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HOW TO SELECT A SYSTEM

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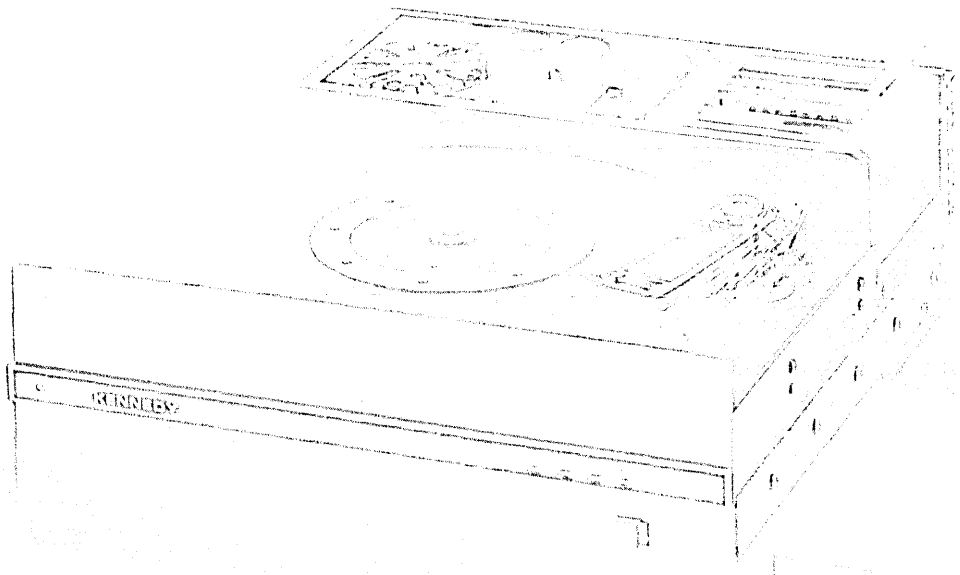

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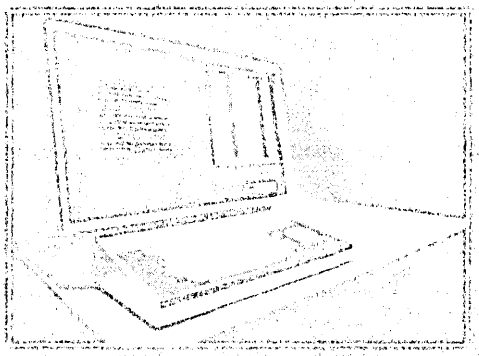

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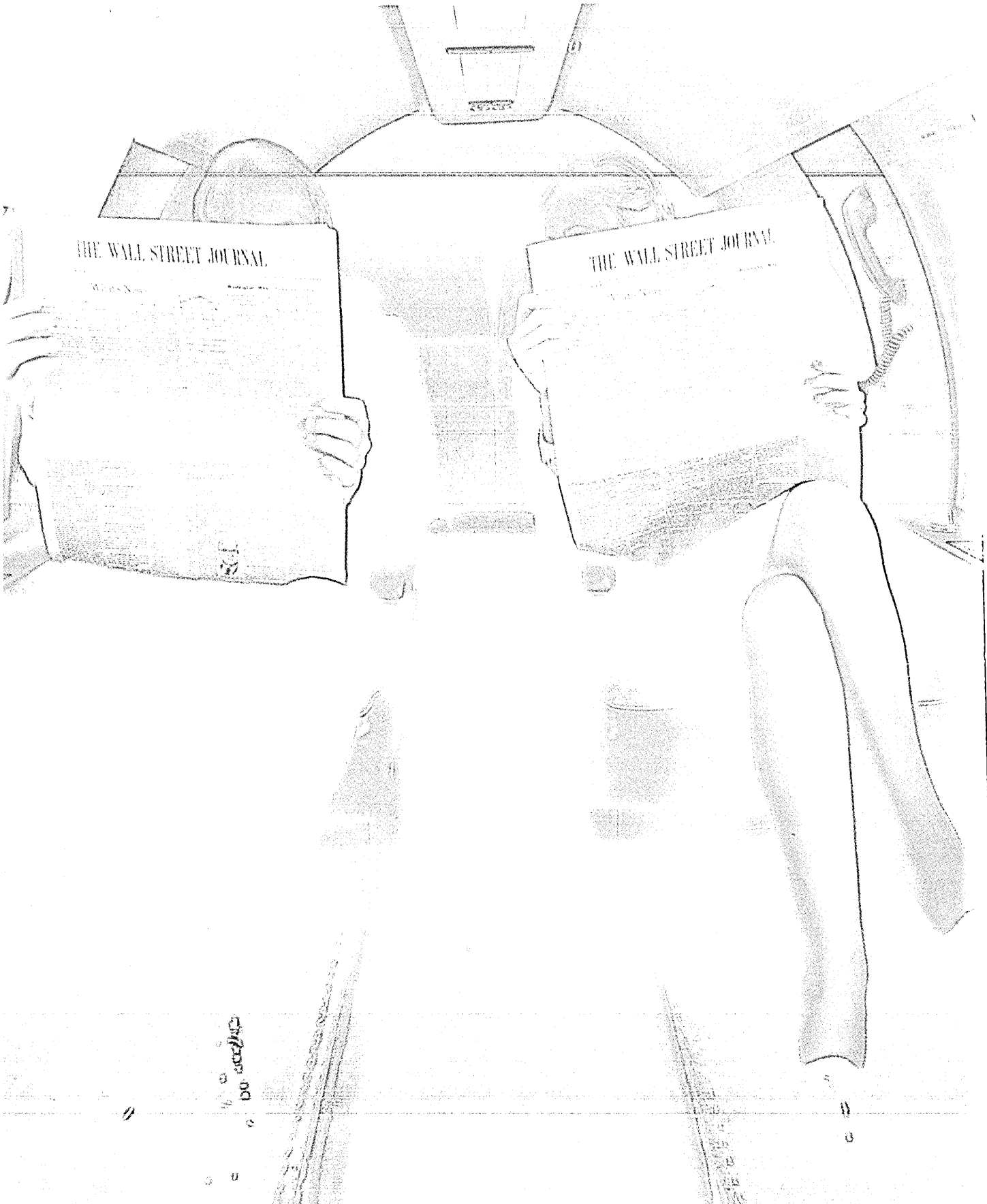

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DATAMATION 81®

FEBRUARY 1981/$4.00 U.S.A.
VOLUME 27 NUMBER 2
This issue, 158,710 copies

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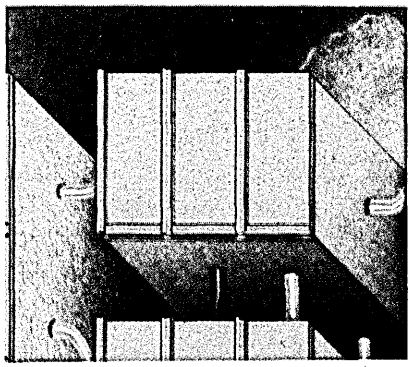

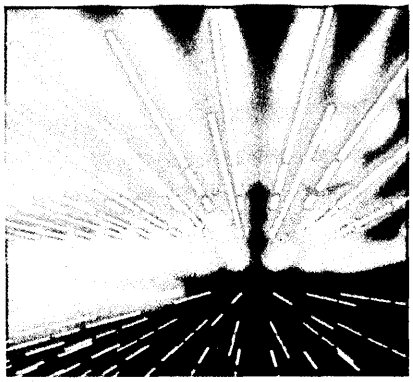

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CIRCULATION
666 Fifth Avenue, New York, NY 10103
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Technical Publishing
a company of The Dun & Bradstreet Corporation

BPA Circulation audited by Business Publications Audit

ABP Member American Business Press, Inc.

DATAMATION (ISSN 0011-6963) Magazine is issued monthly on or about the first day of every month, with the exception of December, which is semimonthly. Published by Technical Publishing, a company of the Dun and Bradstreet Corp., 1301 South Grove Ave., Barrington, IL 60010; James B. Tafel, Chairman; John K. Abely, President. Executive, advertising, editorial offices, and subscription department, 666 Fifth Ave., New York, NY 10103. Published at East Greenville, Pa. Subscription rates: $36 (U.S. and Possessions), $45 (Canadian). Reduced rate for qualified U.S. students: $18. Foreign subscriptions: £43. Additional charge for airmail: £40. Japan, Australia and New Zealand: £47 (air-shipped). Sole agent for all subscriptions outside the U.S.A. and Canada is J. B. Tratsart, Ltd. 154 A Greenford Road, Harrow, Middlesex HA13QT, England, (01)422-8295 or 422-2456. No subscription agency is authorized by us to solicit or take orders for subscriptions. Controlled circulation postage paid at Bethlehem, PA 18016.

Microfilm copies of DATAMATION may be obtained from University Microfilms, A Xerox Company, 300 No. Zeeb Road, Ann Arbor, Michigan 48106. Printed by Brown Printing Co., Inc. POSTMASTER: Form 3579 to be sent to Technical Publishing Company Circulation Office: 666 Fifth Avenue, New York, NY 10103. Single copy: $4.00 in U.S.A.

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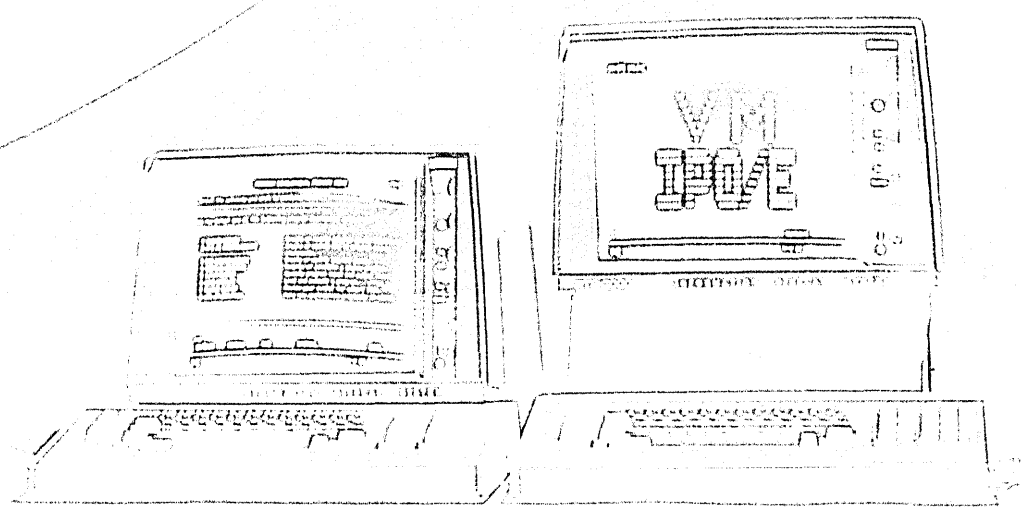

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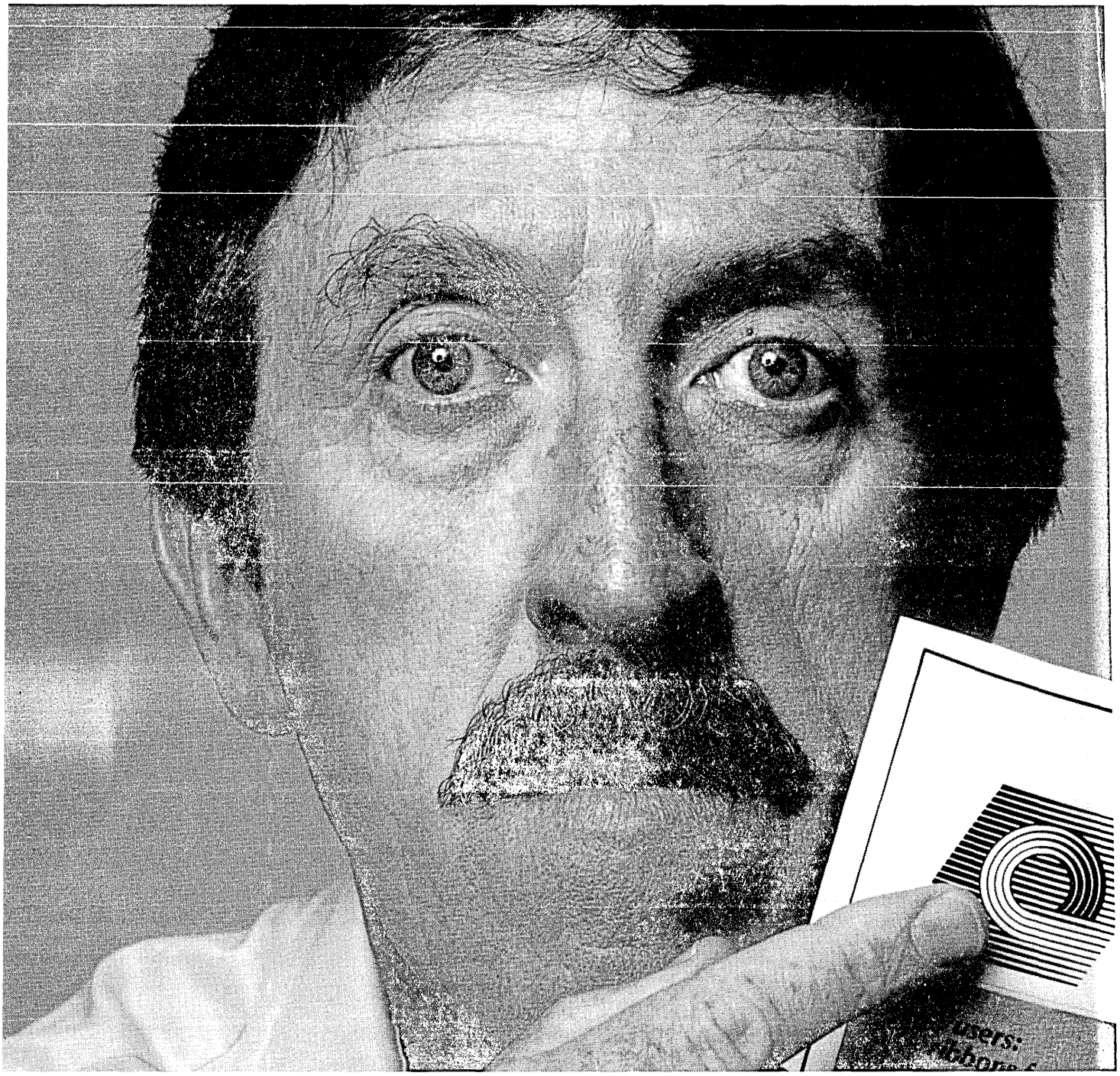

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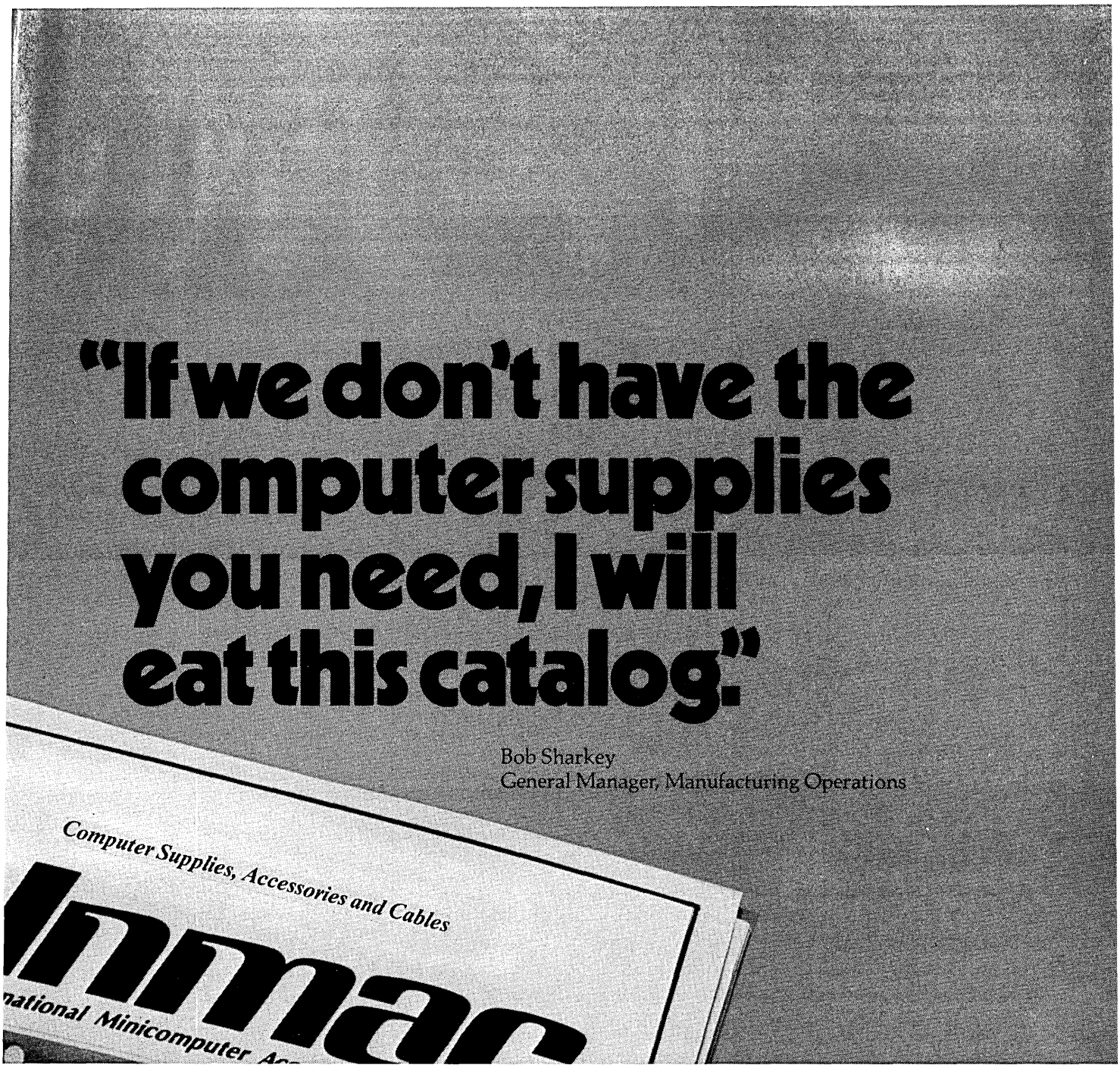

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CIRCLE 8 ON READER CARD

Twenty Years Ago/Ten Years Ago

LOOKING BACK

COBOL CABAL COPS KUDOS

February 1961: The Department of Defense had begotten CODASYL, which had in turn engendered the short-, medium-, and long-range committees. The short-range committee formed four working groups, two of which subsequently reported back to the short-range committee, which reported to the executive committee, which extended the life of the short-range committee, which appointed a subcommittee, which prepared a report that the short-range committee passed on to the executive committee, which okayed publication and then dissolved the short-, medium-, and long-range committees, replacing them with three more committees.

Thus was COBOL—one of the few things on which the industry has ever agreed —born in the Pentagon's shadow. Extant were the COBOL report and the RCA and Univac COBOL compilers; a demonstration seemed the logical next step. Why not compile a COBOL program on both systems?

In September 1960 a government program was compiled and run on the RCA 501, then suggested to the executive committee for use in a demonstration. The committee concurred, adding that it wanted to see an industrial program included in the show as well. RCA and Univac agreed.

Since they wanted to show just what degree of compatibility they had achieved, the two groups of technicians did not confer. Most of the program changes were necessitated by differing hardware; for example, the government program was written for an on-line printer and the Univac II had only off-line options. The two changes that affected the language were the labeling and editing entries.

It took two days for the groups to analyze the problem, make the necessary modifications, and convert input data from cards to tape. On Dec. 6, 1960 a demonstration was given at the Univac center in Philadelphia. The guests got a detailed description of the compiling process, the COBOL printouts produced during compilation, and copies of the problem solutions. The next day the group crossed the Delaware to watch the same compilations on the 501 at the RCA Cherry Hill System Center.

Each of two radically different computers was able to run successfully a program intended for the other. The programs were written employing the COBOL primers provided by the manufacturers, and necessarily reflected the individual systems. Nevertheless, they were 90% compatible.

THE LION'S SHARE

February 15, 1971: While in cpus and memories the Japanese had pulled nearly even with the U.S., in time-sharing they lagged the U.S. by eight to nine years and Europe by six to seven. This was especially odd in light of the government's careful nurture of the computer industry.

The engineer of the logjam was Nippon Telephone and Telegraph, the government monopoly. Though private capital had started trying to develop time-sharing as early as 1964, NTT, controller of communications circuits throughout Japan, was determined to reserve this apparently profitable business for itself. NTT was in the process of developing a National Data Communications Service and planned to have spent $450 million on the system by 1972. The service had started limited operations around Tokyo in fall of 1970 and was expected to expand to Osaka and then to Nagoya. It would eventually comprise a simple computing service for the small shopkeeper, a sales/inventory service for manufacturers and larger retailers, and a scientific computations service that would make use of canned programs to handle things like statistical correlation problems.

Users, manufacturers, and government planners wondered whether NTT had the capital to implement these plans and make services available at a reasonable price. NTT officials admitted that the $450 million they planned to spend was "not enough." The monopoly had helped finance its telephone services by requiring that anyone who wanted a phone purchase a $280 to $420 user bond, and intended to finance the time-sharing system in a similar manner. But NTT had a backlog of 2.5 million people waiting to buy bonds and receive telephone service. If it couldn't keep its customers supplied in its basic business, how could it hope to singlehandedly create national data communications?

—Ken Klee

NEC Trimliners. A generation ahead.

300-600 LPM band printers that set new standards.

At NEC, we've been working on band printer technology for more than seven years. While others were contemplating the possibilities of this practical, low-cost method, NEC was constructing its first units, getting the bugs out, improving the designs. Bringing state-of-the-art electronics to band printer controls. Adding serviceability. Reliability. Durability.

Today, NEC offers two band printers with speeds of 300 and 600 lines per minute. Available now, they are also reliable—now. They incorporate a technology which is now. The band technology. Low-cost, very reliable, extremely flexible.

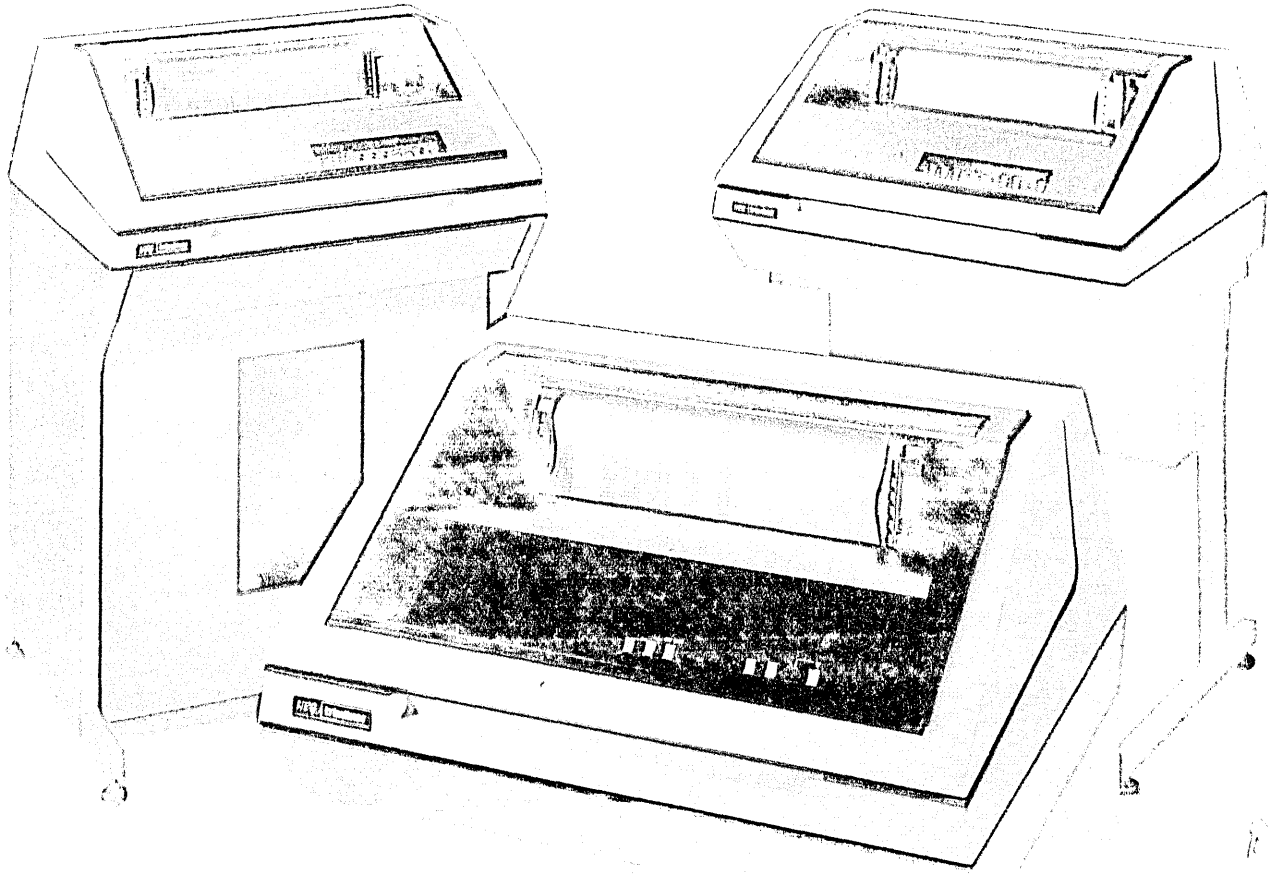
A new enhanced-print feature allows the user to change speeds under either software or hardware controls to produce higher quality printed output. The feature reduces the 300 LPM speed to 170 LPM, and the 600 LPM rate to 350 LPM.

NEC's Trimliner printers have *never* experienced any band breakage. They have uptimes 50% higher than the competition. Trimliners average less than 30 minutes to repair. They're quiet, modular, ultra-cool and available in desktop, pedestal-mounted or two models of quiet cabinetry.

The technology of the 80s in a printer for the 80s from NEC—a company that was preparing for this decade and its band printing needs while others were just thinking about it.

NEC's Trimliner band printers. A generation ahead.

NEC. Going after the perfect printer.



NEC

NEC Information Systems, Inc.

CIRCLE 10 ON READER CARD

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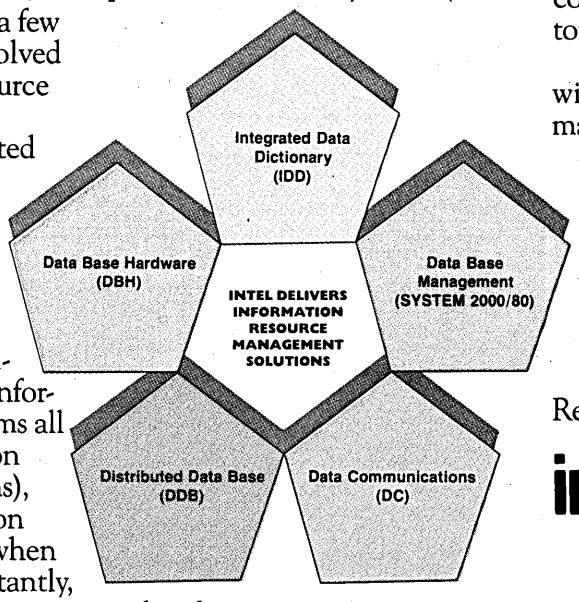
With a wealth of vital information in hand, you can simplify the task of building and fine-tuning new applications. And because the dictionary works intimately with SYSTEM 2000®/80, Intel's powerful data base management system, designers are given extensive data modeling and application prototyping capabilities. Moreover, data items, records, and definitions are easily added, deleted, or modified even after a data base is in full production. And, like all IDD functions, this can be handled on-line or in batch mode.

Enforce standards, communicate, and cut redundancy.

Intel's data dictionary quickly tells you and anyone else involved in data base and application development, what already exists (and



in what form it exists) in your environment. Additionally, the dictionary applies editing, error detection, and correction functions.

Guarantee data security.

Watchdog of your data is IDD's sophisticated security system. With passwords which protect data as far down as the item level, you can be confident that your data remains "clean." You can be confident that unauthorized personnel will not accidentally alter or view sensitive information.

Implement successful solutions.

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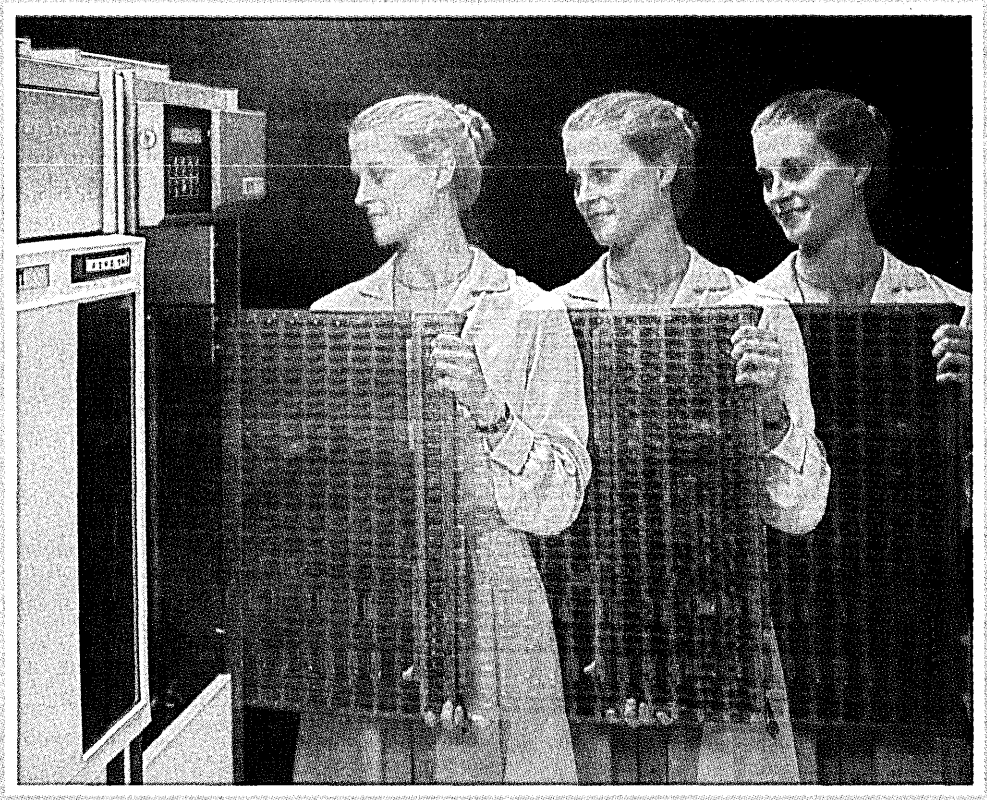
CIRCLE 11 ON READER CARD

BTI 8000 32-bit multiprocessor system

Now you can grow by plugging in resources instead of changing computers



Finally, there's a computer system that lets you grow by plugging in resources, instead of by changing models — the BTI 8000.

The secret is Variable Resource Architecture (VRA): a flexible mix of hardware resources controlled by a single, self-regulating operating system.

Hardware resources consist of multiple processors, memories, and input-output channels operating in parallel without the complex internal networking normally associated with such arrangements. The result is mainframe performance at substantially lower costs, plus unequalled flexibility.

You can tailor the BTI 8000 to serve over 200 on-line, interactive users. Or to handle large batch loads. Or to do a lot of each.

Furthermore, you can vary processing capability over a *tenfold range* by merely adding or deleting hardware modules. Differences in configuration are invisible to user software, and no reprogramming or recompilation is required.

Key features of each BTI 8000 system include:

- From one to eight 32-bit CPUs controlled and coordinated by one shared operating system.
- Up to 16 megabytes of main memory.
- Fail soft architecture.
- Secure multi-user operations.
- Demand-paged virtual memory.
- Simultaneous use of ANS COBOL 74, ANS FORTRAN 77, PASCAL/8000, and BASIC/8000.

As for reliability and support, they're established BTI traditions, proven by over 2,500 other BTI computers operating in the U.S., Canada and Europe. For full details about the BTI 8000, contact the BTI office nearest you.

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COMPUTER SYSTEMS

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CIRCLE 12 ON READER CARD

LOOK AHEAD

IBM TARGETS PBX FOR U.S. USE

In what looks like a first step towards introducing a PBX product in the U.S., IBM has applied to the FCC for authorization to connect its 1750 PBX switching system to the U.S. telephone network. An IBM spokesman said the FCC application was made strictly for internal use of the 1750 at this time. As part of a continuing review of its voice communications facilities, he said, IBM decided to consider use of the 1750 "at a small number of internal locations," and hence the need for FCC certification.

The 1750 is a solid state digital telephone switch introduced overseas by IBM in March 1979; it's now available in five European countries. IBM has two other PBX products -- the 2750, which debuted in Europe in 1969 and is no longer generally available, and the 3750, introduced in 1972 and still offered overseas.

DYADIC DILEMMA

Apparently "dyadic" sounds good, but it's tough to implement. We hear that IBM is having trouble getting a full 11 MIPS from the dual processor, or "dyadic" configuration, on 3081 trials. Seems the MVS operating system is having problems with software resources between the two cpus -- what one source calls "software interlock" hang-ups. Current levels of throughput are believed to be no better than 1.6 times the 303X performance -- well below the mark IBM customers expect.

TAKING SHOTS AT THE 4341

At long last, Magnuson is expected to deliver its M80/43 challenge to the heavily backlogged IBM 4341 this month -- two years after its initial announcement. A technology shift from TTL to ECL circuitry is being blamed for difficulties that delayed the 43 (as well as its slightly slower sister, the M80/42). We hear that startup production is slated mainly for customers of the M80/32 and 31, who want upgrades.

Also romping in the 4341 arena is IPL Systems, the Olivetti-linked PCM vendor. It's now offering 30-day deliveries on the IPL 4443, its challenge to the 4341 Group I. IPL claims that with the 15-month backlog, it has strong hold on the healthy PCM business in this niche.

LATENT BREAKING

Memory will be the name of the game with a new software release expected in the third quarter of this year from IBM for the 3081. The MVS/SP Release 4 will be announced with a "latent" 31-bit addressing capability on this so-called first H Series machine. Currently with its 25-bit addres-

LOOK AHEAD

sing, the 3081 offers 32 megabytes of real memory -- some eight megabytes more than the top-of-the-line 303X. With the new announcement, a minimum of 64 megabytes of "real" could be the order of the day. One industry wag described two megabytes of real memory as a "fully ladened programmer." Nothing like having an extra 16 fully ladened programmers around!

WHAT'S GOOD FOR THE GOOSE...

Word has it that British mainframer ICL is not finding enough new customers for its ME 29 medium systems. We hear that 80% to 90% of the machines are going to ICL's 2903/4 users as replacements for these "old faithfuls." ICL's 2903/4 has been its one enduring success; its fully developed rental base is all profit to the company. "By rolling over these users with the new machines because it can't sell them elsewhere, ICL is reluctantly killing the goose that laid the golden egg -- and before its time," one source said. Result: one big cash flow problem. ICL has apparently taken steps to make its cash flow position look better than it really is by writing off inventories full of ME 29s as "sales" (a step not illegal in the U.K.). Meanwhile, the company has taken steps to tighten the purse strings -- over 2,500 workers in the U.K. are being pruned, and its Washington subsidiary is slowly winding down.

THEY'LL DO IT EVERY TIME

Computing's "oldies but goodies," the members of the Digital Computer Assn., will "dishonor" one of its own on March 20 as only that cork-throwing crew can. DCA's target at this year's annual dinner bash will be Frank Wagner, executive vp of Informatics, Inc. and computer industry pioneer. Wagner's retiring, and DCA wants to help him do it in style. Among other things, the crafty crew wants to point out those of Wagner's industry predictions (he's probably made more than a million) that didn't quite pan out -- predictions like the one he made in 1972 that IBM would be government-regulated by 1978.

HATS OFF TO DAVID BROWN

When David Brown began talking about his ability to recover data from badly damaged disk packs (January, p.45), he wasn't willing to talk openly about one of his biggest jobs -- recovering data from disk packs damaged in the November fire at the MGM Grand. But word got out and now, Brown says, he can talk about his eleventh hour rescue of the hotel's data, which included lists of registered guests -- the only way the Grand was able to ascertain who was missing. The recovery was done in the computer room at Electronic Engineering Co. of California (EECO) in Anaheim.

Think what your programmers could do if your users did their own reports.

Answer/DB, the latest Implementation System from Informatics, is the new on-line software tool for report generation. It lets non-DP people develop their own report requests at a terminal—in an English like language—with as few as four simple statements.

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Answer/DB has made old-fashioned batch reporting systems obsolete because it's designed to handle the problems you'll be facing in the data base and data communications world. Answer/DB operates with your standard OS/DOS files and IMS data bases. And it offers completely interactive, on-line query entry with syntax checking and editing capabilities for creating error-free report requests.

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Computer_____ Operating System: ☐ DOS/VS ☐ OS/VS
TP Monitor: ☐ IMS/DC ☐ CICS/VS ☐ TSO

M-DM-281

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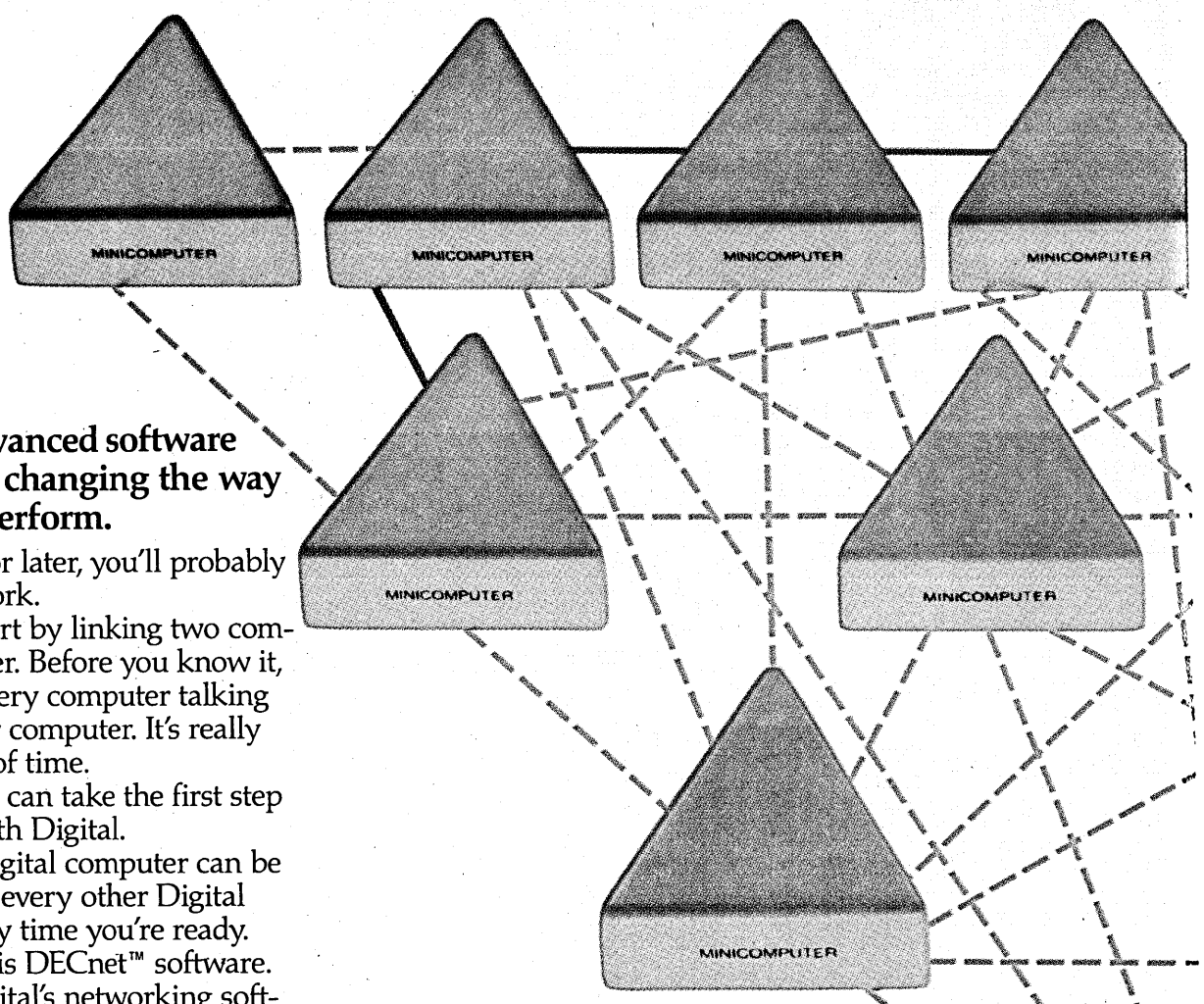
CIRCLE 15 ON READER CARD

Nobody networks



Our advanced software options are changing the way networks perform.

Sooner or later, you'll probably want to network.

You'll start by linking two computers together. Before you know it, you'll have every computer talking to every other computer. It's really just a matter of time.

And you can take the first step right now. With Digital.

Every Digital computer can be networked to every other Digital computer. Any time you're ready. All you need is DECnet™ software.

And Digital's networking software is exceptional. No other vendor can match us for sheer breadth of flexible, cost-effective networking alternatives. Besides standard networking capabilities, consider these Digital options.

Adaptive Routing. It's not necessary to physically connect every computer to every other computer. This reduces line costs. At the same time, network operations can continue even when communications links break down. Information is automatically rerouted around problem areas.

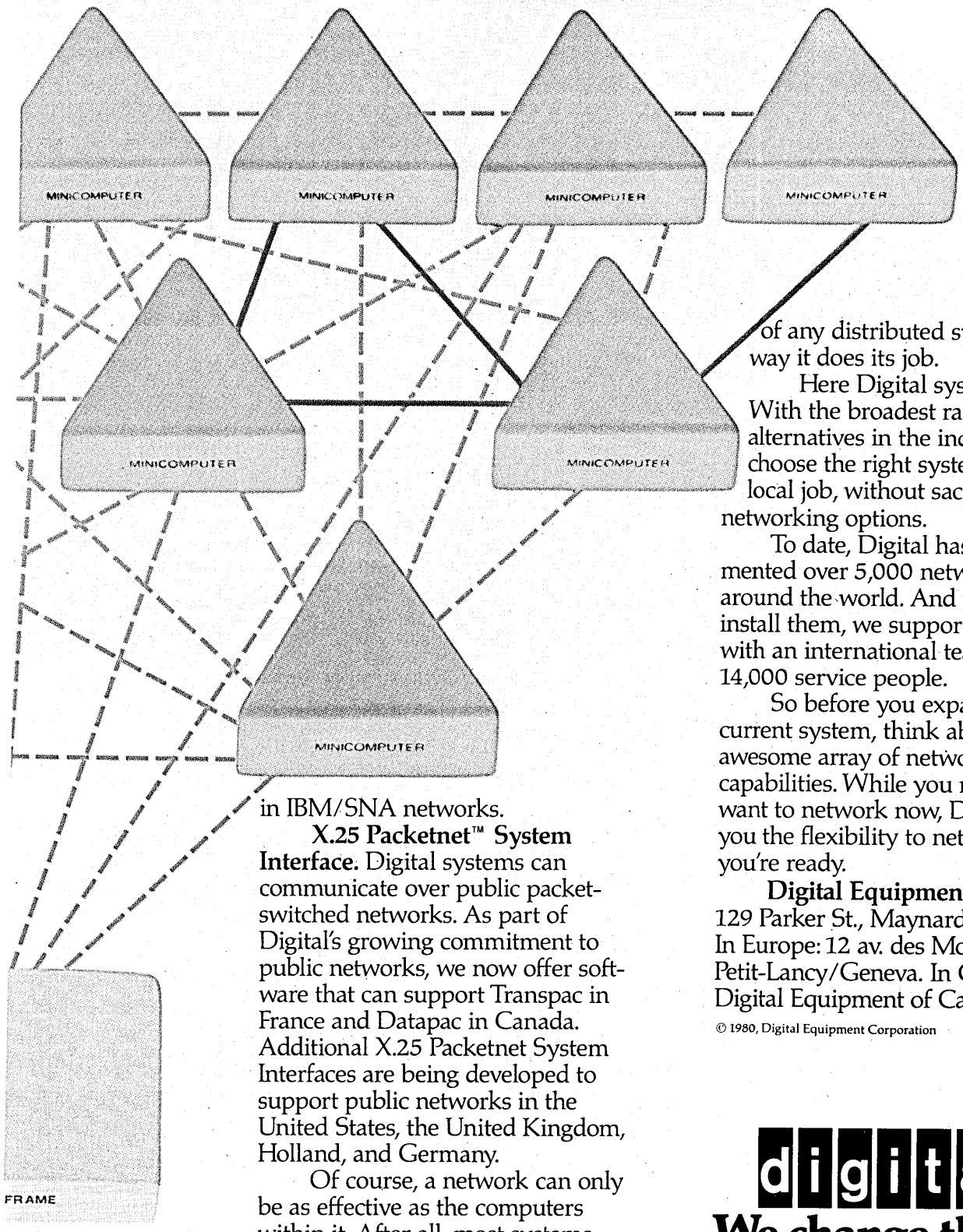
Network Command Terminals. You can control remote computers and remote applications from any location.

Enhanced Network Management. Control is the key to cost savings. DECnet lets you control the use of each communication line. Lets you add new systems to your network whenever you want without shutting down operations.

Multipoint Communications. Now one communication line can serve several Digital nodes simultaneously, reducing your line costs considerably.

Advanced Protocol Emulators. In addition to supporting Batch BISYNC, Interactive BISYNC, and other standard mainframe communications protocols, Digital offers an advanced SNA protocol emulator, so Digital systems can participate

like Digital.



in IBM/SNA networks.

X.25 Packetnet™ System Interface. Digital systems can communicate over public packet-switched networks. As part of Digital's growing commitment to public networks, we now offer software that can support Transpac in France and Datapac in Canada. Additional X.25 Packetnet System Interfaces are being developed to support public networks in the United States, the United Kingdom, Holland, and Germany.

Of course, a network can only be as effective as the computers within it. After all, most systems only use their networking capability 20 percent of the time. The real test of any distributed system is the way it does its job.

Here Digital systems excel. With the broadest range of systems alternatives in the industry, you can choose the right system for each local job, without sacrificing any networking options.

To date, Digital has implemented over 5,000 network nodes around the world. And we don't just install them, we support them, too, with an international team of over 14,000 service people.

So before you expand your current system, think about Digital's awesome array of networking capabilities. While you may not want to network now, Digital gives you the flexibility to network when you're ready.

Digital Equipment Corporation, 129 Parker St., Maynard, MA 01754. In Europe: 12 av. des Morgines, 1213 Petit-Lancy/Geneva. In Canada: Digital Equipment of Canada, Ltd.

digital

We change the way the world thinks.

CALENDAR

FEBRUARY

Financial Information Systems Conference, February 9-11, San Francisco.

Presented by the National Institute of Management Research, this three-day conference has various sessions and workshops concentrating on financial systems. Contact NIMR Seminars, PR Dept., P.O. Box 3727, Santa Monica, CA 90403, (213) 450-0500.

COMPCON Spring '81, February 23-26, San Francisco.

The theme for the spring conference is VSLI and its future effects on design systems. Contact Harry Hayman, IEEE, P.O. Box 639, Silver Spring, MD 20901, (301) 589-3386.

CSC '81, February 23-26, St. Louis.

The ACM sponsors this computer science conference. Contact John W. Hamblen, University of Missouri-Rolla, Computer Science Dept., Rolla, MO 65401, (314) 341-4491.

NEPCON West '81, February 24-26, Anaheim.

The conference is directed toward all persons involved in manufacturing and testing printed circuits, multilayers, microelectronic circuitry, semiconductors, and other devices. Contact Industrial & Scientific Conference Management, Inc., 222 West Adams St., Chicago, IL 60606, (312) 263-4866.

MARCH

Fifth International Conference on Software Engineering, March 9-12, San Diego.

The ACM sponsors this one. Contact Seymour Jeffrey, Director, Center for Programming Sciences & Technology, National Bureau of Standards, Washington, DC 20234, (301) 921-3531.

Fourteenth Annual Simulation Symposium, March 18-20, Tampa, Florida.

Part of Simulation Week, March 16-20, the symposium is sponsored by the IEEE, ACM, SCS, and IMAC. Contact Alexander Kran, IBM, B/300-40E, East Fishkill Facility, Hopewell Junction, NY 12533, (914) 897-2121 X 7142.

Office Automation Conference, March 23-25, Houston.

The major conference for users and designers of electronic office equipment, the OAC is produced yearly by AFIPS. Contact AFIPS, 1815 North Lynn St., Arlington, VA 22209, (703) 558-3617.

Printemps Informatique, March 24-27, Paris.

An international edp exhibit for computer oems. Contact Kallman Associates, 30 Journal Sq., Jersey City, NJ, 07306, (201) 653-3304.

Interface '81, March 30-April 2, Las Vegas.

This is the largest U.S. computer show and exposition. It is devoted to data communications, distributed data processing, and networking. Contact The Interface Group, 160 Speen St., Framingham, MA 01701, (617) 879-4502.

Exposium '81, March 31-April 3, Milwaukee, Wisconsin.

State-of-the-art word processing and information processing systems, from the beginner level through the advanced, will be featured at this four-day conference and exhibition presented by the Word Processing Society, Inc. Contact Word Processing Society, Inc., P.O. Box 92553, Milwaukee, WI 53202, (414) 226-5215.

APRIL

DPMA Quality Assurance Conference, April 1-3, Chicago.

The objective of this conference, sponsored by the DPMA Education Foundation, is to explain methods tools, and techniques for improving computerized applications. Contact DPMA, 12611 Davan Dr., Silver Spring, MD 20904, (301) 622-0066.

6th West Coast Computer Faire April 3-5, San Francisco.

Since 1977, this annual small business and personal computing conference and exposition—with a strong focus on micros—has been held regularly. Contact Computer Faire, 333 Swett Rd., Woodside, CA 94062, (415) 851-7075.

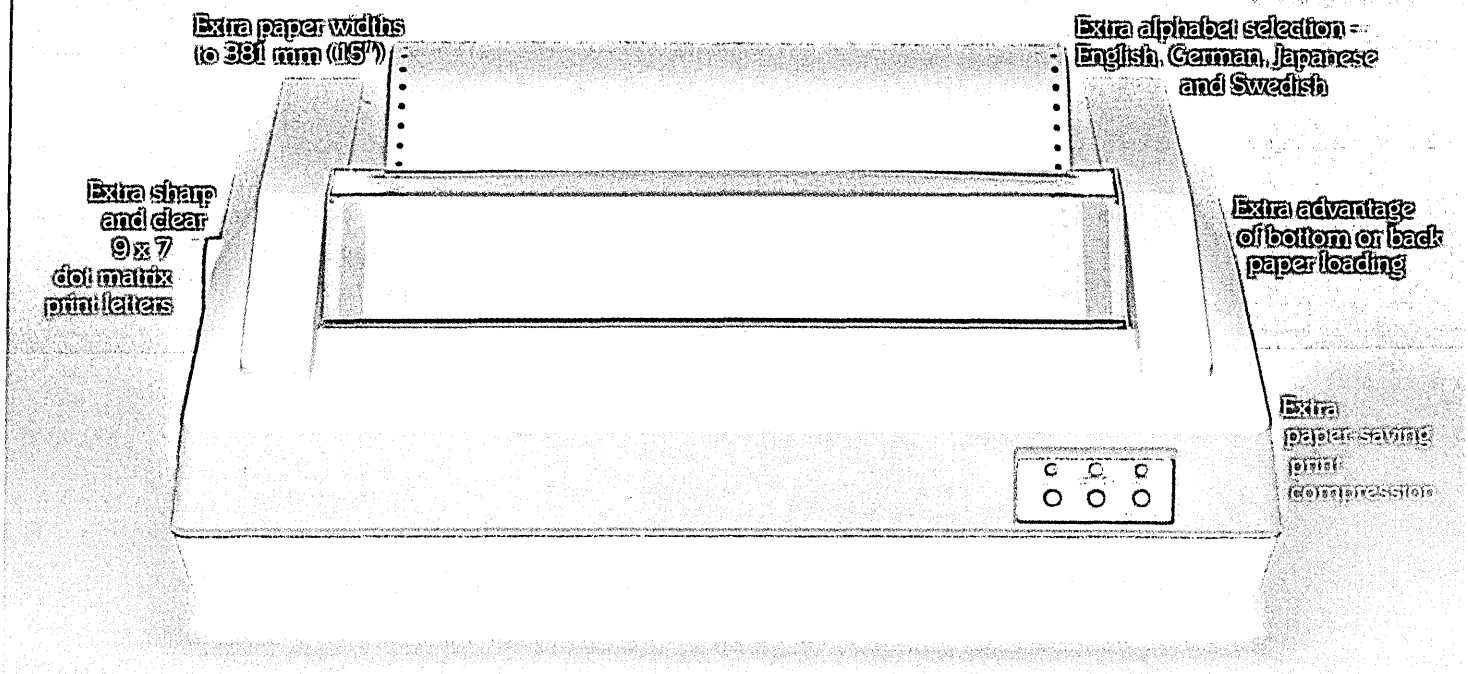
1981 AECT National Convention, April 6-10, Philadelphia.

The Association for Educational Communications and Technology produces this show, the largest gathering of instructional media/AV professionals in the U.S. Contact AECT, 1126 16th St., N.W., Washington, DC 20036, (202) 833-4179.

Ninth Annual Telecommunications Policy Research Conference, April 26-29 Annapolis, Maryland.

The object of this conference is to provide a forum for the analysis and discussion of telecommunications policy issues. Contact William E. Taylor, Bell Laboratories 2C-258, 600 Mountain Ave., Murray Hill, NJ 07974, (201) 582-2108. ✲

EXTRA. EXTRA.

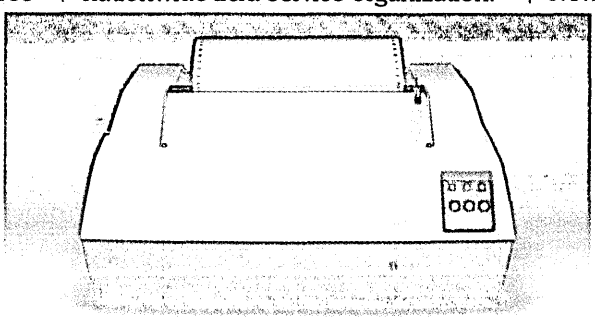


Now you get more extras when you pick the new dot matrix printers by C. Itoh. Choose the Comet 80-column printer and get the extra benefits of four character sizes and paper-saving print compression. Choose the Comet II 136-column printer and receive the added extra of a full-width computer size printer that accommodates paper widths to 381 mm (15").

Both the Comet and Comet II also offer the rare combination of low cost and high performance. Both models operate at an efficient 125 cps bidirectional print speed and in a 9 x 7 dot matrix.

C. Itoh's Comet series has the extra advantage of a unique multilingual capability with a selection of four different alphabets: English, German, Japanese and Swedish. Other special characteristics include a programmable VFU (Vertical Format Unit) plus self-test diagnostics. For your operator's convenience, there's easy bottom or back paper loading, and both Comets use a standard low-cost nylon ribbon. Plus our printers already meet 1981 Class A FCC, UL, and fire safety requirements.

If all that wasn't enough, Comet and Comet II are plug-compatible with all major printers in the industry, meeting standard parallel serial interface specifications. Our printers are backed by C. Itoh's warranty and a nationwide field service organization.



And as a final, all important extra, when you choose either printer from C. Itoh you get immediate off-the-shelf delivery.

So if you want the highest quality at the best price, look into the extras the C. Itoh Comet and Comet II printers offer. You'll get a lot more than you bargained for. For more information, contact C. Itoh Electronics, Inc., 5301 Beethoven Street, Los Angeles, CA 90066; Tel. (213) 390-7778. Chicago Office: 240 E. Lake Street, Suite 301-A, Addison, IL 60101; Tel. (312) 941-1310. New York Office: 666 Third Ave., NY, NY 10017; Tel. (212) 682-0420. Dallas Office: 17060 Dallas Pkwy., No. 108, TX 75248; Tel. (214) 931-0177 C. Itoh represented in Canada by Canadian General Electric.

C. ITOH ELECTRONICS, INC.

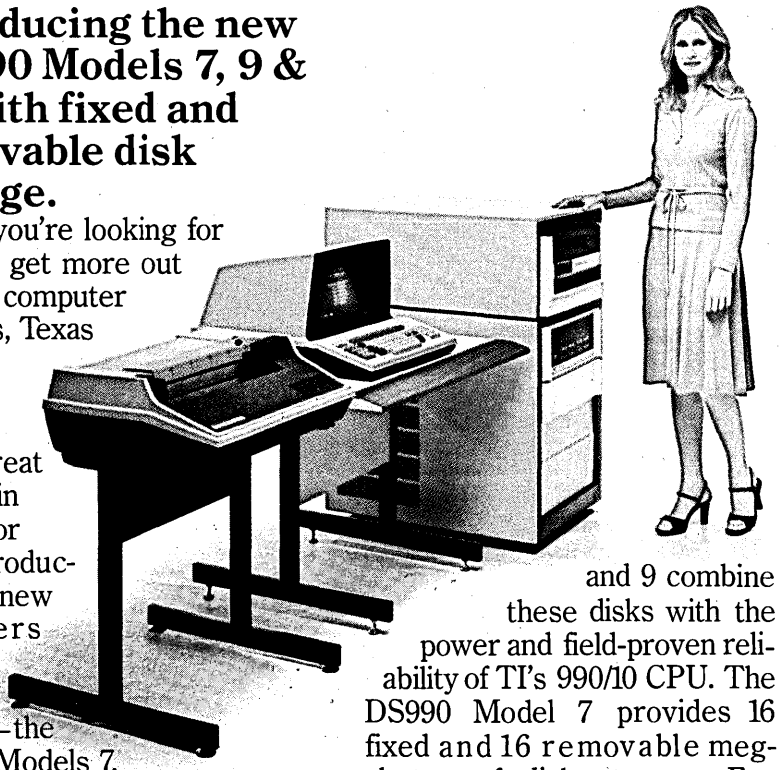
One World of Quality

CIRCLE 20 ON READER CARD

TI Announces H
a Growir

Introducing the new DS990 Models 7, 9 & 29 with fixed and removable disk storage.

If you're looking for ways to get more out of your computer systems, Texas Instruments has got some great things in store for you. Introducing the new members of our DS990 family—the DS990 Models 7, 9 and 29. Powerful computer systems that put the bite on disk storage costs.



New disks for easy back-up.

Flexibility is not forgotten at TI. That's why each of these new DS990 computer systems feature disk storage systems with both fixed storage and a removable cartridge. Fixed disk storage allows easy access to day-to-day information, while removable cartridge disks let users change information when needed. The removable cartridge disk also provides users with a safe, easy, and inexpensive way to back-up information without purchasing another disk drive or magnetic tape drive.

Both the DS990 Models 7 and 9 combine these disks with the power and field-proven reliability of TI's 990/10 CPU. The DS990 Model 7 provides 16 fixed and 16 removable megabytes of disk storage. For greater storage capacity, the DS990 Model 9 includes a disk drive with 96 megabytes of storage — 16 removable and 80 fixed. Should you need it, a second identical disk can be added to either system on the same controller for additional storage.

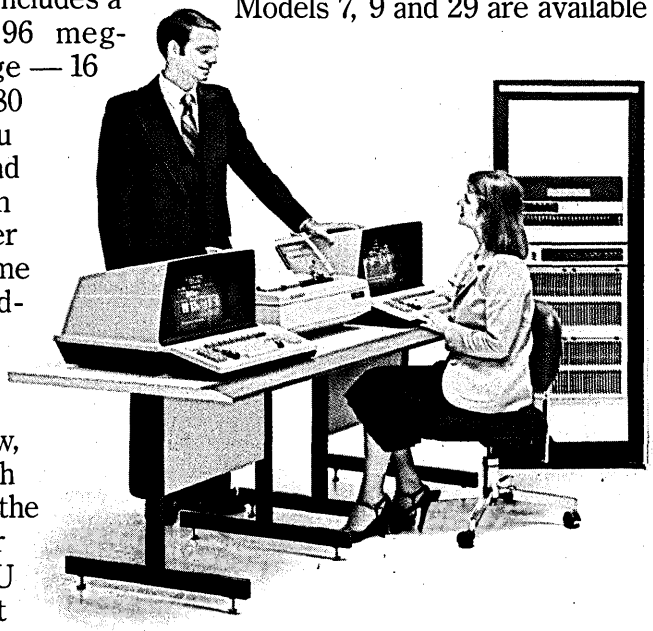
The DS990 Model 29 features a new, low-profile, 60-inch cabinet and offers the processing power of TI's 990/12 CPU — the strongest central processing unit ever developed for a DS990 computer system. With one disk drive, the Model 29 provides 96 megabytes of storage — 16 removable and 80 fixed. And you can double your capacity by adding a second drive on the same controller.

New members of a proven family.

The DS990 Models 7, 9 and 29 fit right into the DS990 computer family. So you can upgrade your system at any time with a minimum of cost and effort, they're upward-compatible with the other members of the DS990 family— from the microcomputer-based Model 1 to the highly-advanced Model 30.

With proven software.

As members of TI's versatile DS990 family, the new Models 7, 9 and 29 are available



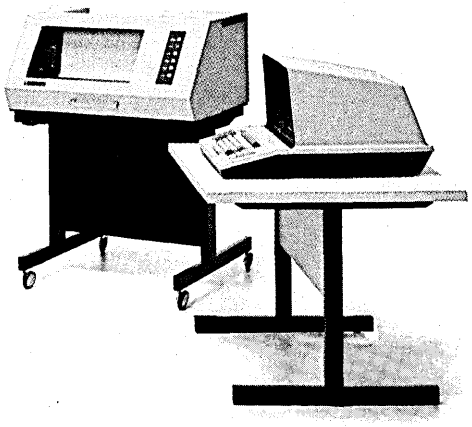
xtra Storage for
; Family.

with proven software, including COBOL, BASIC, FORTRAN, RPG II and Pascal. They also have valuable time-saving software utilities, including a powerful data base management system with query and report-generation facilities as well as TIFORM, TI's uniquely efficient screen-formatting language. Word processing software is also now available to let these systems perform a wide variety of office-oriented tasks.

With our communications software and hardware, these new systems will easily fit into your existing distributed processing environment. IBM 3780/2780 batch communications as well as 3270 interactive communications let our systems talk to other systems whenever information needs to be shared.

Worldwide service and support.

Every member of our DS990 family is backed by an extensive service organization with field locations worldwide.



Our customer representatives are skilled professionals with technical educations, formal TI equipment training, and in-field experience.

As a TI customer, you can take advantage of a wide variety of service and maintenance plans so you can pick the plan that meets your business needs.

By dialing our Customer Support Line, for example, you can talk directly with a selected staff of senior engineers and programmers at our computer headquarters in Austin, Texas. So your questions can be answered quickly and directly.

Also among our varied services are fully staffed Education and Development Centers in Austin and Chicago, which provide a wide variety of classes on the use of TI computer hardware and software. We even offer special classes designed for the needs of our OEMs.

For more information about our new DS990 Models 7, 9 and 29, contact the TI sales office nearest you, or write Texas Instruments Incorporated, P.O. Box 1444, M/S 7884, Houston, Texas 77001. In Europe, write Texas Instruments Incorporated, M/S 74, B.P. 5, Villenueve-Loubet, 06270, France. In Asia Pacific, write Texas Instruments Asia Ltd., 990 Bendeemer Road, Singapore, 1233.

For fastest response, call our inquiry response center at 1-800-257-7850 (in New Jersey, call 1-800-322-8650). Please refer to code #100-F.

We put computing within everyone's reach.

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CIRCLE 21 ON READER CARD

The Prime750 The best way to go big without going with the biggest.

Contrary to popular opinion, mainframe capability does not have to be purchased from a mainframe company. As evidence, we offer the affordable, interactive Prime 750.

The 750 is designed around a full 32-bit CPU. It supports industry-standard FORTRAN '77, ANSI '74 COBOL, CODASYL DBMS, BASIC, PL/I, RPG II, and a host of communications products. And it also supports up to 2.4 billion bytes of disk storage, and as much as 32 Mb of virtual memory for each of up to 63 simultaneous users.

The 750 can handle just about anything, including huge computational analyses, big data processing tasks for business, and complex data communications applications.

And it's interactive – a highly desirable feature on a computer with mainframe power.

Also, the same 750 that runs your business programs can simultaneously crunch some very big numbers. And if you go to distributed processing, the 750 supports PRIMENET,™ X.25, and a wide range of communications products.

The 750 is just one of the fully compatible Prime 50 Series computers – including the 250, 550, and 650 – that share the same operating system, file system, and communications products. So you can start with a smaller Prime computer, and upgrade all the way to a 750 without program recompilation or software modification.

If you're thinking big, contact the nearest Prime office, or write Prime Computer, Prime Park MS 15-60, Natick, MA 01760. In Europe: Prime Europe, 6 Lampton Road, Hounslow, Middlesex TW3 1JL, England. Telephone: 01-570-8555.

PRIME Computer

CIRCLE 22 ON READER CARD

LETTERS

MARGINAL ERROR

Re: "Experimentalists, A Dying Breed" (Nov., p. 88), Professor Feldman of the University of Rochester, referring to the condition of computer science teaching, speaks of many positions being filled by "marginal people—mathematicians and physicists or other people from fields in which there is an oversupply of PhDs."

As one of those "marginal people" my first reaction was unprintable. Next, I thought why doesn't Professor Feldman do something to improve the current condition of computer science education? It is likely many of us "marginal people" will continue to function in this capacity for many years. It seems to me that Professor Feldman undermines his right to criticize undergraduate education in computer science by refusing to conduct an undergraduate program at his institution.

When the mathematics community became aware of problems in high school and undergraduate mathematics education, it took steps to remedy the problem. Many of the finest mathematicians, whose research ability was unquestioned, took it upon themselves to assist smaller colleges and universities to improve their programs. When will the computer science community demonstrate equal concern about the state of computer science education?

If you think we "marginal people" are not preparing our graduates adequately (apparently many employers do not share this view, by the way), then do something to help us meet your standards. You could offer programs at your institutions which will permit us to upgrade our skills and do a better job.

If you choose not to contribute positively to our professional development, then you should bite your lip and endure our plodding efforts in silence.

JAMES E. MCKENNA
Fredonia State Univ. College
Fredonia, New York

Though a lucid description of a crisis facing the computer science research community, Ms. Cherlin ignores one vital element: the "home brew" computer enthusiast. The accomplishments of this creative sector of our trade cannot be outlined in just a few sentences. But to cite a couple:

1. Apple Computer has grown from a "garage" operation to a public company listed in the NYSE.

2. The S-100 Bus configuration, used since the first microcomputers came into being, has grown to the extent that the IEEE has issued a proposed standard for it.

What does such technology have to do with research exploring future concepts in computer science? What is the common ground between academe and the "home brew" enthusiast? To quote a remark from Ms. Cherlin's article: "Anything the mind can imagine is fair game." Neither one has to answer to dictated R&D guidelines. In addition, the computer enthusiast pursues his work not necessarily as a livelihood but mainly as an intellectual pursuit.

It can only be to their mutual advantage if ideas are readily exchanged between them. The sooner that gulf is narrowed, the better for all of us.

THOMAS FREUND
Sr. Programmer/Analyst
Harris/PRD
Syosset, New York

I agree that computer education in this country is exhibiting some disturbing trends. However, not all causes were discussed in the article. The main reason that many people leave academia is not the pay, but the crushing teaching loads and an aloof, parochial attitude on the part of the established faculty towards any kind of applied science, especially as it is manifested by computer systems. The essence of this attitude was best demonstrated by the quote in the last paragraph of the article.

Some people can adapt to this situation, but most cannot and consequently leave for industry where they can tinker with their little brand X computer. That is what I did and I now have more time and equipment to do exciting computer system research than I had in academia. Academia is not the only fertile soil!

DAN HAMMERSTROM, PhD
Staff Engineer
Intel Corporation
Aloha, Oregon

CHEERS FOR SA

Re: "Systems Analysis: Key to the Future" (Oct., p. 145), I expected to read a description of how to integrate the different approaches into a coherent system development life cycle. I was disappointed that it turned out to be vague mutterings of gloom and doom about the new approaches to systems analysis and the difficulties in using them. Unfortunately, Townsend has not said which approaches suffer from which fatal flaws and I am afraid many people may have been left with the feeling that none of the approaches he names support the whole systems analysis job. Even their staunchest supporters do not make that claim. And yes, people have been overly evangelical in selling the new approaches and they have ended up being misused. But this is a problem of too little education, not a fault of the approaches.

All the analysts and dp managers who started the article with a gleam of hope have probably by now gone scurrying back to the trenches reinforced in the belief that these techniques cannot help them in their special situation. Because, after all, they are involved in applications "so advanced that none of these techniques will be sufficient."

That's a shame, because the truth of the matter is that the application development process is not so unique after all. In fact, these techniques can be applied effectively to many different problems. Mistakenly, Townsend equates the techniques, whereas, for the most part, they address different facets of the analysis process and are, in many cases, complementary.

It's quite true that no one of these methods is the whole answer—there are many, many tasks in systems development but they do provide teachable and consistent ways to tackle important parts of the job.

Systems analysis will not remain an arcane art. It is becoming a professional trade, and enhanced versions of the methods Townsends lists will be in the tool kit we'll be using five years from now. Based on sound principles, these techniques are examples of the formalism necessary to render analysis more scientific. Furthermore, their increased use, evolving towards de

facto standards, will encourage the market to develop the automated tools directed to achieving the productivity gains in development we so desperately need.

ANTOINE MALONEY
Montreal, P.Q., Canada

SWIFT RESPONSE

Re: "Race May Be to Swift" (News in Perspective, Nov., p. 62), there are some inaccuracies concerning S.W.I.F.T.: no Eastern Bloc country has yet applied for membership in S.W.I.F.T., therefore making it quite impossible to connect in 1982.

Secondly, I do not know where the rumors in New York have originated concerning S.W.I.F.T. capacity problems. The truth of the matter is that the current three operating center configuration can handle 390,000 messages per day. If one center is disabled, the capacity is cut to 290,000 messages. The board of directors at its October meeting approved the plan to order and install the necessary equipment to triple two operating centers as discussed by Mr. Kok. We do not expect to have a peak day of about 290,000 messages until late 1981.

Also, the entry fee to join S.W.I.F.T. is 1.5 million Belgium francs or about $50,000. This is well above the $7,800 the article quoted.

The Fed Wire is the only Interbank Fund Transfer System—other than moving cash—in the U.S. S.W.I.F.T. is a communication system transmitting information and instructions between member banks. It is doubtful that the Federal Reserve System would want to become a communication system such as S.W.I.F.T., BankWire, telex, TWX, or the U.S. mail. Their scope of controlling the U.S. money supply is best served by their funds transfer capabilities.

Finally, the major U.S. banks dealing in international business are already members, or have already expressed an interest in joining S.W.I.F.T. The U.S. banks which are continuing to watch for more S.W.I.F.T. growth before committing themselves, as the Fed spokesperson was quoted as saying, are certainly not actively involved in international banking in those countries served by S.W.I.F.T.

SAMUEL NEWMAN
Senior Vice President
Irving Trust Co.
New York, New York

SCHEDULING, B.C.

Re: "Tools for Profit" (Oct., p. 93), many productivity write-ups contain at least one enormous error. In this article it is: "Before computers, scheduling in a manufacturing company was simply out of the question." My first manufacturing planning and scheduling system dates back to the late 1940s, when the most advanced computing equipment available was the electromechanical calculator. And I am not a pioneer, by far. I went to a university library to find the oldest textbook on the subject: it was *Plant Production Control* by Charles A. Koepke, copyrighted in 1941. I am sure that this was not the first textbook on the subject either, because the "Gantt Chart," basic principle for the scheduling of requirements, tasks, etc. was developed by Henry Laurence Gantt in 1917.

JACQUES BIALEK
San Francisco, California

ALL WASHED UP

Re: "A Responsive Consulting Service" (Readers' Forum, Nov., p. 197), I did get a message from Don to call somebody about memory fragmentation. But I had been out on a long lunch (a going-away party for a person in the next group), and when I got back I was late for a meeting. I stuck the note in my pocket and rushed out. Three days later my wife pulled a soggy, wadded up piece of paper out of the washer and asked if it was important. I guess it was.

WENDELL WONDERLY
Seattle, Washington

OUT OF THE MOUTHS ...

There should be a computer that would teach children. The computer would give you a choice of things to do in the morning and you choose one and then it gives you instructions. When you finish it gives you another choice of things to do.

When you turn it on in the morning, you have a choice of what to do. When you do math a math sheet appears on the screen and when you finish it tells you your grade. After it tells you your grade it puts the grade in the grade file. For spelling the computer would be like Speak and Spell, and will give you your spelling words. For art there is a blank white place on the screen and there is a switch on the keyboard that you can move all around and draw. For a break you can play Adventure.

When the parents want to see what the children have done they would press a button and the computer would show the grade files. When the child needs help he could push a help button.

With this computer you can work at home. When you are sick you don't have to goto school and you can work at home or in the kitchen. You can put the computer on a table with wheels. You can plug the computer into a wall socket.

CHRISTOPHER TEMPLETON
(Age 10)
Santa Monica, California

In the December issue, in "Picking and Perfecting the Packages" (p. 139), we neglected to mention Auerbach Corp., the cosponsor of the executive round table. Without the cooperation and effort of the staff of Auerbach, the round table would not have been possible. We regret the oversight.

CARTOON BY HARLEY L. SCHWADRON

IBM 3276-2 CONTROL UNIT DISPLAY STATION COMPATIBLE

DM3270 only $2395!

COSTS 40% LESS than a comparable IBM unit, therefore, significantly contributing to an overall *lower cost of ownership.*

ECONOMICAL COMPUTER POWER available at locations never before possible. The DM3270 is designed to satisfy requirements for single station stand-alone applications.

