Vector announced a loss of $7.6 million and the layoffs of 40 employees. ◉



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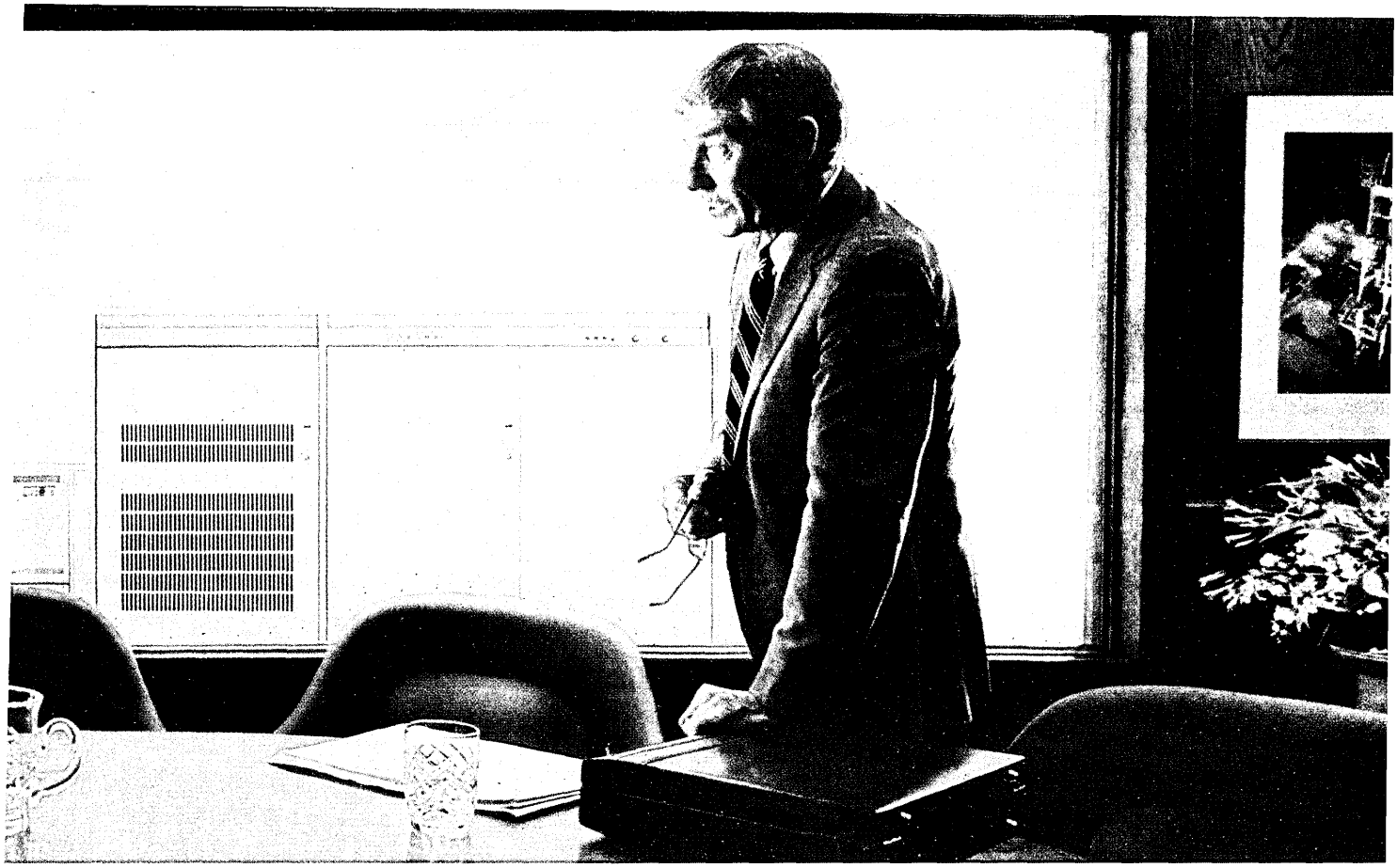

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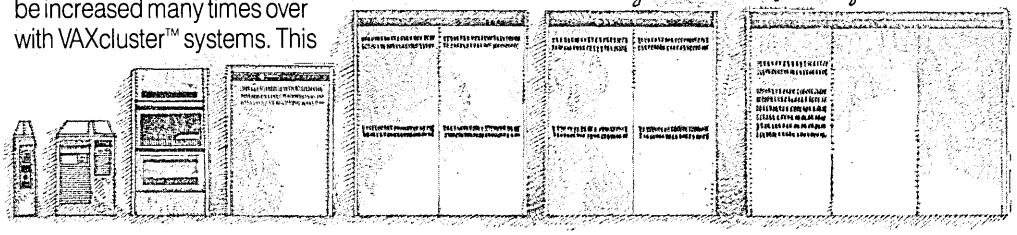

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THE STATE OF CIM

by Daniel S. Appleton

CIM is here. What is it? Who knows? Maybe it's descended from MRP, or from CAD/CAM; or maybe it's the offspring of their (happy?) union.

Whatever it is, it is waxing, while CAD/CAM (computer aided design/computer aided manufacturing) and MRP (material requirements planning) appear to be waning. IBM is ballyhooing the virtues of CIM. So are the Society of Manufacturing Engineers, General Electric, Arthur D. Little Inc., and many other organizations. The 1989 world marketplace for industrial automation is variously estimated to be between $65 billion and $75 billion, up from around $15 billion in 1983.* IBM forecasts that the CIM subset of that market will pass $26 billion in 1989. According to IBM, CIM represents the largest homogeneous vertical market for information automation in the world.

None of this alters the fact that nobody really knows what it is. The acronym, of course, stands for computer integrated manufacturing. But what's that mean? I've heard CIM referred to as a system, a project, a product, a philosophy, a program, and a concept. Defining CIM is as much of a challenge as defining artificial intelligence.

I am not going to define CIM here. I am going to offer a way of thinking about it at the enterprise level. I am going to divide CIM into three parts, examine the current and future structure of each, and explore their interrelationships.

There are really three widely different viewpoints of CIM within a manufacturing enterprise (see Fig. 1). Two of these viewpoints are fairly well understood. The third is not, but it is the third that makes the real difference, as we shall see.

The first viewpoint defines the *demand* for information. It is the *user view* of CIM, determined by the enterprise's market environment and its various product and business life cycles. These things create a need to know and a need to control in the user community, in turn creating the demand for information and subsequently, for enterprisewide industrial automation.

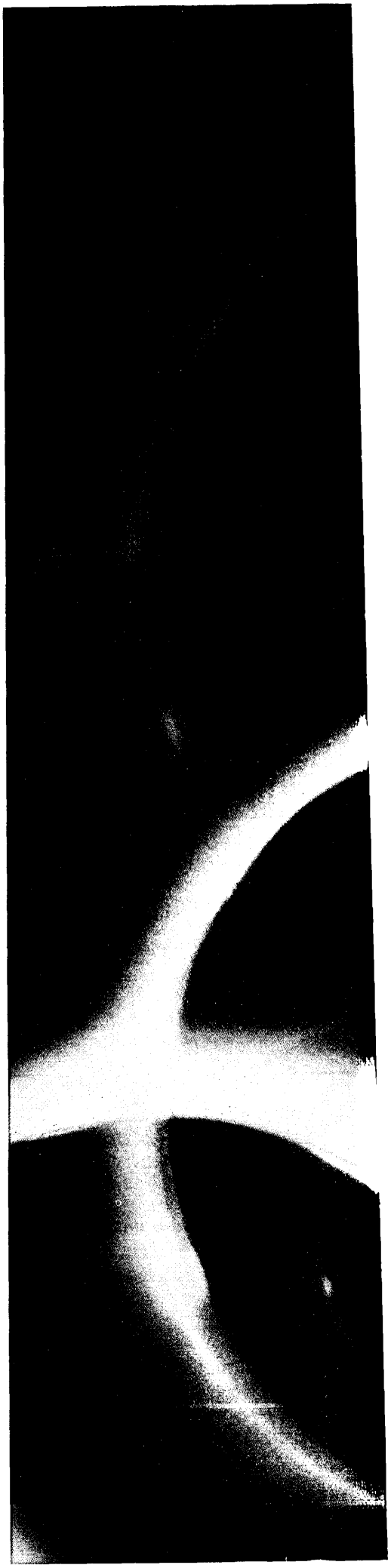
The second viewpoint considers the *supply* of information, and can be called the *technology view* of CIM. This view is created by pressures on the providers of technology. It contains all of the computer hardware, system software, turnkey applications, communications facilities, and databases used in a CIM environment.

In the past, these two viewpoints have been closely interwoven, to the point that it has become almost impossible to distinguish between them. What, for example, is MRP? Is it a user concept or a technology concept? What is CAD or CAM?

User views have in fact been driven by technology views of CIM. Why? Because of the haste to automate. In manufacturing's classic pragmatic style, industrial automation has occurred from the bottom up. The result is that specific user views have been fitted to specific technology views, and—as the vendors had planned—are now hostage to them.

This fragmented approach to industrial automation has produced islands of automation. Typical islands include CAD, CAM, MRP, group technology, shop floor control, cost, process planning, bill of material, purchasing, and so forth. A typical manufacturing enterprise may have automated up to 50 independent functional areas, each with its own hardware, system

*Unless otherwise noted, the statistics in this article are composites derived from five major market surveys of discrete manufacturing. These surveys were conducted by the Yankee Group, Arthur D. Little Inc., Predicasts, Dataquest, and Input Inc.



PHOTOGRAPH BY PETER ANGELO SIMON

As new concepts take hold in manufacturing, they not only solve problems, they create new ones.

software, communications, files, databases, and so on. This is the situation that CIM aims to remedy.

Since the word integration is so critical here, we should probably define it. Two (or more) things that are integrated have common parts. These common parts are leveraged to provide economies and benefits. So where are the common parts in CIM, and whom do they belong to? Are they technology parts that belong to the vendors? Are they user parts?

The answer is that common parts belong to a third dimension of CIM. They belong to the enterprise, and this is what gives rise to the *enterprise view* of CIM. This view provides a control structure that can maintain alignment between the dynamic user and technology views, while at the same time providing for the integration and consistency required by the enterprise as a whole.

WHAT WILL BE SHARED, WHY & HOW?

The enterprise view of CIM contains planning and project management procedures, system and data standards, budgeting and performance controls, and organizational responsibilities. CIM is not possible without an enterprise view that defines what will be shared, why, and how. Through its standards and procedures it answers questions like, will data be shared, and if so how? Will machinery be shared? Programmers? Communications? Reports?

In the remainder of this article, I will examine the state of each of the three CIM viewpoints. It will become apparent that user views and technology views of CIM are drifting apart. It is very difficult to find a cause and effect relationship between the demand for industrial automation and its supply. Vendors and data processing departments are accustomed to telling users what they need, but now users are beginning to come up with their own ideas.

The user view. By a manufacturing enterprise, I mean a whole business—including marketing, finance, engineering, production, and service functions. Manufacturing is the most dynamic management issue of the decade. The U.S. has lost world market share because of poor asset utilization and high costs. Traditional performance monitoring practices (including accounting) have been proven full of faults. New management strategies like "just in time" and "full service" are changing the traditional management concepts.

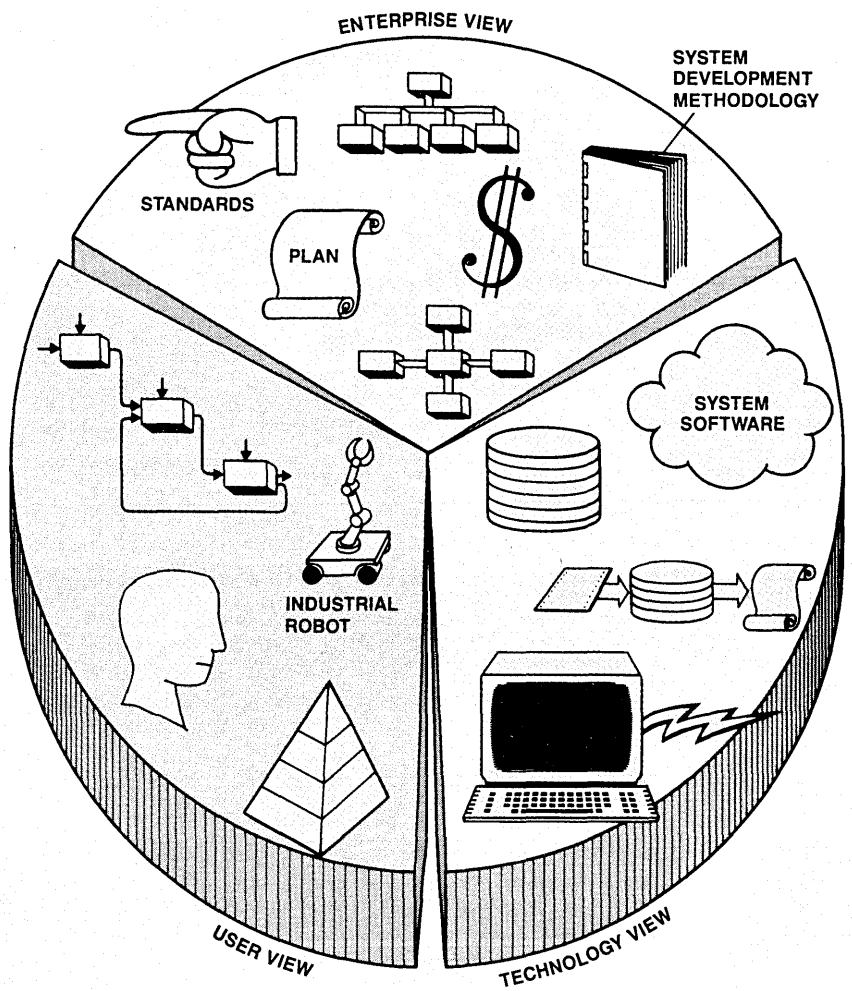
From the user's perspective, manufacturing is anything but static. Markets are changing rapidly, competition is strong, product technology is both complex and dynamic, the economy is whimsical, and so on. Obviously, these are critical factors affecting how users believe they need to manage their activities. They do not translate directly into user demands for industrial automation, however. They go through an intermediate phase. They make users want to manage assets better, and users try to do that with programs that improve quality and productivity, reduce costs and defects, and build new business opportunities.

Here is an alphabet soup of different asset management techniques: TQC (total quality control), MRP (material requirements planning), JIT (just in time), GT (group technology), CAD, MBO (management by objective), SBUs (strategic business units), Theory X (or Theory Z), robots, FMS (flexible manufacturing system), CNC (computer numerical control), ZD (zero defects), and quality analysis. The list is intimidating. It also contains many concepts that are beyond industrial automation. MBO and Theory X, for example, are proven nonautomated techniques for reducing costs and improving asset control.

As such concepts take hold in manufacturing, they not only solve problems, they create new ones. MRP and CAD create radically new asset management and product management styles because they were impractical without automation. They have confused as many manufacturing managers as they have helped.

FIG. 1

THE THREE DIMENSIONS OF COMPUTER INTEGRATED MANUFACTURING



CIM PUBLIC PROJECTS

Everybody's talking about CIM, and a few people are even doing something about it. Following are sketches of six completed or ongoing CIM-related projects whose results are available to nearly everyone. Access to these and other project results can be obtained by contacting the CASA/SME Technical Council, 1 SME Drive, Dearborn, MI 48121.

1. The Manufacturing Automation Protocol (MAP) is a technical standards specification proposed by an ad hoc group of companies for local area networks in manufacturing. It is an ISO-compatible, broadband, token-bus concept that operates at layer one (physical) of the ISO/OSI telecommunications model. MAP was originally instigated by the Advanced Product and Manufacturing Engineering staff of the General Motors Technical Center to solve the problems of communication among various types of computers. MAP is expanding beyond its original concept into a general standards body. GM has presented its message format to ISO as a potential international standard. GM is also looking at the relationship of MAP to EID 1393, the standard that governs numerical controls, and it is talking to the Robotics Industries Association to explore robot programming and controls via LAN. MAP is now being administratively supported by CASA/SME.

2. The International Graphics Exchange System (IGES) is a technical standards specification managed by the National Bureau of Standards. IGES is focused on making it possible to exchange geometric data among different CAD/CAM systems. The program was initiated and funded by the ICAM Program Office (see below) and turned over to NBS for administration. IGES 2.0 is the current release, and it has been proposed to ISO as an international standard. Another ICAM project called Product Definition Data Interface (PDDI) is developing proposed changes to IGES 2.0, which when blended with other recommendations should result in IGES 3.0.

3. ICAM (Integrated Computer Aided Manufacturing) is a U.S. Air Force-sponsored program intended to improve the state of the art of manufacturing automation. There are many projects under the ICAM umbrella. Each project is conducted by a coalition of companies under the guidance of a prime contractor that plans to implement the results. All project results are public domain, but remain under the FEDD (For Early Domestic Dissemination only) clause for two years after completion. Two of the many important ICAM projects are:

- ICAM Project 1105—Conceptual Design of Computer Integrated Manufacturing, which established a conceptual framework for the Factory of the Future (FOF). It was headed by Vought Corp., Dallas, and involved a coalition of 15 companies. Thirty-nine companies served as reviewers of the project results.
- ICAM Project 6201—Integrated Information Support System (IISS), which is intended to develop the technology for accessing and managing databases distributed on different vendor equipment and different DBMSs. General Electric is the prime contractor and is supported by five subcontractors.

4. Computer Aided Manufacturing-International (CAM-I) Advanced Factory Management System (AFMS) has defined a hierarchic control architecture and distributed asset management system for the factory. Billed as an advancement of COPICS (IBM's communications-oriented production information control system), this architecture covers all aspects of shop floor activities both in a semi-automated and automated environment, and describes all external interfaces. The project was conducted by DACOM and supported by a coalition of 20 companies.

5. Integrated Design Support (IDS) System is an Air Force Logistics-sponsored program for management of geometry and engineering product data (geometry, bill of material, configuration management, and so forth) throughout the total product life cycle, in a distributed, multivendor environment. The focus of the program is on the development and management of product data specifically related to improving cost performance in logistics. The program is being conducted by Rockwell on the B-1 bomber, and includes a seven-company coalition.

6. National Bureau of Standards Advanced Manufacturing Research Facility (AMRF) is a test facility for evaluating future standards for integrating automated equipment manufacturing planning and control systems. The facility is in Gaithersburg, Md.

—D.A.

The factory of today is giving way, via CIM, to the factory of the future or, as General Electric calls it, the "factory with a future." This concept of manufacturing is significantly different from what manufacturing managers are used to. Traditional management strategies have been built around a binary picture of manufacturing. Either a business is a job shop, making goods to order, or it is a process shop, making goods to stock. Replacing these two concepts is the custom shop—a manufacturer whose products appear custom-made, but whose assets are optimized like those of a continuous flow producer.

The custom shop concept is an ideal that few if any manufacturers have reached. It is not possible without automation. Nor is it possible without creating minifactories within a factory, and subsequently creating an asset management strategy for them. Those minifactories are called production centers and cells, and they cooperate within hierarchic management structures within an enterprise, using concepts like group technology (GT) and manufacturing resource planning (MRP II).

SUPPLIER, ASSEMBLER NETWORKS

This same custom shop concept is used to link independent enterprises together into what can be thought of as manufacturing networks of suppliers and assemblers (e.g., Borg Warner and GM). In this environment, the custom shop takes on a different and more complex asset management flavor: make to order from your suppliers' stocks. This concept—a step beyond MRP II—is called just in time (JIT), or kanban, which is Japanese for JIT. As you can imagine, JIT raises radically different management issues, depending on whether you are a supplier or an assembler. This asset management strategy is made attractive because of the fact that in today's dynamic manufacturing environment, only 2% to 14% of the product cost is direct "touch" labor, while over 55% is material.

To be a custom shop is the ultimate goal of the manufacturing enterprise. It can be realized if manufacturers can achieve all of their near-term goals at the same time. These goals are:

- Become the low-cost producer. Minimize overhead and direct labor content, while maximizing inventory turnover and ROI on fixed assets.
- Improve asset management. Increase use of existing fixed assets in the face of dynamic and complex product demands, while minimizing value-added assets (e.g., inventories) and expanding market share.
- Get better product control. Reduce product introduction lead time and the cost of new product designs, while expanding the complexity of products and increasing your share of the aftermarket.

These goals are impossible to achieve without integration and automation of physical assets, manufacturing planning and control, and product and process definition.

On the physical side, manufacturers continue to buy and install increasingly large numbers of flexible fixed assets. Flexibility is achieved through automation, and comes in different flavors: flexible manufacturing systems (FMS), robots, automated material handling systems, and numerically controlled machines. Millions of dollars are being spent on the construction of special production centers for sheet metal, composites, tubing, and electronics. Over-

For CIM to become a reality, it must become a management style.

all, this component represents 65% to 75% of the total industrial automation market place, growing at 20% per annum.

Manufacturers are also trying to improve manufacturing planning and control. They are constantly generating new concepts and requirements for inventory control, shop loading, purchasing, and capacity planning control, to name a few, which reflect their new problems of asset and cost management. Planning and control accounts for around 15% of the total industrial automation marketplace, growing at around 30% annually.

Product and process information has been terribly abused in most manufacturing enterprises. Drawing data, geometric data, change data, configuration management data, technical specifications, bills of material, and so on, are in extreme disarray. This information is the most valuable data in manufacturing, and its shabby state is a source of anxiety, low productivity, and high overhead. This, the youngest segment of the industrial automation marketplace, represents about 20% of the total, and is growing at a 35% annual clip.

The above statistics provide a glimpse of the currents driving industrial automation from the user view. While flexible fixed assets still control most of the dollars spent on industrial automation, product and process definition, and manufacturing planning and control are growing faster. These two are collectively called CIM. Within CIM, product and process definition, the late starter, is growing the fastest. This growth is reflected in the great amount of attention being paid to CAD/CAM and product definition databases.

NO TRULY DOMINANT VENDOR

The technology view. Unlike other segments of the computer industry, manufacturing lacks a truly dominant vendor. Until 1983 or so, IBM basically neglected this marketplace, leaving it to Digital Equipment Corp., Hewlett-Packard, and Data General, among others. The result is that the technology view of manufacturing is highly fragmented and heterogeneous.

The typical manufacturer today might be using IBM equipment with IMS data management, TSO, or CICS, and IBM operating systems for business applications; DEC VAX or CDC Cyber equipment for CAE; ComputerVision or Unigraphics for CAD/CAM; Data General or IBM equipment for shop data collection; DEC or HP equipment for test, quality, and process control; and DEC or Wang equipment for office automation. There might be two or three data communications networks and a voice network as well. There will be many application packages written in different programming languages, from different software vendors, each using different data management technologies and teleprocessing monitors. It is not unusual to find offices containing two or three terminals, and maybe a microcomputer.

Most vendors view each of these areas as a different market. They do not, with the possible exceptions of IBM and DEC, view a manufacturing enterprise as a total market. Their product offerings are integrated within these narrow markets, not within an enterprise.

It is not sufficient simply to say that integration will occur because different vendors will all talk to each other over the same communication lines. It's also possible to call Tokyo from Los Angeles; the problem arises when you start to talk. The real integration problem is not in getting a connect, although that remains difficult. It is in the ensuing dialog.

It is the connect problem, however, that is forcing attention toward local networks and general telecommunication problems. Many manufacturers are setting telecommunications standards of their own and—if they are able—forcing the vendors to accommodate. Otherwise, they end up with many different telecommunications technologies. The basic direction of telecommunications in manufacturing is undoubtedly being set by GM with its Manufacturing Automation Protocol (MAP) program.

The intercomputer dialog (or rather, polylog) problem is what is driving data management technology. All of those computers, especially in the hierachic control structures of production centers and cells, must understand each other. This requires two things: a consistent set of database management system (DBMS) technologies across different vendor hardware, and consistent definitions of the data being stored and manipulated by the machines. These are not the same problem, and they are only loosely related.

The DBMS issue is clearly being driven toward relational technology. Most vendors (including DEC, IBM, HP, and CDC) are developing relational database management systems with the functions necessary to optimize data independence, redundancy, integrity, accessibility, security, shareability, and performance in a distributed homogeneous (same hardware vendor) environment. Other vendors, like General Electric, Martin Marietta, and Computer Corp. of America, are attempting to develop powerful data dictionary systems to provide the same capabilities for managing data in a distributed heterogeneous environment.

CHAOS THREATENS PRODUCING

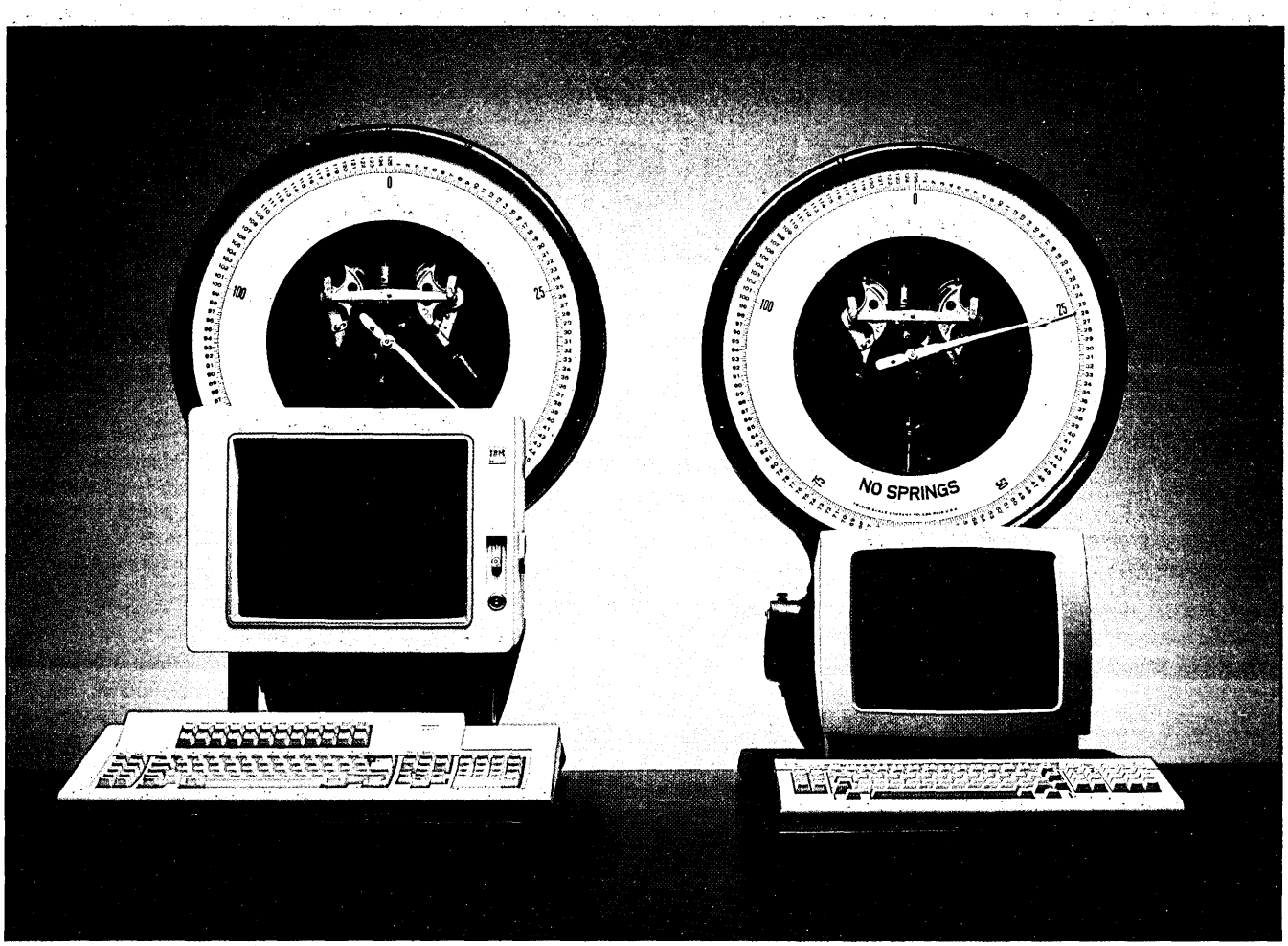
The data definition issue is generally being addressed from the enterprise view, but it's important to note one thing here. The typical manufacturer has at least five (and up to 35) different types of part numbers, three (and up to 10) types of bills of material, and from six to 20 types of costs. He will have seven different types of changes and 16 different types of schedules. The reason is that he develops (or buys) applications packages without any consistent strategy for standardizing these simple concepts. The outcomes range from minor confusion to chaos that threatens the ability to produce products and manage assets. Why? Because of inconsistent and inaccurate data.

All of the problems on the technology side derive from the fact that most manufacturers automate opportunistically. This has led to the rise of various islands of automation that cannot be integrated. From a vendor's perspective, these islands can be continental in size. IBM expects the CAD/CAM market to approach $9 billion in 1989, up from a 1983 level of $1.2 billion. The market for industrial products (bar code equipment, process controllers, transactors, numerical controls, and so forth) is expected to hit $12 billion in 1989.

Of course, the concept of technical standardization is completely absent from the technical view of CIM because vendors do not want to standardize. Standard interface requirements will be imposed on vendors through agents such as GM (the MAP program), the National Bureau of Standards' International Graphics Exchange Specification (IGES), and the IEEE 802 standards.

There is, of course, another major force for standardization in the technical view of CIM. This is IBM, which expects sales levels as high as $120 billion in 1989. The Information Systems and Communications Group intends to achieve $70 billion in sales in 1989. Within the Communications Group, IBM has established the Industrial Systems Organization. It is the only vertical market business in the Communication Group. When Van VanHoesen, the president of the Industrial Systems Organization, was asked how much of the $9 billion 1989 CAD/CAM market he believed IBM should get, he responded, "All of it."

At the Industrial Automation Consultants Seminar in Boca Raton, Fla., in September, VanHoesen said IBM's general strategy for the technical view of CIM is built around a hierachic control structure



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CIRCLE 29 ON READER CARD

Manufacturing businesses with fewer than 100 employees will probably have to wait for the cost of CIM to come down.

consisting of three types of computer hardware: the IBM PC, the Series 1, and the newly announced 4361 supermini with floating point hardware. IBM preaches an open system architecture for manufacturing, and plans to drive as much computing capacity as possible into the shop floor PC. IBM is also advocating local network standardization on IEEE 802.4 broadband token bus, and SQL/DS and DB2 as the future of DBMS technology.

IBM is challenging DEC, HP, Data General, and everyone else head on. The CIM technical view will be a battleground during the remainder of the '80s.

The enterprise view. If integration is the major issue of CIM, it must come from somewhere. Where? If you ask IBM, or any other hardware or software vendor, they will tell you, "Just leave the driving to us." They would like integration to be primarily a technology issue. But, since manufacturing is already such a heterogeneous technical environment, it is ridiculous to assume that any single vendor will provide blanket technological integration. Even if one could, nobody could use it because nobody has the luxury of automating from scratch. There are no technological Rolaids for the heartburn of multiple, isolated systems. Not even from IBM.

NOT A TECHNICAL ISSUE

That is because integration is a management issue, not a technical issue. It must be established through methods and standards. Integration is not a magic wire running among various machines. It is a managed infrastructure of what runs on the machines, regardless of their manufacturer.

For CIM to become a reality, it must become a management style. Integration occurs because automation projects are executed from a purposeful plan, by organized, trained people using consistent tools and techniques, working within specific business standards. It cannot be bought.

Today's enterprise views of CIM are, with few exceptions, anemic at best. This is why we have so many islands of automation. The typical automation strategy in manufacturing is "everyone out for a pass!" Managers are lured by instant gratification from technology pills, and they are coerced into quick fixes by financial justification procedures. They have little incentive to put forth energy to get control. The idea of spending $500,000 to $1 million putting plans, project management systems, data standards, special software development tools and procedures in place to manage CIM is still odd to many. They ask, "What about our dp shop? Isn't that enough?"

It's not, of course, but it is a place to start—along with the CAE/CAD/CAM department. An enterprise view of CIM must first integrate the people who are doing CIM things. If it doesn't start there, it will surely fail.

The path to a CIM enterprise view is to set up a CIM program. Such a program is like a zero defects program, a safety program, or a quality program. Its objective is to change management style by establishing a framework within which industrial automation projects are defined, funded, managed, and coordinated. This framework requires specific mechanisms for planning, financial control, project selection and justification, project management, and project performance monitoring.

The role of the enterprise view of CIM is to ensure the appropriate levels and types of integration. The most important concept in integration involves the use of standards. There are two types of standards: technical and data.

Technical standards are set by and for the whole enterprise. They define what is sometimes called the computer systems architecture. At a minimum, standards for technical procurements are needed in the following areas: telecommunications (e.g., IEEE 802.4), database management (e.g., SEQUEL 2), and graphics exchange (e.g., IGES 2.0).

Unlike technical standards, data standards cannot be obtained from a standards committee. They must be defined and maintained by the enterprise itself. An enterprise view of CIM that includes data standards is said to be data driven because it uses those standards to control software package procurement and in-house database development.

STANDARDS FOR SHARED DATA

Data standards are used to manage shared data, i.e., data needed by many people. The data most often shared in manufacturing are product and process definition data, which is why product definition databases are the fastest growing segment of CIM. Manufacturing planning and control data are also highly shared and must eventually be brought under the control of data standards.

There are two types of data standards: business rules and data element standards (see "Business Rules: The Missing Link," Oct. 15, p. 145). These are defined from data architectures contructed using an information modeling methodology such as the Air Force's IDEF$_1$, DACOM's INFO Model-er, or Database Design Group's LDDT. The selection of the methodology is a crucial enterprise-level decision. The resultant standards will be used for the control of the most critical data in the enterprise.

Data standards are mandatory to achieve the levels of data integrity and consistency needed to run custom shops efficiently and effectively. The target for data integrity in manufacturing is .999, not just for the operational control systems, but for the management and strategic levels as well. This is why a main responsibility of the enterprise view of CIM is to establish and maintain control over highly shared engineering and manufacturing data. These data are deployed on the computers in the technology view and employed by users in the user view.

The CIM marketplace is large, but the technology does not appear to be appropriate for everyone. There are 4,000 plants in the U.S. with over 500 employees, and these plants are the primary market for CIM. A secondary market is provided by the 40,000 plants with over 100 employees. Manufacturing businesses with fewer than 100 employees will probably have to wait for the cost of CIM to come down.

There are are many different vendors in the marketplace. At the Society of Manufacturing Engineers AUTOFACT 6 conference, held in October in Anaheim, Calif., 148 vendors displayed their wares in 98,000 square feet of floor space. Most of them were just selling hardware or software pills, but General Electric, IBM, GCA Corp., DEC, and Gould were talking about total solutions. They are selling planning, organizing, shop and warehouse hardware, process controls, CAD/CAM systems, manufacturing planning, control systems, and more. I expect McDonnell Douglas, Westinghouse, GM, and possibly AT&T to join them soon.

But the total-solution sell is still a siren song. You cannot buy CIM; what you can buy are islands of automation, integrated by a logo. CIM is a management philosophy, not a turnkey computer product. That philosophy is crucial to the survival of most manufacturers because it provides the levels of product control, production control, and shop flexibility they will need to compete in future U.S. and international markets.

Dan Appleton is president of DACOM Inc., specialist in manufacturing information resource management. Dan has been heavily involved in commercial manufacturing and aerospace automation for the last 16 years. He is chairman of the CASA/SME Technical Council and a fellow of the Institute for the Advancement of Engineering.

