SPECIAL EDITION

NOVEMBER 25/5.00 U.S.A.

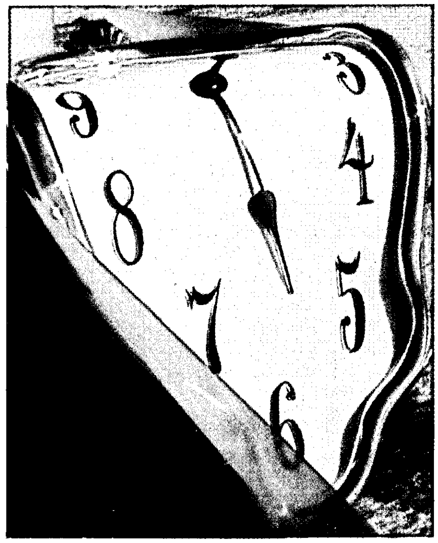
ENTERING THE '80s: A DECADE OF GROWTH

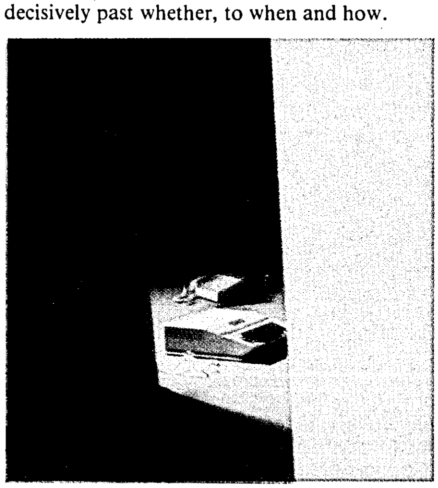
5.00 U.S.A.

DATAMATION 79 ®

DATAMATION 79®

NOVEMBER 25, 1979/5.00 U.S.A. VOLUME 25 NUMBER 13





COVER: PHOTOGRAPH BY PAT FIELD

DATAMATION

Editor John L. Kirkley
Managing Editor Laton McCartney
Special Editions Editor Becky Barna
Articles Editor Wendy Reid Crisp
International Editor Linda Runyan
European Editor Ralph Emmett
Products Editor Bill Musgrave
Copy Editor Florence Lazar
Special Assignments Editor Becky Barna
Articles Assistant Sarah Rolph
News Editor Tom McCusker
Surveys Editor Louise Shaw
Bureau Managers
San Francisco Edward K. Yasaki
Los Angeles Edith D. Myers
Boston Vin McLellan
Correspondents
Atlanta Lynn Ridlehuber
Southwest Robert F. Alexander
London Fred Lamond
Paris Andrew Lloyd
Editorial Advisor Robert L. Patrick
Technical Advisor Lowell Amdahl
Contributing Editors Ralph G. Berglund, Howard Bromberg, Philip H. Dorn, John M. Eger, Ron Frank, Martin A. Goetz, David Hebditch, Louis B. Marienthal, Angeline Pantages, Russell Pipe, Carl Reynolds, F. G. Withington
Design Director Steve Phillips

EDITORIAL OFFICES
Headquarters: 666 Fifth Ave., New York, NY 10019. Phone (212) 489-2574. **New England:** 161 High St., Boston, MA 02110 (617) 426-2487 **Eastern:** 35 Mason St., Greenwich, CT 06830, (203) 661-5400, Telex 996343. 420 Lexington Ave., New York, NY 10017, (212) 682-7760. 6605 Burlington Pl., Springfield, VA 22152. (703) 569-3383. **Southwestern:** 11500 Stemmons North, Suite 152, Dallas, TX 75299, (214) 247-5221. **Western:** 1801 S. La Cienega Blvd., Los Angeles, CA 90035, (213) 559-5111; 2680 Bayshore Frontage Rd., Suite 401, Mountain View, CA 94043, (415) 965-8222. **Foreign:** 20 Leamington Road, Southend-on-Sea, Essex, SS1 2SN, England, phone: Southend (0702) 611648. **TELEX 996-343**

Art & Editorial Production
Director Kenneth Surabian
Advertising Production Mgr. Robert Gaydos
Editorial/Production Assistant William Pohl
CIRCULATION
666 Fifth Avenue, New York, NY 10019
Circulation Manager Suzanne A. Ryan
Marketing Research Mgr. Deborah Dwelley
Publisher James M. Morris

Technical Publishing
a company of The Dun & Bradstreet Corporation

BPA Circulation audited by Business Publications Audit

ABP Member American Business Press, Inc.

DATAMATION (USPS 148-800) Magazine is issued monthly on or about the first day of every month, plus one special issue in mid-May. Published by Technical Publishing, a Dun and Bradstreet company, 1301 South Grove Ave., Barrington, Illinois 60010, James B. Tafel, Chairman; John K. Abely, President. Executive and Advertising offices, 35 Mason Street, Greenwich, CT 06830, (203) 661-5400. Editorial offices, 666 Fifth Ave., New York, NY 10019. Published at Chicago, Ill. DATAMATION is circulated without charge by name and title to certain qualified individuals in the United States and Canada who are employed by companies involved with automatic information handling equipment. Available to others by subscription at the rate of $32 (U.S. and Possessions), $42 (Canadian). Reduced rate for qualified U.S. students: $16. Foreign subscriptions: £33:50. Additional charge for airmail: £30:00. Japan, Australia and New Zealand: £38:50 (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 HA 13QT, England. No subscription agency is authorized by us to solicit or take orders for subscriptions. Controlled circulation paid at Columbus, OH.