COMPACT — 30% SMALLER than the IBM 3270 display station. However, the esthetically designed package maintains a *large anti-glare display screen.*

ADDITIONAL SAVINGS via INCREASED THROUGHPUT. The DM3270 offers concurrent keyboard/display and printer operation. A unique *double buffering scheme* is utilized by the terminal which ensures *continuous page printing.*

ENHANCED PRINTER SUPPORT. The printer is viewed by the mainframe as an IBM 3287, however, the DM3270 provides the system interface allowing utilization of a *low cost non-buffered serial printer.*

BINARY SYNCHRONOUS COMMUNICATIONS (BSC). The unit supports all procedures and concepts with EBCDIC codes and data link communications applicable to the IBM 3276-2.

EXTENDED ATTRIBUTES IBM 3279 compatible — reverse video, field blink and underline.

ADDITIONAL FEATURES include line drawing capability, self diagnostics, a line monitor mode, and 12 key numeric pad.

PROVEN WORLDWIDE. The DM3270 is the newest addition to the *industry standard DM series* of smart terminals.

Call today for demonstration scheduling *TOLL FREE in USA* **(800) 453-9454**

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"A proven competitive manufacturer of smart terminals"

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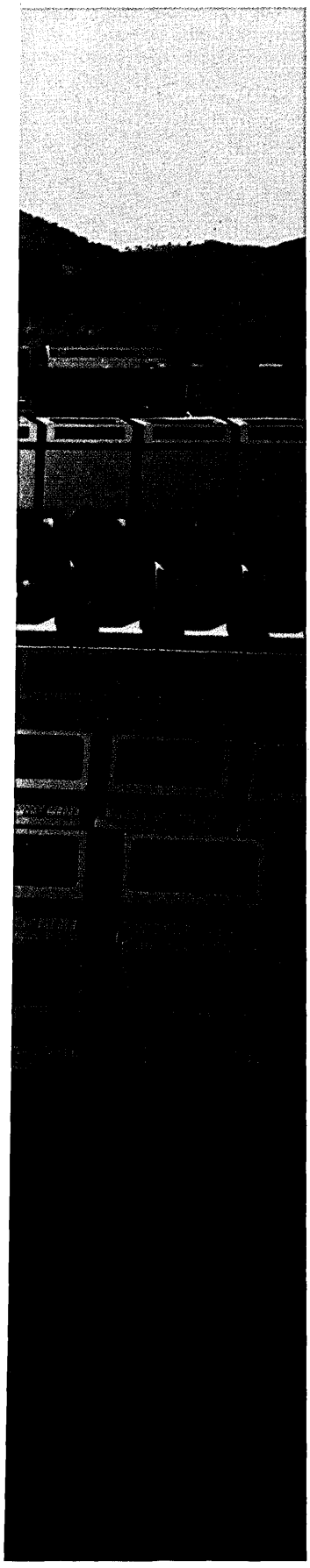
CIRCLE 23 ON READER CARD

Mainframe power.

Announcing the HP 3000 Series 44.

Our newest, most powerful computer supports everything in the photograph, including the new HP 2680 Laser Printing System. And you can take delivery on the computer in just 12-16 weeks.

Small system price.



The new HP 3000 Series 44 extends our computer family's performance range dramatically. For a system price starting at just $110,000.*

It has the power to handle 4 megabytes of memory, 1.9 billion characters of on-line disc storage, up to 96 terminals, 4 line printers, 7 synchronous data-comm lines and 8 mag tapes.

In five minutes, on-line users can access an IMAGE data base 1,560 times to enter or update orders. At the same time, the computer will respond to 51 inquiries into the data base, and generate formatted reports for all of them, with subtotals and totals. In the background, it can compile a 1200-line COBOL program 1.5 times. And read, sort and report a 9,000-record file twice. It will do all this while giving each on-line user a response in an average of 1.5 seconds!**

Six years of compatible software.

The Series 44 continues the HP 3000 tradition of compatibility. So it will run the software developed for earlier models. Or for smaller members of the current family.

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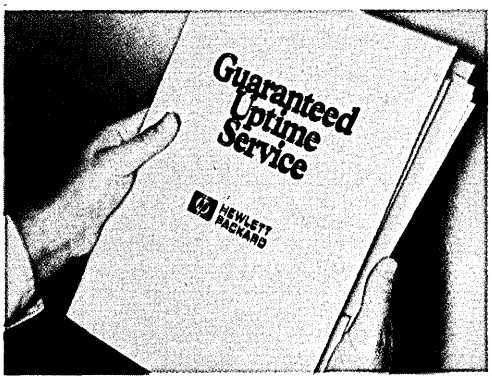

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CIRCLE 24 ON READER CARD

SCIENCE/SCOPE

A prototype of the system that will serve as radar and radio for NASA's Space Shuttle has met its scheduled completion date and is undergoing tests. As a radar, the system will allow astronauts to rendezvous with orbiting satellites in order to repair or retrieve them. It also can track any payloads released from the Shuttle. As a radio, the system will link with the Tracking and Data Relay Satellite System to let astronauts communicate with stations on earth. Hughes delivered the Ku-band integrated radar and communications system, as it is called, to Rockwell International, builder of the Space Shuttle.

Laser designators, devices used by the military to pinpoint targets for laser-homing weapons, can now be tested automatically by a new computerized system. The laser is fired into a collimator to test laser energy output, beam divergence, pulse width, and boresight. Video imagery taken through the eyepiece, along with energy output data, is fed into a computer for analysis. The system, called the Automatic Laser Inspection Measurement System (ALIMS), was designed by the U.S. Army Missile Command to support production of Army laser designators. Hughes converted the design into a working system that is faster and more accurate than performing laser quality tests manually.

A device that scans the sky with heat sensors to detect, track, and identify aircraft and missiles is being developed by Hughes for the U.S. Air Force. The device, an electro-optical threat sensor, could be used with ground, ship, or airborne fire control systems. The sensor holds several advantages over conventional radar. It emits no telltale radiation of its own, it is small, and it can search a wide area rapidly. A signal processor extracts the target signal from the background radiation and feeds this data to a computer, along with the target's relative bearing. An interrogation unit then uses additional sensors to classify targets further. The computer processes the information to classify each target by type and lists them in order of priority.

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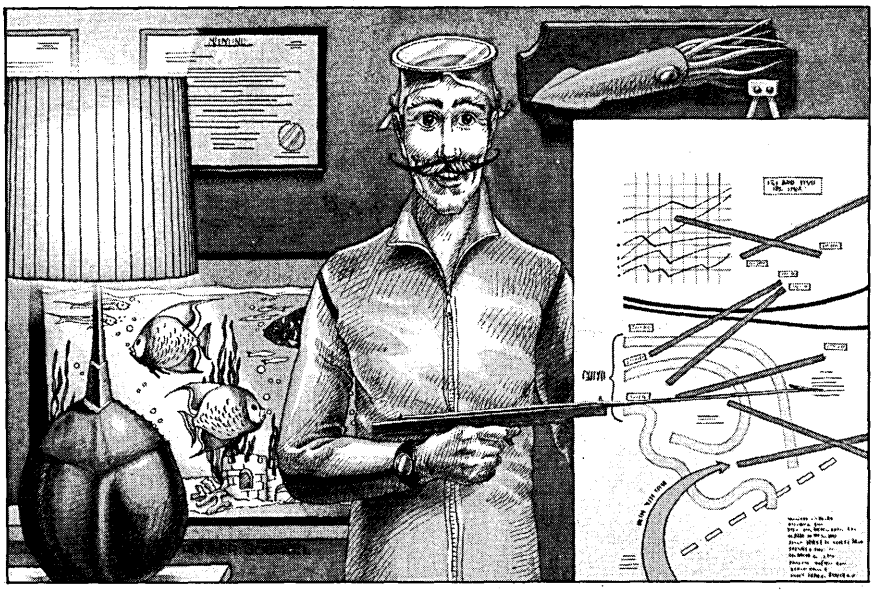
Smart weapons of tomorrow will rely on sophisticated algorithms to pick out their own targets and aim for the most vulnerable spots. The new weapons, like the Wasp anti-armor missile that Hughes is developing for the U.S. Air Force, will incorporate densely packaged electronic components and new low-cost, compact signal processors. The Wasp's automatic target selection will free pilots from time-consuming target detection tasks, thereby increasing weapon delivery rates. Also, the "fire-and-forget" capability reduces the need for close approaches to the target, thereby decreasing pilot exposure to enemy defenses.

EDITOR'S READOUT

MELON AND THE MATRIX MAN



Responding to an urgent phone call from our old friend Persiflage Melon, noted management consultant and amateur ichthyologist, we found ourselves braving the cold of a gray Manhattan winter morning to visit his midtown offices.

Melon, eyes aglow and mustache bristling, greeted us effusively. "Have you noticed the new motif?" he inquired, sweeping one long bony arm to encompass his entire office.

It was hard to miss. Given to periodic fits of redecoration, Melon had chosen this time an underwater theme. A rather large stuffed squid eyed us balefully from the wall above his desk. Aquariums crammed with exotic fish bubbled in the corners of the room, and a bust of Jacques Cousteau graced his desk. Melon himself was dressed in an orange wet suit and was toying idly with a spear gun.

It has a certain salty charm, we answered vaguely. But what is that large draped object?

Melon strode briskly (a rather difficult feat in swim fins) over to a large easel, upon which rested a huge piece of poster board covered over with sailcloth. "This," said Melon dramatically, "is the reason I called you over today. Once more my clients have asked me to rummage about in your computer industry and bring order and logic out of confusion and chaos."

Lifting the edge of the sailcloth in a tantalizing manner with the tip of a spear gun, he said, "Here are the results of my research. This details in graphic splendor where the dp manager's job is now and where it is going given the extraordinary changes taking place within the computer industry. "It is," he said modestly, "a masterpiece."

With a flourish, Melon removed the cloth to reveal a chart that looked like a cross between a Jackson Pollock painting and a spilled load of lumber. Multicolored lines moved in every direction; labels, explanations, footnotes, and legends were scrawled across the surface like subway graffiti. The effect was overwhelming.

What, we exclaimed, is that?

"I knew you'd be impressed," said Melon. "Here," he said, indicating a curved orange line with the spear tip, "is a representation of the dp manager's level of responsibility plotted against corporate revenues. And here is how his job is changing with the influx of minis, distributed processing, data communications, and the like. This section shows how the members of our survey sample reside within their corporations—how many report directly to the president, how many to the controller, etc.

"And of course, we had to plot all this by generation. I mean, there are the older techweenies who can't adapt," he said, pointing to a gray line. "Here are the '60s B-school grads, and here the young Turks who know less about the technical stuff but identify more with corporate goals.

"Now these," he continued, pointing to a series of azure lines, "are the paths to the future for the aware dp manager. You'll notice how this one wiggles, this one droops this way, and this line turns back on itself in . . ."

Wait one minute, Melon, we interrupted. No one can make any sense out of the variegated mess you have here. Do you really know what the dp manager's job is going to be like?

"Well I can make a pretty good guess," said Melon. "As languages get more friendly and the technology spreads, his job will become more of a staff function. He'll set up and install standards, support the corporate database, be involved in data communications nets, and act as a technical consultant on the purchase and procurement of dp hardware and software. He'll have some other jobs, but that's basically it."

Then why not just tell your clients that, instead of presenting this convoluted catastrophe of a chart which no one can possibly understand but you? we asked.

Melon was so aghast at this suggestion that he accidentally discharged the spear gun, neatly impaling a horseshoe crab that had cleverly been made into a lamp. Recovering, he fixed us with a stern eye and asked, "Have you ever been a consultant?" We admitted we had not.

"Should you ever consider the freelance life," Melon intoned, "remember this rule: the main thing is not just to deliver a splendid end product, but to deliver a splendid end product *that automatically requires a follow-up contract*. This magnificent matrix," he said, tapping the chart, "will mean at least two more years of consulting, not to mention book royalties, conference speeches, and the like."

Melon, we said, pulling on our coat, you can be unscrupulous.

Melon gazed around his aquatic office with obvious satisfaction. "True," he said, "but then how else could I afford anything as magnificent as this?"

ILLUSTRATION BY PONDER GOEMBEL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Ann
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IN FOCUS

CDC'S SCRAPPY CHAIRMAN

A pioneer still trailblazing new paths in the dp realm, Bill Norris is the industry's resident mover and shaker.

Where are they now, those titans of the early computer industry? A few have gone on to their final rewards and a few have gone on to justly deserved retirement. But like proverbial old soldiers, they never seem to die; they just fade away from the computer industry.

Thomas J. Watson, Jr., long gone from IBM, has been serving as U.S. Ambassador to the U.S.S.R. Former IBM chairman T. Vincent Learson is in the insurance business in New York. Fred Brooks, the father of the 360 family, has been in academia in North Carolina for more than a decade. Max Palevsky, settled down after manic flings with Hollywood, politics, and publishing, dabbles with a company now and then, but for all practical purposes he's retired from the computer industry.

Conspicuous by his continued presence in the dp industry is, of course, Control Data Corp. chairman William Norris. Never accused of being a shrinking violet, Norris continues to occupy a strong position in an industry he and a handful of other pioneers launched after World War II. He is the industry's resident mover and shaker.

Norris resembles a whirling dervish. His legendary work schedule is still maintained, even though Norris will celebrate his 70th birthday this summer. He still arrives at the Control Data Tower on the outskirts of Minneapolis at 7:30 a.m. every working day. The moving and shaking begins shortly thereafter as Norris, still the intellectual catalyst at Control Data, inundates staff members with material he has read the night before.

"I've been more of an implementor than anything else," said Norris in a recent interview. He is, of course, also part entrepreneur, part engineer, and part captain of industry, but he favors the implementor label over the others.

What is he interested in implementing? The question brings forth a dizzying cascade of ideas ranging from a new campaign to open a chain of nationwide computer stores aimed at attracting small business, to building CDC's computer ties to Eastern Bloc countries.

A Bill Norris manifesto for doing something is usually prefaced with an overriding problem. These are generally situations in which necessity is the mother of invention. Thus, during the 1960s, when the nation's inner cities were burning, a CDC City Venture program to bring plants to inner city poverty areas was created. The U.S. educational system, in Norris' eyes, is a disaster. So, to improve it, CDC developed the Plato computer-based educational system. The country's medical care system, also in bad shape, likewise spawned the CDC preventive medicine program called "Stay-Well."

But, after all, CDC is still a company in the computer industry and, just as you can't talk about heaven without talking about God, you can't talk about the computer industry without talking about IBM.

"IBM really hurt us," said Norris, becoming subdued at the mention of the computer giant's name. "We couldn't get an order for almost a year." He was referring to the antitrust charges leveled by CDC against IBM. CDC claimed that during the 1960s, IBM had announced "paper machines" which it couldn't deliver on time, causing Control Data to lose a huge amount of business.

But the pugnacious Norris perked up when discussing the final settlement CDC won from IBM. Wall Street put a price tag of $100 million on the agreement, but Norris says it was worth a cool $1 billion, primarily because Service Bureau Corp., which IBM ceded to CDC as part of the deal, was worth far more than was realized at the time of the 1973 settlement.

"I had a figure in my mind of $1 billion," said Norris. Vin Learson, IBM chairman, "kept telling me SBC was worth half a billion dollars. I said he was one-half right." At any rate, Norris noted that SBC had established a leading position in time-sharing and data services, and that IBM had "fantastic people talent" in the operation. Norris remembers vividly the negotiations with IBM.

CDC's decision to bring the antitrust case against IBM was one of the best management decisions it ever made.

One day, during the heat of pretrial deliberations in the CDC-IBM case, Learson called Norris at his home around dinnertime. A few months before, there had been some perfunctory cocktail lounge feelers between the lawyers, but this was different: the chairman of the board of IBM called the chairman of the board of Control Data, wanting to settle the case. Norris recalled that Learson insisted on confidentiality, so the two men met in a hotel in Omaha where Learson was registered under a fictitious name.

"Learson did most of the talking," according to Norris. "He said he had something in mind, but it was far short of what I had in mind."

ILLUSTRATION BY DANIEL MAFFIA


WILLIAM NORRIS

IBM first offered CDC Science Research Associates, its educational publishing operation. Norris told IBM he wasn't interested, but then he realized that IBM was serious about settling, so he thought he would try for SBC. He got it.

Norris said the decision to bring the antitrust case against IBM was one of the best management decisions the company ever made. He recalled that after all was said and done, he took great pleasure reminding one member of CDC's board of directors, who had initially been against the IBM action, about his earlier opposition. In settling, IBM denied it had committed any of the charges made by Control Data.

Norris is openly critical about the way other companies have pursued their IBM antitrust suits. Convinced that a key reason for CDC's success in its litigation was the heavy involvement of top management, Norris said he himself had spent "hours and hours" studying the case and the Sherman and Clayton Antitrust acts. He criticized other firms with antitrust suits against IBM for leaving their cases up to lawyers who are often "inept."

There is a scrappy adversarial side to Norris and, as with IBM, he likes his adversaries big. While other industrialists often prey successfully on smaller, weaker firms and institutions, Norris has always derived an almost spiritual strength from dueling with the mighty. Wall Street, for instance, is another big windmill he has tilted at over the years. His troubles with Wall Street go way back to 1946, when Norris and a few others founded Engineering Research Associates to manufacture special-purpose computers. In its wisdom, Wall Street didn't see any investment opportunities in computers.

"We made many trips to Wall Street and we banged on a lot of doors," Norris recalled. "I remember that we tried Glore Forgan. We thought we had a deal with Kuhn Loeb, but it fell through. If there had been a deal, it would have changed the course of the industry."

As it turned out, a financier in Minneapolis backed the company and ERA began making its computers for the government. A few years later, however, the Minneapolis backer sold the company out from under Norris, who felt the investor "was more interested in a fast buck." In that way Norris and Engineering Research Associates were acquired by Remington Rand and merged with the other pioneering computer company of the day, Univac. Norris ended up running the entire division.

A few years later, Norris once again found his operation sold, this time to Sperry Corp. Norris then became chief of the Univac Division of Sperry Rand. By 1957, Norris had had enough, and he formed Control Data. "I'd had a belly full of big companies," explained Norris, who was then faced with the problem of financing the new company. "I didn't want to be funded by the big companies. And Wall Street wouldn't have touched Control Data with a 10-foot pole."

Then began a most unusual effort to finance an American corporation. Norris and the other Control Data founders peddled founders' stock at $1 a share all around the Minneapolis area, in various places, including their own garages. Many of today's Control Data employees remember Norris coming to their high school assembly and pitching the $1 stock.

No one who bought the stock ever regretted it. As Control Data became the premier maker of large scientific computers and as the company diversified, particularly picking up the finance and insurance firm, Commercial Credit Co., CDC stock zoomed. And when Wall Street finally got computer company religion, it did so with a fanatic's zeal. CDC soared to over $500 a share and then settled back when the excessive speculation in computer stocks ended in 1970. Recently, CDC stock traded at $65 a share. As for assets, the firm is valued at more than $5 billion today.

Strangely, despite all his wealth (he is a multimillionaire) and power (Control Data has plants worldwide and has nearly 60,000 employees), Norris has changed little through the years. Until recently he lived in the same modest house in St. Paul that he bought a quarter of a century ago. And when he moved, it was a typical Bill Norris move—to an underground earth shelter. It's said he lives there because he wants to prove that it is possible to live comfortably in an energy-efficient home.

Norris has peppered the Midwest with organizations to nurture small business.

To understand Bill Norris it is necessary to examine his youth in Nebraska. His early years read like a scenario for a soap opera: adversity-ridden, heartrending, but uplifting. Our protagonist, who is a bright pupil at his one-room schoolhouse in Red Cloud, Neb., goes on to attend the University of Nebraska as an engineering student. In 1932, just a few months before graduation, tragedy strikes—his father dies. The Depression, with all its attendant brutality, is under way when the son returns home to attempt to save the family homestead. Tune in tomorrow.

In the next episode, the young college graduate is confronted with a two-year drought. Dust piles up on the farm; the family savings dwindle. Our protagonist, short even on such a basic staple as hay, feeds his small herd of livestock Russian thistles, trying to get the cows through a tough winter. The family now has just $5 to its name. Banks everywhere are failing; in Nebraska, the banks that haven't failed are foreclosing on farms. The Norris cows lose weight. But, miraculously, the Russian thistles work magic. The new calves, not runts or cross-eyed, are healthy. The farm is saved, and our protagonist eventually goes on to pursue his interest in engineering. He takes a job at Westinghouse and later becomes a U.S. Navy officer during the Second World War, building encryption machines. These machines have certain similarities to computers.

Bill Norris will never forget the Nebraska days, even as he rises through the ranks of industry to the heights of success. He keeps the family farm and recently had an irrigation system put in. Never again will a drought threaten the farm. Even as he sits high up in his luxurious and spacious office in the Control Data Tower overlooking the beautiful lakes of Minnesota, Bill Norris' feet will always be set in the Depression dust of Nebraska. All that, of course, is the stuff of which television soap opera ratings are made, but in this case, the story is true.

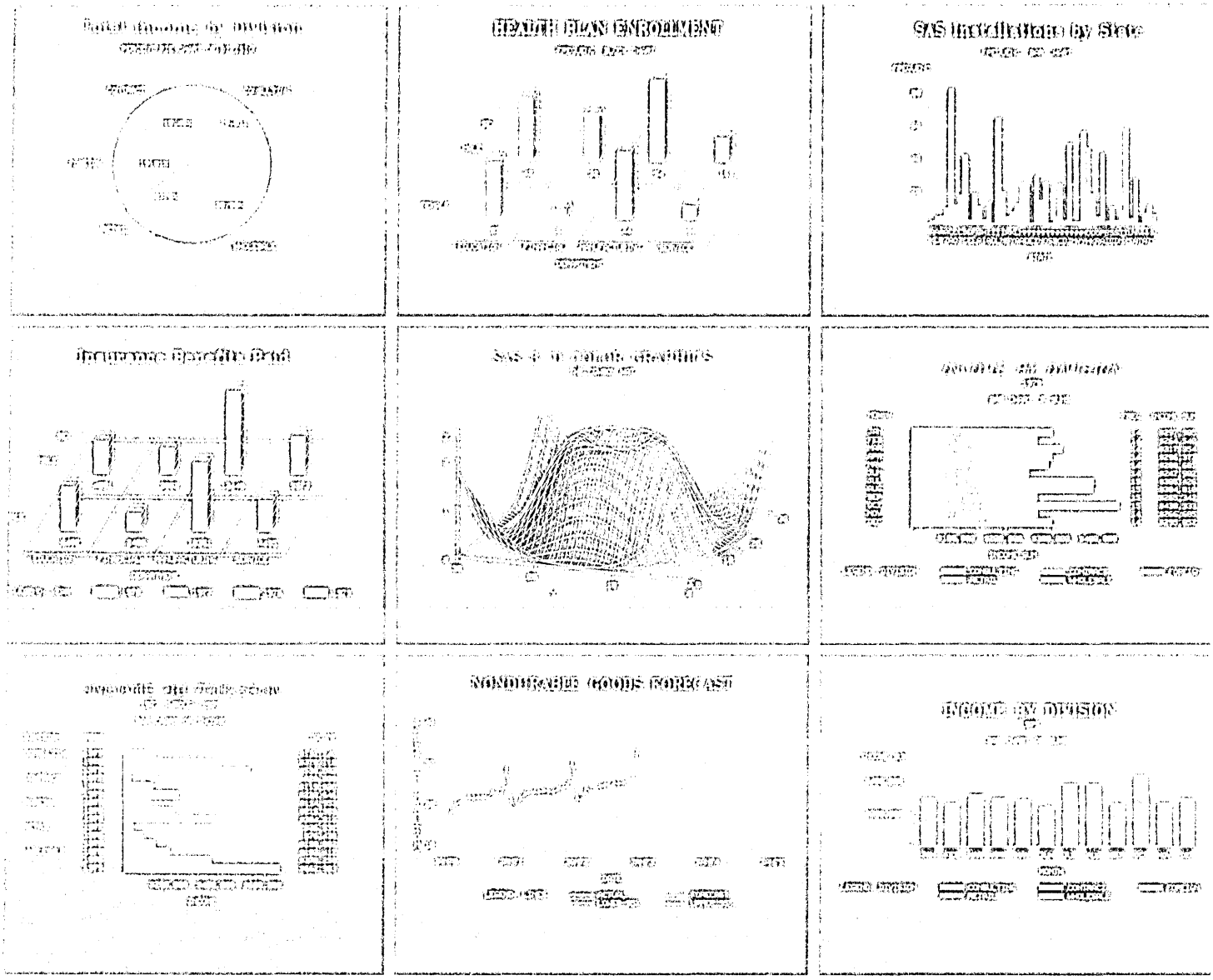
The energetic Norris is an intensely private man, strictly separating his home life from his business life. But with six sons and two daughters and a briefcase always bulging with work, it's obvious that he has kept busy at home through the years with both family and office chores. Norris' twin sister Willa describes her brother as "tenderhearted" and "considerate." That would surprise his business enemies.

Although Control Data has long been a good place to work—CDC is noted for its employee paternalism, generosity, open reception to and support of new ideas—life close to the throne apparently has not always been felicitous. None of CDC's cofounders have survived, or wanted to survive with the firm. But, it should be pointed out, Norris has never been one for cronyism. He measures everyone, including himself, on the basis of the job he's doing.

In observing once that Norris always shunned cronyism, CDC president Robert Price said he believed Norris' early Nebraska years are fundamental to his personality. "His is a personality," said Price, "that could only come out of that rural Nebraska background." Of the Depression years on the Nebraska farm, Norris said simply, "Those were awfully tough days."

Many think it fitting that a new ambitious Control Data program called Rural Venture Inc. is aimed at helping small farmers across the nation. The effort is an offshoot of CDC's highly successful City Venture project.

As part of the program, there have been barn raisings in Minnesota, efforts to farm the tundra in Alaska, irrigation studies in Arizona, and attempts to attract young people back to farming. Not surprisingly, computers have a place in the project, and Rural Venture's managers envision a day when managers can oversee farms and smaller farming projects from afar, using computer terminals.



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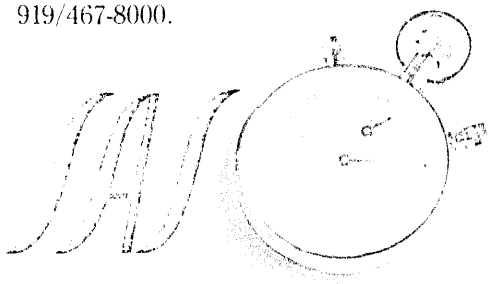


Images produced by SAS/GRAPH with Tektronix 4027, Dunn Instruments 631 Color Camera System and Polaroid film

A fundamental realization of the program is that the small farm, like everything small in America, has been under particular pressure from the bigness syndrome. In recent decades U.S. farms have grown in acreage, more than doubling in size, but have decreased in number, down from 6 million in 1940 to 2 million today. Norris' eternal enemy—bigness—rears its ugly head once again. As is so often the case with Norris, there seems to be in the Rural Venture program as much an effort to annihilate the bigness foe as there is to help the small farmer.

But, what about Control Data itself? With $3.7 billion a year in revenues and growing rapidly, the company is a Goliath in its own right. Can Control Data get too big? "Yes," declares Norris emphatically. "There can be a size limitation. We talk about this all the time at CDC. For instance, we couldn't build this anthill any bigger." The "anthill" is the Control Data Tower, the company's 14-story futuristic headquarters building. And therein lies a telling anecdote, related by CDC senior vice president Norbert Berg, the man with whom Norris has met first thing every working morning for more than 20 years, and the man who is the extroverted eloquent alter ego to the introverted, articulate Norris.

Overseeing the construction project, Berg decided it made good sense to put carpets in the building. Norris didn't like the idea. ("The hell you are!") Berg thought it over, decided he was still right, and this time was able to convince Norris to have the carpets installed.

Berg notes that Norris realizes top management can't exercise the tight control it once could in a small business environment. Therefore, the company has adopted a series of measures and programs designed to retain as much of the small business entrepreneurial atmosphere as possible. "There's an entrepreneurial climate at Control Data," says Berg, "and once people know that management has that interest, then the word gets to us."

Small is beautiful? Indeed it is in the eyes of Bill Norris, the beholder. Norris believes that the great percentage of industrial innovation and the resulting creation of new jobs comes from small business and entrepreneurial environments. Like many other lessons he has learned, Norris came to this position the hard way, as a result of unhappy experiences working for large organizations and of Control Data's acquisition binge during the 1960s. Although the acquisitions helped CDC grow quickly, Norris discovered the firm was also acquiring bureaucracies in the process. Even worse, he found that the chief innovators in the acquired firms left soon after the takeover.

Now, says Norris, when Control Data makes an acquisition, it is generally

Norris' early years in Nebraska read like a scenario for a soap opera.

the acquisition of a product, not the company that designed the product. This approach, he points out, leaves the innovation team intact. Norris has peppered the Midwestern landscape with organizations, committees, and policies designed to nurture the small business mentality he believes is the fountainhead of business innovation. Thus, he helped organize North Star Research to support upper Midwest businesses and the Northwest Growth Fund to finance small businesses. Control Data itself is particularly receptive to employee ideas. There is even investment machinery backed by the company available to employees wanting to set up their own firms.

One example of a Control Data employee who formed his own company is Seymour Cray, a leading designer of supercomputers. When Cray decided to launch his own company, Control Data was one of his early financial backers. CDC's imprimatur was an important early asset to Cray Research, which quickly became the big new force in the supercomputer field. Another brilliant CDC scientist, James Thornton, also left with the blessing of CDC to create Network Systems Corp., already a major mover in the computer data communications arena.

When talented scientists leave other computer firms to form their own companies, it is virtually unprecedented for them to be blessed and financially supported by their former employer; often they are sued, as indeed Norris himself was when he left Sperry Rand to start up CDC.

Norris has also been a backer of cooperative ventures in which smaller firms band together to pool resources to meet the challenge posed by larger firms. For instance, CDC's Computer Peripherals Inc. operation is a peripherals manufacturing troika consisting of CDC, NCR, and the U.K.'s ICL. The arrangement gives the three firms enough critical mass in resources to compete with IBM.

Bill Norris' admirers believe he has created a business utopia, a role model of the free enterprise system at work. But his detracters, and there are some, feel he has occasionally led the firm off on irrelevant and unprofitable tangents.

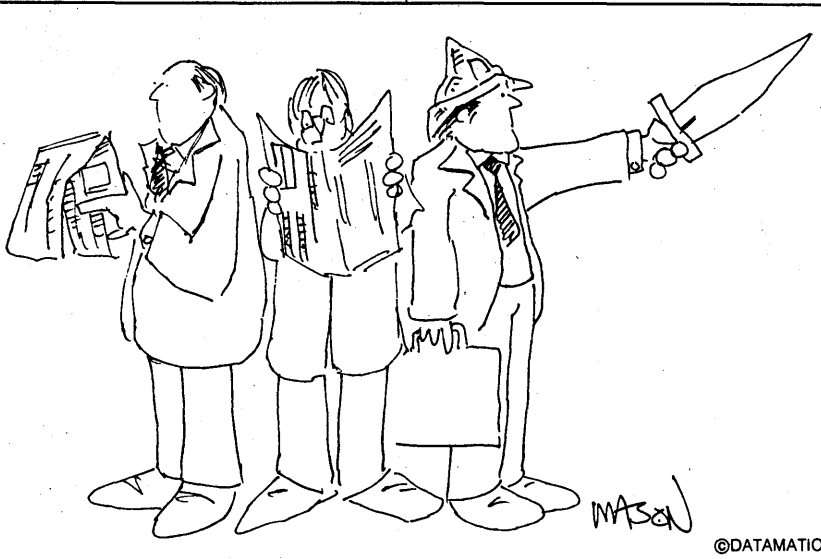
CDC's Plato educational system once looked like the firm's "Viet Nam," with Control Data pouring money—more than $600 million—into what seemed to be a bottomless pit. Moreover, the target date for turning the profit corner for Plato always seems to be extended. Norris now says that Plato will be profitable in the 1983-84 time frame and that some key parts of it are profitable now.

Norris has been particularly aggressive in promoting Control Data's trade with the Soviet Bloc, maintaining that it makes good business sense to trade with the Russians and their allies. Thus far, the venture has been highly unprofitable. When CDC's plan to use Soviet art sales in the U.S. to pay for its equipment bound for the U.S.S.R. collapsed in the wake of an American government embargo on high technology trade with Russia, Control Data sued the federal government. Norris, feisty as always, argues that U.S.-U.S.S.R. relations will be vastly improved in 10 years and CDC will be in a favorable position to do business with the Soviets.

Norris' stance on the Soviet issue is typical; he is adamant and aggressive about all his opinions. Indeed, one of the anomalies about Norris is that today, when he might be expected to begin relaxing a little and enjoying the fruits of his efforts, there is still that air about him of damn the torpedoes, full speed ahead.

—W. David Gardner

Mr. Gardner is writing on assignment for a variety of technical and business magazines, and is completing a book on the computer industry.



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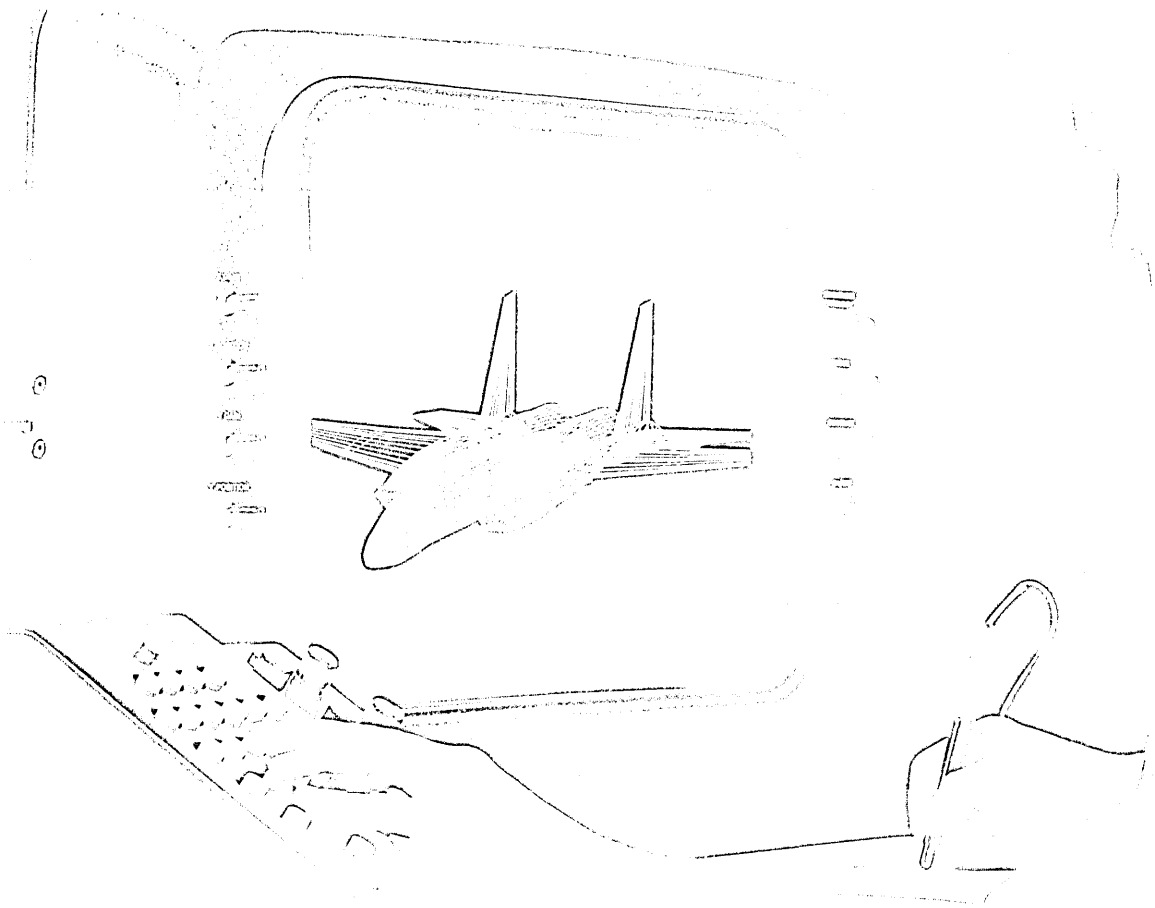

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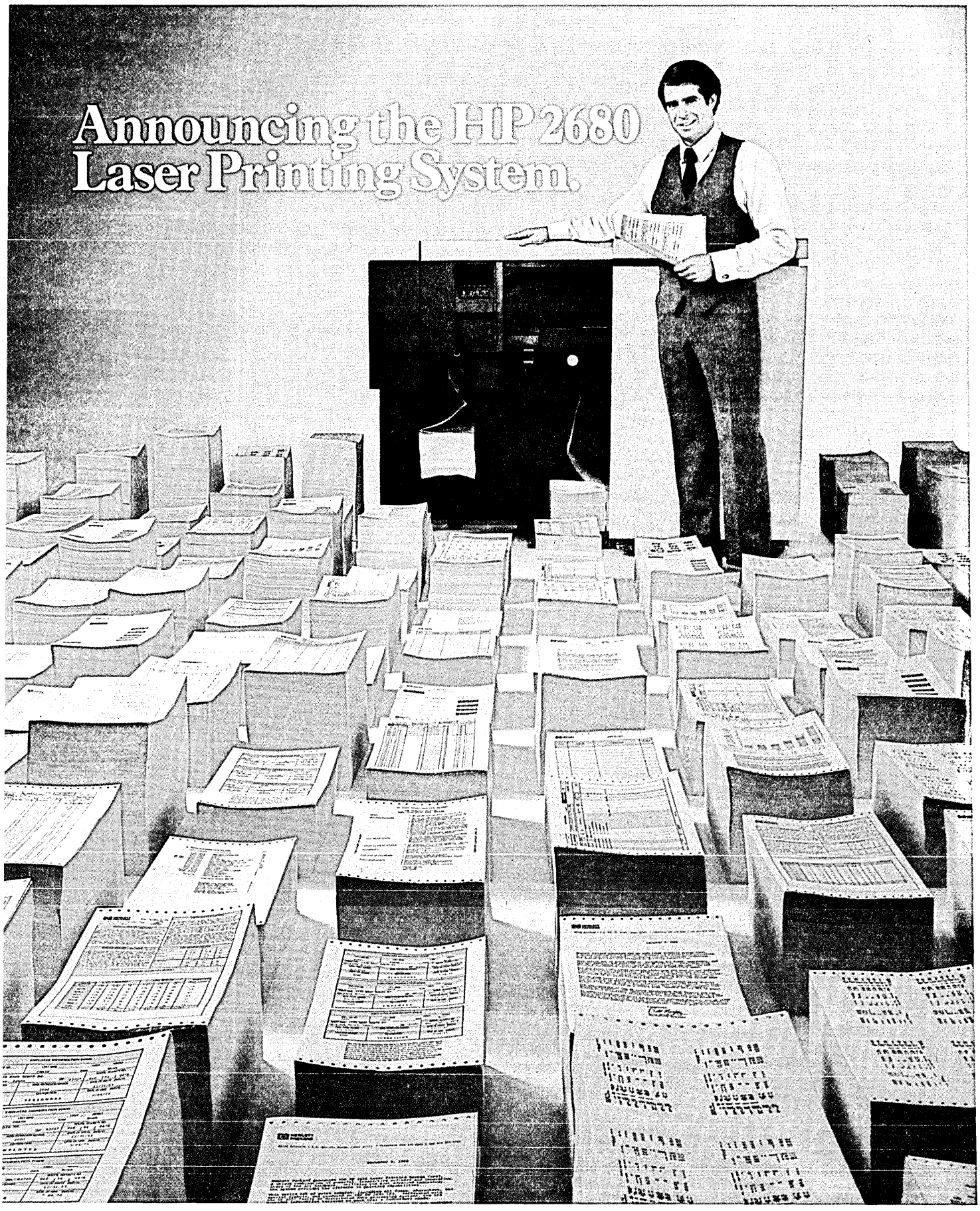

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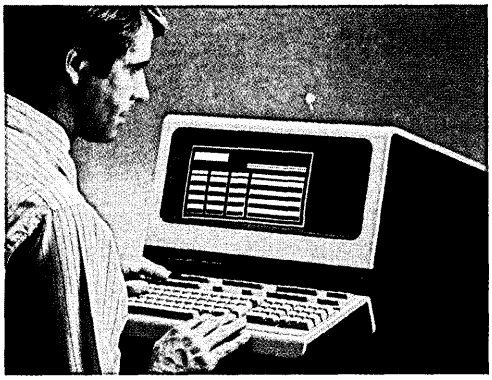

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CIRCLE 42 ON READER CARD

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NEWS IN PERSPECTIVE

MAINFRAMES

WINDS OF CHANGE AT IBM

Watch for the gray giant to replace its aging 3705s later this year with Mirage and Mistral.

Two new computers that could deliver a killer blow to its Systems Network Architecture (SNA) are expected later this year from IBM.

The models are being privately developed in France, ostensibly to replace the company's aging 3705 communications controllers. But for IBM, they have a much deeper meaning. "Our latest intelligence shows that the machines are being developed so that IBM can break from SNA," explained one source close to the company. "The architecture has become an embarrassment to the company."

The machines are being built from IBM's 4300 small mainframe technology. Their internal code names, "Mirage" and "Mistral," are considered unusually appropriate by sources. The latter is a strong northerly wind, both cold and dry, of southern France. "It's like a prophecy," one source said. "A cold wind that will blow right through the company so that it will never be the same again."

The two processors are expected to offer a new kind of interface from IBM, this time based on X.25, the international standard that challenged and finally superseded SNA's own protocol for computer communications—SDLC (synchronous data link control). Rather than the popular exchange of "packets" of data, the new interface is expected to operate as a time demand multiplex link on grounds of economy, one source explained. "With the kind of system they have in mind, it won't matter what protocols you use," he added.

IBM users have been postponing moves to SNA because its proprietary design "locks them in" to an IBM-only approach. Estimates from some experts stress that the most IBM can hope for is that 33% of its users will swallow SNA in its original conception. "The vast majority of IBM users want to get in and out of other networks and other product options," said one observer. "These now all seem to be centering around X.25."

One European banking user summed up the feeling of many IBM customers about SNA: "It seems to be a near dead end. You can't change it enough." He said that SNA's biggest limitation is that it is too centered around large mainframes. "It's difficult to manage just one single point of control, and inefficient to have to route all the traffic through it."

IBM seems to be finding this out for itself with Mirage and Mistral—both of which reportedly have been hit by delays because of software problems. One estimate was that the machines would be announced this June with a 6 to 9 month lead time. But now, the third quarter of this year seems a more likely announcement time frame, said watchers. "The company is having difficulty in reworking the SNA architecture so that host computers can work with the new controllers," said one contact.

The 3705 replacements are long overdue. This nearly 10-year-old system has been juiced up periodically with midlife kickers, but by even the kindest assessments, it is an "antique." According to a study by Strategic Business Services (SBS) in San Jose, IBM is losing "significant" business to such firms as Memorex, NCR/Comten, Codex, Paradyne, and now potentially to Amdahl/Fujitsu with its new software-compatible controller.

Part of the delay has centered around just which technology to use for the 3705 replacements. One early idea was to use the company's 8100 distributed processing system as the heart of the new controllers. The 8100 is seemingly a parallel development with overlaps in functionality. But according to SBS, this approach was dropped on the grounds of cost. IBM couldn't offer a new controller for less than $50,000 with the 8100 technology, according to SBS analyst Rob Elmore. "And this is probably more than IBM's 4300 (or smaller mainframe) users would be willing to pay," he said.

The two processors are expected to offer a new kind of interface from IBM, this time based on X.25.

On the other hand, the new 4300 technology offers the cost advantages of IBM's new circuitry, semiconductors, and packaging, as well as its new thermo conduction modules. With this approach, the best estimate is that IBM could put a controller in the field for as little as $20,000 or $30,000, Elmore suggested.

The other reason for delay has been IBM's dilemma of deciding when, and how much, to break from SNA. According to one IBM competitor, SNA has been the giant's attempt to make computing and communications look like the same business. "That way terminals continue to sell mainframes," he explained. But, according to this source, "If you don't separate them out, you end up with a mess."

One top industry consultant, Philip H. Dorn, said that currently IBM's communications software is so tied in at either

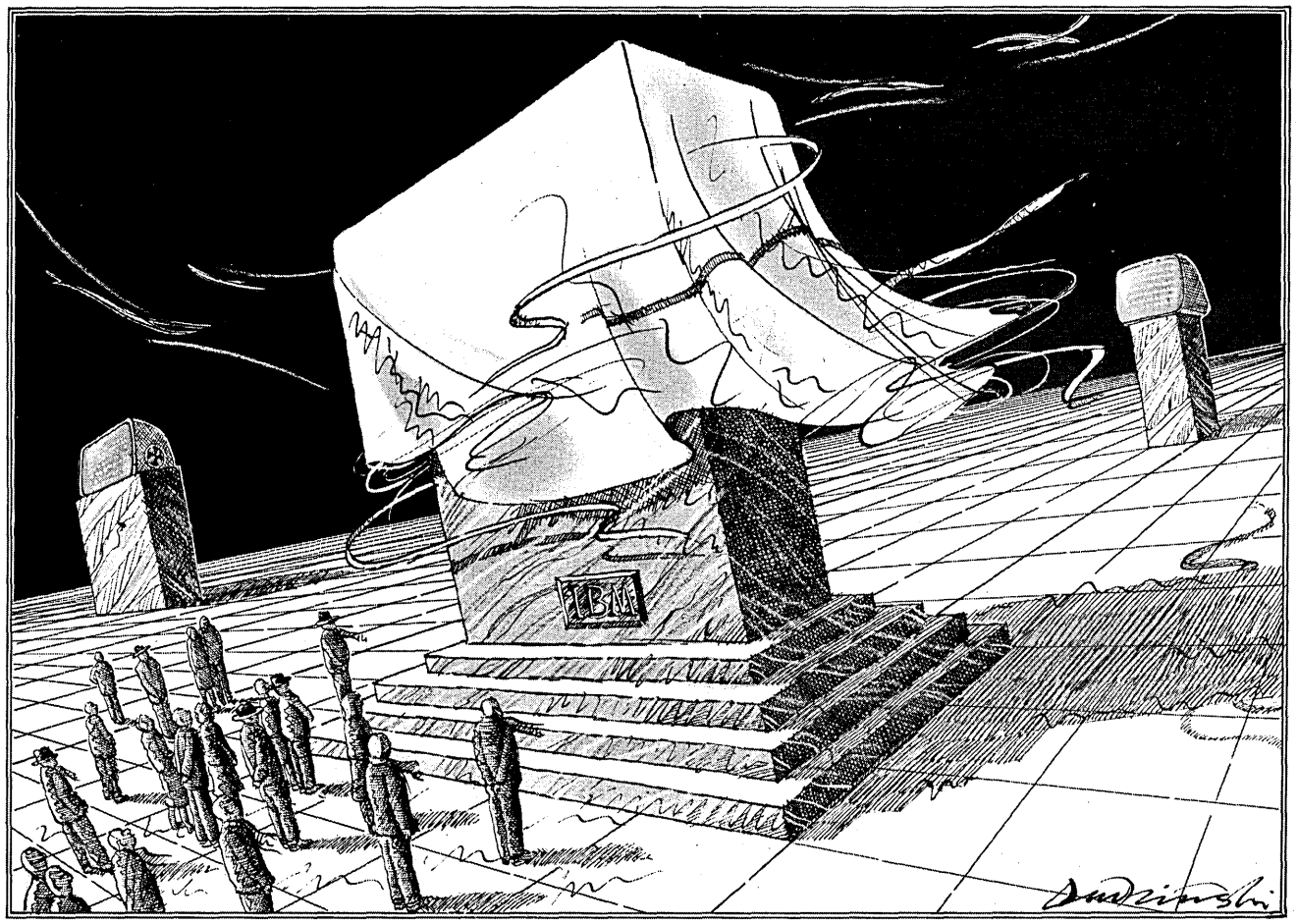

ILLUSTRATION BY ANORZEJ DUDZINSKI

end of the communications link that it would be almost impossible to unravel it. "In order to replace the 3705, you would have to rip this software apart," he said. Dorn added that users "understandably" would rather just plug in an X.25 module or a new box.

IBM has so far resisted offering such a capability. For one thing, it would lead to a whole new plug-compatible market at the front end of its mainframe business. But more importantly, SNA would have to be opened up and its design changed.

Now that X.25 has triumphed over IBM's own contender, SDLC, as the international standard, the company can resist no longer. Nor can it delay the introduction of a replacement for the 3705, say the experts.

Much of IBM's competition expects the mighty mainframer to adopt a two-pronged approach to the 3705 replacement, mainly because its users are very skittish about changing their communications systems. "As well as the new X.25 capability," said one competitor, "IBM will certainly support a 370 I/O interface to preserve continuity until the H series takes off."

Thus, the feeling is that IBM will become very devious by merging its front-end and central processor functions into an integrated system in maybe two or three years' time. By then, say sources, the onus will have swung from the central computer to the communications controller.

One good reason for this shift of emphasis, say observers, is that IBM has fallen behind in the state-of-the-art on mainframes, and wants to switch the scene of the battle to the front end and to software and support. But the key reason is that rather than computing absorbing communications under the SNA standard, as IBM had hoped, the opposite has occurred, and computing is being absorbed into the communications business.

"The important thing to remember," stressed one IBM watcher, "is that when IBM announces the 3705 replacements later this year, it will be as a communications company."

Rather than appear as if the development was forced upon it by a shift in the industry, IBM will probably make it look as if it is acting purely on its own initiative, and that the move is purely mainframe related. "Don't be fooled," said one source, "the signs are clear."

In recent months IBM has talked repeatedly about making SNA more "user friendly."

"When they start using terms like that," said one observer, "you know that some big customers have been doing some real arm-twisting."

—Ralph Emmett

COMMUNICATIONS

DIGITIZED VOICE AT WORK

Time and Space Processing is ready to launch what may be a breakthrough in digitized voice systems.

While industry spokesmen speculate on the glowing potential benefits of digitized voice, a small California company this month will launch a breakthrough system.

Time and Space Processing Inc. (TSP) has had an operational 2,400 bit/sec digitized voice system for about a year and a half that has been sold mainly to military and oem customers. With good recognizable audio at the lower data speed (a key problem in such systems), the model 100 digital telephone has now been upgraded to format its digitized voice data into standard Binary Synchronous Communications protocol.

Previous digitized voice systems

used unique protocols that were not generally compatible with existing data communications formats. Thus, the addition of bisync means it will be much easier for users to integrate digitized voice into operational data transmission systems, according to Ken Krechmer, vice president of marketing at TSP. As he sees it, compatibility with data communications standards constitutes a major step toward storing digitized voice messages (telephone calls) into cpus.

While the storage of digitized voice in computers is coming closer to being realized, the technology still has a long way to go if users want their mainframes to recognize and process the information, he said. It is now possible to treat a digitized voice message as a group of digital bits, but the actual processing of information means that all the myriad characteristics of human speech would have to be recognized by the

While the storage of digitized voice in computers is coming closer, the technology still has a long way to go before cpus can recognize and process the data.

computer, and we are still five to 10 years away from that point, Krechmer believes.

Nevertheless, some significant economies can be achieved with the present system. While a conventional analog phone line can handle only a single conversation, a similar link with digitized voice can handle up to eight conversations at once. As soon as the voice is translated into digitized form, it can be multiplexed and transmitted in the same way as any other data is normally transmitted over a data communications line.

The model 100 digitizer, which is the major element in a TSP digitized voice system, is a microprocessor-controlled system that relies on specialized software and uses a mathematically oriented technique called linear predictive coding to get good voice quality at 2,400 bit/sec.

The bisync-compatible digitizers cost about $12,000 each or $25,000 per end-to-end link. While that may sound expensive, there are some significant cost savings, especially for international phone users. A New York-to-London line costs about $10,000 per month, so the capability to digitize the traffic, together with multiplexing to boost the number of conversations, would allow an overseas user to pay for the system in only three months, Krechmer estimated.

Of course, when digitized voice traffic is added to operative data lines already that are not used 24 hours per day, the savings are also significant, since there are no extra line costs. At present, domestic U.S. users cannot enjoy such economies because typical coast-to-coast tariff rates are much lower. But Krechmer sees this changing rapidly. The demise of Telpak discounts for large business users, the impending AT&T rate hikes as Ma Bell prepares for competition, and such factors as investment tax credits and depreciation mean that digitized voice as an alternative to conventional phone lines looks more and more attractive, he said.

Many large users of national networks are also experiencing delays in getting new line facilities from the phone company, and this can be overcome with digitized voice add-ons to existing data links.

While TSP is gearing up to explain the benefits of its system to users, there is still some question as to whether digitized voice should be regarded as a data communications or telephone operation. Krechmer sees a combined answer to this question. He points out that the cost savings must be justified by comparison with telephone rates, while the actual implementation must be handled by data communications staffs.

TSP expects to install about 160 of the bisync digital voice systems in 1981, and the company has been talking to front-end suppliers about providing the necessary software to allow users to transmit digitized phone calls directly to a cpu. One of the most attractive applications for the digitized voice system is in high-volume telex operations, where a user can get immediate cost benefits, he explained.

The model 100 works well in satellite and all-digital systems such as AT&T's Dataphone Digital Service (DDS). And for now, the TSP system has direct competition from "absolutely no one, amazingly enough," Krechmer claimed.

—Ronald A. Frank

MAINTENANCE

SUPPORT COSTS SOAR

The onus for hardware and software maintenance is on the user.

With the high cost of support, and no easy remedy in sight, computer users will have to take on more of their own hardware and software maintenance, a recent study finds. The vendors, for their part, will have to build into their products more diagnostic maintenance tools that users can work with.

The cost of maintenance is said to comprise from 30% to 40% of a user's data processing budget, about on par with the user's monthly hardware budget. And it appears the maintenance portion is growing faster than the hardware expenditures, says the study by Strategic Business Services (SBS) in San Jose, Calif.

For the hardware and software vendor alike, the most significant factor in the escalating cost of providing service is the rising cost of labor. This, of course, prevents most software vendors from providing local support and makes hardware vendors search for ways to avoid it.

Bob Puette, general manager of Hewlett-Packard's computer support divi-

When rating support factors, users put up time at the top, cost at the bottom.

sion, says he sees some willingness on the part of customers to do some of the diagnostics and hardware maintenance, such as swapping boards, but only among the scientific/technical user community, those engaged, say, in manufacturing or R&D, "where people actually have some in-house capability." But among users of the HP 3000 business dp systems, he adds, there is no such interest. According to Puette, these users include customers willing to return faulty units such as terminals and other smaller products to a depot or nearby repair center. These users can keep spare units on hand for just such exigencies.

One of the big costs of providing on-site support is, according to Puette, the CE's travel time, which occupies about 40% of his time. "So, if you can save that amount of time, you can reduce your support costs." And a customer with, say, 30 terminals can be shown that it pays for him to keep spares on hand and to send faulty units back. Most customers, he observes, are willing to take that saving.

But HP last year surveyed more than 3,000 of its customers, users of both its so-called technical and business computers, and asked them to rate the relative importance of several support factors. They put up time at the top, as being most important, and cost at the bottom. Up time is seen to rate some 10% above several factors that are jumbled together, such as repair time, CE response time, and phone response time. Cost is not only of least importance to these users, but it is seen to have only about 55% of the importance of up time.

For hardware makers, the one factor that has enhanced the maintainability and availability of systems has been improvement in the technology. As that technology has advanced, reliability has gone up and cost-per-function has come down, thereby making it economical to add redundant circuits and to include features that improve availability. But eventually this, too, catches up with users, for the cost of each increment of availability becomes more and more expensive. Says the SBS study,

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"Going from 70% to 80% availability is much cheaper than going from 99% to 99.5% availability for the same hardware."

Improvements in technology, however, are also said to have an exacerbating effect. They lead to more complexity in some systems; this calls for more training of service people. It now costs about $50,000 to train a service person on a large system.

People costs are also paramount in the pricing of software maintenance, for vendors are finding that maintenance for a system comprises from 350% to 450% of the original development cost.

"Vendor software maintenance is likely to be the area which provides the greatest short-term economic impact for users," the SBS study states. Here, users will begin to see vendors charging for local maintenance of software. "That is, for the ongoing availability of maintenance tapes and upgrades," the study says, the user will be required to pay a separate fee.

On average, it is foreseeable that the user's cost for software maintenance on a per-product basis will go up comparable to his hardware maintenance costs. "However, the user should expect to see the number of software maintenance items which are charged for on either a local support or availability basis increase for the next three to four years at about 100% per year."

—Edward K. Yasaki

PERIPHERALS

THE STREAKER IS BACK

DEI has come up with a new meaning for the word "streaker"—a stripped-down streamer.

In the mid-'70s, everyone knew the meaning of the word "streaker." Today the term has an altogether different meaning, at least at Data Electronics Inc., San Diego, Calif. And while it still involves stripping, DEI's streaker is a stripped-down streamer.

The streaker developed by DEI is an oem digital cartridge tape drive that is suitable for streaming backup of Winchester disk drives. It is a stripped-down version of the company's streamer drive based on a streaming concept endorsed by IBM with its introduction of the 8809 streaming drive.

Streaming, explains DEI's marketing vice president, Sam Thompson, is nonstop recording and/or playback. Data is transmitted between the tape backup system and the Winchester disk in a continuous stream with no starts and stops.

Streaming is available in both one-half inch and one-quarter inch tape versions. The one-half inch versions maintain IBM compatibility. This requires interblock gaps and cuts the usable capacity of the available drives from 46 megabytes to about 37 megabytes, Thompson said. Digital cartridge one-quarter inch tape drives, he noted, do not typically have this limitation. "Therefore, by eliminating interblock gaps, they can make more efficient use of the available tape."

Thompson said market surveys generally indicate that 110,000 Winchester disk drives with capacities of under 200 megabytes will be sold in 1981. "Of these, 70,000 will be under 30 megabytes and about 20,000 will be the new 8-inch variety." That's the market DEI is after.

DEI expects to do $15 million in business this year.

DEI got into the disk backup market almost without knowing it. The company was formed in Pasadena, Calif., in April 1974 to produce one-quarter inch 4-track parallel tape drives. In 1976, at a Mini-Micro show in San Francisco, it signed a contract for a quantity of these to go to BTI, Inc., Sunnyvale, Calif. "The application

Now you can watch your four favorite programs...

The new HP 2626 display station will give you a view of your computer system you've never seen before.

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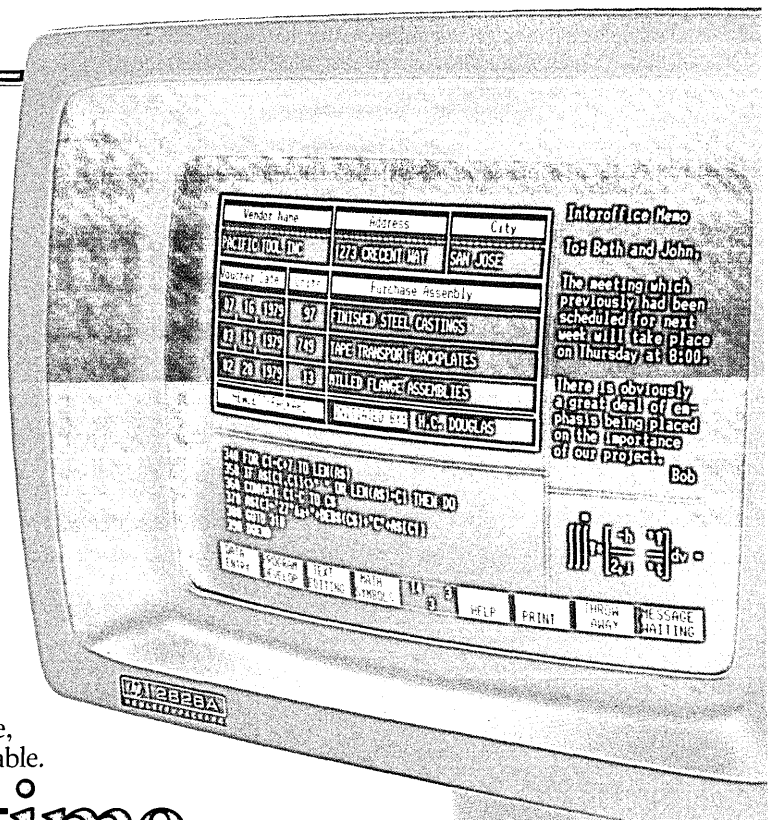

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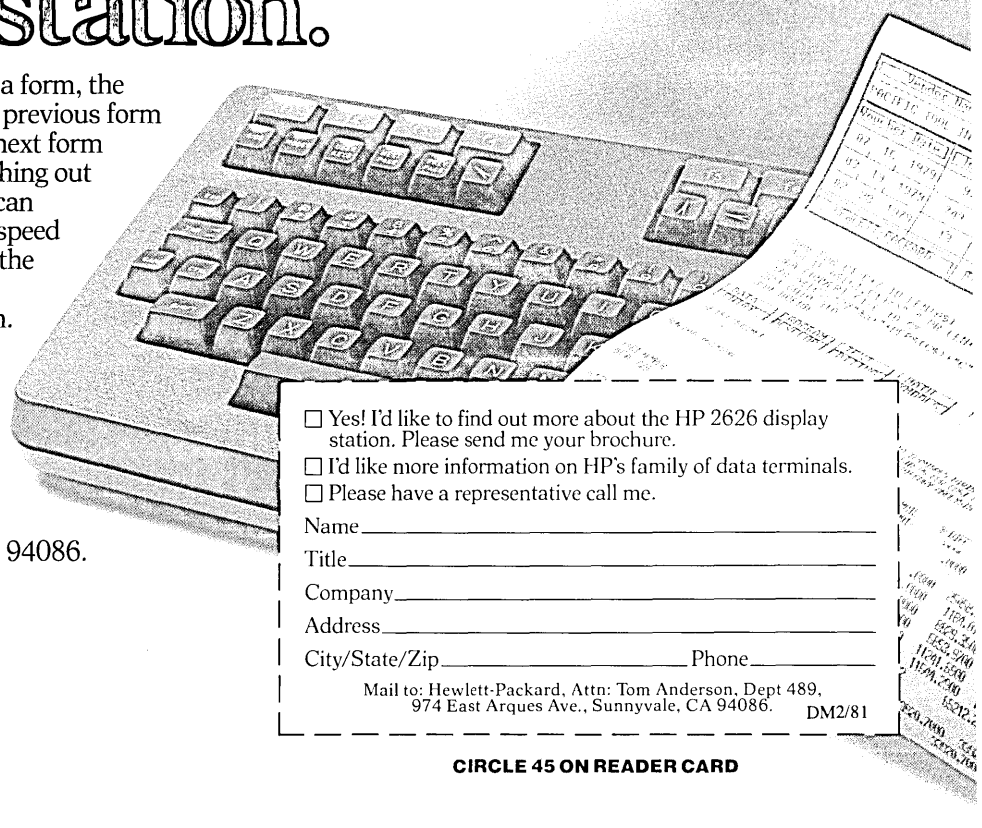

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CIRCLE 45 ON READER CARD

was backup, but we didn't know it," recalled Hal Georgens, DEI president. DEI both licenses and sells its drives. In addition to BTI, its larger licensees include NCR and Basic Four.

Thompson said the company serves three separate markets: first, the people in the small business marketplace; second, the petroleum and geophysical exploration marketplace; and third, the military. But the backup market is the growing one.

"Small Winchester disk drives are now being configured to fit the same size enclosure as a conventional 8-inch flexible disk drive," said Thompson. "It is convenient if the backup device is no larger than the Winchester drive. It is even nicer if the backup device fits the same mounting configuration as the Winchester drive. New small streaming digital cartridge drives meet this objective. The one-half inch streaming tape drives are inherently larger."

Thompson explained that streaming tape drives work best when the transfer rate of the tape drive is closely matched to the transfer rate of the host system during backup. DEI's streaming drives are available with a choice of transfer rates—1.67 megabytes per minute or 5 megabytes per minute.

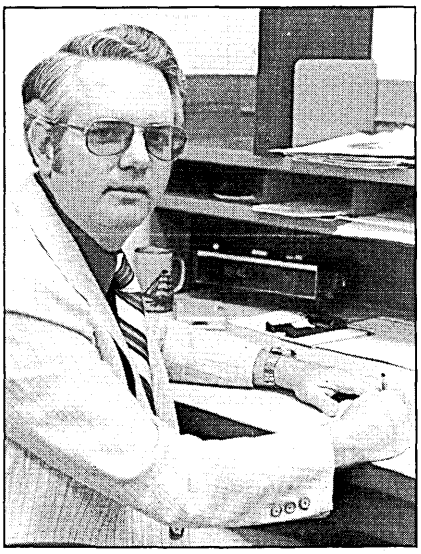
In addition to licensing its drives to computer manufacturers and systems integrators such as BTI, DEI sells directly to oems and through dealers. It recently completed an arrangement with Shugart Associates, Sunnyvale, Calif., and Hamilton/Avnet, a Los Angeles based distributor, whereby a backup drive it renamed the SA 1190 can be had along with Shugart's SA 1000 8-inch Winchester disk and Hamilton/Avnet's SA 1400, a jointly developed disk drive controller. The joint-venture controller was designed for Shugart and DEI by Data Technology Co. of Santa Clara, Calif.

DEI's next step after developing its 4-track parallel drives was to go for high density. "We were the fourth company to have high density, after IBM, Storage Technology, and Telex," said Georgens, "and our job was harder." The other three companies achieved a density of 6250 bpi with large units. DEI went for 6400 bpi on cartridge drive. The American National Standards Institute (ANSI) is circulating a recommended high-density recording format, "and it's ours," said Thompson.

The high-density recording format recommended by Ansi is DEI's.

Georgens noted happily that other companies (he mentioned Quantex, Tandberg and Kennedy) are beginning to come out with drives they claim are DEI-compatible. "For a while our sales were limited by the fact that there was no second source. We're even talking license to another company to produce a DEI look-alike."

Georgens sees tape as being somewhat analogous to keypunches. "Tape is dying on a rising sales curve. Keypunches



SAM THOMPSON: "We had to automate with the streaker and streamer to keep costs in line."

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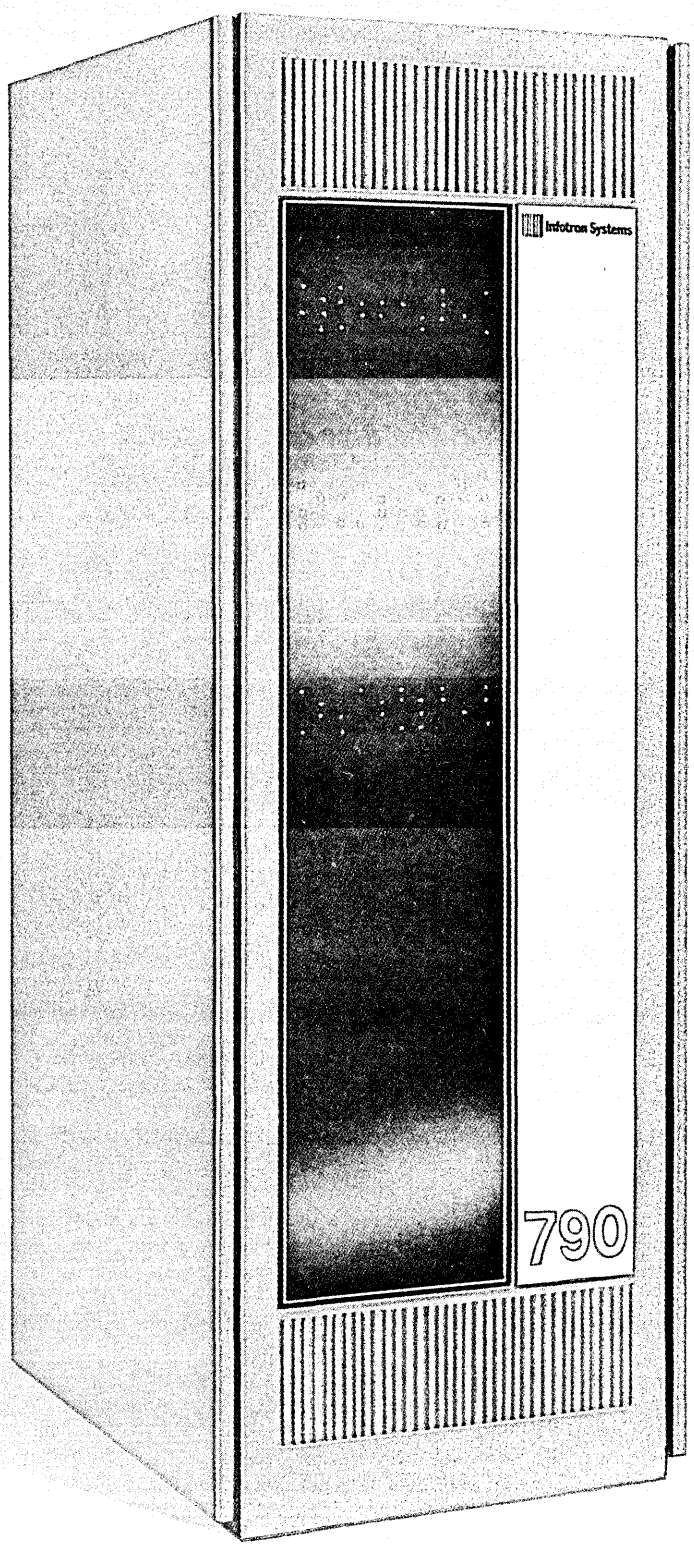

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HAL GEORGENS: "We're even talking license with another company to produce a DEI look-alike."

have been dying on a rising sales curve for 20 years."

DEI expects to do $15 million in business this year and is getting into automated production for its streamers and streakers. A year ago, the firm moved its headquarters from Pasadena to San Diego, where it set up its automated production facility. The automated line was developed with help and advice from Shugart, which had automated earlier.

"We had to automate with the streaker and streamer to keep costs in line," said Thompson. Production of DEI's traditional drives, which is labor intensive, remains in Pasadena.

Thompson is happy with the San Diego move. "We can keep people here. In Pasadena they'd get tired of the smog and move on to cleaner environments like Santa Monica or Newport Beach."

—Edith Myers

INTERNATIONAL TRADE

NEW TDF CONCERNS SURFACE

Recent actions on the transborder data flow front frighten U.S. companies.

U.S. companies could now face heavy monitoring and control of the flow of their corporate information following new developments overseas.

After lengthy discussion, the wealthy Western nations of the Organization for Economic Cooperation and Development (OECD) have endorsed new guidelines to protect the individual from abuses resulting from the storage and transmission of manual and computer data.

Eighteen of the 24 nations signed the guidelines late last September. The six nations which abstained, because they still had no such domestic laws, are expected to sign later this month, according to sources.

The governments concerned, including the U.S., are now "morally" bound to enforce the guidelines with legal, administrative, or any other procedures deemed suitable, says the OECD. The guidelines break down into eight basic principles. If enforced, they should, among other things, allow employees to see their own company records; stop the collection or dissemination of employee data without the employee's permission; and ensure that data is stored only when relevant, accurate, up-to-date, and secure.

Though the governments are now morally bound to enforce the guidelines, there are reasons why some countries—notably those in Europe—will enforce them more strongly than others. The net result, according to observers, is that the code will take on a new dimension, namely, as a football to be kicked around for political advantage.

Already six European countries—France, Sweden, Austria, Norway, Denmark, and West Germany—have stepped from the pack in militant fashion with strict enforcement of the guidelines, according to TDF consultant Russell Pipe. Sweden, of course, has led the entire pack in trying to stop abuses of privacy, but France has the most lethal punishments for transgressors, namely, a fine of about $1 million and five years in jail.

France seems to have adopted an added role, almost a mission. "We must take care to see that information technology does not become the servant of one master," said the French Minister for Industry, Andre Giraud, at a recent OECD symposium.

In another allusion to the U.S., which by some estimates is thought to have cornered over 70% of the world time-sharing and information processing markets, Giraud talked of keeping the "monopolistic forces at bay."

Of its mission, Giraud said that France wasn't just working for its own ends, "but to help to produce options, to open up alternatives."

There is now increasing talk among U.S. multinational companies about the problems of getting data out of Europe. There are now signs, say sources, that these difficulties are beginning to spread to the Third World.

One source of concern, and again a French initiative, is a new network gateway system developed by the Paris-based systems house, CAP-Gemini-SOGETI, which has aroused interest in the developing world. The gateway links the French PTT (Post Office) network, Transpac, with other international networks, including Telenet and Tymnet in the U.S. The gateway allows the French PTT, which is a government department, or any national PTT to perform its own accounting or metering of network flow independent of multinational network hosts, such as Tymnet or Telenet.

The experts agree that this new gateway could provide an effective instrument for controlling and monitoring transborder data flows.

An early customer for this gateway system and software may well be Brazil, according to latest intelligence. This is a country where IBM and other U.S. computer concerns have had notable problems with regulators in recent years.

In addition to this development, the OECD is believed to have formed a new working party this month in Paris to investigate the nature of corporate data flows. One intention is to formulate future guidelines and laws on nonpersonal data flows, say contacts.

In contrast to the strict approach taken in Europe, the U.S. government, under the new administration of Ronald Reagan, is not expected to take a tough line on enforcement. Many U.S. observers at recent data flow conferences have been openly suspicious of European motives for new privacy legislation.

OECD GUIDELINES— BASIC PRINCIPLES OF NATIONAL APPLICATION

1. Collection limited to necessary information obtained by lawful and fair means, and where appropriate by consent of the data subject.
2. Personal data to be accurate, complete, up-to-date, and relevant to the purposes for their use.
3. Purposes for personal data collected to be specified at time of collection.
4. Disclosure must be compatible with purpose for which data collected or by authority of law.
5. Reasonable security safeguards against loss or unauthorized access, destruction, use, modification or disclosure.
6. There should be a general policy of openness as to the existence and nature of personal data held by data controllers.
7. Data subjects may obtain data relating to them within a reasonable time and in intelligible form, have right to challenge accuracy and relevance, and if successful to have data erased, completed or amended.
8. Data controller should be accountable for compliance with these principles.

Source: Transnational Data Report

French minister Giraud recently pointed out the key role information plays in the way production and international trade are organized.

"To where the information flows, the advantage goes," remarked one consultant. Several U.S. companies have pointed out that it is difficult to separate out personal from nonpersonal information in corporate data flows. "If we open up our systems to show one, we must reveal the other," said one mainframer. "In this way our competitive advantage would be eroded."