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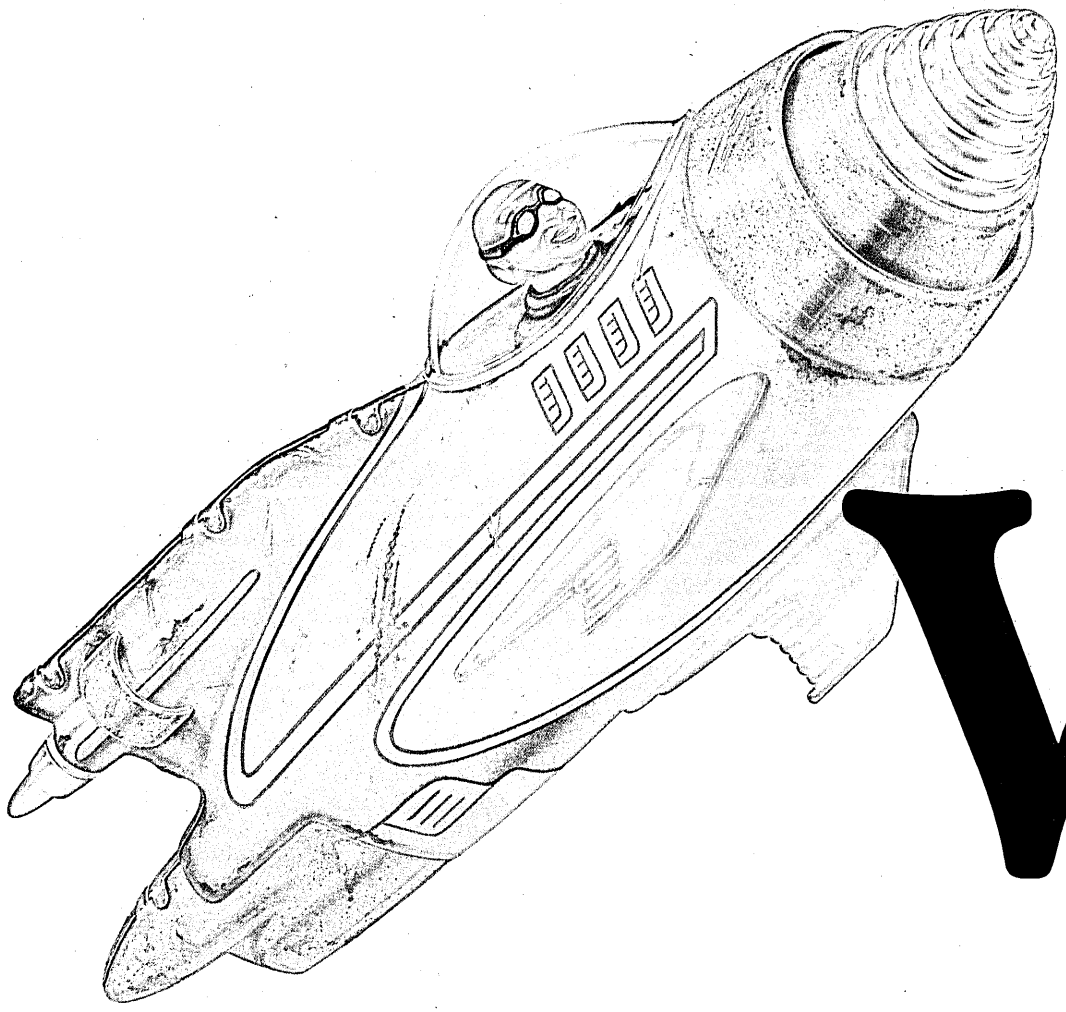

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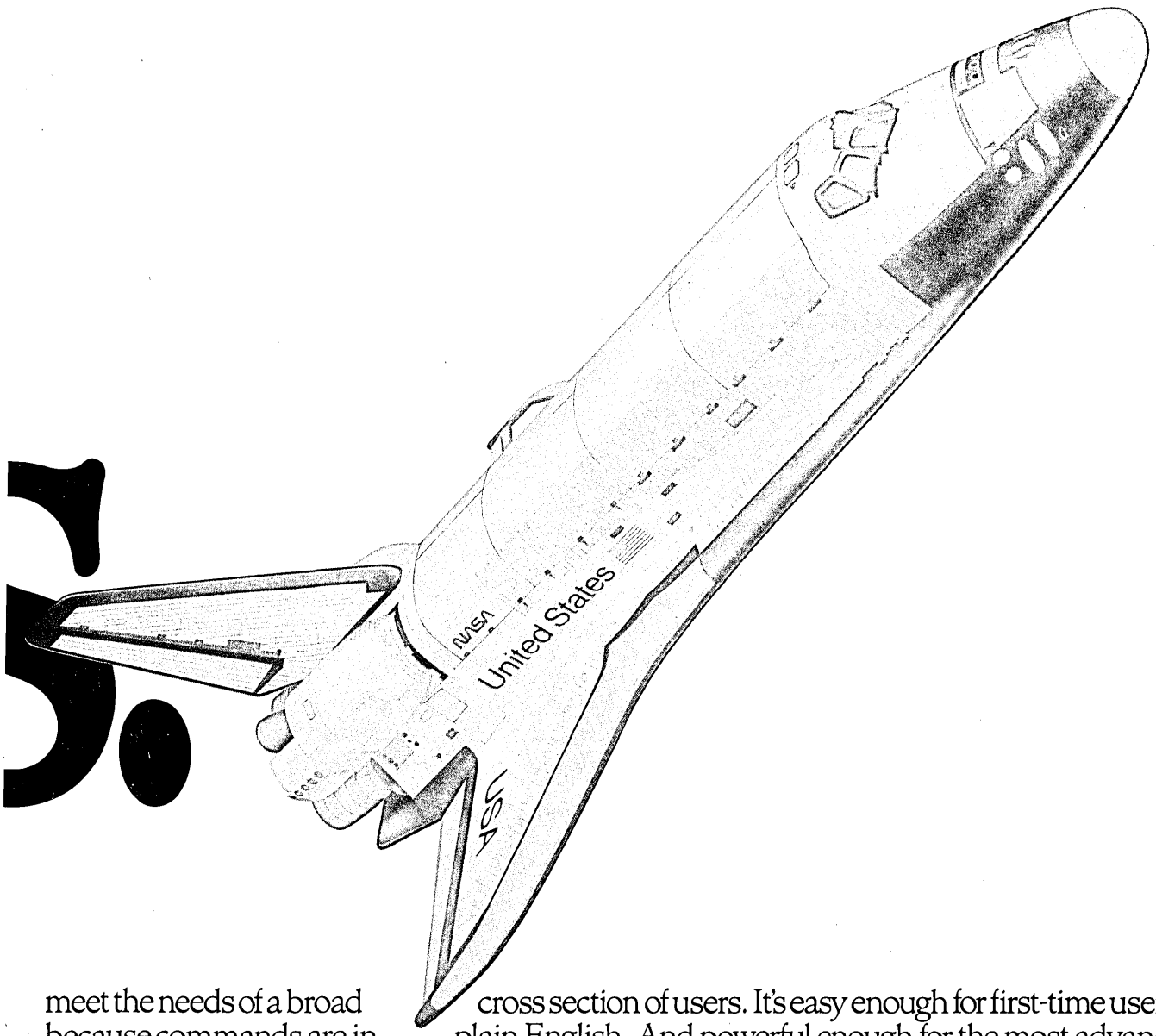

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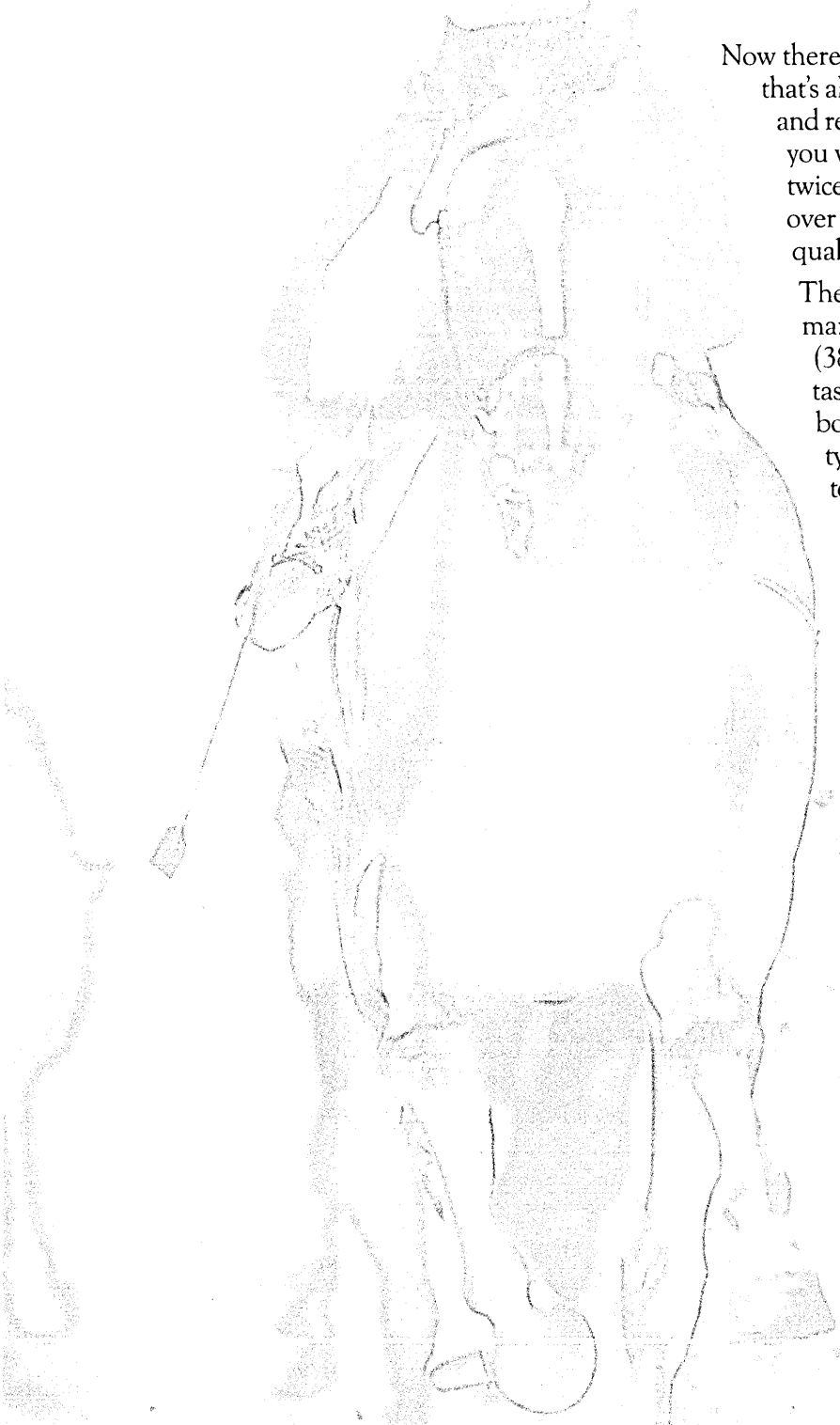

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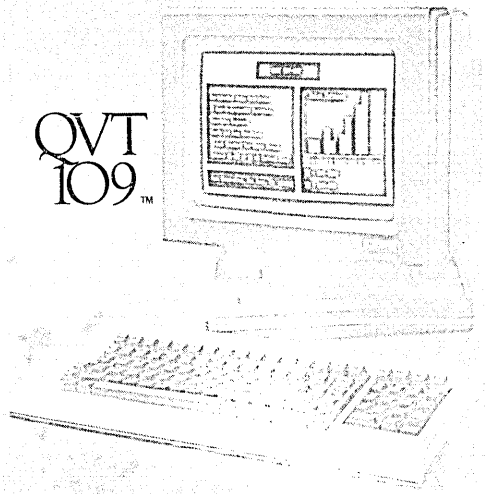


'Twas the night before Christmas, and almost everybody was stirring.

A CHRISTMAS PERIL

by Jackson W. Granholm

Once upon a time—of all good days in the year, on Christmas Eve—old Ebenezer Kludge sat grumping in his chrome-plated office. The Santa Monica weather was prematurely drizzly, and the sigalerts of brush fires had ceased for the time. It was fit weather in which to discover his pet project had been killed by lack of funding.

The door of Kludge's office was open, the better that he might keep his rheumy eye upon Bob Patchit, his warmhearted—albeit incompetent—chief of software who tended toward profligacy in his use of media.

Of a sudden, the buzzer on Kludge's multistation desk phone sounded. It was Kludge's secretary alerting him to the arrival of his obnoxious nephew, a superfriendly IBM salesman.

"God keep you, Uncle," said the nephew, bursting in, "and Merry Christmas from Armonk."

"Bah," said Kludge, "humbug!"

"A sad answer, Uncle, on the day of your new product announcement,' said the nephew.

"There'll be no product announcement here," growled Kludge. "The verkochener bankers have seen to that. They give to the Christmas Fund with their right hands and take away from the deserving industrialist with their left. Humbug, I say!"

"Too bad, too bad," said the nephew in his most businesslike blue-suited tones. "But bless you anyway, Uncle, and a Merry Christmas!"

"Bah," said Kludge, "Be off with you."

The ingratiating figure of Bob Patchit replaced the nephew. "If you please, sir," said Patchit, "I'm out of floppy disks again. If I could just have one or two more . . . ." For Kludge kept the floppy disks locked in his office safe, so rapid was their disappearance from inventory.

"Not another disk!" shouted Kludge. "I think you eat them for lunch."

"Check out operating system . . ." mumbled Patchit.

"What happened to the last 10 I gave you?"

"Subroutines for Vercingetorix . . ." mumbled Patchit.

"You programmers are all a pain in the tush," said Kludge. "I suppose you want the next two weeks off. I don't know what dunderhead negotiated the vacation policy for this dump!" he fumed. "Humbug! Well, here's two disks, and use them carefully. And here's your vacation check. Go squander it."

Bob Patchit went merrily forth, singing Christmas carols as he drove to his humble Bel Air hovel.

As for Kludge, he locked up the plant and went for an equally humble supper at the Pink Pussycat. As he walked toward his dank and dismal Beverly Hills house, so dark and drizzly was the night, Kludge, who knew every flagstone in the driveway, was fain to grope with his hands to the front door.

ILLUSTRATIONS BY DAVID FEBLAND

Before Kludge's unbelieving eyes, the liquor cabinet turned itself into an old Univac metal tape servo.

SINISTER SHADOW AT DOOR

Now it is a fact that there was nothing at all peculiar about the front door. Kludge had seen it, night and morning, during his whole residence in that place. Then let any man explain, if he can, how it was that Kludge, his key in the lock, saw in the door not a door, but a large purchase order. It was not an impenetrable shadow, as the surrounding objects were, but it had a sinister light about it, like a failing diode in the backmost board.

Kludge shook his head and the odd vision went away. Inside and up the stairway Kludge went, to his bedchamber, where he locked the door behind him.

As was his custom, having lit the fire, turned on the air conditioner, and changed into his dressing gown, Kludge prepared his modest nightly refreshment of three double martinis. They were modest martinis, made with warm, cheap gin. The ice maker had been broken for months.

As Ebenezer Kludge sat nodding over his gin, there came a clanking noise from deep in the uttermost corner of the billiard room, three floors down. The sound was muffled but heavy, like the inexorable shutting of the doors of the federal slammer.

"Humbug," said Kludge, not very convincingly.

Hardly had he finished saying it when the noise moved, now sounding from the back stairway. A new note was added to the muffled booming: a buzzing, metallic sound, like a drum printer striking a solid row of periods.

"Humbug," repeated Kludge.

But the mysterious noise could not be ignored. Up the steps it came, and down the hall, till it boomed just outside the door. And then, though Kludge could not believe his eyes, the noise came through the door, bearing with it a standing apparition.

Up to the very chair in which Kludge sat, gripping his now boiling martini, the strange apparition rolled. It was a line printer, or the appearance of one, for Kludge could see the further wall through it, so evanescent was its substance. This ghostly line printer, connected to nothing else in this world, printed continually away, spewing its fanfold jerkily upward before Kludge's unbelieving eyes.

"24 DEC 80-21:45—JOB KLUSCARE, VERSION 1," printed the line printer.

"EBENEZER KLUDGE," it continued, "YOU HAVE MUCH FOR WHICH TO ATONE, PAST MISTAKEWISE."

"Who are you?" Kludge queried tremulously.

"I AM THE GHOST OF PAST SCRUBBED PROJECTS AND SCREWED-UP ORDERS," the line printer wrote, as though, miraculously, it could hear him, "IT'S CHAPTER 11 FOR YOU, KLUDGE. THE VERKOCHENER BANKERS ARE GOING TO PUT YOU AWAY, AND IT'S ABOUT TIME IN MY OPINION."

"Humbug," said Kludge, "how can a line printer have an opinion?"

"YOU ARE DOOMED, KLUDGE, DOOMED I SAY. IT'S TUBESVILLE FOR YOU."

"Can nothing be done?"

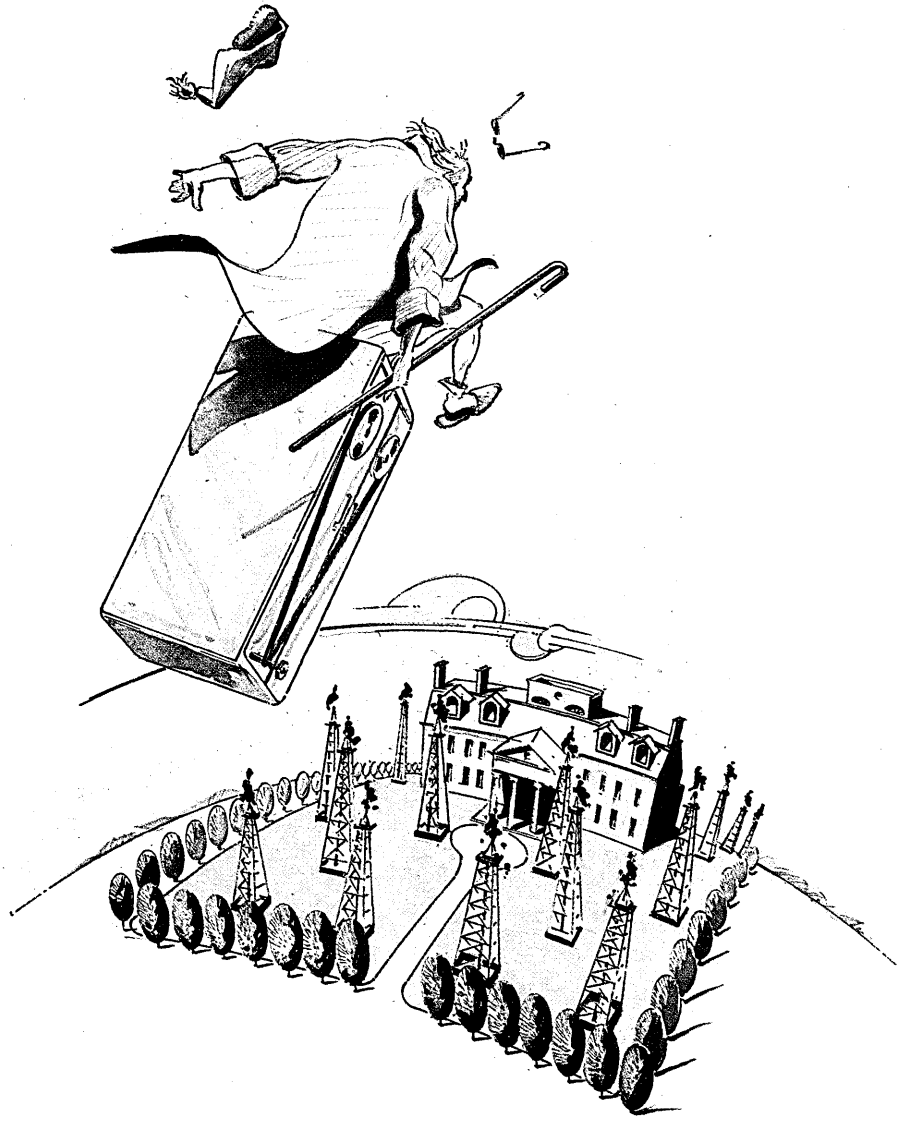
"EVEN IF YOU CHANGE YOUR WAYS DRASTICALLY, IT LOOKS LIKE BAD NEWS. BUT HANG IN THERE. THIS MAGIC NIGHT YOU WILL BE VISITED BY THREE SPIRITS—THE SPIRITS OF PAST, PRESENT, AND FUTURE. HEAR WHAT THEY SAY. THERE'S AN OUTSIDE CHANCE YOU MIGHT SHAPE IT UP."

"Gee, and I was looking forward to a good night's sleep. What are these dingding spirits on to that I should be so pestered with them? Who are you to roll into a private bedroom in the middle of the night and start up with your fanfold?"

"I CAN'T FIELD THOSE QUESTIONS NOW, KLUDGE, NOT WHEN I'M DISCONNECTED FROM MY MAINFRAME. IT'S PRETTY LONELY OUT HERE, KLUDGE, RUNNING AROUND ON A DRIZZLY NIGHT, PRINTING UP WARNINGS FOR UNAPPRECIATIVE PEOPLE. I MEAN, I COULD PROBABLY GET A GOOD JOB AT THE HUMAN RESOURCES DEVELOPMENT OFFICE, PRINTING UP UNEMPLOYMENT CHECKS, AND ALL THAT. AND FURTHERMORE . . . ." And with this the ghostly line printer faded slowly from sight, taking its spiritual paper along with it.

"Mercy," said Kludge, when the printer was finally gone. "I better stay off the juice this time of night." With that, he jumped quickly into bed and was asleep.

When he awoke, it was so dark that he could scarce make out the drizzly window pane from the utter blackness of the interior bedroom. He heard the rumble of the garbage truck in the street outside, however, and knew it was midnight, since the garbage workers always clanged things so residents could set their clocks.



CABINET BEGINS TO GLOW

Kludge lay contemplatively in the dark for a moment. He was amazed to see his liquor cabinet begin to glow with light. Before Kludge's unbelieving eyes, the liquor cabinet turned itself into an old Univac metal tape servo. The servo rolled toward Kludge's bed on nonexistent casters, and spoke to him.

"Ebenezer Kludge," the servo said, "You are looking on the Ghost of Christmas Past."

"You don't say," Kludge remarked.

"Come with me," said the servo, choosing to ignore Kludge's surly comment. "My time with you is short."

And with that, before Kludge had time to ask to get his raincoat, the servo grasped his hand with its take-up arm, and whisked him out the window. As they flew high above the city, Kludge noted that the drizzle did not wet him, and he was about to remark on this when the servo, having called LAX tower, went into a rapid descent to land softly on the unmown Bermuda grass outside a small brick building.

Kludge recognized the building instantly. It was the factory of the J.B. Flapjac Corporation where, as a junior computer engineer, grade B, Kludge had first been employed. He knew the building had been torn down to make way for a high-rise condo, yet here it was, and Kludge, holding tightly to the servo, could see through the walls.

Inside the building a worried, fatherly looking man was talking to a young employee. Kludge recognized himself in his younger years.

"Kludge," J.B. Flapjac was saying, for the fatherly figure was the famous man himself, "You are a goof-up. Even though it's Christmas Eve, I'm going to can you. We just can't stand another one of your design screw-ups."

"But Mr. Flapjac, sir," said the vision of a younger Kludge, "I was only trying to improve the . . . ."

"No, don't!" Flapjac said, "I don't want my better nature to kick in. Pick up your check and get your butt into the parking lot. Never darken my door with your ugly, incompetent face again."

And with this, the scene faded away, leaving Kludge sniffling at the remembrance of this humbling experience, hanging onto the servo in the rain.

Without a word, the machine whisked Kludge into the air and away to the opulent residential areas of North Long Beach. There the servo gently landed them on a vast expanse of lawn, decorated with oil wells. Kludge recognized the home of his former wife, Faith Trueblue.

He peered into the home. There, his younger self was engaged in earnest conversation with his wife and his mother-in-law, Flinty Trueblue.

"We'll show the SOB," Mother Trueblue was saying. "Take my few hundred thousand, Ebenezer, and start your own company. It's no better than Faith deserves."

"The time has come for me to return, Ebenezer Kludge," said the servo spirit as the scene faded away and they were lifted once again into the air. Tears were in Kludge's eyes as the servo spoke.

"You recall your past, Ebenezer, how when you were a young man you failed the beneficent Mr. Flapjac, who was kind to you. Then, marrying Faith Trueblue for her mother's money, you took that money and founded your company. When the money of Flinty Trueblue was no longer required to support the company finances, you began to play around with your secretary, Lorelei Lee, whom you later married and who took you for a round three mill. . . ."

"Say no more, spirit," Kludge said, weeping, "My past has been in some respects dismal, but I have made bootstrap efforts, and my future will not be so idiotic."

"We shall see," said the servo spirit, sighing, and having thus said, deposited Kludge back in his own bed.

"Whoo, boy," said Kludge, sitting up in his bed, "some night!" He lit the lamp and looked at his wristwatch. "That's weird," he said, "it all happened in no time."

At this point Kludge noticed another strange light, this one leaking under his closet door. He got up to determine the source, and upon opening the closet door, walked into an adjoining, brilliantly lit room. It was a carbon copy of his own bedroom, but hung with colored paper tapes, holly leaves, and every kind of decoration.

"Where the heck am I?" Kludge wondered aloud.

"You are in the record of your own room," replied a ghostly disk pack machine standing near the window.

Kludge, by now not at all surprised that apparently inanimate objects should

"I am the Ghost of Christmas Present," said the disk pack in a nonchalant manner.

speak to him, put the question: "And you are?"

"I am the Ghost of Christmas Present," said the disk pack, in a nonchalant manner.

"I should have guessed."

"Are you ready for your trip through your present soul, Ebenezer?"

"Do I have a choice?"

DOWN A BEL AIR CHIMNEY

"No," said the disk pack, and taking Kludge by the hand, flew with him out the window and across the great city. Making a traffic pattern turn that only narrowly avoided a 747 on descent, the spirit whisked Kludge down the chimney of a modest 4,000-square-foot Bel Air house, into the living room of Bob Patchit.

The various Patchit children, boys and girls, bustled about, wielding bowling balls, tennis racquets, golf clubs, and other of their poor toys. Mama Patchit's secret, albeit humble, Christmas present, a Baby Mercedes, was just visible through the living room window.

Just then, Bob Patchit himself burst in, arms loaded with presents. All the smiling children jumped up to greet him except for Tiny Tim, who sat in the far corner, smoking grass.

Kludge looked with some pity on the figure of Tiny Tim, the scars of mainlining clearly visible in the bend of his arm. "To think," Kludge said, "that this family exists this way on the paltry 37K per year, plus stock options and fringes, that I pay Patchit."

"Merry Christmas to you all," said Patchit, "and to the whole world."

"Bullshit," said Tiny Tim.

"And in 'the whole world' do you include that schlemiel you work for?" asked Mrs. Patchit, her merry eyes gleaming.

"We mustn't be hard on Mr. Kludge, dear. He tries."

As they sat down around the dining table, Kludge could not help but notice that the place mats and dish holders all consisted of floppy disks in their folders, and he did not have to stretch his imagination to guess whence these came.

"Ah, me," sighed Kludge, as the disk pack spirit whisked him up and away, through the night sky, to a large residence in Northridge.

Just as his feet touched the ground, Kludge heard a laugh. Was there, anywhere in the universe, a more obnoxious sound than Kludge's nephew laughing? It conjured the assembled insincerity of a congregation of funeral directors.

Kludge saw his nephew's house, and inside it the young man engaged in earnest conversation with his dutifully charming wife.

"I think he's a darling man," said the wife.

"How darling can a bankrupt be?" asked the nephew. "He's about run his business into the ground with those ridiculous farm machines he builds. The bank is going to lower the boom on him next week."

"Oh, no," sobbed Kludge.

"Will he starve, then?" asked the wife, "Will he come to live with us?"

"Oh, no. We'll have a little job for him, adequate to his skills, sitting in the back room, sorting pink and manila cards," replied the nephew.

"Get me out of here!" Kludge said to the disk pack, and they were whisked away over the city, back into Kludge's bedroom.

"This is something else," Kludge muttered, getting back into bed. "Next it'll be green men in a flying saucer."

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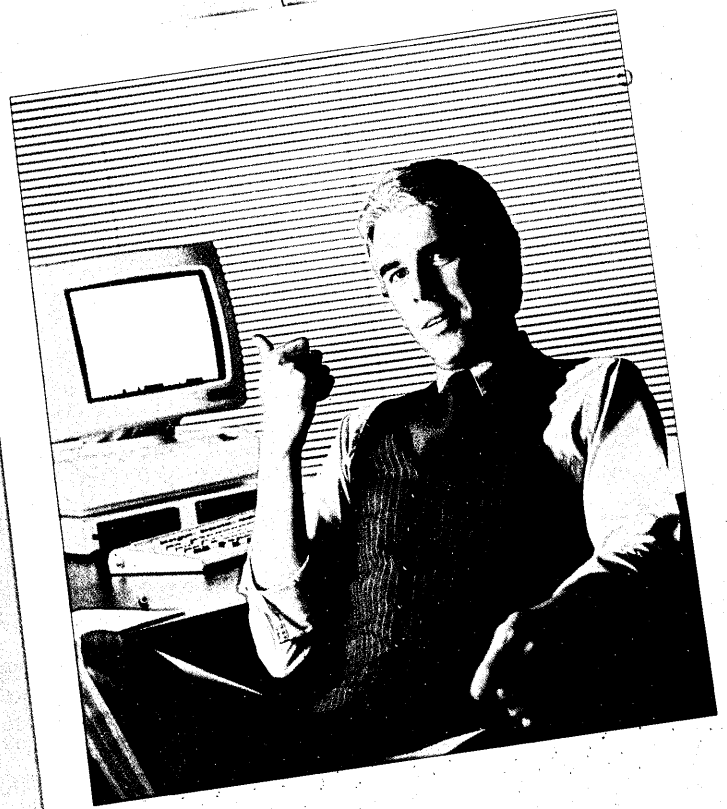

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CIRCLE 32 ON READER CARD

Kludge kept hearing the chip whisper in his ear: "Negotiable stock, Kludge. On the big board, Kludge. It's wealthysville for you, Kludge."

Kludge was sound asleep when something indefinable woke him. "It is I," said a tiny voice, "the Ghost of Christmas Yet to Come."

As a spot of light moved toward him, Kludge realized that it was, in fact, a microcomputer chip, scintillating with reflections.

ON A TRIP WITH A MICROCHIP

"Come with me, Ebenezer Kludge," said the chip, and putting forth an invisible hand, it transported him out the window and into his own office. There, Kludge saw himself, sitting at his desk, reading a document. He peered over his own shoulder.

The document was a purchase order, sent out by the Department of Health and Human Services. Kludge's sleepy eyes were drawn to the quantity. It was a number in the thousands.

"Sign the sonofabitch!" Kludge yelled at his own image, "You've saved us!"

Kludge and his chip guardian were magically transported to the boardroom of Conglomerate Industries, one of the Fortune biggies.

Several men in gray Madison Avenue suits clustered around the board table, engaged in serious conversation. Kludge listened with growing interest.

"This guy Kludge," the chairman was saying, "is cleverer than we thought. I got the inside skinny that right now, he's negotiating a heck of a big order with HHS."

"Geez, I hope he has no idea of how high we're prepared to go," the president said. "If we don't make an acquisition like his company before the end of this fiscal year, we're going to find the team from Texas sitting here next year."

And though Kludge dearly wanted to hear more, the microchip spirit whisked him away, and back westward. But on the way Kludge kept hearing the chip whisper in his ear: "Negotiable stock, Kludge. On the big board, Kludge. It's wealthysville for you, Kludge."

Kludge found himself sitting bolt upright in his own bed. It was daylight outside. The bright sunshine was streaming in the window. Kludge looked at his calendar wristwatch: 10:05 a.m., Dec. 25.

"Good grief, what a night!"

But Kludge whistled as he dressed, for suddenly, he had the vision of salvation. The spirits had shown him the way. He knew, fully and magically, how to turn himself from an ordinary, fumbling, insecure industrialist into a full-blown, greedy, grasping, multimillionaire.

"And it couldn't happen to anyone better," Kludge thought, planning the coming negotiations.

But first there was important work to do, amends to be made. Kludge jumped into his own Mercedes and ripped down the freeway to Northridge, pulling into the driveway of his nephew's house. His nephew was on the lawn with his putter and a mint julep. The cuffs of his blue suit were damp with dew.

"Welcome, Uncle, and Merry Christmas," said Kludge's nephew.

"You can keep it," said Kludge. "And you can also keep that little job you had in mind for me. And as for your little cards, you can shove them."

With this kind remark, he wheeled his Mercedes out of the driveway and went merrily on his route to Bel Air.

When Kludge was welcomed into the Patchit living room, Bob Patchit and his merry wife and their children were gathered about the yule tree.

"Welcome to our humble home, Mr. Kludge," said Mrs. Patchit. "We were speaking highly of you only yesterday."

"Kind of you, I'm sure," said Kludge. "But I have a special Christmas message for you, Patchit. You're canned, dammit. It's about time I got somebody competent to screw up my software."

"Humbug!" said Patchit.

"And another thing," said Kludge, "kindly bring back all my floppy disks you've got stashed in the cupboard there. On second thought, you can keep the ones with coffee spilled on them."

"God bless us, every one," said Tiny Tim, sulking by the Scotch bottle.

"Isn't that sickening?" said Ebenezer Kludge. ◉

"Can't you ever forget the potential disastrous fire hazards and just for once enjoy the magic of Christmas?"

CARTOON BY HENRY MARTIN

Jackson W. Granholm was first published in DATAMATION almost two decades ago.

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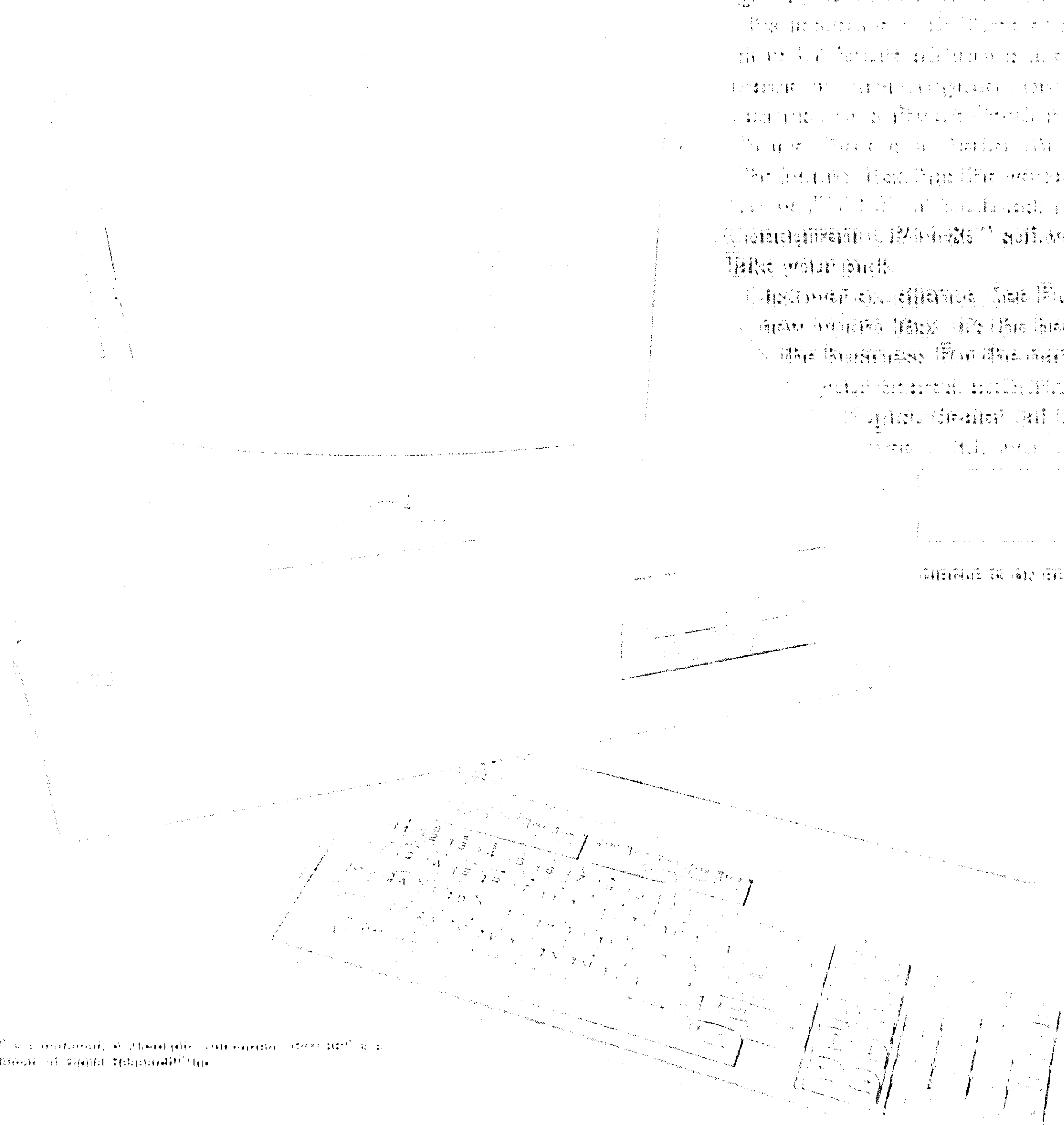

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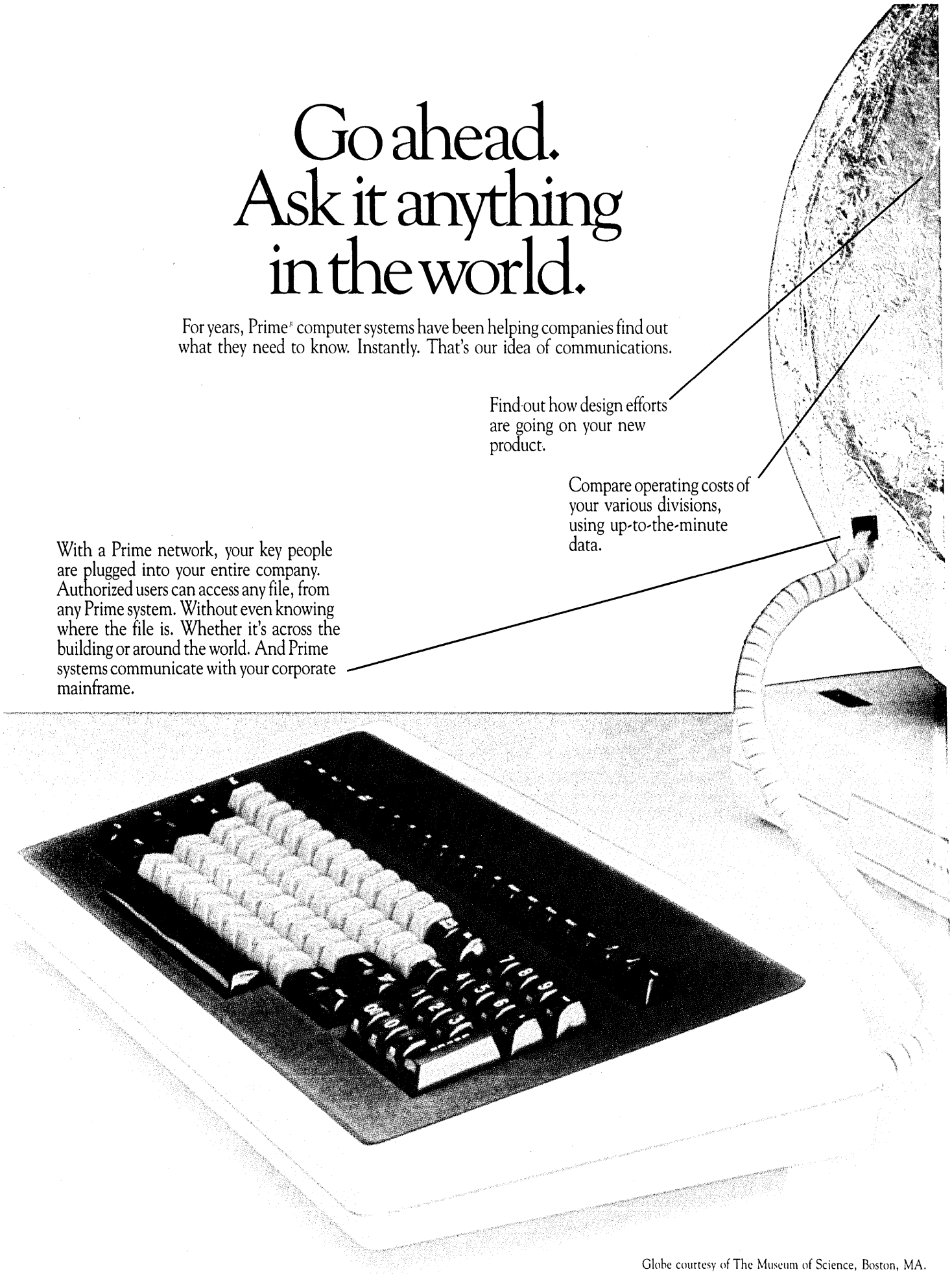

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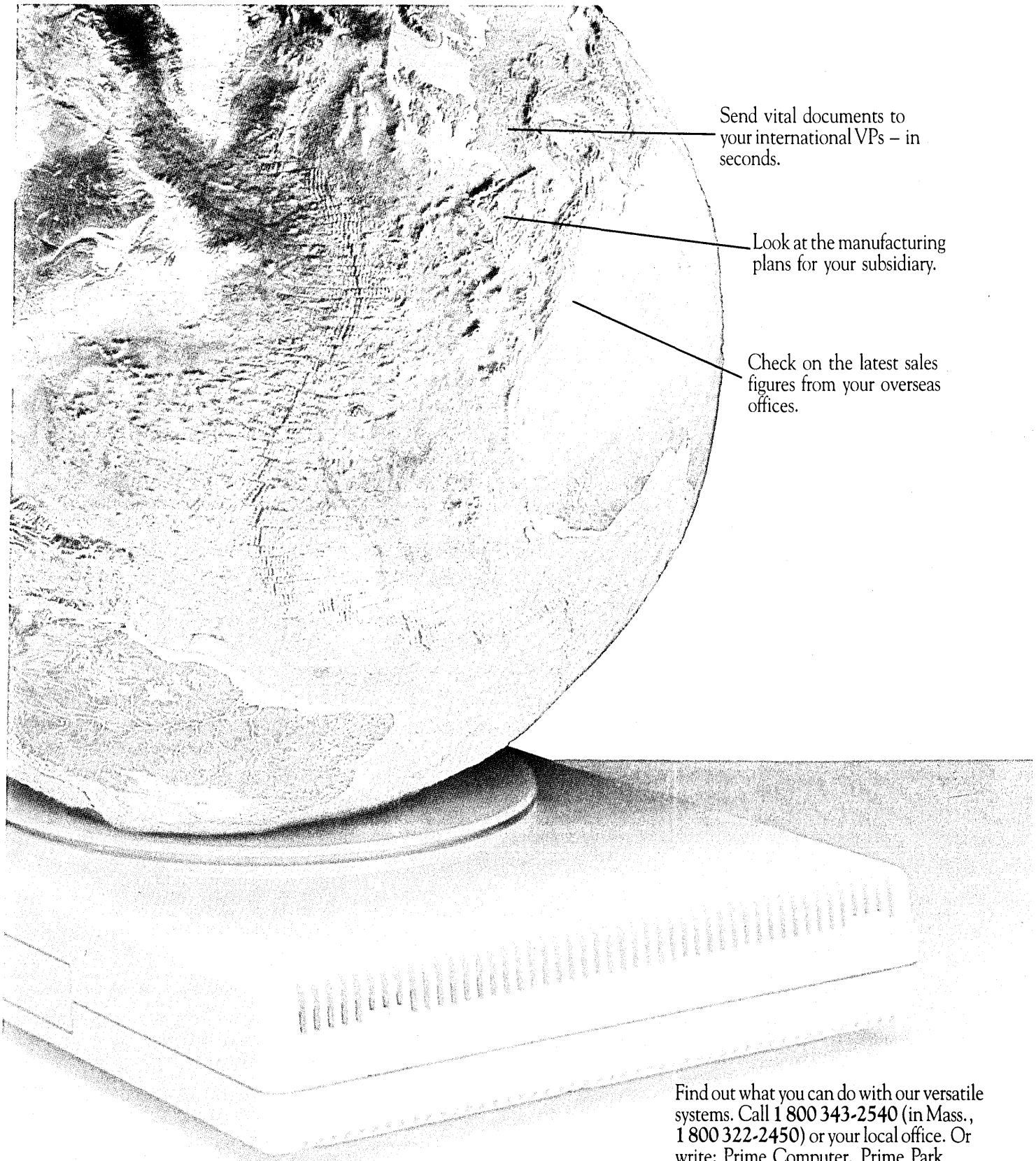

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Normalization isn't easy, but it's crucial to getting practical benefits out of database systems.

THE IMPORTANCE OF GOOD RELATIONS

by Tony Percy

While relational databases and normalization have been widely discussed, the practical benefits these concepts have for businesses have sometimes been overlooked. This article explores these ideas and shows how, with proper application and the correct tools, businesses can benefit as they attempt to model the data relationships that are key to how they function.

Although vendors' claims that their products are relational are coming under closer inspection, there remains a vast amount of confusion as to exactly what a relational database is. Even the experts don't seem to agree. For example, in "What, if Anything, Is a Relational Database?" (July 15, p. 118), Frank Sweet concluded that there are no such things as relational databases but only relational access languages.

This would appear to contradict the orthodoxy that a relational database is one in which the data are organized in tables, a notion derived from Codd and Date's work in attempting to make sense of the concept of data, including the idea of normalization. But here again, one can find disagreement among the experts as to what part normalization plays in the relational model. Some claim the relational model has nothing to say about normalization, that it requires only that data be organized into tables. Others would state that a relation or table has to be in third normal form.

Thus, one can identify three states that qualify a product or system as relational:

- a system in which data are organized in tables,
- a system in which data are organized in tables and are also in third normal form (i.e., with all repeating groups removed, and all data items in each record fully dependent on the candidate key),
- a system that provides a query language with the ability to perform the relational operations of SELECT, PROJECT, and JOIN.

A number of vendors supply products with such query capabilities against data files that may neither be organized in tables nor in any way normalized. They are quite justified in calling their systems relational because their query capabilities perform at least some of the relational operations. Moreover, these claims may be founded on the fact that logical "user views" of data are presented in tabular form, and then mapped onto a more complicated physical structure.

Two further questions present themselves, and these tend not to get answered so often. Do these different relational states represent methods of getting better at performing a particular task? And in what way might any or all of them be useful in helping a business? Because, unless we return to the basic issue of why anyone should be interested in using any flavor of a relational product, the academic exercise remains academic. Let us return to the three relational flavors, and examine their benefits.

Tables. One of the most touted benefits of tables is that they make it easier for end users to view data. Maybe this is true. I suspect many end users think in terms of information rather than data, and may be a little weary of the data processing terms that are passed on to them. Yes, it makes sense to think in terms of neat rows of columns, but the model does not go all the way. What about variable-length textual information, which has to be fitted into a table entry that can accommodate the largest expected? (DB2, IBM's relational DBMS, contains a category of data known as a "long field" that could accommodate textual information, but it is not indexable.) We force the fixed-length construct on the real world. While tables are simple, they do not in themselves address the issue of the accuracy or integrity of the data maintained within them. Their main benefit is conceptual clarity.

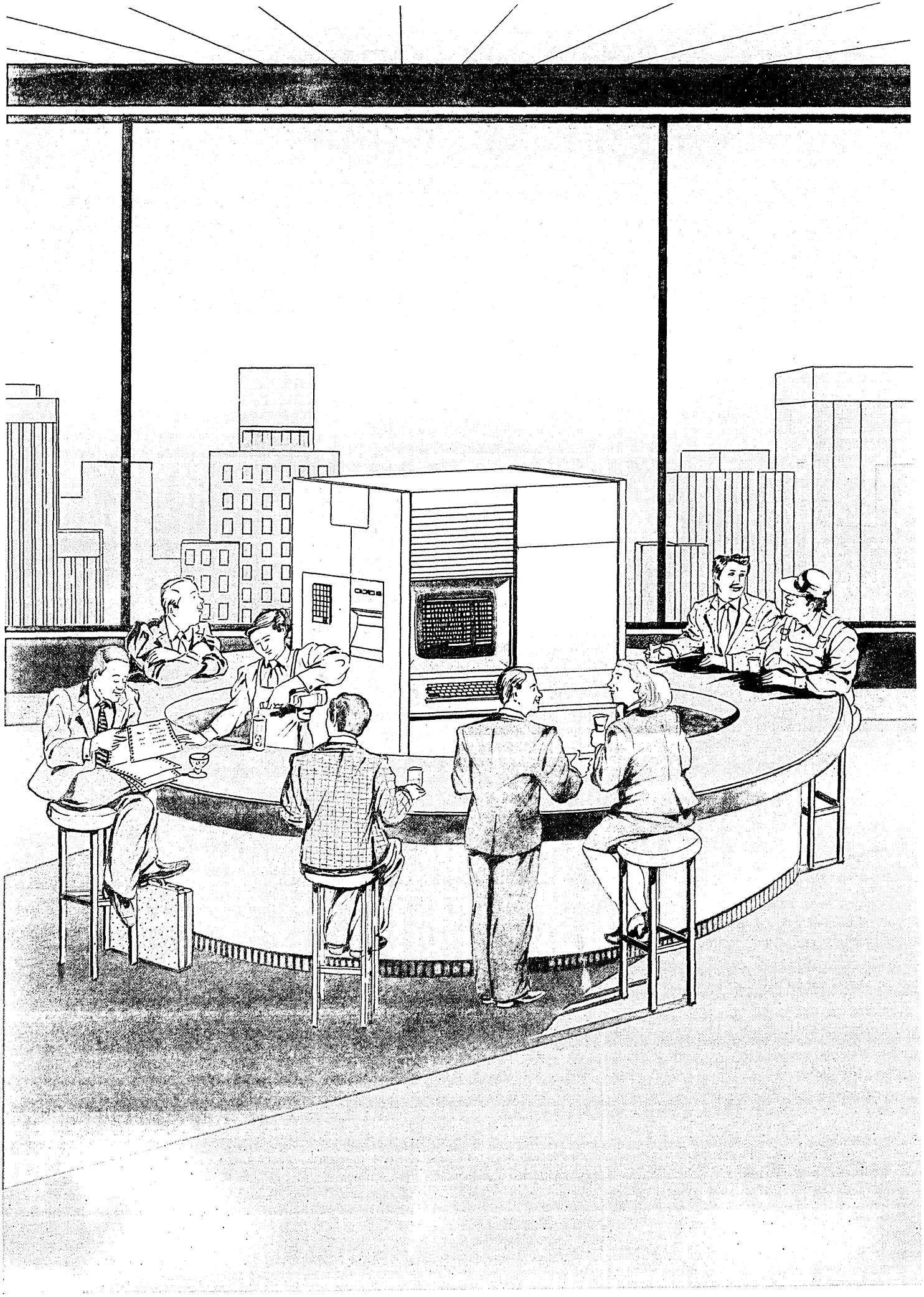
Normalization. Normalization at least attempts to address the integrity issue. Its main benefit is that it leads to more stable data structures (see Fig. 1). The purpose of the process is to get rid of all the anomalies that can be caused by maintaining unnormalized data records. The integrity of data can be lost very rapidly if updates, deletions, and insertions are made on files that have not been broken down in such an organized fashion. Therefore, the value of normalizing data views is much greater with production systems that have high volatility, and where the integrity of the data is critical to the business.

TIGHTENS INFO SLACKNESS

End users are not particularly interested in maintenance issues as far as their private, fourth generation language systems are concerned, and are certainly not trained in good systems design and normalization techniques. While all examples of normalization make excellent sense, it is far more difficult for end users to see the theory converted to practice for their particular business problems. On the other hand, data in multiple normalized tables present performance problems when the data volumes increase. Relational systems are reputed to perform poorly in production environments simply because the pointers that assist the tracing of logical paths between different data are not embedded with the tables. High performance for some applications can be delivered by efficient inversion of indexes on selected columns of the tables. The benefit that normalization offers is a tightening of informational slackness. The process of stabilizing data dependencies is essential if databases with inherent integrity are to be designed and implemented.

Query language. Codd's relational language included syntax for retrieving records but not for updating them. When end users need to access and manipulate data for strategic purposes, the relational operands (SELECT, PROJECT, and JOIN) provide a powerful facility for making highly qualified queries on a database and creating new tables of information. (But it should be remembered that SQL—IBM's structured *query* language—offers far more than mere

ILLUSTRATION BY ANDREA BARUFFI



Eventually, our model may be used for both end user and production systems, and the differentiation between the two may be lost.

query facilities, since it is a comprehensive language of both programmer and end user for complete maintenance of tables, including update, deletion, and insertion.)

Here, normalization does not have to enter the picture. One might therefore raise questions about the integrity of the data that are the source of such queries, and even about the integrity of the data as they are further processed by such users, but this is simply not a relevant factor in the power that a relational language brings. Many fourth generation languages being used in information centers or on personal computers also provide powerful manipulative commands. That fact raises fresh concerns about the proliferation of irregular, unnormalized data, but it does not detract from the relational power. Companies never expressed much concern about auditing such freewheeling decisions in years past, when the information was not mechanized. The main benefit of a relational query language is the power of access over information.

In summary, what we have is a contradiction, at least at this stage of technology. Unnormalized data are unstable, but it is convenient to give them to end users in that form. Normalized data are sound, but they may be difficult to understand and implement, and the performance of systems based on them may be suspect. Relational query languages are powerful, but shed no light on the accuracy or the integrity of the data against which they are being used. Regardless of what database management system is chosen, it is vital that a business go through the exercise of analyzing its data dependencies and relationships if it wants to build reliable production systems that deliver the correct information.

Unplanned (and possibly unsuspected) redundancy of information introduces integrity problems into a database when those data are maintained. A normalized structure will avoid the anomalies that can be caused by insertion, deletion, and updating of records. If we were able to stabilize a database design according to this method, we would know that we had captured the essence of a business as far as its data dependencies were concerned. That would mean that as the facts and operations of the business changed, they could easily and accurately be reflected in the database systems—and we would be able to deliver most of what was promised by database systems in the 1970s.

By understanding what the data entities—the things and facts of a business—are, we can build a stable blueprint for a physical database implementation, and make decisions about that implementation out of knowledge rather than ignorance. If the business changes, the model changes. Eventually our model may be used for both end user and production systems, and the differentiation between the two may be lost.

WHERE TO START THE PROCESS?

But where should we start? How can we assemble these essential facts about the business? And once the facts are collected, how do we set about this task of normalization? Some of the advice given is as broad as the recipe for rabbit stew that begins, "First, catch a rabbit." An otherwise practical book, *Data Analysis,* by Richard C. Perkins (QED Information Sciences Inc., 1984), prescribes very simply: "If possible, business functions should be determined prior to normalization. When normalization has been completed, finalize the business function."

It just isn't that simple. True, there are a number of methodologies offering techniques like bubble charts and crows'-feet, and they are excellent for modeling data flow and helping to represent business entities. But they do not go far enough in tying down the essence of the data items themselves, or in assisting the normalization process.

In the article mentioned earlier, Frank Sweet identified four reasons why normalization exercises often fail: unstandardized vernacular, peripheral data (i.e., data carried for convenience), lack of business savvy by data processing persons, and sheer volume of data to analyze. So how can we get around these problems? Remember, we do not want to fall into the trap of taking as our source the current mechanized file systems, which might have been thought a ready input. Very often database systems have been implemented on the fallacious assumption that this was the best way. Maybe much of the data we think we need are there, but the way they are organized and used reflects the errors we are trying to correct. What we need to do is to go back to the business afresh. We must focus on the original business issues, rather than the media, forms, and output that distort them. To succeed at this, we need a reliable method of capturing the essential data relationships of the business, freed from bias and technicians' slant (see Fig. 2).

Where do we go to get the information? Unfortunately, unlike the Royal and Ancient Golf Club, businesses tend not to have rules committees. Businesses are vital. Definitions of data are dry. "Normalization" smacks of centralized socialist planning, rather than the entrepreneurial dynamics of Western business. After all, does not the word itself suggest that the sources of data are abnormal, or at least irregular?

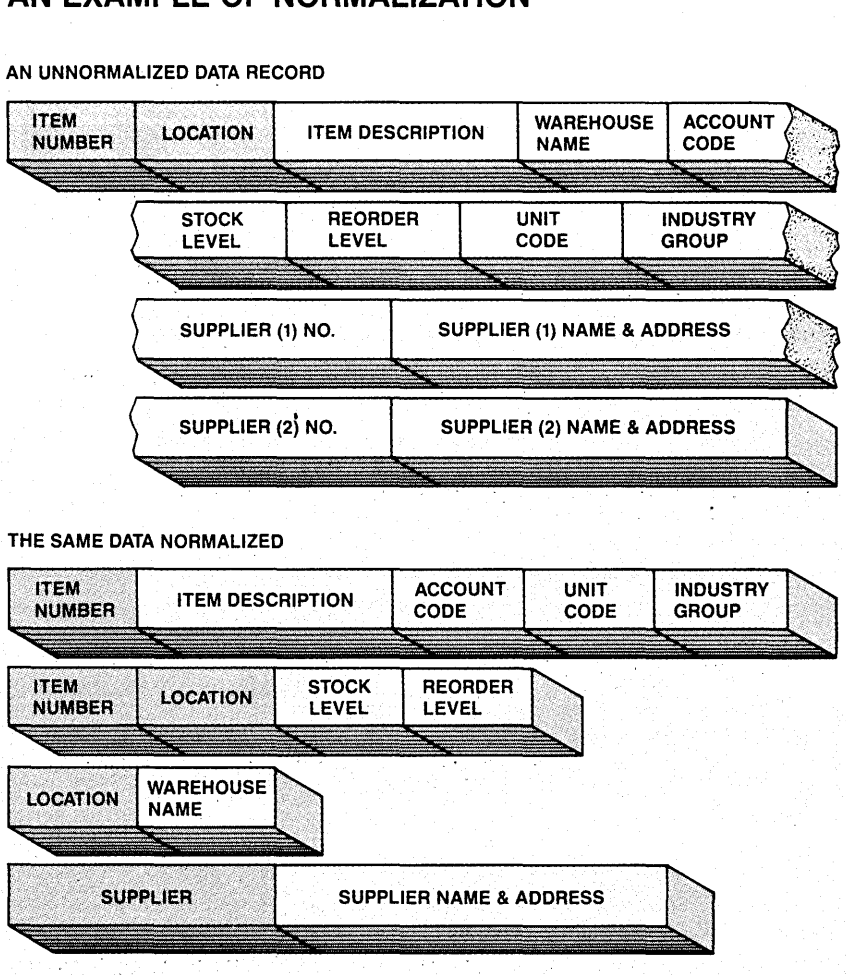
SOME REAL BUSINESS EXAMPLES

One of the most important things to remember is that the rules of data dependence simply may not exist. There will be unreconciled conflicts spattered around the codes and entities of a business, and only obvious ones, or ones that the auditors may spot, are addressed. Let us consider some real examples.

- I have a set of personnel review forms in front of me. The first page, covering salary information, has a field called "Hire Date" on it. The second page, which acts as the beginning of the actual performance appraisal, has a field called "Date of Employment." For the instance in front of me, the dates happen to be the same. Why are there two similar looking items? Were they designed to be different? When does one change without the other? What are the instructions for managers filling out the form? Into what systems will errant changes get transferred? Will benefit statements be calculated mistakenly? How does the personnel database (which I know is separate) interact with or feed the payroll database? Some of these questions may be handled in part by a data dictionary, but the rules are not specified anywhere.
- A manufacturing company has been keeping information on all its items, from raw materials through finished goods, in one file. In converting it to a database, the database administrator, with the input of factory and warehouse personnel, makes some choices about which information should be held singly and which information should be held for each location that holds a quantity of an item. After the database has been implemented, the accountants find that the asset value of raw materials is being drastically miscalculated. Information about the units and costs of raw materials held in different factories was lost in the conversion to the database. The users involved had no easy way to tabulate the data dependencies of different items. A mistake was made in treating raw materials as if they were the same entity type as finished goods. There was no way for the users of the data to codify the relationships of data entities and their attributes to reflect the real world.
- A hardware supplier keeps information about its customers' maintenance status. A simple status code system is added to the database, essentially indicating whether the customer is active, expired, or on demon-

FIG. 1

AN EXAMPLE OF NORMALIZATION



Shaded fields indicate keys. The point is that the rules of the business will determine the data dependencies. In this company, for instance, an account code for an item cannot vary across warehouse locations. One could envisage a further entity with ITEM NUMBER + LOCATION + SUPPLIER as its key or determinant.

stration. The marketing department wants to put out a special mailing to all of the company's active customers to make a special promotional offer on a new piece of equipment.

After it has selected the names and addresses and mailed the piece, it discovers that some of the company's best customers failed to receive the mailing. Eventually the department discovers that because of slight changes to the terms in the new maintenance agreement, a number of customers had delayed signing it. When signed agreements were not returned on time, the contracts administration department indicated the customer account as expired. Again, the facts and needs of various business users had not been adequately identified and built into the data model.

Thus, experience shows the rules are not watertight, and there may not be reliable ways of presenting data dependencies even when the rules exist. The reasons for the looseness may vary: takeovers of new businesses, significant coding schemes forcing impossible standards, undocumented procedures, unmechanized terms, anomalies in mechanized systems. And very often the business has thrived *because* it is vital and uncodified. But we can do a better job of mechanizing it and delivering good information without destroying that vitality.

If we are seriously trying to model a business in our database systems, we should not be discouraged nor should we enlarge upon the sins of the past. We need a way of asking pertinent questions about the facts of the business rather than about the way they are projected in conventional systems and outputs.

As we ask the questions, we may well encounter conflicts in the way these facts are understood by users with different experience, needs, or perspectives. They must not be ignored for the convenience of a technically tidy solution, however. They should be tested against each other until the correct view of data entity usage emerges.

RESOLVE ISSUE OR ACCEPT IT

If the correct view does not emerge because of irreconcilable conflicts or because an anomaly inherent in the business has not been recognized till now, we have two choices. We can either attempt to resolve the issue by showing the discrepancy to those with responsibility, or we can accept it as part of the cost of being a dynamic enterprise. In the latter case, we can at least design a system that takes into account a potential problem area and documents it. Some things take time to mend. Forcing tidiness may give an unwanted impression of dp technology driving the users' needs.

This approach does of course assume that the audience of users we interview can speak with authority on the use and processing of their data. In any case, we probably have no one else to go to. By selecting subject databases for investigation, as opposed to subject application areas, we are at least likely to encounter a solid enough cross section of information users to guarantee a representative sample of needs.

Alternatively, we might come across the hoarier users with considerable experience of the business. When we tell them we want to codify and document their procedures they may say, "Why do you want to know all this? We know how it all works! We've been doing it this way for years!" In this case we must tactfully point out that it is precisely because the facts of the business have remained too long in people's heads that a process of documentation is desirable.

What is needed is a simpler method of representing user views of data, so that information can be verified easily and the communication gap between the business analyst, the database expert, and the end user can be bridged. This, in turn, requires a consistent way of recording users' views of the essential data relationships they encounter in their everyday business (such as how vendors relate to factories, and how volume discounts relate to purchases of certain materials), and a consistent technique for documenting the information. Also necessary is information about the delivery constraints (e.g., frequency, security, medium) of the data users need. Some practitioners are beginning to use such techniques and are achieving a more rigorous recording of "local views."

Of course, all this takes time. But when database systems are implemented that accurately represent the business, the time will seem like a good investment. Finding the right people to interview, docu-

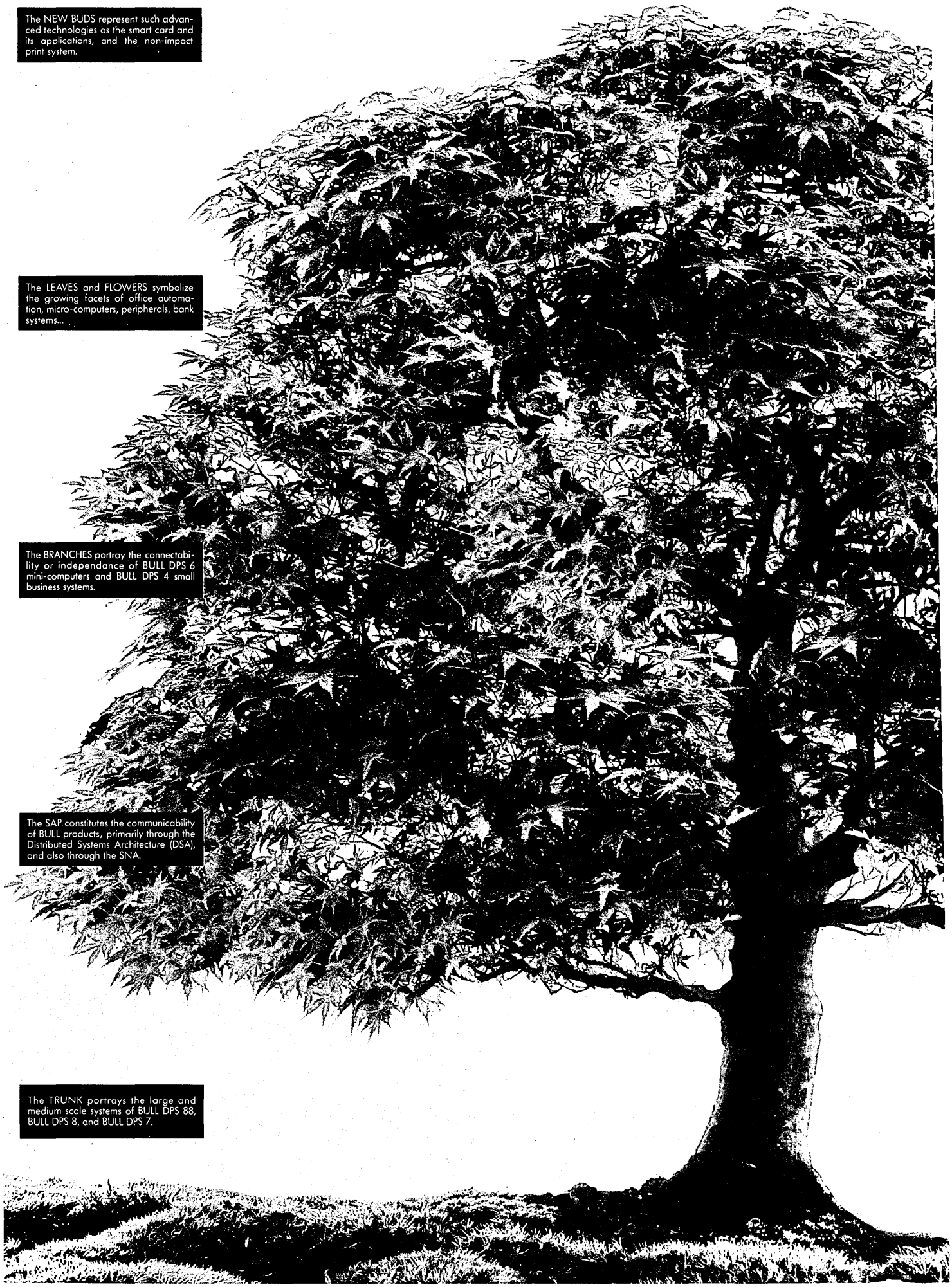

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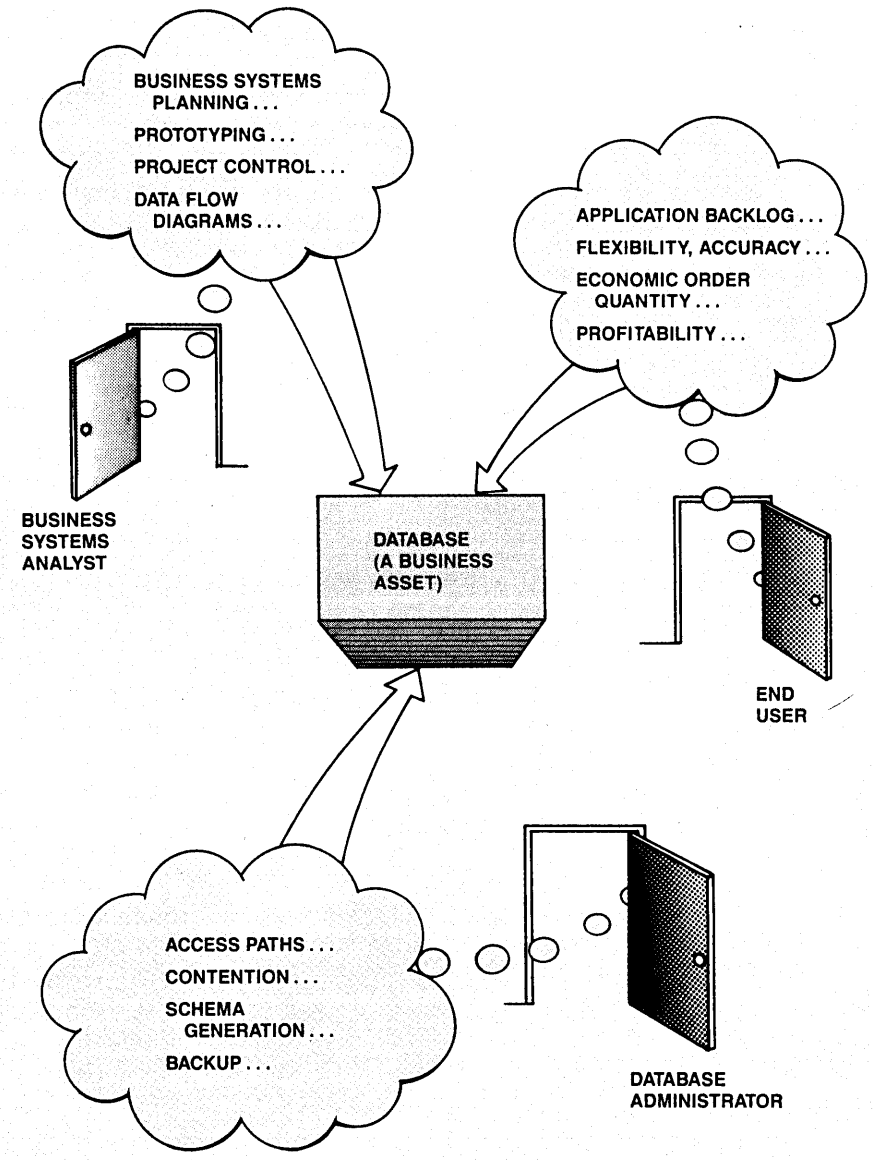
FIG. 2

DATABASE IMPLEMENTATION—THE COMMUNICATIONS PROBLEM



menting their responses, verifying and cross-checking them, going to a higher authority, arriving at resolutions will not be an easy process. And after all this information is accumulated, the database administrator has to try to make sense of it and try to normalize the mass of data views that will have been collected. This is one of the reasons why database administrators and designers tend to sit in rooms for months on end with pieces of paper stuck on all four walls, asking questions like "Does anybody remember where vendor-discount-code is?" or "Is employee hire date the same as employee start date?"

If they do not get carried away by men in white coats or become consultants, they have to start converting their normalized model into a physical database design by taking into consideration the performance characteristics of the DBMS in use, and by trying to make sense of the access paths the data services will generate. It is not surprising that many database systems are implemented prematurely and imperfectly, because management and users have grown impatient.

If the procedures and thought processes can be reduced to a set of logical steps, is this not a place where the computer can help us? In fact it can, although the techniques are not yet widely recognized.

TOOLS IN THE WRONG ORDER

The data processing technologists have delivered the tools in the wrong order. First came the low-level access methods, taking away much of the error-prone grunt work of handling complicated electromechanical disk devices. Then came database management systems that promised the earth but were often used as glorified access methods in reorganizing corporate data. Then came data dictionaries with the argument that in order to design and maintain decent systems, a shop had better get a good handle on the elements of information in the installation, and how they relate to systems, procedures, and users. Last of all came the design methodologies that actually help set up the environment described in the preceding functional areas. There happen to be a great number of methodologies around, but few of them provide the mechanical aids that can automate a good deal of the tedium and help document the elusive informational needs of disparate users.

This is the area where dp professionals and end users are crying out for better tools. They need modeling tools to help with enterprise analysis and business systems planning efforts, so that the painstakingly prepared documents do not become obsolete as soon as the ink dries because of the effort required to maintain them. They need graphics packages that can help speed the process of clarifying and verifying business facts. They need tools to help record the details and delivery constraints of user services, so they can collect, classify, and manage the vast amount of data that needs to be analyzed to produce both logical and physical database designs. They need tools to maintain their data flow diagrams more efficiently. They need tools to assist in the evaluation of different physical database designs to satisfy conflicting access needs.

Many such tools are beginning to appear on the market, and their evaluation should be considered a critical part of any database project. By using such aids, databases can be confidently designed. Contradictions inherent in the business can be recognized at the time when they do no harm, before they are transmuted into mechanized systems. And a stable view of the business can be represented in a clear, sharable, and flexible way so that future systems can adapt to the changes that any flourishing business must undergo. ◉

Tony Percy is a Briton who started his career as a systems engineer with IBM. After a period as a database administrator, he spent nine years in the marketing, development, and support of system software products. He recently joined ADR Inc., Princeton, N.J. He holds an MA in modern languages from Oxford.

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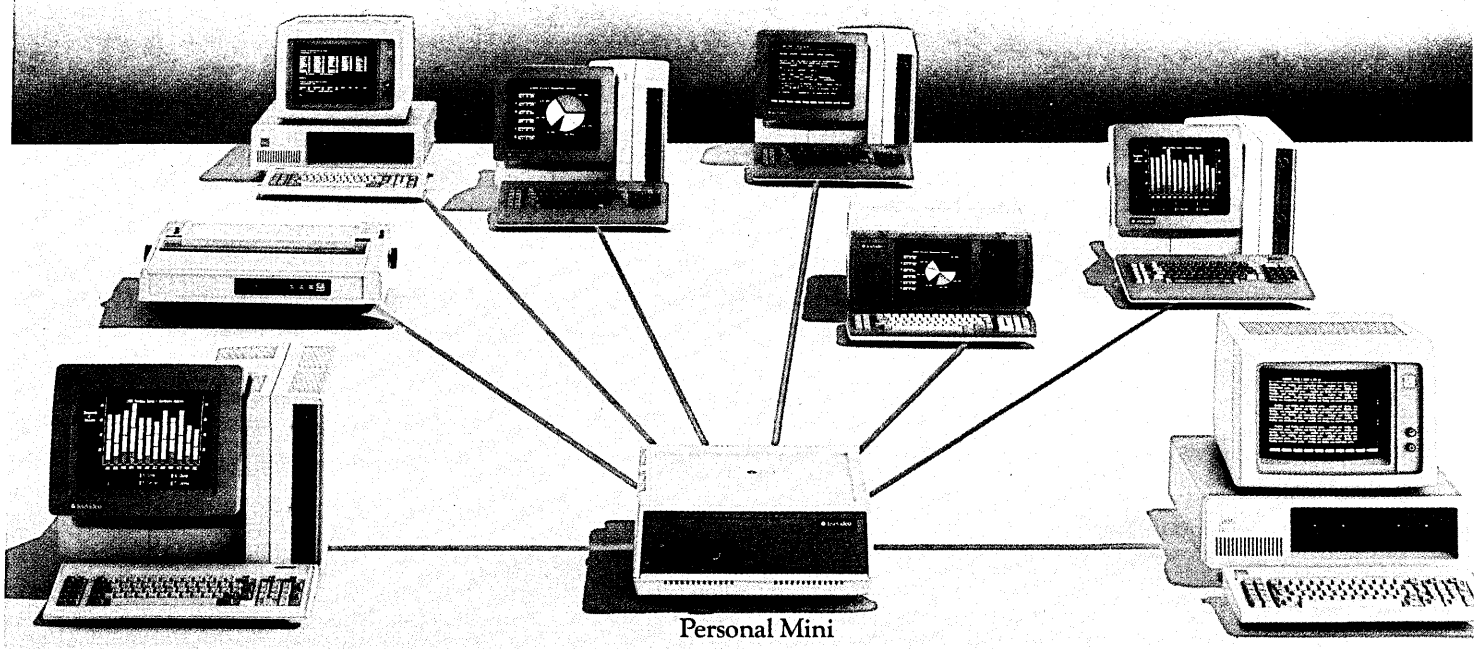

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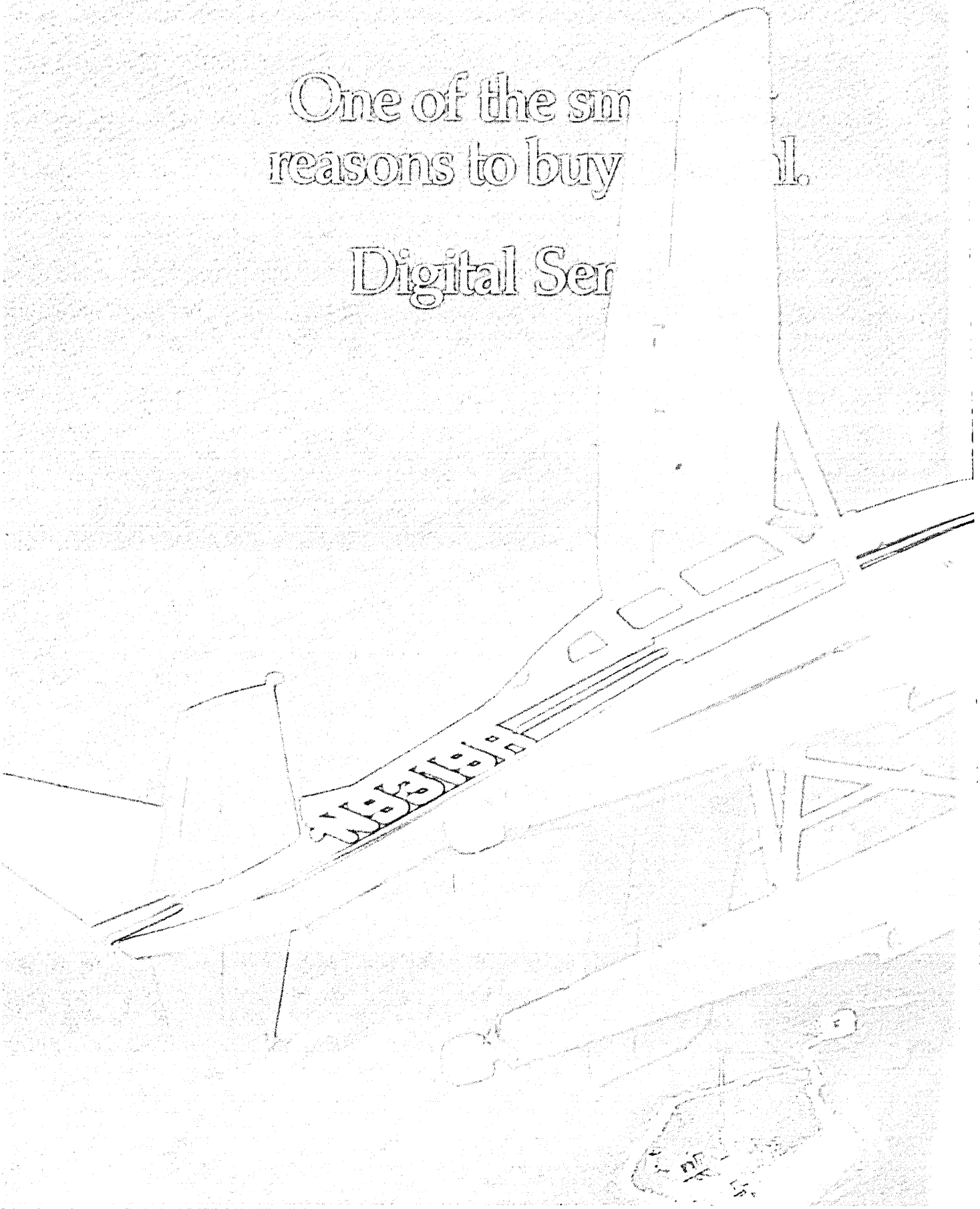

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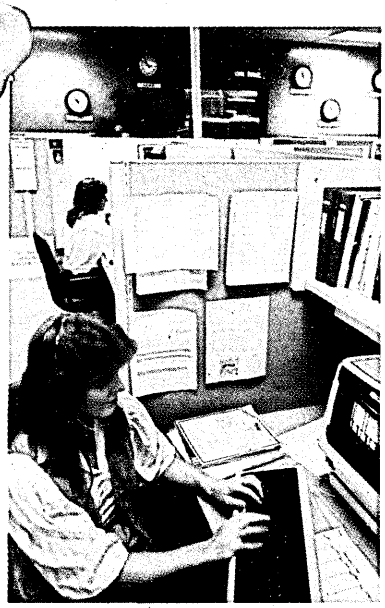

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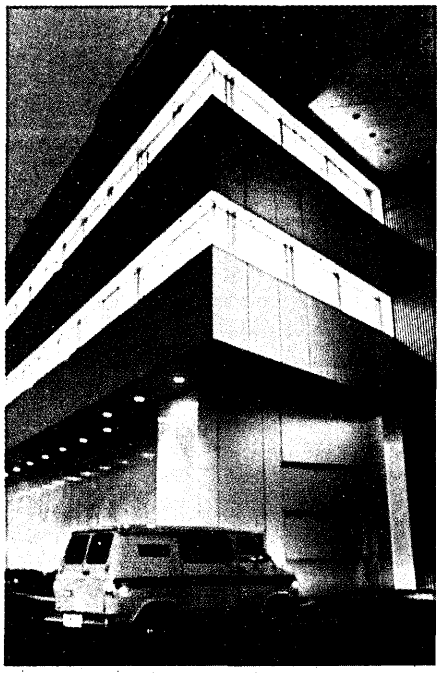

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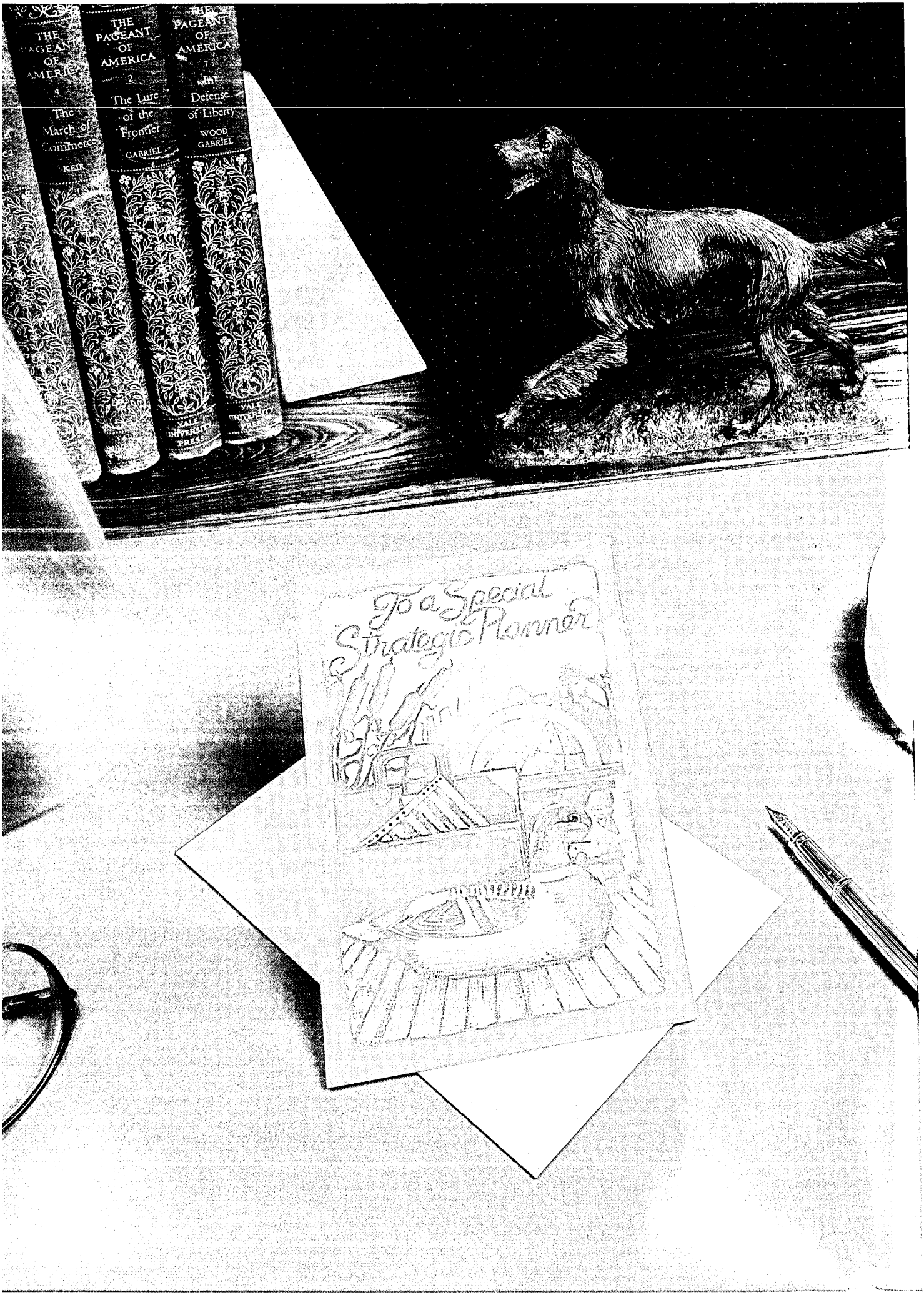
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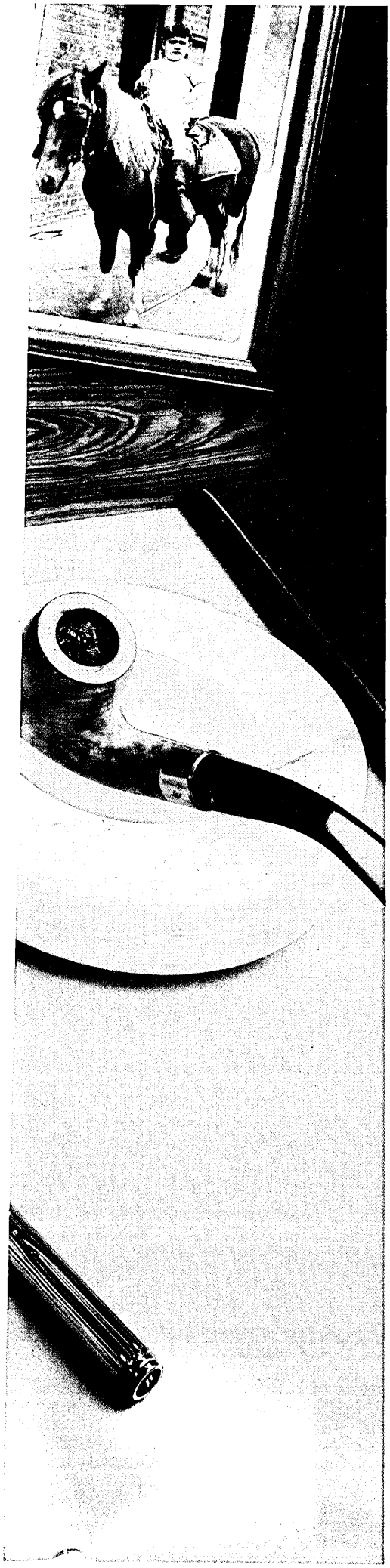


Hallmark cared enough to develop the very best: a planning technique that links MIS plans to business objectives.