Because of this threat to U.S. trade, it is thought that the Reagan administration will insist on nothing stronger than U.S. multinationals keeping their own houses in order, rather than having governments do the checking. In response, other OECD countries could counter with more monitoring and more control, experts predict.

TDF consultant Pipe, who publishes the Transnational Data Report, feels that this could result in the gradual withdrawal by U.S. multinationals of sensitive information residing in their foreign subsidiaries. As a result, says Pipe, the U.S. could become the world's biggest haven for "sensitive" computerized data. This would generate enormous business from those who want to keep their secrets away from prying eyes.

Ironically, such data havens—with privacy abuse on an enormous scale—were the biggest thing that the early European idealists set out to try and prevent.

—Ralph Emmett

SOFTWARE

FOR BETTER OR WORSE

Whether needed or not, a new copyright law now protects computer software.

Program pirates, tape thieves and diskette filchers, beware. Big brother is now watching you.

By virtue of the Computer Software Copyright Act of 1980, the federal government has made it its business to protect the interests and products of program writers.

The act, part of a bill that amended the federal patent laws, brought programs up-to-date with the rest of the copyrightable world. Congress protected that portion in 1976 when it totally rewrote the copyright laws, but no specific reference was made to computers or programs in that revision, so they were floating in legal limbo until the new act. Now, programs receive specific protection of the copyright laws.

"It was pretty fuzzy as to whether programs were covered by the 1976 Act," explained Tom Mooney, minority counsel of the House Judiciary Subcommittee in charge of the bill. "Congress really didn't make a decision that year. If programs were covered, fine. If not, that was fine too. Congress did decide that it would not cover programs specifically in the '76 Act."

The new act protects individual program instructions, in machine or symbolic language, but not the algorithms on which a program is based.

Congress had declined to protect programs because it was awaiting word from the National Commission on New Technological Uses of Copyrighted Works (Contu). When that august body expired in July 1978, it recommended that the Copyright Act of 1976 be amended (1) to make explicit that computer programs, to the extent that they embody an author's original creation, are proper subject matter for copyright; (2) to apply to all computer uses of copyrighted programs; and (3) to ensure that rightful possessors of copies of computer programs be allowed to use or adapt the copies for their use. Those findings led to the introduction of the bill which eventually became the Computer Software Copyright Act. The law was signed by President Carter in December, 1978.

"It sailed through almost uncontroverted," Mooney said. "Halfway through we got a frantic call from a law professor worried about the possible effects on state trade secret laws. But Contu and the Copyright Office had specifically determined that those laws would not be limited by the bill."

The changes were short and sweet. Section 101 of the Copyright Act was amended to include the language "A 'computer program' is a set of statements or instructions to be used directly or indirectly in a computer in order to bring about a certain result." And Section 117 was amended to allow owners of copies of programs to authorize, without violating the act, the making of another copy of that program where it is an essential step in the use of the program or for archival purposes.

"This legislation removes any uncertainty as to the effectiveness of copyright protection for computer programs," an IBM spokesman said. "From an industry point of view, the new law should encourage investment in the creation of new programs and the open marketing of programs previously developed."

Another IBM source explained that

NEWS IN PERSPECTIVE

the law would permit program creators to reach third parties who may have innocently received the program but were nevertheless spreading its use without permission. Thus vendors, previously limited to seeking recourse only against customers, could be more confident of recovering their program investments. Also costs of development can now be spread among more customers, thereby keeping the price reasonable.

The company's marketing strategy is applications oriented.

Not all the potential beneficiaries were equally ecstatic. Their song was muted and their celebration brief.

"I don't think it's likely to cause major harm, but it's not likely to do much good," said Bob Nimtz of Bell Labs. "It's not unnecessary, but it's not terribly vital. Most people will probably continue to vend exactly as they did before. It's not going to change much. Most of the programming use is controlled by contracts anyway. That's between vendor and customer and allows both to control much more than program use, including aspects of the transaction that aren't proper subjects for the copyright law. That's surely going to continue. I think the only reason everybody made such a fuss was because the President appointed a commission and it had to make some recommendation."

Roy Freed, president of the Computer Law Association, rues the day Contu was conceived. "This Act is completely unnecessary and only causes confusion," he said from his Boston office. "I am appalled by the persistent lack of understanding on this subject. The Act of 1976 adequately covers all sorts of media on which information can be recorded, such as diskettes, mag tapes, and the like. There should be no question whatsoever that the information on printed matter or mag tapes is copyrightable."

The new act protects individual program instructions, in machine or symbolic language, but not the algorithms on which a program is based. Those formulas are considered "ideas" not covered by copyright law.

"It's absolutely crazy," insisted Freed, who also outlined his objections in a Dec. 24 letter to *The New York Times*. "Programs made available as licensed trade secrets have the most protection our constitutional limitations on monopoly permit," he wrote. "The plaint that some new form of legal protection of ideas about programs is essential to encourage the creation of those items is sheer rubbish. Creators of programs can utilize easily available legal protections that are entirely adequate.

"You copyright the work of authorship. There's no need to treat the program. You don't copyright that. You copyright the works of authorship that contain the program."

Not true, counters Bob Bigelow, Freed's CLA predecessor. "The general feeling since '76 has been that programs are copyrightable," the Boston attorney said, "but now we know they are because Congress has told us so. Now you don't have to convince a customer, user, or court. You just put the proper copyright notice on the program and you've got the protection of the law."

Bigelow also postulated that the noncopyrightable algorithms can be protected by trade secret laws or through contract provisions, as is frequently done now. But he was unsure whether state trade secret laws would be preempted despite Contu's assurances to the contrary.

"I'm not sure how the courts will feel about that," he admitted. "They may or may not go along with it, since it's not written in the legislation. But there's no question in my mind that it will have a beneficial effect on software. It makes the case for program developers much stronger by giving them added protection, and it gives me another weapon in my arsenal with which to protect my clients' interests."

Bigelow may have more toys to play with once the Register of Copyrights issues regulations. Just when that blessed event will occur has not yet been determined. Until then, Mooney has the last word.

"We just write them," he said. "We don't have to understand them."

—Willie Schatz

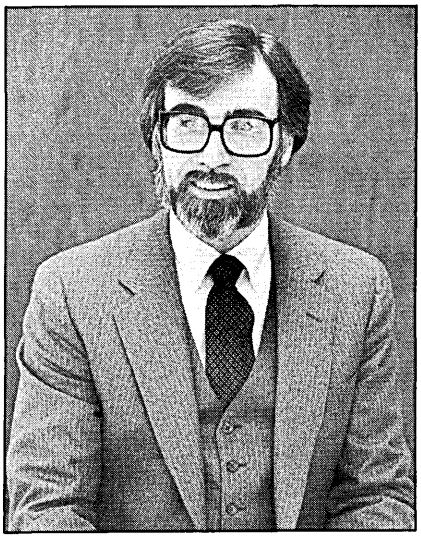
WORD PROCESSING

THE LINE BETWEEN WP AND DP

Contrary to popular belief, NBI execs claim that word processing and data processing are separate businesses.

There's a growing number of people who proclaim that the distinctions between word processing and data processing are blurring. But Thomas Kavanagh's is a dissenting voice.

Kavanagh, president of NBI, Inc., a word processing systems firm based in Boulder, Colo., draws a firm, clear line between the two. He also disagrees with those who foresee a future in which giant companies will compete to supply a given office with its total office systems needs. "That concept is wrong. Our strategy from day



THOMAS KAVANAGH: "Any attempt to market dual function (wp and dp) systems is a mistake."

one has been that we will coexist with other equipment." He sees as a favorable portent for this kind of thinking "the first crack in IBM's dyke—it's support of X.25 in Europe."

This feeling is shared by Carl Carman, brought to NBI in October 1979 from Data General to be engineering vice president. "Our best hope is X.25. We've been forced over the years to adapt to some machine IBM supports, to emulate it and talk to other vendors emulating the same machine."

Carman said that Xerox's Ethernet local communications network is going to face the same problem. "The physical connections (between different types of equipment) are well defined, but we need a standard software protocol. To do it the other way (via emulation) requires a lot more functions, so the customer suffers." He believes it will take five years before anything significant happens.

Carman believes "good multivendor networks are the only way to make electronic mail work." He defines electronic mail as "just one of the applications of office systems." At NBI, he said, they are working on a version that will include "certified" mail, whereby the sender will know instantaneously if his message is received.

The engineering vp doesn't like the term office automation. "Office automation is to the '80s what distributed processing was to the '70s—most people talk about it, but few have it."

Kavanagh doesn't like dual function (wp and dp) systems. "Any attempt to market dual function systems is a mistake. Some categories of customers can only afford one piece of equipment. There is an inherent difference between supporting the word processing task and the data processing task at the workstation level. Word processing can't wait. If you use one unit for both tasks you have to compromise."

The NBI president believes "everybody tries to simplify those four letters [wp and dp]. First you have to identify what dp is. As we refer to dp, we mean applications programming, data entry, file retrieval, record editing, and file sorting. We believe those things are adjuncts to wp. The secretary or administrator using wp is an adjunct to dp. Doing something without programming assistance is the key differential."

In his own company, Kavanagh recently installed an HP 3000 to replace an outside time-sharing service. "My programming staff is stretched to the limit. I wouldn't want to involve them in tasks you might call casual."

Although Kavanagh would separate

NBI sees Wang as its primary competitor.

dp and wp, and although wp is the field his company is in, he definitely seeks out dp expertise. The 300-plus work force of NBI is evenly split between data processing and office equipment people. The technical side is

all dp; sales, support, and product planning personnel come from the office equipment field.

According to Carman, "We like to think of ourselves as a software company. Two-thirds of our research and development staff are software people. We can go far with software upgrades to maintain a customer's investment." He described NBI's software as "very turnkey in nature. We can challenge most of the software types who come to see us."

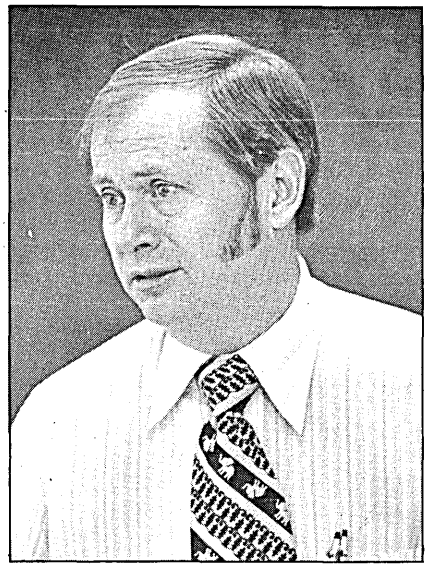
NBI was founded in Boulder in 1973 by Howard W. Selby, III, who served as its president from September 1973 to March 1975 and as vice president from March 1975 to January 1977, and continues on as a director. Kavanagh, a cofounder in 1969 of Storage Technology Corp., joined NBI as president in March '75. Other NBI officers who came to the company from Storage Technology include James S. Mays, vice president of manufacturing; Jesse A. Simmons, vice president of finance; and Carl Carman who was assistant to the president at Storage Technology before joining Data General.

The company was privately held until late 1979 when it made its first public stock offering. A second offering of 400,000 shares was made last October. Its stock, which originally sold for around $4 per share, was in the high $60s in January this year. Kavanagh attributes this, in part, to "quality of earnings." He explained, "We had a different strategy from anyone else in this business from the start. When we got into the business, 80% of the installed base was on rental. We decided to sell in a rental environment. Our target early on was outright purchase of at least 60% of our equipment, and it's never been that low. Now it's running at 70%. I believe the financial community recognizes that this means higher quality of earnings."

The 300-plus work force of NBI is evenly split between data processing and office equipment people.

For the first quarter of its last fiscal year, which ended Sept. 30, NBI had revenues of $11,272,000, up 85% from $6,105,000 for the same quarter a year earlier. Net income increased 91% to $1,109,000 from $581,000.

Kavanagh described the company's marketing strategy as applications oriented. "We generally find a customer's most difficult application and provide a solution to get his attention. You couldn't develop any sense of urgency in the beginning. No one wants to screw up his office, so we would find a difficult problem that was driving him crazy." Kavanagh gave as an example an insurance company which was being driven crazy by claims document processing. "Our equipment offers superb long document handling." Carman noted that in R&D, "we're going after applications that don't exist out there today."



CARL CARMAN: "Office automation is to the '80s what distributed processing was to the '70s—most people talk about it, but few have it."

Kavanagh believes the "difficult problem" approach is one of the reasons the company is able to sell in a leasing environment. Two others, he said, are "better salespeople and a scenario created for customers showing that the cost of equipment is the smallest part of their decision and that they can't walk away from a lease six months later."

NBI's product line consists of a family of systems called NBI OASys. There are three principal configurations: the System 3000, the System 8, and the System 64.

The System 3000 is a software-based, visual display text editor designed for use by a typist or secretary. It consists of a master workstation containing a microprocessor, semiconductor memory, video display, keyboard, and one or two floppy diskette drives.

The System 8 and System 64 are clustered, shared-resource systems that serve the needs of offices which require larger amounts of data and more storage available to multiple operators, or require the system to share printers among a number of operators. System components are connected by coaxial cable and may be separated by as much as 2,000 feet.

The System 8 has up to 10 megabytes of storage and can accommodate eight devices, of which six can be workstations. Two System 8s can be linked to configure a 14-device, 20-megabyte system. The System 64, with up to 70 megabytes of storage, allows the attachment of 64 devices, of which 32 may be workstations.

Kavanagh said the main reason for clustered systems is not economy but the sharing of data and/or expensive peripherals. He said the company has, from the beginning, been competing for "profitability, not market share or volume." But he estimated NBI's share of the market for high performance, video display, standalone or clustered word processing systems at "somewhere around 5% based on the numbers we read from industry analysts."

He sees Wang as his primary competitor and Lanier as another competitor. "And if we compete for the same business with IBM, we typically win." Kavanagh called IBM's pricing on its Displaywriter system "a masterful stroke on their part, almost like a magic act with mirrors. But now we can make an apples-to-apples comparison, which IBM tried to make difficult. If you configure a Displaywriter system comparable to the System 3000, there is very little price difference and a tremendous difference in support."

He said that 75% to 80% of the systems NBI installs replace some form of existing text editing or word processing equipment, with 10% replacing typewriters and the rest going into areas where nothing had been done before. He said 2% to 3% of the purchase decisions are made by "some kind of information manager or office of the future guru; 15% to 20% are made by small task forces, a manager of administrative services, a dp manager, a dp/wp coordinator or an MIS guy; and the rest are made by the office administrator or word processing supervisor."

Kavanagh said the company's goal is "to become the major independent supplier of high-powered office automation systems."

And as for its name, NBI has been said to stand for Nothing But Initials. "It wasn't intended to," said Kavanagh, "but it's the truth."

—Edith Myers

ELECTRONIC MAIL

NEITHER RAIN NOR SNOW...

Electronic mail may have its pluses, but it's a long way from replacing the manual methods of the Postal Service.

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"We switched to NCR."

Frank J. Sanzone, Jr., Carroll County General Hospital

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We switched to an NCR computer for several reasons. First, we had to have an interactive system. And only NCR seemed to offer true interactivity with the power we needed.

NCR's MONOGUE:
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Second, we had reached a gap in our vendor's range of systems, so we were facing a difficult conversion any way we turned. With NCR, we knew we would not run into that kind of gap again.

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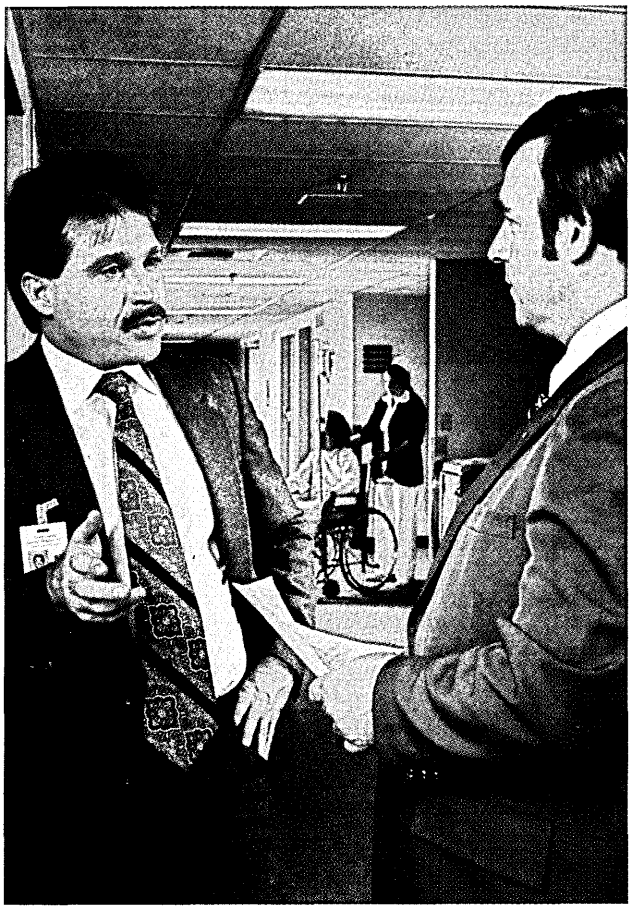
That is NCR's Migration Path Engineering. We believe a user should be able to upgrade his hardware without obsoleting his software.



Frank J. Sanzone, Jr., is Assistant Director of Finance, Carroll County General Hospital, Westminster, Maryland. Robert Monogue is an NCR Representative.

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Then there's multiprogramming, a feature rarely available on systems the size of our NCR I-8410. Without multiprogramming, we would have had to add a second shift. And there's ease of operation. Training an operator takes just hours. In fact, this system runs just the way you said it would. We did the right thing in switching to NCR.

* * *

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An NCR computer can make it happen for you, too.

According to a consensus of speakers and attendees at a recent American Federation of Information Processing Societies (AFIPS) conference on the subject, the mail of the future isn't quite happening yet.

"There will be no significant introduction of electronic mail in the next five to 10 years for low-volume users at costs comparable to current mail," Howard Frank of Network Analysis Corp. predicted. "The technology and efficiency are improving constantly, but not yet to the point where it will soon be useful on a nonbusiness basis. Very-high-volume users will continue to benefit for a while."

"The systems are burgeoning from the bottom up; we should determine how they're going to look from the top down."

Perhaps by the time low-volume users begin to enjoy the fruits of the electronic process, the role of the Postal Service will have been clarified. That organization, pinned between private enterprise and public responsibility, has generally been acknowledged to be the whipping boy of the electronic mail scene.

Its efforts in the area—Generation I, an electronic transfer between major section offices; Generation II, the electronic origination of messages (e.g., Mailgrams); and Generation III, an all-electronic, end-to-end system—have been analyzed at length. Also analyzed were ECOM, a Generation II system in which mail originates on computers and is printed out throughout the country and for which the user could select the carrier of his choice, then reimburse it for services rendered, and EMSS (Electronic Mail Service System), a proposed high-speed fax scanning service which could handle 24 billion messages per year at 1.8 cents per message. Preliminary testing was completed in October 1978 and further prototypes are being developed.

"We want to get the members [of Congress] using electronic mail."

It won't come easy, though. "We see a cooperative role in EM, but not one where the Postal Service is relegated to second string and where the communications common carriers do all the delivering and transmission," warned Paul Jaquish, Senior Assistant Postmaster General, Research and Technology Group. "We will insist on the rights to hardcopy. What's critical is that the telecommunications industry respond to the needs presented by Generations I and II."

The industry is apparently doing this, but some folks think it's going backwards. "The systems are burgeoning from the bottom up," complained J. C. R. Licklider, a professor of computer science at MIT. "We should determine how they're going to look from the top down.

"The future of EM depends, of course, on the future of computers. So far, issues of privacy and security have prevented people from thinking about them more, but I do see increasing acceptance of computers and other technology in the office. The problem is that it's happening from the bottom up, rather than the top down. It's an unplanned evolution."

The conferees agreed that eventually the fittest will survive. Then these, survivors like their predecessors, will have to run the regulatory route. Is EM communications or common carriage? Not even the FCC knows for sure.

"If it really is communications," said FCC Common Carrier Bureau Chief Philip Verveer, "then the FCC has plenary authority over its services. But if it's common carriage, then it may fall within the FCC's jurisdiction under Title II of the Communications Act."

As the FCC's Computer Inquiry II went to great lengths to point out, basic services are regulated under Title I of the Act. Enhanced services, other than those offered by common carriers, get a free ride. But if it is determined (probably by the FCC) that EM is not an enhanced service, does that require the FCC to impose its traditional regulatory authority, such as that exercised over AT&T and other giants? Probably not, Verveer indicated.

Not even the FCC knows for sure whether electronic mail is communications or common carriage.

"With respect to EM there's very little reason to regulate the resellers. They have little market power and are at the mercy of the underlying carriers [e.g., Western Union]. But we will be continuing regulation of the carriers."

With those companies generating $70 billion in business last year, $50 billion of it by AT&T, someone ought to check them out. At least one Congressman would like his colleagues to contribute further to the industry's continuing good health.

"We want to get the members using electronic mail," said Rep. Charles Rose (D-N.C.), head of the House Policy Group on Information and Computers. "We will make an information terminal [a Hazeltine 1510 or TI 745] available to each member who wants one. An electronic environment would make the committee process faster and clearer. It would strengthen the legislative environment and make it more productive. We might even begin with electronic 'Dear Colleague' letters.

"I just want to make sure everyone plays a role, including Granny at home with her videotex if she wants to."

—Willie Schatz

MEETINGS

NEW WAYS OF DOING BUSINESS

Transacting business the electronic way was the topic of discussion at the recent TDCC forum.

The old road is rapidly aging, even in business. Paperwork is out, electronic data interchange is in.

More than 750 people attended the 1980 Transportation Data Coordinating Committee (TDCC) National Data Systems Forum in Washington, D.C. to learn how far they had come and how much farther they had to go in "Transacting Business—The Electronic Way." Twenty exhibitors, including Bell, Honeywell, Lexitron, Bank of America, and Lanier, were more than happy to offer advice on how to speed the journey to the promised land of all electronics and no paper.

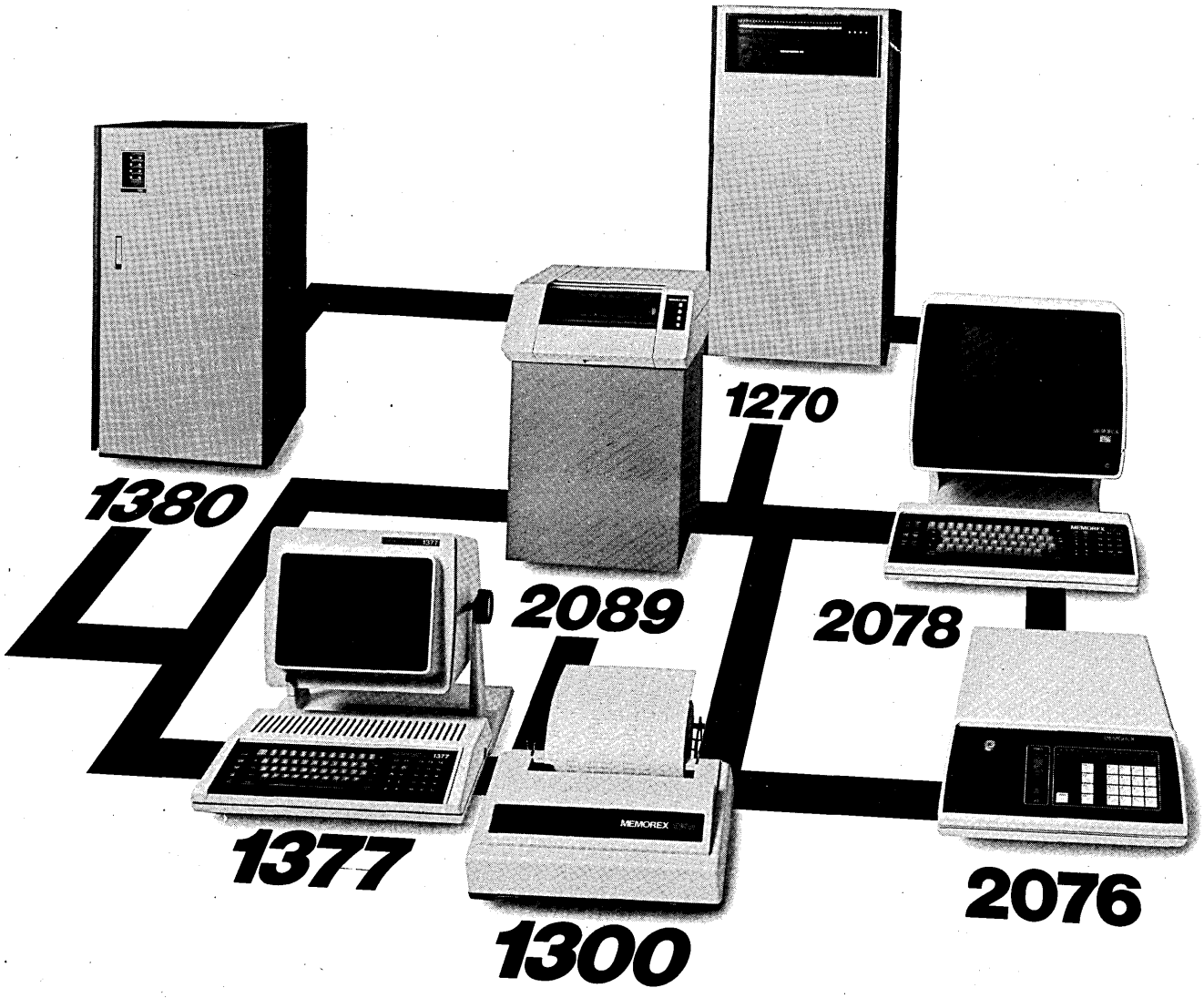
Nevertheless, the TDCC, an organization designed to achieve coordination of transportation data and information systems, made it perfectly clear that the business of America is information.

"The trouble with our times is that the future isn't what it used to be," lamented James J. Crenner, chairman of Dun & Bradstreet, paraphrasing French philosopher Paul Valery. "The days of automatic advancement of the economy are fast disappearing."

Crenner had a simple formula for making those days return: learn how to use information. "We can regain our supremacy step-by-step, the same way we achieved it at the beginning," he told his luncheon audience. "But we can't do it without using information. Harnessing information will be one of the basic tenets of corporate management in the 1980s. I see information as management's most important resource for productivity. It is imperative that all of us concentrate on organizing and utilizing information more effectively and efficiently."

According to Crenner, information managers should think like chief executive officers, or at least create the atmosphere of a ceo; information is the key to the free enterprise system; the ability of people to understand information and data systems will be one of the key changes in corporate management; and information will equal capital and labor as a resource.

"Corporations that will excel in the coming decade will be those that have the



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competitive edge in managing information," Crenner concluded. "The path to industrial supremacy, economic growth, and a better standard of living leads through a door marked 'Information.' "

Someone is going to have to widen the door. The line is getting longer. "We've had a revolution in our time," said John Imlay, chairman of Management Science America. Twelve years ago the same computing power of today's Intel 8080 cost $500,000; now it costs $4. And we're just at the tip of the iceberg."

It may never melt. The revolution is coming faster and faster. Take data communications, for example. A year ago, Neiman-Marcus would let you bring home your personal earth station for $36,000. This year it's a steal at $12,000, as listed in the American Express Christmas catalog. We've gone from depression to boom in software, in which the current 5,116 packages are growing at 500% per year and the 750 companies at 30% per year. In 10 years, Josephson technology will be available in hardware. And the key word is "nanosecond," which is to a minute what a minute is to 32 years.

"The electronic home will be a major battleground of the information revolution," Imlay said after his dissertation on the state of the industry. "We're not going to know where the computer begins and communications ends. Computers will get even smaller, while IBM and Bell will get bigger.

"But there's a real danger we will become too electronic oriented and lose our personal touch," Imlay warned. "We have to guard carefully against that. We also have to remember that the computer is now a commodity. After 30 years of unbridled growth, this industry has yet to reach its infancy."

For TDCC members, the faster the computer industry gets out of the crib, the better. Government, industry, and association speakers and panelists, while examining topics such as "Electronic Data Communications," "Electronic Data Interchange," "Transportation Coding Systems," and "Electronic Data Systems in World Trade," made no secret of their desire to get on with the electronic age.

"The communications industry is moving to deregulation," said Edward Zimmerman, Deputy Secretary of the Commerce Department's National Telecommunications and Information Administration (NTIA). "The old perspectives just don't hold up anymore. There needs to be some sort of mechanism that will connect present and future networks through gateways. The entity would be concerned with tariffs, security, standards, and other aspects of the industry. It's going to have to be a private sector body, though none of the competitors trust each other.

—Willie Schatz

BENCHMARKS

DOUBLEVISION: Ed Spencer, chairman and ceo at Honeywell, recently released a 1981 economic forecast, as Stephen Jerritts, president of Honeywell Information Systems, released a 1981 computer industry forecast. Here are some highlights:

Spencer states that 1980 earnings should meet, and possibly exceed, earnings from 1979. He expects to enter 1981 with "high backlogs in most major businesses" in which Honeywell participates. By concentrating on high-growth technology markets, Honeywell has been able to "moderate" the impact of the present economic slump and inflation on its revenues, Spencer claims. In particular, he sees aerospace and defense systems, energy management systems and services, digital process control systems, and information systems as maintaining a high level of demand. For 1981, Honeywell will continue to expand manufacturing capacity; capital expenditures will rise to over $325 million, compared to $250 million spent in 1980 for plant and equipment. Research and development investments will surpass $600 million in '81, compared to $540 million spent during '80 (customer-funded research is included in both figures). Cii-Honeywell But will spend an additional $140 million on R&D during '81.

According to Jerritts, Honeywell expects "1981 trends in the computer industry to parallel 1980," exhibiting steady growth while uncertain economic conditions linger. Jerritts expects Honeywell to grow faster than the industry as a whole because of its position in high-growth segments of the information market, such as minis, terminals, and large systems. However, 1981 holds some danger for all, if current trends toward record high interest rates continue, he notes. This will affect leasing business, and international markets will weaken. Honeywell has taken precautions against a weakening market by an "aggressive campaign to concentrate efforts on several market segments: manufacturing, distribution, financial, airlines, and federal and state governments. Acquisitions and expansions of facilities are also expected to keep Honeywell's claims secure.

UNIVAC FORECAST: "We anticipate the computer industry continuing its growth in the 1980s," states Richard L. Gehring, president of Sperry Univac. "According to our market research, the value of all computers [excepting minicomputers and small business systems] installed worldwide will increase from $123 billion in December 1980 to $199 billion in 1985." Gehring notes that this represents a compounded growth rate of more than 10% annually. In his year-end business statement and forecast for '81, he claims that the market is not nearly saturated and that users will continue to require computers to save space, conserve power, and cut costs. Gehring estimates that Univac's revenues will increase by about 12% and bookings by 16% in '81. Capital expenditures for this year will exceed $110 million, he estimates, with construction of plants and other facilities high on the list of priorities. R&D for fiscal '81 (ending March 31, 1981) will be close to $250 million, compared to $180 million for the prior fiscal year.

SBS TO RIDE WITH MOUNTIES: Satellite Business Systems has applied for permission to provide private communications services between Canada and the U.S., which would mark the first transborder digital satellite communications services. Before implementation, SBS needs the go-ahead from the FCC, as well as from both governments, and operating agreements by SBS and Canadian communications carriers. SBS has advised the FCC that several customers have "expressed interest" in the transborder plan. These customers are General Motors, ISA Communications Services, Inc., The Travelers Insurance Companies, Wells Fargo & Co., and Westinghouse Corp. If approved, service could begin in the latter part of '81, providing voice, data, electronic mail, and video teleconferencing transmission.

IMPORTS, EXPORTS: "By 1984 Western suppliers of communications equipment may be doing more than $250 million worth of business in China; the figure could go even higher if the Chinese can find enough hard currency to accelerate their modernization program," says a report from International Resource Development, Inc., a Norwalk, Conn., research firm. In direct contrast to the China figures, export trade to the USSR is expected to "shrivel," the IRD report says. Current import rates are about $90 million per year from Western suppliers to China, and $160 million per year to Russia. The IRD report points out that the Japanese suppliers are leading the U.S. in exportation of communications gear to China, but that U.S. manufacturers of advanced equipment may be able to "edge Japanese suppliers out of some specialty market segment."

XEROX'S OEM DRIVE: Xerox Corp.'s Office Products Div. has begun marketing some of its facsimile and information processing products through dealers, systems houses, and oems. Eugene S. Ruffin, division vp of market development, said, "We believe these alternate channels of distribution will provide us with cost-effective ways to significantly increase our market coverage." Xerox will sell its Telecopier 400 and 485 transceivers and the Xerox 860 information processing system through these channels.

—Deborah Sojka

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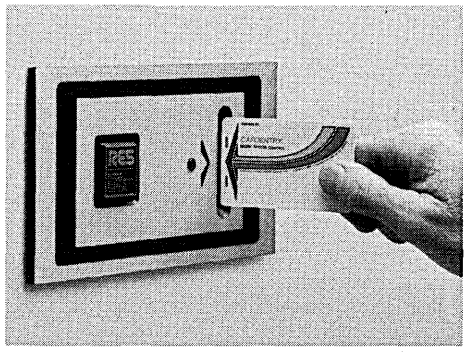

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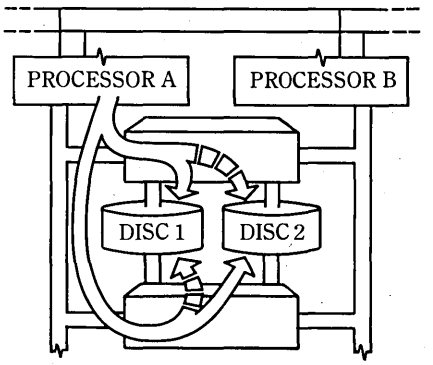

Mirrored volumes automatically maintain identical copies; write operations occur simultaneously, read operations performed using drive with head closest to data.

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Consistency of the data base is essential. Multiple files must be capable of being updated simultaneously, even if located across distributed nodes. If for any reason a transaction cannot be 100% completed, this is the one system in the world which can un-do it completely. Automatically.

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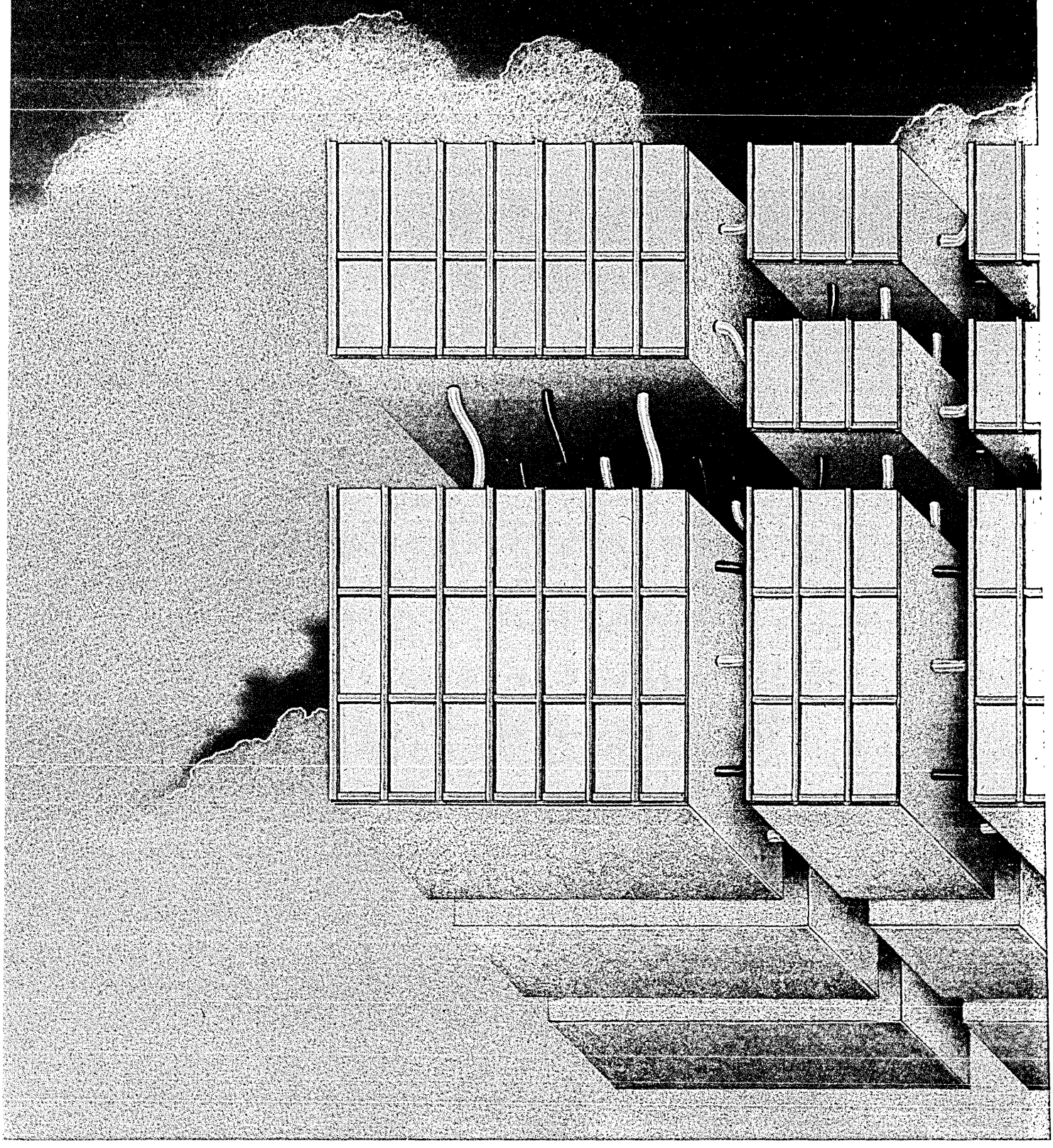
DDP: HOW TO FAIL

Failure to recognize interdepartmental dependencies will lead to a lack of coordination.

by Harold Lorin

Two kinds of failure are associated with unsuccessful systems: failure to come to fruition and failure to achieve functional or economic goals. Absolute implementation failure means that the system as designed does not become operational when needed. Relative failure means that some alternative centralized system could have been implemented more effectively.

The symptoms of failure are familiar. The system is late; its development costs seriously exceed projections; mid-implementa-



tion changes in hardware are necessary to meet functional and performance goals; expanded software development effort is required because projected software packages do not have expected features or performance characteristics; the system partitioning and distribution concepts must be redesigned in midstream because of configuration limitations or discovered constraints in interconnection functions.

Operational failures occur after the system exists. These failures also take familiar forms. The system does not meet its performance goals; it does not meet its reliability goals; it is not useable; it is not flexible; and it is not able to meet larger volumes or new functional requirements in the linear cost, nondisruptive way that the literature of distributed processing promises.

Failure may lead to system abandonment, particularly when growth requirements are not met. These abandonments have sometimes involved a retreat from the concept of distributed processing and a return to more conservative centralized systems.

When the disappointments are moderate, the system is declared a success. It is important to recognize that a system may be a success even if it doesn't achieve all the anticipated benefits. Of the expectations that motivate distributed processing, there will be some that are more important than others. Thus, a system that achieves better end user interfaces may be considered a success even if it does not reduce operational costs; a system that improves reliability may be considered a success even if hardware costs increase.

The relationship between implementation failure and operational assessment may lead to a system that is considered operationally successful even if the cost of develop-

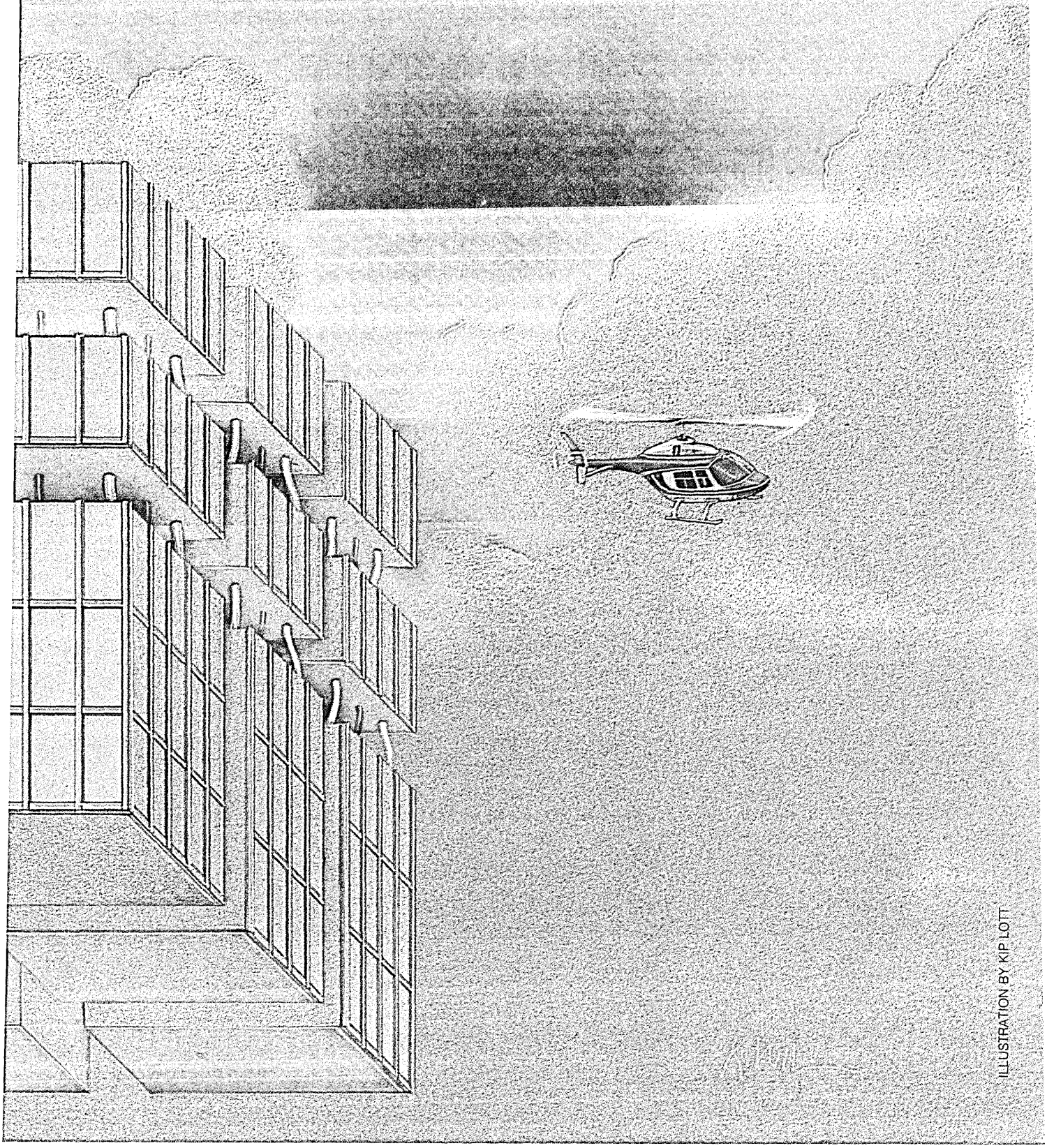


ILLUSTRATION BY KIP LOTT

Distributed processing has two fundamental design schools: the conservative and the radical.

ment is higher than expected.

There are three basic types of failures of distributed systems: organizational concept failures, technology planning failures, and technology design and implementation failures.

A fundamental failure in organizational concepts is a carelessness about clearly understanding the roles and dispersion of power within an enterprise. Decisions must be made about the organizational structure for applications development, data control, global and local network planning, and the relationships between centralized professional staffs and business unit management.

A number of organizational relationships can exist between a dp staff and a business unit. Complete decentralization may shade into a consulting relationship in which the staff acts as an internal consultant but has no power to enforce its standards or its recommendations. There is a level beyond which the dp organization can move up the management chain of the business unit to achieve compliance with promulgated standards. Further on, there is a level of dp authority where resolution is made at a management level beyond dp and the business unit, and finally, there is a level that represents centralization.

ORGANIZATIONAL CONCEPTS

Where a dp staff exists, there is commonly a defined set of dp standards and procedure established by the dp professional function. Professional talent may exist within the dp staff and within the business unit, and the dynamics of interface between them are determined by designation of the point of conflict resolution. At the extremes of decentralization and centralization, dp talent resides only within the business unit or within the dp staff, respectively. A business unit may have no professional talent because it is not allowed any, or because it does not wish any, or some subtle combination of both.

There are two interesting aspects to the relations between dp staff and business units. One aspect is seen by perceiving the activities of dp and the powers of a dp staff as a matrix. The matrix model shows that the power level of a dp organization need not be the same for all skills. Thus, a dp staff may have an enforcing power about the acquisition of particular equipment but only an advisory power about the assessment of a particular application.

Also, the relationship may depend upon some concept of the "level of intrusion" represented by a particular system. Computing systems impact organizations in different ways, depending upon whether they are truly only "tools" that change job descriptions, systems that generate new job descriptions within an organization but affect only intrabusiness unit data flow, systems that impact interbusiness unit data flow, or systems that impact the data flow and decision-making processes that relate a business unit to higher functions in a management hierarchy.

It is important that everyone understands the organizational policy and is competent to undertake the inherent responsibilities. It is also important for each person to understand the relationships between the management structures that will apply to dp and the systems structures that may be defined. There are significant degrees of freedom between centralization of management and centralization of equipment. It is possible to have physically centralized computing and still maintain an entrepreneurial spirit in the dp function.

Failure to clearly define the dispersion of responsibility and activity will lead to an increased conflict between business units and the dp staff. Since one of the goals of distributed processing is to reduce conflict, it is not productive to have an incomplete understanding of who is to do what.

In addition to increased conflict, other organizational problems will arise because of poor decisions. Failure to recognize interdepartmental dependencies will lead to a lack of coordination. Overestimating the ability of business units to undertake specific dp activities will result in misallocations of responsibility.

Another problem is caused by not realizing how much work is involved in connecting systems that were thought to be independent. Late discoveries of constraints resulting from incompatibility of hardware or software or lack of planning in application design may lead to higher costs, changes in operations, and application instability.

The business unit may not have the skills to succeed. Naivete about the scope of an application, lack of knowledge of the characteristics of vendors and products, and ignorance of common pitfalls may result in systems that are more expensive than they need be or systems that do not materialize.

IMPACT OF CHANGE

Another form of failure is caused by a lack of appreciation for the *rate* of change. Changes in the marketplace, in product lines, and in technology require business methods to change accordingly. This has an impact on computer structures. Perhaps worse than the early retirement of a computer system is the ability of an in-house system to retard growth and development. Although it is impossible to project the future precisely, it is necessary to plan with an eye to change within the projected lifetime of the system. If this cannot be done with confidence, then the inability to do so must be factored into dp planning so that payback periods are realistically assessed.

Another error that can lead to unsatisfactory distributed systems is the failure to understand the organizational data flow. This leads to partitionings of data, functions, and access points that cause unsatis factory performance, increased communications costs, and the need to reconfigure data and programs constantly. In systems with heterogeneous nodes, and disparate machine architectures and software interfaces, reconfiguration of data and programs is not possible.

The final organizational concept failure we will mention here is a failure to appreciate the *impact* of change. Organizations, even those with a passion for reform, have a natural inertia. There will always be resistance, some very subtle. Covert attitudes can ensure failure.

In any organization, there will be fear, anger, disappointment, and lack of commitment to make the new venture succeed. This will lead to instances of unexpected failure and unrealistic planning. Any manager who does not assess the potential impact of informal resistance and tries to protect against its occurrence at critical points is taking a great risk indeed.

Distributed processing has two fundamental design schools: the conservative and the radical. The conservatives believe that systems are distributable when there is maximum isolation and autonomy between the units of the system. The radicals are fascinated by the potentials for intense interaction, close cooperation, and high degrees of interdependency. They see the challenge of distributed design to be the realization of close and intensive cooperation between systems that are physically dispersed or between systems that are loosely coupled. Distributed transaction systems in which a number of functionally dedicated nodes cooperate to complete processing of a single transaction with negotiated decisions about systems control fascinate the radicals and possibly indicate a direction for the future.

The systems that have the characteristics of close cooperation desired by the radicals are in universities or corporate advanced technology projects. By and large, commercially successful distributed processing systems have been conservative systems where node interaction is carefully structured and node dependency has been minimized. The question is how long will this be true, how fast will technology move us toward highly interdependent systems so that potential distributed designs that now look risky will look mainstream within the systems planning period that we now confront?

A business may decide how innovative it wishes to be, but this must be an informed decision. Technology projection is

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How fast will technology move us toward highly interdependent systems so that now-risky designs will look mainstream?

critical to dp activities. This should include a review of reasonable design alternatives that represent the mapping of logical systems onto physical systems. The role of the future technologist may be to determine the set of design alternatives of acceptable risk, warranty them, and then permit management to select the computer structure that seems most consistent with management style. The problem is that it is very difficult to assess technology risk. There is also almost no methodology for comparing different systems designs, although there are competing physical designs intended for systems of very different structures and organization. Finally, there is very great difficulty in determining true cost pictures across diverse hardware, communications, operational, and programming cost elements with different sensitivities to workload and organization.

Whatever the difficulties involved with assessing technological rates of change and the interaction between organizational and systems structures, there is a worst possible way to approach distributed processing. A common approach is to identify equipment and a reasonable partitioning across the equipment, and then try to determine what benefits will accrue if applications ae partitioned in this way. The problem with this is that the organization never really sees what its essential goals are, fails to consider alternatives, and evaluates hardware in a conceptual vacuum.

COST ASSESSMENT

One last problem in technology planning concerns assessment of costs. There are a great number of uncertainties about the conditions under which economies of scale are realized in computer hardware—whether operational costs will rise or fall with various forms of distribution, whether programming costs will rise or fall.

What is worse than the uncertainties is the accounting and budgeting naivete of people who manage the hardware budget with no regard for operational expenses. Even more depressing, perhaps, is the tendency to manage only the dp budget and not recognize that there may be significant dp costs hidden in the operational business units. A company that thinks that distributed processing will save money may find that all it has done by moving data entry out of dp is to decrease the dp budget and increase total expenditure for the function.

Another set of risks for distributed systems occur at the design and implementation levels. Often care is not given to understanding the ways that particular systems designs will or will not achieve the expected benefits. There are four major zones that will lead naturally to disappointing systems: failure to appreciate computer hardware characteristics, failure to understand software environments, failure to understand the implications of systems design, and failure to appreciate the special problems of network design and management.

It is necessary to understand the true performance potential of computer equipment.

A temptation to overload a small machine is particularly common among people who are used to large machines. The number of instructions required to represent function will restrict the richness of function that can be put into a small node. It will also limit the workload that can be processed by extending the number of instructions to achieve a particular result. This extension will reduce the transaction rate.

In smaller machines, the I/O interface tends to be simpler and there is a reduction in the ability to read, write, and compute simultaneously. In general, smaller systems cannot achieve stable performance at the high utilization levels of larger machines.

A side effect of the design features usual in smaller machines is a lowering of tolerance for significant spreads in peak-to-average workload levels. A design that undertakes to accommodate a peak workload level that is, for example, six times higher than the average workload level must tolerate characteristic underutilization of the equipment during nonpeak periods as well as achieve service of the peak level at lower utilization levels. The resource management sophistication of operating systems for smaller machines will not make the effort to reclaim usable resource with the aggressiveness of an MVS system.

ANALYZE SOFTWARE SYSTEMS

A basic mistake is a failure to analyze carefully operating systems and software subsystems. It is perfectly valid for a project to do make vs. buy tradeoffs in software. It may be cheaper to develop and maintain a homegrown package over the life of an application than to acquire, install, and maintain a more generalized vendor-offered package. This kind of choice is one that is hotly argued and may involve risks of early obsolescence, underestimated development time, and expenses, but it is a choice that a project may make wisely under certain circumstances.

Never assume, on the basis of a superficial review of software descriptions, that the set of offered functions is identical between contending packages or that offered functions have the same secondary characteristics of generality, reliability, recovery, installability, operability, etc. Unfortunately, at the general product description level, various operating systems and subsystems tend to look the same.

A project may decide that it prefers to write additional code to extend the smaller system and provide recovery and protection enhancements itself. But this decision should not be forced because of an after-commitment discovery that functional enhancements to basic software are required. The late discovery will extend software development expenses, introduce delays and disruptions, and perhaps significantly impact the performance of the node by increasing the amount of code it must store and execute.

It is also important to determine if the software development costs for two contending systems will be the same. Software development costs may differ because of the amount of code that must be written as a result of the richness of the underlying system and because languages and application development support tools may vary significantly from system to system.

Another risk in assessing a software environment is failure to understand the impact that the basic structure of vendor software will have on distributed design. How well a software package can be segmented will determine the size of the hardware nodes by determining memory sizes and processor performance levels. In addition, vendor software structure will determine how many packages are necessary. Certain vendors may put some functions in the base operating system that other vendors put in the subsystems. This decision may affect what layers of software are required for various kinds of distributed designs. It may also have a direct impact on systems cost bcause some of these products will be sold or leased.

Unanticipated expenses may result from underestimating the kinds of systems programmer support various software packages require. An important element in the operational costs of distributed processing relates to the extent to which remote systems can be supported by minimum professional staffs as a result of simple interfaces, programmed operator, or remote oprerator features. One of the motives for distribution is to reduce operational complexity. This is often not achieved.

Yet another desired characteristic of distribution is the ability to accommodate new function or increased workload by module *addition* rather than by module *modification*. The useful life of a distributed system may depend on careful application of programming methodologies in program structure and communication.

DYNAMICS OF THE SYSTEM

A project looking for increased reliability at minimum hardware cost will be disappointed if it designs a highly interdependent system

The problem is that it is very difficult to assess technology risk.

where complete processing of an on-line transaction involves visits to multiple nodes or data references across multiple nodes. A failure may occur if a single and unbacked point of systems control exists as a precondition for routing work through the system. Similarly, stable performance will not be achieved if the workload is unpredictable because of requests for service from other nodes. Many ambitious designs would be reasonable and attractive if components of the system never failed, but they are operationally risky because of the high probability of inoperative periods.

One classic way of designing system failure is to make a wrong assumption about what parts of the system are "hard" and what are "soft." An assumption, for example, that a large host and the lines to it are soft but that a family of small remote nodes are hard because they are duplexed may be defeated because of lack of recovery capability in small node software. A certain paranoid strain is useful in designing distributed systems.

High on the list of reasons for failed systems is lack of appreciation for the special problems of network design and management. Failures here may lie within the context of a particular application or may reach to the application planning level. Failure to provide for an overall networking policy and strategy may result in the proliferation of independent, incompatible, dedicated networks. There may be good reasons to permit business unit or application level networks to proliferate without standards, but it is not something that should happen by default.

Within the context of any corporate-wide or application network it is necessary to have designs that address issues of network robustness, network traffic control, network problem determination, and network growth. An important amount of consideration must be given to the dispersion of power over network decision-making among dp staffs, communications staffs, and business unit application owners.

We are not suggesting rigid control, bureaucracies, or imperial dp planning staffs. A business can undertake any number of power assignment postures and can permit many degrees of freedom. It can decide to risk a rise in costs in order to encourage entrepreneurial spirit; it can decide the cost of planning or the cost of control is greater than the risks inherent in its absence. Very real differences in perspective will exist between those who are moving from complete centralization and those who are moving from complete autonomy. But within the context of different styles, perceptions, judgments, and assessments, it is necessary to be aware and informed about the risks and the implications of how a business is approaching ddp.

The relationships between organizational style and computer structures must be understood; the rates of change in technology and business practice must be considered; the true nature of the systems designs, hardware components, and software components must be investigated; and the special problems of network design must be appreciated. Otherwise, and sadly, failure may compromise the concept of distributed processing and deny the organization the benefits of a set of approaches that may well be basically sound.*

Harold Lorin is on the faculty of the IBM Systems Research Institute, New York City. His areas of expertise are distributed computing, systems architecture, and operating systems. Mr. Lorin has authored several books and articles, and is a frequent speaker at professional development services.

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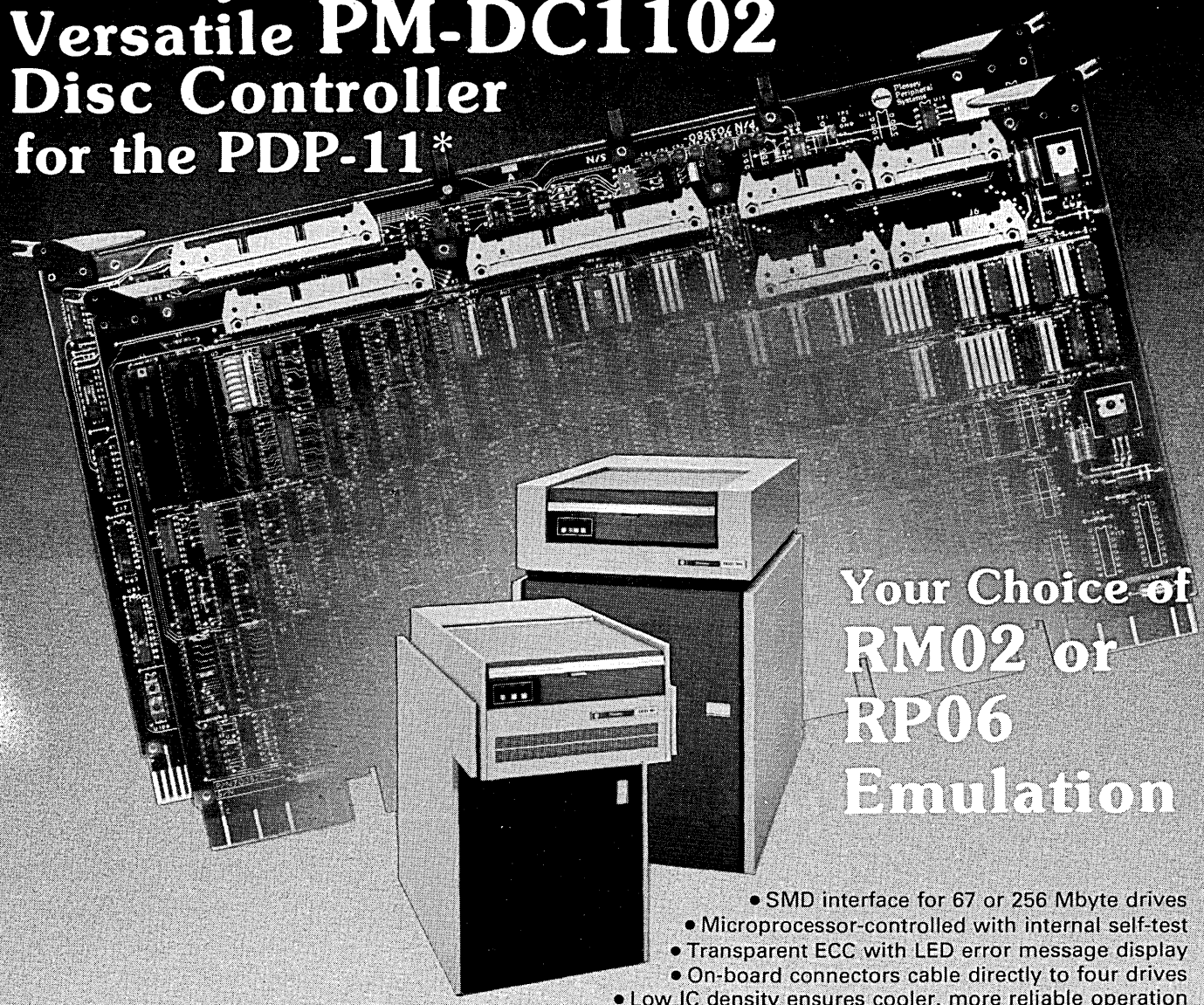

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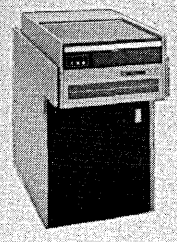
PM-DS02D (RM02 emulation)



Plessey's PM-DS02D disc subsystem consists of the PM-DC1102 controller and one 67 Mbyte PM-DD11/80 SMD drive that has a proven history of reliability and data integrity. The PM-DS02D subsystem provides complete software and media compatibility with DEC's RH11/RM02 subsystem. The PM-DC1102, in this configuration, can directly support four 67 Mbyte disc drives for a total system capacity of 268 Mbytes. Disc pack files created on either the PM-DS02D or the DEC RM02 can be used interchangeably.

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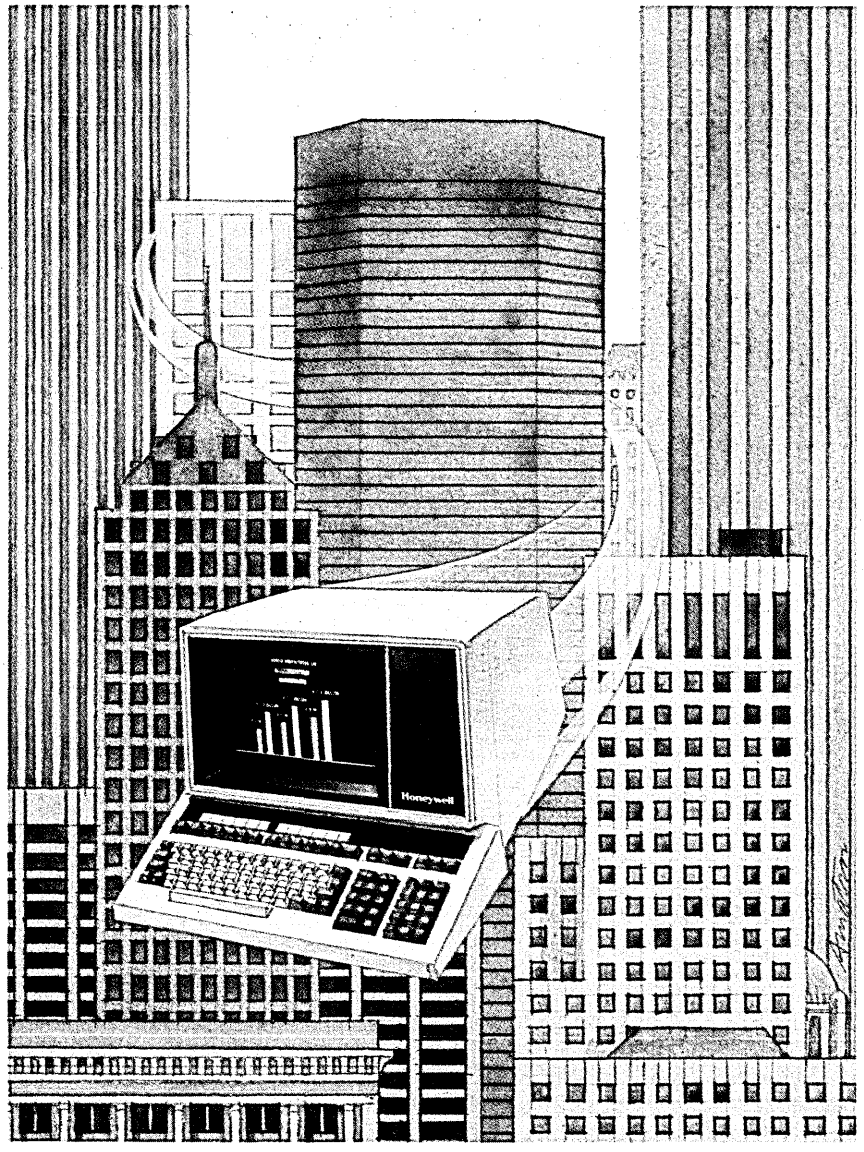

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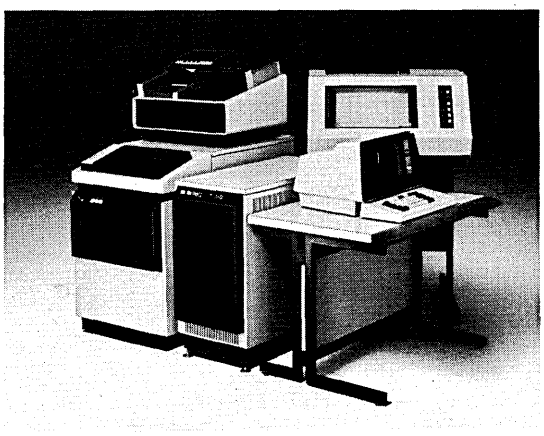

PERTEC SYSTEMS

Perfecting Technology

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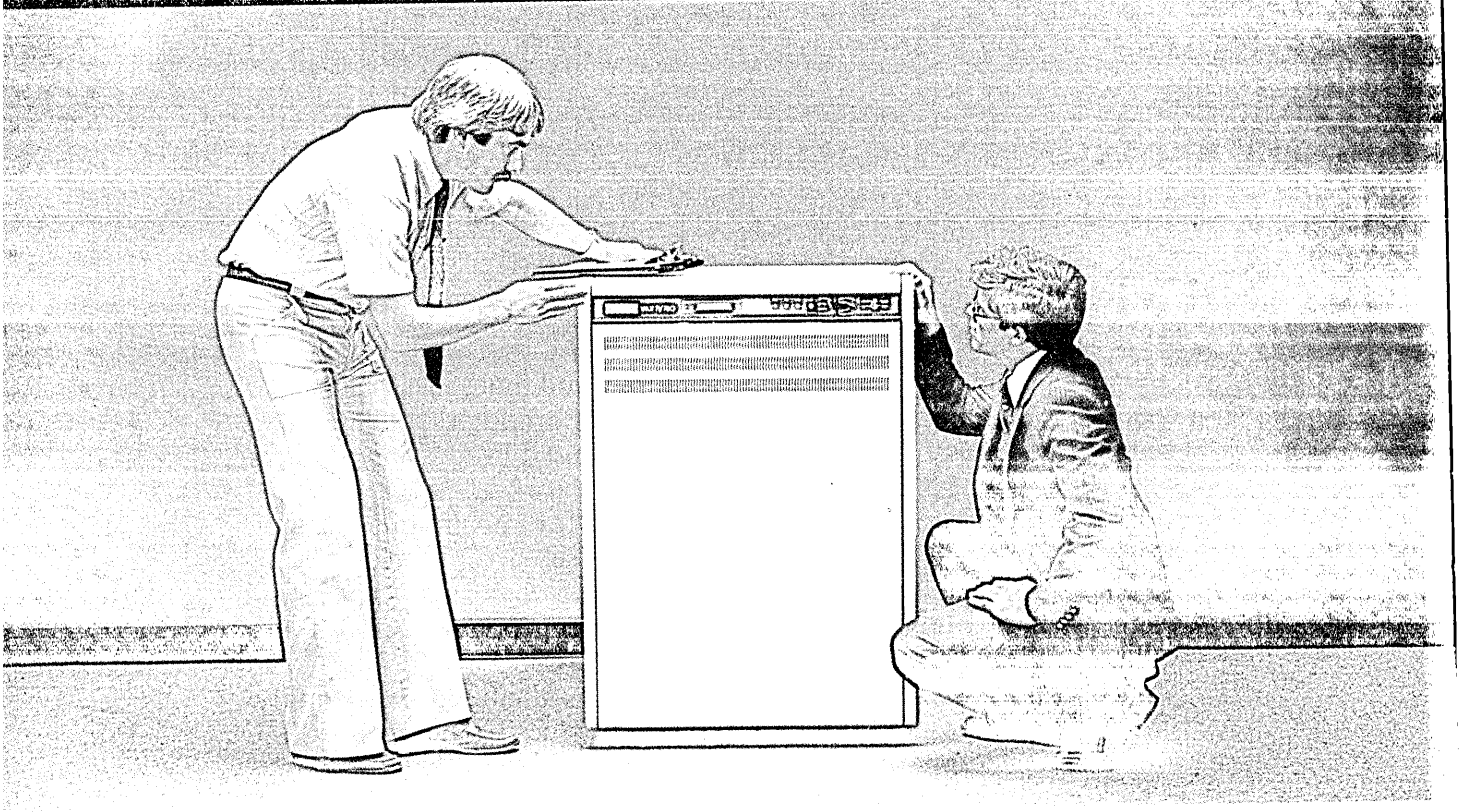
Digital's new



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A computer with virtually unlimited programming space, contained in a cabinet so small it barely takes up the corner of a room.

It will change the way you think about computers.

Imagine VAX system power available to small departments. For dedicated real-time, interactive and batch environments. Distributed throughout your organization wherever it can improve productivity. And in a whole host of new OEM and end-user applications that were never practical before.

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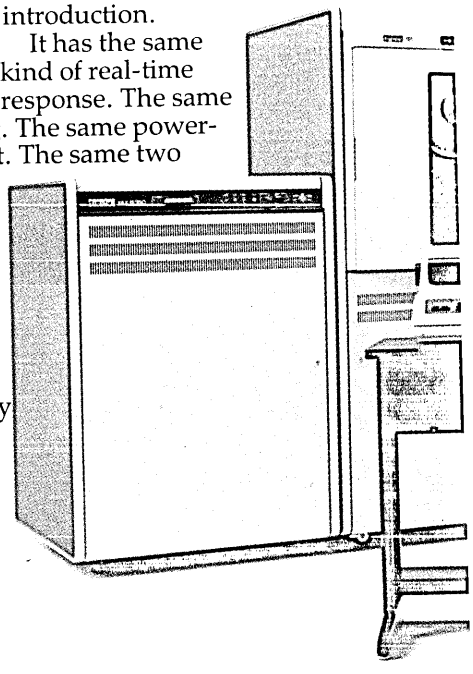

VAX-11/750.

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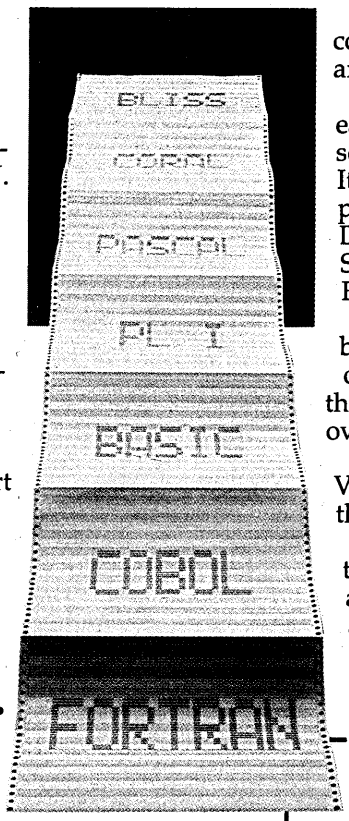

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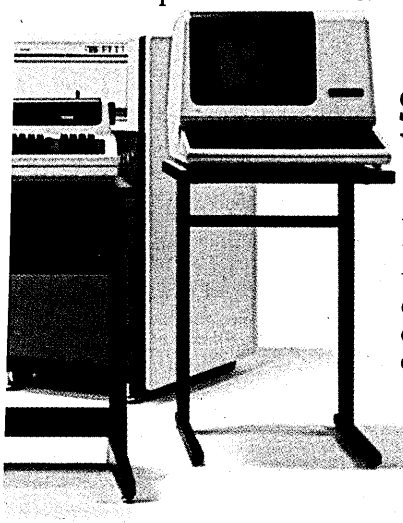

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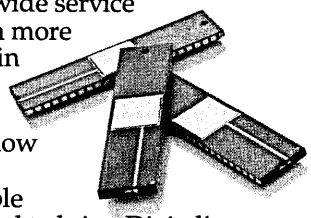

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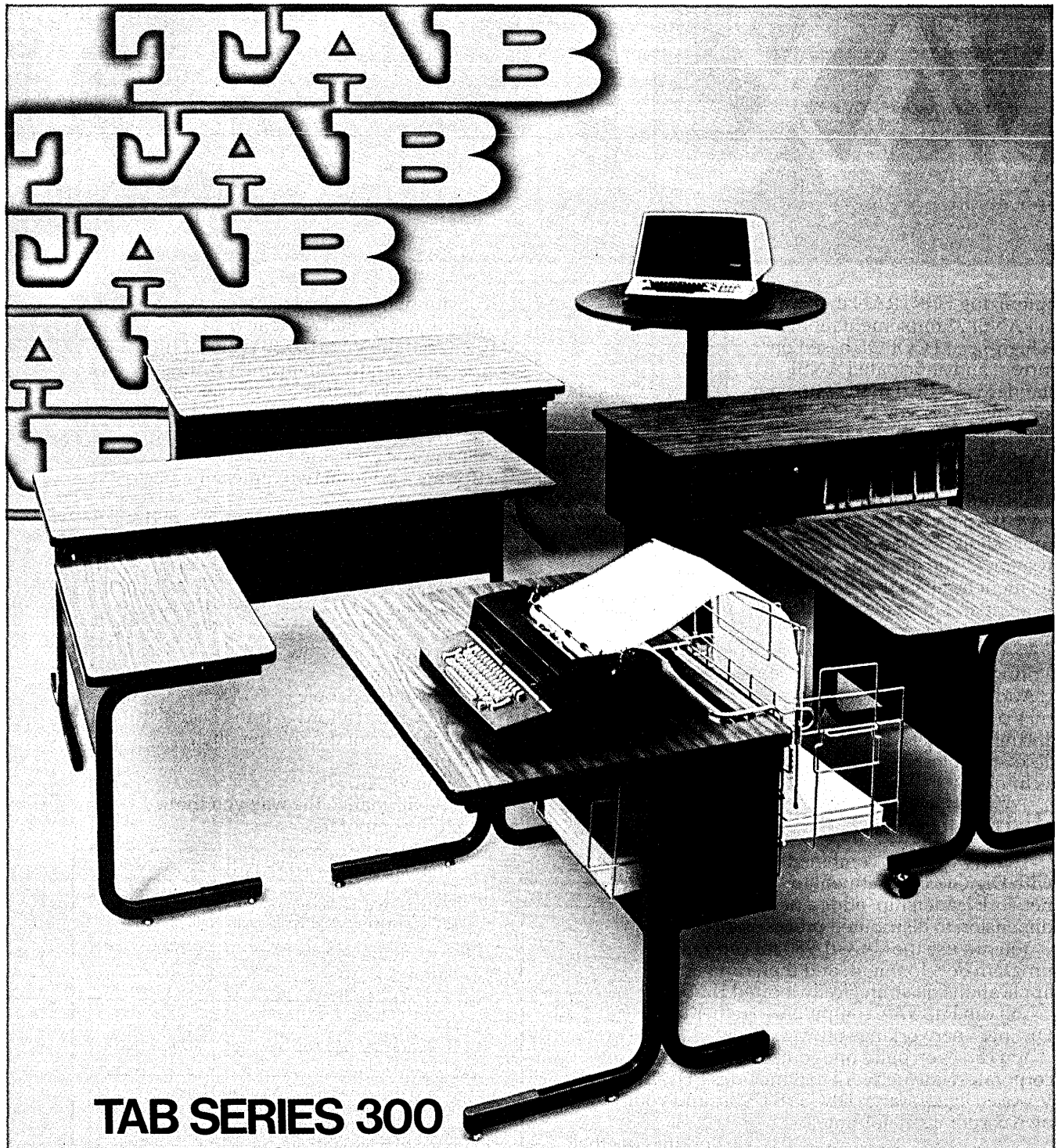

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A systematic approach to simplifying the selection process.