ENTERPRISE ANALYSIS

by James R. Johnson

Over the past eight years, an MIS planning system has been evolving at Hallmark Cards in Kansas City, Mo. When the effort started back in 1977-78, the primary purpose was to forecast programmer staffing needs. Since then, the purpose of the plan has expanded as the process was enhanced. In 1979, we added dp internal communication to the plan; in 1980, corporate communication; in 1981-83, portfolio selection; and in 1984, strategy selection. The current process is both more sophisticated and beneficial to the corporation. It now consists of a three-step process entitled enterprise analysis or EA (see Fig. 1). The objective is to achieve an optimal MIS portfolio by integrating business and MIS plans and selecting the appropriate technology for implementation.

Some major observations resulting from the evolution of EA are:

- The classical definition of planning is inadequate—combining the four types of planning (strategic, tactical, operational, and business) is too confusing.
- Technology has changed the nature of MIS planning—consideration of personal computers, office automation, prototyping, information centers, and so forth, is a requirement.
- Various planning methodologies exist that can be tailored to an individual company. It is important to select a technique that fits the corporate culture.

MIS planning will continue to be one of the most challenging tasks facing a corporation. We hope our experiences will help others improve their planning methods.

A 1983 survey on MIS planning systems (called "Information Systems Planning to Meet Business Objectives—A Survey of Practices") conducted by the New York consulting company Cresap, McCormick and Paget concluded the following:

"Although companies employ a variety of techniques and approaches, success in planning is surprisingly unaffected by such factors as industry, size of enterprise, methodology used, and organizational arrangements.

"What does seem to make a difference is the enterprise's approach to business planning, and efforts to establish links between the processes for business planning and those for information systems planning.

"In summary, it appears that the will to achieve linkage between information systems and business objectives outweighs all other factors."

The will to achieve is directly linked to the strategic impact of information systems in an individual company. In companies where systems provide a competitive advantage or contribute to bottom-line profit, the will to achieve will exist. But can the efforts to establish links between business and information plans be better defined, and if so, what are the options and steps?

A few years ago, MIS planning consisted of ranking those systems development projects that were destined for the traditional project life cycle. More recently, new technology has altered dramatically the options for solving MIS problems. But before exploring EA, it is appropriate to redefine planning.

A planning process and its related documents have numerous definitions. For example, one company may define an MIS plan simply as the strategic, long-range pol-

PHOTOGRAPH BY TOGASHI

icies of a division. Others may include a combination of the following: hardware conversion plans, portfolio selection, capacity plans, control strategies, organization plans, project implementation procedures, and budget preparation activities. Since MIS planning has so many possible meanings, it is important to establish a definitional framework.

Thus, a fourth planning process, EA, has been added to the classical definition of strategic, tactical, and operational planning. The function is not new; it has been part of MIS strategic and tactical planning for years. Extracting the activity from the other three planning processes provides a corporation with the opportunity to concentrate on a specific objective. Fig. 2 outlines the issues and parties responsible for the four planning processes. The arrows point out the relationship tactical business planning has to EA and, subsequently, the impact EA has on strategic and tactical MIS planning.

STRATEGIC PLANNING PARAMOUNT

Strategic planning is the highest level of MIS planning and ideally should involve the steering committee and/or senior management. The two central issues are 1) organization and integration of MIS, office automation, and communication; centralization vs. decentralization, and 2) control—use of chargeback, measurement of performance, enforcement of standards, and selection of EA methodology.

With their direction established in these strategic areas, MIS is in a position to perform divisional or tactical planning. If the direction is not clearly defined by senior management, then the responsibility for setting direction on these issues falls to MIS management. In either case, the strategic planning must precede the tactical planning. A tactical MIS plan addresses the critical issues for a six- to 18-month horizon, such as:

- Hardware migration
- Disaster recovery
- Software migration
- Change control
- Training
- Project management
- Organizational interfaces
- Capacity planning
- Security
- Service level agreements

Finally, operational MIS planning is composed of three parts: budget preparation, design and implementation, and control management.

Having positioned EA with the classical types of planning, it is now appropri-

FOUR PLANNING METHODOLOGIES

Business Systems Planning (BSP)—The BSP method has been offered as a market support program by IBM since 1970. It was developed as a result of internal IBM experiences during the late 1960s (more information is available from two sources: "Business Systems Planning and Business Information Control Study: A Comparison," by J.A. Zachman (*IBM Systems Journal* 21, Nov. 1, 1982); and in "Business Systems Planning—Information Systems Planning Guide," application manual number GE20-0527-3, July 1981, also from IBM).

In 1975, a cookbook-type manual was published that explained the procedure and tools of BSP. The document has been updated twice since then, in 1978 and in 1981. The most recent version consists of 161 pages, including appendixes, and provides excellent instruction on the technique.

In BSP, a project team chaired by a user-manager analyzes information needs from the top down to create a data plan for building information systems from the bottom up. The study is generally a one-time effort and concentrates on ideal information needs. The two basic tools supporting the planning are the process-to-data matrix and process-to-organization matrix. The analyses do not result in design specifications or complete cost-benefit determinations. To get to that level of detail, additional analysis must be performed.

Critical success factors (CSF)—The primary purpose of the CSF methodology, which was documented by John F. Rockart in the March-April 1979 HBR article, "Chief Executives Define Their Own Data Needs," is to identify the "information needs of the chief executive officer or any other top executive of the company."

CSF consists of the following steps:

- Interviewing top management and discussing goals
- Analyzing goals and determining CSFs (three to six in number)
- Defining the prime measures of the CSFs
- For hard information, defining report formats and/or subsystems
- For soft information, recording appropriate data manually

CSFs can be arrayed hierarchically and used as an important vehicle by management for communication, either as an informal planning aid or as part of the formal planning process. CSF is an excellent approach for executives to clarify priorities both for business planning and MIS requirements.

Functional stage assessment—Functional stage assessment was also publicized in that same issue of HBR, in the article, "Managing The Crises In Data Processing," by Richard L. Nolan. The methodology evolved from the stage theory and was developed by the management consultants Nolan, Norton & Co. in Boston.

Although only a limited explanation was presented in the article, it is possible to understand the process. To do a creditable job, however, some consulting would no doubt still be required. Two benchmarks are applied in the functional assessment process. The first is to determine the growth stage based on dollar expenditures. The second benchmark is a functional and technical assessment that rates systems by age, technology, file structure, and maintenance level, as follows:

- Define business functions at stage 6 (chart of accounts)
- Rate existing MIS support
- Match to stage benchmarks
- Look for matches and mismatches

These steps are applied to the four MIS growth processes: application portfolio, organization, planning and control, and user awareness. The analysis for the first growth process, application portfolio, is the EA planning function. Recently, allowance for new technologies has been integrated into the technique. Functional assessment of the other growth processes is part of one of the other planning processes, i.e., strategic, tactical, or operational.

Architecture planning—The architecture planning methodology was explained by this author in the May 1984 issue of *Information Resource Management.* Understanding how existing MIS systems support a company is accomplished by linking MIS systems to functional business areas in graphic, nontechnical architecture charts.

The charts document the existing or proposed system support for a functional area—they link business functions to existing and proposed MIS systems. The criteria for a completed chart is that it must be understood by business managers with no more than 15 to 20 minutes of explanation. Flexibility and creativity are the guidelines when producing architecture charts. Developing a good product is a trial and error evolutionary process.

Business objectives are linked to MIS planning via a planning matrix. The matrix lists user division/department/group on the vertical axis and the following appears on the horizontal axis:

- Planning environment—this is the direct link to the corporate plan
- Current support
- Work-in-progress
- Projected needs (one to three years)
- Projected needs (beyond three years)

The last four items should be linked to the architecture charts. The project worksheet documents projects and requirements defined during the process.

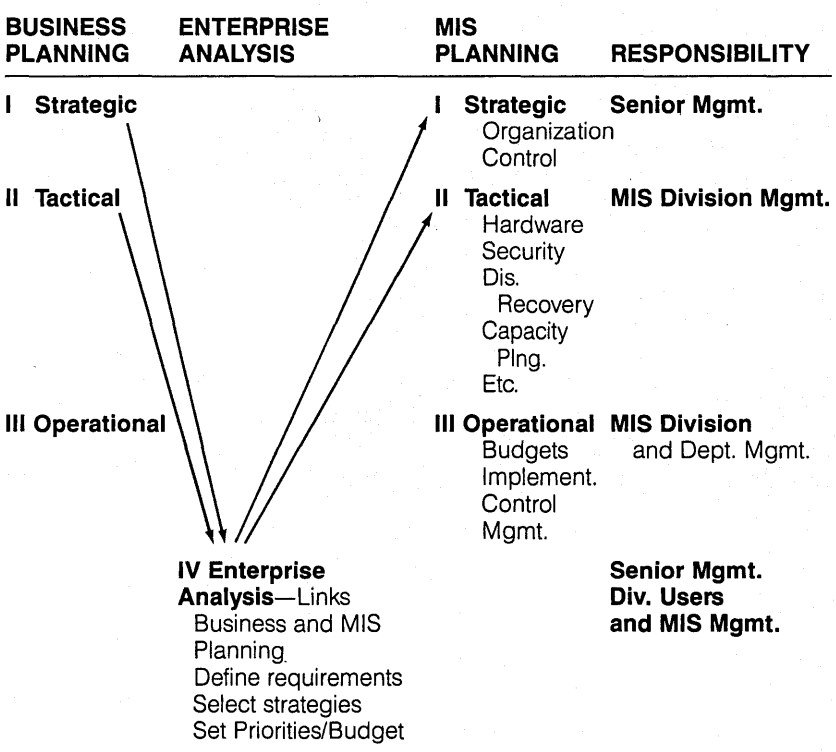
FIG. 1

ENTERPRISE ANALYSIS (EA)

Step 1	Step 2	Step 3
DEFINE NEEDS	**SELECT A STRATEGY**	**ESTABLISH BUDGET AND IMPLEMENT**
Understand existing support	Traditional Life Cycle	Net Present Value
Link business objectives to MIS planning	Prototyping	Portfolio Analysis
	Information Center	Corporate Needs
Document plans consistently	Office Systems	System Voids
	Personal Computer	Strategic Emphasis
	CAD/CAM	

FIG. 2

CLASSICAL DEFINITION OF PLANNING, REVISED



ate to discuss in detail each of the three EA steps: defining needs, selecting strategies, and setting priorities/budgets.

Defining needs. To help accomplish this step, there are four methodologies: IBM's Business System Planning (BSP), critical success factors (CSF), functional stage assessment, and architecture planning (see box).

Each methodology has unique techniques to understand the existing MIS support, link business objectives and MIS planning, and document results.

The four methodologies address the same overall objective of defining needs, but each has certain strengths that may be complementary in some situations. Basically, the thrust of each is as follows:

- BSP—A one-time, analytical method that allows trade-off decisions producing a balance of short- and long-term projects. BSP planning starts by defining the ideal system.
- Critical success factors—Starts with top management information needs and defines measures necessary to satisfy these needs. This general approach may apply to business planning and/or MIS planning.
- Functional stage assessment—Identifies the organization's learning level—where it is now and what the organization is capable of doing next.
- Architecture planning—A continuous planning process that forces visibility and administers the planning process. It starts by defining existing support and then links corporate direction to MIS support via the planning matrix.

By merging tools from different methods, a company may tailor its approach and allow for differences in culture, size, and organization structure.

Selecting a strategy. Step one of EA defines what the corporate needs are and step two addresses how to satisfy these needs. The portfolio of strategies defined at Hallmark are shown in Fig. 3. The basic breakdown is internal MIS development, outside resources, and end-user computing. Within each category three to four subcategories exist, bringing the total number of strategies to 11. Most corporations would have similar options available, although variations exist depending on the status of technology integration. As stated earlier, technologies like prototyping, information centers, decision support, office systems, and the personal computer have created additional options for addressing MIS problems.

COMPARING EXPENSES & MEDIA

Before discussing the strategies, it is interesting to compare the breakdown from two perspectives: current budget expense (people and hardware); and attention received from tv, magazines, and any other medium. Acknowledging subjectivity in my estimated numbers, consider Fig. 4. Note the complete reversal of strategies A (internal MIS development) and C (end-user computing) in the two columns defining percent of budget (75% and 20% to 20% and 75%). From a budget expense perspective, internal MIS development dominates (75%), but if perceived importance relates to attention received, then the pc is the prominent strategy. It may be that over the next five years, the budget will migrate toward the attention-received percentages. In selecting a strategy, however, understanding the strategy and relationships among strategies is important. In the ensuing paragraphs, I've included comments on three new technology strategies: prototyping, information centers, and pcs.

No one is happy with the traditional life cycle (TLC). Because control was emphasized in the late 1970s, the standards governing TLC were designed to cover every situation and ended up becoming bureaucratic. When projects didn't meet users' needs, the solution was to add design documentation steps to *really* define their needs. The specific design tool (such as PSL/PSA,

IBM ON TELECOMMUNICATIONS

Q. WHY ALL THE TALK ABOUT LOCAL AREA NETWORKS?

A. There's been a lot written about Local Area Networks (LANs). What's all the talk about? Why are LANs important? Should your company be looking into them? Is one kind of LAN better than another?

The fact is, a lot of people, ourselves included, think LANs are going to play a key role in the total telecommunications picture for most businesses. Here are some questions and answers that might help you better understand LANs.

Q. To begin with, just what exactly is a Local Area Network (LAN)?

A. It's a system for moving information between devices located on the same premises. Now that calls for some further definitions. By "information," we mean data, voice, text, graphics or image. By "devices," we mean big computers, personal computers or other workstations, printers, telephones, scanners, files, sensors and actuators, and PBXs. By "same premises," we mean office building, manufacturing plant, hospital, campus or other geographically confined area. In short, and quite simplified, a LAN is one way of connecting all these devices to each other.

Q. There seem to be a number of different kinds of LANs. Why the variety?

A. The reason there are different LANs is because different work situations have different needs and different cost considerations. For instance, one type of network is capable of linking different kinds of computers, workstations and other devices throughout a building or campus. This allows for the exchange of information and the sharing of resources and large data bases. Then there's a need for a network specifically designed to interconnect personal computers. There's also the need for a special "industrial" LAN to meet the unique requirements of manufacturing plants. And there may be other networks developed to meet other needs.

Q. What if I want to link all the devices in my building?

A. IBM is developing a way to get all the devices in a building to communicate with each other using established computer and communications architectures. This will allow the mainframe computers, companywide systems, smaller departmental clusters and even individual workstations to interact and share files, applications and peripherals.

We believe this general purpose LAN, utilizing "token-ring" technology, will provide the greatest flexibility and connectivity for different departments, workstations and systems. Other major benefits of this LAN technology will be very high reliability, predictability of performance, and greater overall network management capability.

The token-ring LAN will use the IBM Cabling System as its foundation. Currently being installed, the IBM Cabling System provides the immediate benefits of a common cabling solution for most IBM systems and workstations.

Q. Suppose I only need to connect personal computers?

A. We recently announced an IBM PC Network that allows a department, small company or remote location to interconnect IBM Personal Computers. This low-cost network lets PC users share files and printers, and send messages from one PC to another. The PC Network also lets users access application programs and data bases in larger IBM System/370 computers.

Q. What about a LAN for manufacturing plants?

A. We intend to offer an industrial LAN which will allow factory floor data collection and interconnection of robotic systems, machine tools, numerical processors and industrial computers.

Q. And if I wanted, could I connect these different networks to each other?

A. IBM has announced that its planned token-ring LAN will also act as a "backbone" connecting these different networks. Each network will have the ability to communicate with IBM System/370 host computers and applications.

Q. What if I'm still not sure which way to go?

A. Choosing a LAN is a business decision that will vary from company to company, and from department to department. Remember that LANs are just a portion of your company's overall telecommunications solution—a solution that should be developed in a planned, structured and manageable way. If you'd like some help in figuring out the answer that will best suit your needs today and in the future, call IBM.

There's a lot more to be said about LANs and telecommunications. If you'd like a free copy of "Positioning Local Area Networks," call 1 800 IBM-2468, Ext. 82, or return the coupon.

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FIG. 3

STRATEGIES FOR SATISFYING INFORMATION NEEDS

A. INTERNAL MIS DEVELOPMENT	B. PURCHASING OUTSIDE RESOURCES	C. END-USER COMPUTING
Traditional Life Cycle Initial Investigation Feasibility Study/General Design Detail Design/Prototype Implementation/Prototype	**Contract Programming** Special Skills Supplement Corporate Staff One-Time Requirements	**Ad Hoc Retrieval/Decision Support** Batch Reporting On-line Retrieval Simulation/Modeling Data Analysis Graphics
Prototyping Develop system without life-cycle approach Similar to Research & Development	**Timesharing Network** Special Software Tools Immediate Access Variety of Packages	**Independent Systems** Data Entry/Gathering Department Subsystems Production Jobs
Purchased Appl. Software Follows Traditional Life Cycle but detail design and programming are minimized	**Turnkey Systems** Integrated Hardware and Software Package for Specific Purpose	**Personal Computing** Spreadsheets Communications Applications Files/List Processing Word Processing Graphics
Information Center Write ad hoc requests Consult Develop Small Systems		**Office Systems** Word Processors Clustered Systems Electronic Mail Teleconferencing

which is problem statement language/analyzer, or SADT, the structural analysis and design technique) is not relevant since each technique requires training and adds time to the TLC. Thus, it now takes so long to implement a large system that the problem changes during the process and the design is no longer acceptable.

So TLC has been under attack. But there is hope because the technology of fourth generation languages enables an interactive design technique. This technique is called prototyping and it has two separate definitions (for more on prototyping, see this author's article, "A Prototypical Success Story," Nov. 1983, p. 251). The first, or level one definition, is used within the TLC design and implementation phase to dramatically accelerate the process by directly involving the user and bypassing parts of the TLC standards and paperwork. During the design phase, a working model with less than complete capabilities in one or all of the functions is used in an iterative mode by the user, with MIS's assistance, to complete the design. If the model is completed, it may be implemented and then become the final system.

The second level of prototyping is a replacement for the TLC. Level two is similar to a research and development project where the results may or may not be pursued. It contains these steps:

- Identify user's basic information requirements
- Develop working model
- Use working model to refine needs and justify system
- Enhance model and possibly implement

There would be no feasibility study or other TLC phase distinctions.

How do we decide when to select level two and completely bypass the TLC? Providing a structure is the inherent reason behind the TLC. This structure has a price in documentation, design reviews, approvals, and control. Conversely, level two does not provide typical control techniques; a project team can pursue design in a free-lance mode. Thus, there are some disadvantages, but project characteristics favoring a level two approach are as follows:

- The existence of a unique application—one that is uncommon within an industry
- The use of new technology
- The use of innovative software design
- Uncertainty of the operational impact or difficulty in visualizing its benefits

To illustrate this last characteristic, let's assume a manufacturing plant has a batch scheduling system and a project team is asked to determine the feasibility of a real-time system. It is almost impossible in a feasibility study to define the impact of a totally different way of operation for an entire plant. In this situation, the best way to define and understand the benefits is to observe a system in operation—i.e., implement a working model. In level two, the model encompasses the feasibility study, design, and potential implementation phase. The project phases are merged so that there is no phase distinction.

TWO TYPES OF ICS EVOLVE

Two types of information centers (IC) have evolved. The first type directly supports end-user computing by providing consulting expertise on user languages, databases, network procedures, and so forth. The end user does the work. In the second type of IC, the consulting services include programming ad hoc requests and implementing small systems (five to 50 man-days).

If user programming expertise varies considerably within corporate divisions, which is usually the case, the second approach may be warranted. The philosophy is to attack the MIS backlog by providing alternate service paths, depending on the size and type of request. Fig. 5 illustrates the alternative paths. Each path has a unique priority scheme—the longer the lead time, the more sophisticated the priority process.

Pcs are a new and increasingly desirable way for users to satisfy their MIS needs. Spreadsheet analysis, graphics, minor applications, file/list processing, and communication are all functions that can be done on a host or pc.

Establishing a corporate pc learning center has become a popular approach to user training. Corporate and individual users have demonstrated an unprecedented eagerness to learn about computers. Dur-

ing this learning stage, tight control and justification procedures will inhibit development. Initially, a relative priority approach is more appropriate than a net present value method. Also, encouraging selection of software packages instead of tailored programming is a sound philosophy.

As a strategy, the use of pcs is not new. The concept is a revision of distributed processing or individual processing. Future system design must consider the capabilities and role of pcs; both inputs and outputs may be processed via pcs or the host computer. This option presents interesting challenges to designers.

What obstacles stand in the way of successfully integrating these concepts? First, there are psychological obstacles within MIS to some of the new technologies. Changing standards for prototyping, staffing an information center, or offering pc consulting services are new ways of operation that necessitate change; resistance within MIS can be expected. But assuming the new technologies are established as strategies, the choices are still difficult. Within MIS, the decision of whether to go with level two prototyping or TLC is not straightforward. Also, when considering user computing vs. MIS, multiple departments are involved, and politics may become an issue. Lastly, the roles of the host and pc now overlap for some functions.

Management approaches to resolve the last two difficulties include analyzing the company's current approaches, joint planning with MIS departments and user groups, and communication and discussion on the merits of these various strategies.

Setting priorities/budgeting. This is the final step of EA. Two common techniques for ranking projects are ranking by net present value (NPV), and portfolio analysis. Ranking projects by their NPV is an excellent technique when benefits are tangible—as is generally the case with operational systems. But for management control and strategic planning systems, intangible benefits become the primary justification, and the determination of dollar values is always a problem. Thus, NPV does not provide a complete resource allocating technique and may not always be the deciding factor.

Assessing project risk and then developing a portfolio of projects based on risk profiles is the second popular technique. Risk in this context includes the reliability of programming estimates (project size), the value of intangible benefits, an assessment of the technological problems, and project structure.

Each of the EA methods also provides tools for setting the priorities of projects. BSP and CSF rank subsystems based on corporate need. Functional stage assessment uses the chart of accounts to identify weaknesses or voids. Architecture planning employs graphic charts of historic and projected expenditure trends along with strategic emphasis programs.

The priority process is company-dependent and selection criteria may vary from year to year based on experiences and, certainly from a pragmatic aspect, budget dollars available (corporate profitability). Nevertheless, the tools mentioned above should significantly enhance the priority setting process.

By acknowledging EA, defining corporate requirements, identifying strategies that include the new technologies, and developing criteria for budget decisions, management has the best chance of making the right decisions. ◉

FIG. 4

STRATEGY: BUDGET VS. PERCEPTION

STRATEGY	CURRENT % OF BUDGET	% ATTENTION RECEIVED
Internal MIS Development		
Traditional Life Cycle	55	0
Prototyping	5	5
Purchased Software	5	5
Information Center	10	10
	75	20
Outside Resources		
Contract Programming		
Timesharing	5	5
Turnkey Systems		
	5	5
End-User Computing		
Decision Support	5	10
Independent Systems	5	0
Personal Computers	5	55
Office Systems	5	10
	20	75
	100	100

FIG. 5

ALTERNATE SERVICE PATH

PATH	USER WAIT AVERAGE QUEUE
Traditional Life Cycle (TLC)	1-2+ years
Prototyping	6-18 months
Purchased Software	2-6 months
Small System Implementations (IC)	1-2 months
Ad Hoc Requests (IC)	1-2 days
Consulting for End-User Computing (IC)	1-2 hours

James R. Johnson is director of systems development at Hallmark Cards Inc., Kansas City, Mo., where he is responsible for the design, programming, and implementation of all corporate systems. He is the author of *Managing for Productivity in DP* (Q.E.D. Information Sciences, Wellesley, Mass., 1980). This is his fourth article for DATAMATION.

The key word in that long, drawn-out headline is system.

A system built for PCs.

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Yet the system is so flexible each part can stand alone. Or even team with an IBM PC.

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We call one the HP Touchscreen and the other (because it can do even more) the HP Touchscreen MAX.

The first comes with two double-sided disc drives that give you 256K bytes of main memory, expandable to 640K bytes.

The HP Touchscreen MAX has even more capacity, with the added power of a 14.8-M byte Winchester disc drive.

And both have DSN/Link, to let you set up a direct line of communication between them and your HP 3000 Department Computer.

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The system also includes two printers many people think are simply the best around.

Our Hewlett-Packard LaserJet and ThinkJet printers are both breath-takingly fast and refreshingly quiet.

The ThinkJet printer runs at a rapid 150 characters per second.

Yet because the ThinkJet paints each character with a small jet of ink (instead of smashing the paper with keys), it's as quiet as a sigh.

At 300 characters per second, our LaserJet printer is even faster.

Ten times faster than the best daisy-wheel printers. Yet the image is as sharp as you'll get from a printing press. Amazing.

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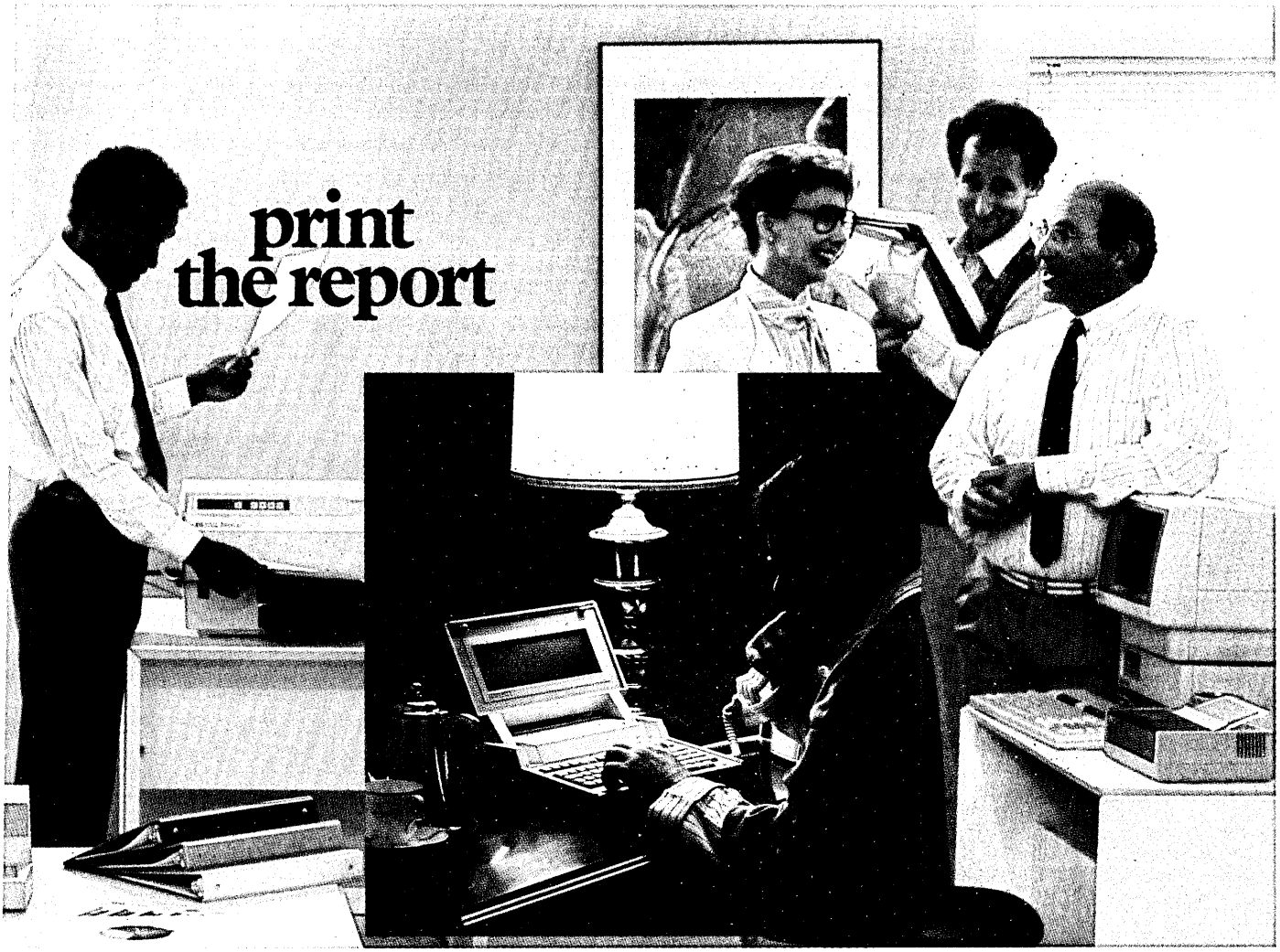

and when you get to your hotel, change everything.

Two different plotters are also part of the HP personal computer system.

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If you like, the system can be knitted together through a LAN.

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CIRCLE 38 ON READER CARD

CONDUCTOR: The MIS Approach to End-User Access

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Some claim computer career paths are in a rut, but studies show that there are more directions than ever from which to choose.

BLUE SKIES AHEAD

by J. Daniel Couger

For nearly 20 years, various authors and speakers have predicted the imminent demise of the business programmer. Coexisting with this negative outlook is the speculation about the collapse of dp career paths, since many computer personnel enter the field via programming.

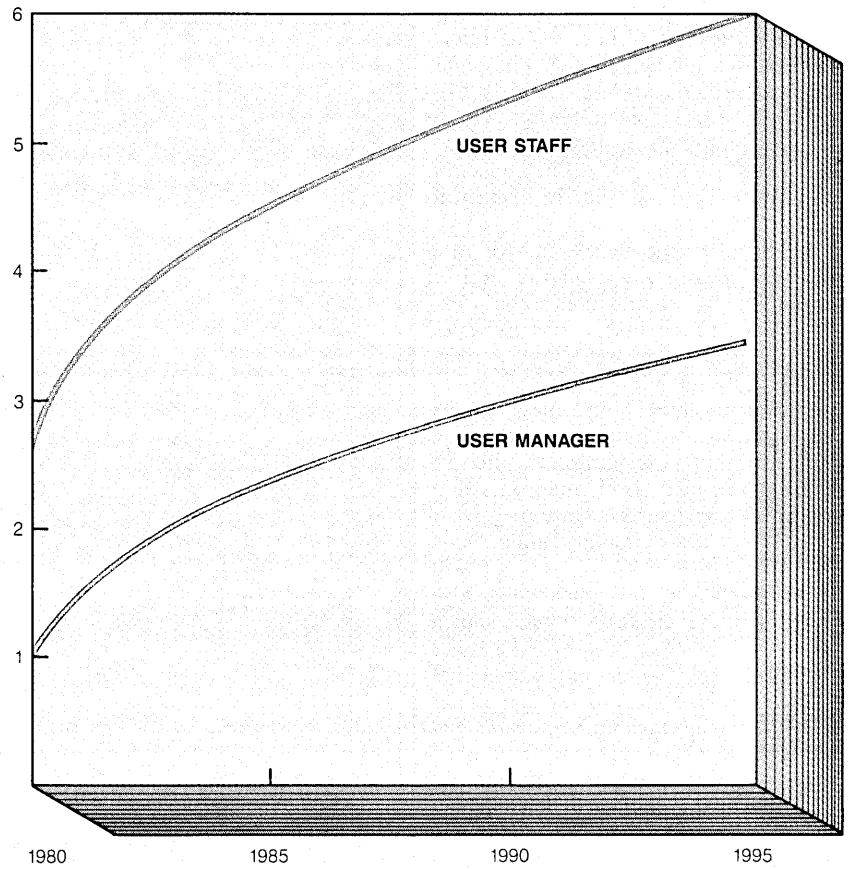
Yet, the demise of the programmer has not occurred, nor does it appear imminent. On the contrary, the number of programmer positions is increasing and is predicted to continue doing so. At the same time, and almost independent of the programmer growth situation, is the expansion—rather than contraction—of dp career paths. The expansion is both horizontal (more paths) and vertical (more openings at the top).

Even if projections are confined to the conservative U.S. Department of Labor forecasts from the November 1983 *Monthly Labor Review,* the growth potential is good. USDL estimates the number of programmer positions will increase approximately 5.9% annually between 1985 and 1995. Annual increase in the number of system analyst positions for the same period is projected at 6.5%. At the optimistic end of the spectrum, Forecasting International Ltd. predicts the number of computer software writers will grow at a rate of 87% annually! (Its findings are published in *Jobs of the Future* by M.J. Cetron and T. O'Toole, McGraw-Hill, 1984.)

Growth in the number of analysts per year is projected at 1.1% for the same 10 years. The discrepancy arises because design is included in the software writer category. The combined analyst/programmer growth rate is projected by Forecasting

FIG. 1

INCREASE IN USERS' KNOWLEDGE OF COMPUTERS OVER THE NEXT DECADE



As users become more knowledgeable, they want to do more sophisticated things.

International to be 51% per year.

Both studies, however, are extrapolations solely of programmer and analyst positions. The career path is much broader; instead of a two-branched path, it is multidirectional. Some paths are not readily apparent. It's something like peeling an onion. While on the surface there seem to be only the two job types, programmers and system analysts, further peeling reveals a multiplicity of layers within.

CURVES REFLECT TRENDS

Fig. 1 identifies one cause of the expanded career paths for analysts and programmers. At first glance these curves seem to demonstrate the reduction in need for computer professionals. The curves reflect trends derived from four recent surveys plus the two survey sources mentioned previously. (The other four are "A Study for the Corporate Use of Personal Computers," MIT Center for Information Systems Research, Cambridge, Mass., 1983; "Effective Use of Personal Computers in Large Organizations," International Data Corp., Framingham, Mass., 1983; "Microcomputer Usage Trends in Fortune 500 Corporations," Newton-Evans Research Co. Inc., Ellicott City, Md., 1984; and "The CRWTH Information Center Survey," CRWTH Computer Coursewares, Santa Monica, Calif., 1984.) Fig. 1 illustrates the precipitous growth in user knowledge, projected to continue through 1985, due largely to the impact of personal computers and information centers.

The user knowledge growth rate should slow before 1990, but the level of their knowledge should continue to expand. According to the surveys, user staff and professional users are doing the most sophisticated work and will continue to do so. Their managers rely on them for model development while the managers use the computer in simpler ways, for tasks like information retrieval. Both managers and staff can be expected to continue to increase their levels of sophistication. As a matter of fact, by 1995 some user staff will reach the 1980 level of technical knowledge held by computer professionals, as shown in Fig. 2.

Some prognosticators assume that this growth in users' computer capabilities will reduce the need for programmers, analysts, database designers, data communication designers, system programmers, and so forth. Such assumptions are wrong.

Certainly, the tools for analysis and programming will continue to improve, thereby facilitating the development process. At the same time, though, new applications are increasing in scope and complexity, and the computer professional's knowledge must increase to meet these challenges. The belief that fewer computer professionals will be needed and its corollary, diminishing career paths, are invalid. On the contrary, career paths are expanding as shown in Fig. 3. Six misconceptions concerning growth rates and career paths in the field are explored below.

The dp backlog is diminishing. The increased sophistication of computer users will enable them to develop many of their own applications, thereby reducing the

FIG. 2

INCREASE IN KNOWLEDGE OF COMPUTER PROFESSIONALS COMPARED TO USERS

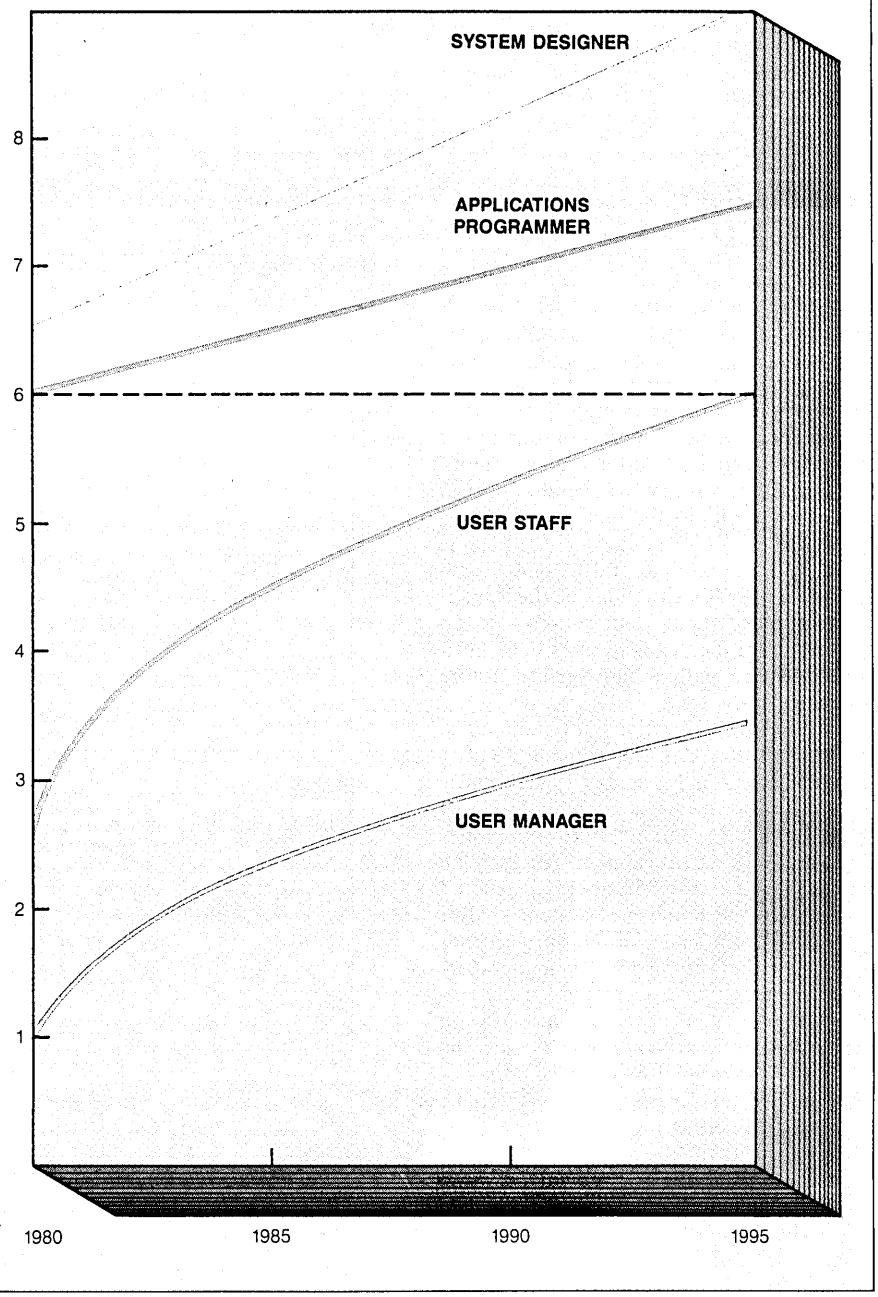
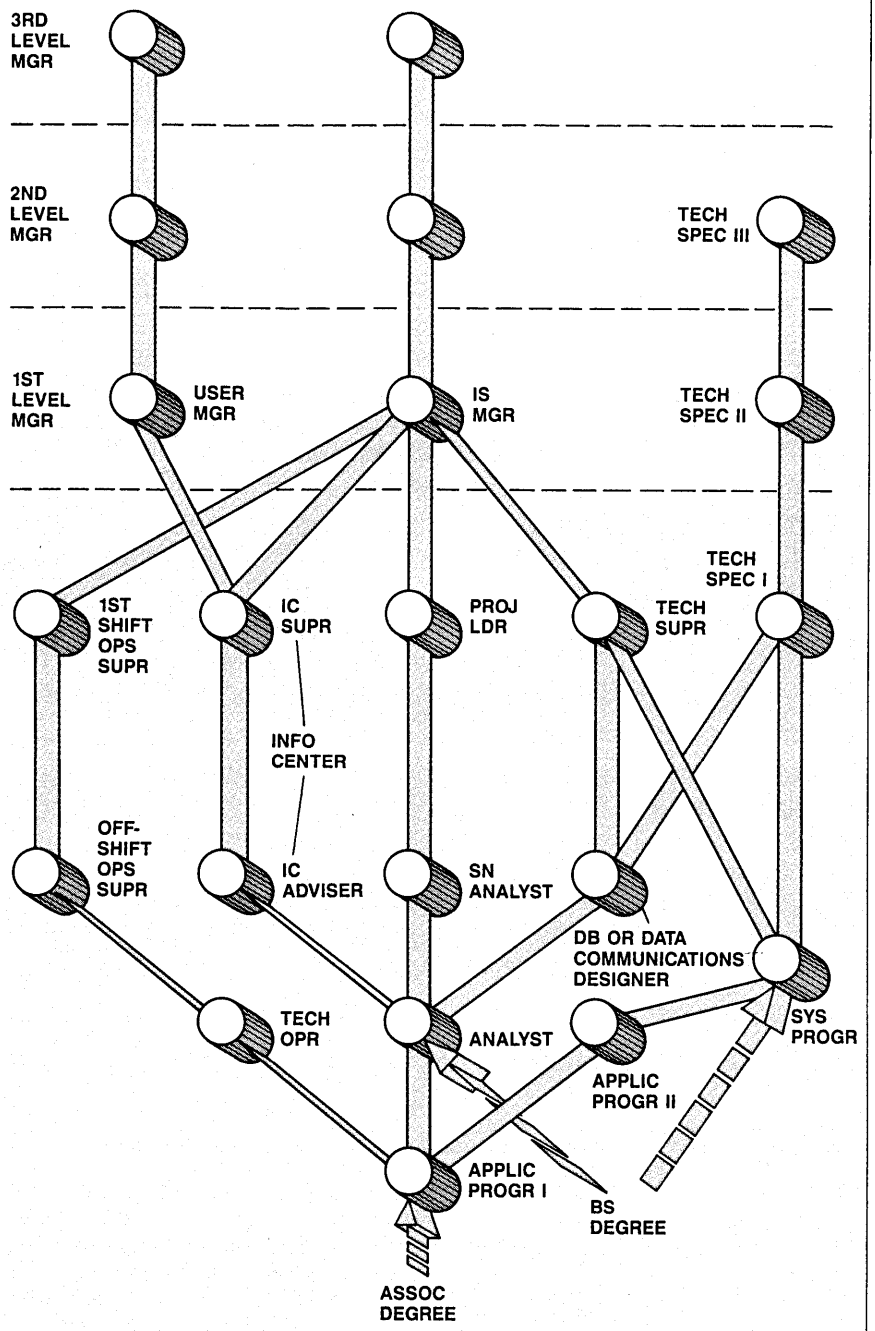


FIG. 3

EXPANDED CAREER PATHS OF COMPUTER PROFESSIONALS



need for computer professionals.

It is true that staff and managers are developing some applications that could be done by computer professionals. The reason they're doing those, however, is because the applications have been given low priority on their companies' system development plans. The slots eliminated in the plans by user development appear to be quickly filled by other requests. Thus, there is really a redistribution of applications developments, not a reduction.

Also, as users develop some of their own applications, they quickly realize they have neither the resources nor the desire to develop large-scale applications. They are confining their development efforts to smaller decision support systems rather than transaction processing systems. Or, when a DSS increases beyond the size originally anticipated, users transfer maintenance of such a system to the dp department. The company's overall system plan is often relatively unaffected by the applications that have been developed by users.

There is a decreasing need for technical assistance. The new computer-knowledgeable user community will reduce the need for technical assistance and therefore for computer personnel.

Despite such conjecture, this type of pattern has not emerged, nor does it seem possible in the future. First, a large number of courses are being taught for user managers and staff, resulting in a demand for more dp training personnel. This segment of the career path is not even shown on the expanded career path in Fig. 3. Nevertheless, it requires technical resources and it is not a temporary phenomenon, for once first-time users are trained, many will desire advanced training. Second, as users become more knowledgeable, they want to do more sophisticated things. They need technical assistance and guidance to accomplish this more complex work. That has been the clear pattern, as revealed in the surveys.

Simplified development tools will require fewer professionals. With the advent of higher-level languages and improved system development tools for computer professionals, fewer technical personnel will be needed.

This is true only for the simpler categories of work. As shown in Fig. 2, technical personnel are expanding their knowledge base, though at a slower rate than user personnel.

The faulty reasoning is caused by thinking in terms of present-day applications. While new techniques for development have occurred in each computer era, more complex applications are always undertaken. These challenging new application areas require even more technical expertise. Examples in the present era are database design and data communication design. In the next generation it will be expert system and AI system design.

Other areas to be developed are the consolidation of major internal databases, the integration of external and internal databases, and the perfection of network reliability and functionality. All these activities call for computer professionals with increased technical skills.

CAREER PATHS ARE EXPANDING

Career paths for computer professionals will become attenuated. Increased computer user sophistication will narrow the career paths for computer personnel.

As Fig. 3 shows, the career path is not diminishing but is actually expanding. The new path of the information center adviser is an example of horizontal expan-

Until recently, the top dp job always appeared to be dead-ended, but that's no longer the case.

sion of the career path. These personnel not only have opportunity to advance within the information center path but also to cross back to the dp management path. A third alternative for them is to enter user management by virtue of their new business skills, acquired while advising users on developing decision support systems.

Another expanding path is in operations management. In the past, this direction was not particularly appealing to development personnel. But recent computer technology has converted the operations environment from large numbers of lesser-skilled operators in earlier generations to one of a limited number of high-skilled technicians in the fourth generation. Supervision of this area is now a more appealing choice for technical personnel.

An example of a vertically lengthened path is that of the technical specialist (right side of Fig. 3). A technically superior person should not have to move into a managerial path to progress. Today, a number of firms have a standard path wherein technical specialists can advance to a compensation level equivalent to a second-level manager. It would seem, however, that one more level of advancement could be justified, since these personnel make a major contribution to the firm.

Low dp stature limits advancements. Because the dp organization reports at a low level, there are fewer opportunities for advancement.

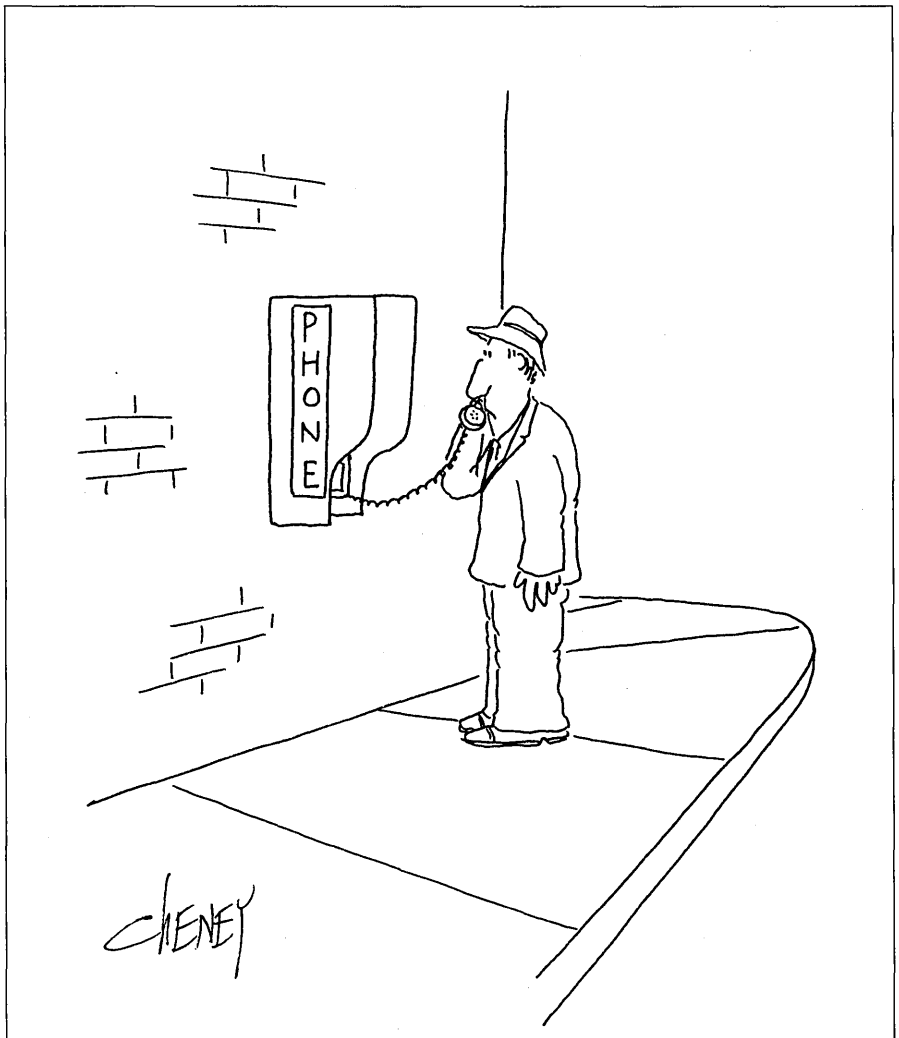
A decade ago, few dp directors reported directly to the executive vp. They reported instead to one of the functional vps, such as the vp of finance. Today, many firms have elevated the dp organization one level. It is now headed by a vp who reports to the executive vp. The effect is more than just one job opening at the top: another complete layer of management is added. The career paths of all individuals in the organization are expanded, not just those with the potential for the vp job.

The dp managerial path is dead-ended. The top dp manager will never become the executive vice president.

Until recently, an executive vp who was previously the information systems vp was as rare as a completely debugged system. The top dp job always appeared to be dead-ended, but that's no longer the case. At last year's national meeting of the Society for Information Management (SIM is headquartered in Chicago) in San Diego in September, there was a session featuring four individuals who had achieved the executive vp level. They were asked to explain the reasons for their promotions, and the discussions indicated that such progress was not peculiar to these individuals but that there were specific activities and patterns that could be followed by other information system vps. When a promotion like this occurs, advancement opportunities ripple down throughout the organization.

Instead of diminished opportunities, there will be a continued expansion in both the number of positions and the variety of career paths for computer professionals. While this analysis has been confined to the corporate and government areas, expanding career opportunities also exist within computer manufacturing and software houses. The explosion of entrepreneurial opportunites for people who have acquired experience sufficient to initiate their own firms should also not be overlooked.

In this light, negative speculation concerning the demise of application programmers appears relatively insignificant. Perhaps the ratio of application programmers to the user community will diminish. But the growth opportunities within the overall computer field are accelerating, not diminishing. ◉



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CARTOON BY THOMAS CHENEY

J. Daniel Couger is a professor of computer and management science at the University of Colorado College of Business. He has more than 25 years' experience in the computing field, including 10 years as a manager.

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CIRCLE 40 ON READER CARD

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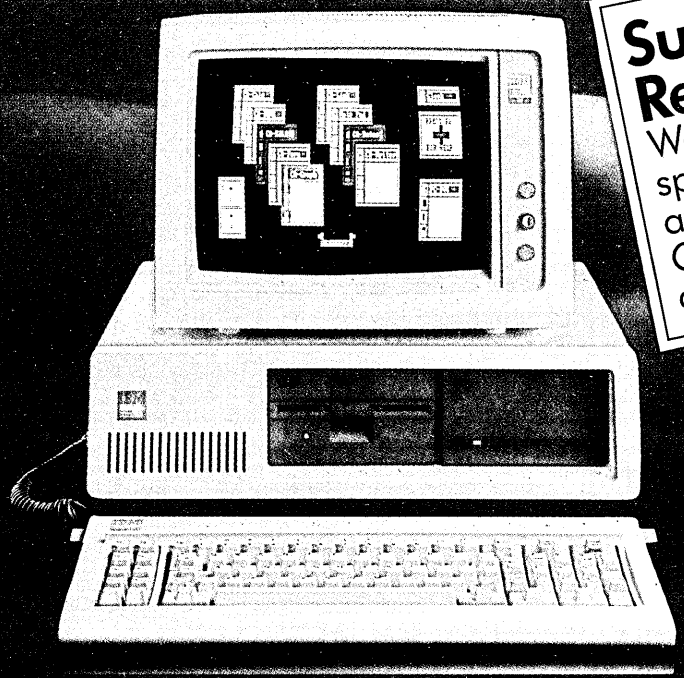

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CIRCLE 41 ON READER CARD

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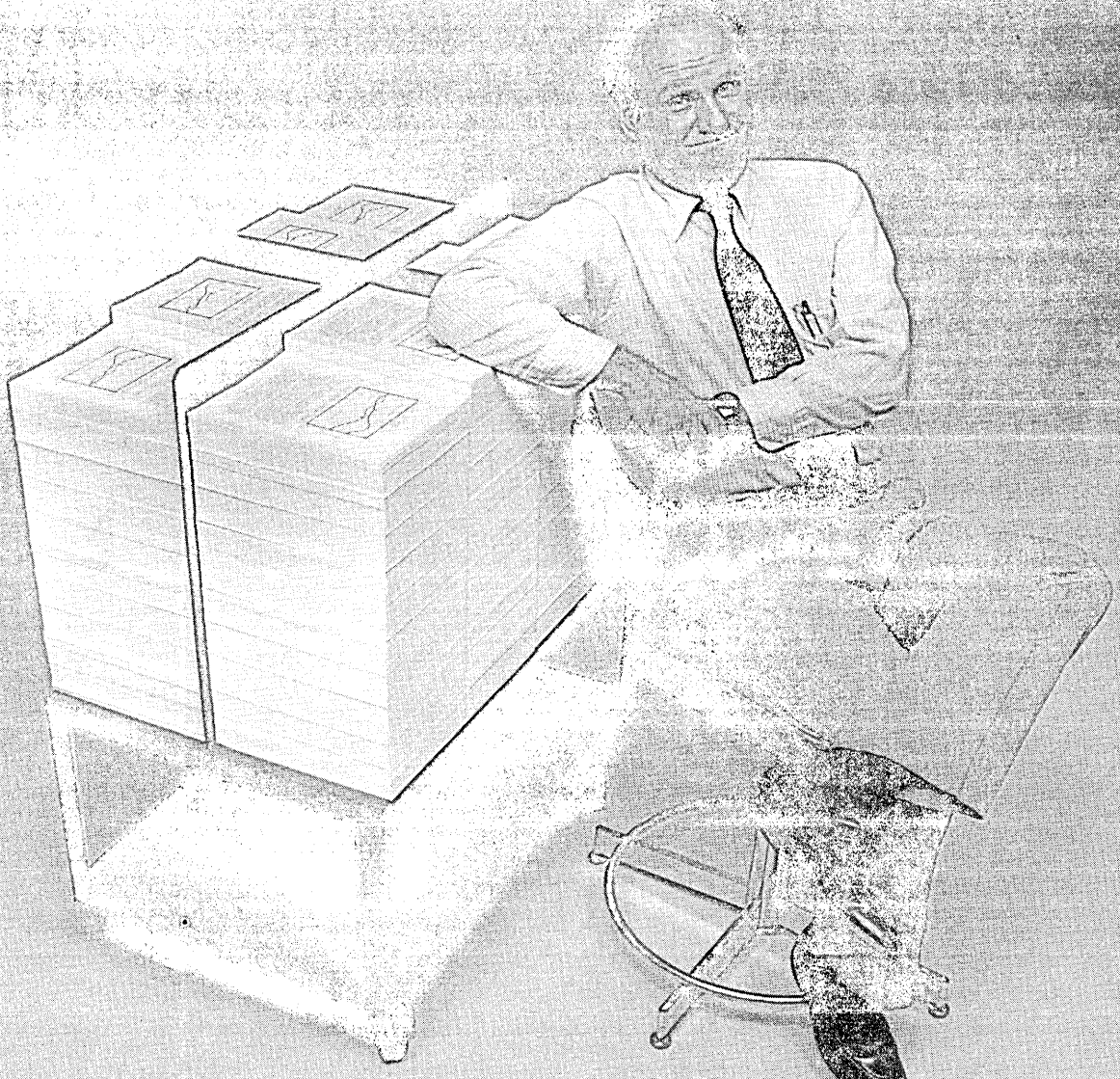

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CIRCLE 42 ON READER CARD

How to create the kind of programs that improve efficiency and lower costs.

SOFTWARE QUALITY MEASUREMENT

by Jay Arthur

Data processing managers often overlook quality improvements as a means to achieve productivity improvements. The timeless adages "there's never time to do it right, but there's always time to do it over" and "quality is free" overstate what should be obvious. High-quality products require less maintenance and enhance both development and maintenance productivity. Software quality measurement can achieve these goals.

In the average company, system maintenance and enhancement consume 50% to 80% of the dp budget. Why is that? In most cases, the programs are poorly written to begin with. Then they are enhanced in ways that cause them to decay rather than improve. Finally, the programs become such a burden that management has to invest in rewriting them. Unfortunately, the next version of the system is not written any better than its predecessor. This recurring failure stems from the inability to measure and improve quality.

Software quality is composed of many factors: maintainability, flexibility, reliability, reusability, efficiency, and a host of other quality-related metrics (see Fig. 1). Each of these factors can be measured at some time during the software life cycle. Only when measurement is applied routinely do the benefits become visible.

What are the benefits of measurement? Statistical quality control has been widely used to reduce manufacturing costs. Quality control, based on measurement, helps to do this by eliminating defects in developing systems (see Fig. 2) and by identifying maintenance problems. Costs are also reduced because programmers and analysts eliminate scrap (throwing away bad code), rework (fixing defective products), and downtime (productivity losses).

Software measurement provides benefits to managers, system developers, and maintenance personnel. Management benefits from early identification and resolution of problem areas. Because their software products will be more reliable and maintainable, clients will perceive dp management as more responsive. Finally, investment in quality control and quality improvement typically maximizes the corporation's return on investment; Pareto's Rule says generally 20% of the programs cause 80% of the costs.

Dp managers can work to eliminate the costs of maintaining programs by focusing on those that consume the major portions of their budgets. Management can even identify poor quality in developing programs and take corrective action before the programs are compiled or tested. Coding is only 10% of the development process. Early in the cycle, quality changes can be effected with little impact on the development schedule. If anything, quality changes will shorten the development process by reducing testing.

In a development environment, software quality measurement can provide programmers with immediate feedback about the quality of their emerging code. They can take corrective action without a walkthrough. Code quality improvements will ultimately be reflected in the maintenance costs for the new system. Programmers will have more time to enhance the existing system or to develop new ones, and this means greater productivity.

In a maintenance environment, software quality measurement helps identify reliability problems and improve maintainability and estimation techniques. Tracking the kinds and frequency of program errors helps identify reliability problems. Knowing the size and complexity of existing code helps estimate maintenance costs. Software metrics also provide the ammunition to convince management and clients to invest in correcting poor code. You wouldn't expect a car to run forever without an oil change or a computer to operate without preventive maintenance. Why expect anything different from your software? Software metrics can identify quality problems and suggest solutions that can be integrated into the normal maintenance process.

FIRST KNOW THE BASICS

To understand how all of this is possible, you must first understand the basics of quality measurement. Software quality measurement can occur in any phase of software development and maintenance using manual design inspections, prototyping, static analysis, dynamic analysis, operational analysis, and change management tracking.

Design inspections, although labor-intensive, help achieve quality in system and program designs. Prototyping provides immediate feedback about the usability of the system. Software metrics, based on a mechanized analysis of the system's code, provide a means to quantify many important quality characteristics before a module is compiled or tested. Dynamic analysis helps identify efficiency problems. Operational analysis measures reliability. Change management tracking helps determine

You wouldn't expect a computer to operate without preventive maintenance. Why expect anything different from your software?

maintainability, flexibility, and reliability. Unlike other methodologies, software quality measurement can be applied to both the development and maintenance of code.

Software quality measurement should be applied as soon as possible in a developing system to identify and eliminate quality problems. Since measurement during the design phase is largely manual, you should look to the coding phase as the first opportunity to mechanize quality measurement. Static analysis, in the form of code analyzers, can take many quality measurements. Since code is the major product of the development process, these software metrics analyzers form a major defense against quality problems. Because code analysis was easily automated, static analysis has received the lion's share of study and verification—another reason for relying on static analysis. It can be used in both the development and maintenance of software; design inspections and prototyping cannot.

Static analyzers predict code quality using two forms of measurement: size and complexity. Size measurement using executable lines of code (ELOC), functions, and software science metrics has been widely correlated to development and maintenance costs. Complexity measurement, using decision-based metrics, has also been widely validated and correlated with productivity. Both forms of measurement give managers, analysts, and programmers information to aid in quality control.

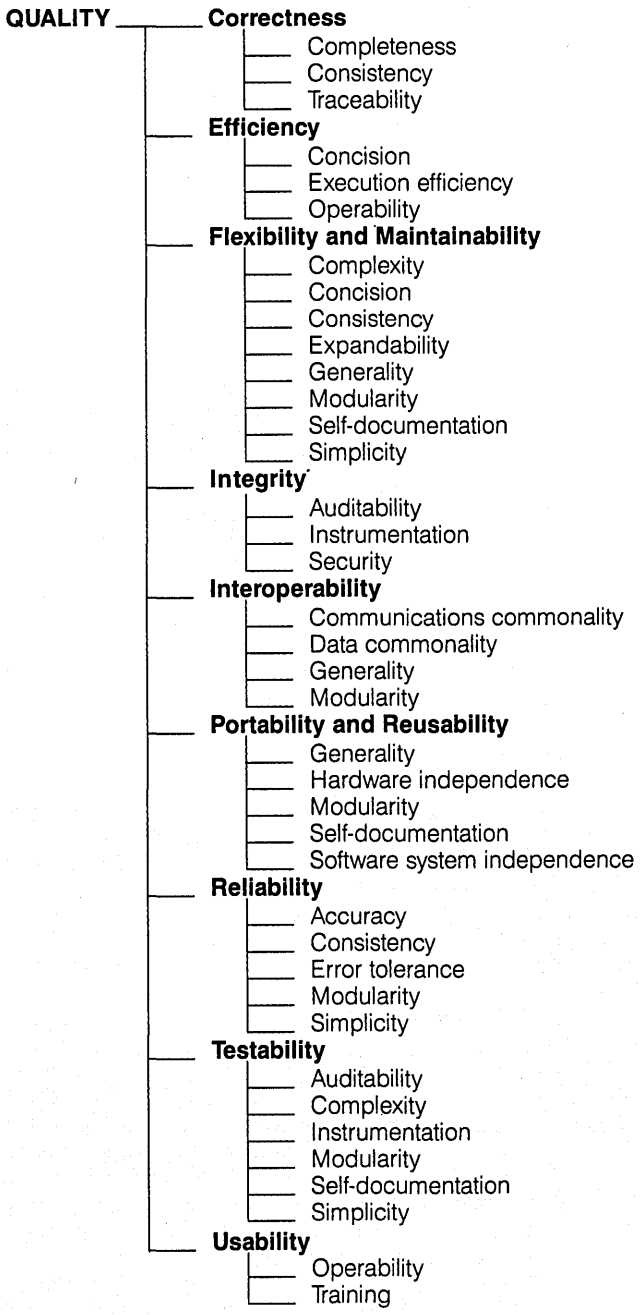
The size of a module can vary from a few executable lines to many thousands. Recommended module sizes vary from 50 to 100 ELOC. I have found that for a module to possess data coupling and functional strength—two reliability criteria—it will almost always fall within 100 ELOC. There are only two exceptions: large CASE constructs that evaluate hundreds of possibilities (for example, item numbers) or modules that edit transactions with hundreds of fields. At the code level, no better simple metric of size exists than ELOC.

Functions can be determined from the number of paragraphs in a COBOL module or procedure statements in a PL/1 module. Functions have been correlated with productivity (see "Taking the Measure of Programmer Productivity," May 1979, p. 144). Function point metrics based on inputs, outputs, inquiries, master files, and external interfaces, have gained wide acceptance for estimating system complexity and developmental costs. Both these size metrics can be applied at a module level, but are normally used at the system level.

Software science metrics are a more complex set of size measurements that depend on both the executable lines of code and the number of data items used in a module. Based on these elementary metrics, M.H. Halstead (in *Elements of Software Science*, Elsevier Science Publishing Co. Inc., 1977) suggests many quality-related metrics: length, volume, difficulty, and effort. Volume and effort have been widely correlated with program defects, quality, and productivity. An IBM study (by K. Christensen et al, called "A Perspective on Software Science," in the *IBM Systems Journal*, Vol. 20, No. 4, 1981), however, found no significant difference between ELOC and the software science metrics as measures of size.

FIG. 1

THE COMPONENTS OF QUALITY



DECISIONS ADD TEST PATHS

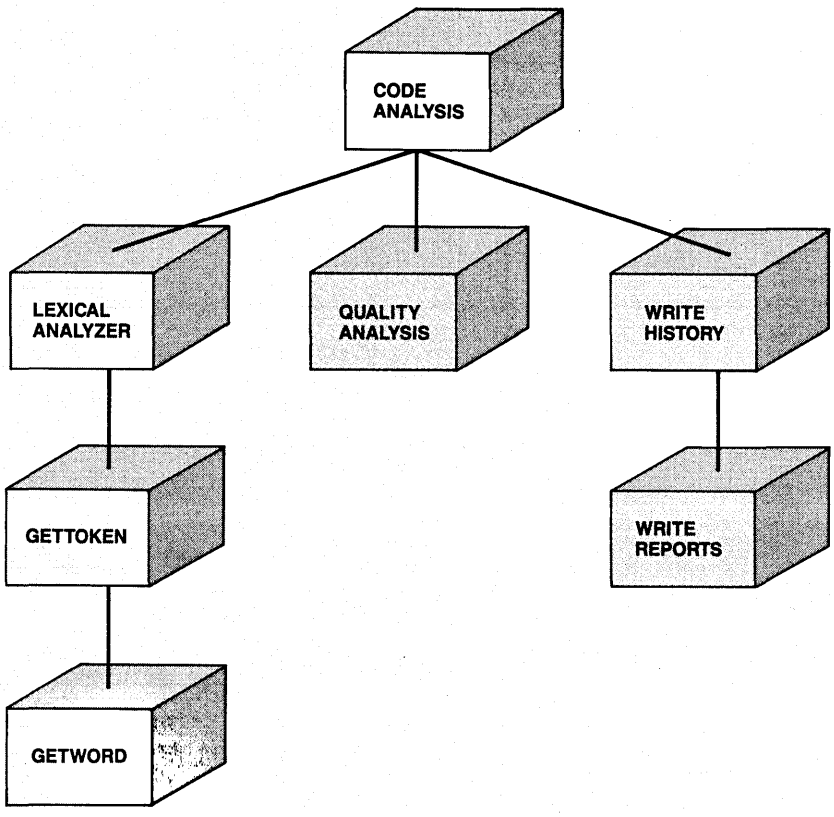
Decisions, like IF-THEN-ELSE, CASE, DOWHILE, and DOUNTIL, are the basis of most complexity measures. Intuitively, this seems reasonable because each decision adds two or more test paths to the code. The complexity of the logic depends on the number of paths through the code. Reliability, maintainability, flexibility, and testability have all been correlated to decision complexity. A simple count of the number of decisions in the code gives a basic metric of complexity. A module of 100 ELOC can have complex decision logic without affecting its quality; people can understand two pages of code. In modules larger than 100 ELOC, however, productivity and quality suffer as the number of decisions increase.

A widely validated extension to decision metrics, called cyclomatic complexity, was introduced by Thomas McCabe (in the article, "A Complexity Measure," in *IEEE Transactions on Software Engineering,* December 1976). It is based on graph theory, but boils down to the addition of logical operators (AND, OR, and NOT) to the count of decisions. Each logical operator is a thinly veiled IF statement and must be included to truly reflect complexity. McCabe found that modules possessing a cyclomatic complexity of 10 or less contained no errors. Most modules under 100 ELOC contain 10 or fewer decisions.

The use of GOTOs (a decision with only one outcome) also increases complexity. McCabe found that there were only four kinds of structure violations: branches into or out of a decision or loop. What has to exist to allow these violations? The GOTO. GOTOs also make it difficult to reduce the complexity of a program by splitting it into functional modules.

Size and complexity metrics like ELOC and cyclomatic complexity are easily obtained from code. Since coding is one of the earliest phases in which to detect and correct quality problems, static analyzers should be implemented to improve code quality. A simple design for a code analyzer is shown in Fig. 2.

FIG. 2
SOFTWARE METRICS CODE ANALYZER



During testing, dynamic analysis helps identify efficiency problems. If a program runs for two hours in testing, you know it will run longer in production. Efficiency improvements and checkpoint restart capabilities can be added at this time.

Reliability problems will first crop up in testing. Program A will fail several times compared with program B, which never fails. Management should invest in reliability analysis and correction of program A. In testing as well as in production, analysis of operational data like system management facilities (SMF) logs can provide reliability metrics like mean time between failures (MTBF) and mean time to repair (MTTR). Operational analysis can be mechanized via a variety of products that evaluate operating system logs.

Across all the phases of development and maintenance, problems and enhancements will be identified. Tracking these requested changes gives insight into the reasons for quality problems and offers an opportunity to prevent the same problems in newly developed systems. Change management tracking also identifies systems, programs, and modules that require the most changes. These data can then be used in combination with actual work effort to propose quality improvements that will reduce maintenance costs. Problem tracking systems are few, but they will gain acceptance as software engineers observe, like their manufacturing counterparts, that quality tracking is the most important element in developing a quality improvement plan. Without historical data, dp personnel are doomed to repeat mistakes that could otherwise be avoided.

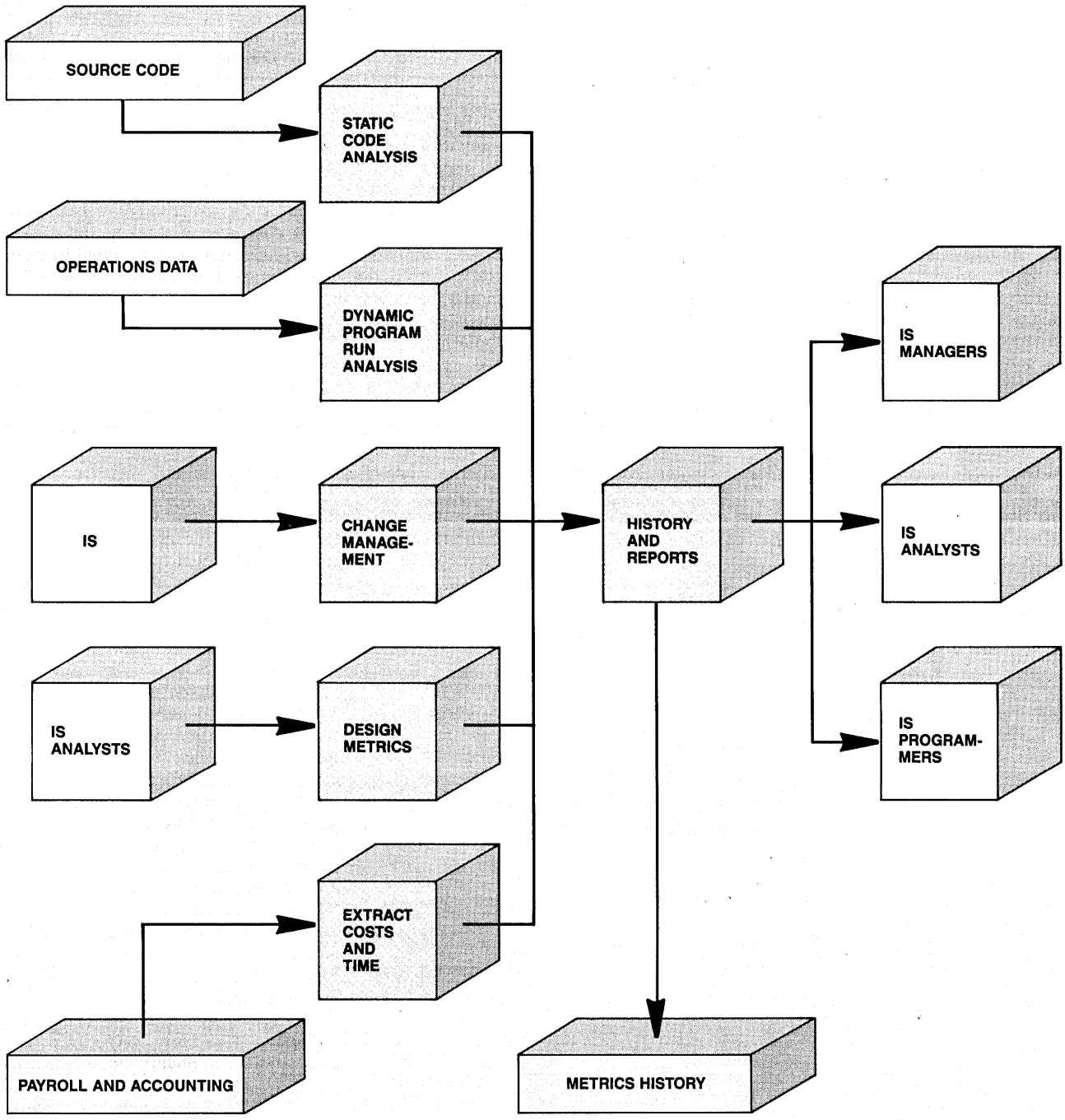
All these measurement tools should be automated and integrated as shown in Fig. 3. They can, however, be built and used as required.

USING QUALITY MEASURES

How do you use software quality measurement? As we've seen in the past, the development of each new system adds to the burden of maintenance. The maintenance of existing systems becomes more difficult with each enhancement or program fix. To maximize the company's return on investment, each new product must be built to minimize maintenance costs, program failures, and run time. These new systems need to be designed to maximize maintainability, flexibility, reliability, and efficiency. To improve productivity, new systems will have to take advantage of reusable code. Security will be an issue. Programmers can code toward specific quality goals. Coding

FIG. 3

SOFTWARE MEASUREMENT SYSTEM



to maximize productivity only serves to minimize software quality and maximize long-term costs.