SELECTING A DISTRIBUTED SYSTEM

by Jon C. French

Select a system to serve a number of users spread over a wide area. Keep those users happy without spending a fortune. How would you get the job done? Here is a systematic approach to simplify that job.

First, determine the service each user will require. User needs may vary from inquiry/response systems to batch operations and may even include real-time applications. Each group will have different needs and use different terms. Still, the needs of each group can be summarized and merged; that is, most inquiry/response system users will have common needs even if they state them differently. The latter problem can be solved by providing each user with the same list of questions. Answers may be averaged or at least arranged in subgroups. The problem then becomes one of identifying groups, producing lists of questions to identify needs, and summarizing responses into a form suitable for system specification. Each group's needs may require considerable description even in the final summary.

Certain terms have become standard in describing groups of networking system users.

Conversational Users. Applications vary widely, but they have a set of common characteristics. Input and output tends to be a single line of less than 100 characters and is balanced. If the user inputs about 50 characters at one time, the application will usually respond with about 50 characters. Another characteristic is that this class of users will expect a response to each line input in about two seconds; this expected response time may increase to about five seconds when a complex service is being performed. The response time should not vary more than one-half a second for a given application.

Finally, the actual number and distribution of the applications must be considered in terms of central processor power and mass storage requirements throughout the system. Clustering many applications at a single site may require expensive hardware to produce the desired response times. Distributing these applications and associated databases will often reduce this cost by providing parallel processing opportunities.

Inquiry/Response Users. This group is exemplified by short input messages and long responses; crt users filling in blanks on a displayed form are a good example. Emphasis is placed on the ability to process inquiries against large distributed databases. Database design, size, and access time tend to outweigh other considerations. User-expected response time could rise to as much as 20 seconds in cases where extensive queuing or processing time is expected. Responses to simple inquiries should occur in less than two seconds. Again, consistency of response time for similar inquiries is just as important as minimal delay. Applications in this group are typically few in number although there may be considerable variation between successive requests to the same application.

Data Entry Users. Long input and short response time are typical of this group. The database used by the previous group may be generated by this one. In this case, processing time is generally not a factor. Response time should be less than five seconds and consistent. Data entry may be done in a conversational mode where the application provides some of the information. Response time in these cases should be less than two seconds.

Batch Users. The previous users are referred to as interactive because with each transaction they "interact" with the system. Batch users also interact with the system but not to the same degree. Turnaround time for interactive users is measured in seconds; for batch users, in minutes or hours. Batch users may input large volumes of data and expect large amounts of output. The amount of processing power required for a job may also be large. On the more positive side, these users can be scheduled, often in off-shift hours. Interactive users can seldom be scheduled. Finally, batch users expect a high degree of automatic recovery. For interactive users, recovery may be a cooperative process.

Other Users. While the above the groups normally contribute the bulk of the load to a distributed system, there are other groups of users who should be considered. First, there are the administrative users. These people control the system, schedule resources, bill users, and perform other related tasks. Second, there may be applications that interact with other applications, such as the automatic updating of a master database on user log-off. These may vary in nature from "conversational" to batch types. And third, some systems may be expected to handle real-time applications, such as process control, where local interaction is often measured in microseconds. Interactions with other components in the system may require a response time measured in milliseconds. Data volume in the latter case is normally low.

WHAT TO ASK

To draw up a realistic profile of expected user load, the following sets of questions should be asked. User specific definitions, terminology, etc. should appear in the questions. You must speak the language of the users and the vendors.

INTERACTIVE

- How many times per day do you log on?
- What is the average time you remain logged on (nearest half-hour)?
- When do you log on (approximate time of day or rate)?
- Average size of input (nearest 20 characters)?
- Average size of output (nearest 20 characters)?
- Maximum size of input (nearest 20 characters)?
- Maximum size of output (nearest 20 characters)?
- Average number of inputs in a 10-minute period?

CONVERSATIONAL

- What applications do you use and how many times a day do you use each (not number of inputs)?
- Do you use any of these applications at specific times (application, approximate time periods, and number of "sign-ons" by time period)?
- What are your mass storage requirements

GUIDELINES FOR PRESENTING A PROFILE

Capacity
1. Total number of potential users
2. Number of geographic sites that will exist
3. Number of users at each site
4. Percentage of users by site which fall into following groups:
   a. conversational
   b. inquiry/response
   c. data entry
   d. batch
   e. other (specify types if percentage is significant)
5. Number of users to be supported simultaneously
   a. by site
   b. by group
   c. by site and group
   d. by application
6. Description of each application in terms of maximum and minimum resources required. Applications may be grouped by type.
   a. Description of applications which must operate simultaneously
   b. Log-in/log-out rates by site each hour of the day
   c. Description of required terminals and peripherals by site
   d. Description of databases that will exist
   e. Description of all projected expansion in above areas for three years

Performance
1. Quantity and type of data which must flow into and out of system
   a. at each site by hour
   b. for each user group by hour
   c. for each user group by site by hour
   d. peak rates and duration of peaks by site
2. Typical response times required for interactive users
   a. by group at each site
   b. by users of specific applications
   c. logging on or off
3. Projected processing time of each application (type) for a typical interaction with a user
4. Number of accesses/modifications to be made to each database by hour by site
5. Limitations on database accesses/modifications

Availability
1. Percentage of time system must be available by site
2. Percentage of performance degradation acceptable at each site and period acceptable (response time degradation, reduced user load, applications unavailable, etc.)
3. Longest period of unavailability acceptable by site
4. Sites or time periods where redundancy is required
5. A description of the impact on each site if some other site cannot be reached

Reliability
1. Percentage of retransmissions acceptable because of lost or distorted data
   a. by group at each site by day
   b. by application user by hour of use
2. Importance of recognizing loss or distortion of data
   a. by group at each site
   b. by an application user
3. Importance of "soft" crash capability; ability of a user to close a file, release a resource, log-out, etc. on warning that the system is about to fail
4. Importance of checkpointing or restart capability
   a. by group at each site
   b. by an application user

Flexibility
1. Modifications to be made to the network
   a. users
   b. applications
   c. groups
   d. sites
   e. databases
   f. peripherals
   g. terminals
   h. performance
2. Impact on current users acceptable during modifications; degree of automatic recovery required; correction of errors before user is aware they have occurred
   a. at each site
   b. for each group
   c. for users of specific applications

Security
1. Security requirements that will exist
   a. to log into the system
   b. to access specific applications
   c. to access users at other sites
   d. to access databases
   e. to modify system (supply detail)
   f. to modify individual sites (supply detail)

Accountability
1. Kinds of things that need to be recorded on a user basis
   a. connected time
   b. amount of data transferred
   c. amount of memory used
   d. amount of mass storage used
   e. processing time
   f. applications used (when and how long)
   g. amount of input and output
   h. use of peripherals (when and how long)
   i. databases used (modifications made, accesses, etc.)
   j. log-ins and log-outs (when)
2. Other events that need to be recorded
   a. hardware failures
   b. enabling/disabling of hardware
   c. loading/unloading of applications and systems
   d. congestion or data flow problems
   e. security violations
3. Resource utilization factors that must be recorded for hardware and software (percentages of time a device or component is actually used to perform a user's task expressed as a fraction)
4. Those who will need above information and form in which it must be presented

in number of characters for each application type?

INQUIRY/RESPONSE

- What applications do you use and how often each day?
- Do you use any of these applications at specific times (application, approximate time periods, and number of "sign-ons" by time period)?
- What databases do you access (database and application)?
- Do you use crt devices (% of time)?

DATA ENTRY

- What databases do you access (database and application)?

BATCH

- How many jobs do you submit a day?
- Describe each job.

a. What is the application or application type?

b. What is the typical form and amount of input (cards, records, etc.)?

c. What is the typical form and amount of output (lines printed, records written, files updated, etc.)?

d. How long does this job currently run (nearest minute)?

e. What resources does it require (memory, mass storage devices, line printers, plotters, etc.)?

f. What kind of turnaround time is required (hours)?

g. What databases are modified?

h. What days of the week are best to run each job?

QUESTIONS FOR MANAGEMENT

There are also questions to be addressed to management:

- What is the impact if the system is unavailable (an hour, a day, prime time, off shift)?
- What expansion plans exist that will affect the system to be proposed (how much system growth might be required)?
- Can department access to the facility be scheduled?

- What is the impact of an undetected error on users of various applications or at various sites.
- Can you limit the number of simultaneous users?

STUDYING THE ANSWERS

The integration of answers into a meaningful profile of users' needs is a difficult task. These descriptions must be made using nonabsolute terms such as probability of occurrence, percentage of users, average traffic flow. A good example of this integration process is the examination of how to treat a single factor, such as the number of simultaneous users. This number will vary continuously in most installations. Study of your survey answers should provide several values with an hourly basis. These might be the average number of users by group and site, the maximum number of users by group and site, the rate that users are logging on (and off) by group and site, or the percentage of users in one time period that could be moved to another time period (by group and site).

Setting up a system to handle the average number of users may be a mistake. On the other hand, responding to the worst case is not cost efficient. Most installations settle for something in between. There are no right answers. Each factor must be examined in conjunction with every other. Tradeoffs must be weighed and decisions made before the first vendor is approached. The issues are confusing enough without including the idiosyncrasies of vendor hardware and software. Vendors will be much better at interpreting users' needs in terms of vendors' systems, and many vendors will even help users refine those needs, but they will not have a user's viewpoint.

Table I is a guideline for presenting a profile of user needs to a vendor. The actual format can vary and can include tabulated data, histograms, or descriptive paragraphs. The important point is to communicate in terms a vendor will understand.

Whenever possible, the data should be presented in nonabsolute terms. Response time requirements for a conversational user group might be described in the following way:

- 95% of all responses should be made in two seconds plus or minus one-half a second.
- 99% of all responses should occur within five seconds. No responses should exceed 10 seconds.

This will satisfy the conversational user group without placing a severe constraint on the vendor. Requiring that 100% of all responses occur within two seconds plus or minus one-half a second might double the cost of the ultimate system or force many vendors not to try for that particular business.

Jon C. French is a staff analyst with the distributed systems development group in the small systems and terminals division of Honeywell Information Systems. He holds a BLS in mathematics from Boston Univ.

For letters and reports that really matter, you can't beat our D-50. With its superfast hammer and a resolution twice as fine as other daisy wheel printers (over 11,000 points per square inch), the D-50 prints the sharpest characters and clearest graphics in the business.

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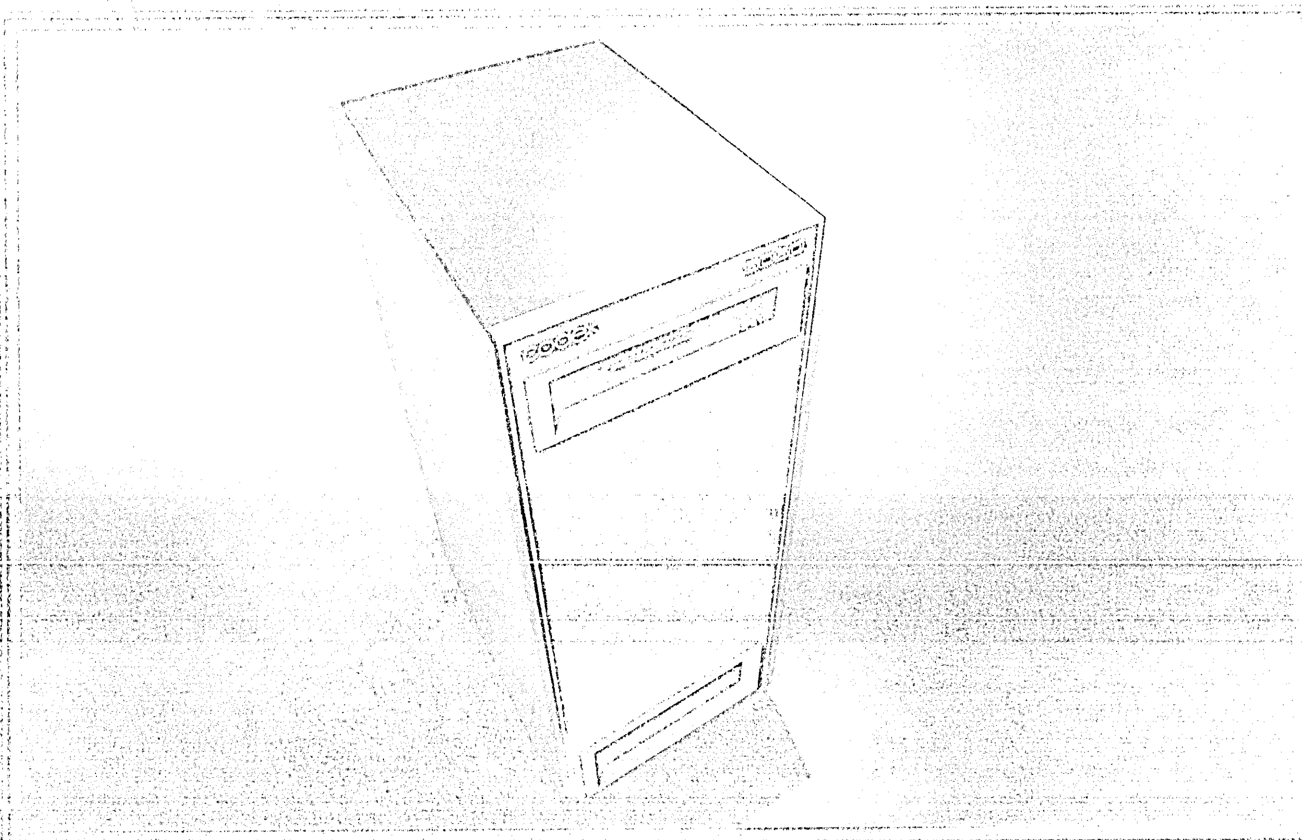

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If a corporation doesn't take care of its documentation, it will inevitably need a technical writer to diffuse the time bombs of neglect.

DEATH, TAXES, AND DP DOCUMENTATION

by Lindsay Wilson

As a technical writing consultant, I have worked on assignment to four major corporations in the last three years. I clean up messes, untangle file structures, sort out mislabeled bytes, and put precision back into wobbly systems. Usually I deal with crises, work against deadlines, or try to sort out the disastrous consequences of production runs gone awry. Programmers, systems designers, and directors are usually delighted to see me, especially when auditors are breathing down their necks. I soothe nerves and sometimes even restore reputations. I do the work no one else wants to do, or has time to do, or is capable of doing. My fee is between $120 and $300 a day, and I have never had to look for a job.

Dp documentation is not only necessary; it is as inevitable as death and taxes. Companies that realized this in the past are far ahead of those that didn't. But if your documentation closet is a mess, lack of foresight may be only partly to blame. You may be caught in the "dp historical bind," the situation that arose between 1965 and 1980, when development outstripped the ability of users to keep up.

Most of the large corporations that committed themselves to dp in the mid- to late '60s went through one or more major conversions in the '70s. This alone would be work enough to document; to complicate things further, these companies probably went through several hundred job-hopping programmers and systems analysts as well. All of these people thought and programmed differently, but it somehow remained an article of faith that someone would be able to understand their work when they left.

If a corporation expanded or diversified during the '70s, more hardware was probably brought in to accommodate the dp needs of the acquisitions. Often the state of the resident system was disregarded. More systems designers were brought in to cement new systems to existing ones, and the only

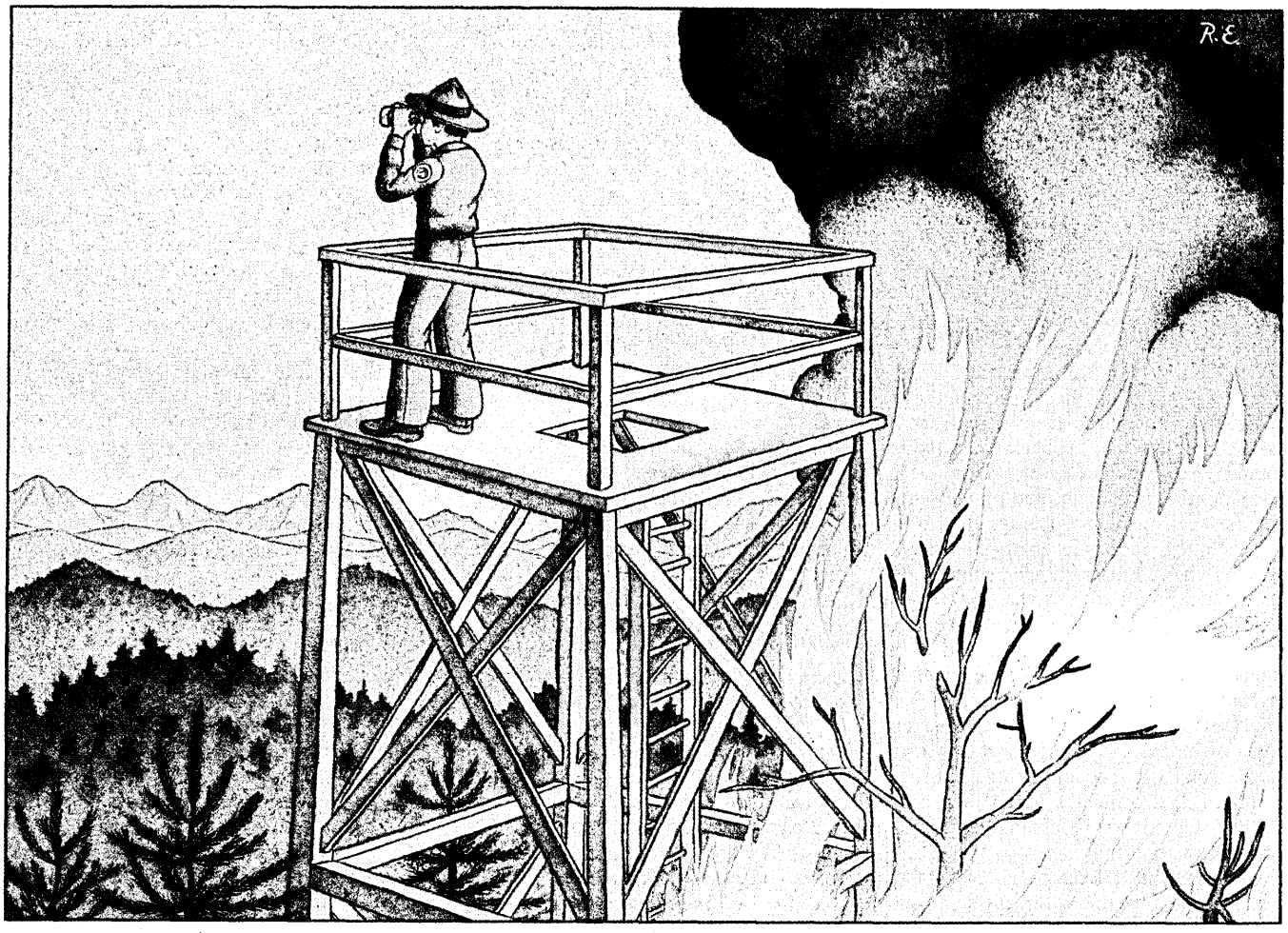

ILLUSTRATION BY RICHARD EGIELSKI

One company could have avoided a lot of headaches with a standards department that kept up-to-date information on systems, files, and reports.

question ever asked was: Does it run yet? The handful of experts hunched over terminals, pecking away at modules. They got everything running and then moved on. Corporate management sat back with a sigh of relief and began to receive monthly reports.

Who really knows what the system does? What are its exact limits? Is the file structure ideal? Does the system offer anything saleable? Could anyone explain the system to top management?

Let's say that a serious bug disrupting production is discovered, or that something goes terribly wrong when a simple modification is attempted. The maintenance programmers prove to be of no help and the original programmers have all left. Fast action is needed, but development was so rapid that there was no time to stop and write.

A close look at such a system will likely reveal a patchwork of programs written in the late '60s and producing "old faithful" reports, a mixture of languages and styles of programming (some reaching back to the earliest days of Autocoder thinking), a great deal of duplication of processing, roundabout processing that could be reduced by 75%, and possibly a hodgepodge of hardware. A lot of time, money, and core are being wasted.

Huge systems that seem to have grown by themselves and have large areas unknown rightly awaken fear in most managers. Yet the MIS people don't want to admit that they don't know exactly what their systems do. Glibness can pass for knowledge for a while, but if systems are not sorted out and maintained responsibly, managers and companies will eventually be swamped. "The computer made a mistake" is an excuse that no one accepts anymore.

CASE HISTORY NO. 1

Never leave a system in one person's head. I was sent out to document a system that had been sold by a major New York bank to a large group of users. After the sale, the bank contacted my company to produce user guides. This seemed ordinary enough, but trouble started the first week on the job. The system was immense, much further-reaching than the dp division knew. Existing documentation was far less than promised. I was handed about 15 hand-scribbled pages, an assortment of specs, and a few report samples. It was assumed I would produce a 40-page document in about six weeks. The system had been seven years in the making, encompassed hundreds of modules and huge sections of the bank's total dp. The user guide had been promised in two months' time, but no one was worried. Everyone assured me that the system ran beautifully.

Problem 1: Because no map of the system existed, no one was really sure which areas would concern the user and which would not.

Problem 2: Users were going to be able to update files. Although major files and certain aspects of processing were shared, there was no departmental interface.

Problem 3: Only one person in the dp division could define the limits of the system with any authority. Having begun with the system seven years earlier, he quit three weeks into the user project and left behind no more than a few scraps of information. No one from the dp or non-dp branches of the bank had ever required anything from him but design, and he took with him the ins and outs of about 700 interlocking programs.

Not only the user project but the bank itself could have been in serious trouble if it weren't for the fact that most of the original programmers were still on the job. Without systems analysts or real documentation, the job was extremely tedious, took much longer, and cost a great deal more than it would have otherwise. When it was finished, though, the dp division had for the first time a large map of the system, which could be read by dp and non-dp personnel alike. Processing cycles were set up for interdepartmental use, reports were organized, and files were standardized and laid out.

It was a little amazing to me at the time that these basic dp tools were totally absent. I certainly didn't cover much more than just what the user project required. And I still wonder what will happen to this large division if its two top programmers—the ones who debug daily on-line and have everything in their heads, who can recreate the whole file system in three days, like the time they lost it in June 1979—ever leave.

Summary: Maybe this division avoided any major crises for a number of years because it seemed to be made up of hundreds of people who took responsibility for only very small areas of processing. The user project was vastly underestimated, but it taught the division a lot about the rest of the system. This division still has no set of standards or any guidelines involving documentation.

Moral: Sooner or later, the need for documentation is going to catch up with a corporation. This bank is only safe until the next time, or until the next key person leaves.

CASE HISTORY NO. 2

One step from disaster. My next assignment was a call for help from a large film network. The problem involved "about 40 systems; we're not sure ourselves." Armed with four researchers in three different languages, I went to work on the system that produced the monthly checks.

The system had been part of standard processing in the late '60s, then in 1971 it was converted from a Univac straight to a 360. Debugging and altering the file structures were feverishly accomplished on-line. Nothing was ever quite the same after that. As the corporation grew, dp mushroomed and staffs of programmers and analysts came and went. There was one major effort at documentation in 1974.

By the time I arrived in 1979, the check producing system consisted of an unknown number of programs and files. No person or group of people knew when, why, or how updating of files took place before checks were produced. The extremely fragile file system had to be accessed in the most cumbersome way imaginable. Serious problems with the checks arose almost every month. When this happened, the best programmers in the corporation would camp out at the dp center in 48-hour shifts. All the original programmers and analysts had been gone for years. Existing documentation ranged from adequate to dangerously misleading, and had never been updated. Finally, with auditors and government commissions demanding answers, a director said, "Enough!" and called in my team of technical writers.

Just defining the system took three months. There was disagreement on each of the following questions: What files are used? What is done off-line? Who are the users? Who gets the reports? Even the program library was in disarray, with listings difficult to trace or altogether unavailable. All the accumulated woes of the last 15 years were present. The mess was known as "the impossible system."

It began as a simple COBOL system with four reports, and everything worked nicely for a couple of years. A BAL team expanded the check producing system. After the traumatic conversion, new files were created with each new program to protect the original files. An influx of these superfluous files coincided with the system's most rapid period of development, and no documentation was written for them or for new programs, which were patched front and back onto the original COBOL-BAL system. Programmers and analysts came and went throughout the '70s, altering programs, adding or subtracting from the library or production cycle without leaving a trace. Then a brilliantly designed new on-line system for general processing was awkwardly grafted onto the now staggering old check system. Patial documentation was done for the on-line system because the check system's files were now shared. When things didn't quite fit together, on-line simulation of off-line processing was also added.

Documenting such a system was a real problem because any design concept had been lost. Programmers in the late '60s were influenced by a lot of fads, many of which were still being used each month on the

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Huge systems that seem to have grown by themselves and have large unknown areas rightly awaken fear in most managers.

checks. Without documentation, it takes twice as long to figure out why someone is doing something a certain way when at the top of the page he did it differently and on the preceding page the task is accomplished with five instructions instead of two. Dozens of one-line patches inserted without comment are difficult to fathom. It's not hard to imagine that debugging this monstrosity meant setting up cots for the programmers at the dp center.

Summary: This system was close to breakdown. Master and machine no longer had much contact. The documentation produced so far has been instrumental in dealing quickly with the crises that the check producing system still spawns. When the system is rewritten, the documentation will provide the information base for design.

Moral: While there was not much evidence of real sloppiness, and while getting caught in the historical bind is more common than one might think, a lot of headaches could have been avoided by having a standards department that kept up-to-date information on systems, files, and reports.

CASE HISTORY NO. 3

One corporation doing things right. It was the neatest, cleanest assignment yet: an international corporation dealing in communications and electrical circuitry needed a technical writer to act as a liaison between its laboratory technicians and its marketing division. There was no crisis here, and the dp division had a strong library and a long history of documentation and rigid standards. Within a week, it was evident how much this influenced working conditions at all levels. If top management had questions, the appropriate charts and reports were brought out. If software development had problems, the file layouts for all compatible systems were immediately available. And if a new employee wanted to research a system, the documentation was there.

Everyone wrote a great deal. Programmers, staff, and consultants alike were required to provide their own documentation. Middle management was responsible for updated, detailed file and system documentation. Top management wrote comprehensively on hardware and development. It was taken for granted that not everyone wrote well; the head of standards (an English major) had an intermediate dp background and served as editor for everyone. He rid the division of confusing, misleading documentation, eliminated all obsolete written material, and honed the reports coming from middle and top management.

My project was to produce user guides for a new piece of hardware developed in the corporation's laboratories. It had been programmed and tested by the staff and was about to be brought to market. The people I had to deal with were problematical: a renowned mathematician who barely spoke English and a European engineer who wrote two-page sentences and produced documentation that no one could figure out. The programmers sidestepped them and marketing was afraid of them. With a certain amount of patience and teeth-gritting the user guide was produced, but even here the length and scope were underestimated. A "five-page blurb" ran 20 pages, one user guide became three when the user group suddenly expanded, and the project stretched from one month to four. Because the company was so well prepared, though, nobody had to lose any sleep. There was virtually nothing that couldn't be researched immediately, and the most obscure information could be brought to light within a day.

Summary: At some point in this corporation's history, someone realized the value of standards and writing. The librarian had a certain amount of power and an unusual amount of respect. Programming and systems design was up-to-date and consistent. There was a good deal of departmental interface. The working pace was never frantic.

Moral: Nothing beats an ace in the hole.

Technical writing is a relatively new field and, as such, is often over- or underestimated. It tends to be an unloved stepchild in many dp divisions. Some programmers have even gotten away with asserting that documentation is "beneath" them, which must be one of the great crimes of the '70s. But however one feels about documentation, one thing is certain: if a corporation doesn't take care of standards and documentation itself, it will be requiring my services very soon. ✱

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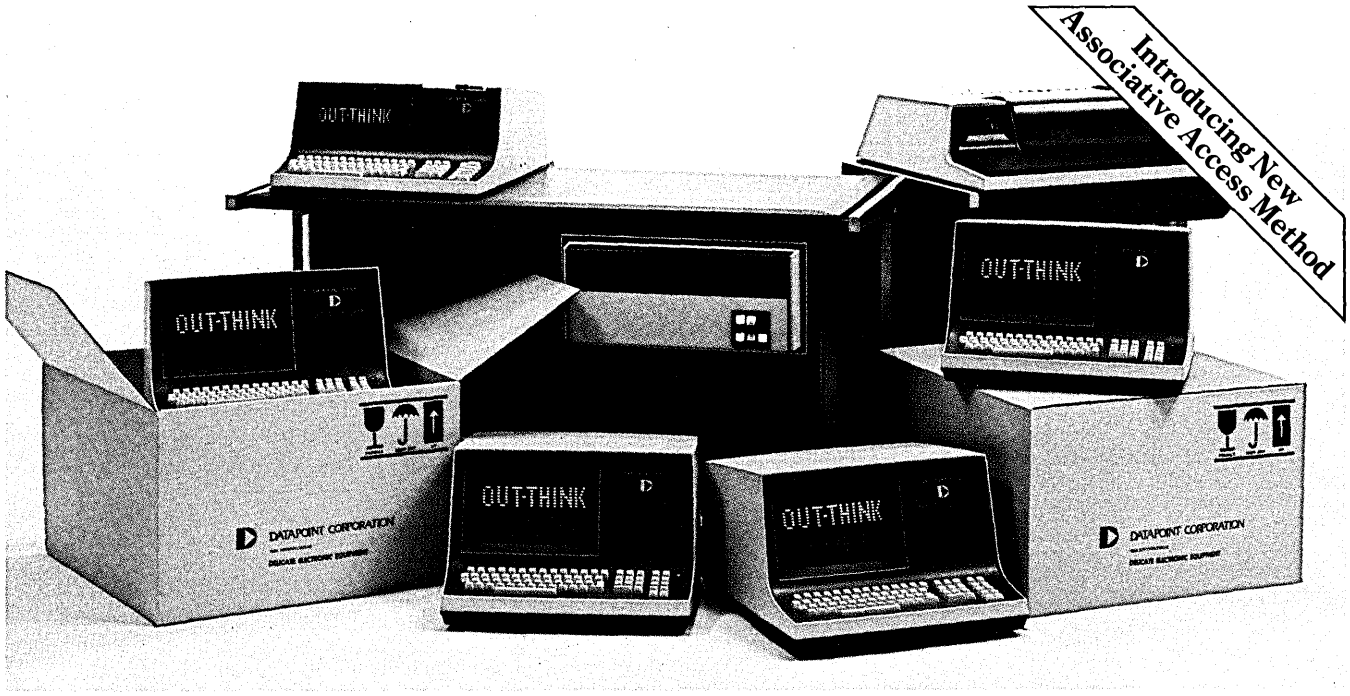

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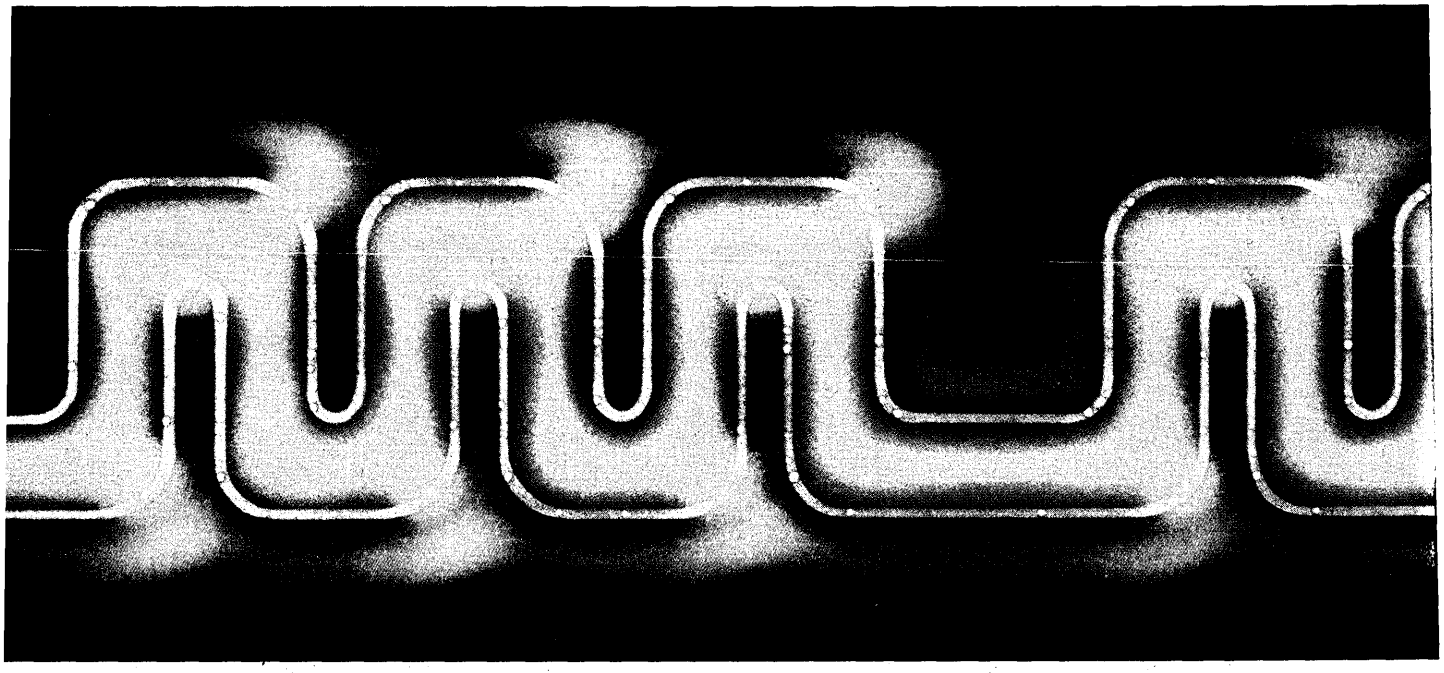

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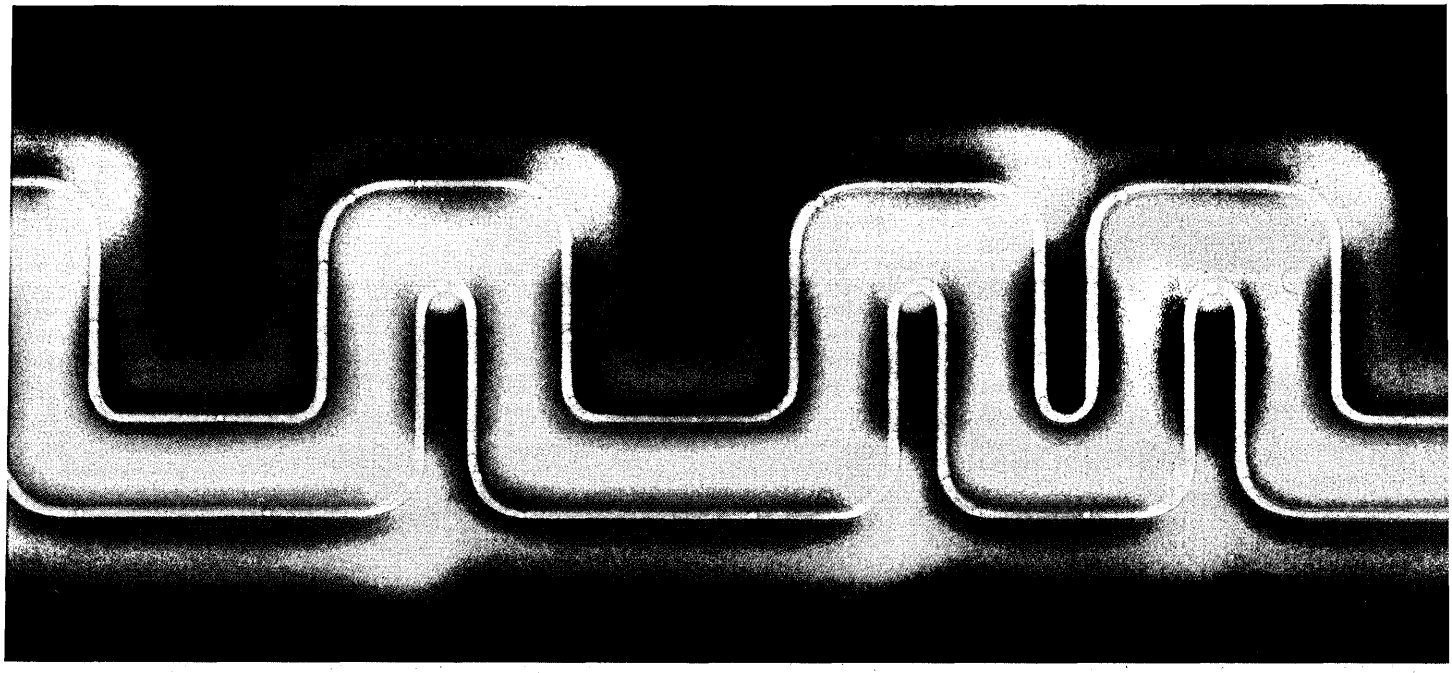

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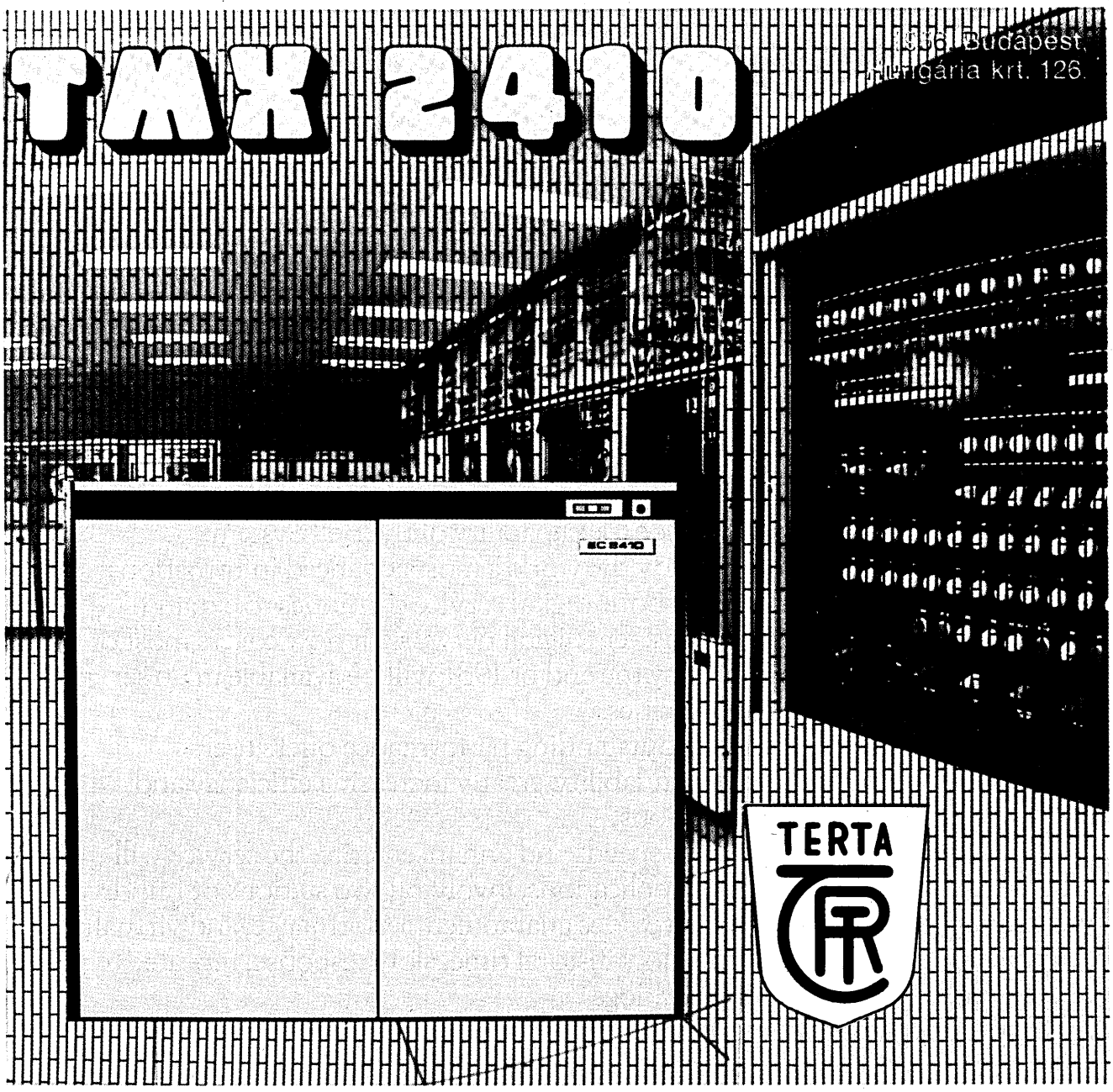

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"It's not the writer's job to prepare the best manual in the world—just what he can when it's needed."

TECH WRITERS TALK

by Perry Petersen

Despite the growing difficulty of sweeping the subject of documentation under the rug, technical writing managers continue to report that they have trouble getting the budget and scheduling allowances they need to succeed. But as more and more managers find themselves burned by the problems that lack of proper documentation can cause, the status of technical writing is changing.

A series of interviews with technical writing and dp managers seemed a good way to discover how the field is evolving and what remains to be accomplished. These interviews span several industries and several kinds of technical writing. However, responses to certain questions—who should do technical writing, for example—are strikingly similar.

As might be expected, small, standalone dp departments typically respond that documentation comes last, if at all, and that the writing is done by the analyst/programmer; editing falls to the dp manager (or the user, in extreme cases). At the other end of the spectrum is the large organization that typically has supplied hardware, software, or services for over ten years. Here, the writer is included as part of the development team, and work on documentation starts at the concept stage. Standards for format, outlines, style, illustration and maintenance are in place. Writing, editing, and even final typesetting use on-line systems so that words may never touch paper until camera-ready copy is produced. In between are departments of medium to large size that use varying timing, methods, and personnel for writing. Some use pencil and paper, then word processing, then editing. Some relegate documentation exclusively to programmers, who are asked to do it after the code is functional.

Esprit de Corps, an apparel manufacturer, is growing rapidly. The company is about to convert to larger hardware; systems and user staffs are expanding; and several other companies are using the same custom software. These are conditions that make extensive documentation invaluable, but keeping pace can be difficult. Says Larry Vonnegut, dp manager: "We're aware of the problem [of needing better documentation], but the new system is needed as of yesterday." To minimize training time requirements, he says, "We use menus and prompting to self-train where possible."

Vonnegut stresses simplicity in materials for the terminal user because "with a big manual, the user wonders where to start." On the systems side, his department uses self-documenting code to improve cost-effectiveness. He says that as conversion time nears, he wants to emphasize documentation more and would like to hire at least one person to do technical writing. He is concerned enough about documentation to have prepared a manual with narrative, report samples, and screen formats. His reaction to a documentation seminar? "I was amazed at the emphasis on production. They were talking about $150,000 budgets for reproduction and binding. I will be happy to photocopy ours."

Good documentation, Vonnegut says, means that "the manual must be easy to use, well presented, not too big; and it must be clear to the user where to start. Right now, we are fortunate to have a good staff, with comments well built into code, but we have to look at each line to make changes."

THE ART OF TECH WRITING

Users expect a lot from documentation that accompanies a major hardware purchase. Bernie Goldstein, technical writing manager for Amdahl, is responsible for a wide variety of such publications, including customer manuals which show operators how to run the equipment, reference manuals for programmers, and field service documentation to support hardware and software. Many of these publications come in both tutorial and referential forms.

Goldstein says that users need clear writing and that he'd be better able to provide it if he got more information from them. "We don't get as many complaints as we would like, even with reader comment forms in the back of the manuals. Plus, we rarely get comments about what may be missing that could be used. We plan to send an interviewer to the field—both to customers and service people—to ask questions like 'what's not used' and 'what's missing.' "

The documentation process is well defined; the first step is to write a detailed prospectus of a proposed manual. Sections are outlined, including draft illustrations. Then the prospectus is routed to people who have good instincts for what will be effective. Because good editors are hard to find, Goldstein says, management will often review the prospectus.

For Goldstein, documentation is the art of the possible: "It is not the writer's job to write the best manual in the world, just what he can when it's needed. The reason many manuals may be poor is a function of the time the writer has to prepare it."

Amdahl has a full-time writing staff and can support its work with tools that a small shop couldn't afford. On-line writing is passed on to a phototypesetter. The publications group manager is aware of a product early in its development, and he writes a plan and schedule to identify publications needed to support it.

What qualifications does Goldstein look for in a technical writer? "Writing can involve abilities that a [typical] programmer doesn't have and a wide range of skills related to production." These include "being people-oriented, knowing printing and photographic methods, as well as writing clearly. Technical writers are becoming regarded as professionals, where before they were necessary evils. Now, they are more involved with demanding people, and they get started early as part of the development team. We are putting together an entry-level course for writers; also, the writers who will write field manuals take the field engineering course as part of their training."

DATAMATION's April 1980 Salary Survey showed no listings for technical writers. In July, the Letters column held an eight-signature critique of the omission by the writers at Blue Cross in Oakland, Calif. In a group interview, writers Martin, Schiavone, Blake, Robinson, Barth, Burton, Brinke, Schlansky, and Tharaldson offered their ideas about what technical writing is, how it's received, and what needs to be changed.

The group was more concerned with how their documentation was received by users than with how their pay compared with that of programmers. The consensus was that

The people who prepare hardware and software documentation are gaining new respect in the dp industry.

programmers made more money, but the writers—including former programmers—said they would rather work where "no one was calling you at 3 a.m. about a program halt."

At Blue Cross, documentation is done for both hardware and software. Standards manuals are in use, one for writing and one for software development. After several years during which technical writers have done an increasing volume of work, one of them says, "Technical writers are becoming more accepted by the programming staff. They [the programming staff] don't want to do the writing and are becoming conditioned to giving it to us."

When asked his opinion of "self-documenting code," another writer replied, "If enough documentation was written into the programming, it would be okay, but the people who don't want to document are the programmers."

One of the writers' few complaints concerned feedback about the finished product: "It is tough to say how successful we are in technical writing; it involves a substantial time frame, and you [typically] don't get to see what happens to the result." There is immediate managerial review by the user department, but the long-term results are not well known.

SOFTWARE AND TECH WRITING

Technical writing is considered a necessary part of the software engineering process at Hughes Aircraft, says Ed Van Tilberg, the company's senior scientist. "As a software department, we deal with software for embedded products, such as radar, air traffic control, missile guidance, etc. Technical writing is used in proposals, specifications, test plans and procedures, and in technical manuals that are part of the products. We try to put the work into English, without jargon. We do have outlines, and there is a writer's guide to minimize the need for rewrite."

Van Tilberg also wants more input from users: "There is a push for good communication, but we usually hear about material only if it is judged unsatisfactory. We are not looking so much to increase efficiency of communication, more to avoid poor communication. At the technical level, some try for increased efficiency of communication, but this concept is not recognized at the management level."

Not surprisingly, Van Tilberg feels that technical writers have an important job: "There is a diverse explosion in technology, and to keep up to date, synthesize communication, and get general understanding is a problem, and a challenge. The tech writer gives 'flow' to facts, and engineering personnel depend on this to make sense out of it."

NONAVAILABILITY OF STRAIGHTFORWARD FORMULATION

Is a relatively organized file one that's kind of organized or did your sister write it? What are the "true implications of replication?" Why do we have fuzzy animals like these wandering around in our specifications and manuals?

Louise Becker, an information sciences analyst with the Library of Congress's Research Center, explained it this way to a recent National Bureau of Standards symposium: "Library people talk to library people; managers talk to managers; and the dp people talk only to God." Presumably He understands; after all, YHWH is the primordial acronym. But just between us mortals, there's an aching need for clear language in dp.

At least once in your career you have probably been disappointed to read that "reprioritization of schedules caused slippage"—once you realized that it meant the product wouldn't be ready on the date promised. You may even have written such a line, in which case, may YHWH have mercy on you. You'd never *say* it that way. If we could write the way we talk, the fuzz factor would diminish.

Of course, some of us have been around computers so long we actually speak a kind of computerese. We say "utilize" when we mean "use," "methodology" when we mean "methods." Are we trying to preserve a mystique, or do we want to leave room for changes by avoiding specificity? We change nouns to verbs to adjectives to adverbs back to weird new hybrid nouns guaranteed to obfuscate the simplest statements; we take ordinary words and insist they mean something different from what they usually mean. Consider:

Installabilities—Things to install? How to install things? Ability to install?
Electronization—Build it with electrons?
Graceful Degradation—Each key slowly became stuck?
Grateful Termination—Thank God it stopped, we didn't know what to do?
Timage—Something like Babbage?
Nonavailability—The date is off?
Subscribable—Ask and ye shall receive?
Routinization—Common? Divided into routines? Subroutines?
Discrepant—Not correct?
Inconspicuousness—You'll never see it?
Distinguishable—You might see it?
Cosmopolitanism—Run this program only in San Francisco, New York, or Paris?
Uninterruptedly—The off switch doesn't work?
Operability—Sometime it might?
Mirror image—Backwards?
Almost exactly identical—How's that?
Meaningful card columns—Ones you have a relationship with?
Conveniently specified stochastic inputs—Ouch.
Straightforward formulation of correlated variables—Nothing that says it's straightforward is?
The information is intack—Nailed to the disk?
Interesting File—Is there such a thing?

Now, string some curiosities like these into a paragraph—randomly, as it's usually done—and look what you come up with:

"E-Beam memory: to minimize this montonic degradation, the entire field is slightly shifted geographically.

"Note that if the data are being transmitted directly from mag tape, the disk not being available, there is no scratch facility in which the data can be transmitted and therefore, will appear in a different form from data transmitted from disk files."

We leave documentation until the end of the project because we don't like to do it; then we write it as quickly as we can, and it shows. We need to give documentation a more prominent place in the development process. Remember: In the event that you fail to succeed initially, endeavor, endeavor again. All users of your documentation will then live happily ever after subsequently. And you will know that all's well that terminates well.

How could technical writing be improved? "In journals, highlighting and assisting scan ability for articles is important," says Van Tilberg. "This is coming to be important in routine technical writing. We are trying to develop a tutorial level of dos and don'ts for the management of software engineering."

Writers at Hughes use pencil or typewriter, and editing is done with red pencil before the final material goes to the word processor. This contrasts with the routine at some other organizations of comparable size, where on-line equipment is used extensively.

"We write for people in the agency with little experience, and try to substitute for training and courses," says Tom DiAuria, director of user services, City of New York. Many people "want documentation to bail them out of production and maintenance problems," DiAuria continues, "but on the other side, there is a lot of documentation written to get people familiar with the computer so the computer can be used as a tool for

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CIRCLE 80 ON READER CARD

Ten years ago, salaries were those of clerks. Now writers are in demand, and salaries are competitive with the technical staff.

them." In managing these kinds of efforts, DiAuria encounters the typical problem of management's concern for the bottom line. There is pressure to get programming done and to leave the documentation to the end. Although "in the last couple of years, management has begun to acknowledge that documentation is critical and should begin before coding," he says, "it is still very rare to do it that way.

"In many cases, management still is not committed to have documentation. This commitment has two parts: financial and philosophical. The budget has to be there, and documentation should be with the programming or before the system is released to the user." DiAuria feels that "documentation should really start at the proposal stage with memos or correspondence. If the project is really technical and sure to go, someone should be assigned to finish the feasibility study and polish it" so it can be used as the work proceeds.

DiAuria is past chairman of the ACM Special Interest Group on System Documentation and has been on the consulting end of documentation. He feels the cost justification for documentation with system development is clear: "There is up-front cost for documentation and the savings are not realized for a while, but it could easily cost two to three times as much to do the documentation after the system than with it, especially if you use consultants later. The technical writer typically earns less than a programmer, and technical writing aids the programmer in getting to a new project."

Is the increasing importance of technical writers reflected in wages? "Salary is very dependent on the area in the company," says DiAuria. "Ten years ago, it was like a clerk. Now it is competitive with the technical staff, and writers are in demand."

TRAINING TECH WRITERS

How should writers be trained? "Some of the best writers have no technical training," DiAuria says. He would prefer teaching a writer about technical subjects than trying to teach writing to a technician. The important thing is that "the person has to want to do technical writing; you can't force the writer to learn systems or the programmer to write."

Joe Rigo, a technical writer with Sysdoc, Inc., believes that "writers are more competent today and understand computer systems. However, there is no education for technical writers, except college English; a lot of writers used to be English teachers and have switched professions." Rigo feels that with people like auditors demanding manuals, the field is expanding fast, and that there is a shortage of good technical writers.

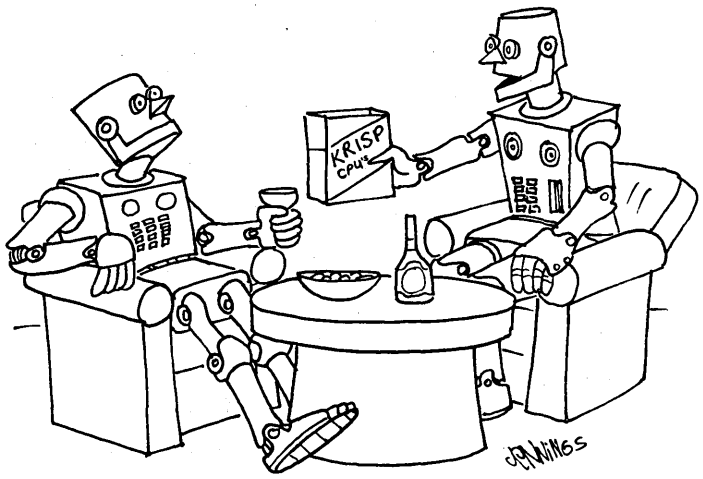
"It is a pleasure," Rigo says, "to work with highly skilled programmers and be accepted as a member of the team." But even in environments where the importance of documentation has been established for years, it's a pleasure writers are sometimes denied. Says the manager of a writing group for a large financial corporation: "We have about twenty people, and most of our work is for the end user of financial systems. Our approach is variable—sometimes we interview the programmer, or read his writings or listings. A technical writer needs good language skills, but also good *people* skills. For example, one programmer would not willingly write at all. After several months of interviews with the tech writer, the programmer finally praised the tech writer. [He realized] the writing could make you look good to your boss."

The manager continues: "Some people think that tech writing is worthless. In the early '70s, with the crunch on economy, people started into writing as 'any job.' Or writers were 'burned-out programmers.' The success level is going up now, and they are coming up fast in salary on programmers. Writers get no by-line, and some tend to feel like unsung heroes; but they do have some fans in the programming department.

"I am pleased that the writer is on the project from inception. The developers do the system on-line, and then the writer looks at it and does on-line edits; writers go to all review meetings with the rest of the team. All work from one main file. The writer works closely with the developer." Even in this setting, though, the writing manager felt it was a compliment, rather than a necessity, to have documentation included as a major subject in a six-month managerial review of in-house systems development methodology.

While talk about documentation is common, the mechanics of writing system and user manuals is often left to the front-line troops. Often, there are no specific goals for the manuals to meet. Perhaps part of the reason for this is that higher management doesn't realize the cost of this vagueness.

Good writing cuts costs. Documentation prepared along with the system, by writers who want to write rather than by programmers who don't, will enhance the bottom line. Vendors might note that clear documentation means faster results for the users, and that's a selling point; it can also save a company money by reducing customer service calls. It may take many months for writers and technical staff persons to learn to cooperate. Once they do, however, each group can concentrate on what it does best, and the company will benefit. ✱



"More chips?"

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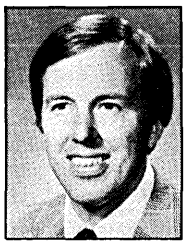
PERRY PETERSEN



Mr. Petersen is chief planner, Western region, for SPCM, Inc., the project and construction management subsidiary of Sverdrup Corp. He manages planning and control activities for clients' design and construction projects and also manages Western region data processing activities. Mr. Petersen holds a BS in Civil Engineering from Cornell Univ. and an MBA from the University of Santa Clara.

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CIRCLE 82 ON READER CARD

People committed to common goals will develop dp systems more effectively.

TEAM BUILDING AND SYSTEM DEVELOPMENT

by Peter Stroh

How do you keep good people?

The usual answer has been to institute a formal system development process with the understanding that capable people cannot succeed in a poorly designed structure. However, we still have unmet goals, high turnover, and lack of user support, so maybe better organization is only part of the answer.

A team building approach is an effective complement to system development. It succeeds because it increases the commitment of people to work together effectively. By building teams with key dp managers, professionals, and users, project cycle times and turnover can be substantially reduced.

Team building works with newly formed or existing management and project teams of five to 20 people. It is most cost effective when conducted with senior policymakers working on highly visible, multiuser/staff or time-sensitive projects. An unbiased "third party," usually an outside or internal consultant, is the manager.

Formal development procedures are often blocked by three conditions. First, there is an increasing number of nonstandardized applications, many of which require multiuser participation. How to involve several user departments in a single project or allocate leadership responsibility for a simple accounting vs. payroll-personnel system is not always clear. Second, the skills needed may not be available. Training units are usually limited in providing the managerial, technical, and human relations skills necessary to make the procedures work.

Third, and perhaps most important, formal procedures assume people's commitment to act according to plan. These expectations are frequently not met. It is hard to get individuals involved, but getting them to work together is often even more difficult.

People commit themselves to a team when they see that their personal goals are aligned with the team's goals. Building commitment requires each team member to clarify personal purposes and goals, participate in developing a common statement of team goals, and assume responsibility for his own success. The emphasis throughout is on goals rather than on existing problems (a more common focus).

Personal Purpose. "Being creative." "Doing tasks with excellence." "Making a difference." These are statements of personal purpose. When people begin to view their work as a means to achieving a personal purpose, they tend to increase their personal commitment to the job and therefore increase their effectiveness. Moreover, when people understand who other team members really are outside of work, they increase their appreciation for each other. Consequently, an early step in the process of developing a team is to ask each member to clarify and then share his purpose with other team members.

Team purpose. The next step is to have the members jointly declare a team purpose. The team then reduces the purpose to an operational set of strategy objectives with expected completion dates, and later reduces this set to performance goals that define the discrete steps to achieve each objective.

For example, the purpose of a dp management team may be: "Develop timely dp systems for the user community that meet user goals and are used as productively as possible." A related strategy objective would be: "Develop 12 new systems by Dec. 30, 1981," and a performance goal: "Complete general design for a payroll-personnel system by Oct. 31, 1980."

Personal Responsibility—Have you ever noticed an analyst or programmer exercise positive influence on a project that far exceeds his formal accountability over the work? This person's effectiveness is often related to how responsible he feels for the project. Developing responsibility is a key task in the team development process, because people who feel responsible are more likely to keep their commitments. They are also more likely to be satisfied, because they are achieving what they set out to do.

For example, a project manager in a rapidly expanding company was frustrated because he was accountable for more projects than he could effectively manage. When he was asked to take responsibility for this situation, he discovered that he had more control than he had originally thought over how many projects he agreed to oversee. His bosses and peers on the management team were delighted when this manager decided to take on fewer projects and complete each one with excellence and on time.

Organization Responsibility—"Making only those agreements you intend to keep" is an example of a ground rule that successful teams frequently adopt. Team members adopt such rules because they are more capable of relying on each other when they are all operating with the same set of rules. Although any reasonable set may work, teams find the ground rules be particularly effective.

TABLE I

GLOSSARY OF GROUND RULES

1. Make only those agreements you are willing to keep. Whenever possible, discuss any potential broken agreements before they are broken; mend broken agreements at the first appropriate time.
2. Speak honestly; be forthright in all discussions.
3. If a problem arises, clarify it, discuss it at the first appropriate opportunity with the person who can do something about it, and focus on the solution, not the problem.
4. Manage all conflicts to an agreed-upon solution.
5. Assume personal responsibility.

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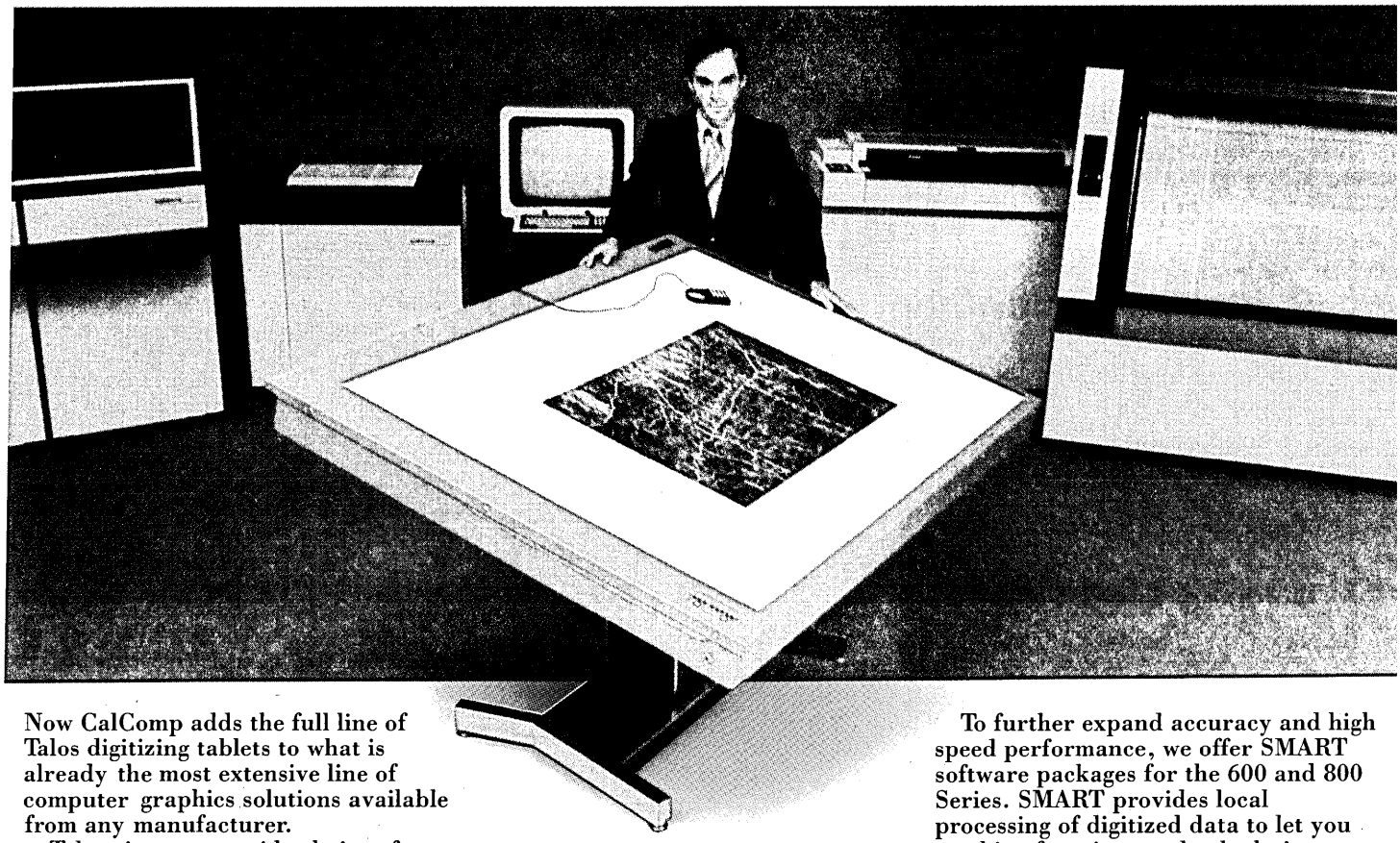

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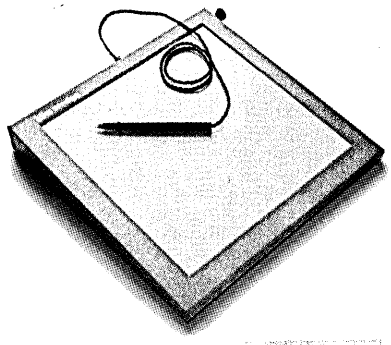

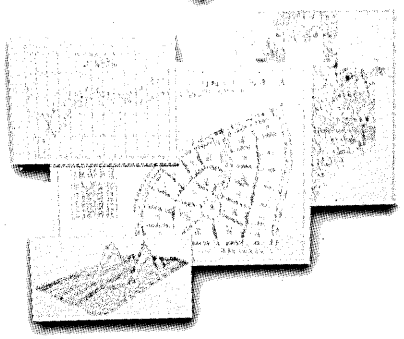

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CIRCLE 83 ON READER CARD

Only after the team has developed commitment to common goals is it ready to establish *how* the results will be achieved.

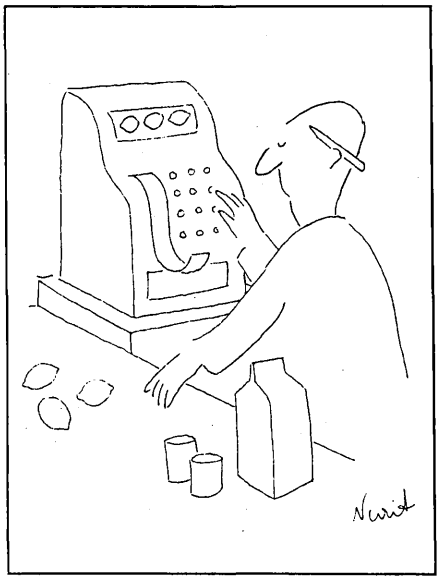
Developing personal skills is an important part of this process. Because of the fast-changing dp environment, the focus here should be teaching generic skills, skills that enable people to be more effective.

The fundamental skill in achieving any desired result is to focus primarily on what you want, and only secondarily on the problem or process of getting there. All too often, people make the process more important than the result, for example, by insisting on one right way to program or one procedure to develop all new systems. Focusing primarily on the process tends to decrease efficiency. At the same time, it is important to be aware that the path to success is usually not a straight line. When you are knocked off course, it is more efficient to correct with respect to the desire results rather than the process.

One simple way to strengthen your company's standard dp procedure is to reestablish the system development process, with user participation, on a particular project. Have all team participants determine the key tasks to be accomplished, the people to be involved in accomplishing each task, and how each person should be involved. For example, on the task of developing an MIS feasibility study, the user project manager might be ultimately accountable (you should have only one person in this role for any task), with the dp project leader having an approval role, the systems analyst a consultant role, and programmers a support role.

Team members can also learn and immediately apply other organizational skills directly to the team's tasks. These skills include problem solving, decision making, role negotiation, meetings management, and time management. Because the skills are immediately used on the job at hand, team members regard them as relevant and effective.

Peter Stroh is vice president of Innovation Associates, Framingham, Mass.



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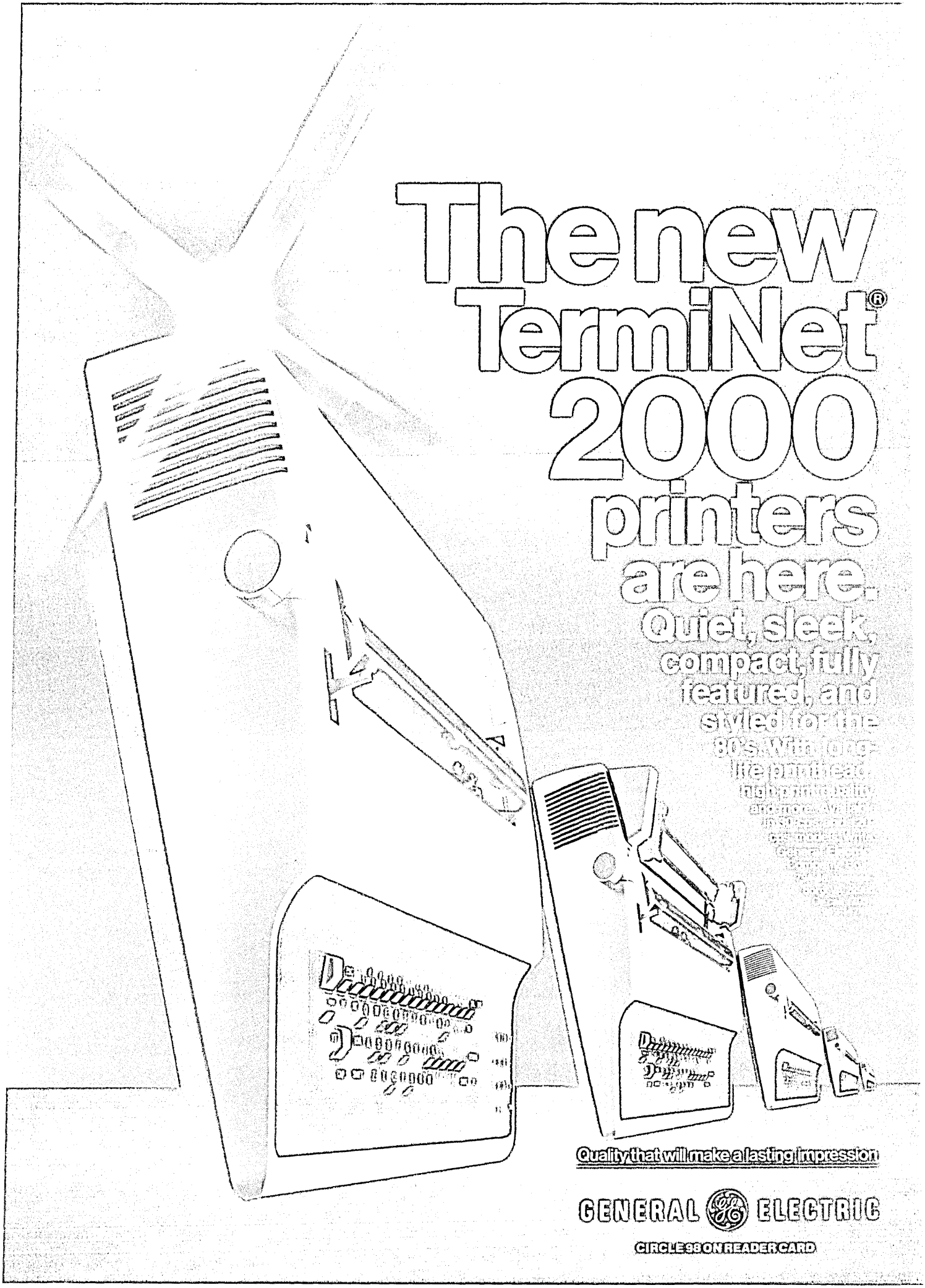
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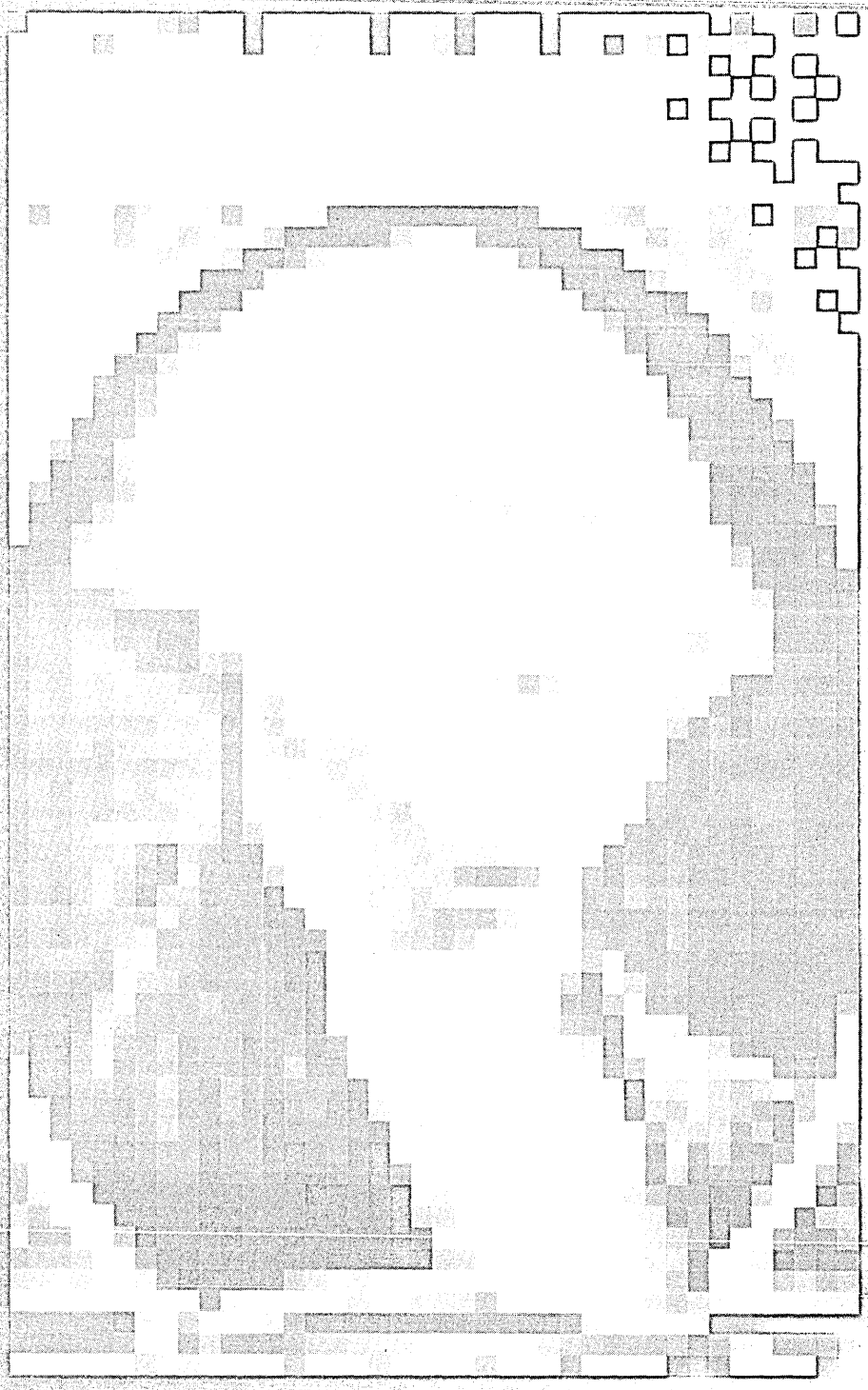

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CIRCLE 87 ON READER CARD

Anyone who has labored to change an inked drawing can well appreciate the ease with which a graphic database can be corrected.