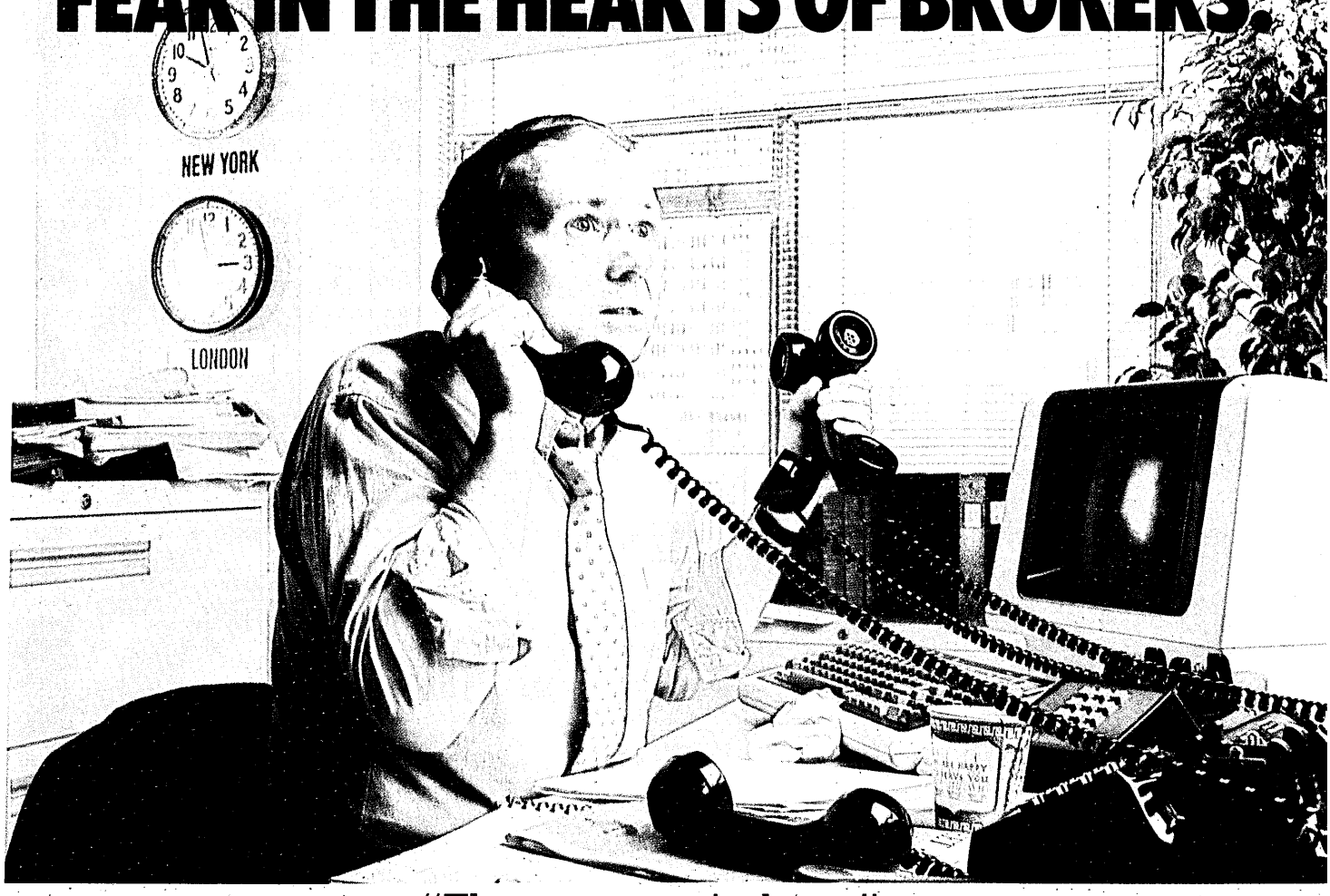
Using the qualities shown in Fig. 1, you should establish early in the development process the qualities that are most desirable in the finished product. Analysts and programmers can meet those goals.

One quality that is crucial to productivity is reusability. In one software project I worked on at Bell Labs, the first version of the system relied on extensive use of reusable code and modules. Reusability and maintainability were the software quality goals of the development team, which delivered 70,000 ELOC. Expanding the system to account for all occurrences of reusable code, the delivered system contained 260,000 ELOC. It would have taken four times as many people to develop and maintain the system without reusability.

Once software quality goals like these have been established, you should use as many of the measurement forms as possible to track the development of quality in the emerging system. Take corrective action whenever necessary. Do not allow quality problems to slip into the finished product.

There are three types of maintenance: repair, enhancement, and preventive. Most dp organizations practice the

FOUR LITTLE WORDS THAT STRIKE FEAR IN THE HEARTS OF BROKERS.



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Quality tracking is the most important element in developing a quality improvement plan.

first two types; few practice the third. Repair and enhancement maintenance have to get done. Preventive maintenance happens when there is time. Of course, there never is time. This is most unfortunate, because preventive maintenance offers the maximum potential for productivity and quality improvement.

Maintenance consumes 80% of the typical dp budget. Yet there seems to be a reluctance or an inability to find ways to reduce that burden. Software quality measurement will help identify the 20% that incur 80% of the costs. To reduce maintenance costs, these programs should be modified, upgraded, or rewritten. Rewriting programs comes under the heading of new development—quality goals should be selected, measured, and adhered to. Modification and upgrades are the province of preventive maintenance.

Once a program or module has been identified as a candidate for preventive maintenance, an editor (not the programmer) should be chosen to review and revise the code. In programs where size is a problem, the editor should look for and eliminate redundant code.

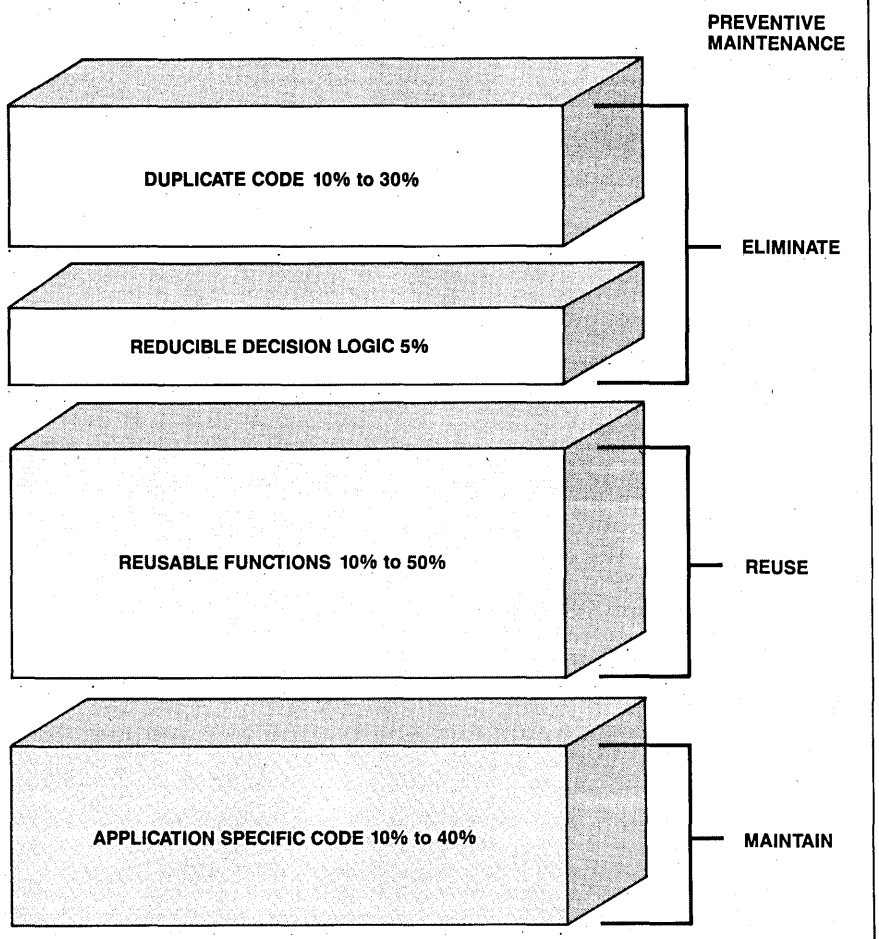
In a typical program over 100 ELOC in length, 10% to 20% of the program code is redundant. In the case of one program over 2,200 ELOC, I was able to remove 700 ELOC, insert references to the reusable code, and test the program in a single day. Based on current research, this means I permanently reduced the future maintenance costs by 30%.

Once an editor has removed the duplicate code, he or she should then attempt to reduce decision complexity. Eliminating NOT logic is one of the simplest ways to reduce decision complexity—cyclomatic complexity decreases every time a NOT is removed. Next, the editor should look for any way to restructure the logic to reduce the number of decisions and decision nesting. Eliminating all GOTOs will further reduce complexity because there can be no structure violations.

At this point, the module has been reduced to its simplest form. If the module conforms with basic quality goals, it can be tested and released. If not, it should be broken down into several functional pieces that meet the quality goals. Most programs contain a significant number of reusable functions (see Fig. 4). A payroll program might contain a social security number edit that is reusable. Another module could contain report headers, footers, and data formatters that can be separated. The editor should make these further alterations, even if they take several days. In the end, the program will be maintainable, flexible, and more reliable. And because reusable modules have been isolated, future development efforts can use them to improve productivity.

FIG. 4

TYPICAL APPLICATION PROGRAM



Maintenance costs will shrink to a fraction of their previous levels because there is less code to maintain and each module is less complex. These benefits are available for the investment of one to five days per module. Compared to the cost of rewriting such a program (possibly several weeks), preventive maintenance offers a way to ease out from under the dp maintenance burden, releasing programmers and analysts to tackle the system development backlog.

Each dp organization has a large base of existing code that eats a significant portion of the budget. The remaining resources are used for new development using conventional technology. Organizations just beginning to use fourth generation technology find that productivity and quality decline during the first few projects. You will need measurements to determine the benefits of new technology and methodologies. Quality assurance groups are needed to develop, maintain, and collect productivity quality measurements.

Software quality measurement is one more tool to aid in the development and maintenance of high-quality software. It not only stimulates better quality, but also stimulates higher productivity. As a result, software quality measurement serves as a basis to elevate software development one more notch toward the goal of software engineering. ◉

Jay Arthur is the productivity and quality analyst for Mountain Bell, Denver. He authored *Programmer Productivity* (John Wiley & Sons Inc., 1983), and *Measuring Programmer Productivity and Software Quality* (also published by Wiley), which will be available this January.

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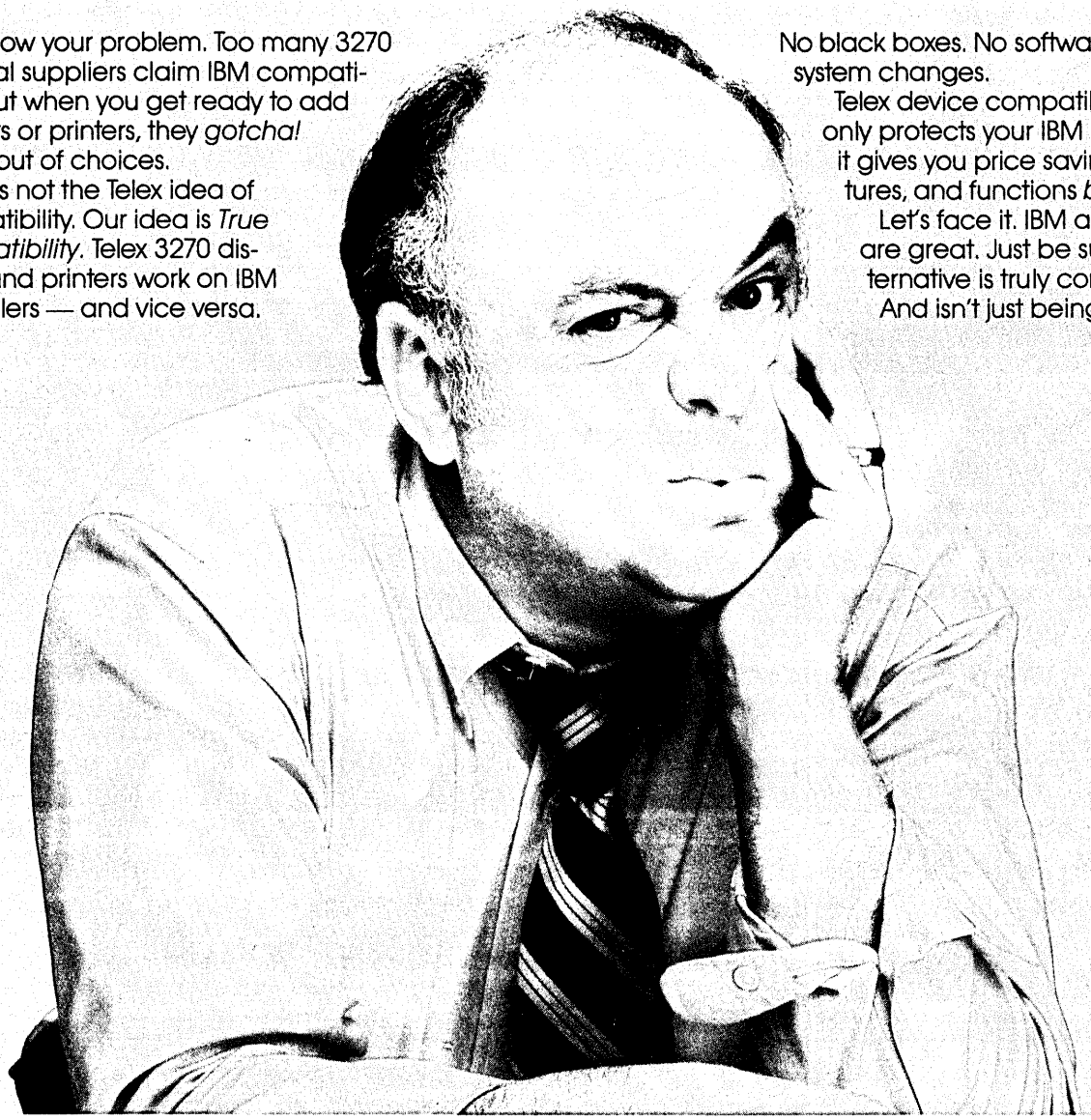

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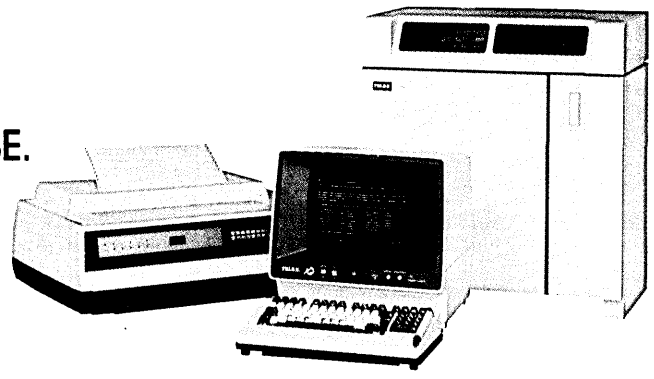

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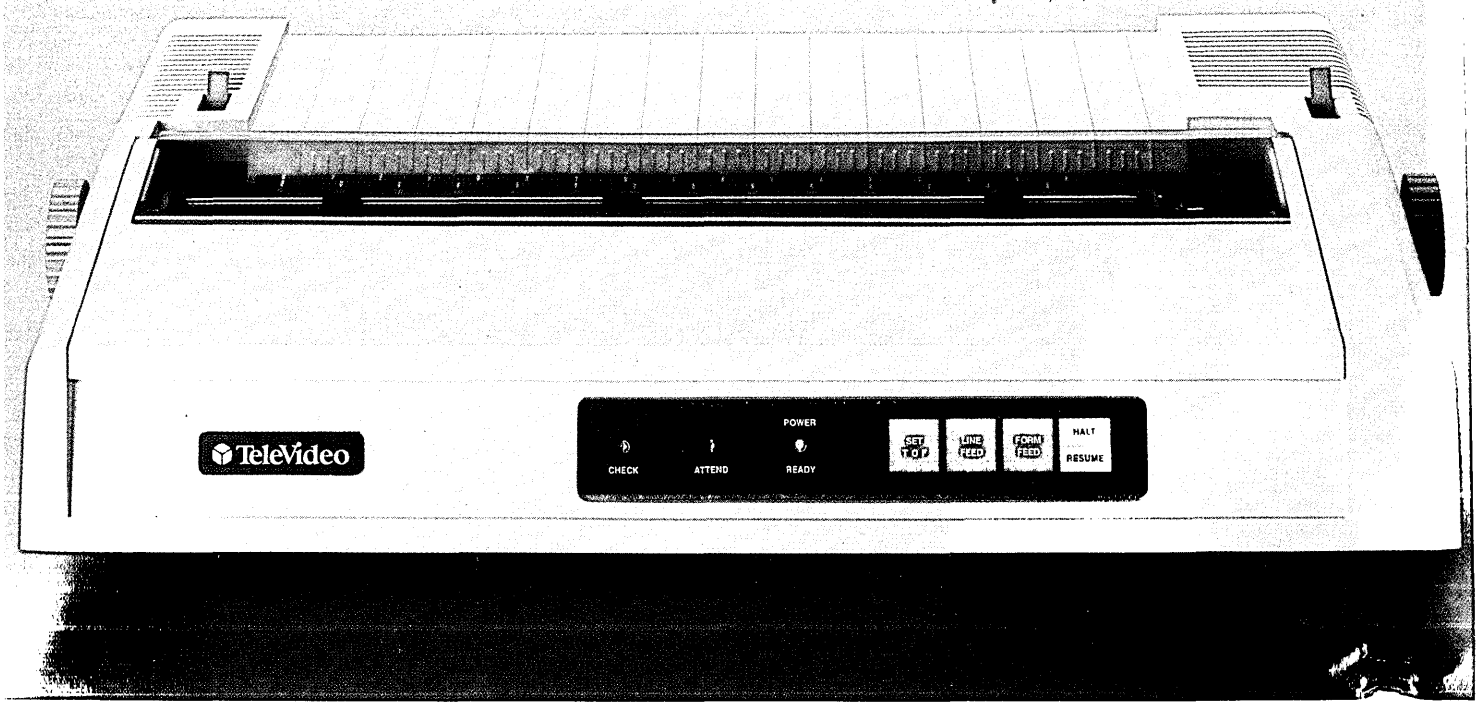
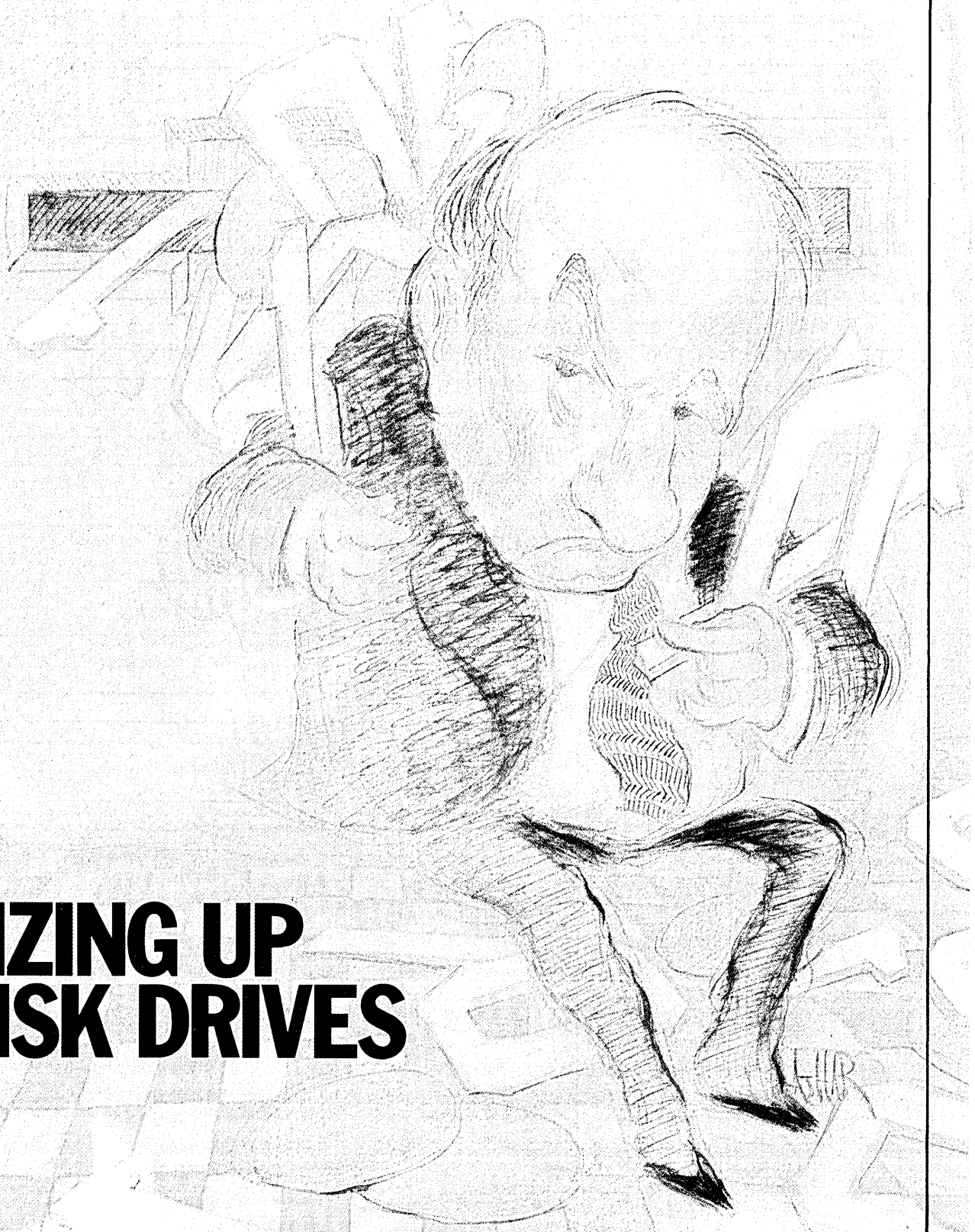


OEM EDITION

DATAMATION



SIZING UP DISK DRIVES

ILLUSTRATION BY BRIAN AJHAR

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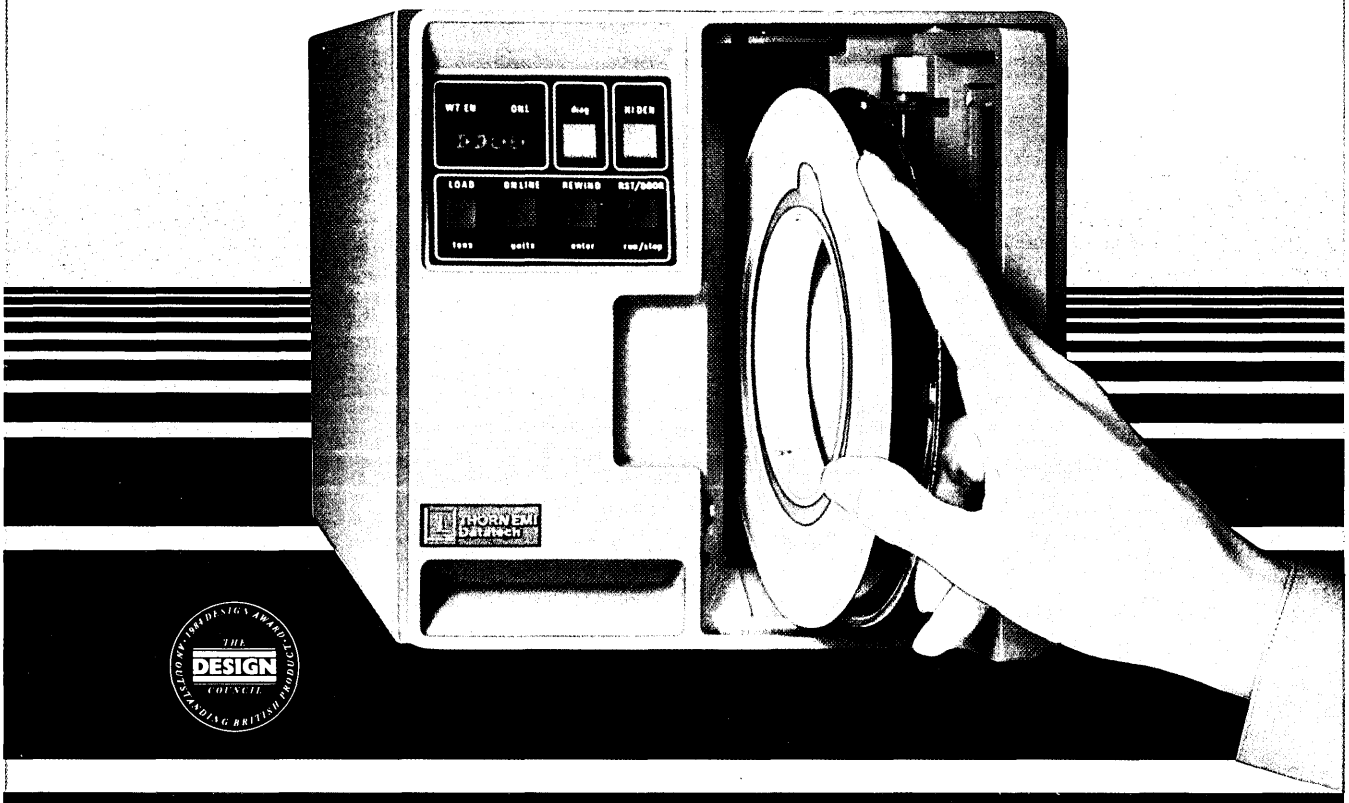

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CIRCLE 53 ON READER CARD

Driven by IBM, vendors juggle different technologies as they try to stuff more capacity into their products.

SIZING UP DISK DRIVES

by David Morris

An observer of the mass storage industry can develop some strange and rare parallels. Consider IBM and Winston Niles Rumboord, a character in *The Sirens of Titan*, a novel by Kurt Vonnegut Jr.

Rumfoord runs his spaceship into a chrono-syclastic infundibulum. As a result, he is fated to exist as a wave phenomenon in space. He pulses in a distorted spiral, the origin of which is the sun acting with the planet Betelgeuse. As the earth periodically intercepts his spiral, Rumfoord materializes at his estate in Newport, R.I. For each of these materializations a crowd gathers in anticipation of his arrival, anxiously awaiting some kind of miracle.

IBM and its impact upon the rest of the computer industry, especially the mass storage segment, is like that. IBM periodically materializes after a long absence, makes some kind of shattering announcement, and then just disappears for a while.

Consider what happened more than a year ago, when IBM introduced the PC XT, with its 10MB Winchester disk drive, which in turn produced an instant demand for 10MB and higher-capacity products from drive manufacturers. Every PC-compatible and PC add-on system supplier felt sharp pressure to provide a comparable product that cost less, or come up with a better system for the same price IBM was asking.

Last August, IBM materialized again. This time it dropped two bombs on the Winchester disk business when it announced its PC AT product. One bomblet was a multi-user version of the PC AT, available the first part of 1985, which would offer the Xenix operating system. Now, joining telecommunications giant AT&T Technologies Inc. of Lisle, Ill., IBM was lending its support to the Unix operating system. "The move legitimizes the idea of an industry standard operating system and firmly establishes Unix as that standard," says Michael Killen, president of Strategic Inc. in Cupertino, Calif., a market research firm. "For Winchester disk drive manufacturers, the action authenticates the business strategy for building high-capacity, high-performance Winchester disk drives," adds Jim Adkisson, executive vice president at Vertex Peripherals Inc., in San Jose.

IBM's second bomb heralded the PC AT disk drive options. The PC comes with a full-high 20MB Winchester drive, which can be expanded to 40MB. "The effect," says Killen, "was to define the 20MB Winchester disk drive as the minimum storage capacity for a personal computer." According to Terry Johnson, president of Miniscribe Corp. in Longmont, Colo., "Disk drive manufacturers are no longer building inventory in full-height, 10MB drives. These drives are only being built to satisfy existing contracts." Most new production is for half-high 10MB, full-high 20MB, and higher capacity half- and full-high drives.

Ever since Atasi Corp., Maxtor Corp., and Vertex Peripherals Inc., all of San Jose, announced 5¼-inch disk drives with capacities from 40MB up to 380MB, there was a prevailing belief that these products would serve in multi-user computer systems typically executing the Unix operating system. The rationale goes like this. Multi-user operating systems, especially Unix, are typically disk hogs. Operating system utilities and overhead routines consume large amounts of disk space. Also, each user added to the system takes large chunks of available disk capacity.

Besides demanding large storage space, Unix makes frequent access to the disk, and the number of accesses rises exponentially as more users are added to the system. Larry Boucher, president of Adaptec Inc., a manufacturer of disk drive controllers in Milpitas, Calif., says lowering average access time a few milliseconds on a high-performance disk drive lets a system builder add two to three more users to a multi-user computer system. Thus, drive makers reasoned, manufacturers of Unix-based systems would need not only high-capacity, but also high-performance Winchester disk drives to support the operating system's mass storage hunger.

SHARED SYSTEMS ANNOUNCED

In recent months, this rationale has been substantiated by a number of multi-user computer system announcements. Japanese computer manufacturer Sord Computer of America Inc., in Los Angeles, announced in August it was using the Maxtor XT-1000 series of 5¼-inch drives in its M68 desktop computer and M6085 supermicro, which use a Unix-like operating system providing multi-user capability. The computer maker plans to offer Maxtor drives in its new M343SA, a powerful 16Mb, multi-user microcomputer and the CAD-BRAIN, a general purpose CAD system.

In September, Hewlett-Packard released its HP3000 Series 37 office computer. A significant add-on introduced with the computer system was the 55MB HP7945A disk drive subsystem, which is built around the Vertex 5¼-inch Winchester drive. According to the company, the subsystem is small in both size and price. It is one tenth the size of current HP products of the same capacity and uses 90% less power.

Finally, in July, disk manufacturer Micropolis Corp. of Chatsworth, Calif., gave notice of a contract with MAI/Basic Four in Tustin, Calif., for the sale of high-performance 5¼-inch Winchesters. In the announcement, Don Nawrocki, vp of material at Basic Four, said, "Our systems demand high capacity plus fast disk access in order to support multi-user configurations." He went on to laud the Micropolis product for delivering on the requirements.

In these few computer system announcements can be seen some of the applications of high-performance, high-capacity Winchesters: multi-user small business systems and computer aided design systems. According to Dataquest Inc., a San Jose-based market research firm, sales of multi-user business computer systems priced between $5,000 and $30,000 should reach $3.4 billion this year. In terms of unit sales, Dataquest expects an increase to 812,000 in 1988 from the 226,000 units sold this year. Since each system needs one to four drives,

The 20MB Winchester drive has been defined as the minimum storage capacity for a pc.

that's a lot of business for drive makers.

Another major market for high-end 5¼-inch Winchester drives is that of desktop computer aided design systems. Single-user CAD systems are also notorious disk hogs. The large amount of graphics to depict a design and the many files needed to define design elements—from large-scale integrated circuits to automotive transmissions—demand drive capacity beyond the 10MB common on a microcomputer.

In the past, CAD/CAM (computer aided design/computer aided manufacturing) systems typically cost as much as $500,000 each. Then, companies like Daisy Systems Corp. of Sunnyvale, Calif., Mentor Graphics Corp. of Portland, Ore., and Valid Logic Systems Inc. of Mountain View, Calif., introduced their CAE (computer aided engineering) systems that sold for $40,000. There is a now a distinct trend toward using microcomputers as CAD workstations. The recent PC AT announcement, with its faster microprocessor and larger disk storage space, only hastens the arrival of design engineering software for pcs. Carl Machover, founder of the Machover Research Corp. in White Plains, N.Y., counts 40 companies now offering microcomputer-based CAD/CAE/CAM systems. Not including home computers, 1.2 million desktop units will be sold this year, says Machover. By 1988, he expects 6 million desktop units to be sold. Though Machover's figures include some or all of the multi-user small business systems cited earlier, a million units is still a lot of sales.

To serve the mass storage needs of computer systems, disk drive makers offer a line of products. Generally, the selection can be split into three categories: low end, midrange, and high end. At the low end, drive capacities range typically below 40MB and average access time is 60 milliseconds and above. Midrange units typically offer 30 to 100MB and offer 40 to 60 milliseconds average access time. The high-end products contain over 100MB of storage and can access a data block in less than 30 milliseconds on average.

PRODUCTS AIMED AT PC USERS

The bulk of the low-end product is earmarked for sales to manufacturers of— what else?—the numerous low-end personal computers, such as 8Mb-CP/M machines from Apple Computer and Commodore, as well as consumer products from IBM. "If you look at the marketplace we have, it consists of 20 major oems," says Finis Conner, previously vice chairman of Seagate Technology, Scotts Valley, Calif., and now a private consultant nearby. "They are telling us that drives with 50MB and under [will satisfy] 75% of all their requirements for the next couple of years."

Because of these large volumes and the limited number of actual buyers, however, the low-end arena is intensely price-competitive, and margins on these drives are the lowest to be found anywhere in the disk business. Drive makers have fled the U.S. to cut labor costs, and all have had to scramble to reduce the costs of their basic drive designs. In addition, the designs must be easy to manufacture in high volume with a minimum of rejects.

The drive actuator—the mechanical arm that positions the read/write head over one of the many concentric tracks on each surface of the rotating disk containing data inside the drive—comprises the bulk of a drive's cost. These three elements, the arm, the head, and the track density, also determine drive capacity and performance. The storage medium on the disk surface and, to a lesser extent, the read/write heads also help. Hence, drive manufacturers with the most cost-effective and easily manufactured mechanical design have an advantage over competitors.

To illustrate this point, consider Seagate's ST425 product, introduced in the first part of 1984. It stores 25.52MB of data on three disks and offers an average access time of 60 milliseconds. Contrast this product to the Seagate product it superseded, the ST419, which stores 19.2MB on three disks and has an average access time of 85 milliseconds. Only readily available low-cost components are to be found inside both the drives: a stepper motor actuator, ferrite read/write heads, and oxide media disks. On the newer unit, however, the company squeezed more tracks on each data surface to increase capacity, and stretched the stepper motor actuator to improve average access time.

In contrast to the low end, the midrange is less price competitive, mostly because manufacturing volumes are still relatively low. According to disk industry consultant James Porter, the worldwide oem market for 5¼-inch disk drives in the 30MB to 100MB capacity range was around 70,000 units last year. He expects it to nearly double to about 130,000 units in 1984, and nearly triple in 1985, to 230,000 units. Porter says that in 1983 about 1.1 million low-end drives were shipped.

Midrange disk drives increasingly stretch the three drive components previously described to add capacity and to reduce average access time further. Take, for example, the newest drive from Computer Memories Inc., in Chatsworth, Calif. The firm recently grabbed headlines as the disk drive supplier for the IBM PC AT. Coincidentally, Intel Corp. of Santa Clara owns 30% of CMI, and IBM owns 20% of Intel. At the National Computer Conference in Las Vegas last July, CMI announced its CM7000 family of drives, a three-disk version. The CM7660 holds 60MB, while the four-disk version—the CM7880—holds 80MB.

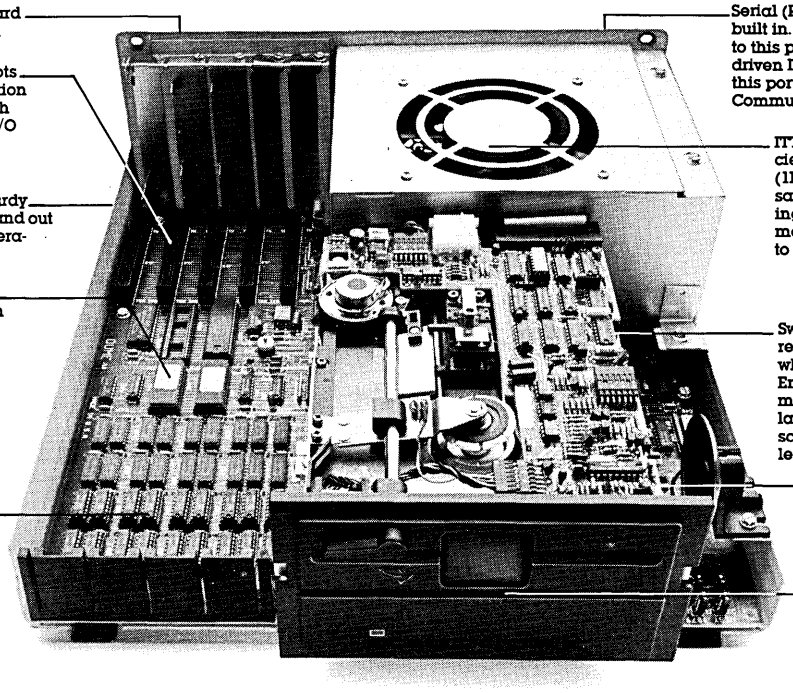
MORE TRACKS ON EACH DISK

Compared to the three-disk version from Seagate, the CMI product stores much more information. The CMI drive squeezes 2.4 times as many tracks on each disk surface as the Seagate drive. It also offers a fast 30-millisecond average access time, which is half that of the low-end drive. To achieve these specifications, the company adds a closed-loop servo to its product. A drive with a servo system provides much greater head positioning accuracy than one with only an unassisted stepper motor, thus allowing more tracks per surface than would otherwise be possible. The CMI drive is unique in that its servo system adds little to the drive cost. Quantum Corp., Milpitas, also offers a low-cost proprietary closed- loop servo scheme on its Q500 family of 5¼-inch drive products.

Companies like CMI and Quantum have gone to such pains to lower the cost of their servo systems simply to be priced more competitively than other companies already in the market. Most notable in the competition are Atasi Inc., Vertex, and Maxtor. Atasi's 3046, a 46.3MB product, uses a closed-loop servo system that is typically found on high-end products, as well as on larger 8-inch and 14-inch Winchester drives. The servo system contains a voice coil actuator which is more costly than the stepper motor actuator systems on CMI or Quantum products.

Atasi was an early entrant in the midrange market for 5¼-inch Winchesters, however. It was the first company to begin shipping 40MB drives in volume and the first to land a large contract: the company signed with Convergent Technologies Inc. of Santa Clara to supply drives for Convergent's Miniframe computer. The Miniframe is sold, in turn, to large oems like Four-Phase Systems Inc. of Cupertino, Calif., whose products are just becoming generally available. Thus, disk drives in this capacity range represent the bulk of current midrange shipments. David Eeg, Atasi's senior vice president for marketing and sales, says that multi-user microcomputer manufacturers are still learning how to sell these products through distribution channels. "Once they get an installed base and look at enhancements for those sys-

YOUR BRAINS. OUR GUTS.



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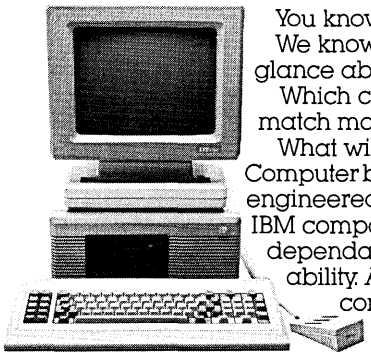

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CIRCLE 54 ON READER CARD

The market for 5¼-inch disk drives for multi-user systems may triple by the end of 1988.

tems, 75MB to 80MB drives will be the products they will focus on in high volume," he observes.

To continue increasing capacity and performance, drive manufacturers have stretched servo systems and voice coil actuators to their physical limits. To go beyond 80MB in a 5¼-inch form factor requires new technology. One new approach is to use run length limited (RLL) encoding schemes like the one IBM has on its 3380 drive to store more data without actually writing more magnetic data on the medium. A second is to add more disks inside the drive form factor. A third is to use thin-film media to store more data on each disk surface.

Run length limited codes are used to encode data on a disk surface more compactly. Controller manufacturer Adaptec Inc. of Milpitas, recently announced an LSI chip that will perform the encoding and decoding function.

Jeff Miller, vice president of marketing at the company, claims the chip on a controller board used with Maxtor and Vertex drives produces a 50% increase in capacity with no change to the drive at all. The announcement provides disk makers with a "free" capacity increase without the extensive six-month design that would otherwise be required.

By comparison, getting greater capacity from adding disks is an expensive undertaking. First, the mechanical design must be radically changed to accommodate more disks. Maxtor is the only company thus far to accomplish the feat of putting eight disks in a space where others can only put four. The design puts the spindle motor, which turns the disk, inside the spindle itself.

Critics of the Maxtor approach point out that using more disks to increase capacity is costly, since disks and read/write heads are the most expensive part of a disk drive. Nevertheless, Maxtor is one of the few companies able to ship drives over 100MB in the 5¼-inch form factor. This April, the company began shipping its 190-MB, XT2190 to U.S. Design Corp. in Lanham, Md., for use in that firm's VIP/X mass storage add-on to the Digital Equipment Corp. PDP-11 and VAX-11 minicomputers.

HIGHEST CAPACITY PROMISED

Maxtor promises the highest capacity yet in a 5¼-inch form factor on its EXT4000 family of products. The EXT4380 will hold 380MB on eight thin film disks. Adding more disks over the four typically contained in this size drive accounts for the largest part of the increase.

The company, however, also makes full use of the thin-film disks contained in the drive. Literally every inch of space on the disk surface is used to contain a data track. Moreover, the tracks are spaced closer together. Finally, the disk stores twice as much data inside each track as midrange and low-end drives.