ANIMATION ON A DESKTOP

by Colin Cantwell

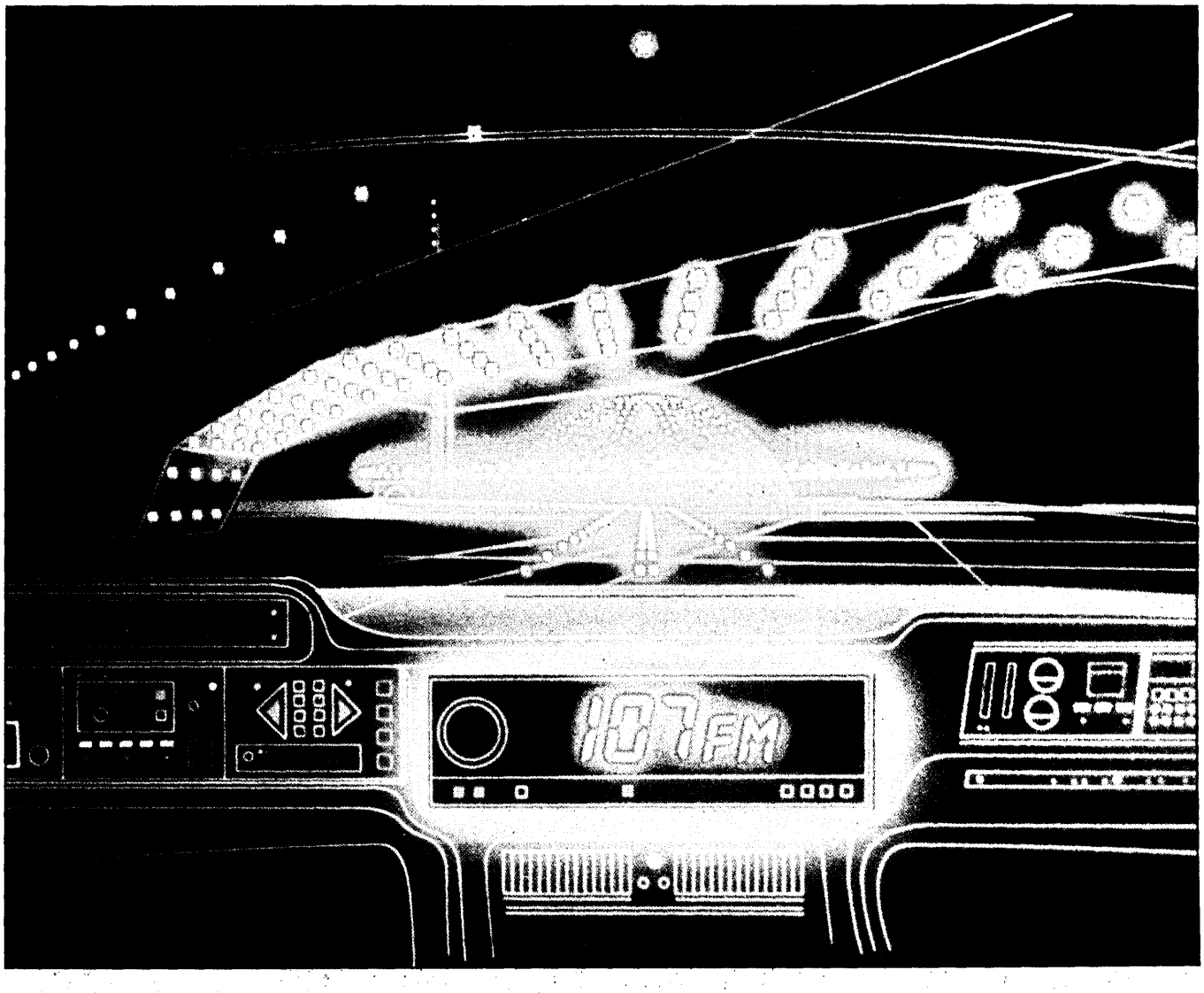
Perhaps you have seen the following animation on television: the view is from a car speeding through a computer-drawn landscape. You rush past reflectors along a curving highway, beneath bridges, past an immense dome, and through a tunnel into a city of light. Then a local radio station urges you to tune in whenever you drive this way again.

In the U.S., a luminous ABC logo maneuvers in space. In Australia, Network 9 takes its audience on a cross-continent flight.

These three-dimensional perspective graphics were created on a desktop computer system, including a digitizer for graphic input and a pen plotter for hardcopy output, using a technique that has produced high-quality images within the commercial constraints of tight budgets and deadlines.

The first step from initial conception to the tv or motion picture screen is the production of an "electronic storyboard," in which each important frame of computer graphics is created on the crt to give a visual overview of the entire production. This usually involves inputting a graphic database, a good deal of interactive design, and some on-the-spot programming. All software for this animation system is written in enhanced BASIC, which includes many graphic and matrix handling statements, as well as calls to subprograms.

A digitizer, or data tablet, is an excellent device for translating existing artwork, such as drawings and logos, into the numeric form required by the computer. Slides and frames of motion picture film are back-projected onto the translucent platen of the digitizer. Freehand drawing is sometimes input more naturally with the light-pen on the



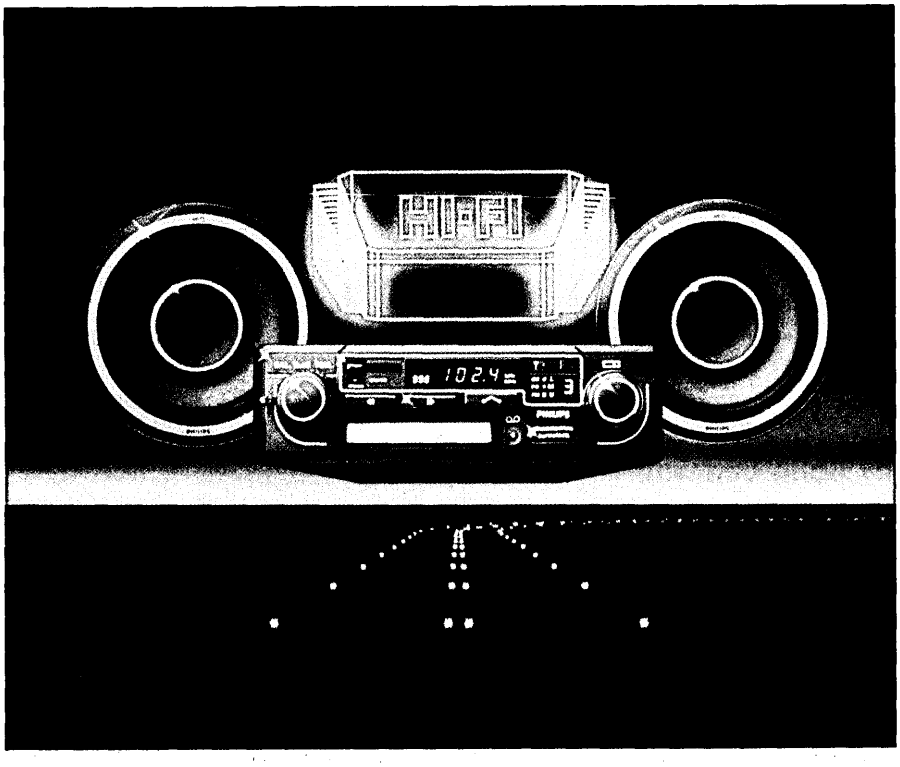
PHOTOS BY MARKS AND MARKS

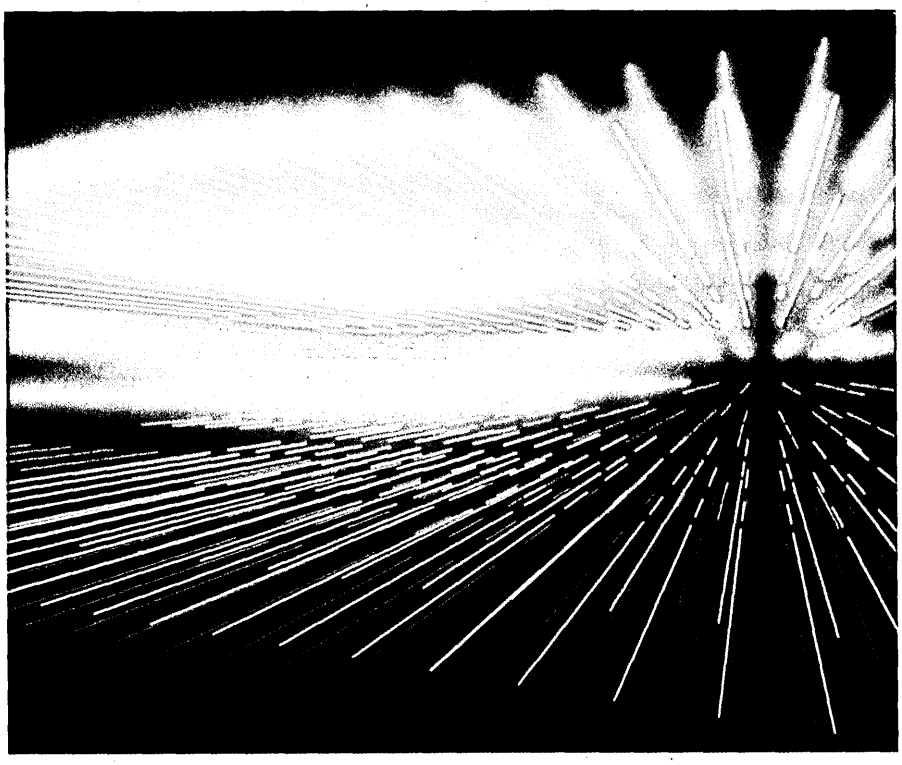
color computer. The crt cursor-control keys are an effective graphic input when horizontal and vertical alignments must be maintained. Anyone who has labored to change an inked drawing will appreciate the ease with which a graphic database can be corrected.

The operating system of the color computer allows plotting instructions to be saved in an array. For example, as the light-pen is being used to draw a picture on the crt, all the instructions necessary to replot the drawing are automatically being stored in a data array. These arrays can be modified, or even generated numerically, and "played back" to any plotting device on the system.

Once the graphic database has been input to the computer in numeric form, it can be manipulated mathematically to simulate three-dimensional movement and perspective. Moving and rotating an object is mathematically equivalent to a series of matrix multiplications performed on the database. Perspective is added by the simple operation of dividing by the distance from the viewpoint so that an object twice as far from the viewer will appear half as large. There are a few additional details to take care of, such as not displaying objects that are behind the camera, but the programming is not difficult. The computer is notably friendly, and debugging is fast and easy, thanks to an interpreted (rather than compiled) BASIC.

Each frame of the storyboard is designed on the desktop computer color crt. First-guess values are given to the variables, and the graphic designer watches as the computer plots the picture accordingly. He then modifies the inputs and views the results, in an interactive cycle, until the image is satisfactory. When all of the frames are completed, the program is saved, and the storyboard is photographed for the client's approval directly from the crt.





TESTING, CREATING MOTION

The second step in the production process is defining and testing all computer graphic motions; in effect, "in-betweening" the storyboard frames. The desired motions must be translated into intermediate positions for each 1/24th second of action.

The character of the motion determines the technique used to express it numerically. Smooth, precise movements are usually expressed as simple algorithms. Curve-fitting can produce richer, "choreographic" movements between the chosen storyboard frames, but this technique must be used with care. Considerable experience may be necessary to know what is making a move better or worse. It's not surprising that the most expressive movements are input by hand. Both the light-pen and data tablet can sample points in two dimensions at a very rapid rate. This allows subtle hand movements to be digitized directly.

Since the computer is not fast enough to draw the images at 24 frames per second, a color motion test is filmed directly from the crt, frame by frame, using a 16mm camera under computer control. Motion tests are often shot overnight, and it is routine for the computer to expose 4,000 frames unattended. Alternatively, each picture can be copied in black and white on the built-in thermal printer, to be photographed by a commercial animation service.

When the motion test is projected, all aspects of the computer graphics are examined carefully. Any changes are retested, because this is the last stage at which the computer program will be modified.

The third step is to make the high-resolution plots corresponding to each frame of the successful motion test. The plots are automatically drawn with black pen on paper. A separate plot is needed for each color in the final image. Drawings are usually made as large as possible within the maximum plotted area, which is about 11 × 16 inches. (Later, these will be photographically reduced to 8 × 10 negatives.)

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CIRCLE 88 ON READER CARD

ABOUT THE HARDWARE

Initially, the computer was a Hewlett-Packard 9845B desktop with monochrome graphic display. While all essential animation techniques were implemented on this machine, the lack of a color crt was a disadvantage during the interactive design process. Later, when the HP 9845C color desktop became available, it was added to the system. The final pen-plotting programs can be run on either computer, but they are usually turned over to the monochrome unit, leaving the color machine free to begin the next job. Large memories are helpful for the manipulation of graphic databases, and both computers are available with 449 kilobytes of user memory, not including the graphics memory that supports the crt display.

The HP 9874A digitizer is the primary graphical input to the system. Most animation projects require considerable data from existing artwork and film, and drawings are digitized on this device. Its transparent platen also permits back projection from slides and movie film. Rather than typing numbers, the designer uses the stylus to input positions, sizes, and angles directly. On the color computer, the light-pen shares some of these functions.

The plotter is the key to this 3D animation technique. High-quality visuals for theater projection and tv require much greater resolution than is available on a standard crt to avoid effects like the "jaggies," where diagonal lines show clearly discernible steps. The HP 9872S plotter has 16,000 addressable steps to the width of the drawing. Plotting speed is under software control. When a slower pen velocity is selected, all movements with the pen raised are executed at maximum speed.

The plotting operation must be efficient and trouble-free to deal with the large number of plots required for most projects. At 1,440 or 1,500 frames per minute, multiplied by the number of colors per frame, it isn't unusual to produce several thousand plots. On a recent project, the people worked in three shifts, but the plotter worked 24 hours a day for five days straight.

The plotter needs only occasional attention. Not only is the computer programmed to sound an alarm when the end of a paper roll is reached, but the plotter automatically advances the paper and cuts off and stacks the completed plots. Every 10 minutes or so, someone removes the stack of finished plots and visually checks them to see if the pens need changing. Plot quality is excellent, showing crisp, clear lines with no evidence of "jaggies." Pen velocity is under computer control. For the finest images, a speed of about 12 centimeters per second is used.

THE HIGH-CONTRAST NEGATIVE

The fourth step is to send the plots to a photocopier, who has been alerted to the special requirements of the animation process. As the plots are photographed with high-contrast negative film, it is very important that the size ratio remain exactly the same, not only from plot to plot, but also from day to day.

When the negatives return from the photocopier, they are mounted in precise registration on animation cells. This is the most labor intensive and highly skilled operation in the production process. Registration marks or frame lines are included in each plot, and if these are not aligned accurately, the final image will appear to float or wander.

Animation photography is the fifth and last step in producing 3D computer graphics for both motion picture and television. (For tv, the filmed images are transferred to master tapes.) The registered high-contrast negatives are sent to an animation camera service to be photographed on a 35mm animation stand with "bottom light" capabilities. Here, the negatives are placed on a color-balanced light box, similar to that used by a doctor or dentist to examine X rays. When lit from behind, the negatives of the computer plots appear as glowing lines against a black background.

Photographed through a star- or flare-filter, the lines will appear even more glowing. If viewed through a red filter or gel, all the lines will be colored red.

Typically, a scene is shot from beginning to end, one frame at a time, to expose the first color. Then the camera lens is capped, and the film is rewound to the beginning of the scene. The filters are changed to the next color, the lens is uncapped, and the next set of plots is photographed frame by frame. This process is repeated until all of the colors have been added through multiple exposure.

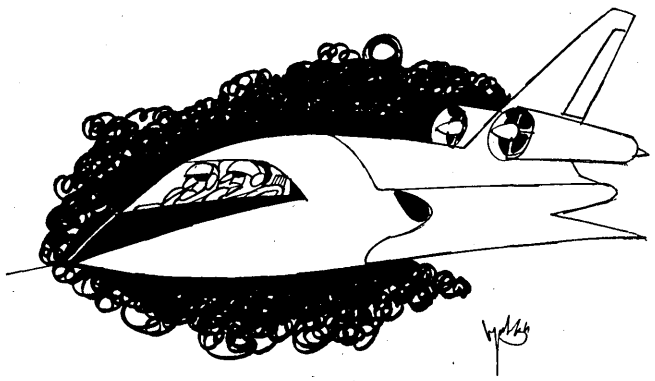
Audience response to footage generated in this way is always enthusiastic, but is the process commercially viable? The answer is an unqualified yes.

In this industry, deadlines are notoriously short and air dates are not negotiable. Questions of equipment reliability and overall throughput take on real meaning.

In my experiences over the last year and a half, hardware reliability has been excellent, with no delays due to computer or peripheral failures. New programming has been quickly accomplished and software has been trouble-free.

One question that constantly arises, however, is "how does the production time for desktop computer animation compare with the time for normal animation?" For complex visuals such as 3D perspective animation, the desktop computer is far faster than normal animation techniques, which are often totally impractical in such instances. Using the desktop computer, the typical job can be completed, from approval to delivery, in four to seven weeks. Moreover, a desktop computer system is quite economical, costing far less than many of the larger computer animation systems now available.

To date, the desktop computer has proved to be an effective means of producing commercial animation. Judging from the increasing demand for computer animation in the tv and movie industries, there will be plenty of work for it to do. ✲

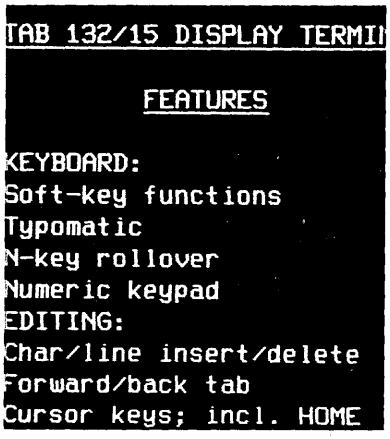


"...I used to get five light years on one tank of plasma..."

CARTOON BY DAVID HARBAUGH

COLIN CANTWELL

Colin Cantwell, founder of Crystal Chip, Inc., Newhall, Calif., is a computer graphics consultant and technical consultant to the motion picture industry. His feature film credits include computer graphics for "Buck Rogers," special effects animation for "2001: A Space Odyssey," original spacecraft design for "Star Wars," and technical dialogue for "Close Encounters of the Third Kind."



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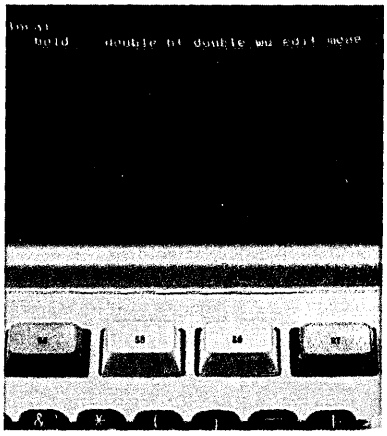
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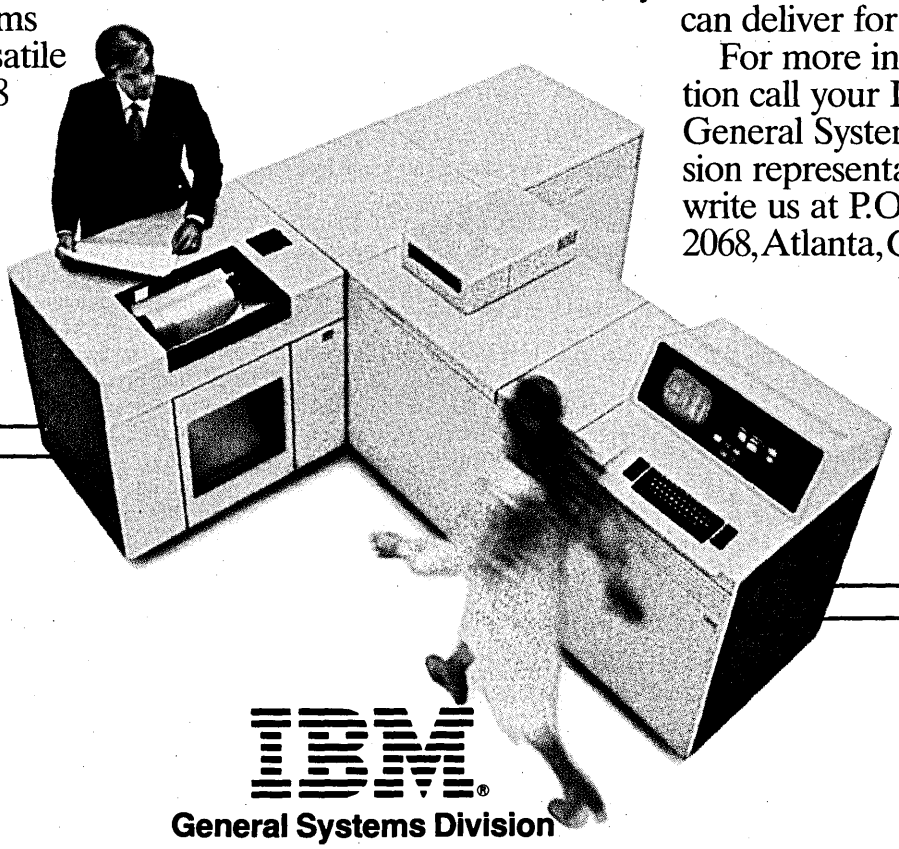

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CIRCLE 90 ON READER CARD

MBAs want to learn computer technology to solve management problems, but where should they be placed in the systems department?

CARVING A SYSTEMS NICHE

by Debra Zahay

Many graduates of MBA programs would like to begin their careers within the systems department of a corporation. They know the importance of computer technology to business, and are particularly interested in how this technology can be used to solve management problems.

As a graduate of Northwestern University's J.L. Kellogg Graduate School of Management, I interviewed with 17 major companies, five software consulting firms, and five Big 8 accounting firms. Over an eight-month period, I spent at least a full day with representatives of each organization.

During the course of this interviewing I learned that MBA skills are directly applicable to corporate dp departments. The major question, for both the graduating MBA and the prospective employer, is where to place MBAs within the systems department. Systems jobs offered to MBAs range from internal consultants doing general systems design to programmer trainees who have little contact with users. Departments either separate the systems analyst and programmer roles or employ programmer/analysts. Where separate career paths were offered, MBAs were usually offered the systems analyst role. Here, the term "systems analyst" means someone who is involved in the design of new systems or changes for old systems but who does not do programming. The systems analyst also has a high level of user contact.

A programmer/analyst may be responsible for determining the initial solution to the business problem, but primarily designs the system in detail and codes it. Of the 17 large companies interviewed, eight placed MBAs only in the systems analyst position, seven placed them only in the programmer/analyst role, and two placed them in either position, depending upon the skills of the individual and job availability. In two high technology companies, the objective of offering only programmer/analyst jobs at entry level was to allow the MBA to obtain a sound technical base to aid in future systems design. In contrast, the conviction of the eight firms offering only analyst jobs to entering individuals was that the more technical knowledge the individual possesses, the more likely he or she will be to design systems that meet the limitations of the machine instead of the needs of the user department.

In the five software consulting firms and five consulting practices within the accounting firms, the programming skills of the MBA were not considered as important as the ability to communicate with clients and use a background in management to solve business problems. Only two of the 10 firms required MBAs to undergo programmer training and work as a programmer before assuming systems analyst responsibilities. However, the competition is keen to enter the consulting side of the Big 8 practice; it is difficult to gain entry if one has no previous work experience and does not wish to program. Several years of accounting or computer audit work experience or a specialized technical undergraduate degree may be required.

Five of the seven companies that offer only programmer/analyst positions to the entering MBA are hiring programmer/analysts with a wide variety of skill levels and educational backgrounds. Computer science majors work alongside undergraduate liberal arts majors, MBAs, and people with advanced degrees in all fields.

In organizations where the programmer/analyst position exists, individuals are not expected to achieve technical excellence as much as technical competence. The candidate does not need to be, for example, a technical support specialist or an assembly language programmer. This definition seems to be a response to the shortage of programmers and of technical people who can communicate with nontechnical staff.

JOB IS STOPGAP SOLUTION

Initial contact with users as a systems analyst is not readily offered to the MBA by most companies, although the ability to understand computers and business terminology at the same time is appreciated. The programmer/analyst position is often a stopgap solution to the problem of communication between functional areas and systems staff. Again and again tales are told of the difficulties in translating design into code. These problems in communication, however, are not necessarily a valid justification for the programmer/analyst position.

Programmers and analysts possess different skills. In a recent article* the following skills are outlined as necessary for the systems analyst: gathering and evaluating information, understanding organizations and human behavior, understanding environmental influences and trends, problem solving, persuasion communication, and project management. The author, John B. Crawford, did not link these skills with the skills possessed by the MBA, but the connection exists. Most MBA training emphasizes organizational skills, particularly group work and the importance of a broad view of the organization. The MBA systems analyst might not know immediately what the problem is, but should know, if he has been well trained, what questions to ask: "What are the user's needs?" "How can they be met?" "How else could we do this?" "Is this really the problem?" "Where do these numbers come from?" It is in asking these questions that the MBA can best aid the systems department.

Many problems companies encounter in designing and installing business applications are management problems, not technical ones. Many programmers and programmer/analysts who have a technical undergraduate education obtain MBAs at night to aid them in their careers. One systems manager attached to a controller's group confided that his first day on the job his project leader drew a T-account on the board and he panicked. Nothing in his computer science background had prepared him for the business terminology he encountered on the job. He signed up for graduate accounting courses at night, an act which eventually led to his obtaining an MBA.

MBAs are also trained in techniques of financial decision-making such as capital budgeting decisions involving discounted

*"Business DP Curriculum: Next Step's Employee Skill Definitions," by John B. Crawford, *Data Management*, Feb. 1980.

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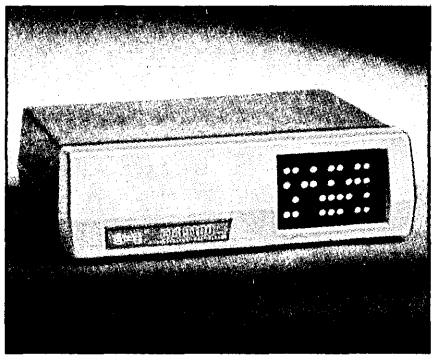

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CIRCLE 96 ON READER CARD

Many programmers with technical undergraduate educations obtain MBAs at night to further their careers.

cash flow calculations. Only two of the 17 major corporations used discounted cash flow (DCF) methods in financial justification of systems projects. (Admittedly, using financial methods to justify systems installation is an evolving field; DCF is by no means the proven method.)

Quantification of intangible benefits, such as increased orders through a better services level, is also a current topic of discussion. However, a majority of project managers expressed some ignorance of how the analyst in the corporate financial department had arrived at the figures for a project. An MBA's financial training makes him sensitive to this side of project management.

MBAs do not often choose systems management as a career goal. The typical MBA may be induced to remain in systems, particularly in an internal consulting capacity, but systems work does not have the advantage of providing the experience in line management (profit and loss responsibility) viewed as important for career advancement. The MBA is usually more interested in learning how a computer-aided business system facilitates the work of the functional area in which he has an interest.

The typical systems career path is project team member to project leader to supervisor of several project teams to department head. This flat organization structure leaves very little room for promotion once training has been completed. The career-minded MBA will want to leave the systems organization when he can rise no further. A good next move would be into another department of the company such as finance, marketing, or manufacturing. This way, the company retains an employee with detailed knowledge of its operations and the systems department gains a valuable ally within another functional area. Only seven organizations interviewed offered any career path out of systems. Another seven were trying to establish such a path. In the controller's department of one oil company, movement from the systems department to financial positions and back again was common. This created a healthy atmosphere for career development. Individuals made it known the moment they entered the department whether they had intentions of moving into the controller's function or whether they wished to build their career in systems.

Another high technology manufacturing company had positions for systems analysts reporting to the user organization, making movement into management of a functional department a natural progression.

Three groups interviewed, responsible for manufacturing systems within corporations, were not aligned within the traditional systems organization. These systems groups were responsible for determining needs and coordinating the design and installation of new systems for manufacturing planning and control. In each case, this special group had reported to the financial chief. A separate manufacturing group was formed to enable more rapid response to user needs. In these organizations, it is probably easier to make one's career within manufacturing management than to build a career in the systems organization.

©DATAMATION

CARTOON BY SIDNEY HARRIS

TRANSFER MADE EASY

One of the other two organizations offering mobility out of the systems analysis function is a manufacturing systems group within the headquarters systems group of a diversified conglomerate. In this company, transfer into the divisions in materials management is quite easy. Headquarters' group members function as internal consultants in MRP, using their knowledge of materials management to compete with outside consulting firms for the business of the divisions. Many other companies that offer only systems analyst positions to MBAs are also committed to marketing their systems services to the rest of the organization and to acting as internal consultants. Two departments viewed themselves as internal consultants not only in systems but in business consulting as well. In several cases, the groups interviewed were headquarters' systems groups, and the division management could elect to use the services of outside software consultants in lieu of the internal department. Only one organization regularly used MBAs as internal consultants, analyzing business problems, and proposing a technical solution if necessary.

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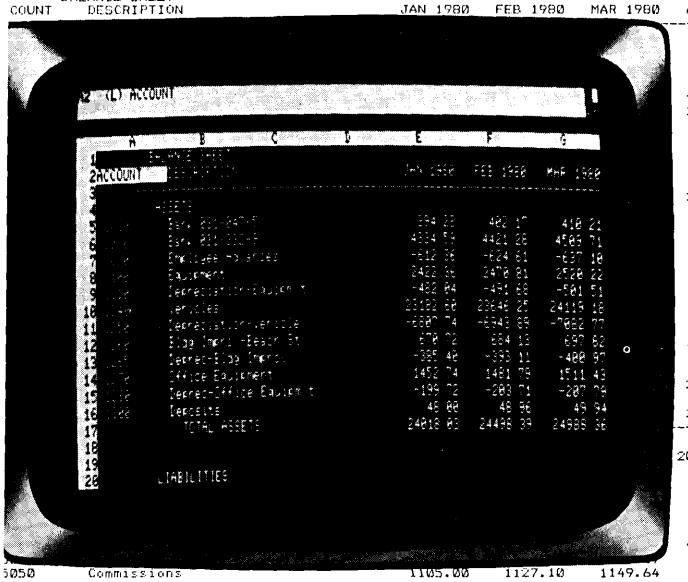

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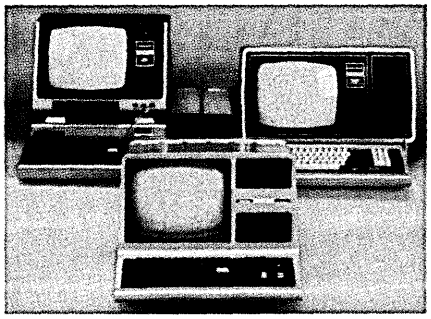

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CIRCLE 61 ON READER CARD

Only seven organizations interviewed offered any career path out of systems.

mobility to a functional department after a stint in systems was a high growth, high technology company. A company with rapid internal growth usually provides this opportunity for the systems analyst MBA. However, this opportunity is not without a price. The high technology company also might require greater technical competence in programming.

The situation in the trenches often seemed confused. Half of the organizations visited were changing from the programmer/analyst arrangement to separate career paths for systems analysts and programmers. The other half were switching the other way. Every organization chart was introduced with the proviso "Of course things have changed since this was printed." One farsighted company put its organization chart on word processing equipment and updates names and reporting responsibilities quite often.

Despite the confusion, several developments seemed to be inevitable.

One major development will be an increased use of marketing concepts by systems departments. The application of these concepts to the systems department, whose business it is to satisfy user needs, is apparent. Eight large companies are taking that approach with their systems departments: two of the departments visited were specifically directed to take the "marketing approach."

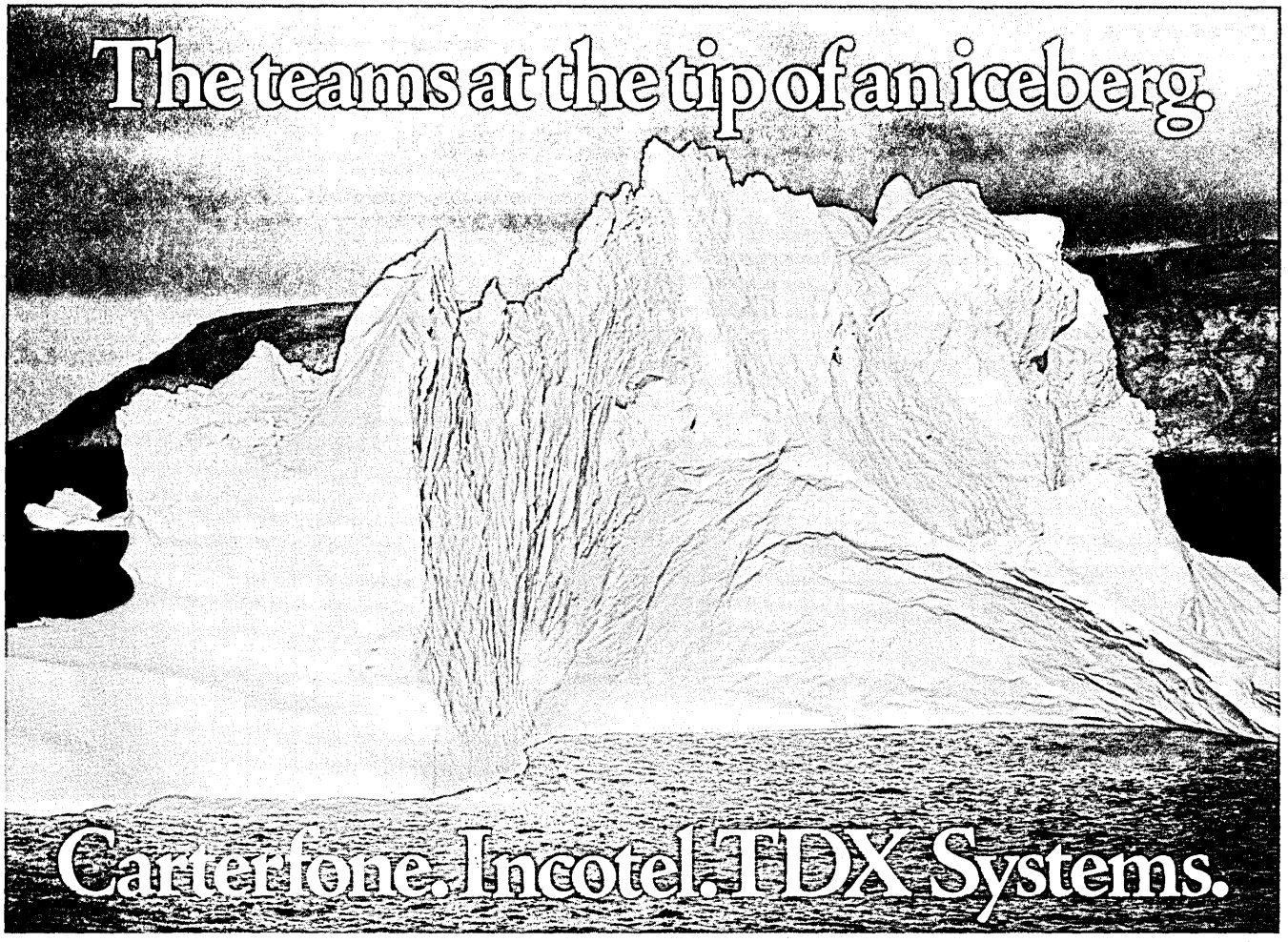
In addition, the question will be decided on whether there will be mobility in and out of systems. Managers at three companies mentioned that their systems departments were already seen as pools of talent for the organization. Systems employees are not only among the best educated employees in the corporation, but also among the best informed about day-to-day business operations.

More than one systems department employee said that his department knew more about the user department's job than employees in the user department. This boastful comment should be an omen to managers in functional areas that the systems department should not continue to be isolated from the rest of the organization. Interdepartmental mobility will permit managers to keep talent within the organization while allowing for career development.

Although the 27 firms discussed here all hire MBAs for systems work, there are companies that do not know what to do with an MBA who applies for a systems position. The MBA in systems can facilitate communication and, at the same time, learn about the organization's operations. In order to attract a qualified individual, a company must offer a job commensurate with the skills possessed by the MBA and provide opportunities that lead to advancement both within the organization and within the greater industry. *

DEBRA L. ZAHAY

Ms. Zahay is currently a Systems Analyst for manufacturing systems in the MIS Dept. at FMC, Chicago. Prior to her position with FMC, she had worked with GE, the Major Appliance Business Group, Louisville, Ky. Ms. Zahay has a master's degree in MIS management from Northwestern University.



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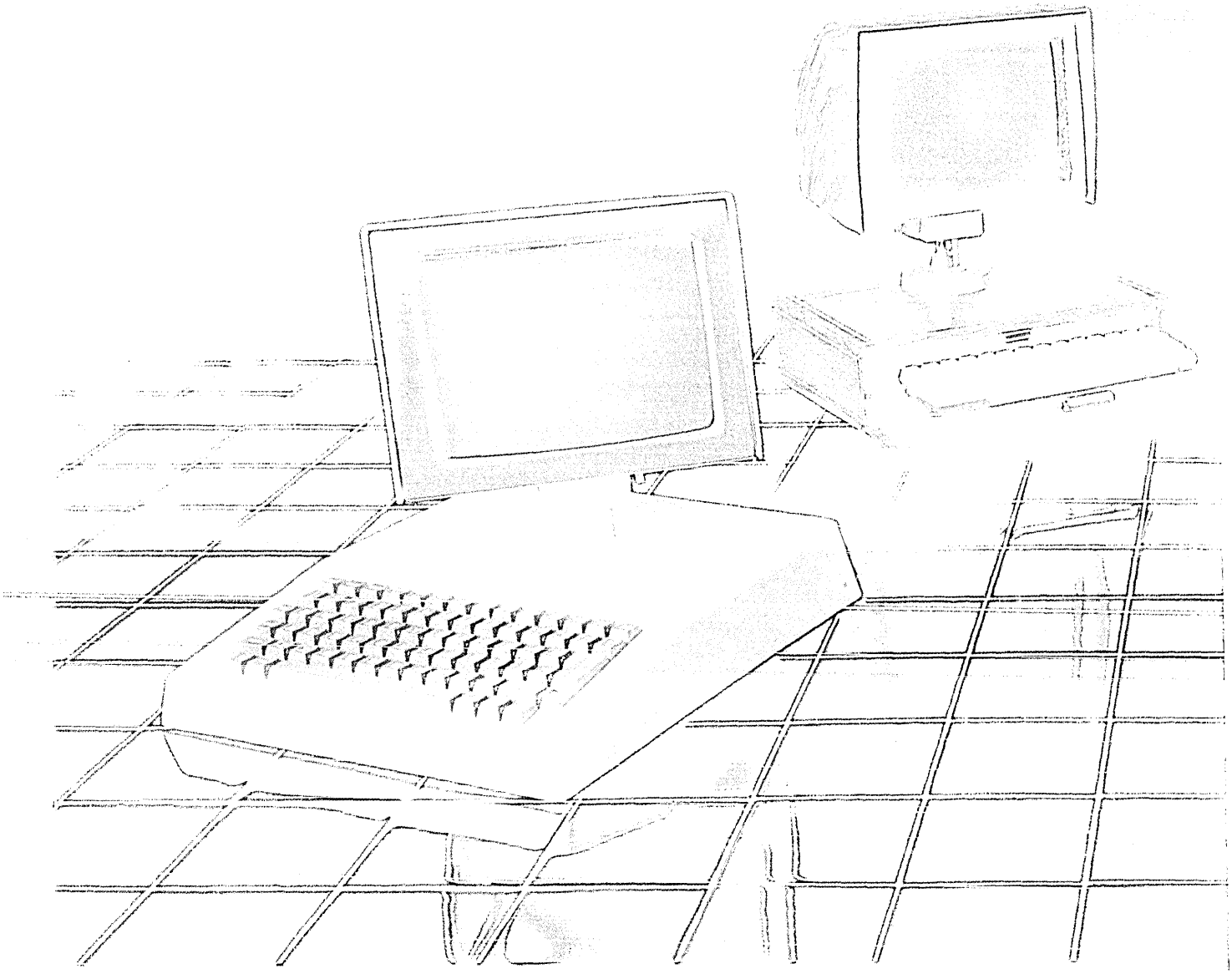

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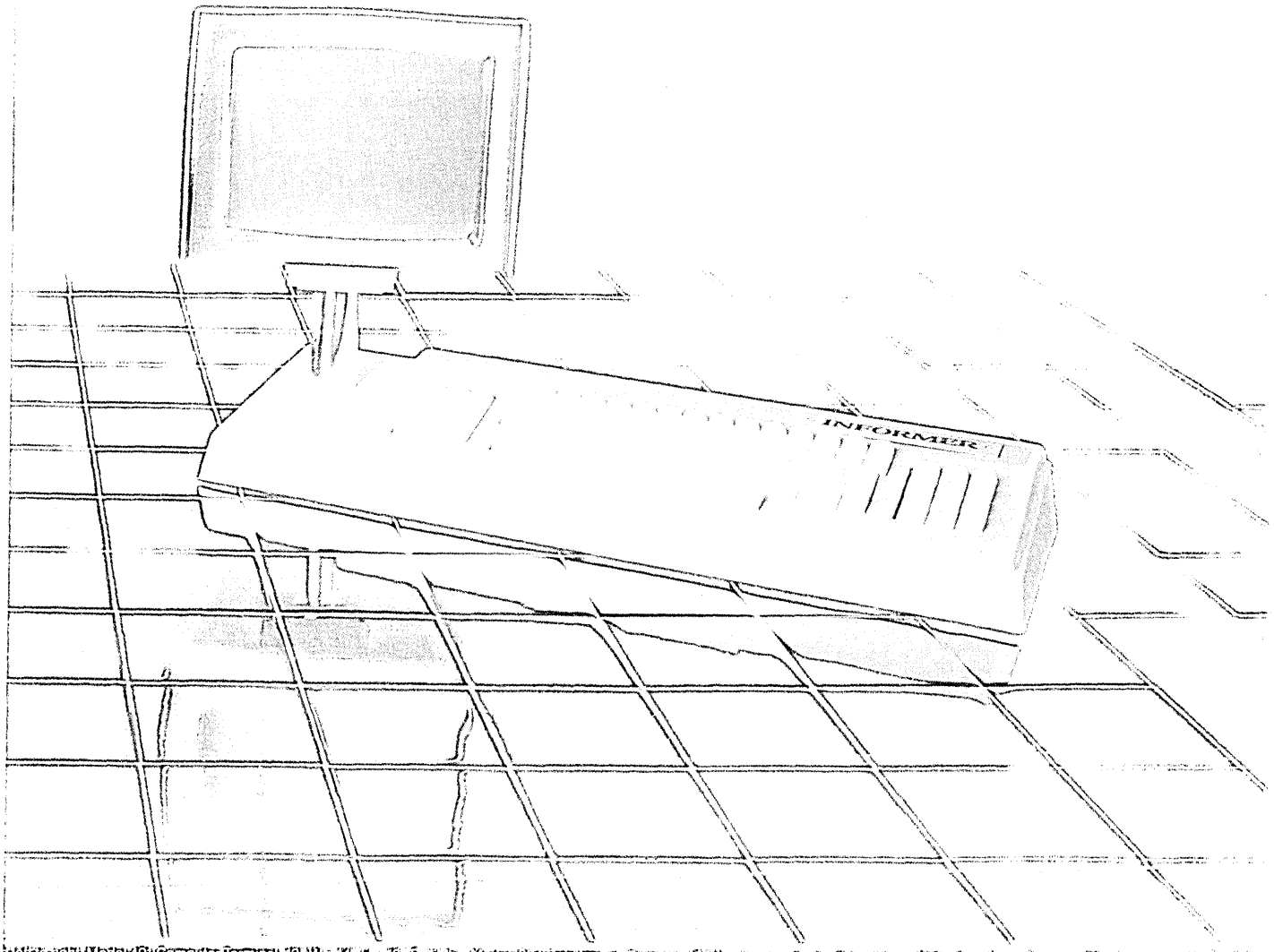

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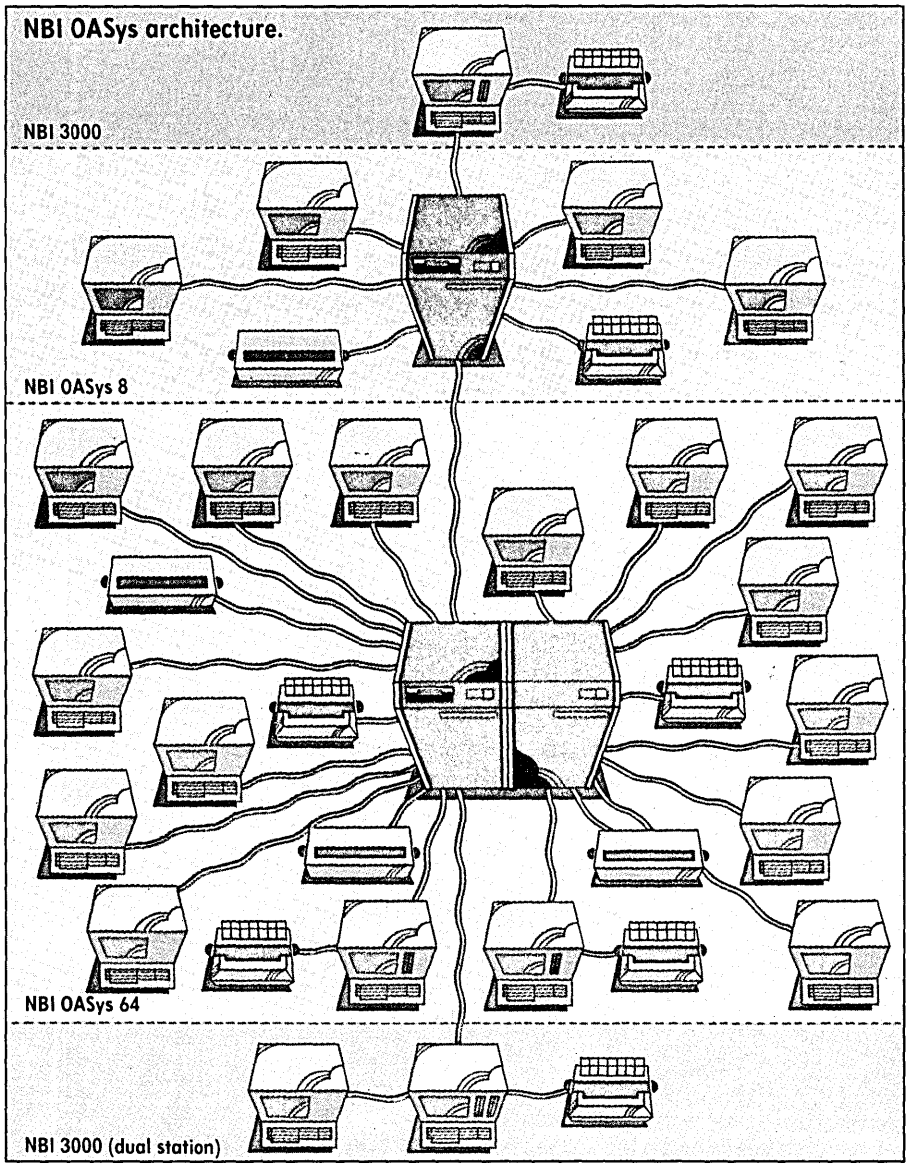

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A fourth generation language is used to control an integrated database.

ASSURING MIS SUCCESS

by Nigel S. Read and Douglas L. Harmon

An integrated management information system is an important dp goal because it uses the computer to solve problems for an entire organization, instead of attacking problems on a piecemeal basis. The MIS promise remains largely unfulfilled, however, because it is one of the most difficult business systems to effectuate. Failures have far outnumbered successes, and, until recently, the few successes have occurred only in large, well-managed, well-financed organizations with operations not subject to rapid change.

In late 1977, we were assigned to develop from scratch an MIS for a complex military organization—the U.S. Navy's Fleet Combat Direction Systems Support Activity (FCDSSA) in San Diego. This organization manages a wide range of products and services, each of which requires different management, accounting, and production techniques. Also, it must synchronize these activities, with a sister organization 3,000 miles away, and it must be prepared to accept any additional functions that the Navy may suddenly impose. An industrial equivalent would be an international airline which also operates a hotel chain and real estate network, and whose board may suddenly decide to go into appliance manufacturing. FCDSSA's top management must control all of its diverse functions, separate common resources from product-specific resources, collate all the different accounting systems, and somehow produce budgets and five-year plans to control future operations. Complicating this process, the scope of "future operations" can change on a biweekly basis. This "naval experience" proved to be an apt challenge for MIS capabilities.

To eliminate many of the drawbacks which had hitherto plagued MIS developments, we needed to adopt a radically new technical approach. At the heart of the problem was COBOL, the main MIS language. An MIS requires great flexibility, and most large COBOL programs become totally unmanageable after just a few major changes.

To build a comprehensive, functional MIS around a totally integrated relational data bank whose constituent databases all talk to one another using dynamic relational accessing techniques, we used FOCUS, a new programming language (see Fig. 1).

The resultant system contains the essential building blocks—data entry, data validation, database update, audit trail, report generation, and integrates 11 applications comprising 300 separate program routines, and 170 standard reports in matrix, graph, or standard printer output. Combined reporting with the sister organization is done via the distributed database linkage. New applications are added by setting up new relational databases, and then pulling in standard software modules off the shelf. Although it is a full-scale MIS for an organization with an annual budget of over $20 million, the system was accomplished with two programmer/analysts and one MIS analyst—approximately one-fifth the people required to do an equivalent MIS in COBOL.

SYSTEM USES FOCUS

The system was programmed entirely in FOCUS, a fourth generation language (4GL) of Information Builders Inc., New York. FOCUS is one of a group of similar products (see Table I), all of which offer the user:

- 90% reduction in physical code over COBOL.
- Performance of major rewrites simply and routinely when the organization changes.
- Elimination of compilation.
- Computer operations JCL eliminated as a result of an interface with the host computer's operating system.
- An easy-to-use, highly sophisticated DBMS (relational, hierarchical, network structures, alternate file view, complete data independence, etc.).
- Dynamic, relational database accessing (as opposed to the static version which requires schema changes or cross-reference indexes). Dynamic relational accessing lets the user collate data on-the-fly from all the key fields and data fields of all databases in the data bank. More simply, any data can be retrieved from anywhere with no restrictions.
- Total computer operations reduced to a simple clerical operation. User's nontechnical personnel control everything via a single 8½ × 11″ form and its crt screen facsimile.
- Language code comprising a wide range of powerful nonprocedural verbs with English syntax.
- Reports from a single database that can require as little as three lines of code.
- Reports produced on-the-fly collating data from 16 databases that are routinely coded using relational database matching.
- Standard MIS report conversion to on-line interactive graphics display (bar charts, pie charts, histograms, point-plots) with just one line of code.
- Statistical analysis capability (polynomial regressions, ANOVA, chi square, discriminant analysis).
- Host language interface (HLI) for calls from a third generation language.
- Interactive file editor, permitting on-line, interactive update and retrieval.
- Data encryption down to the field level for Privacy Act or other sensitive data.
- Non-FOCUS files from external systems (IMS, IDMS, VSAM, sequential, etc.) accessed through existing keys.
- Very flexible distributed database processing using a single nonprocedural verb.
- Data dictionary interfaced with host computer accounting system. This not only identifies which programs use a specific data field, but also computer run statistics on how often the data field is used.
- Large new pool of programming talent (i.e., neither prior programming experience nor technical training are prerequisites for use of 4GL programming techniques).

The 4GLs are currently being called "nonprocedural languages," but this term is too limited because in large, real world systems a liberal sprinkling of procedural code (e.g., IF statements) is essential for fine-tuning the main nonprocedural code. In addition, the nonprocedural descriptor gives no insight into the broad sweep of new capabilities that come with it. "Fourth generation language" more closely describes what it is: a full-bore, comprehensive programming language which is a quantum leap over COBOL as COBOL

By programming the system entirely in FOCUS, the MIS was implemented with one-fifth the people needed to do the same job in COBOL.

was over assembler. Advances in modern software technology are just assimilated into it; for example, DBMS is as inclusive to a 4GL as FILE-CONTROL is to COBOL, and interactive graphics is simply another output device.

MIS USING A 4GL

The following is a description of particularly important or unique 4GL contributions to an MIS:

Integrated Relational Databases. The MIS of the future must not have only an ad hoc, interactive, variable-view capability, it must also be flexible to reflect changes in the organization. The integrated relational database is a more superior data model for supporting such an MIS than either the hierarchical or network models, and if the DBMS permits dynamic relational accessing, the capabilities are indeed potent. The 4GLs incorporate DBMSs that handle this routinely.

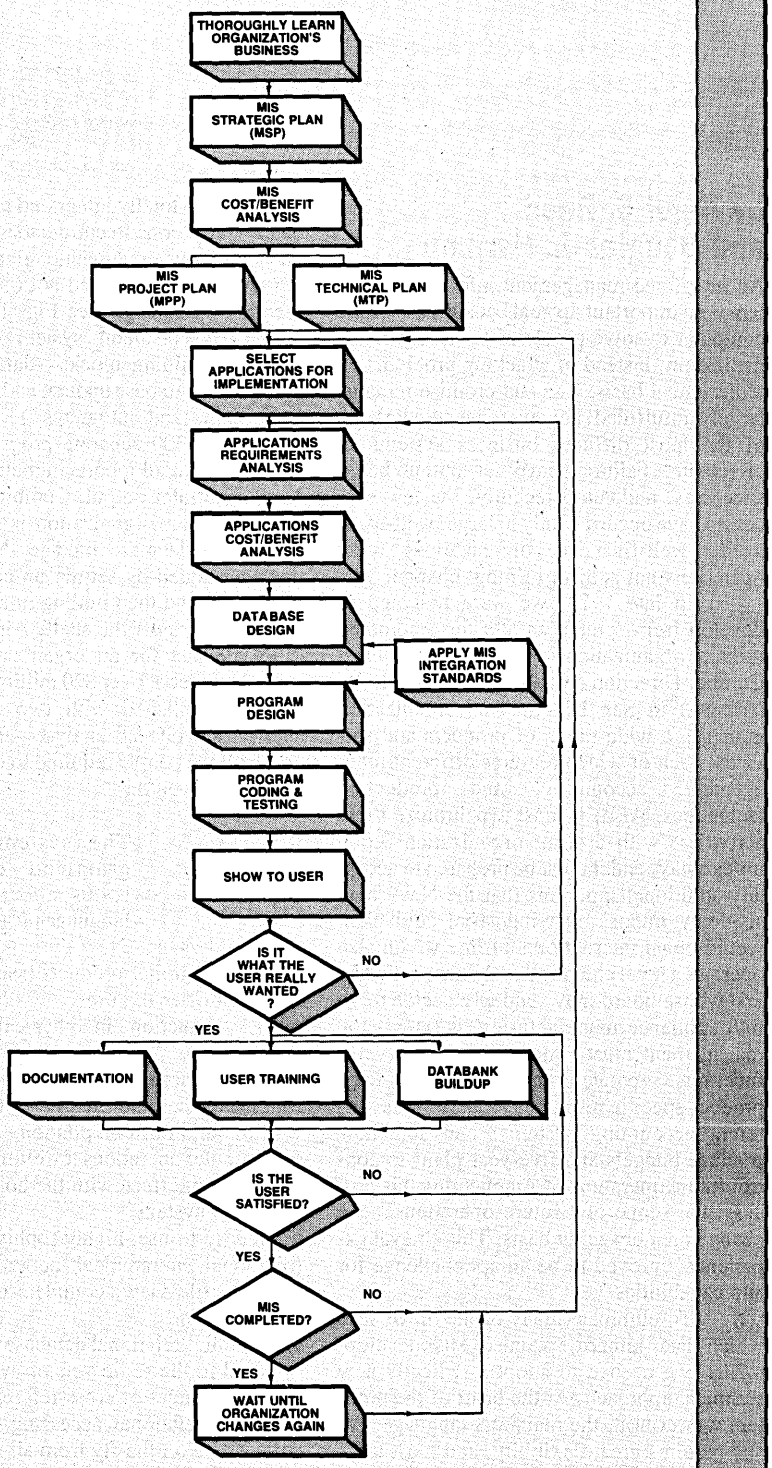
It is assumed that the reader is somewhat familiar with the concept of relational databases and the jargon that goes with this particular data model. Some of the terms we use should be defined, however. "Integrated" means that every single relation in the data bank can communicate with every other relation via any like key field or data field. This linkage is made possible by a set of integration standards that guarantees the resident values in those key or data fields will be identical if describing the same piece of source physical data. "Dynamic relational accessing" means the communication between any two data fields in the data bank can be performed on-the-fly, with no requirement for schema changes or access path restrictions.

The significance of being able to do dynamic relational accessing cannot be overemphasized. Since it permits data from any or all databases in the MIS data bank to be pulled out, collated, sifted, and displayed, management can get interactive answers to "what if" and "what is" questions on anything in the organization that is reflected in the data bank. An integrated relational data bank with dynamic accessing is mandatory if the MIS is required to include a Decision Support System (DSS) as part of its inventory. The FOCUS DBMS provides these capabilities via the use of its nonprocedural MATCH verb (and the soon implemented JOIN verb). The MATCH verb permits dynamic construction and joining of data records from any combination of external (i.e., non-FOCUS) files and FOCUS databases. The joining is done regardless of whether the fields being linked are keys or elementary data, and is performed while the program is executing.

Another major benefit of the integrated relational model is the ease with which it can be expanded when new applications must be appended to the MIS. Although the data bank is integrated from a data consistency

FIG. 1

DEVELOPMENT PROCESS OF AN MIS USING A FOURTH GENERATION LANGUAGE AND AN INTEGRATED DATA BASE



CHARTS BY CYNTHIA STODDARD

viewpoint, the relational databases are actually logically separate with their own database schemas and sets of maintenance software. When a new application is required (or a major rewrite), the new database and software can be created independent of existing software. Even when it gets into production, there is still only a virtual linkage (i.e., no schema-bases hard linkages) to the rest of the data bank, created by adherence to the MIS integration standards. This permits almost routine expansion of the MIS.

HARDWARE SOLUTION TO COME

Currently only resource-intensive software solutions to the dynamic relational joining problem are available; in the next 10 years, however, a hardware solution will be available using associative disk (i.e., a disk drive with multiprocessors on each track). When associative disk becomes widespread, it is likely that the relational model will be used for most applications.

We do not exclude the use of hierarchical databases, but when MIS information is needed, the hierarchical databases may be accessed *relationally*, the required data extracted, collated with whatever is required from the other databases, and the necessary MIS graphs or reports are produced. FOCUS, with its alternate file view capability using both up pointers and down pointers, permits the user to look at a hierarchical database from the top down (or inverted from the bottom up), or simply go in from the side and look at any branch of the data tree.

System Run Control Record (SRCR). The SRCR is a single 8½ × 11″ form used to specify a whole computer run from start to finish. The user takes less than a minute to fill out a few blocks on this form, which is then entered onto a screen facsimile of the same form; all the user has to do then is turn on the printer for the reports. The SRCR eliminates the nightmare of a JCL-oriented, crisis-oriented COBOL computer operations department. No technical knowledge is required to use it.

TABLE I

PROGRAMMING LANGUAGE GENERATIONS

1. First generation: machine language
2. Second generation: assembler (BAL, EASYCODER, NEAT3)
3. Third generation: high order (COBOL, FORTRAN, PL-1, ALGOL)
4. Fourth generation: nonprocedural (FOCUS, NOMAD, RAMIS, INQUIRE)

The SRCR is made possible by FOCUS's recursive programming capability combined with its host computer operating system interface. FOCUS reads parameterized data from the SRCR, then writes out and executes its own code. One program writes several versions of another FOCUS program during various stages of a database update. Another rewrites and reexecutes itself during a monthly database audit run. Specific database values, called global variables, are passed from the SRCR to the executing programs. These global variables may contain simple data for report headings, such as Report Effective Date, or may contain in interconnected set of parameters for data selection, data suppression, and report sorting which are primarily useful in ad hoc reporting.

Even distributed processing operations can be performed using the SRCR. Based on values read from the SRCR, FOCUS will write and execute a FOCUS program that will 1) issue a command to link to and address other users' disks; 2) issue the FOCUS commands to link the databases into one large structure; and 3) set a global flag to notify the other FOCUS programs that they are operating in a distributed mode. Because this program was designed to minimize user interaction in distributed data processing, it masks the simplicity of how FOCUS does distributed data processing. To initiate the process one need only issue the nonprocedural verb USE, followed by a list of the databases to be accessed, followed by the word END. This is a prime example of how a 4GL reduces the most complex of operations to a simple task.

Software Factory. The use of a 4GL's nonprocedural code drastically reduces programming effort over that required for COBOL. When a genuine software factory type of operation is added, programming time is reduced to as little as two days for a major system. Using our software factory for a new system, we can take generalized FOCUS database maintenance programs "off-the-shelf" and, with a minimal amount of tailoring, hook all the pieces together and start testing.

SINGLE FIELD FORMAT

At the heart of our software factory capability is a generalized "single-field" input format that consists of a database code, data base key(s), data field code, delete code, and a 60-character free form data field. This generalized input format is not limited to 4GL programming; in fact, we have used it on earlier COBOL systems. The tailoring that must be done, however, is much faster using a 4GL. For instance, the software factory program for database update contains a core of only 8 to 10 lines of code, and these same 8 to 10 lines of code can update any database in the whole data bank using the general input format. This being so, we can ready a major new database maintenance program for testing in half a day. The latest full application that was appended to the FCDSSA MIS was written, tested, and implemented in four days.

Graphics. The management of our client organization had a great desire to have data from the MIS summarized and displayed graphically. Rather than plow through 120 pages of a detailed report, they wanted to look for "peaks and valleys" on a graph and then go to the pertinent part of the report. Incorporated in FOCUS is a high resolution vector graphics feature which is used to produce graphics output (bar charts, pie charts, point plots, etc.) as routinely as regular reports. In fact, regular reports can be converted to graphic output (and vice versa) by a single FOCUS nonprocedural verb.

Distributed Data Processing. One of the requirements of the MIS was that it must be able to be implemented easily at a similar Navy command on the East Coast. It was further required that the MIS produce combined summary reports for both organizations. This problem was solved by placing all database schemas and operating software on a separate disk; all users then access this software for data base maintenance and reporting. Once the system is standardized in this way, a single FOCUS verb will concatenate any combination of users' databases for maintenance, or reporting, or both. Simple as this sounds, it makes extensive use of many esoteric 4GL features which will be common when broadband satellite communications have matured.

Interface with Other Programming Languages. The developers of a good 4GL will supply many functions for editing character strings, numeric computations, etc., but they obviously cannot predict the future. Consequently, the user must be able to custom design his own functions. To this end, FOCUS supports calls to user-coded FORTRAN, COBOL, or PL/1 subroutines. We used this feature to overcome one of the few deficiencies we found in FOCUS compared with COBOL: byte (or character) manipulation. COBOL facilitates byte manipulation much better than FOCUS at this time, but we believe this is only temporary. Since 4GLs are in an early stage of development, not much attention has yet been paid to the byte manipulation problem.

Self-Programming Report Generator (SPRG). A user's nontechnical personnel require some formal training in the use of terminals, time-sharing communications, and, in the 4GL, they must also have access to a terminal. After our MIS was operational for a short time, it became apparent that it was impractical to try to train all the users while burdened with a stream of user queries and ad hoc report requests. The solution was a Self-

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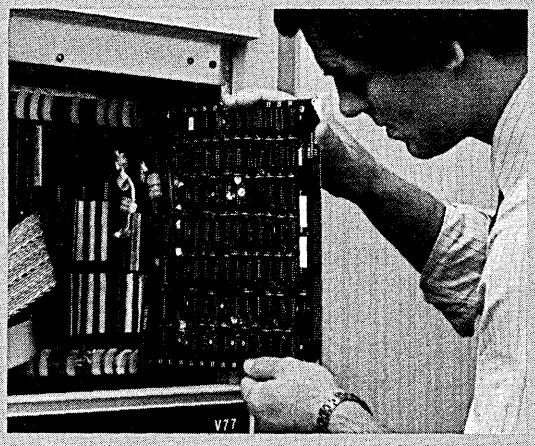

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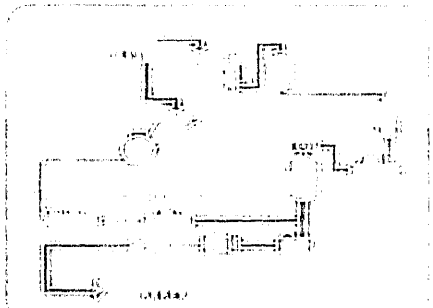
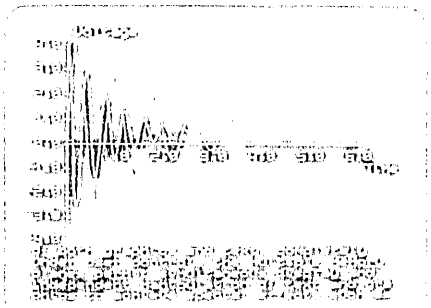
Low Entry Cost The basic 8600 color system is priced at about $15,000. It can be upgraded to higher resolution and a greater number of colors, but even fully expanded it still comes in at less than $19,000.

Or, you can start with a black and white system for less than $8,500 and upgrade to color at any time by the addition of a color processor and monitor.





Simultaneous Graphic/Text Display

The 8600 offers outstanding control and formatting of both graphics and text. Completely under user control, the multiple memory planes permit simultaneous display and independent manipulation of text and graphics to achieve special effects such as overlays, scrolling and zoning. This capability, in conjunction with Terak's unique flexible character generation, enables the 8600 to present visual displays that are unequalled by any other system of its class.

Broad Spectrum of Color Selection

The number of color maps and the colors in each map is completely under software control. With a 6-plane memory (640 x 480 x 6), up to 64 colors can be displayed on the screen simultaneously. With a 3-plane memory (320 x 240 x 3), up to 8 simultaneous colors can be displayed from any one of eight color maps. The output of the color map produces eight levels each for red, blue and green. The result is the selection of 512 possible levels of intensity, saturation and hue. Switching from map to map is under software control.

Zoning

The 8600 monitor screen can be divided into a maximum of four variable size zones. In a typical application, the upper three zones can display graphics while the lower zone displays text. The text can be scrolled or slow scrolled while the graphics are changing to coincide with the text changes.

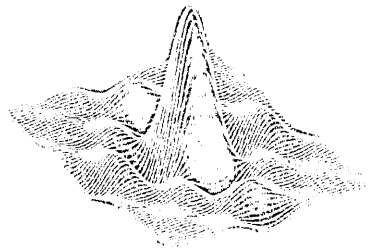
Dual Processors For Speed and Flexibility The two 16-bit processors each with its own memory are assigned those tasks which they can perform most efficiently with the fastest throughput. The result is more available user space in memory, faster processing and increased flexibility of operation.

DEC Based Hardware and Software The DEC based hardware and software includes the LSI-11 main processor, RT-11 operating system and Q-bus compatibility. As a result, the 8600 will support a variety of software and easily integrates peripheral devices.

USCD Pascal, Too The 8600 also supports the easy to use USCD Pascal operating system for program development, text editing, word processing and interactive applications.

Siggraph Core Standards, 2D Level Graphic support is provided for USCD Pascal and RT-11 for Fortran, Basic and Pascal.

The Other Reasons? Add such things as graphics display list processing, high resolution guarantee, four modes of display planning, emulation, remote service diagnostics, etc. The list goes on and on. But to fully appreciate the system you should see one in action. We'll be happy to set up an appointment. Just contact us.



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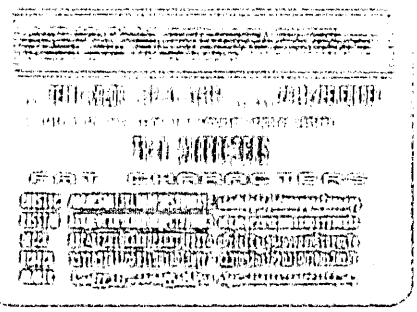

The 8600 also offers several dynamic features that are impossible to illustrate and must be seen to fully appreciate.

Flexible Character Generation

Unlike the rigid cell sizes of many graphic display systems, the 8600 character generation is under software control. Characters can be programmed to any size or shape including the creation and display of foreign languages such as Arabic, Hebrew, Russian, etc., mathematical symbols, primitives, specially configured letters, characters or symbols and a host of others.

Fill Algorithms

Terak's fill algorithms are fast and allows you to fill the inside of simple or complex geometric figures without calculating points. This not only helps define charts, graphs, etc., but greatly enhances the appearance of presentation material.

Smooth or Line Scrolling

The speed of the vertical, bi-directional scrolling is under operator control. It can be slowed down for text editing or speeded up for search. And, unlike most terminals that jump a line at a time, the 8600 moves in increments of one scan line. The result is a smooth moving text that is easy to read.

External Video Synch

The 8600 can be synchronized to receive externally generated RGB signals or transmit 8600 signals to external video monitors. This lets you combine and/or overlay internally and externally generated characters and graphics onto a single screen if mixing hardware is incorporated in the system.

CIRCLE ICON ON READER CARD

A major benefit of the integrated relational model is the ease with which it can be expanded to add new applications.

Programming Report Generator (SPRG), which was developed using techniques similar to the System Run Control Record. A simple 8½ × 11 " form had blocks to check off or fill out; then FOCUS would interpret the parameters read from the SPRG and recursively write the necessary programs to an executable file (hence the term "self-programming"). In an SPRG paper form, the user fills in the file name, data dictionary codes, sort arguments, etc., on the screen facsimile. The form is entered via a crt screen facsimile. The request is validated, converted to FOCUS syntax, and stacked for either interactive or batch execution. The SPRG includes a cataloging feature to store and maintain ad hoc reports for further use.

PRECEPTS FROM PRACTICE

Developing an MIS in theory is a far easier proposition than developing one in practice. A deadline-oriented, cost-conscious, political, multifaceted organization like the Navy is a proverbial school of hard knocks when it comes to introducing an MIS, and we have had our knocks. From our immersion in developmental problems using COBOL for 10 years (as well as our use of a 4GL on a daily basis for almost three years), we developed some important working precepts.

Limitations and Drawbacks. There are conditions under which the effectiveness of 4GLs is so limited that they should not be used. Powerful as 4GLs are when properly applied, they do have drawbacks which need to be weighed against their advantages:

1. Computer resource usage is high. A 4GL uses up to 50% more computer resources than does a 3GL performing an equivalent function. The difference comes primarily in the usage of Input/Output operations rather than cpu processing. Poor database design can cause this to balloon to 500% to 600%. After two years of hands-on experience, however, we have found out that the increased overhead averages 10% to 30% and is primarily dependent upon transaction volume, access method, and record screening criteria. The root of the problem is actually a major benefit of the 4GL—4GLs make the computer do a lot of the drudge work that the 3GLs make people do.

2. Program transportability is poor. Because all major 4GLs are targeted to IBM 370-compatible machines, transportation of 4GL programs is limited to this mainframe group. An ANSI standard would break this IBM armlock, but until then the best solution is for the 4GL developer to bring out separate versions for the other mainframes.

3. Computation-intensive work is not handled well. The 4GLs target the same computer applications spectrum as COBOL: I/O intensive character (byte)-crunching operations rather than cpu-intensive number-crunching operations. Scientific's 3GLs, such as FORTRAN, should still be used for heavy computational work. If an application requires both character-crunching and number-crunching, write it in a 4GL, but call the 3GL for computational work.

4. Applications must be selected carefully. For example, a missile guidance system, with its high-speed real-time requirements, would be a poor choice. Material Requirements Planning (MRP), with its integration of the inventory, purchasing, bill of materials, engineering planning, and accounting databases, is ideal. Computerized Axial Tomography (CAT), with its single-application minicomputer and real-time analog features, would be poor. Payroll and Labor Distribution, with its routine personnel and accounting databases, its requirement for an extensive parameter database and a comprehensive audit trail, is ideal. Monte Carlo simulations of nuclear reactor performance, with their inherent number-crunching algorithms, would be poor.

5. Character (byte) manipulation should be avoided. As mentioned earlier, it would be better to do byte manipulation applications (e.g., mailing list, word-processing) in COBOL until the 4GL developers concentrate more effort on this capability.

6. The computer using a 4GL must have virtual memory and high-speed I/O handling. Fast I/O is essential. The 4GL's sophisticated DBMSs permit single executing programs to summarize up and down hierarchical databases, use inverted index or embedded link network structures for high volume interdata base communications, and perform dynamic relational accessing of other databases—all of which place heavy demands on the computer's I/O handler. The major 4GLs are megabyte programs, so virtual memory is mandatory until someone burns one into a ROM.

KEEP DATA BANK CURRENT

One of the key benefits of an MIS is that management can hit it with unexpected and even strange information requests that must be satisfied immediately. Consequently, administrative controls must be applied to keep all data fields in the data bank current.

A useful management technique here is assigning "owners" to each single item of data in the data bank. A data element owner is the individual who has the responsibility to originate the data, or to collect it from its various sources. This data element owner concept is useful in another way: when some bad data has clearly gotten into the database, there is no confusion over who should clean it up.

View Everything Through the Eyes of Nontechnical Users. Among the many areas in which this precept can be applied are the requirements definition document, data entry forms, data entry commands, validation program edit messages, all report formats, graphic output, training seminars, and so on. The 4GLs are superior to 3GLs for supporting nontechnical users; for example, interactive custom tailoring of reports requires minimal effort; graphics output is a routine operation; operating system interface eliminates JCL from operations; integrated relational accessing gives the manager his needed information all on one report or graph. Rather than running through a detailed checklist of examples, however, it is better to inculcate the whole development team with the attitude of trying to view everything through the user's eyes.

This heavy emphasis on user orientation is of particular importance to the MIS analyst who must guide the database design function. If the MIS is to be functional and flexible, the database designs must conform to the natural structure and requirements of the organization, but often this natural structure is hidden or very subtle. Only if the MIS analyst has had extensive exposure to the users and thinks the way they do, will these natural structures be properly discerned.

Do Iterative Requirements Analysis. Stated simply, define the detailed requirements, program the system, show it to the user; if it's not right, repeat this cycle again and again until it is right. If we were using COBOL programs in dealing with large systems, they would become unmanageable after the third iteration. With a 4GL's flexibility, corrections are easy. Having a relational database eliminates the pain that accompanies the dismantling of complex hierarchical data bases when the requirements are seriously wrong. All that is required is to reset the virtual linkages to the correct relations.

Requirements analysis is the most important phase of any overall software development. In the real world, unfortunately, it is almost impossible to define a perfect set of requirements. First, nontechnical users may know their jobs perfectly and still be unable to communicate to the system developer every single facet of information they use; often the information is only in their subconscious minds. Second, there's no such thing as a perfect systems analyst. Third, even if the requirements analysis has been done perfectly, by the time the system is ready for use, the organization itself has changed and thereby many of the previous requirements have become obsolete.

The initial requirements analysis should receive thorough attention, but as soon as all the user data have been collected, the application should be programmed bottom-up, shown to the user, then corrected by successive iterations of this cycle. A year

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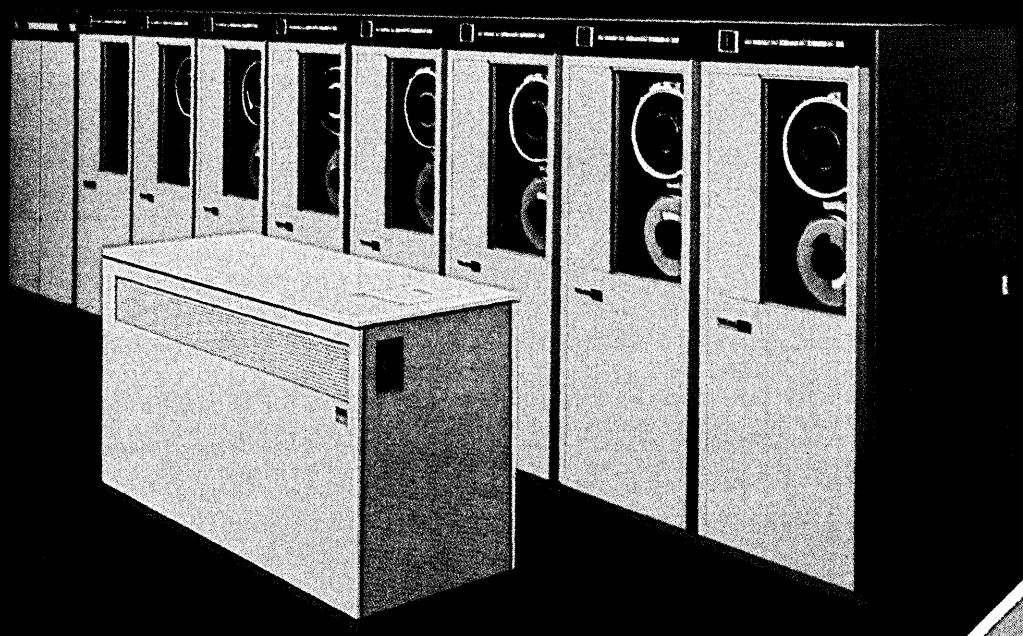

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spent producing a 10-pound manual full of meticulous detail would probably be futile and would certainly be inefficient.

HOW TO DEVELOP 4GL MIS

How do we develop an MIS using a 4GL? In a nutshell —gradually. The first step is to make a 4GL available to the in-house programmers. Then, plan to put up two important, related applications, e.g., General Ledger and Payroll, or Inventory and Bill of Materials. Don't try to do any others initially—they'll only muddy the water, and will be much easier to do later on.

Recognize that a major one-time effort is required before applications programming can start: setting up the 4GL environment. This should be done as a completely separate, parallel operation to the in-house COBOL shop. A 4GL is so different from COBOL that it is essential for COBOL values and methods not to permeate, and thereby dilute, the 4GL's capability. Setting up the 4GL environment includes:

- Training key in-house personnel in 4GL programming (including database design)
- Developing the MIS Strategic Plan
- Developing the MIS Project Plan
- Developing the MIS Technical Plan
- Defining the vital MIS Integration Standards
- Building a few MIS software utilities (e.g., Parameter File, System Run Control Record)
- Building software factory modules (e.g., Data Entry, Input Validation, Database Update)

Performing these operations coincides with a heavy learning cycle. It should take no longer than six months in a progressive organization.

New programmers need not worry about building databases initially; the 4GL can read external files (e.g., IMS, IDMS, VSAM, ISAM, sequential, etc.) as easily as its own databases. As soon as the first two applications are up and integrated, and allow combined reporting, then do at least four or five applications in each follow-on phase until the whole organization is informationally integrated.

Programming with a 4GL. The glossy brochures and magazine ads touting 4GLs often claim "nonprogrammers can produce their own reports easily with little training." On the whole, this is true, but what is not explained is that such claims apply to report generation for single applications using single (and often simple) databases employing a minor part of the full power of the 4GL.

Real world systems, particularly MISs, require much more complicated, integrated, multi-database environments with a full range of specialized functions. A more complex programming technique is required than that needed for simple three-line report generators. With current 4GLs, programming

FIG. 2

MIS DEVELOPMENT— TECHNICAL KNOWLEDGE REQUIRED

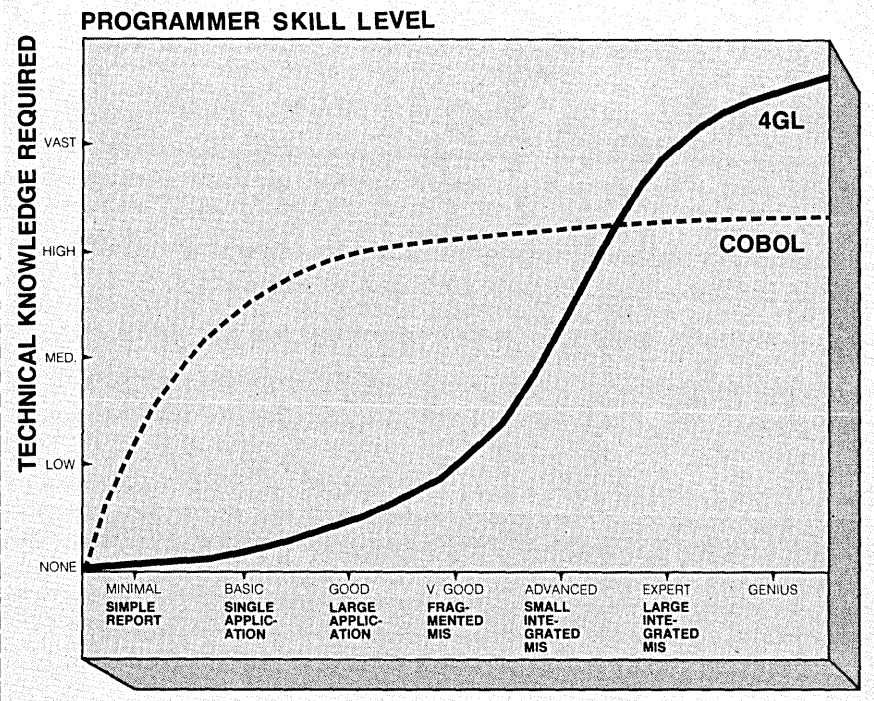
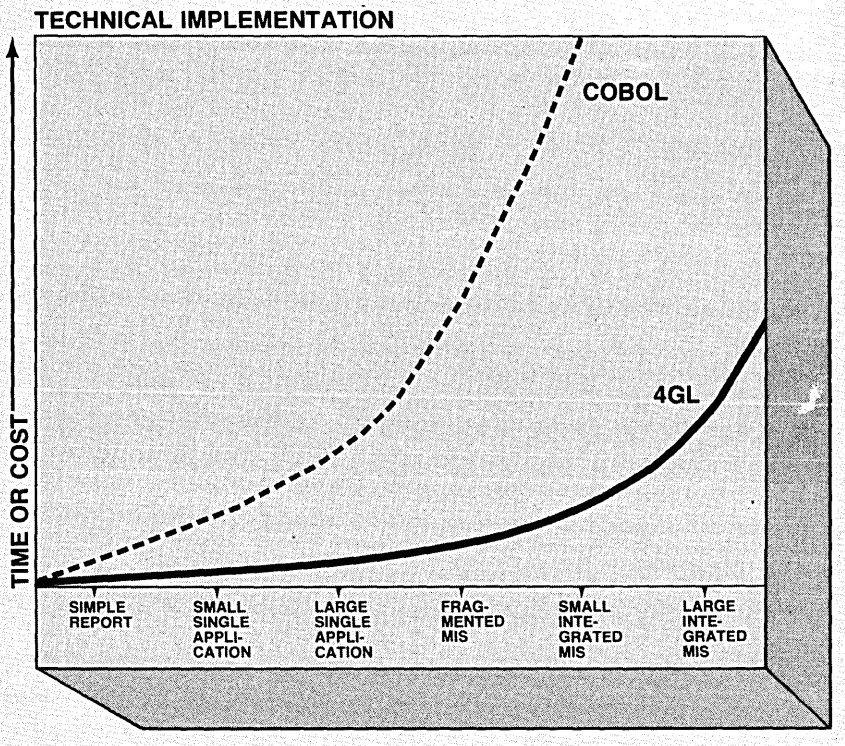


FIG. 3

FOURTH GENERATION LANGUAGE V. COBOL TECHNICAL IMPLEMENTATION TIME/COST



Note: 1. Technical implementation starts when requirements are certified.
2. Time and cost are equivalent when not operating in a crisis mode.

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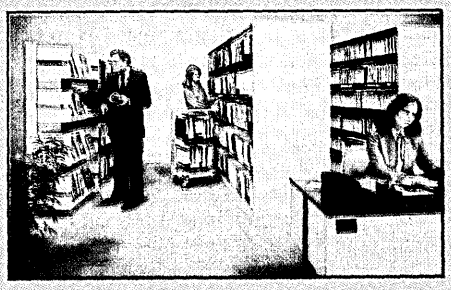

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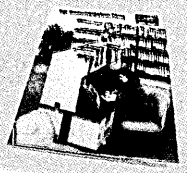

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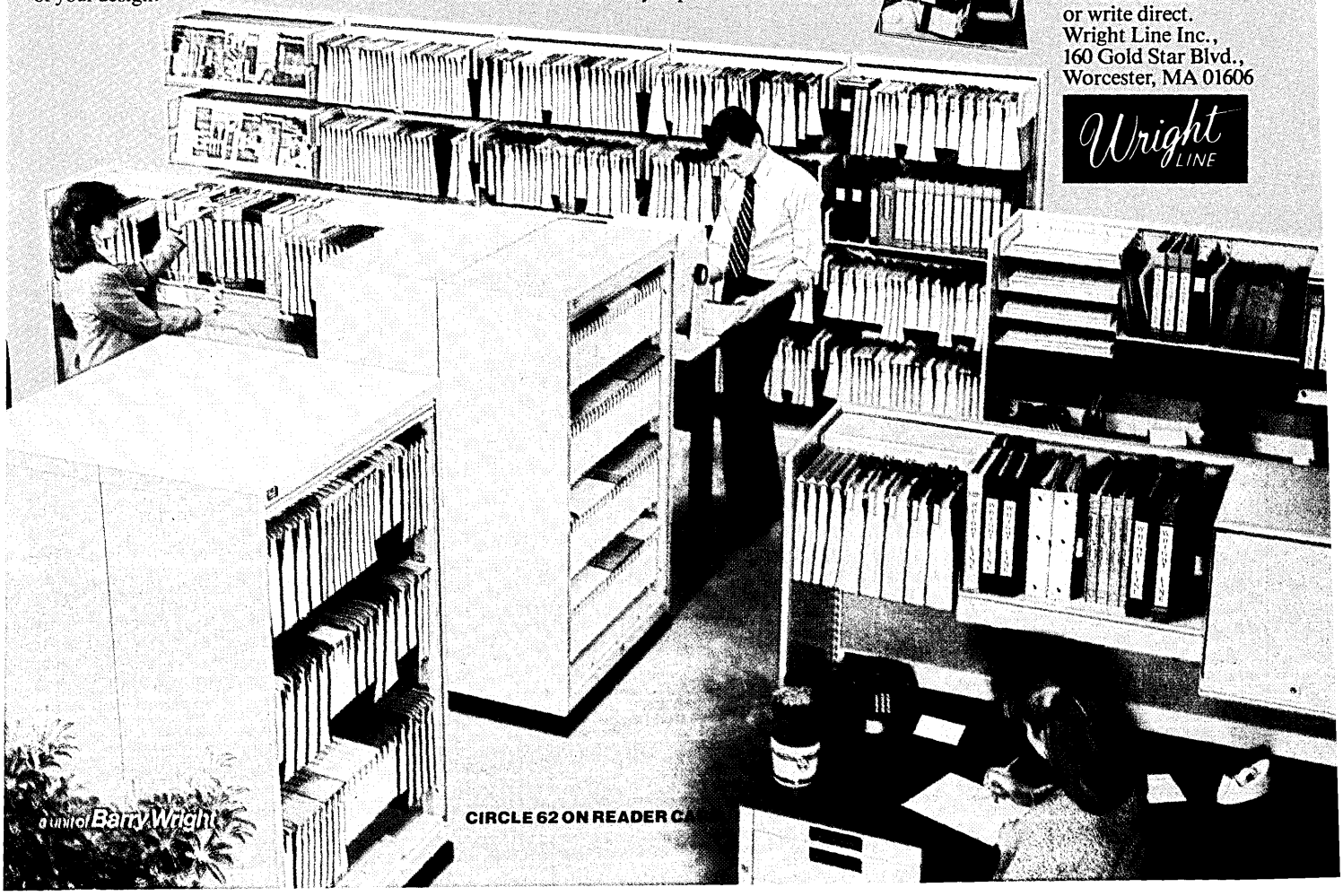

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The use of a 4GL's nonprocedural code drastically reduces programming effort over that required for COBOL.

complexity rises exponentially with product complexity (see Fig. 2), and to be functional at the upper levels requires a considerable amount of knowledge and experience. Such programming is definitely not for "nonprogrammers . . . with little training." Nevertheless, when a programmer has mastered the techniques and has software factory modules on the shelf, major systems can be constructed very quickly. Unfortunately, these programming techniques have to be learned from scratch, because there is almost no similarity between programming in COBOL and programming in a 4GL. In fact, for a variety of reasons, a knowledge of COBOL may be a hindrance.

The situation will improve. 4GLs are about where COBOL was in 1964; they are in the early part of the life cycle and are constantly being enhanced. Nonprocedural verbs will become easier to use, universal programming standards will be developed, and probably an ANSI standard will eventually be issued.

TRAINING 4GL PROGRAMMERS

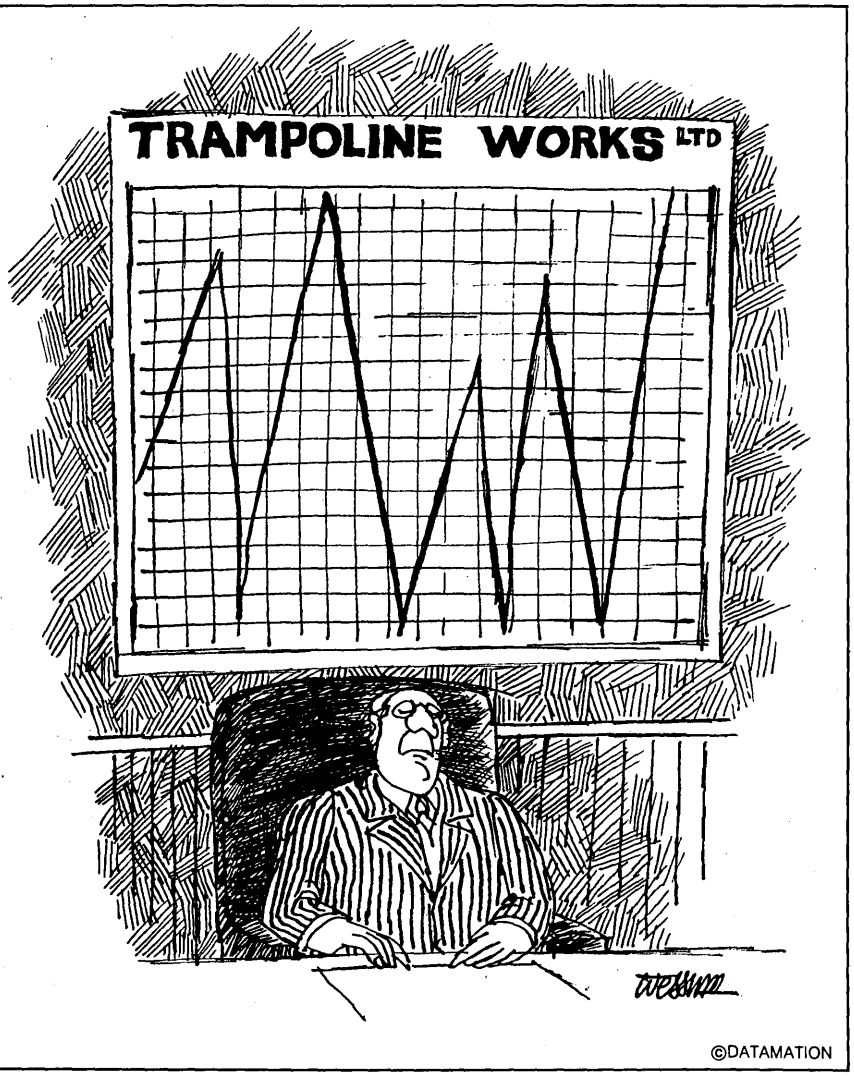
Since programming techniques with a 4GL are so different from those of earlier generation programming languages, everyone has to start from square one, which opens up a large new pool of programming talent.

Knowledge of how computers work is not required. After we had developed the initial phases of our MIS using very experienced 3GL/2GL programmers, we decided to conduct an experiment by trying it out on someone with no knowledge of computers whatsoever. Our secretary was intelligent, administratively well organized, and highly motivated to leave secretarial work. We taught her FOCUS in gradual steps because the programming techniques are fairly esoteric at the upper end. She is now an associate programmer; she has implemented a complete MIS application, including systems analysis, programming, testing, documentation, user training, and implementation.

The 4GL we used (FOCUS) is only one of a number already on the market, and new ones are being announced regularly. Some products comparable to FOCUS are NOMAD, RAMIS, and INQUIRE. While they are all in early stages of development, the productivity increases over COBOL depicted in Fig. 3 are available now, and the gap will widen as the 4GLs develop. What is not shown in Fig. 3 is the significant increase in software capability that accompanies the 4GLs.

Now that we have extensive experience using 3GL COBOL and a 4GL, we believe COBOL is obsolete and will slowly die. Existing inventories of software will only retard this inexorable process. By the mid-1980s, as more real world cases are recorded, we predict 4GLs will gain wide acceptance as the standard method of MIS development.

Using a powerful 4GL, combined with software factory methods, provides a quantum leap in both information control capability and programmer productivity. It also opens up programming to a much larger section of the work force. When an organization has its 4GL environment set up, quickly rewriting old systems or appending new systems will be as easy as falling off a log; the difficult part will be getting onto the log in the first place. *



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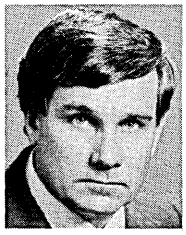
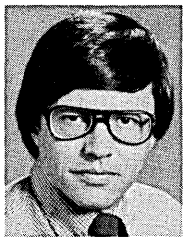
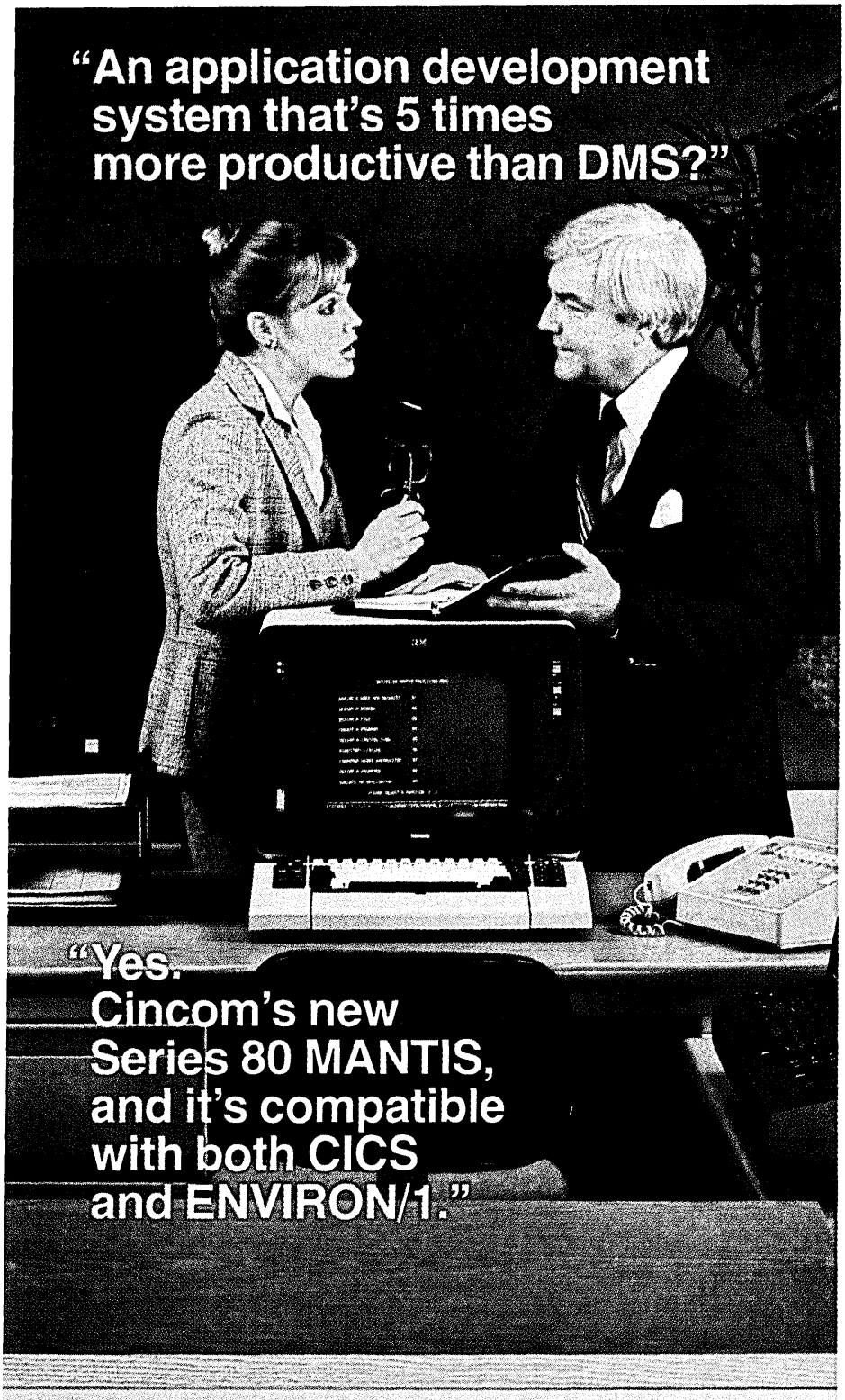


Mr. Read is director of MIS for the Data Services Div. of Planning Research Corp., San Diego. Before joining Planning Research, he was the vice president, Systems and Programming for Cubic Corp., a San Diego-based manufacturing company. Mr. Read is a member of the U.S. Society for Management Information Systems (SMIS).

DOUGLAS L. HARMON



Mr. Harmon is the deputy director of MIS Development, also with the Data Services Div. of Planning Research. His previous work in the dp field includes medical systems decision modeling and software error analysis.



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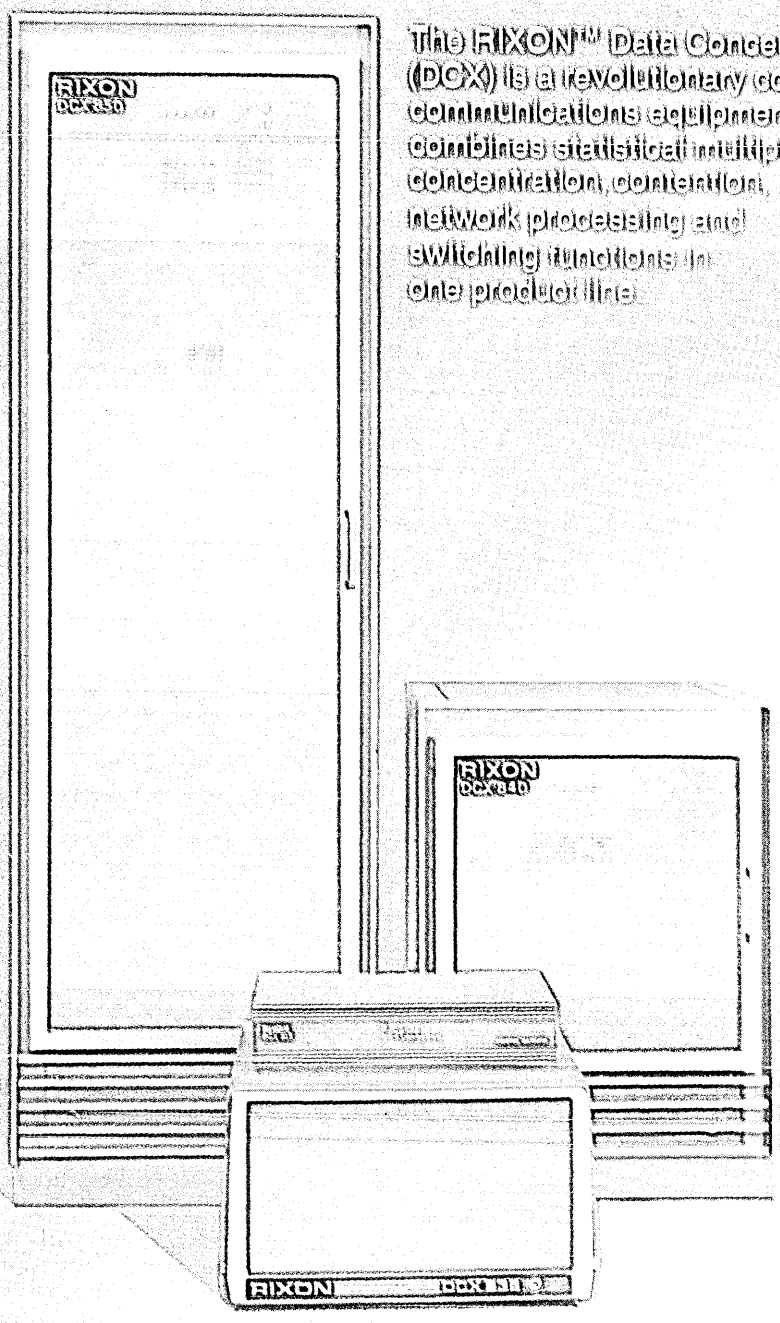

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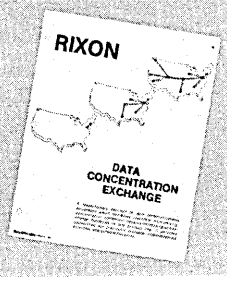

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If operation costs are high, project deadlines are missed, or users complain, it may be time to change the information services structure.

GETTING IN SYNC

by Margrethe H. Olson and Gordon B. Davis

It may be time to change the organizational structure for using, managing, and controlling computer-based information processing; the current structure may no longer be providing the most effective services. Management must devise an information services (IS) organization that fits the overall organization structure: a good fit will provide the most effective service.

Here, we will present the criteria for recognizing a need for change, and describe three areas for possible organizational change: system operations, system development, and system management. Our criteria and recommendations are based on a study of information services organizations in 43 companies.

First, corporate management must decide on two major issues: the appropriate balance of centralized and decentralized control over computer-based information systems, (i.e., the allocation of control between user organizational units and a centralized information services department); and the appropriate organizational structure to achieve that balance. The proper balance is unique to each organization.

Change usually occurs as a result of dissatisfaction with operation costs, failure to meet project deadlines, and user complaints. In our interviews, we found information service managers can easily recognize the symptom of a need for change: pressure to improve services. Often, however, the causes are difficult to analyze. One approach is to examine three possible reasons for a need for change. See if they apply in your organization:

- Information services is out of sync with the general organization.
- Information services does not fit the overall corporate level of standardization or specialization.
- Decision-making and control over information services do not correspond to decision-making and control authority in the rest of the company.

If one or more of these situations exists, it is time to reorganize information services.

How does information services get out of sync with the rest of the company? Sometimes, the structures of the operating units change and information services does not keep up. For example, a company with a large number of retail chain stores recently reorganized its business operations. Rather than have all business support functions handled by the corporate office, it set up a number of regional offices. The company's corporate information services center had directly serviced all local outlets, but with the reorganization it was apparent that centralized operations could not respond quickly enough to the new regional offices. The company is now decentralizing its information systems to the regional level.

Another reason for being out of sync is that the company responds to other organizational problems by reorganizing information services. The result—whether centralization or decentralization—may be inconsistent with the operating organization. We interviewed a manufacturing company in which plants had traditionally been autonomous, each with its own business support functions including information services. Corporate management wanted to recentralize control over information services to increase efficiency and decrease cost.

A corporate information systems manager and a central programming staff were hired, and their first assignment was to build a standardized budgeting and general ledger system for all plants. However, centralized information services and centralized budgeting and general ledger were inconsistent with the decentralized, relatively autonomous organization and diversity of plant operations. The results were disastrous. Rather than conform to the standardization proposed by the systems staff, the plants demanded continued flexibility in system design and continued control over their own information systems. A relatively powerless corporate information systems manager was unable to cope with conflicting demands between corporate management and individual plants. The plan to centralize control was abandoned.

EXAMPLES OF GOOD FIT

Two examples from one company illustrate a good fit between information operations and organizational functions. In the U.S. the company manufactures and distributes a product line in a dozen regions. The company has decentralized some authority to each region but has maintained strong, centrally enforced operations and procedures. The policies and organization of information services follow the same pattern. Information system applications processed at the different plants are virtually identical. All operating data and transactions for a plant have been decentralized to a minicomputer located at the plant with communications to master files maintained at corporate headquarters.

This system provides for decentralized data entry and data access. There is, however, strong central control in order to maintain uniform information processes, and each plant has very little discretion in the use of its computer. All programs are developed and installed by the central corporate staff, and the plants do not have the technical capability to change programs or create new ones. The plant computers are locked into a daily schedule of updates and reports dictated by the corporate information services.

The company also has a large international division with plants and offices throughout Europe and South America. Each office provides a slightly different set of products for its unique clientele. Even though information services for the international division are under the control of the same corporate staff as the domestic division, they are organized differently. The international information services organization reflects the autonomy and variety of the international operating units. Each branch controls the quantity and quality of its technical resources. It chooses its own computer hardware based on its size, system needs, and availability of vendor support. Each branch also has its own operations and

If the information services function is out of sync with the organizational structure, a change is needed.

TABLE I

CRITERIA FOR CENTRALIZATION/DECENTRALIZATION OF INFORMATION SERVICES FUNCTION

CRITERION FOR CENTRALIZATION/ DECENTRALIZATION	SYSTEM OPERATIONS	SYSTEM DEVELOPMENT	SYSTEM MANAGEMENT
I. **General organization structure**	Location of hardware and data files Amount of work performed locally		
II. **Organizational standardization and specialization**	Degree of autonomy of local sites	Location of systems analysts Specialization of systems analysts	Method of project selection
III. **Location of decision-making authority in the organization**		Location of systems analysts User liaisons	Method of project selection Method of project management Method of charging for IS services

programming staffs under the direct jurisdiction of the controller of the branch. The only controls maintained by the central department are approval of all new equipment purchases and the requirement that all reports meet certain corporate guidelines.

Organizational standardization refers to the degree of standardized procedures for guiding company activities. A company with many formal rules and operating procedures is highly standardized, while a company that is run informally lacks standardization.

Our survey of 43 businesses indicated that companies with a high level of standardization were more likely to have decentralized information services than those that were less standardized. In other words, standardization and well-established operating discipline may be necessary for the successful decentralization of information services. The existence of standards for other organizational functions eases the introduction and enforcement of standards to control decentralized information services.

The relationship between overall standardization and decentralization of information services is provided by a comparison of two restaurant chains. One is a fast-food chain with a standard set of products using precisely prescribed ingredients. The other is a chain of dinner houses where each local manager has some choice in menu planning. In the fast-food chain it was possible to implement a decentralized inventory control system in which local outlets keep track of their own ingredients and replenish their own stocks based on standard product specifications. For the chain of dinner houses, lack of inventory standardization prevented such decentralization. A centralized program controls only gross inventory quantities for basic menu items such as meat, while the majority of inventory processing and control is not computerized.

NEEDS MUST BE KNOWN

Organizational *specialization* refers to the number of specific organizational functions. Our survey showed that the degree of specialization of organizational units is reflected in the organization of information services, especially system development. To be effective, information services for a specialized division must have system designers who understand the requirements of the division. System development people can, in such cases, be assigned to the specialized divisions to learn the requirements.

Success or failure of decentralized development personnel may depend on the degree of organizational specialization. We observed one highly specialized company where the computer systems analysts were actually users with additional training in systems analysis skills. They brought to their task the skills and knowledge of trained specialists in their user roles and felt strongly that this knowledge was essential to building effective user systems. Another specialized company had decentralized systems analysts to functional units, provided intensive training, and thus made them local experts.

As an example of inappropriate organization, systems analysts in a nonspecialized company were decentralized to product divisions. In each division, the analysts worked on the same broad spectrum of business systems as they had when they were centralized, only for a smaller business unit. As a result, service was not well integrated into the user division and the analysts continued to identify professionally with the central systems group rather than the user division; the systems they designed were apparently no more effective than when they were centralized.

Failures may occur when central information services groups attempt to impose "standard" information systems in companies with highly diverse, specialized divisions and little or no organizational standardization. In one large manufacturing company, all specialized product divisions were served by a central data processing department. The central staff attempted to develop a standardized manufacturing system for all divisions, even though divisional products and procedures were highly diverse. There were no user experts to define unique needs, and the standard system that evolved was unsuitable for most of the divisons.

The structure of decision-making au-

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TABLE II

DESIGN OF MECHANISMS

MECHANISMS	STRONG CENTRALIZATION	MODERATE CENTRALIZATION/ DECENTRALIZATION	STRONG DECENTRALIZATION
A. System Operations			
1. Location of hardware and data files	Central location only	Some hardware and data in local sites but under central supervision	Local hardware and operating data under complete local control
2. Amount of work performed locally	All work performed centrally	Some local work (e.g., transaction data entry) performed locally, most at central site	All work pertaining to local unit performed locally
3. Degree of autonomy of local sites	Local sites have no autonomy—all control central	Local sites have some flexibility in scheduling operations under central overall control	Local sites have complete autonomy in scheduling and control of their own processing
B. System Development			
1. Location of systems analysts	Central staff only	A few analysts decentralized, plus a central staff	All systems analysts decentralized to user divisions
2. Specialization of systems analysts	Project or function assignment only—no specialization	Centralized analysts specialize in one user function only	
3. User liaison	Central staff has no user liaisons	User liaisons from central staff assigned to particular users	
C. System Management			
1. Method of project selection	Projects selected by Information Services management	Corporate management/ steering committee	Users make all decisions regarding systems affecting them
2. Method of project management	Central IS staff does all project management	Some user input on cost/benefit; user sign-off on some project phases	Users involved in cost/ benefit analysis; have responsibilities and sign-off of all project phases
3. Method of charging for services	Overhead only	Costs allocated to users in rough proportion to use; or users charged for development or operations but not both	Users charged actual costs for both system operations and development

thority in the company affects the organization of information services. In some companies, authority is confined to a small core of top management; in others, decision-making is delegated to lower levels. In our discussions with information systems managers and corporate executives, we learned that conflicts occur if the level of authority and control over information system services does not coincide with the level of authority and control over other business functions. For instance, if plant managers have been delegated authority for the operation of their plants, they should also have authority over their own information processing. If top management retains highly centralized control over company operations, control over information systems should also be centralized.

In the companies observed, unit managers who controlled other functional support services exerted pressure to gain control over information services if they did not already have it. In one large, highly centralized company, all support services including information systems had been located at the corporate level. Recent changes in top management had resulted in some major organizational changes; essentially, decision-making authority and control had been decentralized to the divisional level.

At the time of our interviews, information services was still a corporate function. There was considerable pressure for it to reorganize, and there were many complaints of lack of responsiveness to user needs. Divisions were actively negotiating for authority and control over their own information systems, and some form of decentralization of control to the divisional level appeared inevitable.

ORGANIZE IS FIRST STEP

If there is a need for a change in your company, the first step is to organize information services to be more effective. The organization design choices are grouped into three functions: system operations, system development, and system management. These functions should be examined separately because they can be organized separately—one may be centralized and another decentralized. There are also different organizational mechanisms to achieve centralization or decentralization of each of the functions. Table I summarizes the mechanisms for achieving centralization or decentralization of these three information

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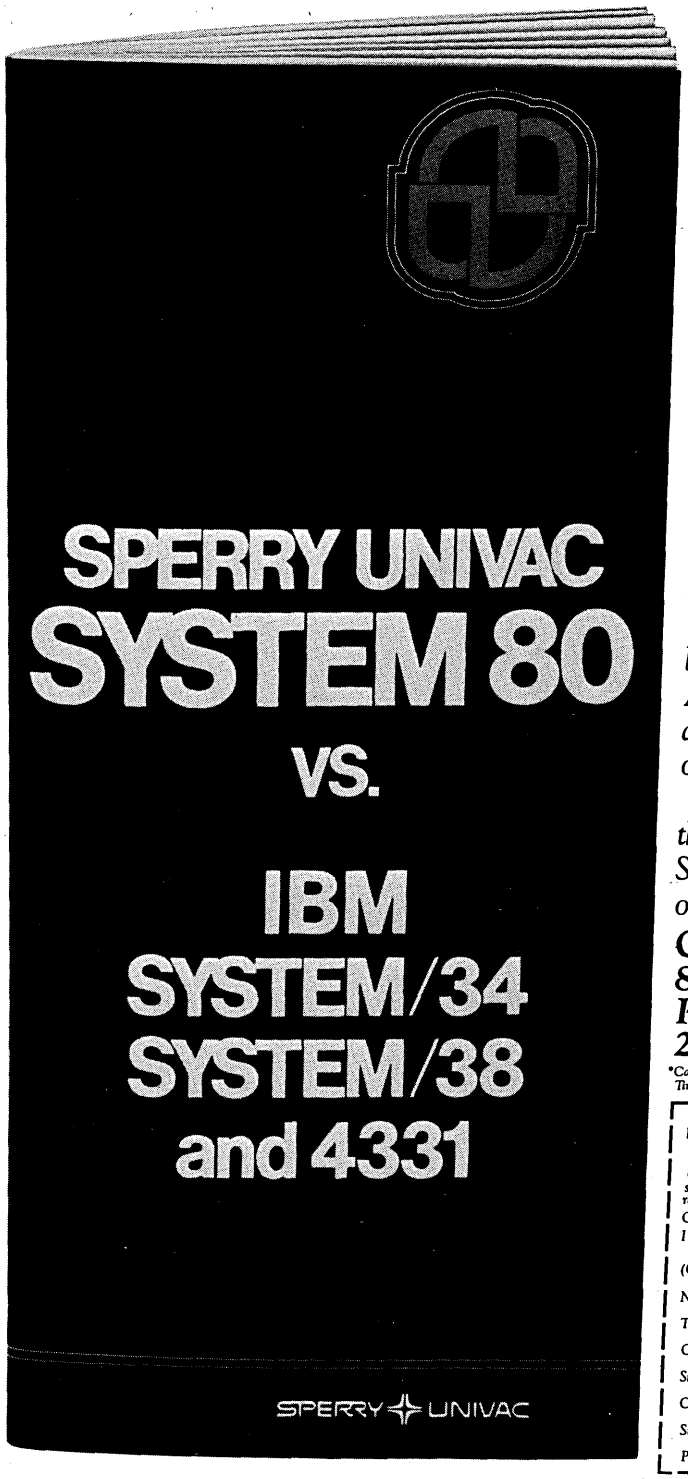

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In order for information services to operate effectively, they must be organized to fit the company environment.

services. Table II shows the possible design alternatives for each mechanism in order to achieve the desired degree of centralization or decentralization.

If management finds information services to be out of sync with the general organization structure, the most appropriate remedy is to reorganize system operations. Changes in system development or system management are less effective in correcting the mismatch.

Decentralization or centralization of system operations is achieved by design alternatives for three mechanisms: location of computer hardware and operating data, the amount of processing performed at local sites versus the central site, and the degree of autonomy of local sites regarding the daily scheduling and control of their operations.

Highly centralized system operations have a centralized computer site where all data is stored, all processing is performed, and all scheduling and control of operations takes place. Highly decentralized operations are characterized by user divisions having their own computers, managing their own processing and operating data, and scheduling and controlling their own operations. Different combinations of the three mechanisms may by employed to achieve moderate decentralization of operations. A centralized information services department can place a minicomputer in every user department and still centrally schedule and control all daily operations. A company may have a large centralized computer but still achieve some decentralization by permitting users to schedule and control their own daily processing through dispersed terminals.

Our survey showed that two of the three mechanisms for changing system operations were commonly used to correct the out of sync problem: the physical location of computers and the amount of work performed at local sites (Table I). In most cases observed, the trend was toward decentralization of hardware. Decisions about how much of the hardware and related operations should be performed locally and how much should remain centralized usually depended on the degree of interdependence of operations, especially when the local sites were dispersed.

In one company, the functional divisions are highly interdependent and a centralized, integrated data base is required. The company uses a centralized on-line system with each division handling its own transaction data entry procedures through terminals. All other hardware and operations are centralized. In another case, an insurance company has multiple regions that handle essentially the same types of transaction processing, but which have relatively independent files. Each region has its own computer system and handles its own operational data processing. Only summary data items are consolidated on a central computer.

If the impetus for organizational change is based on the effect of standardization or specialization, system operations can be altered by changing the degree of autonomy given to local operating sites. Greater autonomy of local operations is generally found in companies with high organizational standardization and specialization. The insurance company cited above manages highly autonomous local sites through extensive standardized procedures. Because these standards are well established, local sites have autonomy in the scheduling and control of daily processing and yet still conform to organization guidelines. The need for a central watchdog staff to monitor local operations and troubleshoot local systems problems is minimized.

In our observations, location of decision-making authority in an organization does not affect the organization of system operations. Although some user-managers felt that having their own computers allowed them to exert more control over the use of computers, this was not usually the case. In fact, the physical location of computers was not usually a major factor in determining the degree of decentralized control over operations.

ALTERING SYSTEM SETUP

Three mechanisms for achieving centralization or decentralization of application system development are location of systems analysts, specialization of systems analysts, and user liaisons.

The most commonly suggested scheme for decentralizing system development is to physically move systems analysts to user divisions while retaining a centralized staff of programmers. Theoretically, the user analysts can become expert in the system needs of the user functions to which they are assigned while the centralized programming staff can take advantage of technical specialization. Programmers are assigned to an application based on their availability and the particular skills required for that system. Analysts will not only be experts in the user functions but will be highly visible in the division and will be able to promote participation in development.

The level of decision-making authority appeared to affect the location of systems analysts. In organizations where decision-making authority is delegated to lower levels, authority over the systems analysis function is also delegated to those levels. In companies with highly centralized authority, control over systems analysis is more likely to be centralized by retaining a central pool of analysts.

A second method of altering centralization/decentralization of system development is specialization of systems analysts. In the survey, specialization of the system development function was found to be particularly related to organizational standardization and specialization. We found that companies where user divisions perform highly specialized functions are more likely to use specialized systems analysts to support those functions than less specialized companies. This specialization is accomplished by physically decentralizing analysts to user divisions and training them in the functions of that division or by training users in systems analysis techniques.

When physical decentralization of systems analysts is not feasible, some highly specialized companies organize the central systems analysis staff so that each analyst is only responsible for systems in a particular user function. This arrangement allows analysts to become specialists in systems for the user function while remaining in a centralized group and permits users to identify their own analysts, thus improving communications between users and the central staff.

A third method of organizing for decentralized influence in system development is the user liaison. This is used in some companies where decision-making is delegated to lower levels but physical decentralization of systems analysts is infeasible. User liaisons are typically responsible for communicating the system needs of one or more user divisions to the central development staff. They help users establish long-range dp plans and set short-term system development priorities. They also advise users on information system changes and technical developments.

Such a liaison gives the user a direct contact in information services and gives the central staff continuous appraisal of the system needs of user divisions. The existence of this position mitigates the adverse effects of a centralized development staff in a decentralized organization by permitting many users at lower organizational levels to have input into system development activities.

SYSTEM MANAGEMENT

System management, which encompasses the activities for administering and controlling information system resources primarily involves system use management and the assignment of development priorities. Important system management activities which can be used to achieve centralization or decentralization are project selection, charging for system services, coordination of overall systems planning, cost/benefit analysis of proposed projects, and formal project management techniques.

In our survey, three system management activities were examined: the method of

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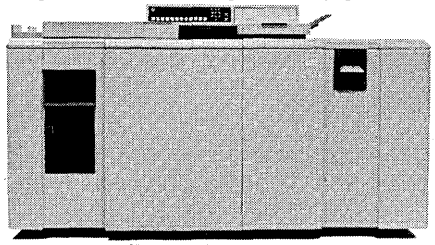

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One method of organizing for decentralized influence in system development is the user liaison.

project selection, the method of charging for services, and the location of control over project management. We found a variety of combinations of centralized and decentralized control over these activities.

The degree of centralization or decentralization of system management activities can be relatively independent of system operations or development. For instance, in an organization with highly centralized operations and development, users may exert a great deal of decentralized control over the use of information services through decentralized control of system management. On the other hand, a company may require highly decentralized operations and development but still maintain control by centralizing system management activities.

Two companies with centralized system operations and development illustrate opposing views of system management. In the first, a centralized information services staff makes all decisions on project priorities, allocates all dp expenses to divisions in rough proportion to their use, and permits only minimal user involvement in project management. In the second company, user divisions independently set their own project priorities. They expect information services to meet demands for new projects and ongoing services and are charged for actual operations and development costs. A central development staff charges for development on a fixed-bid basis, and users have the option of shopping for competitive outside services. Users have active, ongoing involvement in project development, including approval of all development decisions made by the central staff.

Most companies fall somewhere between the two extremes of control over system management. User departments often negotiate with the central staff for project priorities during the budgetary cycle, thus allowing some user control even though the central staff makes the final decisions.

In some companies, steering committees move the responsibility for project selection for information services to top management users. The use of steering committees is most prevalent in companies that are organizationally standardized or specialized. Our survey showed that the degree of decentralization of decision-making authority strongly affects management control functions (Table I). In companies with highly decentralized decision-making, both project selection and ongoing project management responsibilities are more likely to be decentralized to users than in companies with highly centralized decision-making authority.

Interestingly, we found that charging users for actual services used does not effectively decentralize system management unless it is coupled with user control over project selection and/or project management. In several companies with highly centralized decision-making authority, users were fully charged for system services but had no power to reduce or increase those services. These users were not able to pay for services, and therefore control over system management remained highly centralized despite the use of chargeback.

There are many ways to organize the information systems resource; the most effective organization is at least partly dependent on the company environment. Equally, if a change in organization of information system services is indicated, there are many ways to centralize or decentralize. Using the guidelines we have presented, management can organize the information services function to conform more closely to the needs and structure of the organization, and thus provide more effective information services. ✻

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CARTOON BY CHUCK VADUN

MARGRETHE H. OLSON

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GORDON B. DAVIS

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- Flexibility
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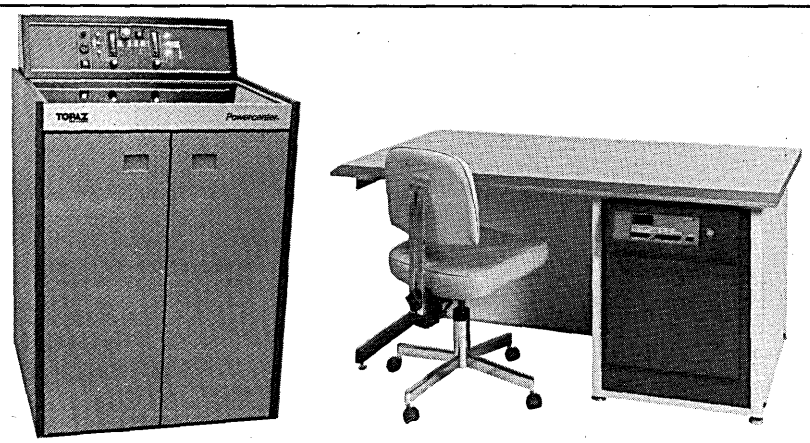
*George W. Allen and Donald Segall, IBM Systems Development Div., "Monitoring of Computer Installations for Power Line Disturbances," presented to the IEEE Power Engineering Society.



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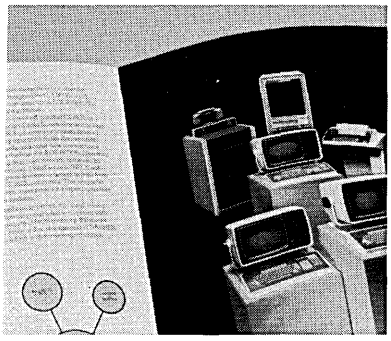

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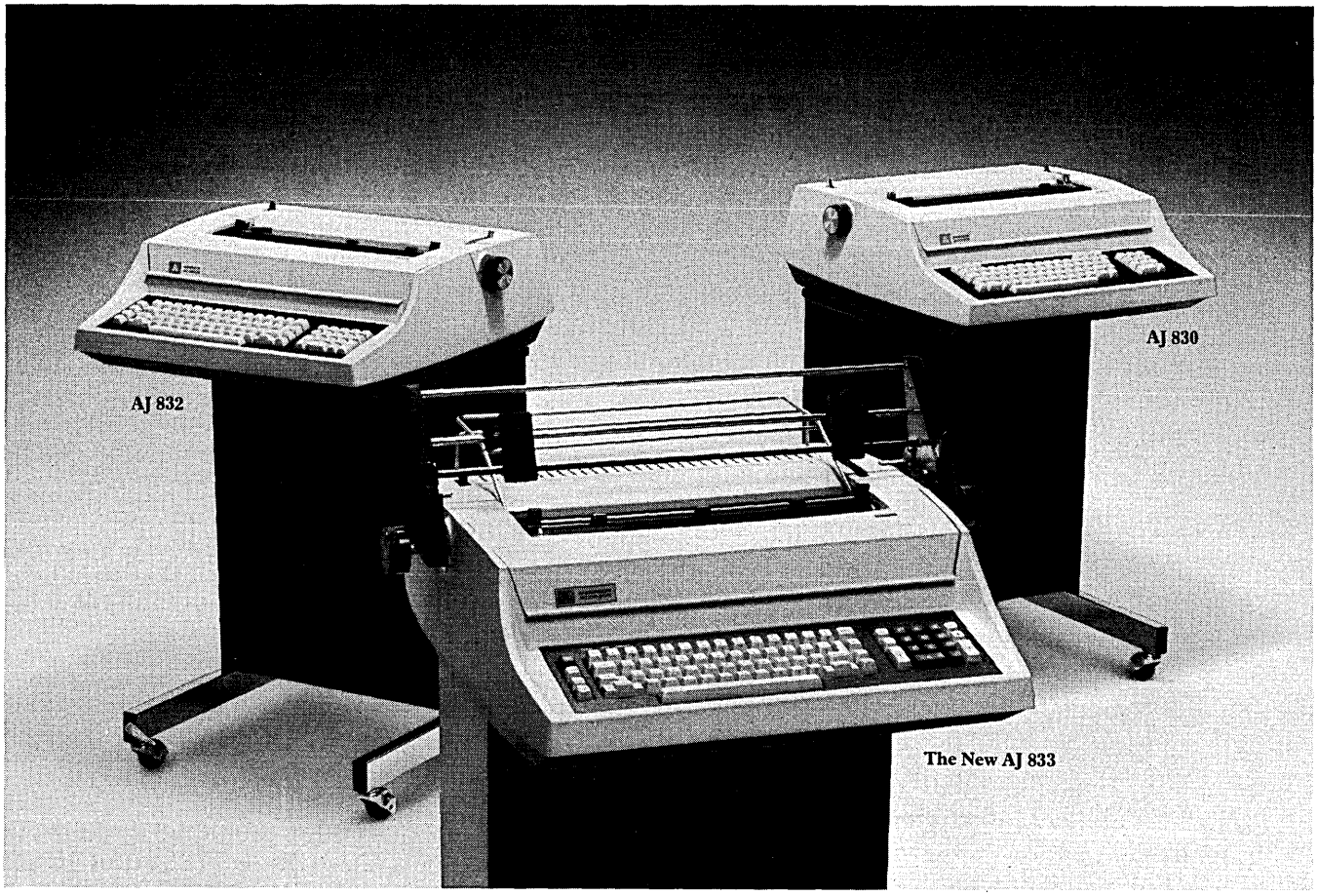

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PEOPLE

A SELF-MADE MAN

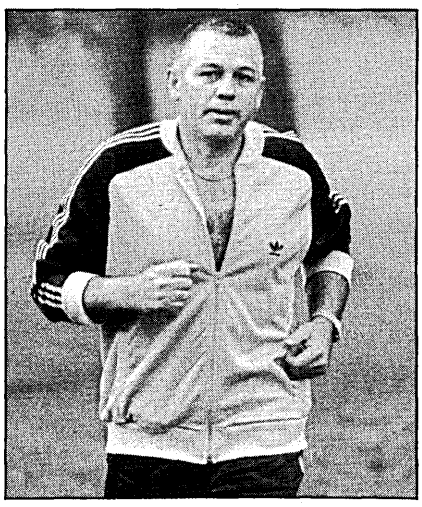
In many ways, his is the classic rags-to-riches success story. His ascent from farm boy during the depression years to self-made millionaire and electronics entrepreneur is pure comic book stuff.

In the eyes of workers at the expanding terminals and service concern, Data Access in New Jersey, Gerald (Jerry) R. Cicconi is more than just the boss. "He's the type that heroes are made from, the good old-fashioned American kind," said one.

The larger-than-life Cicconi certainly looks the part. His presence adds weight to his contention that the pioneering all-American male didn't die out with John Wayne. His looks combine the macho physique of a 200-lb. marine sergeant with the winsome smile of John Travolta. He appears a good deal younger than his 50 years.

His rugged looks are a legacy of his early years when he patched together a living from a series of dead-end laboring jobs, drifting from employer to employer throughout his home state of Pennsylvania. "But behind the muscles is a quick intelligence that has always been there," said a colleague.

"I knew from my childhood days of tinkering with radio that I wanted to work in the electrical business," says Cicconi. When he was 10 years old, his father's fortunes slumped and the small dairy farm that had sheltered them through much of the depression was sold. The family moved to the big city to eke out a living. "When I first saw all those lights, everything went 'wham' inside my head," Cicconi remembers. "I knew I just had to get into electrical school." In 1948, when he was 17, he joined the army in the hope of gaining electrical experience. "But they put me in the infantry," he sighs. Instead, he indulged his athletic prowess and saw active service in Korea.



JERRY CICCONI: Still searching for those former days of freedom . . .

Following discharge at the end of 1951, he began the grind of dead-end jobs all over again, always looking for that elusive opening into the electrical business. In 1952 he married. His wife Margaret has had an enormous influence on his life, Cicconi says. In addition to taking care of the money, she has prodded and urged him into making the best use of his energies. "She keeps me up to the mark."

Teamed with his wife, he started a series of small businesses, the most enduring of which was a tiny radio/tv repair shop. As well as working in the shop, Cicconi studied six hours a day for 18 months at the Trenton Technical Institute before graduating in electronic engineering.

At the end of 1956 his first break came. Cicconi secured an opening with Sperry Univac: "After answering 12 questions on nuts and bolts, I was in, doing electrical assembly."

Two years later Cicconi began a 10-year career with RCA, which would take him all over the world as a computer project engineer and instructor. From the first IBM semiconductor computers, the 7090s, to the later 1401s, Cicconi set about cutting his electronic teeth.

By the middle of 1969, Cicconi figured that he knew enough to branch out on his own. Using money he had netted from playing the stock market, Cicconi bought RCA hardware at bargain prices to set up his own computer services company, Computer Investments and Leasing Corp. (CIL).

In 1973, having merged the company, Cicconi pulled out a wealthy man. He went on to head a number of companies including Data Access, which he took over in 1978.

This $37 million company is primarily a services concern. It designs and builds its own add-ons and markets a full line of data terminals and peripherals from such leading companies as Texas Instruments, Digital Equipment, and Hewlett Packard. "The key to our business is the way we add financial muscle and know-how, as well as service, support, and spare parts to these lines," says Cicconi. "These big names aren't geared to selling to the consumer world, and they can't afford house calls." The company's stock has now started to find fans on Wall Street, and sales are expected to jump to over $100 million in two years, according to Cicconi.

Though Cicconi's whole philosophy of life seems to point to incessant change and living for the moment, he says he's a planner at heart. Lately the company has sacrificed near-term profits to be better placed for the future. Both the sales force and plant capacity have doubled, and a new leasing subsidiary has been formed. Currently, Cicconi is seeking an extra $15 million to offset the drain on working capital, as well as looking for new acquisitions.

But such growth has its price in other ways. "I used to have so much freedom," he remembers. "I always thought I'd be happiest just driving a truck, or a bulldozer, or something."

Though Cicconi revels in his newly acquired skills as accountant and numbers man, he says sadly, "I've become a prisoner of this desk."

Now maybe only Cicconi's body offers a reminder of his former days of freedom. But if another is needed it stands framed on his desk. The inscription reads:

"Along the way take time to smell the flowers."

—Ralph Emmett

HARDWARE

OFF-LINE

Results from a reliability prediction model show Zilog's Z8000 16-bit microprocessor has the lowest predicted failure rate of 16-bit micros, according to Zilog. Model results show the Z8000 has a predicted failure rate 13% below that of its nearest competitor. The model used takes into account device complexity, package complexity, junction temperature estimates, voltage derating stress factor, and quality factor. The model was developed by the Reliability Analysis Center of the U.S. Air Force's Rome Air Development Center.

Beginning this spring, Micropolis, the Chatsworth, Calif., small disk maker, will begin bulk deliveries of its MicroDisk eight-inch Winchester drives to Britain's ICL. ICL reportedly will use the drives with its recently introduced ME29 computers. ICL's three-year, multimillion-dollar contract with Micropolis for drives and controllers is said to be the disk maker's largest contract to date.

Formation, Inc., the Mt. Laurel, N.J., manufacturer of IBM code-compatible minis, has let a $1 million, two-year contract to Kennedy Co. for that firm's Model 9000 mag tape transports.

Cray Research, Inc. ordered $190,000 worth of Lee Data Corp's Series 300 (IBM 3274-compatible) local and remote display systems which were to be installed last December. Lee Data's terminals will be used for software development using the CMS editor. Cray says that its programmers plan to use the Series 300's large screen capabilities, including 132-column mode.

DISPLAY TERMINALS

Models 4543 and 4420 are two of Teletype Corp.'s latest entries in its data communication terminals product line. Both are modularly designed microprocessor-controlled crt display terminals with the electronics housed in a 15-inch circular base that supports the display. Each has a tiltable, glare-reducing screen that displays 24 lines of 80 characters. Both can be had with a variety of detached keyboards which include programmable function keys. EIA RS232C interfacing is standard, and either terminal can drive an auxiliary character or line printer.

The 4543 (which complements the existing 4540 clustered terminal system) uses IBM SDLC protocol to communicate over nonswitched point-to-point or multipoint private communications lines at data rates of up to 9600bps. It has full editing and formatting capabilities. The 4543 lists at $4,731, with deliveries beginning next quarter.

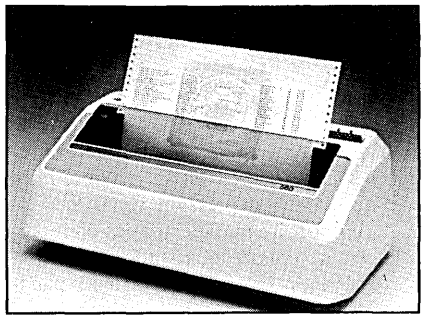
For asynchronous point-to-point communications at up to 9600bps, the 4420 fits applications ranging from data entry to time-sharing. Features include editing and formatting, cursor addressing and readout (x-y coordinates), character of block trans-

mission, and a three-screen memory. A current loop interface conversion kit is available as an option. The 4420 lists for $3,824, with "standard" keyboard; it's available now. TELETYPE CORP., Skokie, Ill.

FOR DATA CIRCLE 308 ON READER CARD

132-COLUMN PRINTER

Integral Data Systems' model 560 Paper Tiger is a 132-column bidirectional dot matrix printer. Capable of printing at up to 150cps, the dot matrix print head overlaps points—both horizontally and vertically—producing characters that the vendor says are of correspondence quality. The microprocessor-controlled printer produces 96 upper and lower case ASCII characters



with descenders; foreign or custom fonts can be added, and the units can contain up to four separate character sets. Proportional spacing, enhanced bold characters, and 10- 12- or 16.7-pitch printing are features of the model 560 Paper Tiger. It can handle single and multipart forms ranging from 1.5 inches to 15 inches in width. A raster graphics plotting option, dubbed DotPlot, can be added to the basic unit for $99. A Centronics parallel interface and an RS232 interface are standard; serial data rates are switch selectable in the range of 110bps to 9600bps. The basic printer sells for $1,695. INTEGRAL DATA SYSTEMS, INC., Milford, N.H.

FOR DATA CIRCLE 301 ON READER CARD

DAISYWHEEL CONTROLLER

The Retroscroller is a single board microcomputer programmed as a text output processor that is designed to exploit the capabilities of daisywheel and thimble letter-quality printers. The board plugs directly into Diablo HyType printers (including the 1620 and 1610); packaged in a standalone version with power supply, the Retroscroller can control Qume daisywheel printers and NEC spinwriters. The controller can accept serial data—via an RS232 interface—at any of 16 data rates up to 19,200bps. Users can prepare their texts using virtually any computer and text editor; control codes embedded in the text specify Retroscroller functions, such as page numbering, horizontal and vertical tabbing, plotting, and many other functions. The board also can handle propor-

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2400 BPS	☐ $340	☐ $362
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9600 BPS	☐ $463	☐ $608

Name _____

Title _____

Organization _____

Address _____

_____

Phone _____

DAT 2/81

All prices per month, based on 60-month lease.

RACAL The Electronics Group

CIRCLE 119 ON READER CARD

The new VISUAL 200 terminal has the features of competitive terminals and will code-for-code emulate them as well. A flick of a switch on the rear panel programs the VISUAL 200 for compatibility with a Hazeltine 1500, ADDS 520, Lear Siegler ADM-3A or DEC VT-52. To an O.E.M. customer it means no change in software to displace the older, less powerful terminals in his product line with the new, reliable and low cost VISUAL 200. To a Distributor it means offering a single modern terminal which is compatible with all the software his customers have written for the older terminals. And you're not limited to mere emulation; you can outperform them at the same time by taking advantage of the additional features and human engineering of the VISUAL 200, such as:

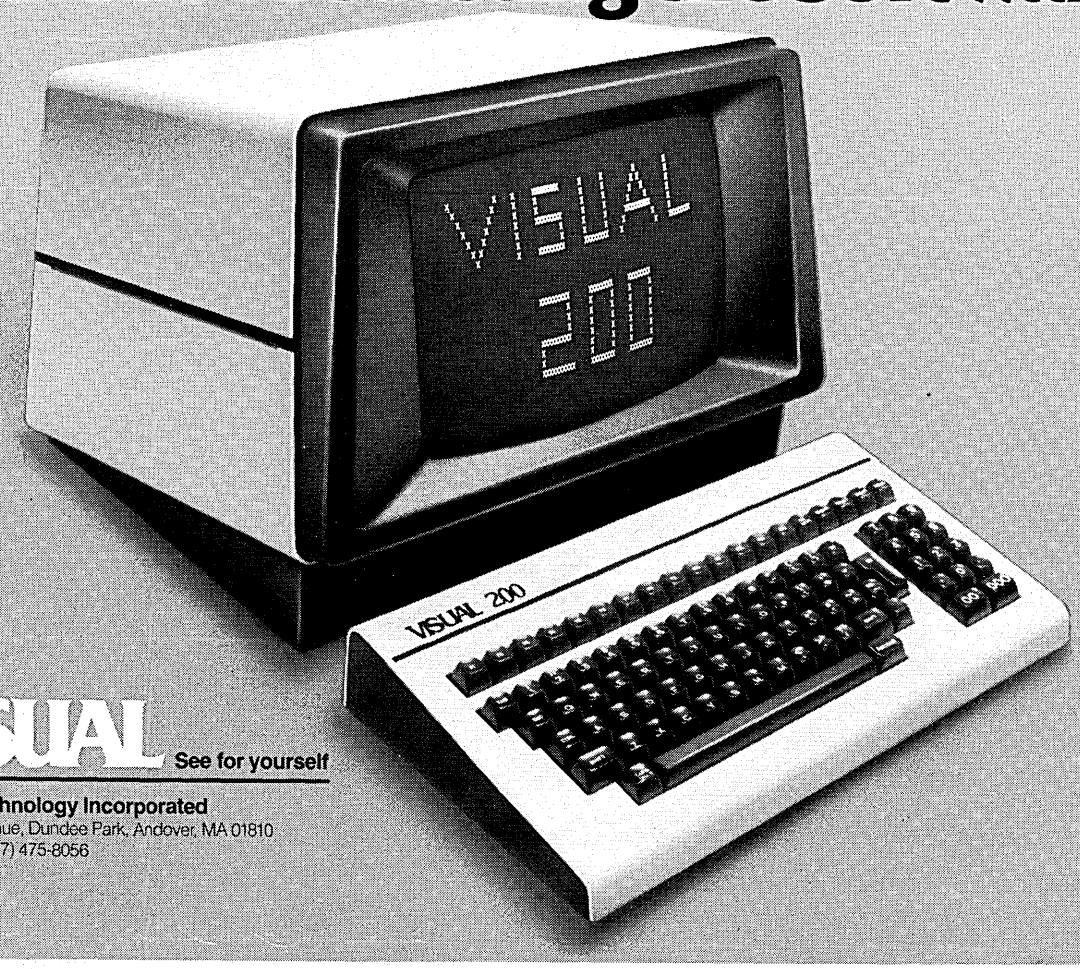
- Detachable Solid State Keyboard
- Smooth Scroll
- Tilt Screen (10° to 15°)
- Large 7 x 9 Dot Matrix Characters
- Others in the Feature Comparison Chart

For a pleasant surprise on quantity prices, call or write us today.

FEATURE COMPARISON CHART

FEATURE	Visual 200	Hazeltine 1500	Hazeltine 1420	Lear Siegler ADM-3A	Digital VT-52	ADDS 520	ADDS Regent 20	ADDS Regent 40
24 x 80 Screen Format	STD	STD	STD	STD	STD	STD	STD	STD
7 x 9 Dot Matrix	STD	STD	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
Background/Foreground	STD	STD	STD	**NO**	**NO**	**NO**	**NO**	STD
Insert/Delete Line	STD	STD	**NO**	**NO**	**NO**	**NO**	**NO**	STD
Insert/Delete Character	STD	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
Clear End Line/Field/Page	STD	STD	**NO**	**NO**	STD	**NO**	**NO**	**NO**
Blink	STD	**NO**	STD	**NO**	**NO**	**NO**	**NO**	STD
Security Mode	STD	**NO**	STD	**NO**	**NO**	**NO**	**NO**	STD
Columnar and Field Tab	STD	**NO**	STD	**NO**	**NO**	**NO**	**NO**	STD
Line Drawing	STD	**NO**	**NO**	**NO**	STD	**NO**	**NO**	STD
Upper/Lower Case	STD	STD	STD	**OPT**	STD	**NO**	STD	STD
Numeric Pad	STD	STD	STD	**OPT**	STD	**NO**	**NO**	STD
Composite Video	STD	**NO**	**NO**	**NO**	**NO**	STD	**NO**	**NO**
Current Loop	STD	STD	**NO**	**OPT**	**OPT**	STD	STD	STD
Serial Copy Port	STD	STD	**OPT**	STD	**OPT**	**NO**	STD	STD
Hold Screen	STD	**NO**	**NO**	**NO**	STD	**NO**	**NO**	**NO**
Detachable Keyboard	STD	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
Solid State Keyboard	STD	**NO**	**NO**	**NO**	**NO**	**NO**	STD	STD
Typamatic Keys	STD	STD	STD	**NO**	**NO**	**NO**	STD	STD
Cursor Addressing	STD	STD	STD	STD	STD	STD	STD	STD
Read Cursor Address	STD	STD	STD	**NO**	**NO**	**NO**	**NO**	STD
Cursor Control Keys	STD	**NO**	STD	**NO**	STD	**NO**	**NO**	STD
Secondary Channel	STD	**NO**	**NO**	STD	**NO**	STD	**NO**	**NO**
Self Test	STD	**NO**	STD	**NO**	**NO**	**NO**	**NO**	STD
Baud Rate to 19,200	STD	STD	**NO**	STD	**NO**	**NO**	**NO**	**NO**
Smooth Scroll	STD	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
Microprocessor	STD	STD	STD	**NO**	STD	**NO**	STD	STD
Tilt Screen	STD	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
Switchable Emulations	STD	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**

The new VISUAL 200 obsoletes competitive terminals without obsoleting the software.



VISUAL See for yourself

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Telephone (617) 475-8056

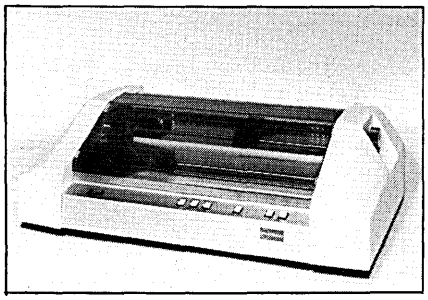
CIRCLE 161 ON READER CARD

tional spacing and justification, sub- and superscripts, reserving space for figures, bidirectional printing, and diagnostics. The Retroscoller retails for $750. SCROLL SYSTEMS, INC., Tucson, Ariz.

FOR DATA CIRCLE 305 ON READER CARD

MATRIX PRINTER

The PM-LC11 serial dot matrix printer can print the full ASCII character set and produce graphic output. The printer features 200cps printing and logic-seeking bidirectional printing. It includes a 600-character buffer (2,000 characters optionally) and can accept parallel data or serial data through either an RS232 or current loop interface. External operator controls include power on/off, on/off line, vertical alignment, feed, top-of-form, and form feed. The printer, from Plessey Peripheral Systems, also offers variable print densities (10cpi, 12cpi, or 13.3cpi) and eight or six lines per inch vertical spacing. In its densest printing mode, the PM-LC11 can print 176 characters per line; the unit is also capable of underlining and printing double-width characters. With a parallel interface, a single PM-LC11 sells for $2,307; oem discounts are offered. PLESSEY PERIPHERAL SYSTEMS, Irvine, Calif.



FOR DATA CIRCLE 302 ON READER CARD

DISPLAY TERMINALS

Perkin-Elmer's Terminal Div. now offers two additional members to its Bantam family of crts: the models 550S and 550E. The 550S is a block mode editing display terminal, with three operating modes optimized for conversational time-sharing, transaction processing, and text manipulation or software development. It can optionally be equipped with a second page of scrolling memory, allowing the operator to scroll through 48 lines of 80 characters. In transaction processing applications, the second page can store a form that will be called up as the operator tabs off the first page. Its keyboard includes 83 keys, with a multifunction numeric pad and four program functions keys (eight functions using the shift key). An ASCII serial printer port is standard. The $1,189 model 550S features various character display attributes and five transmission types.

The 550E, listing at $1,016, is a "glass teletypewriter" targeted at commercial applications. It has a dedicated keypad for numeric entry and cursor control. Both the 550S and 550E are subject to quantity discounts, and both are scheduled for availability this calendar quarter. PERKIN-ELMER CORP., Terminals Div., Flanders, N.J.

FOR DATA CIRCLE 318 ON READER CARD

TERMINAL

Datamedia's DT80/3 offers a wide variety of keyboard-selectable features, ranging from 80-column or 132-column operation to emulating (as a subset of its features) any one of four popular terminals: the Lear Siegler ADM 3A, ADDS Regent 25, Hazeltine 1420, or Datamedia's 1521A. The user can select operating characteristics from the keyboard by entering setup mode. Operating options can be committed to nonvolatile memory or set up as temporary changes. The terminal can also operate as a line monitor—in transparent mode—ignoring commands, controls, and escape sequences, simply displaying data as received.

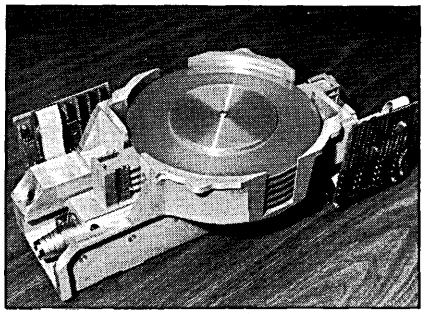
The operator can select data transmission rates ranging from 50bps to 9600bps. Normal or reverse screen video, character length, parity, cursor type (block, underline, blink, or nonblink), and other

HARDWARE SPOTLIGHT

EIGHT-INCH WINCHESTER

In the past two years, we've seen a number of 8-inch Winchester disks enter the market, primarily as faster, higher capacity alternatives to floppy disk drives. Indeed, many are physically and electrically compatible with the floppies they are intended to replace, plugging into the same mountings and power supplies existing in systems designed originally to use floppies.