Another company offering a drive with over 100MB of capacity achieved by increasing the data inside each track is Advanced Storage Technology Inc., San Jose. The firm's model 96203 provides 103MB on three disks in a half-high 5¼-inch form factor. The drive also uses thin-film heads supplied by Advanced Storage Technology's parent company, Cybernex Corp., also in San Jose. Both drive products, however, face difficult system integration problems.

Until now, drive makers have resisted capacity gains that increased the amount of data stored inside a track. They have resisted because all the controllers for 5¼-inch Winchesters have been designed to work with drives providing a 5Mb-data transfer rate. The transfer rate is defined as part of the ANSI (American National Standards Institute) standard ST506/412 drive interface.

Mechanically, the rate is determined by disk rotational speed: they all turn at 3,600rpm, and most have a bit density of no more than 9,000 to 10,000bpi. Data stored at this bit density on a disk turning at 3,600 rpm comes off at a 5Mb rate. Increasing the bit density directly increases the transfer rate. It will very likely take 12 to 18 months for any controller manufacturer to provide a controller to handle a drive with the faster rate.

With system integrators wanting a 5¼-inch product with over 100MB in capacity, drive manufacturers have no alternative but to increase bit density. To do so has meant defining a new data transfer rate, and that has entailed developing a new drive level interface. Enter Maxtor, Vertex, Memorex Corp. of Santa Clara, and Control Data Corp., among 22 other disk drive and controller manufacturers, to form the Extended Small Device Interface (ESDI) Committee in November 1982. The group defined an interface physically similar to the ST506/412, but with provisions for drive and controller to communicate—no such capability exists presently—as well as for data transfer rates beyond 15Mbps.

It has taken some time for ESDI to be defined in a way amenable to all interested parties. This definition is finally beginning to emerge, according to Joseph V. Jaworski, president of Peripheral Concepts Inc., a research firm in Irvine, Calif., that follows the disk controller business. Jaworski says controller manufacturers like Distributed Logic Corp., in Garden Grove, Calif., Xylogics Inc., in Burlington, Mass., and others are currently offering controllers for the ESDI interface. Control Data, Maxtor, and Micropolis are among the disk drive manufacturers offering products with the ESDI interface. "The trend for the ESDI, however," Jaworski says, "is to offer products with a 5Mbps-data transfer rate in 1984 and products with a 10Mbps rate in 1985."

ANALOG CIRCUIT TOOK TIME

The delay stems from disk manufacturers taking time to design the analog circuit (a data separator) needed to extract the data coming from the disk at the higher data transfer rate. Not only was the design difficult to develop, but it took time to reduce the rest of the drive's control electronics so there was room on the disk to hold the circuit. The controller manufacturer has a similar problem: designs must evolve to handle twice the data rate they were previously handling.

One other company with a drive offering over 100MB is Applied Information Memories in Milpitas. The company's DART 130 stores 130MBs on four disks, yet it has managed to avoid the problem confronting Maxtor and Advanced Storage Technology. In place of the ESDI interface, the AIM drive comes with either an ANSI standard SMD (storage module drive) or SCSI (small computer system interface) built on-board. There are many controllers able to interface an SMD; however, until now, no other drive company has been able to squeeze the electronics into the drive required to implement an SMD interface. Until recently, the same was true of the SCSI interface. The drawback to this approach, however, is that there is a substantial extra cost of implementing SMD or SCSI. Whether the AIM product is cost-effective in relation to a competitive product with an ESDI interface remains to be seen.

Watching the growing hunger for more and more space to store more and more data, one is reminded of Salo, another character in *The Sirens of Titan*. He is a messenger from the planet Tralfamadore, with instructions to carry his message as far as Tralfamadorian technology can take him. So it is with mass storage technology. It has been given a mandate to deliver to the limits of its technology and it compulsively reaches on. So it goes, so it goes. ◉

David Morris is a New York-based freelance writer.

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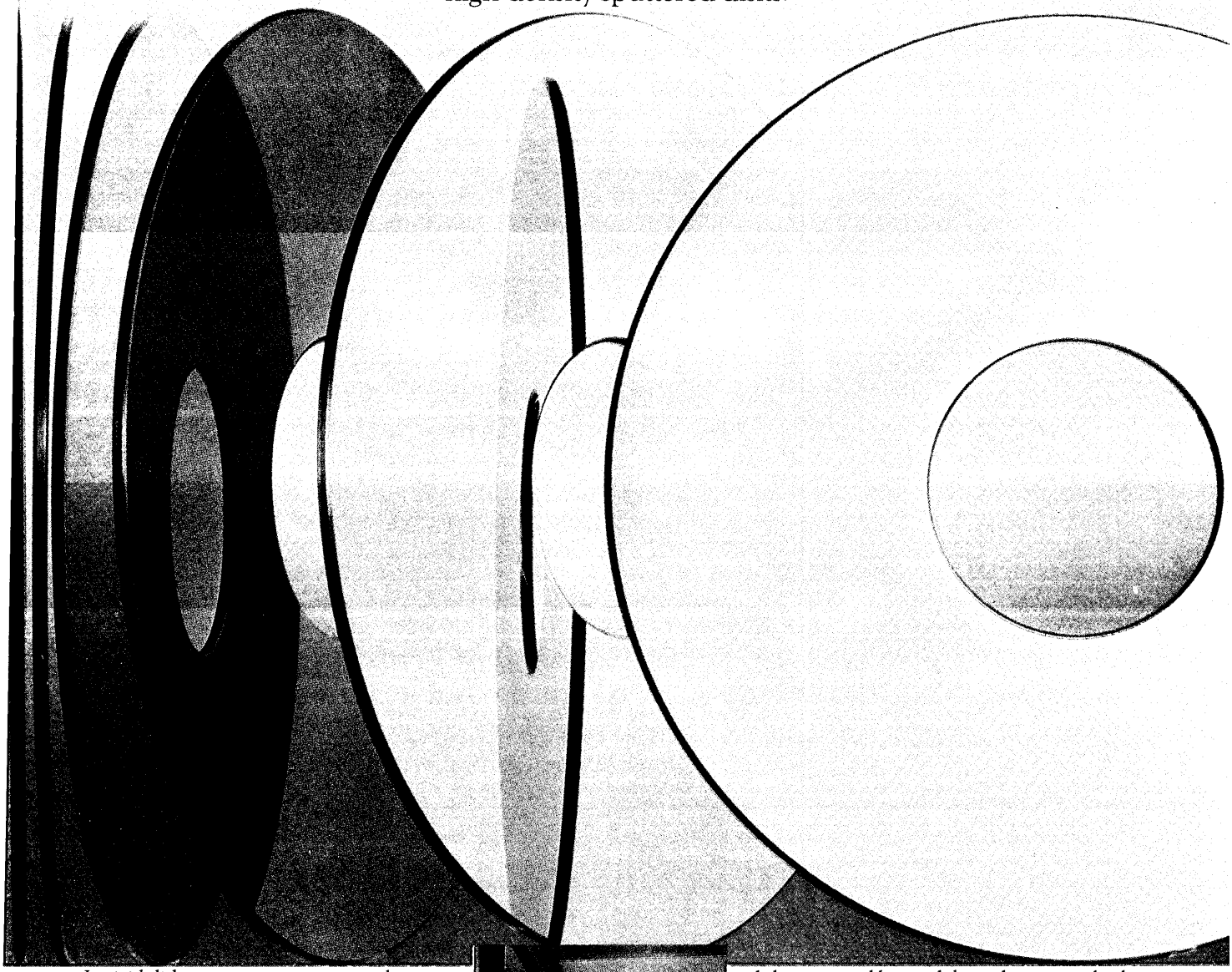

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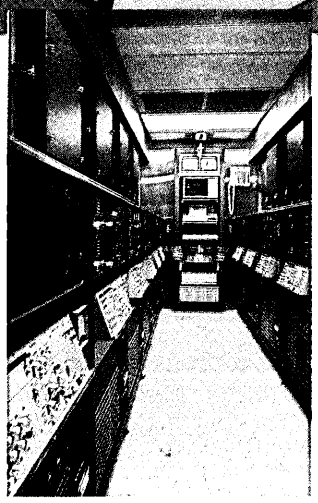

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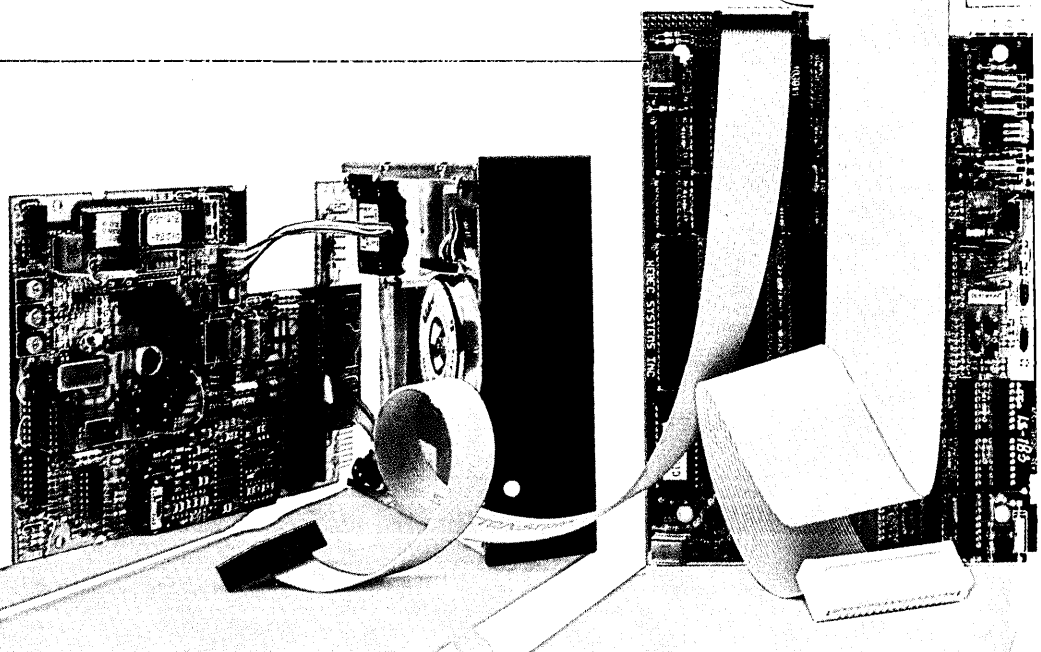

Microcomputer storage history has progressed by a series of small "next logical steps." A replacement of a component here, a refinement of technology there. But now Xebec has taken a giant step, with its Owl intelligent disk file.

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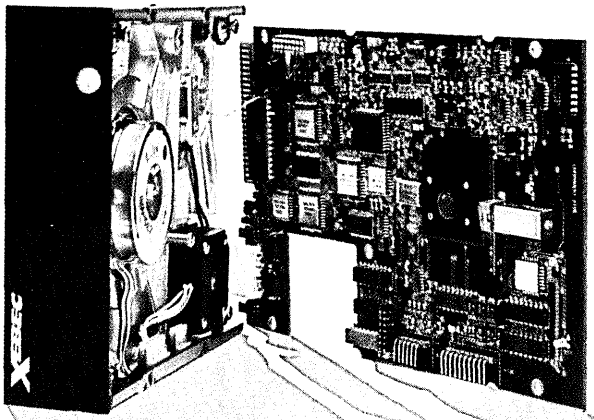

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CIRCLE 56 ON READER CARD

A $40 billion marketplace dawns for oems and vars as fault tolerance gives way to high integrity.

IS FT FOR THEE?

by Lorraine King

In the beginning, the marketplace for fault tolerant computers delivering continuous applications availability after a power or hardware failure was both narrowly defined and limited. Few manufacturers were willing to risk the substantial research and development costs necessary to compete for a high-priced system sale based on a promise of fault tolerance alone.

But it has recently become obvious that most users are now buying these machines not for the fault tolerance capability per se, but because their on-line environment can be transparently upgraded without an applications rewrite and because they protect information files from many kinds of corruption. Thus, a new marketplace has been created, albeit a curiously defined one, and one analyst estimates that there are now 15 vendors competing for sales that may be worth $40 billion in 1987.

As users began buying these systems for applications other than fault tolerance, the semantics peculiar to the arena began to change. Manufacturers now talk of a high-integrity marketplace, which encompasses all on-line transactions processing applications (OLTP). Some of these applications will demand absolute fault tolerance as one of the many features described by the term "high integrity." The majority will not.

It is predicted that within 10 years, fault tolerance will become an automatic feature on all computers of all sizes; by itself, fault tolerance will provide no market definition.

The real attraction for manufacturers and value-added resellers lies in the fact that competitive pressure is forcing many established medium-to-large mainframe users to discard their old batch processing systems and convert to on-line transaction processing.

An entirely new type of computer user is also being recruited by high integrity. Through a barely recognized synergy, the availability of systems that can be trusted to protect data and remain continuously on-line is giving birth to applications that would be impossible to risk to batch processing. Office automation, supervisory systems for manufacturing and engineering, point of sale, and electronic funds transfer, are four of several applications that demand totally reliable, perhaps 24-hour, processing.

Some users claim they have been successfully running systems on dual mainframes for years. But the high-integrity systems manufacturers respond that this is not the same thing at all. First, dual mainframes are much more costly and less processor-efficient than one high-integrity machine. Second, they are not truly fault tolerant and provide minimal protection for information. Many traditional manufacturers, like Digital Equipment Corp. and Hewlett-Packard, may claim fault tolerance, but so far their machines do not measure up to the standards of high integrity. Third, the footprint of a high-integrity system may have one-third that of a similarly performing mainframe or minicomputer.

IBM is the threat everyone weighs when estimating market share. "I reckon I've got a two- to three-year window before IBM makes its entry," says Brian Knowles, director of marketing at Parallel Computers Inc. of Santa Cruz, Calif. "If I can make my mark, get established with a sizable customer base, I'll survive."

Of Tandem Computers Inc., the Cupertino, Calif., vendor whose NonStop machines started the whole fault tolerant market back in 1976, Knowles says, it "will survive because it's got that base, but I don't know about any others." Parallel does not compete in Tandem's pool of Fortune 500 users. A newly established manufacturer of absolutely fault tolerant, high-integrity computers, Parallel currently sells into the marketplace delimited by the DEX Vax 11/725 and 11/780 minis. As yet, the company has not competed for a sale with any other high-integrity vendor, but it frequently encounters minicomputer manufacturers offering traditional equipment.

NEED TO EDUCATE THE USERS

"We still have to educate the users," says Knowles. "I wish more were saying 'We demand high integrity,' but they mostly demand a micro/mini/mainframe with OLTP." Few medium-sized companies support a dp department with state-of-the-art wisdom. Only after the user has suffered from corruption of on-line information, and from loss of access to processes vital to his bottom line, does the user appreciate the benefits of high integrity.

In competition for purely on-line transaction processing sales, Parallel may soon be encountering new entrants to the marketplace. Tolerant Systems Inc. of San Jose, Calif., has begun selling its Eternity System to the supermini class of user. Priced at around $100,000 with a Unix-based operating system and packaged with applications development tools, the Eternity is closely matched against the Parallel 300 wherever OLTP is the buyer's main purchase criteria. And OLTP is clearly the factor driving consultant Yankee Group's predictions of a $40 billion marketplace for mainframe-type systems uniquely designed for real-time operation and fault tolerance.

"We still have to educate users. Mostly they demand a machine with OLTP."

AT&T's Information Systems division at Morristown, N.J., is now selling its 3B 20D as a "high-availability, OLTP machine," says staff manager Rich Bergstedt. The 3B achieves high availability through a combination of hardware duplication and monitoring by the operating system. AT&T IS will sell its offering through oems and vars, but it will also sell direct, particularly to large corporate clients.

"Parallel intends to have very little relationship with the end users," says Knowles. "We want to provide a high-percentage solution to the oem and var who recognize the value of high integrity and are focused on specific vertical markets." Parallel also sells through the divested Bell operating companies and other manufacturers. The company is concentrating on reducing the need for its customers to be sophisticated technicians, or even to be called out to service equipment.

"If the oems' downtime is less, they look better," notes Knowles. "We provide the tools to let them keep their clients happy and just send complete, push-in replacement units if ever a fault occurs. The user need not notice anything has failed until his spare is delivered." Parallel had hoped this market strategy would allow it to concentrate on manufacturing and technical issues, leaving business applications to its resellers.

Knowles now acknowledges that resellers follow user-dictated fashion, and do not create it. The task of educating users, particularly where skilled dp departments are not driving the sale, falls back on the manufacturer. If Parallel and its competitors are to attract quality resellers in all the vertical markets that can benefit from high integrity, they now recognize they must market to the end user as well as to the reseller.

In the mainframe-size marketplace, the high-integrity vendor must sell direct. Sales cycles often exceed a year, and the buyer expects a lot of solicitous attention from a company asking $350,000 and up for one system. "We have to live, breathe, eat, and sleep our customers," says Rick Bennett, manager of corporate communications for Synapse Computer Corp., Milpitas, Calif.

But this does not mean that Synapse sells only to end users. The company is now in discussion with telephone manufacturers and service suppliers who will, in turn, sell to their customers.

Even in a direct sale, Synapse has found it must work with vars and systems houses capable of bridging the widening gap between manufacturer and end user. The company is now trying to make agreements with software suppliers who can provide comprehensive, quality packages to maximize performance of its OLTP system. "We're not in the process control business," stresses Mark Leslie, vice chairman of Synapse. "We are in transaction processing, on-line integrity, providing resilient information retrieval."

SYNAPSE MAKES A MOVE

Synapse experienced user problems with its original release and had to withdraw from beta testing for design enhancements and the rethinking of its marketing strategy. Last September, the company announced the sale of two N+I systems, valued at $2.34 million, to the Nashville Police Department. Synapse is confident that other announcements will follow and is now eager to distance itself from simple fault tolerance.

"Many fault tolerant manufacturers have misunderstood the reason for Tandem's success, which is upward compatibility," says Bennett. "But you've got to ask: 'Subtract fault tolerance and what do you bring to the party?' For six years Tandem has had it to themselves. Now they have competition."

Synapse, Tandem, and Stratus Computer Inc., of Marlboro, Mass., must all compete for the same sales, but no one wants to see Tandem fail. "Tandem must succeed to keep our customers believing in high integrity," says Bennett, and his view is echoed by market observers. "Realization of market potential is slowed by the major player slowing," agrees Omri Serlin, president of ITOM International Co., a Los Altos, Calif., research firm. "It has an impact on more conservative buyers who wait for the name they know to provide what they want with minimal risk."

But Tandem has slowed. The company's 1984 second quarter figures showed a net income of $1.97 million, compared with $6.45 million for the same quarter in 1983. Third quarter net income to June 30, 1984, shows an increase to $9.25 million, producing a total net income for the nine months to June 30 of $21.3 million. Total net income for the same nine months ending in 1983 was $22 million.

Tandem seems surprised by its declining profits. Peter Lowber, a senior market analyst with the Yankee Group, says the company is ill prepared to operate in a competitive marketplace after six years of unchallenged rule. Last August, Tandem lowered its prices and announced it would sell entry-level, packaged, NonStop 1+ systems for approximately $55,000. It also launched a third-party program called Alliance to persuade software houses to license their vertical packages for use on Tandem equipment.

Before 1982, Tandem could persuade itself that its marketing communications were effective and its customers were satisfied. But over the past 18 months, surveys by organizations such as ITOM and Cowen/DATAMATION have shown that up to 22% of its customer base intends to change suppliers. The high cost of software maintenance and service is the most common reason given.

Another reason, less concrete but just as persuasive, may be the impact of competitive advertising at a time when many Tandem systems are due for replacement. Moreover, media coverage, which concentrates on the technology of fault tolerance alone, does not give Tandem's proven database and networking software a fair hearing.

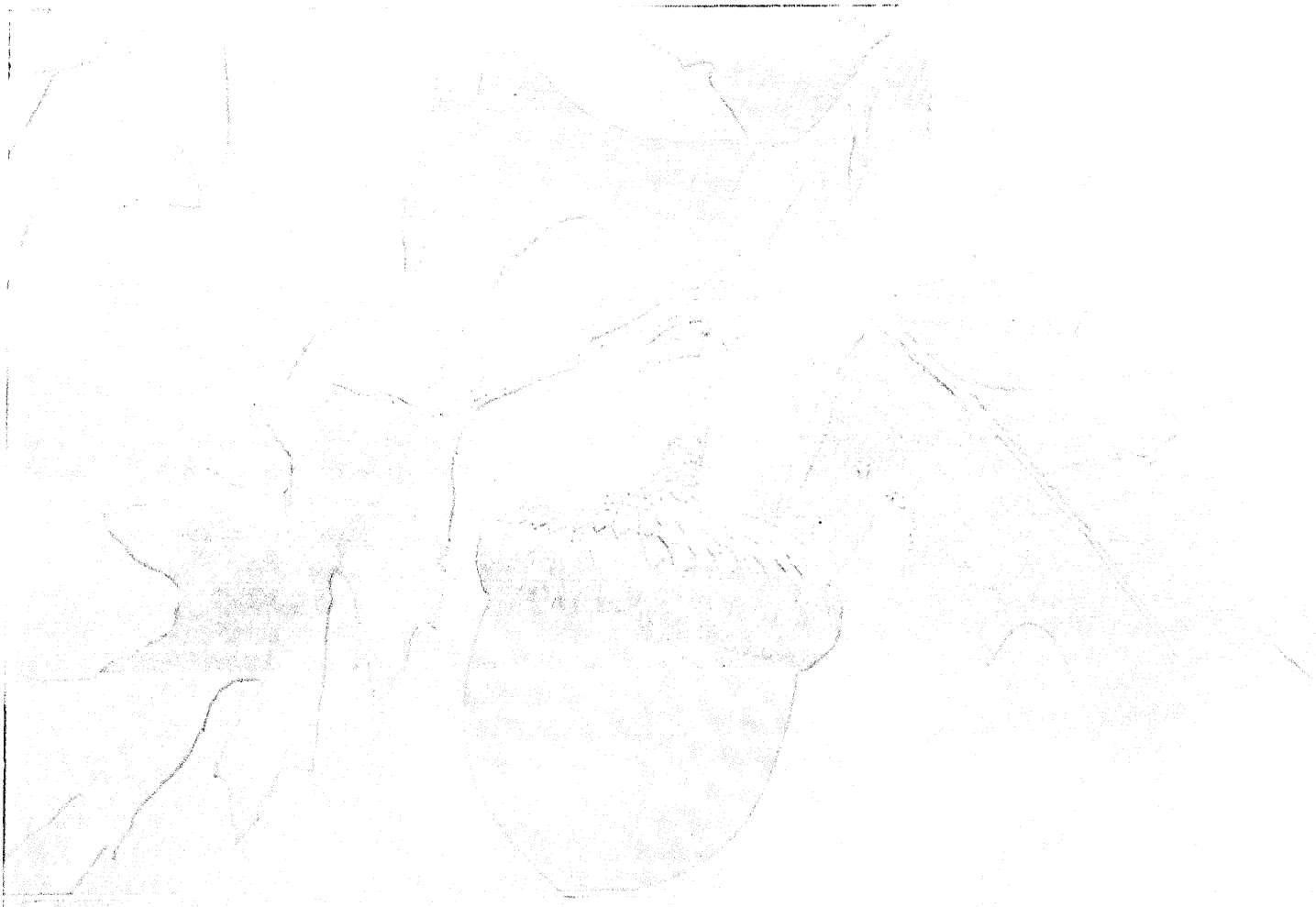
Tandem's competitors have been quick to stress that their microprocessors deliver better fault tolerant price/performance than Tandem's "old technology" of multiple minis. Comparative testing shows that any difference that may exist is generally transparent to the user. Benchmark testing is in any case ridiculed by responsible vendors of high-integrity machines.

"People seek benchmarks, which is useless and very frustrating to [those in] the industry who know how irrelevant these data are when it comes to deciding whether or not a system is suited to a particular application," says Bergstedt of AT&T IS. He also sees users allocating the higher cost of a high-integrity system by spreading it across the number of workstations supported by the system. The more features a high-integrity system delivers, the costlier each workstation appears and the less likely such a sale will be made.

TANDEM EXPANDING ITS IMAGE

Tandem's brand name of NonStop was once an asset. Today it suggests only fault tolerance, the smallest contribution to the high-integrity feast. Tandem is hastening to expand its image as the competition intensifies. "We sell OLTP, not fault tolerance per se," says Barry Ariko, director of marketing at Tandem. "Fault tolerance can be achieved by throwing micros at the problem. Tandem offers networking and data protection." With several competitors' products based on micros, Tandem has no choice but to expand its marketing pitch.

Now the micro-based competitors are matching that effort too. Stratus, Tandem's major competitor, uses the Oracle relational database and its own StrataNET to enable a Stratus system to function as an



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Benchmark testing is ridiculed by vendors of high-integrity machines.

SNA network device. Now Stratus offers high-integrity features combined with absolute fault tolerance. Recent buyers include GTE Government Systems, Stamford, Conn., which will turn around and sell the system on an oem basis to NORAD (North American Aerospace Defense Command), and Honeywell Information Systems, in Waltham, Mass., which will repackage for a federal government system deal.

"We're on a roll," says Bill Elliott, director of product marketing at Stratus. "We couldn't be happier right now with the response. I see educated buyers and users from all vertical markets saying, 'As long as I have something important to do I might as well have a fault tolerant system.' " But while Elliott expects a swelling demand, he believes that actual implementations will be slow because of inadequate software and manpower skills.

"No one has the software," he says. "The shortage of quality, fault tolerant applications software will slow up the market." Stratus sells all its systems direct, frequently working closely with a software house to provide the applications software. Today's educated buyer not only understands the benefit of high-integrity systems, he also knows that in a competitive marketplace he can demand and get someone else to write the comprehensive applications to justify high-integrity costs.

Computer manufacturers today are seeing their buyers growing increasingly unwilling to learn the techniques of computing. The high-integrity system buyer is often not a member of a dp department, but an office manager or process control engineer who has had enough of the paralysis his department suffers when the computer goes down for hours on end. He's shopping for guarantees of a good night's sleep, not several hundred hours of reading computer manuals.

The manufacturer of high-integrity systems is generally even less willing than the traditional manufacturer to become involved in applications issues. But if a high-integrity installation is to justify its initial cost, it must take responsibility for 80% to 90% of all applications procedures, not the 60% commonly addressed by packages. It must also free personnel from the auxiliary and backup procedures considered essential for critical applications on traditional machines.

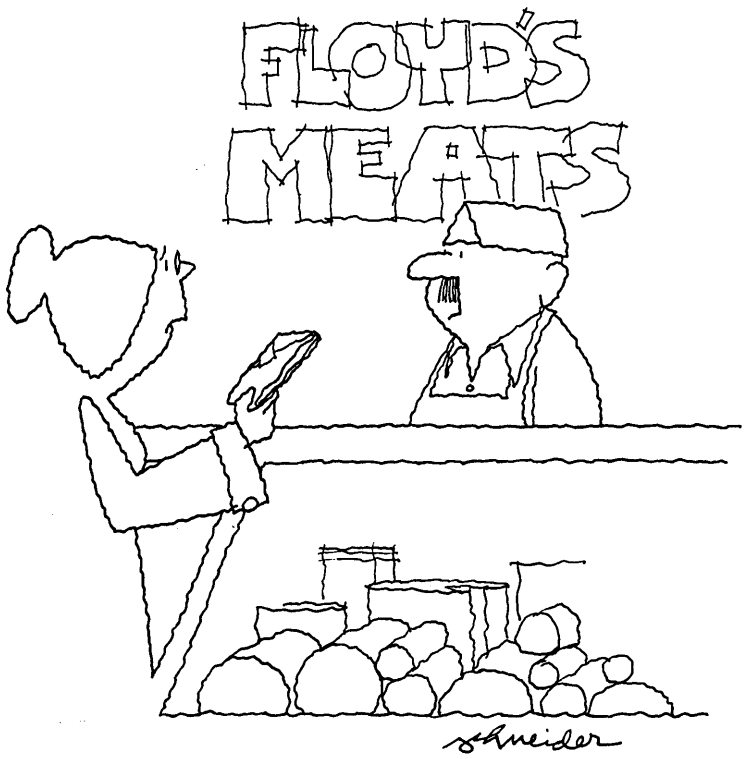
The need to reduce labor costs is particularly urgent in the office. Manufacturers agree that the electronic office is a major force driving the development of high-integrity systems. Corporations suffering from proliferating desktop micros now seek to consolidate information by hooking various brands of micros into one processor that is just as consistently accessible as a metal filing cabinet: ergo, the high-integrity computer.

The lack of comprehensive packages is forcing some users to tailor their own software, or at least to dramatically enhance existing packages. The immediate cost of taking this route discourages many who might see long-term cost benefits. "Only those industries which cannot provide human backup are forced into fault tolerance today, says Elliott of Stratus. "Others will gradually fall into this position, almost by accident." But the user who is wedded to manual backup or who has no in-house skills to write and implement tailored, high-integrity systems may be unable to justify the higher cost of purchase.

If the benefits of the high-integrity system are to be enjoyed by the average user, software houses will have to develop the more demanding and comprehensive packages required by on-line transaction processing.

Perhaps more essential, some branch of the computer industry must accept the fact that the user who is willing to pay has the right to demand a "load and go" solution that doesn't require becoming literate in computing.

Today's user is asking for help in selecting the best high-integrity system for the business application, for help in enhancing and fitting packages to take over a high percentage of the procedures and thus avoid manual backup, and for help in implementing a comprehensive system. Instead of complaining about unsophisticated users, vendors are learning to ask, "Why not give the customers what they want?"◉



"A dollar's worth of baloney *is* $2.95!"

CARTOON BY JACK E. SCHNEIDER

Lorraine King is president of Adam, Cobb & King Inc. of San Francisco. The company provides strategic and functional marketing services to the computer industry and implementation management to users of high-integrity systems.

HARDWARE

OFF-LINE

Texas bills itself as being on the leading edge of states in the Sunbelt that support high-technology companies. But sometimes actions speak louder than government rhetoric. Last October, the Dallas Police Department seized more than 100 computer terminals from Syntech International Inc. that were earmarked for delivery to the New York State Lottery Commission. Authorities said that the terminals were confiscated because the vendor violated the Lone Star State's gambling statutes. In an emotional plea for the return of the hardware, the company's lawyers said that the firm did not believe that the state's antigambling laws applied to the manufacture and sale of computer terminals, even if those terminals were to be used for gaming in other states. The company says this is the first time its terminals have ever been confiscated by authorities. Why the sudden confiscation now, when the firm has been supplying lottery terminals for several years? A company spokesman helpfully says, "I don't know." At press time the terminals had not been returned to the vendor, and no formal charges had been filed.

Compaq Computer Corp. is beefing up its Deskpro computer line with increased mass storage capacity and a co-processor. The Houston company contends that the addition of a 30MB disk drive is not in direct response to the IBM PC AT announcement, but that it was announced last June when the Deskpro series was rolled out. Regardless, this vendor is making it known that more hard disk storage is available (rebutting a criticism voiced when the product was unveiled). A second 10MB half-height drive is also available. The Deskpro streaming tape unit, however, still backs up only 10MB.

Even though Compaq says it is not butting heads with the PC AT, its actions are typical of vendors who compete against Big Blue: all they can do is offer what they say is more computer at faster speeds for less money. Yet IBM is not leaving Compaq and others much room to operate, since its prices are already aggressive for the technology IBM sells. Thus, at $7,200 for an AT-like configuration, the Deskpro is certainly no bargain. And while IBM does not offer any tape backup on the AT, there are several third-party vendors making products to back up the AT's hard disk. Thus, even though the Deskpro has tape backup, increased storage space, and a lot of the extras that are expected of PC clones, it may not be enough.

Moreover, the AT is billed as a multi-user system. Compaq says there are Unix-like software packages that turn the Deskpro into a multi-user system, but the company does not specify. Further, even though the Compaq Deskpro and portable computers can be connected to local area networks, the vendor has yet to offer its own network product. Sources say the company is going to remedy that void; Compaq says it does not discuss future product plans.

For the moment, however, the company is in good shape. Despite a precipitous drop in net income for its third quarter, Compaq posted an impressive 140% revenue gain, to $87 million, over its strong 1983 third quarter sales of $36 million. Moreover, the firm is undertaking a $55 million expansion program. It has recently completed a 107,000-square-foot addition to its headquarters solely to make Deskpros, and it plans to add a matching unit within six months. Compaq refuses to break out the percentage of its sales that came from the Deskpro line, but a spokesman says that 5,000 of the units were shipped in September alone, justifying the manufacturing expansion.

LASER OPTICS

CLASIX (Computer/Laser Access System for Information Exchange) is a laser optic information system that delivers a large volume of data to microcomputers. The CLASIX product line includes three basic components: the DataPlate, a laser optical disk capable of carrying up to 2GB or 2 billion characters of prerecorded data; the DataDrive Series 2000, a read-only computer peripheral that allows access to information on the DataPlate; and the TRIDECC premastering system, a mini-based service that adds error correction encoding and converts data into the format necessary for DataPlate production.

Information on the DataPlate may include digital data, video still frames, analog or digitized audio, full motion video, and digitized images. Each prerecorded DataPlate is removable and is loaded and unloaded from the DataDrive with a plastic carrier. The DataDrive can be connected to any mini or micro that supports the ANSI SCSI standard. The device is capable of reading mixed video, audio, and digital information from the DataPlate when augmented with a video option kit, which can be added in the factory or the field. The TRIDECC premastering process is a service that converts and encodes information from ½-inch magnetic tape to videotape. The videotape is used as the primary input to the DataPlate production or mastering process.

During the premastering process the vendor's proprietary TRIDECC error correction technology ensures the data integrity of the DataPlate. The CLASIX DataDrive sells for $5,000. Fully configured DataDrives including power supply, EDAC processor, DataDrive Controller, and DataPlate sell for $9,000. The video option costs $550. Prices are for quantities of 100, and larger oem discounts are available. The TRIDECC premastering services command a basic fee of $2,500 per DataPlate side plus $250 per additional reel of input tape. REFERENCE TECHNOLOGY INC., Boulder, Colo.

FOR DATA CIRCLE 302 ON READER CARD

HARDWARE

32-BIT FAULT TOLERANT MINI

The Sequoia System is a 32-bit, fault tolerant computer designed for on-line transaction processing. The system's tightly coupled architecture allows up to 64 processor elements, and up to 128 memory and I/O elements, to be interconnected in nearly any combination through dual, high-speed system buses. Each element is self-checking and new elements can be added and defective elements can be removed without interrupting operations. The system also features a fault tolerant implementation of Unix compatible with both the Berkeley 4.2 and the AT&T System V operating systems.

Processing capability ranges from 2.5MIPS in a small system to over 50MIPS in the largest configuration. Main memory can be expanded from 4MB to 256MB. I/O capacity can be expanded from two to 96 channels, with each channel able to support up to 16 controllers, and up to four disk and tape drives, or 16 terminals, printers, and other peripheral devices.

The product's automatic load balancing eliminates the need for users to manually distribute processes among processors. Other features include an 80MBps bus that transfers data among processor, memory, and I/O elements, a 128KB cache memory, and a fine-granularity resource that locks access to shared resources.

A wide range of software is available, including IBM remote job entry and 3270 terminal cluster controller emulators. The vendor also offers compilers for the C, COBOL, Pascal, and FORTRAN programming languages. In addition, many peripherals are available. A 2.5MIPS Sequoia System with two processing elements, two 2MB memory elements, two I/O elements, a system cabinet with dual systems bus segments, a peripheral cabinet with two Multibuses, a disk controller and a 404MB disk, a communications controller, the operating system, and a C compiler costs $290,000. SEQUOIA SYSTEMS INC., Marlborough, Mass.

FOR DATA CIRCLE 303 ON READER CARD

PLOTTERS

The 1625-S and 1645-R pen plotters produce drawings on a variety of media, including film. The 1625-S is designed for single sheets from sizes A through E, and features a large visible plotting surface to aid in monitoring output. The 1645-R is a roll media plotter and can plot drawings from sizes A through E. Control functions regulate scaling, windowing, digitizing, and paper loading. All functions are accessible through a keyboard and digital display on the front panel. The system also has arc generation, five fonts of 128 characters each, and polygon filling.

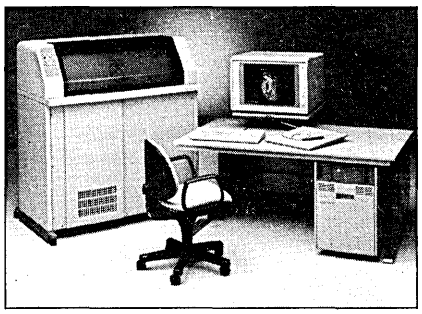
The pen carousel for both models accepts up to eight pens, including ball points, fiber tips, and liquid ink pens. The vendor's capping system keeps pens from drying out when not in use. Maximum speed and optimal acceleration are self-adjusted, according to the pen selected. The 1625-S will achieve speeds of up to 20 ips with 2g acceleration. The 1645-R plots up to 24 ips with 4g acceleration. Both have built-in dual-interface capabilities. Interfaces for the products include RS232C, Centronics-type parallel, and parallel IEEE-488 ports. The 1625-S single-sheet plotter sells for $12,000. The 1645-R media roll plotter costs $17,000. BENSON INC., San Jose, Calif.

FOR DATA CIRCLE 304 ON READER CARD

GRAPHICS WORKSTATION

The 4991S1 Graphics Input Workstation transforms documents, such as maps and engineering drawings, into CAD database files. It streamlines the entire data capture process, from automatically scanning hardcopy documents to editing and transmitting structured graphics data to host mainframes for storage in CAD databases.

The product consists of graphics



structuring software that converts the vectorized data into high-level graphics primitives; host interfacing software that transmits the structured drawing data to the host for CAD database storage and future CAD system processing; an M4115B computer display for local graphics structuring and drawing enhancement functions; the vendor's 4991 Autovectorizer that automatically scans and vectorizes hardcopy drawings; and a 4957 graphics tablet to ease user interaction.

The 4991 Autovectorizer automates the basic inputting task, providing the user with a preliminary vectorized drawing, ready for review and manipulation. It accepts drawings submitted on paper, Mylar, or other media up to size E. Once vectorized, a drawing file is available for graphics structuring, a process that translates vector line coordinate data into higher-level graphics primitives. During the graphics structuring stage, users select graphic manipulation and structuring functions from on-screen menus.

Structured drawing files are sent directly to RS232C-compatible host computers, where the hose interface software accepts the information and inserts it directly into one of the three currently supported CAD software systems: IBM Corp.'s CADAM, Computervision's CADDS 4X, and Tektronix's PLOT 10 Computer Aided Drafting Software (TekniCAD). All host communication takes place in background mode, freeing the computer display terminal for further processing. In addition, because all scanning, vectorizing, and structuring functions are performed locally, host processing power is reserved for high-level CAD database manipulations. The 4991S1 Graphics Input Workstation sells for $150,000. TEKTRONIX INC., Beaverton, Ore.

FOR DATA CIRCLE 305 ON READER CARD

—Robert J. Crutchfield

HARDWARE SPOTLIGHT

OPEN SYSTEM LINK

The K-200 hardware and KNET software comprise a system that provides an "open connection" among IBM mainframes, IBM and compatible personal computers, and non-IBM workstations and systems existing on the same Ethernet network. According to the vendor, this product is a local area network link and not a standard communication package. With a data transfer rate between 2.5Mbps and 3Mbps, data can be transferred at rates comparable to those achieved between IBM mainframes and peripheral devices. Accessing data from a remote, non-IBM computer or workstation can be done transparent to the user.

The K-200 is an Ethernet controller enabling a myriad of heterogeneous processing devices to share resources, as well as to gain high-speed access to databases and applications, in any IBM or compatible mainframe running VM/SP. This device acts as a link between a standard block multiplexor channel and an Ethernet receiver.