In Silicon Valley, where the whole thing started, there's a new company named Ontrax that's come up with a novel, elegant head positioner that forms the basis of three drives, including what is probably the highest capacity, high-performance 8-inch drive to date. Using 210mm media, the models 136, 68, and 34 have unformatted capacities of 136MB, 68MB, and 34MB, respectively. Aimed at the oem market, the 136MB drive carries an approximate price of $4,000 per unit, in lots of 250 to 500. That's for the drive with an ANSI-compatible (X3-T9.3/143 Rev. 5) interface; Ontrax also offers a formatter/controller, based on a 16-bit M68000 microprocessor, for an additional price of about $1,500 per unit, in the same oem quantities. This formatter is, in reality, a microcomputer, with plenty of room for value-added circuit boards to plug into its backplane. The user-selected interface is simply another card that fits into the formatter chassis; it can be one (or more) of a selection including SMD, RS232, byte-parallel, data streaming mag tape (for backup), or customer developed.



While the formatter/controller looks good, it is the head positioner that is both unique and exciting. Patents are pending on this positioner, invented by Ontrax vp Dieter Schulze. It consists of nine telescoping cylinders, each capable of traveling a binary-weighted distance. Each segment can be activated independently by passing current through electromagnetic coils embedded in each element, allowing selection of 512 discrete positions. But the drives have 600 cylinders. This apparent discrepancy is reconciled with the same mechanism used for temperature compensation: a final "squeeze coil" stage, consisting of a stiff spring and an electromagnet, located at the end of the positioner arm. Embedded servo information verifies head positioning but is not used for actual positioning. There are no servo heads, and no part of any disk surface is dedicated to servo position sensing and feedback. In the event of accidental destruction of servo information, the disk can be reformatted in the field.

Average access time is 25msec, greatest access time is 55msec, and track-to-track moves take about 6msec. Average rotational latency is 7msec, and the drive's data transfer rate is in excess of 9.2Mbps. The 136MB drive uses two positioners, five platters, and 16 heads; the 68MB drive also has two positioners but only three platters, while the 34MB drive has two platters, four heads, and a single positioner. Dual positioner drives allow independent head positioning, so that each drive appears as two units having half the total drive capacity apiece. Evaluation units will become available in April, with production availability slated for June or July. ONTRAX CORP., Sunnyvale, Calif.

FOR DATA CIRCLE 300 ON READER CARD

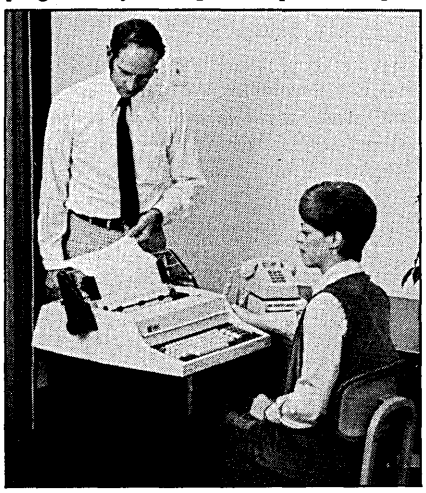
characteristics can also be set by the user. Double width and double height characters are available. Editing features are provided, as is a protected mode for displaying data entry formats. Protected mode formats allow the operator to tab between data entry fields; the computer can selectively erase the operator's input, leaving the form on the screen.

Scrolling can be selected as either smooth or line, and the screen can be partitioned so that a specified block of lines scrolls, while the remainder of the screen remains unaffected. The terminal's keyboard resembles that of a typewriter, with the addition of an 18-key accounting-style keypad. RS232 interfacing is standard, with 20mA current loop optional. Communications are asynchronous in either full- or half-duplex. A single DT80/3 sells for $1,395; oem discounts can bring the price down to $995 in lots of 150 to 249. DATAMEDIA CORP., Pennsauken, N.J.

FOR DATA CIRCLE 316 ON READER CARD

DAISYWHEEL TERMINAL

Anderson Jacobson's AJ 833 Keyboard Printer Terminal uses a daisywheel print mechanism and has a programmable keyboard, nonvolatile memory, bidirectional printing, and an optional 1200bps full duplex operation. Other options include proportional spacing, bold face printing, automatic centering, justification, and underscoring. Nonvolatile memory stores operating parameters (margins, tabs, etc.), program key settings, and pitch and plot

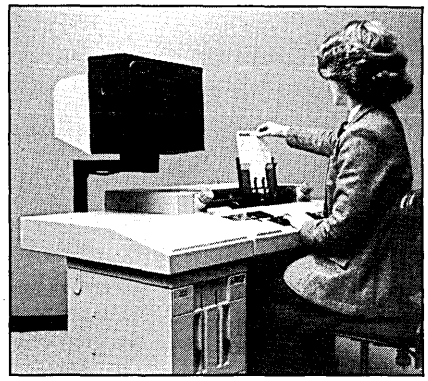


modes. The printer mechanism runs at 45cps and is optimized with look ahead to cut printing time with bidirectional printing, and fast slewing over horizontal and vertical blank space. The 128-character ASCII set is standard; IBM correspondence and EBCD are optionally selectable. Data rates are selectable from 110bps, 150bps, 300bps, or 450bps, and optionally 600bps and 1200bps. The AJ 833's 2KB buffer can be expanded to 32KB. The basic AJ 833 sells for $3,995. ANDERSON JACOBSON, INC., San Jose, Calif.

FOR DATA CIRCLE 317 ON READER CARD

SMALL COMPUTERS

A pair of BASIC-speaking small business computers intended primarily for general accounting applications seem well configured to bring old accounting machine users into the computer age. Both of Olivetti's new machines, the BCS 2030 FV and the BCS 2025, can produce hardcopy ledger records of accounting transactions, as required by the user. Both systems include a 1,920 character video display screen, and diskette storage starting at 2MB (a pair of 1MB floppy drives). Two additional floppy drives can be added to either system, and the BCS 2030 FV can support up to 20MB of



hard disk. The 2030 FV has an integrated 100cps matrix printer with an 18-inch print line. Auxiliary printers and data communications capabilities can be added to either system. Turnkey applications packages are available for both systems. The 2030 FV has a base hardware price of $14,950, while the 2025 base price is $12,950. OLIVETTI CORP., Tarrytown, N.Y.

FOR DATA CIRCLE 315 ON READER CARD

CARD READER

For use with IBM Series/1 minicomputers, Cardamation's CR400/01 80-column card reader can operate at up to 400 cards per minute on a demand basis. The desktop CR400/01 includes a controller and an interface cable that plugs into the mini's backplane. The card reader's controller translates punched data into EBCDIC on the fly, overlapping Series/1 cycle-stealing operations. The CR400/01 complements Cardamation's year-old 300-card-per minute reader previously announced for the Series/1. The new reader sells for $6,950; it can be leased for $273 per month over three years, or $185 per month over five years. CARDAMATION CO., Frazer, Pa.

FOR DATA CIRCLE 307 ON READER CARD

MULTIPLEXOR

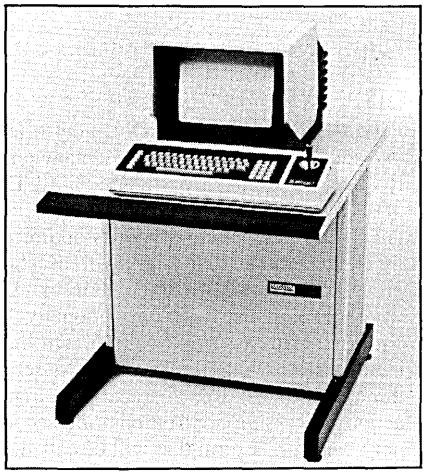
For low-volume communications, the SM/2A two-channel statistical multiplexor allows two terminal devices to share the same modem and communications line. The $825 multiplexor includes error detection and automatic retransmission, compression of blank spaces, independent buffers for both terminal devices, and independent transmission rates for each device. The SM/2A uses an RS232-compatible multiplexor operating asynchronously in full duplex mode. It can operate at 300bps with 103A-type modems or 1200bps with 212A modems over the dial network. Over leased lines, the SM/2A can use 202T modems for 1200bps or 1800bps traffic. Speeds to 4800bps are possible with direct connect or short haul modems. TECHNICAL ANALYSIS CORP., Atlanta, Ga.

FOR DATA CIRCLE 314 ON READER CARD

COLOR GRAPHICS

Megatek's Whizzard 6250 color graphics workstation offers many of the features available in the more sophisticated Whizzard 7250, but at a price intended to appeal to many users who previously couldn't justify the cost of such a system. One of the major applications for the new workstations is expected to be in CAD/CAM applications; sophisticated business graphics is another potential applications area. Megatek prices the system at $17,500, which includes the basic hardware, sans options, and a FORTRAN graphics package for the host (representing $600 of the price tag).

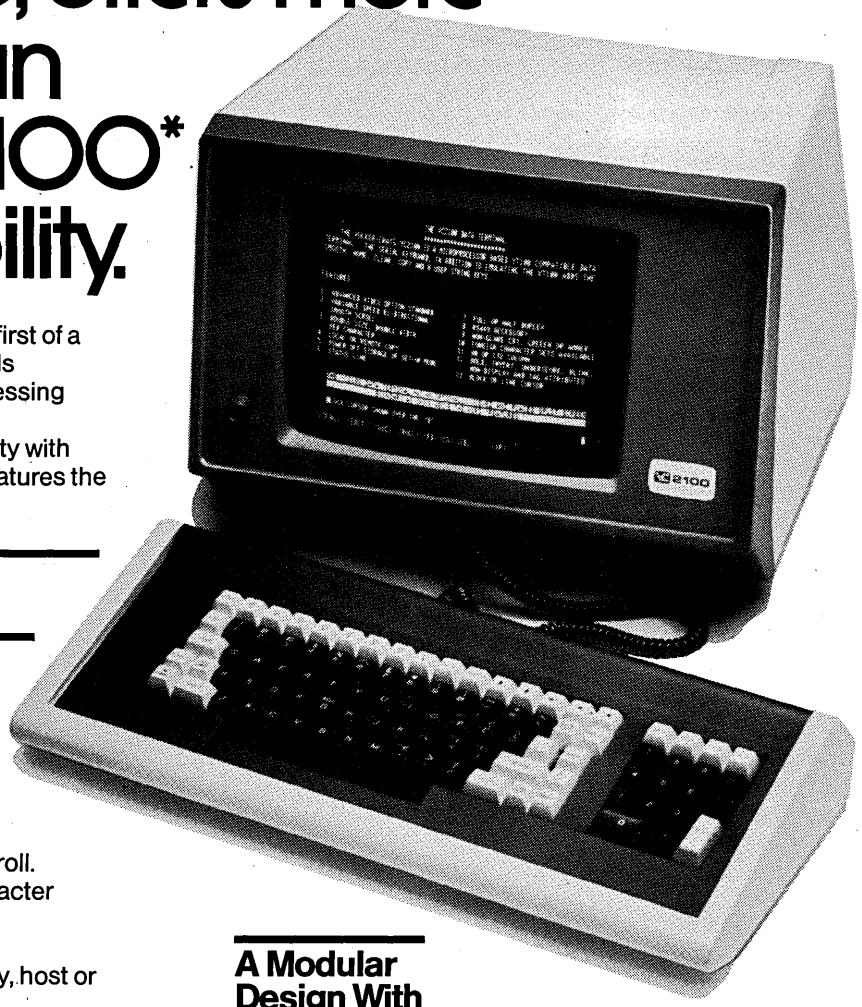
The 6250 consists of a 13-inch color raster monitor, keyboard, joystick, and cabinetry housing graphics processor, vector memory, RS232 serial interface, and room for options. It can display eight colors (no color lookup table is offered). The 6250 is not a standalone graphics system; it's an intelligent display for use with host-based graphics applications. The workstation includes a 32-bit processor for providing local graphics functions, such as pan and zoom, as well as hardware character generation. Options include additional vector memory,



hardcopy output, and a data tablet interface. The 6250's capabilities have been limited intentionally to keep the price within the reach of many cost-conscious customers.

Most Whizzard 7250 basic capabilities are available in the 6250. RS232 communications to 9600bps are standard (an option on the 7250); high-speed parallel I/O is not available, nor are user-definable character sets. Sophisticated 2D and 3D scale, translate, rotate, and clip functions

A new terminal from Volker-Craig, the VC2100, offers more benefits than just DEC VT100* compatability.



The microprocessor-based VC2100 is the first of a new series of Volker-Craig display terminals designed for the more intensive data processing needs of the 1980's.

VC2100 provides plug-in compatability with the DEC VT100 and offers many useable features the DEC terminal does not have.

Advanced Features Standard On the VC2100:

- ☐ Microprocessor-based M6801 (Terminal Controller) and 8048 (Keyboard Controller)
- ☐ Advanced Video Option (AVO) standard, but non-AVO functions supported.
- ☐ Jump/Smooth scroll, key selectable.
- ☐ Bidirectional/variable speed smooth scroll.
- ☐ Double size, double width on a per character basis.
- ☐ User-oriented status line.
- ☐ 8 user string keys, 20 characters per key, host or user loadable.
- ☐ Host savable set-up control.
- ☐ Home and clear keys.
- ☐ Local or remote copy.
- ☐ Full and half duplex.
- ☐ Stored set-up mode parameters.

VC2100 Optional Features:

- ☐ RS449 interface accessory.
- ☐ Current loop accessory.
- ☐ National character sets.
- ☐ National Keyboard layouts.
- ☐ Serial peripheral interface (buffered).
- ☐ Non-glare CRT, green or amber.
- ☐ Second screen page (24 x 132).

A Modular Design With Worldwide Service and Support.

The new Volker-Craig series of terminals will feature the cost efficient principal of a modular printed circuit board design. Keyboards, screens, power supplies, and logic systems are separate, easy-to-replace units. This design reduces end-user service costs, and supports value added OEM modifications.

The new, first in a series, VC2100 combines features and price that surpass DEC VT100 and other emulators.

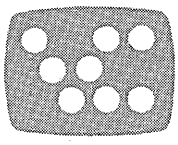
It has superior capabilities that are competently supported worldwide by engineers and trained distributors.

Learn more about the VC2100.

For details about the new VC2100 and about a full range of other terminals tailored to your needs, contact us today.

*Registered trademark of Digital Equipment Corp.

CIRCLE 120 ON READER CARD



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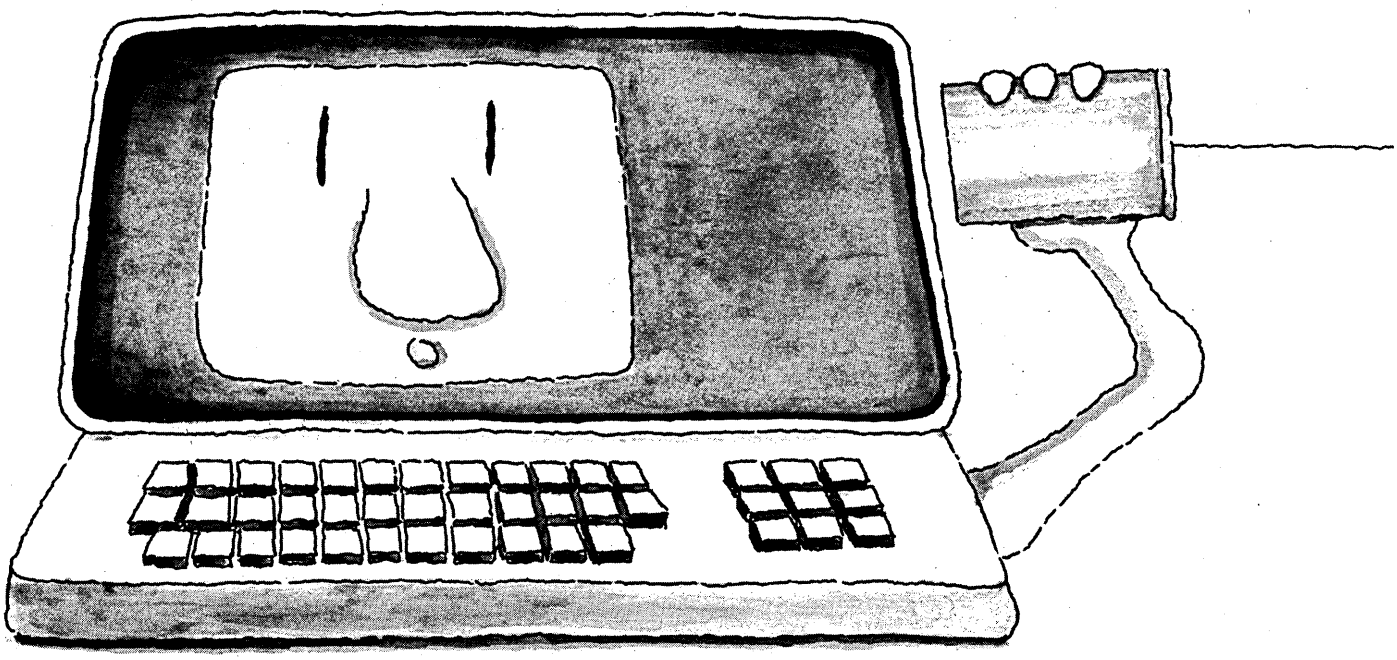
PACKET-SWITCH
TO COMI



A decade ago Bolt Beranek and Newman invented the packet-switch network.

Today we offer you a field-proven line of processors and controllers so advanced they liberate network design.

Now you can ignore speed variations, line disciplines and load levels. For the first time you can create an inexpensive communications network with compatibility among all hosts and terminals.

For any applications requirement.

On any scale.

Listen:

True Adaptive Routing. On a BBN network, lines are never pre-allocated. Packets—even from the same message—may run along different paths. Maximum efficiency is the standard. If a failure should occur, it is automatically sensed and the failed line bypassed. True adaptive routing means no manual intervention is ever required when a failure occurs or when traffic loading changes quickly.

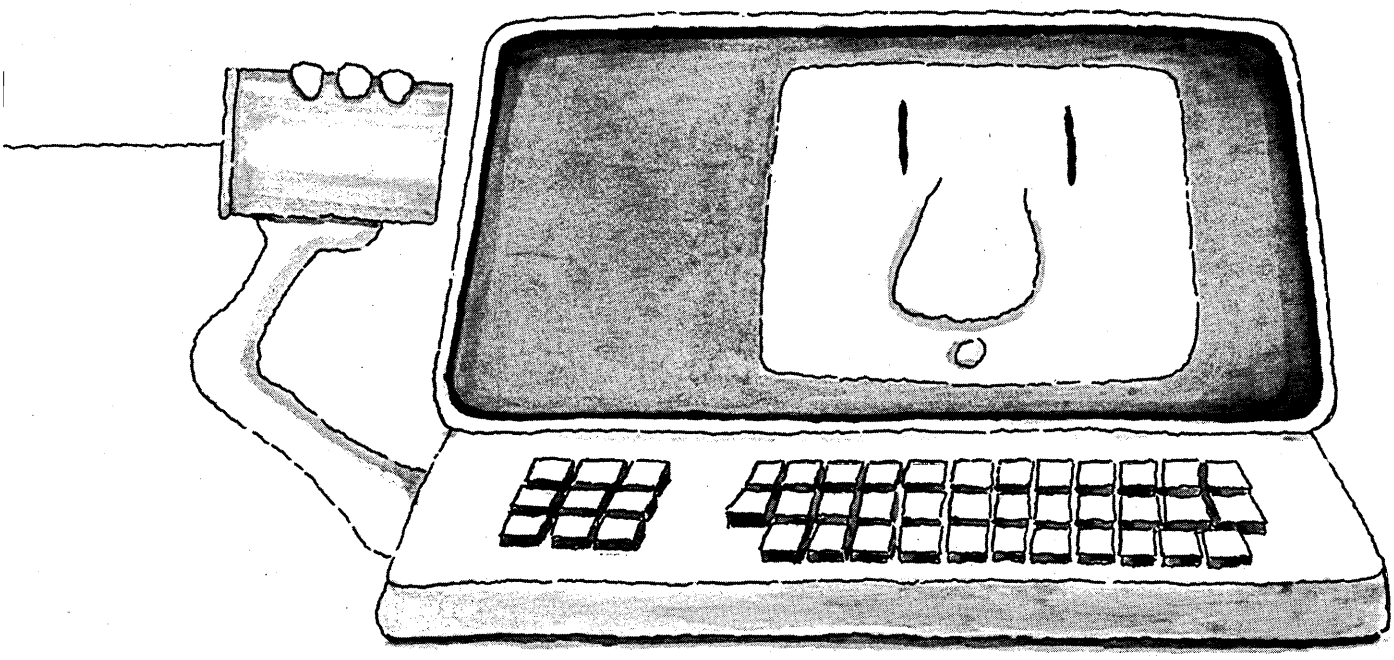
Common Software. With BBN, software is the same at each node. Already in place throughout the network is the interface Message Processor (IMP) program to handle packets from both hosts and other nodes. A program variation, Terminal Interface Processor (TIP), supports terminals as well as hosts.

Maintenance costs are now dramatically reduced. More important to the designer, system configuring couldn't be easier.

Equality among nodes. For flexibility all BBN nodes are created equal. When you add or subtract sites, the change is automatically sensed and accepted throughout the network. No special hardware, software change or system redesign is required.

Superior Message Control. Importantly, BBN networks deliver messages in milli-seconds, not minutes. They do so with superior message control. Routing control. Error control. Status control. Traffic control. It's all automatic—the host node even receives an im-

VAITING FOR IETWORKING)F AGE?



mediate acknowledgment that the message got through.

All lines and nodes are effectively transparent in the system. And overall, channel coordination and control are so sophisticated there is essentially no lost data.

Passive Supervision. Unlike other packet-switch networks, BBN systems can run without an operations center or human supervision. Our passive control philosophy puts most management functions in each packet processor.

On a global scale, monitoring tasks may be assigned to a Network Monitoring Center. It appears to the network as just another host, but with it you can diagnose, problem solve and report on an instantaneous basis.

If you've been waiting for the tools to design powerful and trouble-free communications networks, your day has come.

BBN Computer. It may be a new name in packet-switching to you, but we were there in the beginning.

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Call (617) 491-1065, or write:

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Cambridge, Massachusetts 02138

Yes, I'm interested in BBN's unique approach to packet-switch networking. Please send me more information:

☐ C/30. The first communications processor priced like a mini.

☐ Pluribus. The only high-throughput packet-switch multiprocessor with complete system redundancy.

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Company _____

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City _____ State _____ Zip _____

CIRCLE 121 ON READER CARD

(options on the 7250) are not offered for the 6250. The 6250, like the 7250, offers 4096 by 4096 virtual space, binary zoom with true scaling, hardware translation, and continuous panning through the entire 4096 by 4096 virtual display space. An optional rasterizor can convert displays into raster format for plotting on an electrostatic plotter. MEGATEK CORP., San Diego, Calif.

FOR DATA CIRCLE 304 ON READER CARD

OFFICE NETWORKING

Xerox's Ethernet, known since the mid '70s in various stages of development to the research community, has been pretty much a medium in search of a message. True, Xerox previously announced that its 860 word processing system could attach to the coaxial cable-based Ethernet local network. Also true is that the design philosophy behind Ethernet is that of an open network—one that supports communications between disparate pieces of equipment supplied by any vendor providing the proper interface, and that the Ethernet specs published this past September were jointly developed by Xerox, Digital Equipment, and Intel.

Now, under the umbrella moniker of the Xerox 8000 network system, the company has released an assortment of equipment said to comprise "a business information system that allows users to assemble a completely integrated office network." The system lets users create, process, file, print, and distribute information. The first office workstation for use in the Xerox 8000 network system is the extant 860 information processing system, complemented by three Ethernet-attachable resources: a file server, a communications server, and a print server. All the servers are controlled by a proprietary processor and customized with software and peripherals to fit their intended functions. Devices connected to the same Ethernet communicate at roughly 1MBps; outside communications lines can allow separate Ethernets to exchange information.

File servers act as electronic filing cabinets for workstation users, and as central points within an Ethernet for receiving, holding, and forwarding electronic mail. Initially, three models differing in storage capacity are offered. Each includes processor, floppy disk storage, and a crt terminal; rigid disks with capacities of 10MB, 29MB, or 58MB allow storage of roughly 1,000, 4,500, or 10,000 pages of text, respectively. Additional disk capacities are planned. Files and documents within files are accessed by name. Transferring a document from a workstation's local floppy storage adds its name to the file catalog. Electronic mail is handled in a similar manner: there is a post office catalog listing mailbox names, as well as levels for mail folders and individual pieces of mail. Both mailbox filing and electronic filing are subject to security control, allowing sharing of information or protection through user code names and passwords.

Communications servers come in two types and three models. The Xerox 8000 Network Communications Server provides three functions—it lets remote Xerox 850 and 860 systems exchange electronic mail with 860 systems connected to an Ethernet; it allows interconnection via leased or dialed phone lines of geographically separated Ethernets; and it lets users address file and print servers, attached to any connected Ethernet, by textual names instead of by actual internal network addresses. These three services can be supplied either by a dedicated communications server or as an added function of a file server. In either case, operations are controlled from a crt terminal attached to the server. The communications server supports both half- and full-duplex modems operating at up to 9600bps.

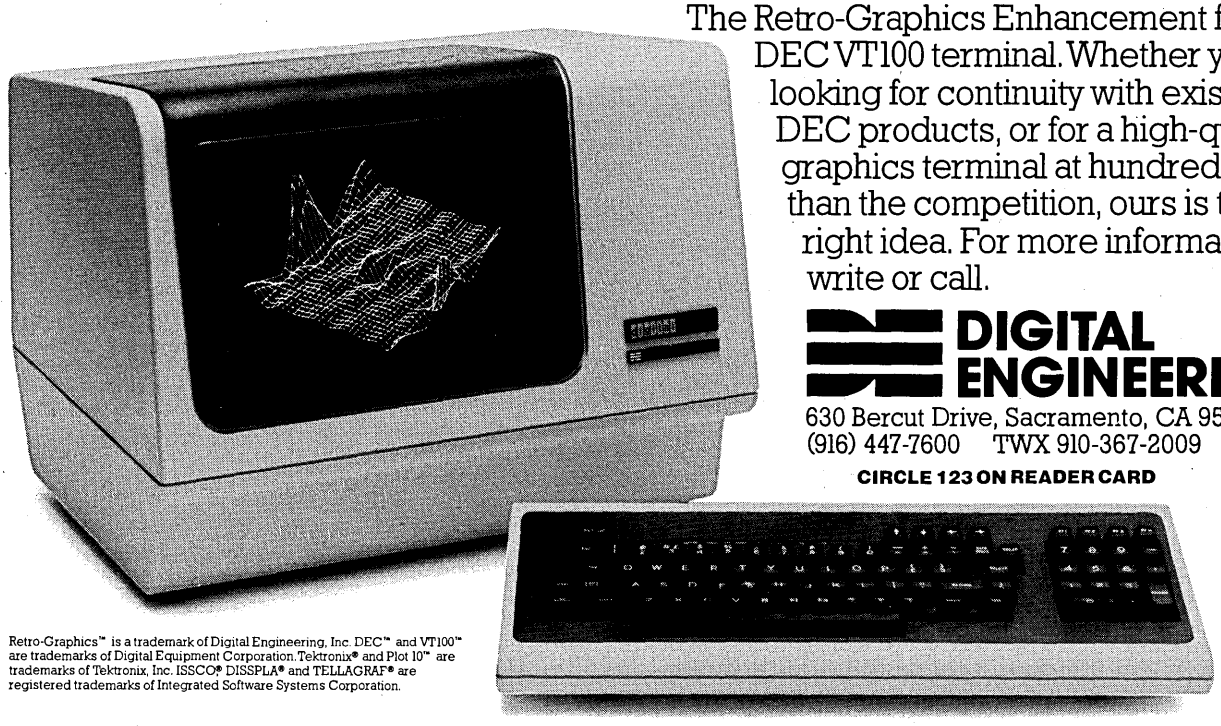
The models 872 and 873 communications servers provide four or eight RS232 ports, respectively, allowing many currently available devices to interface to an Ethernet. Supporting a variety of communications protocols, the 872 and 873 allow connection of remote or local devices that cannot connect directly to an Ethernet. Such

The Idea:

To take the DEC™ VT100™ terminal and turn it into a sophisticated, yet economical graphics terminal.

Will wonders never cease? Not if Digital Engineering has anything to do with it. We're the pioneers in retrofit graphics. And this time we've turned DEC's VT100 alpha-numerics terminal into a full-fledged graphics terminal that features multiple character sizes, dot-dash lines, point plotting, vector drawing and selective erase for quick, easy updating of the graphics display.

We call this transformation The Retro-Graphics™ Enhancement. And while it begins with complete emulation of Tektronix® 4010 Series terminals—and compatibility with most existing graphics software, including Tektronix Plot 10™ and ISSCO's® DISSPLA® and TELLAGRAF®—there is much more to be said for this breakthrough. First, graphics are displayed on a 12″ (diagonal) green-toned screen at 640 x 480 resolution. Refresh raster scan technology insures a bright, easy-to-read display. And all of the features that the DEC VT100 terminal begins with remain intact, including 96 upper/lower case ASCII characters, up to 132 characters per line, numeric and function keypads, detachable keyboard and a wide variety of screen customizing features.



The Retro-Graphics Enhancement for the DEC VT100 terminal. Whether you are looking for continuity with existing DEC products, or for a high-quality graphics terminal at hundreds less than the competition, ours is the right idea. For more information, write or call.

DIGITAL ENGINEERING

630 Bercut Drive, Sacramento, CA 95814
(916) 447-7600 TWX 910-367-2009

CIRCLE 123 ON READER CARD

devices might be workstations, terminals, or host computer systems. Data transmission rates range up to 9600bps in asynchronous, byte synchronous, or bit synchronous modes. Initial protocol offerings include TTY, IBM 2780 RJE, IBM 2770 bisync, IBM 3270 multipoint bisync, and Xerox 850/860 point-to-point.

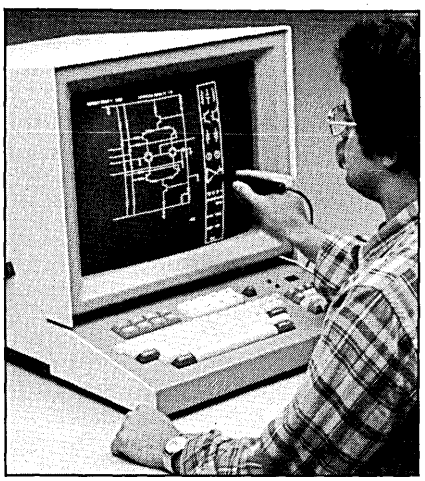
Even in an electronic office, there's a need for hardcopy sooner or later. To meet this requirement, Xerox offers a printer server, consisting of processor, floppy and rigid disk storage, crt terminal, and a laser-imaging printer (a little cousin to the recently announced 5700 electronic printing system). Documents sent via the Ethernet are stored on the print server's disk and printed in the order received. The printer has a resolution of 300 dots per inch, horizontally and vertically, and images are generated from stored digital fonts by a scanning laser. A number of fonts are offered—in 10-point and 12-point with proportional spacing—and multiple fonts may be used on the same page, under program control. Pages can be printed vertically (portrait) or horizontally (landscape) at a rate of 12 pages per minute. Two 250-sheet cassettes feed plain paper into the printer. Output documents can be automatically collated.

Deliveries are to begin this quarter, with the availability of various functions phased over the year. With the exception of the print server, hardware and software are separately priced; there is also a monthly maintenance charge on the software. System unit pricing ranges from $13,995 (including software) for the smallest communications server to $29,995 for a print server package. The same units lease for $605 per month and $1,135 per month, respectively, on a one-year lease. The smallest file server, 10MB, sells for $20,995, including software; while the largest file server, 58MB, is $27,995. The actual Ethernet medium is coaxial cable costing as little as 50 cents per foot; transceivers are $200 apiece and repeaters, the most expensive part of the Ethernet transmission system, sell for $1,285. XEROX CORP., Office Products Div., Dallas, Texas.

FOR DATA CIRCLE 312 ON READER CARD

GRAPHICS TERMINAL

Imlac has developed a self-contained interactive graphics terminal—the Dynagraphic Series II—for oems developing CAD/CAM and other engineering applications. Priced at $8,840 each for quantities of 100, the microprocessor-based terminal has a 19-inch vector refresh display with 2048 by 2048 resolution. The unit's local intelligence provides fast dynamic user interaction such as selective erasure and on-screen "dragging" of complex images. Integral



firmware and optionally available support software simplify integrating the Dynagraphic Series II into larger interactive systems. Interfaces are available to Tektronics 4631 hardcopy units; additionally, the Series II supports Versatec V-80 electrostatic plotters and compatible units. IMLAC CORP., OEM Marketing, Needham, Mass.

FOR DATA CIRCLE 313 ON READER CARD

COMPUTER

At the tail end of 1977, when Datapoint introduced its Attached Resource Computer architecture, the firm said it had no immediate plans to produce yet another top-of-the-

Things are bigger in Texas.

But bigger doesn't necessarily mean better. Take printers, for instance. The 310 Ballistic™ Printer from Lear Siegler doesn't have a price tag nearly as big as the Texas Instruments 820. And though we're not the big guys in the printer field, we can offer you big enough reasons to buy our 310 Ballistic Printer. And that's a matter of no small importance.

A BIG DIFFERENCE.

You can see for yourself. Right down the line. When placed up against the big competition, the 310 Ballistic Printer comes out ahead.

First off, at 180 cps and with space/blank compression, you get higher throughput for higher volume data flow.

You also get a nine-wire head with a 9 high by 7 wide dot matrix. Which gives you true lower case descenders plus underlining.

The 310 Ballistic Printer also has a buffer expandable from 512 to 2048 that allows you to dump a full CRT screen in a split second.

THE 310 BALLISTIC PRINTER FITS RIGHT IN.

Our printer is totally compatible with all Lear Siegler terminals or with any RS-232C interface. It fits anyplace you have a CRT terminal or small business minicomputer system.

Feature	LSI 310	TI 820RO
Speed	180 cps	150 cps
Dot Matrix	9-wire head (9 hi x 7 wide)	7-wire head (7 hi x 9 wide)
Lower Case	Standard, with descenders and underlining	Standard, but no descenders or underlining
Buffer	512 expands to 2048	Fixed 1280
Space/Blank Compression	Yes	No
Interfaces	Serial and parallel	Serial only (parallel not available)
Current Loop	Standard	Optional
Forms Control	14 settings standard	Optional
Elongated character sets	Standard	Optional
Price	Base Price $2045 Expanded buffer 100 Price as shown $2145	Base Price $1995 Options 310 Price as shown $2305

The 310 Ballistic Printer is capable of satisfying low-speed day-to-day requirements and is economical enough to handle those high-speed tab runs, too. With the patented Ballistic printhead and 100% duty cycle, no job is too difficult.

NOW YOU'VE GOT A CHOICE.

With the 310 Ballistic Printer, Lear Siegler brings to computer printers the same high standards that made our Dumb Terminal® video display the standard for an entire product category.

That makes us a "full terminal" supplier now—that means CRTs and printers, too. Texas is no longer the lone star.

We're certain that we can offer you many things our competitors can't. We've listed them here in black and white. We feel the evidence speaks for itself.

So go ahead and choose. Because now you've got a choice.

LEAR SIEGLER 310 BALLISTIC™ PRINTER.

CIRCLE 126 ON READER CARD

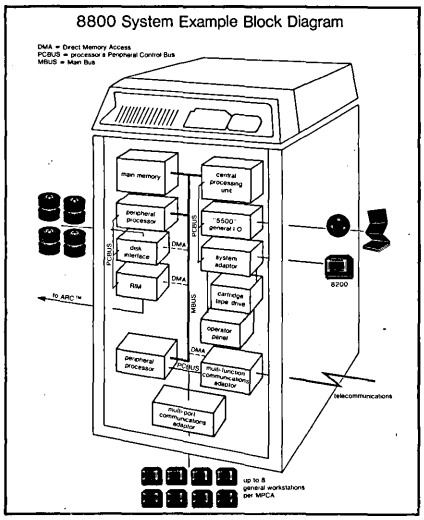
LEAR SIEGLER, INC.
DATA PRODUCTS DIVISION

Lear Siegler, Inc./Data Products Division, 714 North Brookhurst Street, Anaheim, CA.92803, 800/854-3805. In California 714/774-1010. TWX: 910-591-1157. Telex: 65-5444. Regional Sales Offices: • San Francisco 408/263-0506 • Los Angeles 213/454-9941 • Chicago 312/279-5250 • Houston 713/780-2585 • Philadelphia 215/245-1520 • New York 212/594-6762 • Boston 617/423-1510 • Washington, D.C. 301/459-1826 • England (04867) 80666.

line processor. Three years later (a long time in this business), the San Antonio minimaker decided a new large processor was in order, hence, the 8800, the firm's first computer that *doesn't* look like a terminal.

The 8800 can function as a standalone processor, or, within an ARC system, as either an application processor or a file processor. Announced with the 8800 is RMS (Resource Management System), a new operating system that handles resource allocation for up to 24 terminal users. In its initial release, RMS supports programming in COBOL, DATABUS, and assembler; additional language support is planned for future releases. RMS can run on most Datapoint processors (except single-user systems) having at least 64KB of main memory. An ARC system can comprise hosts running RMS and the existing DOS operating system (DOS will continue to be supported).

Maintaining the goal of product line compatibility, the 8800 uses an enhanced version of the 6600 instruction set (the 6600 was the previous top-of-the-line processor from Datapoint). The 8800 actually consists of several processors and additional functional units connected by several bussers. The major units connected via the main bus include the cpu, memory (from 256KB to 1MB, in 128KB increments), and peripheral processors. Disk interfaces and RIM boxes (the interface to an ARC system's coaxial interprocessor bus) connect to peripheral processors through the processor's peripheral control bus; DMA access to the main bus also provides for RIM and disk interface communications with the system. The cpu itself connects to a peripheral control bus that provides a link to a "5500" standard general (for slower devices, such as printers and mag tape) I/O controller and a system adaptor. Multiport communications adaptors handle workstation interfacing, and multifunction telecommunications adaptors provide access to the system.



The 8800 comes in three initial configurations: standalone (8860), file processor within ARC (8840), and applications processor within ARC (8830). The 8860, with 256KB of main memory, system console, peripheral processor, multiport communications adaptor, disk interface, and 202MB of disk, sells for $88,000. An 8840 data resource processor, with 256KB, system console, peripheral processor, disk interface, RIM, and 202MB of disk, sells for $87,500. The application processor, model 8830, with 256KB, system console, peripheral processor, multiport adaptor, and RIM, sells for $42,500. Additional 128KB memory increments sell for $3,250. RMS software is included with the purchase of a processor; otherwise, each software item has a one-time license fee of $1,500. Lease and rental plans are offered. DATAPOINT CORP., San Antonio, Texas.

FOR DATA CIRCLE 320 ON READER CARD

CRT TERMINAL

Southwest Data Systems' R725 weds an ADDS Regent 25 chassis with a Hall Effect keyboard from Honeywell's Micro Switch Div. to provide an upper and lower case terminal for Basic Four computer users. The terminal has editing capabilities, screen formatting, and descenders on lower case letters. An auxiliary printer interface is standard. The R725 can also function as a

HEY VAX, WATCH YOUR LANGUAGE.

DEC VAX 11/780 and 11/750 systems hardware, running VMS, does everything right. But the software should use better language.

They should use INFO.

INFO IS THE HIGH PRODUCTIVITY LANGUAGE.

It is already in use at more than 300 installations. Many of the FORTUNE 500 use INFO extensively and many other companies do all their data processing in INFO.

WHY INFO?

INFO is a true productivity language.

Development time is 4 to 10 times as fast as COBOL. An application that takes one week in INFO would take four or more weeks in COBOL, with access to large data files through your host's multi-key ISAM.

INFO IS COMPLETE.

- Use it for Relational Data Base Management.
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- Report Generation.
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INFO IS FRIENDLY.

It not only improves programmer productivity, it improves the efficiency and accuracy of users.

Managers and Secretaries agree, INFO's plain English commands are easiest to use.

INFO IS FOR IBM, PRIME AND HONEYWELL L/6 SYSTEMS, TOO.

INFO is inexpensive.

Complete and installed, INFO costs about one-fifth what systems with less capability cost:

$10,000 for VAX and Prime Systems.

$15,000 for IBM 4300, 303X and 370 installations, with VM/CMS.

If you want your computer to use better language better get the details on INFO. For a copy of our new INFO brochure, write, send coupon or call (617) 237-4156 (TWX 710 383 7529).

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CIRCLE 128 ON READER CARD

I WANT TO USE BETTER LANGUAGE

Please send INFO info to:

Name: _____ Title: ____

Address: _____

City: _____ State: _____ Zip: _____

Can't wait. Call me at: _____

HARDWARE

line monitor, displaying control codes so that programmers can more easily debug screen formatting operations. The terminal has a 12-inch screen, formatted as 24 lines of 80 characters. RS232 interfacing is standard; 20mA current loop interfacing is available as an option. Switch-selectable data rates range from 110bps to 9600bps. The R725 retails for $1,875. SOUTHWEST DATA SYSTEMS INC., Burbank, Calif.

FOR DATA CIRCLE 311 ON READER CARD

TERMINAL

The CTi 1000 is a display terminal that features compatibility with both the IBM 2740 and 3767 keyboard printers. Built by Custom Terminals, Inc., the CTi 1000 can provide hardcopy as needed with the addition of one or two slave printers; the printers can also be directly addressable by the host cpu.

The microprocessor-based terminal has a 12-inch display screen, organized as 23 lines of 80 characters, plus an additional 24th status line. Screen formats can be down-line loaded into the CTi 1000 or stored locally in the terminal's nonvolatile memory. The terminal has an 81-key typewriter-style keyboard which includes a 10-key numeric pad and keys for full cursor movement, programmable functions, and upper and lower case characters. The terminal has a 440-character transmit buffer and an 1,840-character receive buffer. Communications speeds range from 110bps to 1800bps. In its standard configuration, a single CTi 1000 sells for $2,350. CUSTOM TERMINALS, INC., Raleigh, N.C.

FOR DATA CIRCLE 310 ON READER CARD

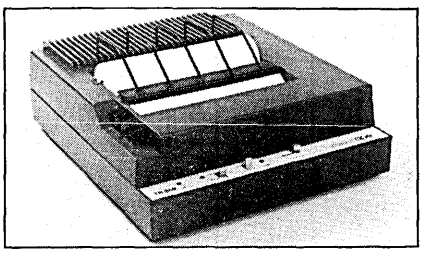
AUTO DIALER

Terminal equipment can perform pulse dialing over the switched telephone network using the model P-701 auto dialing interface from Prentice Corp. FCC-registered for direct connection to the dial network, the P-701 allows a cpu or intelligent terminal to establish a communications link without a telephone or additional external equipment. Plug-compatible with any of the vendor's dial modems, the P-701 operates in two modes: normal mode, and bypass mode where it is electrically removed from the circuit for modem testing. Prentice says the P-701 is not a replacement for Bell's 801 auto dialer, but it can be employed in similar applications using one port instead of two. Its market is expected to be in networks using intelligent terminals where auto dialing form the remote site is desired. The P-701 auto dialing interface sells for $175. PRENTICE CORP., Sunnyvale, Calif.

FOR DATA CIRCLE 319 ON READER CARD

THERMAL PRINTER/PLOTTER

Manufactured by Olivetti and distributed in the U.S. by Printer Systems Corp., the



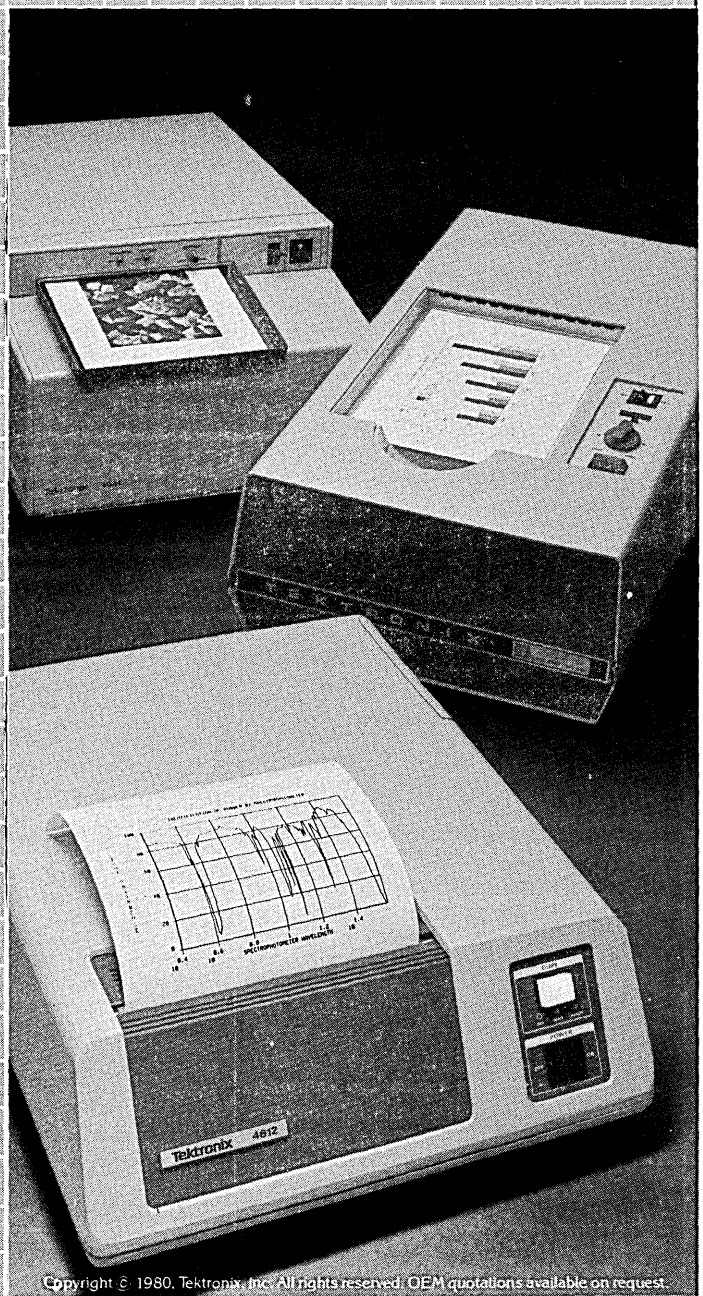
TH 240 is an 80-column thermal printer capable of operating at up to 240 lpm. The printer is offered in two configurations: alphanumeric-only or alphanumeric plus plotting. In plotting mode, the printer produces 70 dots per inch. It comes with either an RS232 or current loop interface. A 756-character buffer is provided to accommodate burst data rates in excess of 1200bps. The basic alphanumeric version of the TH240 sells for $1,395, while the alphanumeric plus plotting version goes for $1,595, with a one-year warranty. PRINTER SYSTEMS CORP., Gaithersburg, Md.

FOR DATA CIRCLE 303 ON READER CARD

COLOR MONITOR

Aydin Controls' model 8040 is a 19-inch high-resolution color monitor. Using an in-line gun and .31mm black matrix shadow mask, the monitor can achieve misconvergence of less than .75mm (at the center of the screen) without using any dynamic con-

Permanent copies. For pennies a page. Introducing the most practical copier of all!



The new Tektronix 4612 video & raster scan hard copier.

For a low purchase price and just pennies a page, the 4612 can copy the graphics and alphanumerics on your raster scan or video display, at the press of a button. Tektronix' unique electrostatic technology produces sharp, high contrast, permanent images. With easy loading of paper and toner. And reliability in the best Tektronix tradition.

The copying process is liquid-free. Our dry powder toner is clean and convenient, and makes electrostatic images of the highest quality. Copies last indefinitely, and are as easy to write on as bond paper.

The 4612 expands the Tektronix family of video copy devices... including the toner-free 4632 for high resolution and gray shading. And the 4634, whose critically sharp photographic quality and extensive gray scale shading is the most economical approach ever to continuous-tone imaging applications.

The Tektronix video copier family is compatible with any RS-170 video signal, and with many others as well. So for the most practical approach to putting your displays on paper, contact your Tektronix sales engineer or call, toll-free, 1-800-547-1512 (in Oregon, 644-9051 collect).

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THE GRAPHICS STANDARD

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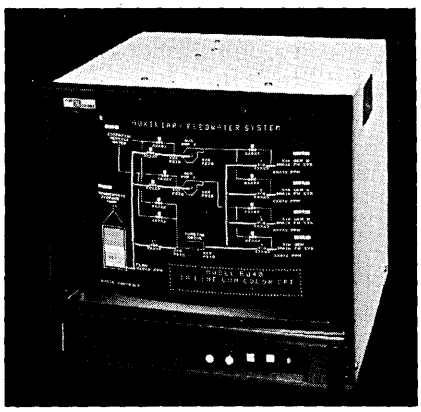
vergence circuitry. The monitor's video amplifier operates at 25MHz, allowing resolution of 900 pixels per line; the 8040 provides a retrace time of less than 9usec,



operating at horizontal line rates from 15.5KHz to 23.5KHz. Neutral density filters, long-persistence phosphor crts, and rack mounting equipment are optional. Single units sell for $2,820. AYDIN CONTROLS, Fort Washington, Pa.

FOR DATA CIRCLE 306 ON READER CARD

COMPUTER FAMILY

Honeywell made its move into the 32-bit "supermini" with the introduction of its DPS 6 family of small computers, effectively superseding its Level 6 product line. The DPS 6 line is comprised of 10 models—eight 16-bit machines and two 32-bitters—with systems priced from under $30,000 to more than $500,000, and performance ranging from about twice that of a Level 6 model 23 to approximately three times that of the top of the Level 6 line (model 57). The smallest member of the new DPS 6 family, the 6/30, is said to have roughly twice the performance of a comparably configured Level 6 model 23, at a price about 10% to 20% higher, and that comparison is said to hold across the line. While the DPS 6 line will likely appeal to new customers, the Level 6 will continue to be marketed, primarily to existing customers with systems already designed around the mature line.

Compatible with the Level 6, the DPS 6 family runs under the GCOS 6 operating system. Announced concurrently with the DPS 6 were a new word processing facility for both Level 6 and DPS 6, two communicating shared resource systems allowing the DPS 6 to address the office automation market, and GCOS 6 Mod 400 Release 2.1 for the DPS 6. The DPS 6 also can function in a network under Honeywell's recently announced Distributed Systems Architecture (DSA).

Compatibility is important, but Honeywell seems most excited about its ability to field upgrade larger 16-bit DPS 6 systems to 32-bit systems. The DPS 6 line breaks into three obvious segments: the smaller, 16-bit models 6/30, 6/32, 6/34, and 6/38, which cannot be upgraded; the larger 16-bit models 6/48, 6/54, 6/74, and 6/76, which can be upgraded either to larger 16-bit machines within their class or to full-blown 32-bit systems; and the 32-bit machines themselves, the models 6/92 and 6/96. There is actually an 11th machine in the series, the 6/94, which cannot be purchased per se but results from upgrading a 16-bit 6/76 into a 32-bit processor.

The four smaller 16-bit machines—in typical configurations priced from $28,800 to $75,000—support from 128KB to 256KB of memory (512KB max in the first quarter of next year), two to eight communications/workstation ports, a single disk drive, and up to two Multiple Device Controllers (MDC) for printers, card readers, and diskette drives. The 6/38 configuration rules are an exception: that processor can support from 256KB to 768KB of memory,

two to 24 ports, two to four disks, and from two to six MDCs, all attributable to additional slots available on its bus. None of these four machines handle mag tape units.

The four upgradable machines can be had with memories ranging from 256KB to 2MB, two to 64 ports, two to eight disks, up to four mag tape units, two to six MDCs, and an optional Scientific Instruction Processor (SIP). Prices for typical configurations of the midrange systems run from $72,200 to $175,000.

The high-end 32-bit systems start off with at least 1MB of memory and go up to a maximum of 16MB. SIPs are standard equipment. These machines can have two to 112 ports, two to 12 disks, up to four tape drives, and two to six MDCs. Pricing ranges from $300,000 to $600,000.

The instruction set of the 16-bit members of the DPS 6 family is identical to that of the Level 6 model 47. This instruction set, in turn, is a subset of that provided on the 32-bit machines. Additional instructions available on the DPS 6/92, 6/94, and 6/96, particularly those for 32-bit data handling, further increase execution speed. FORTRAN and COBOL programs are said to execute at about three times the speed of the fastest Level 6 machine, yet the 32-bit DPS systems are said to be in the same general price range. Honeywell prices its software separately, with GCOS executives (available in four configurations) carrying initial license fees ranging from $2,090 to $5,610, and annual support charges running from $633 to $2,500 a year. COBOL, FORTRAN, BASIC, RPG, and assembler are offered.

Hardware deliveries are slated to commence this quarter for the 16-bit DPS 6 systems, with the 32-bit systems coming in the fourth quarter. HONEYWELL INFORMATION SYSTEMS, Waltham, Mass.

FOR DATA CIRCLE 309 ON READER CARD

"We're looking for cost reductions. Can Junior Achievement build a nuclear submarine?"

CARTOON BY CHUCK VADUN

THE LATEST ADVANCE IN VIDEO GRAPHIC HARD COPY RECORDING FROM HONEYWELL

VGR 4000, Honeywell's new and advanced video graphic recorder, provides fast, crisp, 8½ x 11" hard copies on dry silver paper from most CRT's and other video sources.

White-on-black or black-on-white images are as simple as flipping a switch. With options, images can be produced having up to 16 shades of grey or even more.

An innovative processing technique eliminates the need for large heated platens. This allows the recorder to run cool, consuming very little energy.

The VGR 4000 is the only recorder on the market available with a self-contained test-pattern generator providing a choice of formats for proper copy verification.

Rugged, yet cleanly designed for easy operation, the compact VGR 4000 can be used on a desk top or rack-mounted, taking up only 7" of front panel space.

Honeywell's VGR 4000 is the latest advance in video-input hard-copy reproduction systems, built by the people with the most fiber-optic CRT recorder experience in the field.

To get the whole story on the VGR 4000 and how it can meet your needs, call Durke Johnson at 303/773-4700. Or write Honeywell Test Instruments Division, Box 5227, Denver, Colorado 80217.

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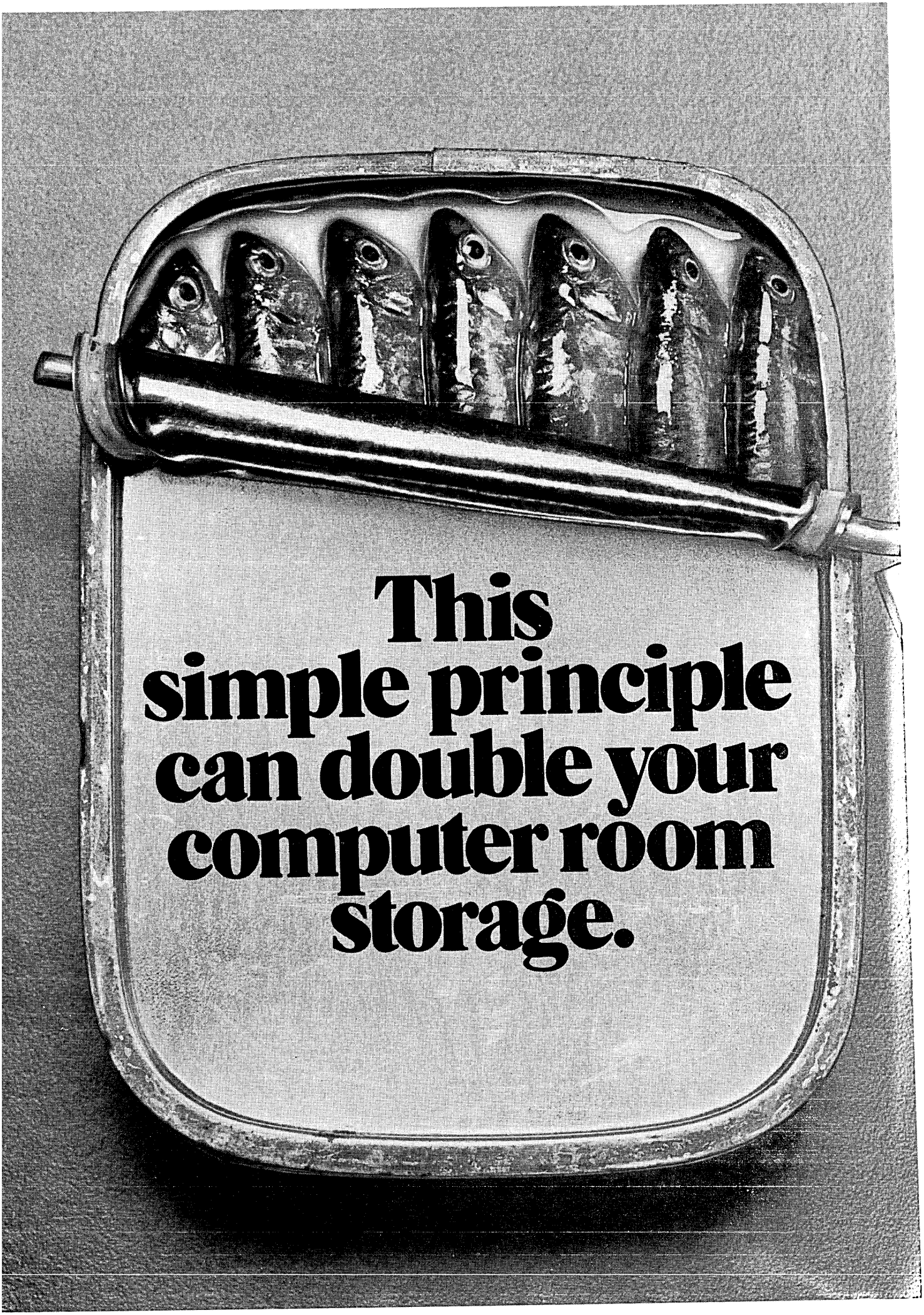
CIRCLE 130 ON READER CARD

HON-6-631


This
simple principle
can double your
computer room
storage.

Introducing MAX

The new Magic Aisle® X high density storage system doubles capacity and saves space.

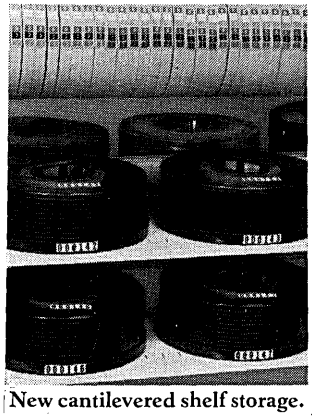
Have you ever seen sardines packed loosely in a can? Of course not. Because space is used most efficiently when they're lined up neatly and orderly, fin-to-fin.

The same principle applies to your computer room. If you're using stationary cabinetry or open shelf storage, you're wasting a lot of valuable floor space.

That's why we're introducing "MAX." The new Magic Aisle X series from Acme Visible is the multimedia storage system designed specifically to meet the needs of the computer center — to save you space, time and money.

Maximum space savings.

Now you can let MAX compact mobile shelving double your storage capacity. Units slide together eliminating unnecessary aisle space.

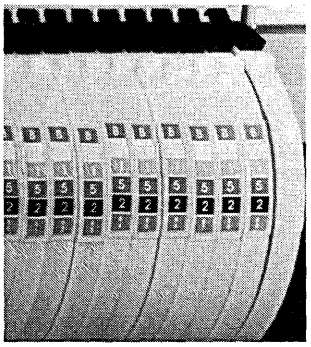


New cantilevered shelf storage.

With adjustable levels of storage on each side, MAX units make maximum use of every cubic foot.

Maximum time savings.

MAX gives you fast access to whatever information you need. At a push of a button or turn of a handle, these track-mounted units slide open to allow entry at the proper location. New cantilevered shelving allows fast scanning over an entire storage bank.



Faster filing with KromaKode.

Add new KromaKode® color-coded tape reel labels to the system and filing time can be cut up to 40%. Eliminate misfiles, too.

Maximum flexibility.

MAX provides storage accessories specially adapted to many different types of media. For tape reels. Disk packs. Data binders, printouts and more.

Maximum ease of installation.

Why risk excessive downtime with units that require tracks built *into* your floors?

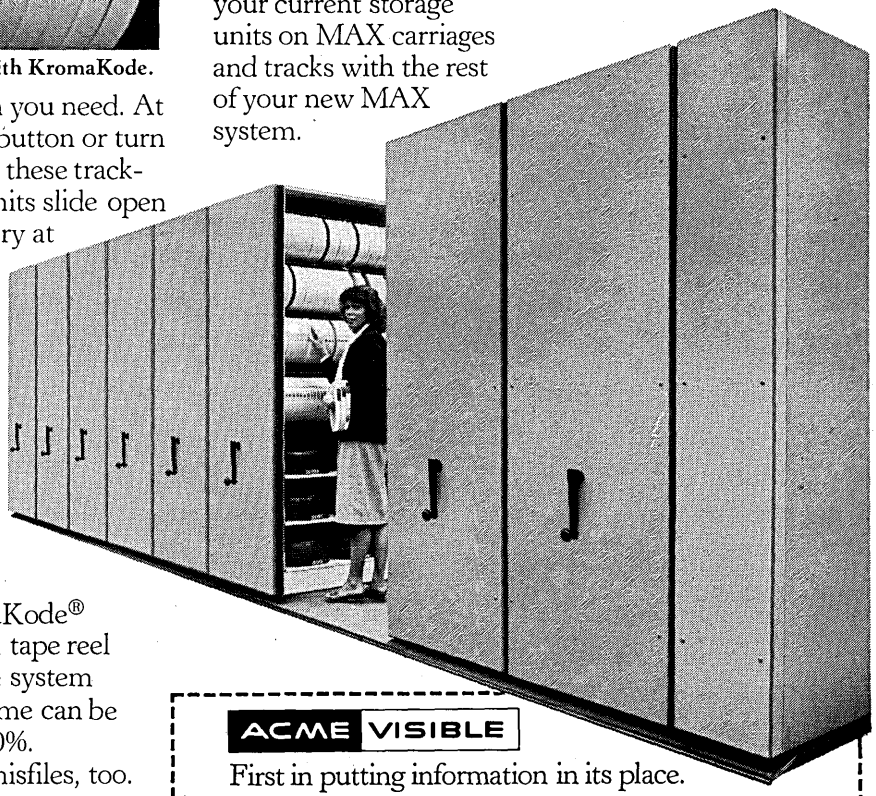
MAX utilizes new modular track and deck that mount directly on current raised flooring. Installation is fast and economical.

Your existing stationary shelving can also be incorporated into the MAX system. Simply put your current storage units on MAX carriages and tracks with the rest of your new MAX system.

Another new idea from Acme Visible.

Magic Aisle X series is just one of the many new systems Acme Visible has designed to meet the needs of information management.

Find out what else is new. Call us collect at 804-823-4171 or return the coupon below.



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CIRCLE 131 ON READER CARD

SOFTWARE AND SERVICES

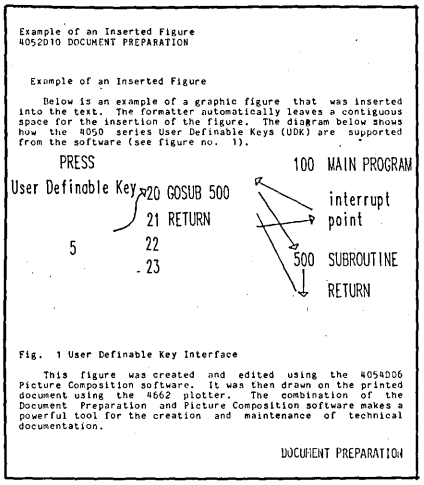
UPDATES

The American National Standards Institute announced in mid-December that its Computer and Information Processing Committee (X3) has approved the BASIC Information Bulletin Number 1 prepared by X3's technical committee (X3J2). The bulletin interprets and clarifies the ANSI X3.60-1978 standard for a minimal BASIC. Copies go for $3, and can be ordered from BIB #1, X3 Secretariat, CBEMA, 1828 L St., Suite 1200, Washington, DC 20036. A check and mailing label must accompany each order.

Mea culpa. A. Richard Miller, of Miller Microcomputer Services, one of the sources for microcomputer implementations of FORTH mentioned in our November Software & Services Spotlight, tells us we erred when we said, "TRS-80 users may be out in the cold unless they've invested in CP/M." He informs us that his company also offers versions of FORTH for the TRS-80. "CP/M versions of FORTH have necessarily forfeited some of the more powerful advantages of the FORTH environment -- its internal operating system," Miller writes, adding, "and happily, one of the stronger versions of FORTH has been available for the TRS-80 Model I since early 1979." Standard versions are offered for systems using cassette, diskette, or Corvus 10MB hard disk as backing store. Prices begin at under $100, and versions run in as little as 16KB. A Model III version should be available now. Miller's firm operates from 61 Lake Shore Rd., Natick, MA 01760.

DESKTOP SOFTWARE

Seven new programs—designed for the problem-solver, as opposed to the computer professional—have been added to the Plot 50 Software Library for use on Tektronix 4050 series desktop computers. The applications range from digitizing to document preparation, with statistics (two volumes), project management, picture composition,



and preparation of overhead projector transparencies rounding out the catalog. Most of the new programs use menus to simplify the user interface; common file formats for both raw data and graphics allow data to be shared between programs.

Interactive Digitizing ($1,500) runs on 4052 and 4054 computers outfitted with the 4907 File Manager (floppy disk). Using the 4956 graphic tablet as an input device, the user can digitize images, including maps, photos, drawings, and strip charts, and create a graphic database. In addition to preparing an input file for subsequent programs, Interactive Digitizing can calculate area, perimeter, and line lengths.

FOR DATA CIRCLE 325 ON READER CARD

The two new statistics packages bring to three the total of disk-based stat packs in the Plot 50 library. Statistics: Analysis of Variance and Statistics: Multiple Linear Regression ($800 apiece) run on the entire 4050 series (including the first member of that family, the 4051). The packages include graphing routines to produce box-and-whisker plots, scatter plots, and others. Analysis of Variance offers one-way, two-way, and three-way classification of data; Multiple Linear Regression handles multiple regression, stepwise multiple regression, weighted regression, and polynomial regression.

FOR DATA CIRCLE 326 ON READER CARD

Project Management, again for the entire 4050 family, uses PERT and Critical Path Method models. Project Management helps schedule and track projects, determine interdependencies between tasks within a project, and to evaluate the effect of project changes. The $4,000 package is a predictive model for analyzing changes, delays, and other conditions, with the goal of minimizing conflicts and costs within a project.

Picture Composition, for the 4054 with Dynamic Graphics Option, lets even the neophyte develop working drawings. The $1,500 package helps users with problems pertaining to design, document preparation, and engineering working drawings. Dynamic Graphics allows user interaction with graphics elements on the screen: objects can be displayed, moved about, and removed, without affecting the remainder of the display. The Picture Composition package can interchange graphics data with other packages using the Graphic Model Exchange standard file format for pictorial information. The package also supports the 4956 Graphics Tablet.

FOR DATA CIRCLE 327 ON READER CARD

Think some overhead projector slides will make your next presentation more effective? Want to use the most current data (and avoid waiting for the art department)? The Presentation Aids package (which even comes with preframed transparency film and other materials) provides the tools for creating bar charts, line graphs, text, and pie charts. The package sells for $850.

FOR DATA CIRCLE 328 ON READER CARD

Scientists and engineers who must prepare periodic technical reports can use the Document Preparation interactive text formatting package ($800) on 4052 and 4054 systems. This package is command, not menu, driven, and includes a text editor for creating and modifying the textual part of a report. Producing hardcopy is the ultimate goal, and the package addresses this requirement by providing the means to format and generate reports; text and graphics are easily combined in reports. Additional features include the ability to produce two-sided documents, automatic page numbering, and automatic generation of a table of

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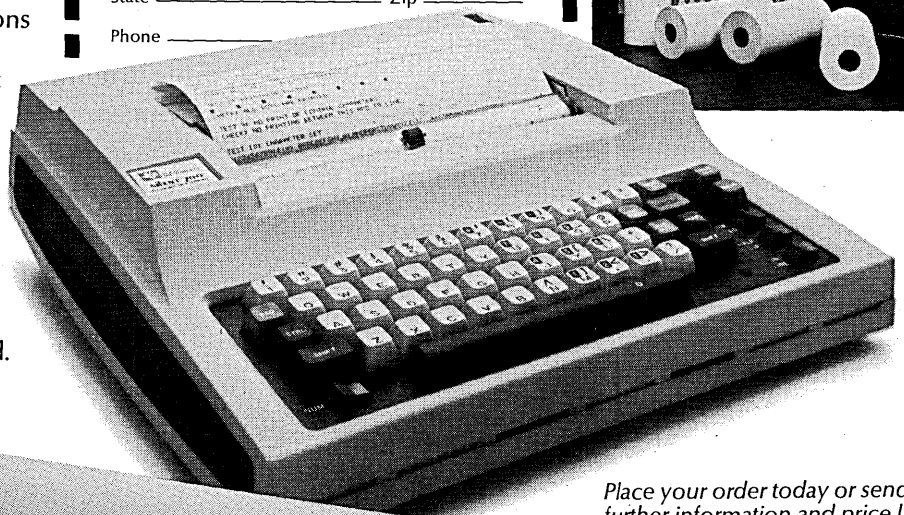

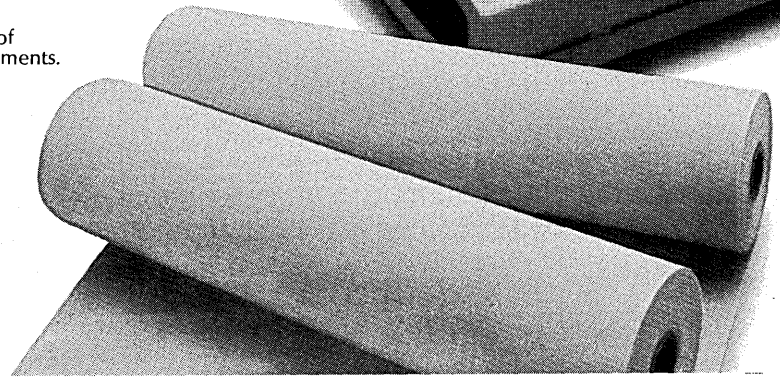

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CIRCLE 69 ON READER CARD

THE LEADING EDGE

#1 in a series of reports on new technology from Xerox

About a year ago, Xerox introduced the Ethernet network—a pioneering new development that makes it possible to link different office machines into a single network that's reliable, flexible and easily expandable.

The following are some notes explaining the technological underpinnings of this development. They are contributed by Xerox research scientist David Boggs.

The Ethernet system was designed to meet several rather ambitious objectives.

First, it had to allow many users within a given organization to access the same data. Next, it had to allow the organization the economies that come from resource sharing; that is, if several people could share the same information processing equipment, it would cut down on the amount and expense of hardware needed. In addition, the resulting network had to be flexible; users had to be able to change components easily so the network could grow smoothly as new capability was needed. Finally, it had to have maximum reliability—a system based on the notion of shared information would look pretty silly if users couldn't get at the information because the network was broken.

Collision Detection

The Ethernet network uses a coaxial cable to connect various pieces of information equipment. Information travels over the cable in packets which are sent from one machine to another.

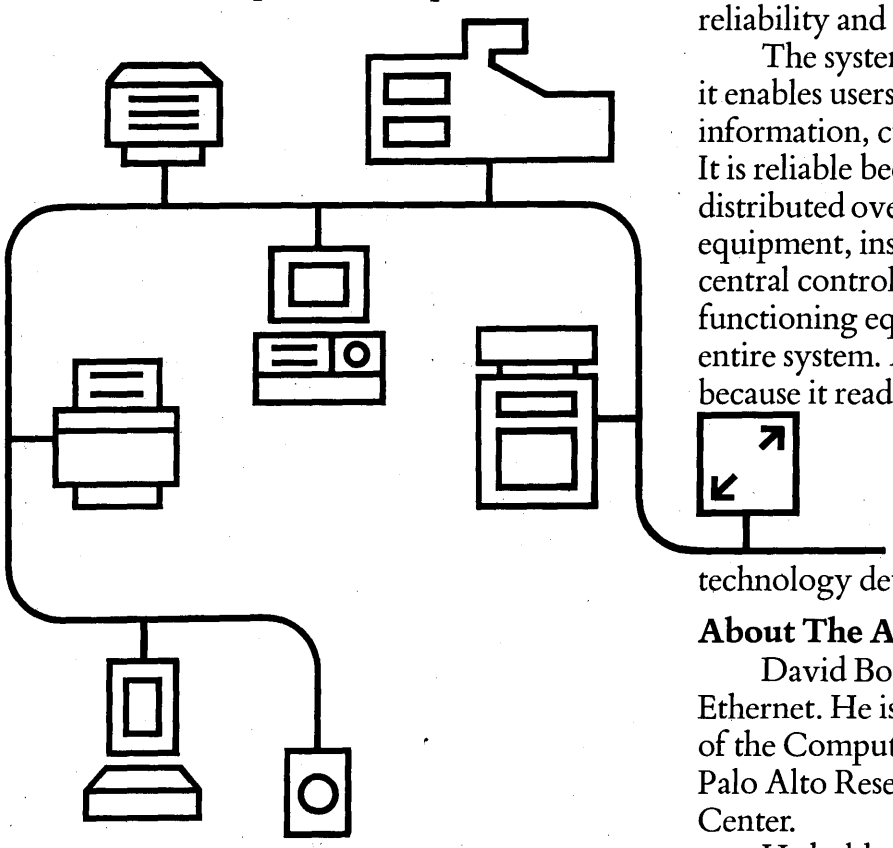
A key problem in any system of this type is how to control access to the cable: what are the rules determining when a piece of equipment can talk? Ethernet's method resembles the unwritten rules used by people at a party to decide who gets to tell the next story.

While someone is speaking, everyone else waits. When the current speaker stops, those who want to say something pause, and then launch into their speeches. If they *collide* with each other (hear someone else talking, too), they all stop and wait to start up again. Eventually one pauses the shortest time and starts talking so soon that everyone else hears him and waits.

When a piece of equipment wants to use the Ethernet cable, it listens first to hear if any other station is talking. When it hears silence on the cable, the station starts talking, but it also listens. If it hears other stations sending too, it stops, as do the other stations. Then it waits a

random amount of time, on the order of microseconds, and tries again. The more times a station collides, the longer, on the average, it waits before trying again.