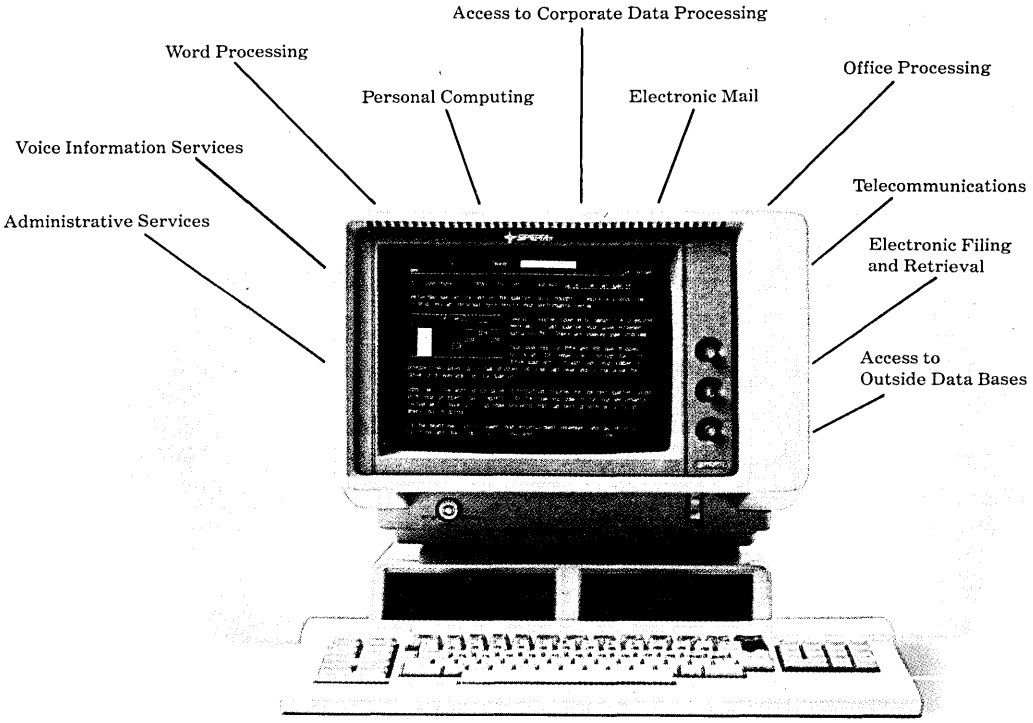
The controller is driven by KNET networking software running as an application program under CMS. It doesn't require any modifications to the VM control program or to CMS. KNET implements the TCP/IP protocol for data transmission. In addition to supporting Ethernet, it can also be used with bisynchronous communication lines and channel-to-channel adapters.

Potential users include manufacturers of CAD/CAM/CAE and office systems. A typical configuration of the K-200 controller and KNET software sells for $24,000, but they can be purchased separately. Prices vary and the vendor is also offering the products on an oem basis. SPARTACUS COMPUTERS INC., Bedford, Mass.

FOR DATA CIRCLE 300 ON READER CARD

SPERRYLINK™

OFFICE SYSTEM



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SPERRY

CIRCLE 47 ON READER CARD

Getting a group of five or six personal computers networked isn't that big a deal. But it gets complicated when the group gets bigger. And in case you hadn't noticed, the groups are getting bigger. Fast.

Experience may have already taught you that low-end PC networks run out of steam in a hurry once you have more than five or six stations connected. If your plans include several PCs or several hundred, high performance isn't a luxury. It's critical.

WHY YOU SHOULD BUY YOUR PC NETWORK FROM A COMPANY THAT UNDERSTANDS HIGH PERFORMANCE.

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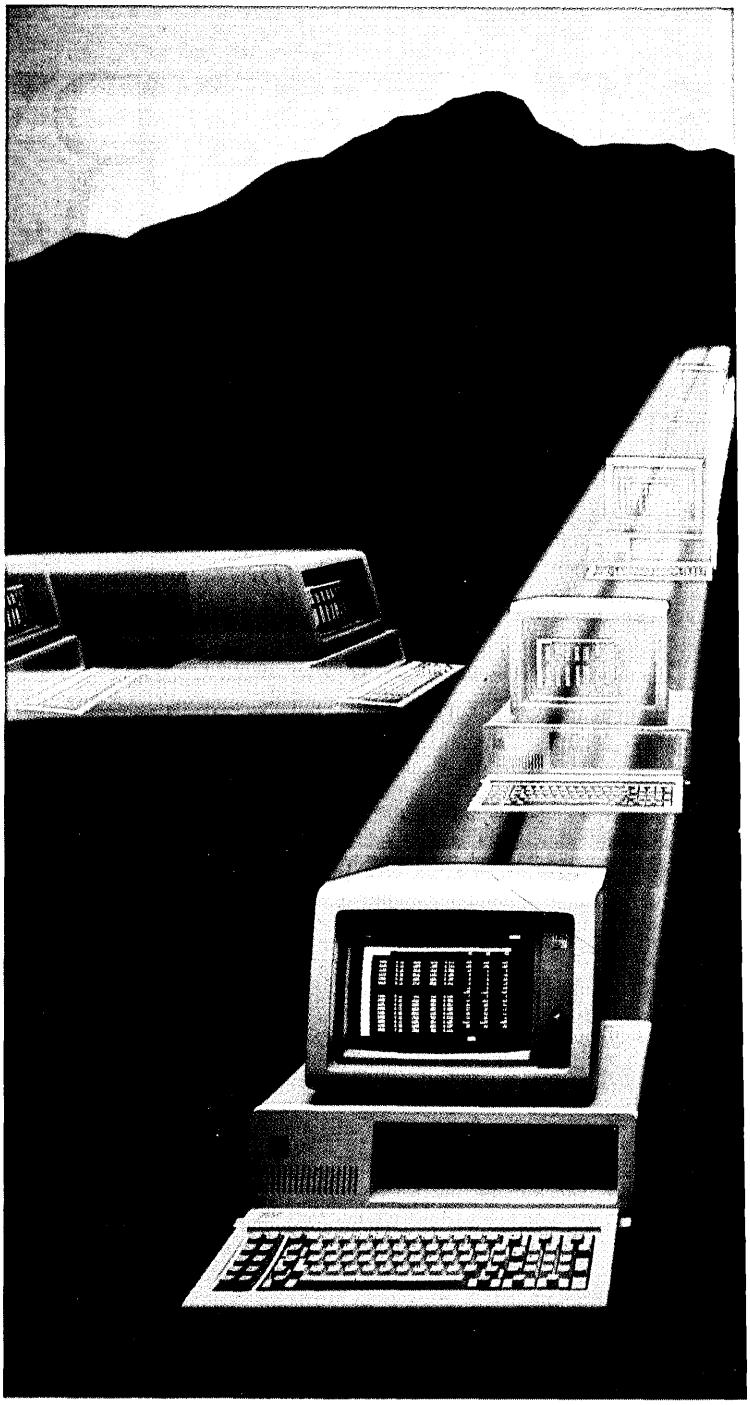
The Net/One Personal Connection™ is a high performance, high speed network system that can take your PCs as far, and as fast as you want in the corporate network. With the Personal Connection's SNA server software, a PC can emulate a 3278 and get a direct SNA route to the top. With Diskshare™ and Printshare,™ PCs can share information and expensive peripheral resources, and Mailshare™ gives you complete electronic mail service.

It's a far-sighted solution, even if all you want to do now is hook up a few PCs economically. And it's the *only* solution when PCs need to be mixed cost effectively into a high-speed corporate network with devices from different manufacturers.



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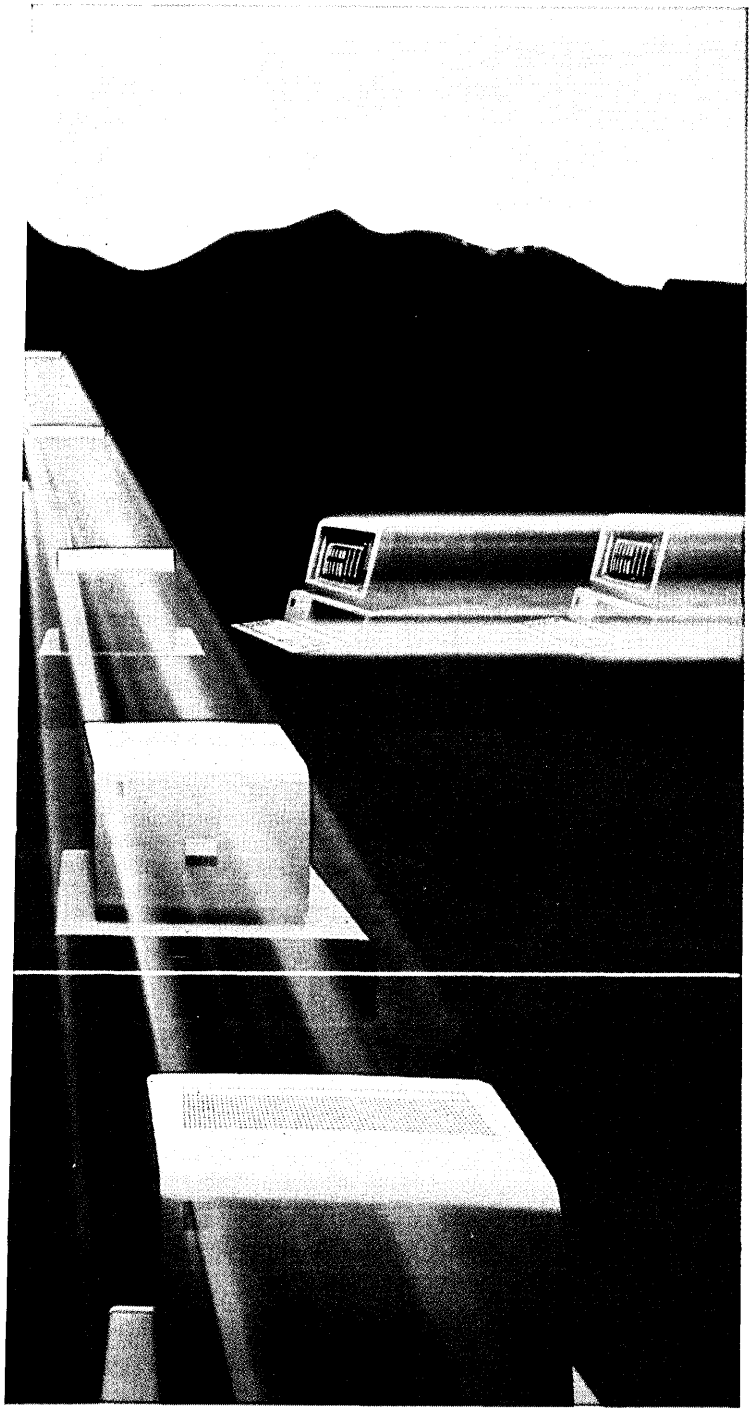

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The Net/One Personal Connection system packs the microprocessing power to offload all networking functions, so it doesn't eat up the host CPU's resources. That frees up a work station that other systems require simply to do their network's work.

WITH TWO BOARDS TO CHOOSE FROM,
THE COST GOES WAY DOWN.

We now have two Personal Connection interface boards, with two levels of intelligence and two prices. At stations on the net where this additional offloading intelligence isn't required, plug our newest, most economical Personal Connection board into the PC, and bring your cost-per-connection down to where it would be tough to justify buying anything less. The full network functionality is all there with either of the two interface boards; they can be used interchangeably on the network and it makes no difference to network users. But now, with the option to pay for only as much intelligence as you need at each station, we've made it possible to have a real network at PC network prices.

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CIRCLE 48 ON READER CARD

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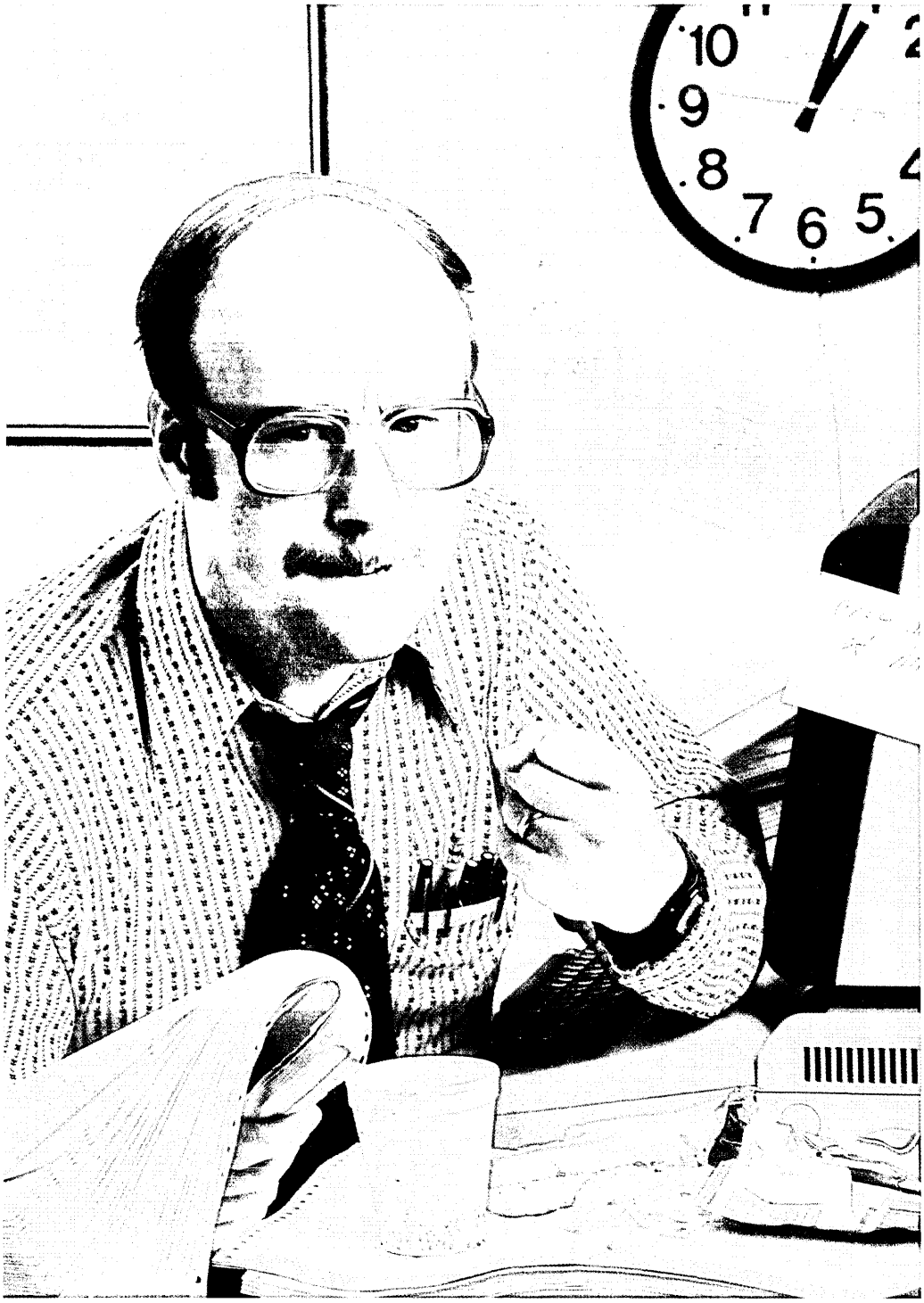

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And if you prefer, VMCENTER also allows you to assign pools of disk space to individual groups or departments and let *them* manage it—so that if there is a problem, it won't be yours.

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Best of all, this capability comes in a proven single-vendor package that's more convenient, more reliable, and more cost-effective than any possible collection of separate piecemeal approaches.

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VM SOFTWARE INC.

1-DTM-1284

CIRCLE 49 ON READER CARD

SOFTWARE AND SERVICES

UPDATES

The fictional HAL 9000 from 2001: A Space Odyssey has done more to take the wind out of the sails (and sales) of the artificial intelligence vendors than even AI's severest critics and doubters. Several vendors have recounted tales of taking visitors through their plants on a "dog and pony show" tour only to be bitterly dismayed by their guests' reactions. Most often, they say, the visitors exhibit a blank stare that indicates they have no appreciation for the expert systems being displayed. Inevitably, in this situation, the vendors' latest systems, which in many cases are quite impressive and sophisticated, are benchmarked against that smooth-talking, nearly omniscient HAL. With some users, artificial intelligence and HAL have become synonymous. And let's face it, after a potential customer has watched a talking computer guide a deep space probe and exhibit the innate intellectual faculties of fear, jealousy, and despair, it's not easy to impress him even with today's nearly English-like natural language query systems or the more advanced expert systems.

What if HAL were offered as a product today? Certainly, even a system as impressive as HAL would have its critics. For example, does it work in the IBM world? Or does it have one of those proprietary operating systems, and if so, where can you find good programmers? Can you connect pcs to it, and when will there be a Unix version? Isn't it going to take up a lot of expensive memory? And what about security? Is my data secure not only from the evil intentions of my subordinates but also from HAL itself (himself)? If it can read lips, how can I curse it when I screw up? In the final analysis, the gurus might conclude that it will fill a nice little niche market as an on-board computer system for unmanned, one-way interplanetary space travel. Not the most common of dp sites, but then again, it would be great p.r. for the vendor.

The reason for these ruminations, of course, is that now, 16 years after the original movie was released, Hollywood is about to give us 2010: The Epic Sequel Nobody Wanted. The flick will probably get the coolest reaction from the folks who know the most about AI and talking computers--the AI community itself. As much as the vendors hope visions of HAL will someday fade away, 2010 is sure to give us a wholly new mythical benchmark against which today's AI systems can be unfavorably compared. (After all, how can they possibly match what Hollywood can do?)

Texas Instruments is very much involved in artificial intelligence research and development. Its NaturalLink products offer users a simple English interface to MS/DOS commands as well as other micro software packages. The TI Consultant enables people to develop expert systems for use in many areas. The vendor has also made advances in voice technology. Both users and other software developers can license these packages.

A major drawback of this impressive array of products, however, is that currently they run only on the TI Professional Computer, which is not IBM PC compatible. It would seem that with the sheer number of PC/DOS units in the market, it makes sense to offer these types of products for IBM-compatible environments as well. TI's perspective, in essence, is that by offering this software at least for now only on its own micro, it will sell more of them. Perhaps. After all, it's a solid machine, in some ways better than its more popular competitor. Either way, the software certainly deserves a closer look.

PROJECT PLANNING

Quick-Plan is a project planning and modeling tool that facilitates the development of business strategies, competitive bids, resource allocations, budgets, schedules, and long-range plans of both a corporate and project nature. Managers can explore the consequences of alternative decisions prior to committing resources and funds to a course of action. It builds plans based on time, cost, and resources through a series of menu screens written in conversational English. The system provides editing and modeling capabilities and 13 different report formats. Zoom, spread, and isolating graphics are available on screen and in hardcopy for network logic review.

Using precedence diagramming with lags and four types of connectors, the software handles 250 activities, 99 resources, and 500 connectors for each project. Users specify currency and time units from minutes to years. Networking features such as LAGS and TAILS help control "float" to avoid resource scheduling conflicts and to control scheduled activities that do not affect project duration.

The software is specifically designed to upload information to a full scale management and project planning system that runs on a variety of 32-bit minis. The system disk and documentation include six sample projects that give insights not only to system operation, but also to effective project management. The product operates under MS/DOS version 2.0, and requires 384KB of RAM. A graphics option is necessary to print diagrams. Quick-Plan sells for $1,000. MITCHELL MANAGEMENT SYSTEMS INC., Westborough, Mass.

FOR DATA CIRCLE 326 ON READER CARD

FONT CONVERSION

FONT1 is a computer program for processing character font and logo files compatible with Xerox electronic printing systems. The software converts font and logo files designed for the Xerox 9700 and 2700 laser printers. It can generate char-

acter width tables for word processors accessing proportional fonts. FONT1 is available for IBM mainframe computers supporting MVS, TSO, or CMS. It costs $950. GAUL COMMUNICATIONS, Downers Grove, Ill.

FOR DATA CIRCLE 327 ON READER CARD

SAS PROCEDURE

DLITEST is a procedure added to SAS/IMS-DL/I software, the SAS System interface to IBM DL/I databases. This procedure enhances the interactive capabilities of the SAS/IMS-DL/I software by allowing SAS programmers and database administrators to test database calls in full-screen interactive mode.

Users format a DL/I by filling in fields on the DLITEST screen and executing the call with a RUN command. The results of each call, including the feedback data and status codes, are displayed on the DLITEST screen.

Retrieved data segments can be browsed or edited on the screen in character and hexadecimal modes. The editing capability is convenient for REPL calls because users can retrieve the segment to be replaced, edit it on the screen, and then issue the REPL call from the same screen.

The procedure can also be used as a training tool and debugger for new IMS programmers. By interpreting the status codes and feedback data from the procedure, new programmers learn about the effects of different status codes and calls. The DL/I test procedure acts as an interactive full-screen procedure, and can also be executed in noninteractive mode. In noninteractive mode, the procedure builds DL/I calls from values in an input SAS data set.

The DLITEST procedure is available to SAS/IMS-DL/I users at no additional fee. To use SAS/IMS-DL/I software, an installation must have the base SAS software product, which includes tools for data management, statistical analysis, and report writing. SAS/IMS-DL/I software runs on IBM 370/30xx/43xx and compatible machines under OS and DOS/VSE. The software will interface to IMS/VS DB, IMS/VS DB/DC, and CICS/OS/VS systems under OS. It will interface to DL/I DOS/VS and CICS/DOS/VS systems under VSE. The first year license fees for corporate customers in the U.S. are $7,900 for base SAS software and $4,000 for SAS/IMS-DL/I software. SAS INSTITUTE INC., Cary, N.C.

FOR DATA CIRCLE 328 ON READER CARD

SOFTWARE DEVELOPMENT

PrograMaster/OL is an on-line applications software development tool for the IBM mainframe environment. It works as an integrated package with the vendor's PrograMaster/BP, a batch processing product.

The systems feature prototyping, management, and screeen and report painting. The software supports automation of the development process, including design, prototyping, program design, and implementation. The combination of program logic and the designer's specific requirements for the application provide the information necessary for the construction of a software system.

The product is intended for on-line dp installations that have IBM or IBM-compatible mainframes running under IMS and use the COBOL programming language. It generates complete and logically consistent on-line applications software systems in ANSI '68 or ANSI '74 COBOL. The product employs what the vendor calls reusable technology that automates and standardizes portions of any application system that are the same or highly similar. Once the user has created a portion of the program using the system, that portion is automatically filed in the system's library, and each time it is used to develop an application, the amount of standard code increases and the amount of new code required decreases.

In addition, the system has a program prototyping capability, a systems management capability, and a monitor to control the reusable software library. The PrograMaster/OL and PrograMaster/BP are available separately or in an integrated package that sells for $7,500 per installation plus $3,000 per month or $145,000 for a perpetual license. MASTER SOFTWARE INC., Watertown, Mass.

FOR DATA CIRCLE 332 ON READER CARD

SOFTWARE SPOTLIGHT

SOFTWARE COMMANDS

NaturalLink technology is a result of the vendor's artificial intelligence research. The products enable users to operate various software packages without having to know syntax or DOS commands. Instead, users interact with the computer by building English sentences. Users can issue commands directly to the application or employ the sentence-building feature of the NaturalLink commands. This product translates the command so that the application understands it.

According to the vendor, NaturalLink products are designed to make it easier to use software on its microcomputers by providing an alternate way to issue commands to the application or the operating system. Users can ignore command syntax and can concentrate on the task being performed.

These products use the same technology as the NaturalLink access to the Dow Jones News Retrieval Service. The system prompts users with "I want to . . . " and users finish the statement by describing what they want to accomplish. Although users form complete sentences describing what is to be done, little or no typing is required. Words and phrases are presented on the screen, and users point to them with arrow keys and return keys. From left to right on the monitor, the options are presented in the logical sequence necessary to perform the specific task. As the cursor is moved from one column to another, the user's choices are limited to the parameters of the original request.

To access help, users press a single function key, and help messages appear that are relative to where the user is in the program. The NaturalLink Commands program runs concurrent with the application for which it is designed. Versions of the product are currently available for BPS Business Graphics, dBase II, EasyWriter, MultiMate, Multiplan, PeachText 5000, R:Base Series 4000, SuperCalc 3, and WordStar. There is also a version for MS/DOS that works like the other packages, guiding users through DOS commands by translating them to English. The NaturalLink Commands packages sell for $75 each. The technology is also available for third-party software applications. Currently, the products only support applications running on the Texas Instruments Professional Computer. TEXAS INSTRUMENTS INC., Austin, Texas.

FOR DATA CIRCLE 325 ON READER CARD

BATCH JOB CONTROLLER

Maestro automates and provides centralized control over batch job processing for one or more Hewlett-Packard HP 3000s. It is based on the concept of defining and creating schedules, which are a collection of one or more logically related jobs (queues). Within the framework of this concept, the software allows users to specify timing, sequencing, and dependencies for schedules and jobs. Maestro automatically handles job scheduling, multiple queue job dispatching, forecasting production requirements, compiling run documentation, and cataloging output. It works with multiple-linked HP 3000s to allow jobs from one computer to be dependent on jobs from another. A master console program is provided to allow the operator to see the production of any linked HP 3000. The entire production schedule for several computers may be kept on a single machine, allowing all scheduling information to be kept in a central location. Terms and commands are in English. Maestro costs $9,000. COMPUTING CAPABILITIES CORP., Mountain View, Calif.

FOR DATA CIRCLE 333 ON READER CARD

—Robert J. Crutchfield

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LET'S GET PERSONAL

A recent survey by Seminar Information Service (SIS) finds companies gravitating toward a more personalized form of employee training. SIS publishes the *SIS Workbook,* a directory with listings of over 3,200 business and technical seminars around the country. By polling its readers, the organization found that companies are favoring more seminars in the general management field than in highly technical areas. Also, more in-person seminars are being held at company sites than ever before.

While over 25% of the courses given last year were dp oriented, only 3% were this year. SIS claims that general management courses, especially those emphasizing people management, team building, and meetings have all increased.

SIS also says that seminar sponsors are offering many more communications skills seminars, especially in telephone etiquette and technique. Seminars in this area have more than doubled in the past year. Cathy Belizzi, editor of the *SIS Workbook*, feels that "people are reacting to computerization overkill. They want to feel we are all communicating as human beings, not just computer to computer. The *Megatrends* theory of high technology being balanced by a highly personal touch is definitely alive and well in the seminar field."

PROPER TRAINING FOR PC USERS

While we're on the subject of training, David Ferris, chairman of Ferrin Corp., a San Francisco-based pc services firm, says that "the whole area of computer education is a disaster, and the problem is just beginning to be understood."

Ferris's complaint is that it takes a lot of time to learn a pc package (and therefore costs a lot of money), and that the training people get is "generally appalling."

Ferrin has found that it can take anywhere from 20 to 100 hours for a person to get up to scratch on the basic operation of a single pc program, like a spreadsheet or database package. The company figures that the average cost to a corporation is $40 per hour per student, and the total learning cost can reach $800 to $4,000 for a single corporate pc user. There's also the added cost of the other people that get involved in helping users, such as department colleagues, in-house computer professionals, and outside organizations like Ferrin. Ferrin calculates that additions like these can up the total learning cost to between $1,000 and $6,000 per user. And that's just for *one* package.

The company claims the kind of pc training favored by most companies is that taught by an instructor, as opposed to training that uses videotapes, books, or computer-based tutorials. For companies that are large enough, Ferrin suggests that the way to increase efficiency and lower costs is to set up high-quality, in-house training programs and to avoid decisions based on class pricing. It also suggests that companies compare content, focus, and instructors and make sure stand-up (instructor) training includes hands-on experience, preferably with one pc per user. The firm advises you to check all references carefully and look for a consistent, integrated program of study covering a spectrum of packages, with introductory through advanced classes in each package offered.

SO WHO NEEDS SECURITY?

According to a recent survey by *Data Processing & Communications Security Magazine,* senior management is concerned about computer security and will support computer security programs.

The magazine wanted to assess the computer security awareness of companies and their senior management by surveying general security, computer security personnel, edp auditors, and internal auditors of businesses in the U.S.

Seventy-four percent of the respondents indicated that their companies had a major or growing concern for computer security. Fifteen percent claimed computer security was mandated by federal law or government contract, and 5% said the organizations viewed security only as a necessary evil. Forty percent said their management was very interested and supportive of computer security programs, 38% said it was fairly interested and supportive, 20% said their management was not very interested at the time, and 2% said management was uninterested in it.

Management's concern for computer security increased over the past year according to 66% of respondents, while 33% said it remained unchanged and 1% felt it had decreased.

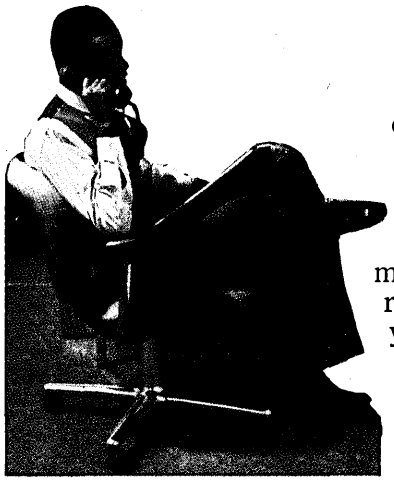
Those industries revealing the highest organizational concern for computer security were manufacturing and finance/banking. Both industries claimed the highest percentages of senior management showing favorable attitudes toward and increased concern for computer security. The retail industry showed the least amount of concern as well as the poorest management of computer security.

For more information on the survey, contact Data Processing & Communications Security, P.O. Box 5323, Madison, WI 53705, or call (608) 231-3817.

—Lauren D'Attilo

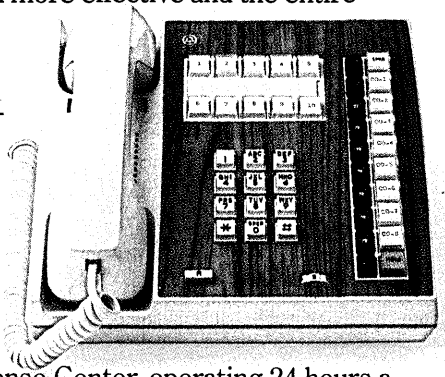
You'll be impressed with [illegible] computer.

If you need service [illegible] you'll be impressed.



In evaluating a computer system, many users put service at the top of their list. So do we.

We start by making one individual responsible for your system's performance. He's highly trained and knows you and your operation first hand. And he's the focal point of a person-to-person approach that makes communication more effective and the entire program more responsive.



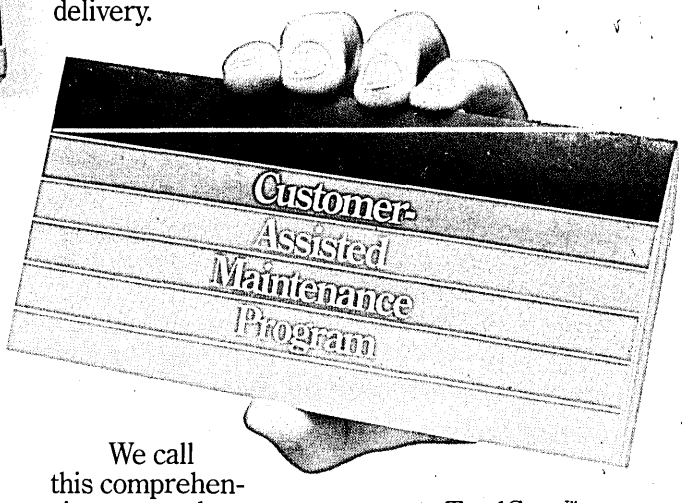
The Honeywell service program includes varied resources to assist your representative in meeting every eventuality. Like our National Response Center, operating 24 hours a day, seven days a week. Your one call here is all it takes to trigger action. All of the historic data on your system is at their fingertips, all resources at their disposal.

Among these are our Technical Assistance Centers. Staffed by hardware and software experts, each TAC is equipped with system documentation libraries and advanced capabilities to quickly diagnose your problem remotely.

If spare parts are required, you'll get them. Fast. Our nationwide on-line inventory tracking system and network of stocking centers allow us to locate and ship any part. Quickly.

Still another element of our customer service is training. In addition to such basics as programming, we conduct classes in advanced areas such as data communications and database design. Using the latest computer-assisted learning techniques, these classes can be conducted at your facilities or ours.

There are no compromises in the quality of our service. But there are varying levels of service available that can be tailored to meet your system availability requirements. Our Customer-Assisted Maintenance Program (CAMP), for example, provides tools for self-diagnosis of difficulties and offers additional economies through parts replacement arrangements that include carry-in, mail-in, or call-in options for expedited delivery.



We call this comprehensive approach to system support TotalCare™ service. It represents all that we've learned in more than 25 years of serving the needs of customers all over the world.

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CIRCLE 52 ON READER CARD

A-001-USA-DM

An exchange of readers' ideas and experiences. Your contributions are invited.

READERS' FORUM

MOTEL LESSON

One morning, on my way to work, I noticed they were tearing down the motel on the interstate near home. I wasn't surprised, a week or so later, to see a new one going up on the same spot, as it's an ideal site for tourists on their way to south Florida. I became curious, though, when the new building turned out to be a perfect copy of the old, right down to the color scheme, furniture, and Disney World leaflets in the rack near the registration desk. So, when I chanced to meet the chain's district manager some weeks later at a restaurant across the highway, I asked her why they'd replaced the unit with an identical one.

"Buildings age," she answered. "In time, monthly maintenance climbs beyond the cost of new construction. When that happens, it's cheaper to tear it down and build a new one." She paused, looking out the window at her new motel. "They're not really the same, actually; they just look it. Since construction methods keep improving, we can put them up faster and at less cost, using materials and techniques in effect at the time. Our guests don't notice, though," she chuckled. "Last week, a family told us they'd stayed there every vacation for 10 years now. Naturally, we didn't disillusion them."

Why don't we treat dp applications with the same cold-blooded realism? Many dp shops seem doomed to maintain aging applications that use obsolescent languages and outmoded designs. The cost in effort, turnover, and training (found a good RPG-II programmer lately?) is measurably high. Yet the only time we seem to write a whole new application is when there's a whole new user requirement.

We're not that different from building contractors. Our tools and methods also continue to improve. Using the latest application generators and database packages, we build an on-line system today at a fraction of what it cost us to write the equivalent batch system six or seven years ago. Furthermore, if we use structured methods, we can maintain the system at a fraction of the cost as well.

Few today would doubt that on-line database updating is simpler than batch. For one thing, you needn't sort, print, and distribute error listings; you just display a message on the screen. Also, on-line updating avoids complex recovery procedures to handle batch job or step failure. Of course, you need a database handler that automatically backs out the effect of abending transactions, but almost all packages do that today. The main advantage of on-line updating is that its relative simplicity pays off in ease of maintenance.

On-line development tools themselves have improved dramatically in the past five years. Studying the time charged to eight CICS applications involving some 58 screens, I found that IBM's Basic Mapping Support/Screen Design Facility systems averaged about 23 person-days per screen. This figure includes negotiating functions, design, implementation, documentation, and user training. In later systems, using IBM's Display Management System, the cost was almost halved, amounting to about 12 person-days per screen. Today, using the latest application generator, we average five person-days per screen.

Interestingly, faster programming does not account for all the improvement. Coding and testing a screen today costs less than a person-day. Much of the improvement appears as less costly feature negotiation and design. We attribute this to the adoption of more structured methods, more standardized screen designs. The point is that both tools and techniques have improved in recent years. We have better software with which to develop applications, and we've gotten a little smarter at going about it.

Now, I'm not suggesting that we set out tomorrow to rewrite every application we have, nor that we tear down and rebuild systems with low maintenance history. But look at that bottomless pit system. You know, the one nobody wants to work on. The one where, if you fix one thing here, three problems pop up over there. Objectively measure what it's costing you to maintain this system. Compare that with the proven cost of building and maintaining one that provides similar end-user functions, using modern tools and methods. If you'd be better off, do it. I've tried it. It works.

Better yet, once you've done the first, you'll have a more realistic feel for the cost trade-off. You can set up a regular schedule. Each year, replace the system with highest maintenance history. Every time you do, you'll free up more resources. Your application backlog won't shrink, of course. The far end of the service request pipeline is fed by rising end-user expectations. But your shop will certainly produce more and at a lower cost.

You say our users wouldn't agree to the initial resource diversion? Take a lesson from the motel manager. She didn't make a big deal out of it; why should we? The decision was hers, not her guests'. Of course, we can't sneak a new system onto them without their noticing, as she did. On the other hand, we don't have to tear down the old one first.

—Frank Sweet
Jacksonville, Florida

ADVERTISERS' INDEX

*OEM Edition

BE A HERO! EXPLAIN THE FACTS OF COMPUTER FIRE PROTECTION TO YOUR MANAGEMENT.

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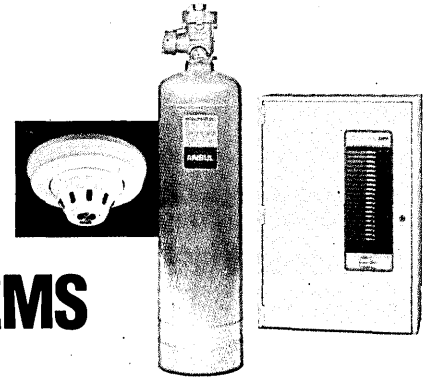

ANSUL HALON SYSTEMS

CIRCLE 2 ON READER CARD

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16 modems per rack

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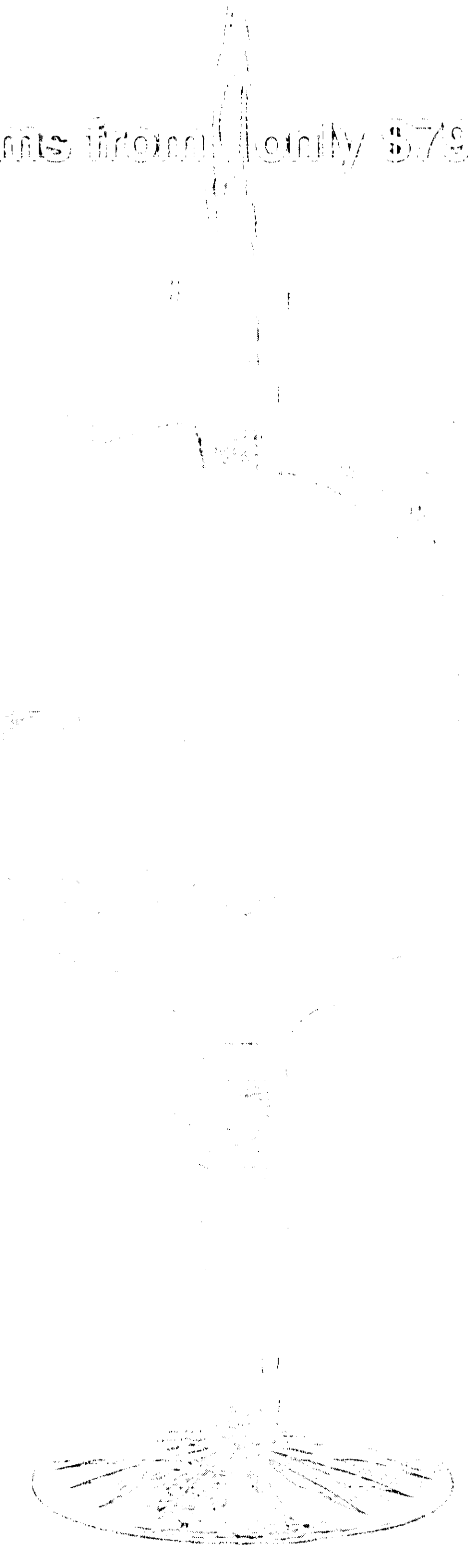

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