In the technical literature, this technique is called carrier-sense multiple-access with collision detection. It is a modification of a method developed by researchers at the University of Hawaii and further refined by my colleague Dr. Robert Metcalfe. As long as the interval during which stations elbow each other for control of the cable is short relative to the interval during which the winner uses the cable, it is very efficient. Just as important, it requires no central



control—there is no distinguished station to break or become overloaded.

The System

With the foregoing problems solved, Ethernet was ready for introduction. It consists of a few relatively simple components:

Ether. This is the cable referred to earlier. Since it consists of just copper and plastic, its reliability is high and its cost is low.

Transceivers. These are small boxes that insert and extract bits of information as they pass by on the cable.

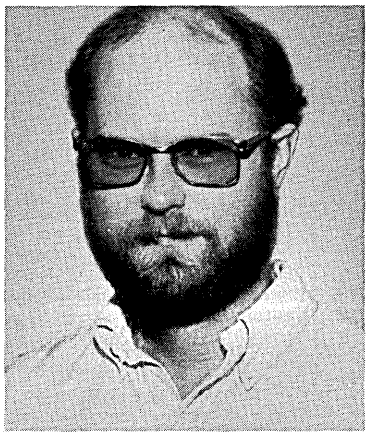
Controllers. These are large scale integrated circuit chips which enable all sorts of equipment, from communicating typewriters to mainframe computers, regardless of the manufacturer, to connect to the Ethernet.

The resulting system is not only fast (transmitting millions of bits of information per second), it's essentially modular in design. It's largely because of this modularity that Ethernet succeeds in meeting its objectives of economy, reliability and expandability.

The system is economical simply because it enables users to share both equipment and information, cutting down on hardware costs. It is reliable because control of the system is distributed over many pieces of communicating equipment, instead of being vested in a single central controller where a single piece of malfunctioning equipment can immobilize an entire system. And Ethernet is expandable because it readily accepts new pieces of information processing equipment. This enables an organization to plug in new machines gradually, as its needs dictate, or as technology develops new and better ones.

About The Author

David Boggs is one of the inventors of Ethernet. He is a member of the research staff of the Computer Science Laboratory at Xerox's Palo Alto Research Center.



He holds a Bachelor's degree in Electrical Engineering from Princeton University and a Master's degree from Stanford University, where he is currently pursuing a Ph.D.

SOFTWARE AND SERVICES

DOCUMENTATION AID

HIPO-11 automatically generates HIPO diagrams for BASIC-Plus programs developed on PDP-11s; HIPO-11 itself is written in BASIC-Plus for execution on PDP-11s running under RSTS/E.

The package makes one request of the user: each routine within a program to be diagrammed must begin with an identifying remark. HIPO-11 scans source code, extracting data about each routine in the program. Data collected includes beginning and ending line numbers, descriptive text, and the calling pattern between routines. Calling patterns form the basis for calculating a routine's level number and its position within its level. Up to 255 levels, each with up to 255 routines, can be accommodated.

HIPO-11 generates reports in two formats: a "structural diagram" showing beginning and ending statement numbers for each routine, the routine's name (with indentation to graphically show the routine's level), and level and position within level in numeric format; the second report is a HIPO chart, which graphically displays the relationships between routines. HIPO-11 is priced at $1,500. COBOL and BASIC-Plus-2 can't be diagrammed as yet, but that's in the works. REICOR SYSTEMS, INC., Schaumburg, Ill.

FOR DATA CIRCLE 331 ON READER CARD

SOFTWARE SPOTLIGHT

MANUFACTURING CONTROL

McDonnell Douglas Automation Co. (MCAUTO) has developed extensions to IBM's CAPOSS-E manufacturing control system. These extensions are embodied in three offerings which provide on-line transaction programs, databases, and additional batch reports. The packages can be licensed by 360 and 370 sites running OS or VS with IMS DB/DC, and they are available to remote users of MCAUTO's system.

Three modules are offered: a batch Executive module, an on-line Process and Routing module, and an on-line Order Status module.

The Executive ($35,000) can be used with or without the on-line modules. It helps management by providing better standard reports covering machine or manpower capacity. Implementation of a new history file allows manufacturing management to evaluate work center operations by comparing planned and actual work times.

The on-line Order Status module ($60,000) lets production planners and schedulers enter factory work orders into CAPOSS-E and inquire about work in progress. Eight-screen formats are provided.

The on-line Process and Routing module ($40,000) lets planning engineers maintain instructions for manufacturing processes and sequencing machine operations. Being on-line keeps everything up to date; output from the Process and Routing module feeds automatically into CAPOSS-E.

All three modules can be licensed at the same time for the reduced fee of $115,000. MCDONNELL DOUGLAS AUTOMATION CO., St. Louis, Mo.

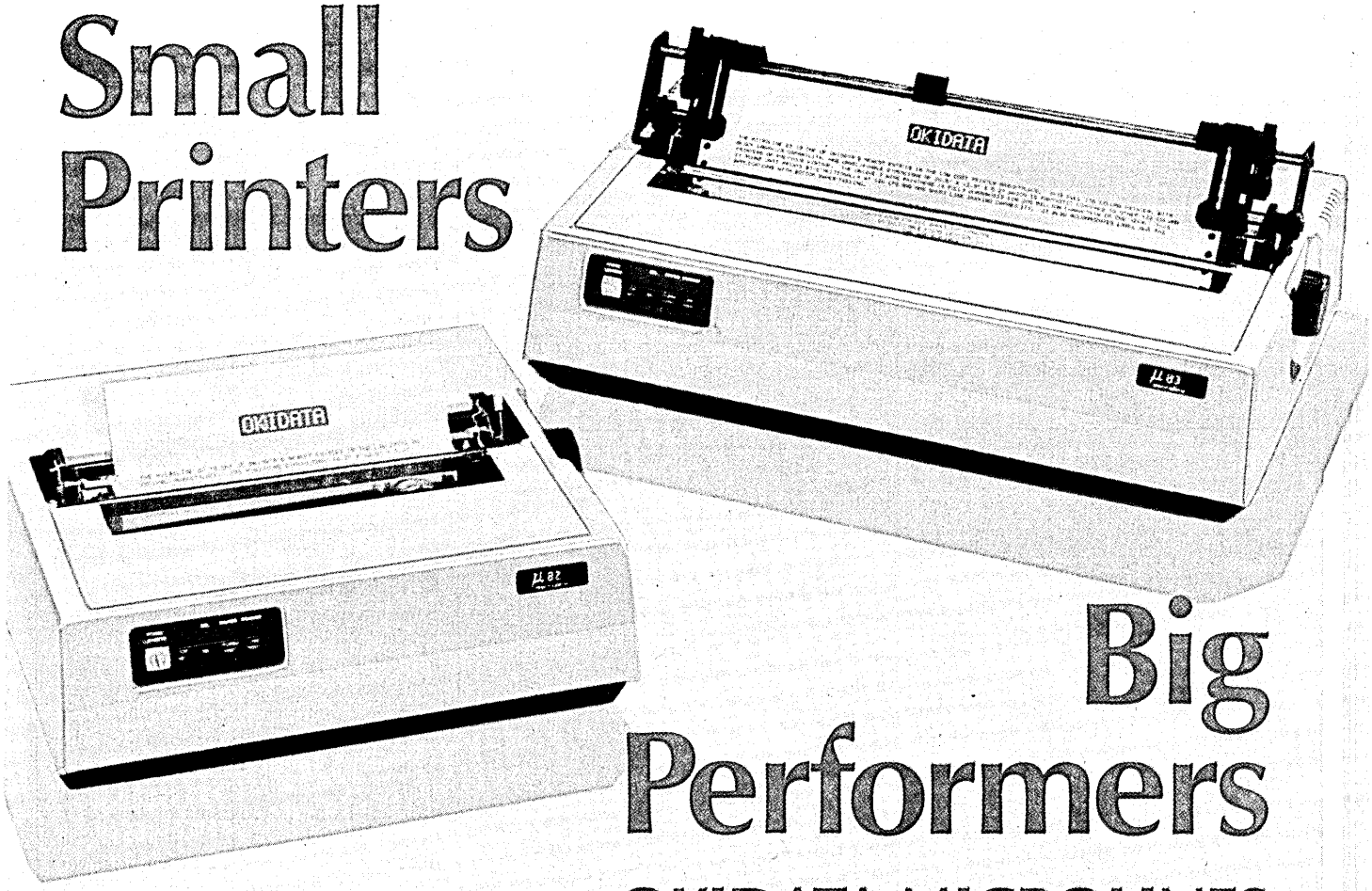
FOR DATA CIRCLE 330 ON READER CARD

MICRO MAILING LIST

Commercial Mailer is a mailing list program for 48KB Apple II computers, equipped with a Corvus 11AP hard disk, and a printer (80 columns or 132 columns). Written in Applesoft, the program maintains sizable mailing lists of up to 30,000 six-line labels; the program can handle multiple lists, limited only by available disk storage. Users can adapt the program's six-line-per-label capacity to fit user-specified formatting. A utility/code field is included. Cheshire or pressure-sensitive labels can be printed, from one-up to four-up. The Commercial Mailer program sells for $250 plus $3 for shipping. STONEHENGE COMPUTER CO., Summit, N.J.

FOR DATA CIRCLE 332 ON READER CARD

Small Printers

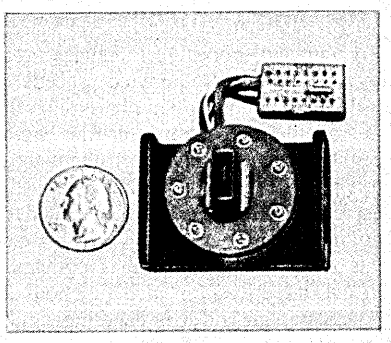


Big Performers

OKIDATA MICROLINES

The Okidata Microline 80 printer set the standards for the home computer market. Now there are two new low cost Microlines for business use that have already won the praise of the most demanding OEMs—the Microline 82 and 83—setting new standards for performance, reliability and flexibility.

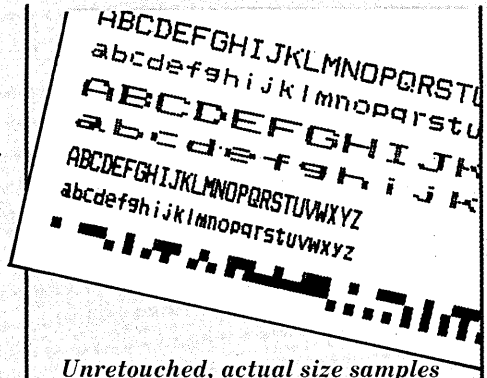
Using a tiny, seven-pin head that weighs less than four ounces, the Microline 82 and 83 produce sharp, crisp copy *and graphics* on plain paper, multipart forms. The unique head is driven bidirectionally by an elegantly simple mechanism at 80 cps in the Microline 82 and 120 cps in the 83. Short line seeking logic further boosts throughput by 80% over equivalent unidirectional printers.



The low mass, high performance Microline head is warranted for 200,000,000 characters.

OEM savings add up because there is no need to stock different models (and spares) for different customers. The Microline 82 and 83 include *both* RS232C serial and Centronics-compatible parallel interfaces as standard equipment. Both printers have friction platens that accept adjustable snap-on tractors and form controls that include vertical tab, top of form and a vertical format unit.

Since 1972, Okidata has been building the best. There are thousands of Okidata printers in computer rooms throughout the world bearing nameplates of the top OEMs in the industry. The same standards of excellence have been applied to the low cost Microline Series—two motors, rugged cast aluminum base, *no* compromises. Call today for details. Representatives throughout the world.



Unretouched, actual size samples of Microline printing. Standard, double width and condensed characters and 64 block shapes for charts, diagrams and illustrations.

OKIDATA

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609-235-2600

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CIRCLE 64 ON READER CARD

contents. Output can go to any Tektronix copier or plotter supported by the system, or virtually any printer with an RS232 interface. TEKTRONIX, INC., Beaverton, Ore.

FOR DATA CIRCLE 329 ON READER CARD

SORT

Software Techniques' Ezsort runs on DEC PDP-11s under RSTS/E or RSX, providing an applications program callable sort facility to programmers working in BASIC-Plus-2, COBOL, or DIBOL. Ezsort works with any file management software, including RMS, FMS, Total, Databoss, and DMS500, handling any number of keys. Any combination of ascending/descending and string or numeric keys can be sorted in a single pass. In normal use, only two calls are used to interface with Ezsort. Ezsort is priced at $775; oem discounts are offered. SOFTWARE TECHNIQUES, INC., Los Alamitos, Calif.

FOR DATA CIRCLE 333 ON READER CARD

PROJECT MANAGEMENT

Milestone is a project management package designed to run on most personal computers (including the TRS-80, Apple, and S-100 systems running CP/M or the UCSD Pascal operating system). It requires a 24-line, 80-column screen, and 48KB of RAM.

Milestone uses critical path network techniques. It is useful for projects that can be divided into a series of distinct tasks, each with an associated duration, level of manpower, and cost. The program lays out jobs over a time scale, identifying critical tasks and those that can suffer a delay without having an impact on the rest of the project. Manpower and expenses can be displayed against a time scale. The package also calculates totals and project completion date. Scheduling changes may be incorporated while the project is under way, with Milestone automatically calculating the impact of these changes. The program sells for $395 ($295 before April 1). ORGANIC SOFTWARE, Livermore, Calif.

FOR DATA CIRCLE 334 ON READER CARD

SOFTWARE PROTECTION

For authors selling software to users of Hewlett-Packard 9835A and 9845B/C desktop computers, Structured Software Systems has developed programs to protect proprietary software and algorithms. OEMSEC transforms source programs so that symbol names for variables, labels, functions, and subroutines are deleted from any program listings. Programs processed by OEMSEC are claimed to be impossible to trace. And, of course, a user can't interrogate program variables when no variable names are known. OEMSEC sells for $2,000.

NODUP blocks unauthorized program duplication. Protection is provided by initializing the program tape cartridge with security codes (a different code for each NODUP user), and appending a binary program to each program to be protected. The binary program locks the computer's keyboard if the proper security codes aren't present—forcing the user to reset the machine, clearing memory. Programs protected by NODUP can be copied to disk and executed from disk, but the original tape cartridge must be inserted into the drive; without the tape, there's no execution. NODUP sells for $2,500. NODUP and OEMSEC can be purchased together at the reduced price of $4,000. STRUCTURED SOFTWARE SYSTEMS, INC., Mt. Holly, N.J.

FOR DATA CIRCLE 336 ON READER CARD

COMMAND LANGUAGE

The Command Procedure Language (CPL) allows definition of command procedures for Prime computers; simply typing the name of the CPL command file begins execution of the stored set of commands. CPL is provided at no additional fee in the latest release of PRIMOS (Rev. 18), slated for distribution this quarter. CPL's basic elements are PRIMOS commands, augmented with CPL directives for such functions as argument passing and error handling. PRIME COMPUTER, INC., Natick, Mass.

FOR DATA CIRCLE 335 ON READER CARD

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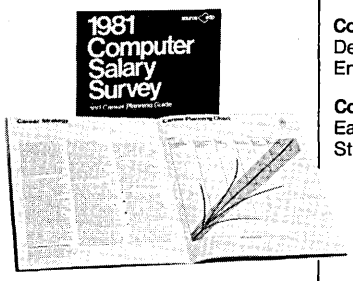

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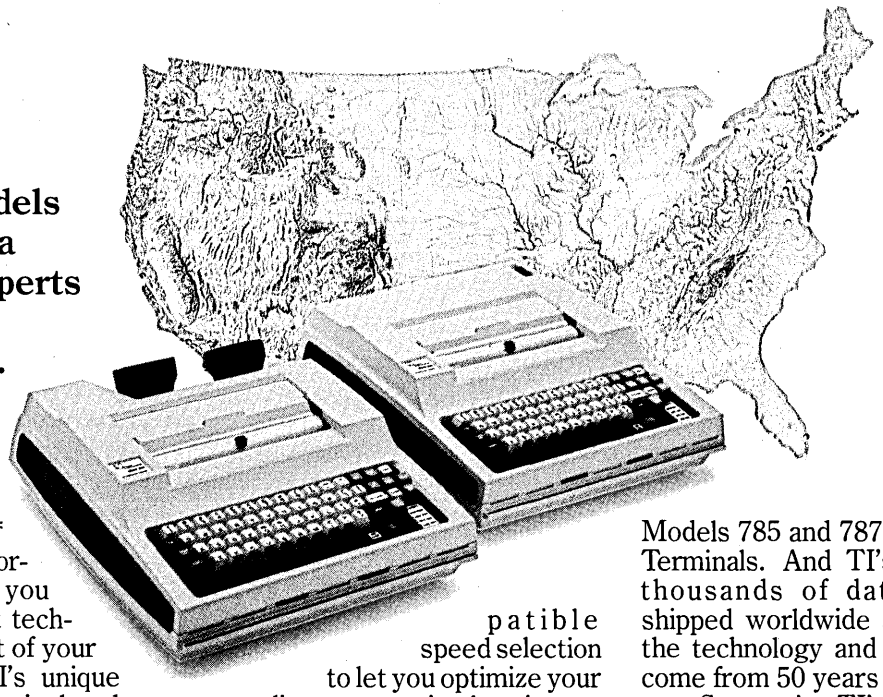

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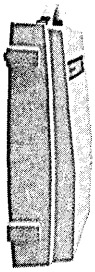

The Model 785 Portable Data Terminal combines speed with remote access capabilities. With the 785's built-in 300/1200-bps acoustic coupler, users are able to transmit and receive data using a standard phone and electrical outlet. Other standard features include automatic modem selection and compatible speed selection to let you optimize your on-line communication time.

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If you would like more information on the Models 785 and 787 Portable Data Terminals, contact the TI sales office nearest you or write Texas Instruments Incorporated, P.O. Box 1444, M/S 7884, Houston, Texas 77001 or phone (713) 373-1050.

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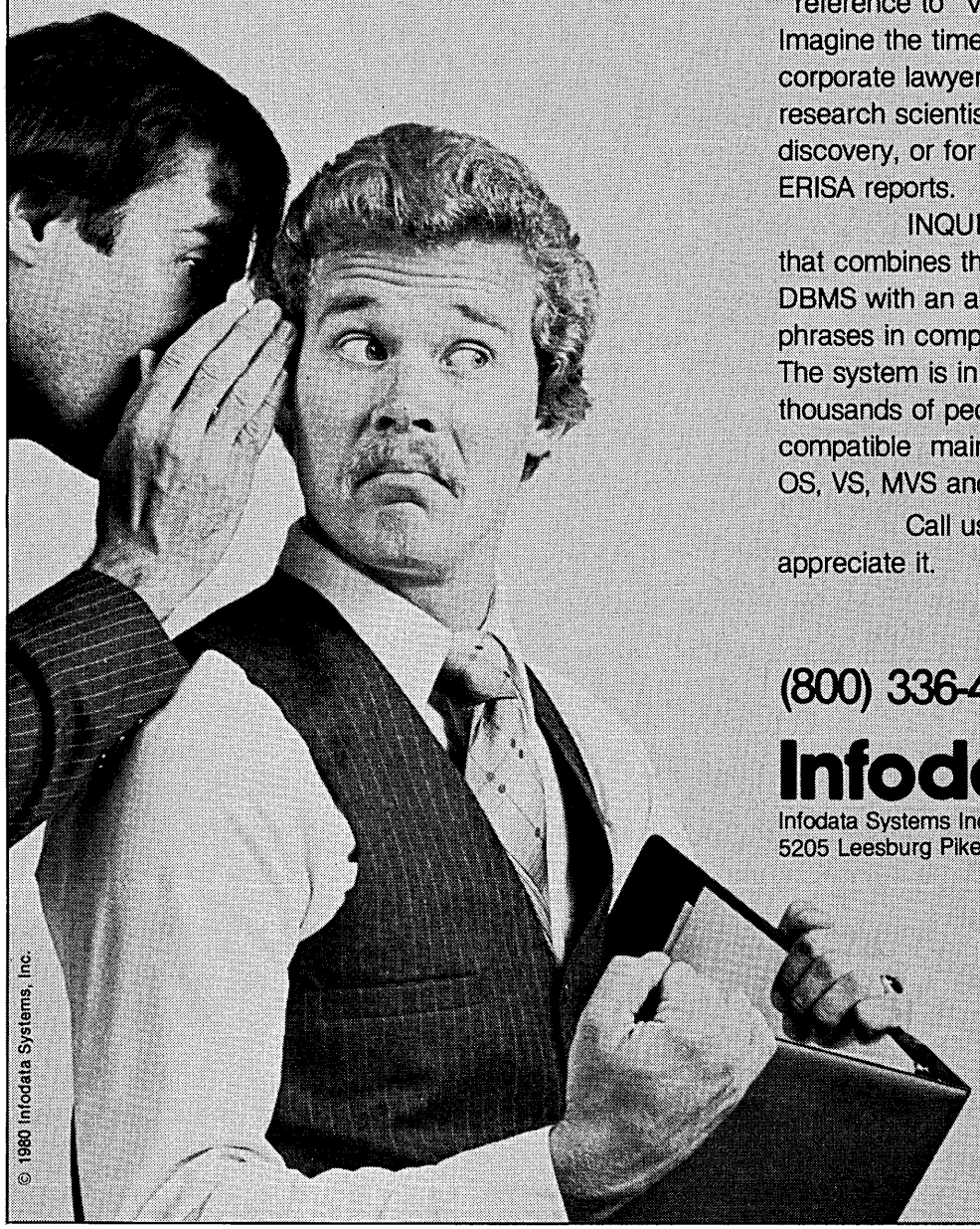

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BOOKS

ILLUSTRATION BY CAROL WALD

EMERGING DATA PROTECTION IN EUROPE
by Frits W. Hondius

The idea of merging existing bureaucracy with data processing and then trying to legislate the result is enough to make any corporate lawyer shudder. It might even daunt a politician. Nevertheless, European governments have been facing up to the complex task of devising legislation to cover data processing. They began early and have been working diligently, which is a good thing; they have their work cut out for them. Existing laws are based on varying histories, and legal structures differ sharply from country to country. Everywhere, vast interrelationships are apparent: national interests and international interests overlap; what is clearly the "public interest domain" flows over into the private sector; and personal and national security cannot be defined to everyone's satisfaction. Some nations are saddled with constitutions so rigid as to make it all but impossible to write laws dealing with data processing.

Although computer law is still in its infancy in the United States, the problems of American users and legislators seem simple compared to those faced by the European community. For example, at the time that the French government admitted that the right to privacy existed, the precise meaning of privacy was left undefined. One important legal decision even avoided the word computer. In Austria, constitutional lawyers observed in the early '70s that the federal structure of their government tended to have a petrifying effect on legislation, since the writers of the constitution could not possibly have foreseen the development of computers. Germany, as early as 1970, enacted a landmark Data Protection Act, which quickly proved its practicality and usefulness, but which was still criticized for being inflexible. In Sweden, the free exchange of data among various agencies has been part of the constitutional law and practice since 1766, but as late as 1965 there remained the minor difficulty that a member of the public seeking access to data would require the aid of a computer facility and specialized personnel.

Frits Hondius has worked throughout Europe with a wide range of high-level organizations concerned with the development and future of computers. These include the Council of Europe in Strasbourg, the Organization for Economic Cooperation and Development, and Oxford University, where he was a visiting fellow.

Hondius has written a comprehensive book. *Emerging Data Protection in Europe* covers, among other topics, national legislation, the role of international organizations (the U.N., among others), transnational data flows, controls and sanctions, and such interesting and diverse fields as secrecy, professional conduct and ethics, anonymous information, and penal sanctions. The writing is excellent, although sometimes a little heavy on footnotes and lists of who attended which conference and introduced which motion.

Because the book first appeared in 1975 as a legal publication, it must by now be regarded at least partially as an historic reference. It isn't just for the legal scholars, though.

Hondius' book will prove valuable to anyone in the computer industry who needs to know what issues, legislation, and regulations she or he may encounter when dealing with the Europeans. North-Holland Publishing Co., Amsterdam (1975, 282 pp., $36.75). American Distributors: Elsevier North Holland Publishing Co., New York.

—Sally Williams-Haik

MANAGING THE SYSTEMS DEVELOPMENT PROCESS
by C.L. Biggs, E.G. Binks, & W. Aktins

The success of any system development effort depends on a host of factors, including the competence and experience of the development team, the nature of the problem, and the clarity and completeness with which the customer/user requirements are presented. Perhaps the most critical factor is

the management of the system development process. Unless management controls the process and supplies the staff involved in project performance with a clear understanding of what should and should not be done, the chances of project failure are high.

Effective management of the systems development process is hampered by two common misconceptions held by many systems managers and developers:

1. Established management techniques successful in other fields do not work in systems development, and

2. Each project is different and can only be accomplished with an ad hoc, on-the-fly approach.

The authors of this book do not share those beliefs. Instead, they believe that the systems development process can and should be subjected to disciplined, organized management, and that traditional management principles offer the best hope of controlling systems development. Their book is an adaptation of those management principles to the field of systems development. The book avoids the presentation of theory, sticking to the presentation of procedures that have been proven to work.

The main body of the book weaves together two themes: a definition of the systems development process and a definition of the management process to be utilized throughout the system life cycle. As each phase in the system development process is elaborated, the management techniques applicable to that phase are explained. In this way, the authors give guidance both on how a system should be developed and how that development should be managed.

Four phases are defined. The first, systems planning, sets out the problem and assesses the feasibility of implementing a specific system. The second, systems requirements, defines user requirements and translates these into a functional or system design approach. The third and largest phase is the actual systems development, which includes the detailed design and coding of the system. Systems implementation, the final phase, consists of installation and field testing. Each of these phases is broken down into a series of steps. For each step, guidance is provided concerning standards, procedures, checklists, and management controls.

Central to the authors' approach is the use of forms; a total of 69 are introduced and explained. One's initial reaction might be that all this is too cumbersome, bureaucratic, or formal. However, the manager who wishes to avoid the freewheeling approach to systems development must overcome his or her aversion to forms. Systems development is a complex activity; it involves the orchestration of staffing, cost estimation and monitoring, progress monitoring, and much more. The use of forms provides a structured, formal way of capturing and controlling everything that is needed for the effective management of systems development.

Managing the Systems Development Process is thorough, well thought out, and easy to follow. It can help any systems development manager perform more effectively. Prentice-Hall (1980, 408 pp., $24.95).

—William Stallings

BEST OF INTERFACE AGE, VOL. 2, GENERAL PURPOSE SOFTWARE, edited by the Interface Age staff

Second in a five-volume series, this book contains 14 reprints from the personal computing magazine *Interface Age*. I first picked up the book because a friend asked me to give him a few games his kids could play on a personal computer. Unfortunately, the title misleads: the book contains three sections—"Useful Ideas," "Some Medical Software," and "Games, Education and Personal Finance." Hardly "General Purpose." I skipped the first two sections; after all, the kids had no use for a DECsystem 10 BASIC Cross-Assembler for the 8080 or the morbid Heart Attack programs. The third section seemed a good place to start, and I chose Shooting Stars, an interesting game of logical subtleties.

Unfortunately, based on the treatment of Shooting Stars, I can only recommend that you avoid this book. The editors of *Interface Age* should have done a bit more editing. The program contains at least one logic flaw—an invalid move results in an appropriate message, and an entirely inappropriate subroutine exit via a GOTO. You may need to make the same mistake quite a few times, but sooner or later Shooting Stars will blow your BASIC's stack, bringing the whole thing down on its ASCII.

Then there's the problem of the program listing, prepared on a poorly adjusted printer, with virtually indistinguishable Es and Fs. Luckily, the sample run made it a bit easier to track down the problems this caused. The program even includes a misspelled word in its instructions (hey, fellas, the plural of "try" is "tries," not "trys").

If Shooting Stars is typical, the editors of *Interface Age* have no concept of good programming style, or even correct programming. Don't waste your money! dilithium Press, Portland, Ore. (1980, 204 pp., $8.95 softcover).

—Bill Musgrave

"In here is where our federal guidelines are created."

CARTOON BY STEVE ATTOE

REPORTS AND REFERENCES

GRAPHICS TERMINALS

Auerbach is offering a report on computer graphics terminals. The report emphasizes the latest generation of terminals that handle alphanumeric and graphics at once, and predicts a rise in data entry applications of such machines. The report covers hardware, applications, and systems applications, as well as a general overview of computer graphics. Price: $435, including a year of monthly supplements. Auerbach, 6560 N. Park Dr., Pennsauken, NJ 08109, (609) 662-2070.

SUPERMINIS

The Outlook for the Minicomputer Industry in the 1980s: 32-bit Superminis Come of Age includes competitive analysis of the players; an overview of industry and applications; discussion of trends including pricing, distribution channels, the mainframe/microprocessor threat, vertical integration, R&D, service, distributed processing, and small business computers; and a survey of DEC VAX 11/780 users. Company profiles

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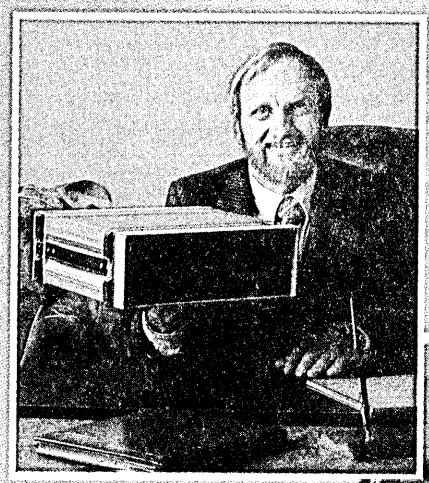

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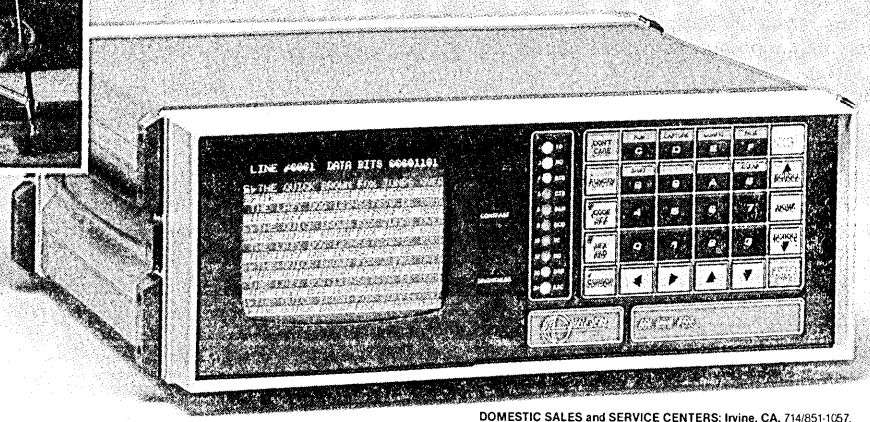
President



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OLD WORLD ATTITUDES

Datapro Research Corp. asked 3,485 European users how they liked their computer systems; the result is *European User Ratings of Computer Systems*, yours for $25. IBM rated highest. 1805 Underwood Boulevard, Delran, NJ 08075.

SEMINAR

STUDY MODELING

The Production Automation Project at the University of Rochester will offer a course entitled "Geometric Modeling of Rigid Solids" May 11-15, 1981. The course will deal with the mathematical theory and software technologies needed to model mechanical parts and similar solids in industrial CAD/CAM systems. Fees: $650. Contact Arlene Rosenberg, Production Automation Project, College of Engineering and Applied Science, The University of Rochester, Rochester, NY 14627. Tel.: (716) 275-3775.

PERIODICAL

TEACHING KIDS COMPUTING

The Computing Teacher is a journal for people interested in the instructional use of computers at the precollege level. Each issue contains a number of feature articles —"Getting Kids Ready for Computer Thinking" and "Instructional Design and CAI" are some recent samples—plus departments devoted to software reviews, computing problems, and new products. There will be seven issues in the 1980-81 academic year and nine issues the year after that. U.S. subscription rate $10 (7 issues), $20 (16 issues), $27 (25 issues). *The Computing Teacher*, c/o Computing Center, Eastern Oregon State College, La Grande, OR 97850.

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FOR DATA CIRCLE 350 ON READER CARD

SUITABLE SEATING

Do you have a proper seating attitude? Are the seats of your staff lowering productivity in your department? The answers to these and other important questions are available in two booklets from Krueger, "The Principles of Office Chair Selection" and "Seating Systems, Fatigue, and Productivity."

FOR DATA CIRCLE 351 ON READER CARD

MONSTROUS PASTIME

Avalon Hill is touting a new fantasy game called "Lords of Karma," for use on a TRS-80, Apple II or PET. The game can be played solitaire and involves satisfying lordly demands while avoiding being eaten by monsters.

FOR DATA CIRCLE 352 ON READER CARD

SHACK SHOPPING

Radio Shack's latest TRS-80 catalog introduces new color and pocket computers plus new printers and a system called Videotex. Software packages are described, as is a voice synthesizer that costs $399.

FOR DATA CIRCLE 353 ON READER CARD

The Wang VS computer puts the crunch on your data, without putting the squeeze on your staff.

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But Wang VS systems aren't just powerful computers. They're complete systems that make computer power ingeniously easy to use. Our programming aids, for example, let you create a data entry screen as easily as writing a word processing document. Our Symbolic Debug utility lets you test and modify COBOL, BASIC, RPG II and Assembler programs at the source level. And our menu-driven file management facilities let you set up files, process transactions, generate reports and establish field-level security controls — interactively.

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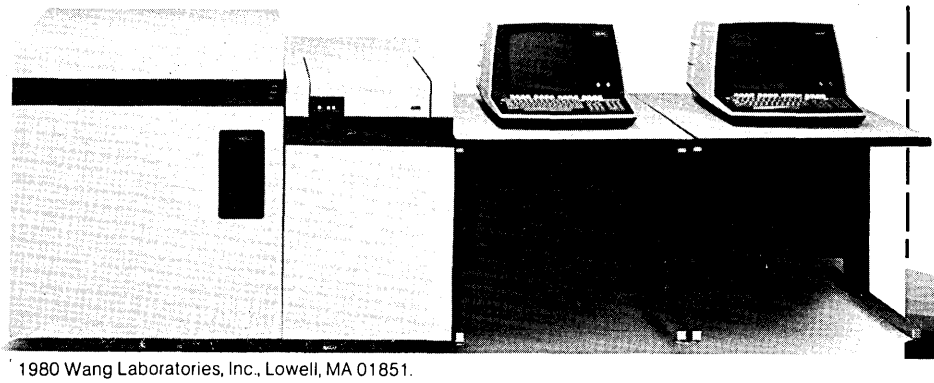

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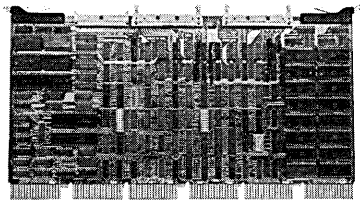

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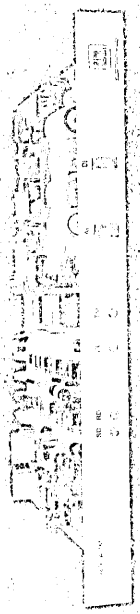

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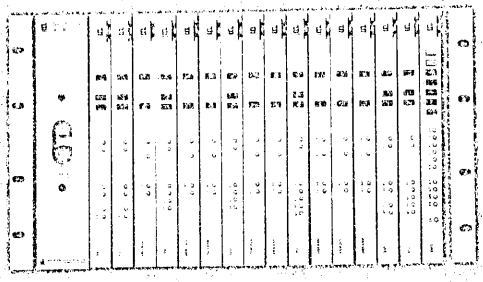

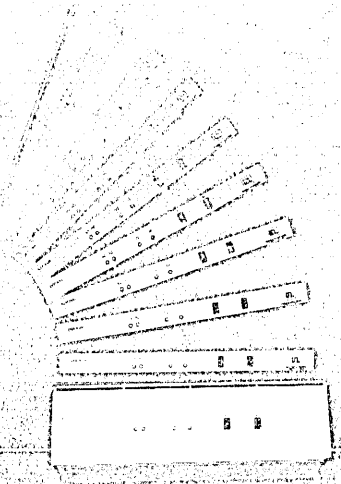

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An exchange of readers' ideas and experiences. Your contributions are invited.

READERS' FORUM

HELP FROM A HEADHUNTER

What's in it for you if you use a headhunter?

Fee-paid agencies (client companies pay the fee, not the job-seeker) offer job applicants career counseling services without charge. Part of the career counseling service includes writing a revised resume that incorporates formal training and an evaluation of on-the-job training.

The agencies also assess the applicant's current opportunities for advancement, and examine whether a person likes to work with the public, is happier working with a small group, or would be most satisfied working entirely alone. They will also determine if a present salary is fair for the amount of experience, how the salary compares with peers in a competing organization, and how much an applicant is worth on the open job market.

Headhunters also provide information on companies being considered for employment: what is the general attitude of the company? How is morale? Is there a high or low turnover? Is the company moving forward/backward/stagnating?

When should you use a fee-paid employment agency? Answer: the moment you decide to take a good close look at your employment situation. That may be when you are facing a dead end situation, when you feel there are technical limitations to your advancement, when you are seeking a change of pace or place, when you would like to earn more money. Don't be put off by statements that fee-paid agencies cater only to senior-level management positions or jobs over $35,000. Several agencies place the bulk of their applicants in jobs ranging from $22,000 to $35,000. These jobs are in five main categories: 1) programmer/analyst; 2) systems programmer; 3) systems analyst; 4) hardware or software communications specialist; 5) DBMS specialist.

Once you decide to seek out the services of a firm specializing in executive placement, how do you find the right one? The best way is through personal referral. Another is to talk with technical managers in other companies. They know the executive search firms that send them successful employees. If you select a firm from classified ads, be sure the firm specializes in dp. "Full" service agencies usually do not provide a program tailored to serve the high-tech field. Additionally, be sure it is "fee pay," which means you neither sign a contract nor pay a fee. Once you select a search firm, carefully interview the staff consultant. A programmer's job description, for example, should be handled by someone who knows what COBOL is.

Be sure the firm has a good base of appropriate client firms from which to choose, and that the staff of the firm works closely with the client. For example, many headhunters provide clients with information about the potential or actual trouble spots in their companies. The agencies seek feedback from every company and placement, and when they learn about dissatisfaction with a particular manager or department, they often discreetly share this information with the client. It gives the client the opportunity to make appropriate changes or take action before it loses employees or wastes work time.

—Howard Weeks
Rockville, Maryland

NO JOB STABILITY IN DP?

The high turnover rate in dp is usually attributed to employee dissatisfaction, but this is only part of the problem. Employers tend to assume that they provide an environment of job stability when in fact there are destabilizing elements built into the work. It just isn't fair to immediately dismiss as a job-hopper an applicant who has had, say, eight jobs in five years.

Most firms follow a cyclical pattern of systems development. Peak developments usually run two to three years, during which time demands for systems analysts are heavy. After these systems have been implemented, the cycle shifts to three- to five-year period of modifications and maintenance requirements. In both parts of the cycle programming demands remain high, though they slacken somewhat in the latter phase. Thus, programming is more stable than analytical and management positions.

In analytical positions demands are heavy during development and drop sharply during modification and maintenance. This means that after about three years, systems analysts can count on being fired. The cliché is true: a competent systems analyst is always building himself out of a job.

What do most firms do about these cycles? They follow practices of hire and fire, much like defense firms that work from contract to contract. To change such practices companies would have to develop means to use the surplus systems analysts and programmers in other areas until a new development cycle is undertaken. But how many firms do so?

At management level, visibility and risks are far greater. The high turnover rates for dp managers and directors are not entirely due to incompetence; much of the blame can be placed on executives who make unrealistic demands and fail to provide support.

Job changing is currently a way of life for those who pursue dp careers. If employers would take off their blinders and make serious efforts to solve the problems that cause instability, turnover rates would drop sharply—to the benefit of employees and employers alike.

—John Callahan
Terre Haute, Indiana

THE JAPANESE CHALLENGE

By most accounts, 1980 was a successful year for the Japanese computer industry. For the first time, a Japanese computer manufacturer, Fujitsu, outsold IBM Japan, the wholly owned subsidiary of the American industry leader. Fujitsu has also inked an agreement with TRW to establish a $100 million joint venture that will sell Japanese hardware in the U.S.

Nor was Fujitsu the only Japanese challenger of U.S. supremacy. Both Hitachi and Nippon Electric Company (NEC), two of Fujitsu's competitors at home, unveiled machines that are comparable in performance to the 3081.

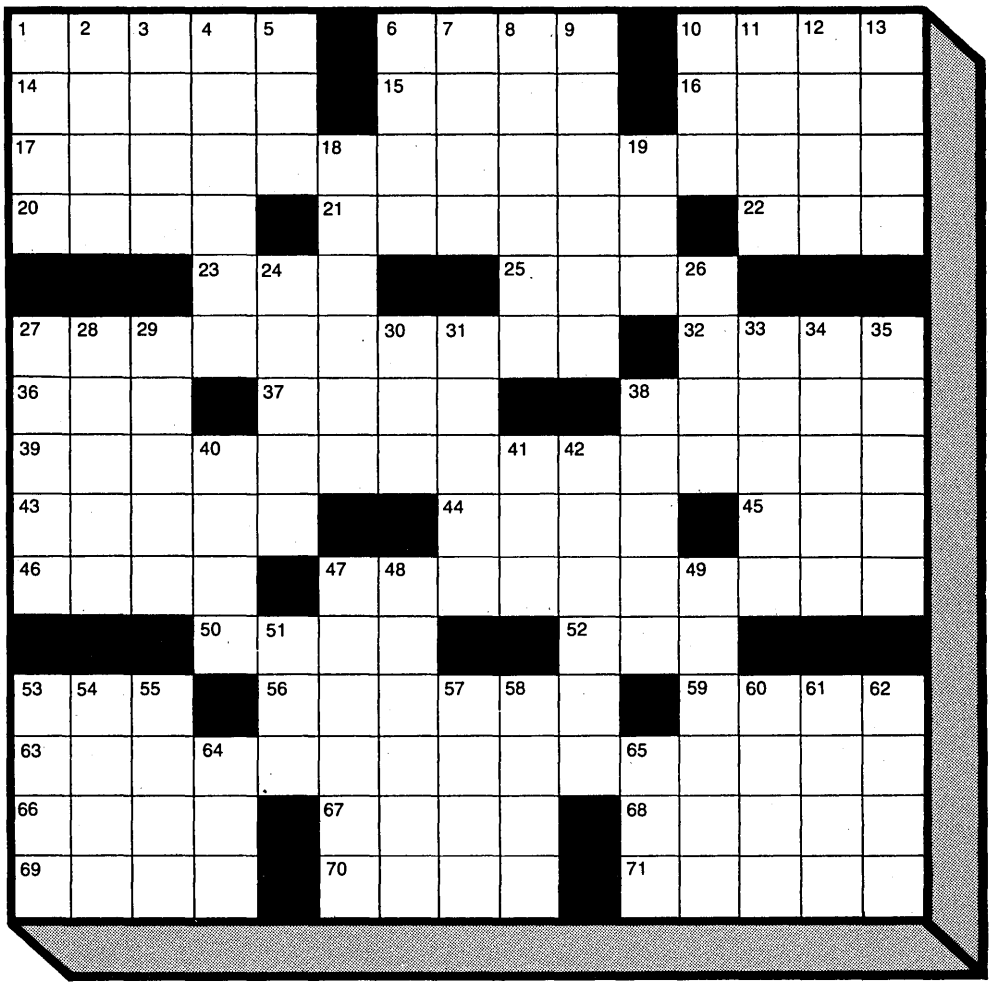
In less than 15 years, the Japanese have created a competitive $4.5 billion industry with five mainframe manufacturers: Fujitsu, Hitachi, NEC, Mitsubishi, and Toshiba; Japan's computer market is exceeded in size and vitality only by that of the U.S.

This has Americans worried. Concern over the Japanese competition has become a staple of virtually any discussion of the future of the American computer business and it is difficult to separate what is real from what may be a bad case of nerves.

Depending on who is talking, Japan either possesses fault-

DATAMATION CROSSWORD

THE TOP DRAWER
by
Brian FitzGibbon Burke



ACROSS

1. Island in the Bay of Naples
6. The _____ (northern tip of Jutland)
10. Feeble, shrill sound
15. Ireland, to a Gael
16. Word with title or play
17. When his son was born, his name was made
20. Half: prefix
21. Expatriate
22. Null is one
23. Campbell's org.
25. Interjection for a butterfingers
27. Pension play
32. Increases, supplements
36. Mimic
37. City in northern Okla.
38. Tropical Lizard
39. President from Missouri
43. _____ & Fred
44. Unaccounted-for soldiers: abbr.
45. Neck
46. There's none of this in heaven
47. Private industry's FTC
50. Lives, to Plutarch
52. Native of: suffix
53. Drunkard
56. North of Albion
59. Front sight on a firearm
63. Macro fils
66. Kind of dale
67. Placed
68. Lithuanian monetary units
69. Navy mascot
70. Assertiveness trainings
71. Revere

DOWN

1. Jazz devotees
2. Dull pain
3. Seniors' night out
4. Adriatic port city
5. Mountain overlooking ancient Troy
6. Constituent assembly of the Polish Republic
7. Shoe polish or a green fruit
8. Northeast region of Spain
9. Declaration of horses at Hollywood Park
10. Con's partner
11. Quite a while
12. Threatening alternative
13. Jaunty
18. Lunar: comb. form
19. Apart: abbr.
24. Brother in Brest
26. State flower of Utah
27. Seventh month of Moslem year
28. Kind of poem
29. Titter
30. The game of marbles: colloq.
31. Swelling of body tissues
32. Kissinger has one
33. Key letter
34. Moslem prince: var.
35. _____ dog
38. Helpers: abbr.
40. Arbitration group
41. Start of tv dog's name
42. _____ face value
47. Merchant sailors' quarters
48. Spanish wines
49. Spider monkey, e.g.
51. O.T. Book: abbr.
53. Kind of party
54. Mississippi tributary
55. Annual cry in Pamplona
57. Fool
58. Fleming and Anderson
60. Within: comb. form
61. Somewhat open
62. Three in Munich
64. Pavarotti's domain
65. Tania's group

Solution on page 192

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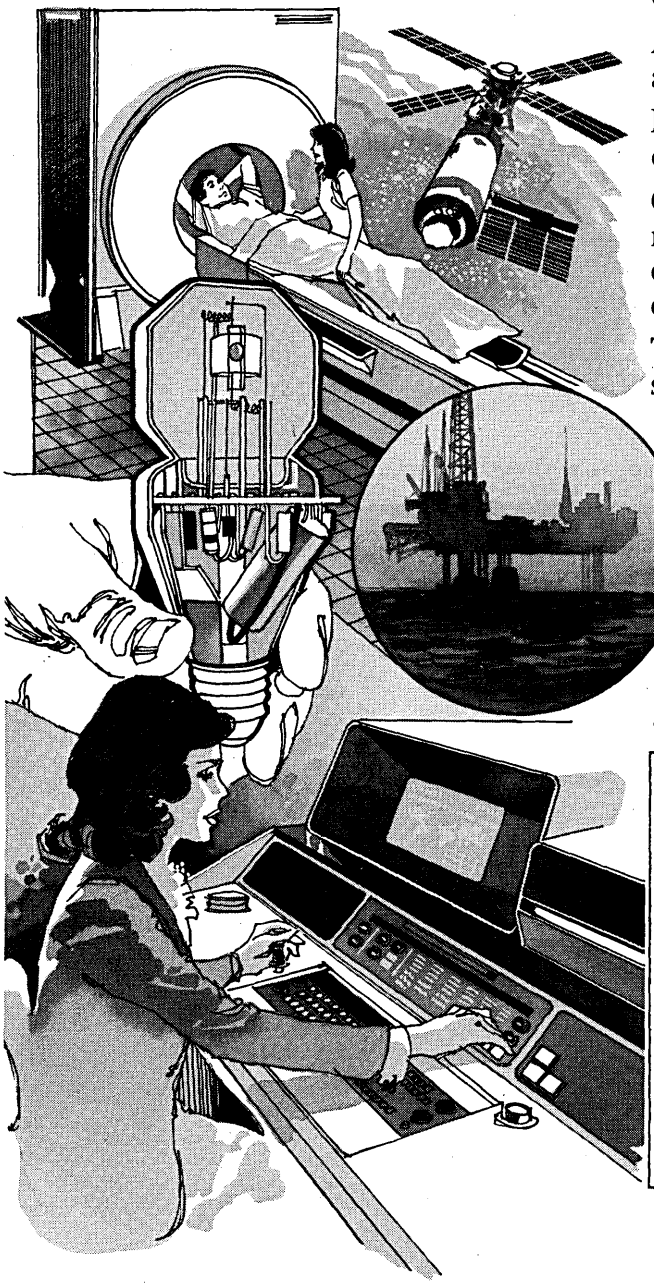

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READERS' FORUM

less business acumen or, alternatively, has by some means exposed all the shortcomings of the American economy.

While American labor is called to task for stagnant productivity and rising costs, Japanese workers are being lauded for cooperation on the assembly line and undemanding conduct at the bargaining table. While American semiconductor manufacturers suffer sharp criticism for their high defect rates, their Japanese counterparts are praised by customers in the U.S. for the consistent reliability of their semiconductor chips.

No typical discussion of the Japanese computer phenomenon is ever complete without a citation for the role played by the government with its research subsidies and protective tariffs. The U.S., by contrast, is said to have an ill-focused industrial program, discouraging tax policies, and cumbersome regulations.

As Charles Sporck, president of National Semiconductor told *Forbes*, "it is almost incompehrensible that IBM, which is probably the nation's most important industrial asset, is under attack by the U.S. government for being too successful. Can you imagine the same action being taken in Japan?"

IBM, for its part, does not miss any opportunity to use the threat of Japanese competition for its own purposes. At the antitrust trial in New York, IBM produced as a witness Henry Rosovsky, dean of the faculty at Harvard and an expert on the Japanese economy. Rosovsky told the court that by 1990 the Japanese would gain a share of the American computer market comparable to the 20% they now have in automobiles. If Rosovsky's prediction comes true, Japan will have captured a market share as large as that presently held by all of IBM's mainframe rivals combined.

By itself, Rosovsky's forecast might be subject to criticism. While IBM thought the Harvard dean's testimony was worth a fee of $13,000 to $14,000, the academic conceded during examination that he had never made a careful study of trends in the dp industry. Rosovsky, however, is hardly alone in his opinions.

For more than 10 years, there have been authoritative warnings about the coming Japanese computer challenge. These predictions have not all panned out. In 1970 the National Research Council sponsored a study that concluded Japan would reach parity with the U.S. in software development by the year 1975. Today, most observers on both sides of the Pacific agree that the Japanese are still five to 10 years behind the U.S. in software.

The difficulty in obtaining a clear picture of the Japanese computer challenge is compounded by the sometimes confusing actions of the American business community. On one hand, IBM executives express concern over Japanese competition, while on the other, they agree to market large numbers of Minolta copiers, providing yet another distribution channel for imported office equipment.

Simon Ramo, chairman of the board of the TRW-Fujitsu joint venture, has written a book, *America's Technology Slip,* diagnosing America's decline and offering some homegrown cures. At the same time, his company hopes to improve its dp business by giving the Japanese more clout in the U.S.

In case after case the myth of the terrible Japanese challenge is promoted by American computer industry executives—at least in public. But Ulric Weil, computer industry analyst at Morgan Stanley, is not sure how seriously these same executives take their own public statements. When asked whether the U.S. computer industry will lobby in favor of some kind of government help once the Reagan administration gets settled down in Washington, Weil said he doesn't "think [the industry top brass] will make the case that strongly. For public relations reasons they might. But privately, they all say 'we can handle it, and if we can't, it's our own fault.' "

THEY STRUGGLE TOO

This veiled optimism is due in part to the slowing growth of the Japanese computer industry. In the early 1970s, Japan's dp business had a robust 25% annual growth rate; today it is a more modest 15%.

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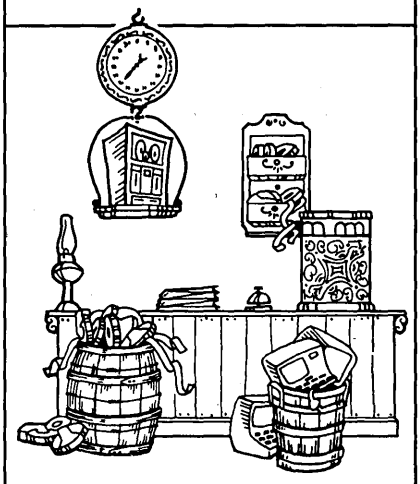

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CIRCLE 151 ON READER CARD

of computer gear, the Japanese computer makers need to control their domestic markets. So far, they have not done this. Fujitsu may have passed IBM Japan in sales this year, but just barely: $1.55 billion for Fujitsu to $1.54 billion for IBM Japan. And even so, these numbers include Fujitsu's sales worldwide, while the revenues of IBM Japan are derived substantially from sales in that nation alone. IBM Japan's 1979 profits were nearly three times the earnings of Fujitsu for its fiscal year, which ended March 31, 1980. In numbers of computers, IBM Japan is the leader, accounting for as much as 31% of the 45,000 machines in Japan. Sperry Univac, NCR, Burroughs, and other American vendors are estimated to control, together, another 14% of the market.

Japan is the only foreign country where American manufacturers have less than half the local dp business. This is testimony less to the strength of the Japanese companies than to the fiercely protectionist policies adopted by the nation's government. IBM Japan, which operates on a license renewable every five years, is said to have agreed not to let its share of the market push the total foreign share above 50%.

That may now be changing in light of both reduced tariffs on the part of the Japanese and plans by NCR, Burroughs, and Data General to take advantage of the relaxed rules by expanding their production.

In spite of tariff barriers, IBM Japan has successfully kept the native manufacturers off balance in the same way it has managed to stay on top of the American market. After IBM's introduction of the 370 series in the early 1970s, the Japanese manufacturers, supported by government research subsidies, fought back. Japan produced good machines, but they were not good enough to withstand the market tremors that came in the late '70s. That was when IBM introduced the 303X and the 4300. There were also price cuts on IBM's older models. The announcements threw the Japanese market into turmoil, pitting domestic companies against each other in an orgy of competitive price cutting and forcing them to hurriedly introduce new models before the product cycles on their older machines had run their course.

A shakeout followed. Two of the Japanese manufacturers, Oki Electric and Toshiba, abandoned their lines. Only Fujitsu and Hitachi were able to muddle through and come out with any kind of profit.

The topsy-turvy market in Japan was a mirror image of the unsettled conditions that greeted the Japanese companies making their first tentative forays into the American market, which was also reeling from the 4300s.

The Japanese reputation for good business judgment was tarnished by the spectacle of Hitachi signing with Itel to market large-scale machines from Japan. Itel's 1979 losses of about $430 million give Hitachi an intimate connection with one of the most notable business disasters of recent times. (Hitachi is still building computers and selling them through National Advanced Systems Corp.)

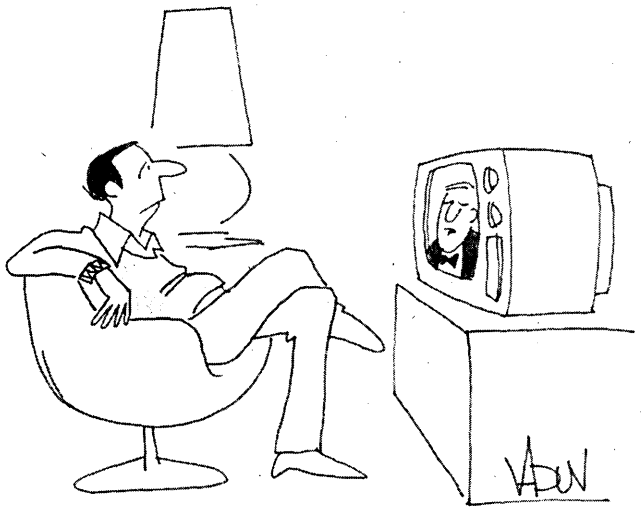
To date, the number of large computers sold in the U.S. that were made in Japan or made using a high percentage of Japanese parts is small to the point of being insignificant. According to International Data Corp., the total is fewer than 300; more than 4,600 machines of comparable size have been sold by IBM.

Two other Japanese companies, NEC and Mitsubishi, sidestepped the market for large machines, confining their American activities to the small business system market. They established wholly owned subsidiaries that sell their products through networks of equipment dealers, but remain vendors nevertheless.

"The Japanese are still groping for an export strategy," says William Rapp, an investment banker who follows the Japanese market closely. "They are trying to pick up different channels of distribution in this country. The Itel saga shows that those channels can be vulnerable."

Even so, great fortunes have been made from more modest beginnings. The Japanese have clearly gained in experience from their early encounters with IBM and they show no sign of abandoning their national goal of increasing exports by nearly a third each year,with much of that earmarked for the U.S.

—Joseph Kelly
New York, New York



"And, it's not raining rain, you know, it's raining violets."

CARTOON BY CHUCK VADUN

ADJUSTING AFTER AUTOMATING

I am an anthropologist who, for the last few years, has consulted with firms that incurred employee productivity problems after automating. My previous research had shown that all social groups had to adjust to the impact of new technology. Tribes, villages, and whole civilizations have differed in their degree of success to that adjustment, and the best adjusted groups were those who were able to integrate the new technology with their existing work and social patterns. What I have learned during my "office fieldwork" reinforces the lessons of the past and suggests that anthropological perspectives can help clarify the problems we in dp are encountering.

Perhaps the most important lesson is that any technological innovation is likely to cause a major change in the way line authority and formal work are organized, often in unseen ways. A dramatic example is supplied by the experience of a group of missionaries assigned to an aborigine tribe in Australia. The well-intentioned missionaries attempted to improve efficiency by giving every member of the tribe a new steel ax, replacing the primitive stone axes. At first, everyone seemed pleased with the shiny, effective new tools. In a short time, however, the tribal structure had disintegrated! What the missionaries had failed to realize was that the stone axes symbolized authority—only men had possessed them, and only a few men at that. Moreover, a select group had manufactured the stone axes and were awarded a correspondingly elite status. Once the steel axes had been distributed to everyone, the tribal members were unable to tell who was in charge, to whom they should defer or what their functional roles should be.

In certain cases technological advances are likely to create problems for key personnel under the guise of helping them. The elders in the tribe just mentioned found themselves with a title but no role. In several small businesses with which I worked, the bookkeeper or the accountant who was put on-line found himself in a

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READERS' FORUM

similar predicament. According to two of my business informants, MBAs specializing in data management, the predicament occurs when these personnel can no longer follow their own double entry bookkeeping. Forced to rely on their computers, which demand single entry input, they lose sight of the cash flow. And they find their own positions superfluous, since anyone can now access their data. They have become as demoralized as the Australian aborigine elders did.

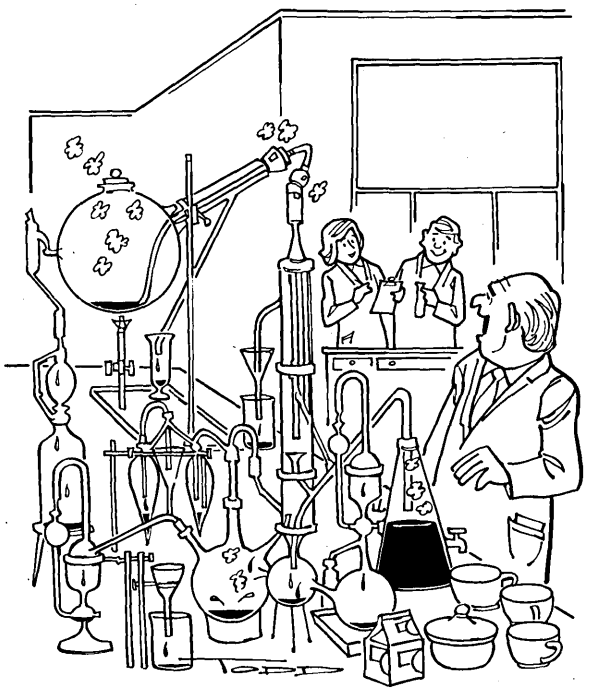
BACKUP IS ONE SOLUTION

One obvious answer is that people who are used to working with a manual backup should continue to do so even if it seems inefficient. Accountants and bookkeepers may need their books. Similarly, stockroom personnel should keep some hardcopy records, rather than relying on computer-based inventories alone.

Another problem in introducing new computer technology is what I would call the "magic box" effect. Computers are still seen as magic boxes and dp personnel are seen as magicians by some non-dp personnel. In many sub-Saharan tribes, the ironworkers are viewed with the same kind of awe and dread. As practitioners of the magic of smelting, these people are feared and kept away from the rest of the tribe.

Dp personnel unconsciously or consciously play the same role in many companies. Their jargon and dress is distinctive, and they are sometimes accorded special privileges. In one client firm the dp manager had literally put his office in the remotest part of the building. Two doors separated him from the rest of his staff. Unlike other mortals, he had a door of his own to the parking lot. I helped bring him back into his "tribe," so that now he is in the middle of several departments. And people actually ask him out to lunch!

Office automation can also affect informal work patterns. These patterns are the accommodations people develop in any work situation to make the formal structure actually operate. They are necessary and healthy compensations for the limits of any formal system. Travelers to Mexico have probably seen women going out to a well to draw water, singing, and trading off tasks with each other. Developers have ruined these informal patterns in many areas by putting in single dwellings with their own faucets. True, it becomes easier to get water, but the women now have nowhere to so-



"Coffee's ready."

CARTOON BY LEONARD TODD

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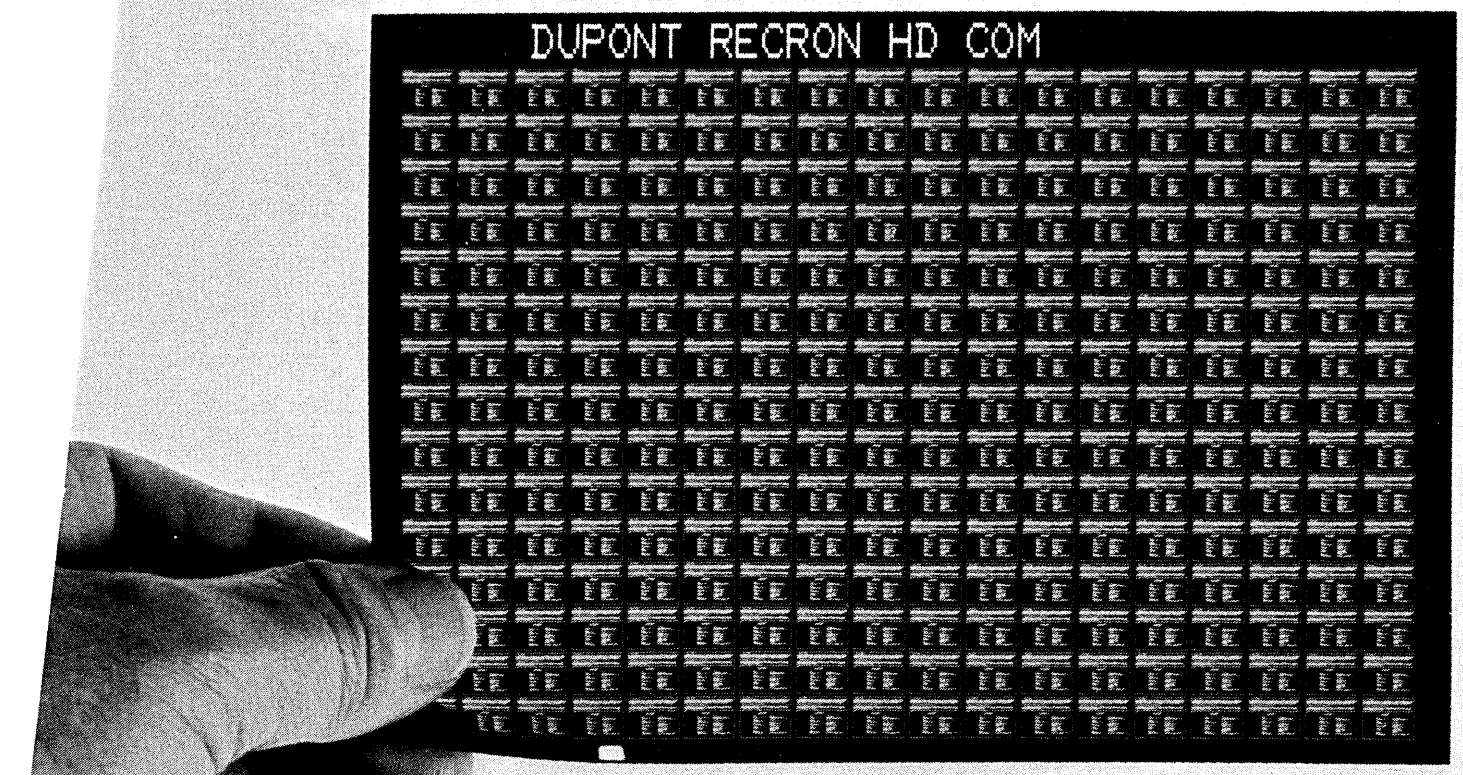

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READER'S FORUM

cialize and do the essential sharing of work that has kept the village functioning smoothly.

Secretarial pools that have been given word processors experience similar adjustment problems. Before the new machines, typists could use their machines and chat with each other. With the word processors, they find that they can no longer chat and do necessary trade-offs. Many complain of being isolated. Moreover, they are forced to keep their bodies in a more rigid position, which results in a good deal of additional stress. Many offices are experiencing demoralization in these pools without understanding why. It isn't an easy problem to solve, but offices can be alerted to the possibility of a solution.

Introducing office technologies may bring about subtle adverse reactions by the "natives." Years ago in India, eager developers gave villagers solar disks with which to cook their meals. The villagers quietly discarded them or used them as bowls, because they preferred the taste of food cooked with their traditional fuel—dung. Office computers and peripherals aren't as easy to discard, but, again, they tend to be sabotaged or ignored by alienated workers. In one small utility, the bookkeeping staff argued that the computerized billing system did not work very well. They had been using it for five years and had found that it could not adjust itself to the high degree of transiency in the service area. The solution was a return to handwritten billing.

A large utility's dp manager forestalled a good deal of employee resistance to automation in two ways. First, he innovated according to the levels of technology each office chose independently. Second, he installed standalone minicomputers so that each office had to be approached in the customary ways to retrieve data. This approach also helped to prevent the bane of modern inventory control: the deliberate inputting of false data by staff attempting to short-circuit supervisory oversight.

People have evolved complex and subtle ways of working with each other to satisfy job requirements and personal needs. People involved in automating offices must alert themselves to these patterns, and must concentrate on "appropriate technology" as much as on high technology. While insightful organization of office tasks can avert many problems, plans should be made to accomplish automation upgrading gradually if the office organization is to function as effectively as a traditional "tribe."

—Richard Zimmer
Santa Rosa, California

Answer to puzzle on page 184

C	A	P	R	I	■	S	K	A	W	■	P	E	E	P	
A	C	R	I	D	■	E	I	R	E	■	R	O	L	E	
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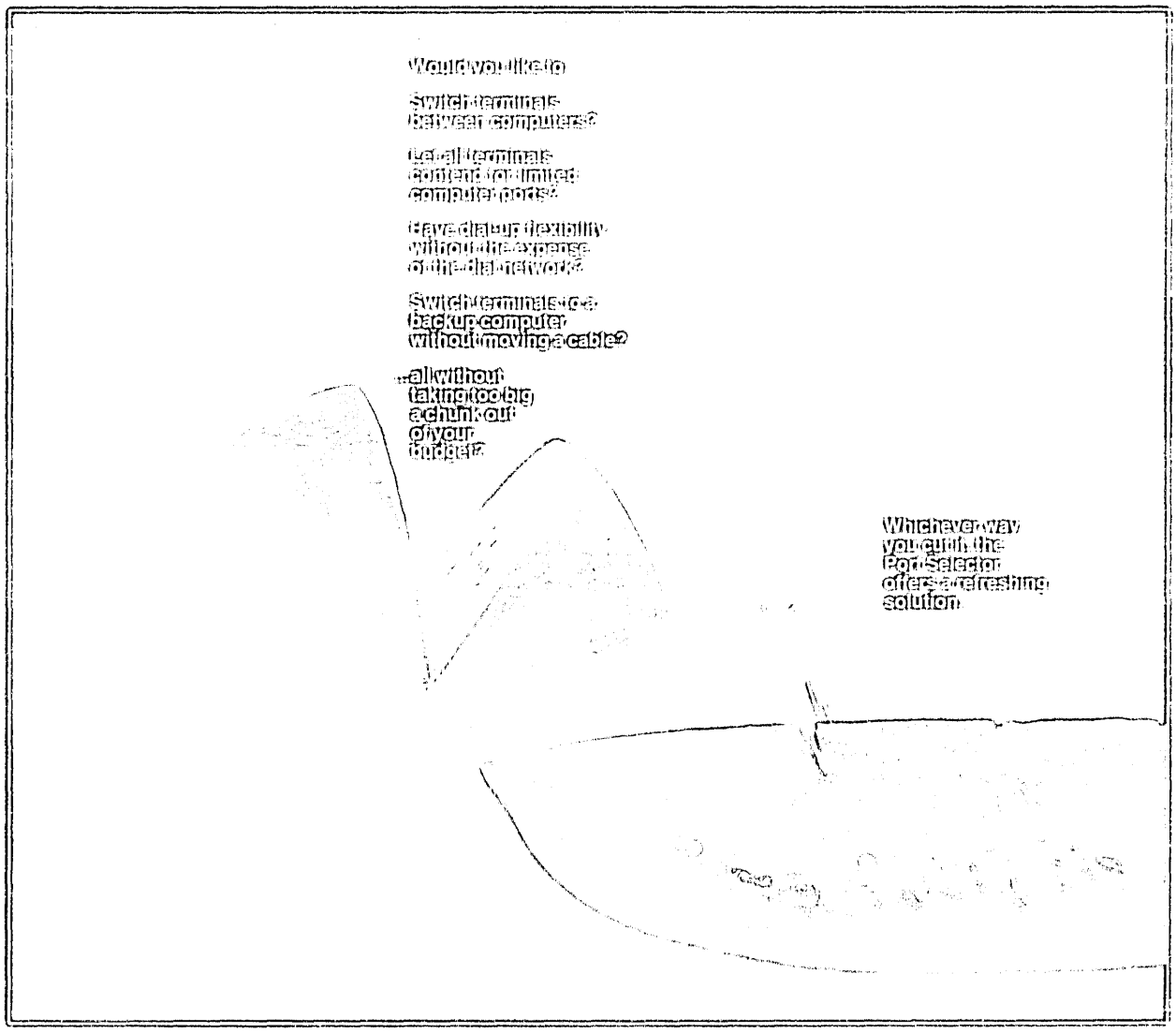

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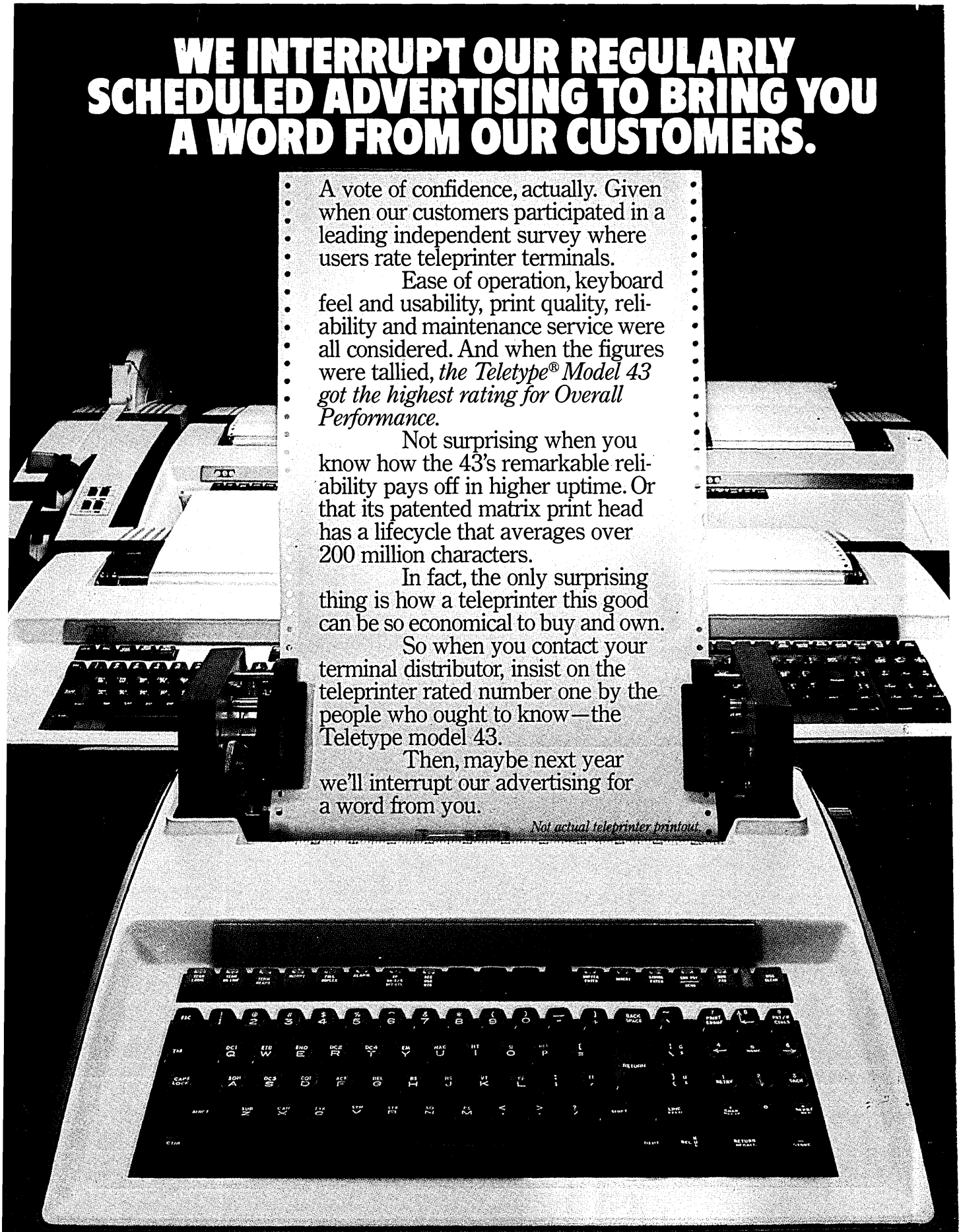

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