Microfilm copies of DATAMATION may be obtained from University Microfilms, A Xerox Company, 300 No. Zeeb Road, Ann Arbor, Michigan 48106. Printed by Beslow Associates, Inc.
POSTMASTER: Form 3579 to be sent to Technical Publishing Company Circulation Office: 666 Fifth Avenue, New York, NY 10019. Publication Number: 148800. Single copy: $3.00 in U.S.A.

Software is 80% of costs & going up

RAMIS II®

stretches your software budget

In 1965, system development costs were fairly evenly divided between software and hardware. Today many sources indicate that 80% of the cost is software. And the trend is continuing.

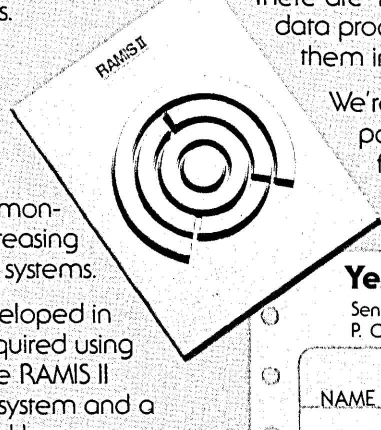
Why? Because software technologies are not keeping up with hardware in improving productivity. Software is now the major constraint restricting effective use of computers.

How can you get more from your software dollar?

RAMIS II.

RAMIS II improves software productivity by decreasing the amount of money spent on maintenance. And increasing the amount left for productive new systems.

With RAMIS II, new systems are developed in no more than one-fifth the time required using conventional means. That's because RAMIS II is both a data base management system and a complete English-like nonprocedural language.



With RAMIS II, you just say what you want. You don't have to tell the computer how to produce it.

A simple request gives you information from anywhere in the data base. And, you don't have to make costly application changes every time you change the data base.

There are 175 ways RAMIS II can improve your data processing. We'd like to tell you about them in our free RAMIS II factbook.

We're Mathematica, a technical consulting, policy research, and computer software firm involved in the improvement of decision-making techniques.

MATHEMATICA

The brains behind RAMIS II

CIRCLE 7 ON READER CARD

Yes! I'd like the free RAMIS II Factbook.

Send to: Mathematica Products Group
P. O. Box 2392, Princeton, New Jersey 08540 /800·257·9576

NAME ______________________

TITLE ______________________

COMPANY ______________________

ADDRESS ______________________

CITY ____________ STATE ________ ZIP ________

PHONE ______________________

by Becky Barna, Special Edition Editor

EDITOR'S READOUT

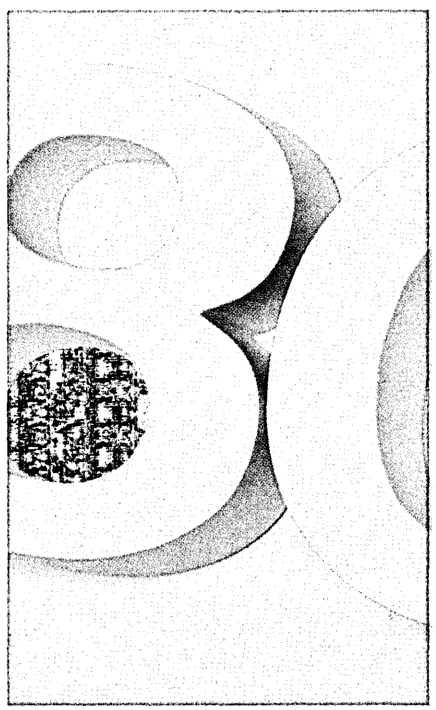
CORPORATE COORDINATION

With this Special Edition, we look to the future and the promises and predicaments in store. It is possible that technological advances will carry us as far in the next 10 years as we have traveled in the past 100.

The technology will be there. What is in doubt is management's ability to exploit it to the fullest. One problem that may stand in management's way is its relations with the data processing department. One of the more amusing antics in industry occurs when a corporation goes in one direction and its dp department in another. It would be even funnier if so much time, money, and talent weren't being wasted.

Somehow we think we're too sophisticated today for this situation to occur, but obviously we aren't. We've long since passed the stage where data processing was eyed as some sort of black magic. But we've yet to realize fully that dp is an important part of an organization's bag of tricks.

Some interesting findings about management's appreciation (or lack thereof) of the dp function are revealed in a recent report from Deutsch, Shea & Evans, a New York-based human resources consulting firm. According to DS&E's nationwide survey of 1,054 dp professionals, a common complaint of programmers, systems analysts, and dp managers alike is that corporate-level management remains ignorant of the dp function and fails to include dp departments in major company decisions.



Probing the subject of perceived management attitudes, DS&E asked survey respondents the following question: "Do you think your company's management adequately appreciates the contribution to overall company operations made by the edp department?"

A bare majority, 53%, answered this question affirmatively. Of the 357 respondents who had a negative view of management's attitude toward data processing, the top ranking reason was that upper level management lacks understanding of the contribution of dp as an organizational function, of the work it involves, and of the potential it holds. (Typical comment: ". . .management is made up of former salesmen and Harvard MBAs with no edp background.")

Next ranking was management's lack of support of the dp function (e.g., ". . .they ignore us for the most part, except when they need something"), followed by complaints about budgetary constraints (e.g., ". . .continual fight to justify large, needed expenditures").

We would no doubt get some equally critical comments if the tables were turned, but that's not the point. The point is that there is a failure to communicate, a lack of corporate coordination.

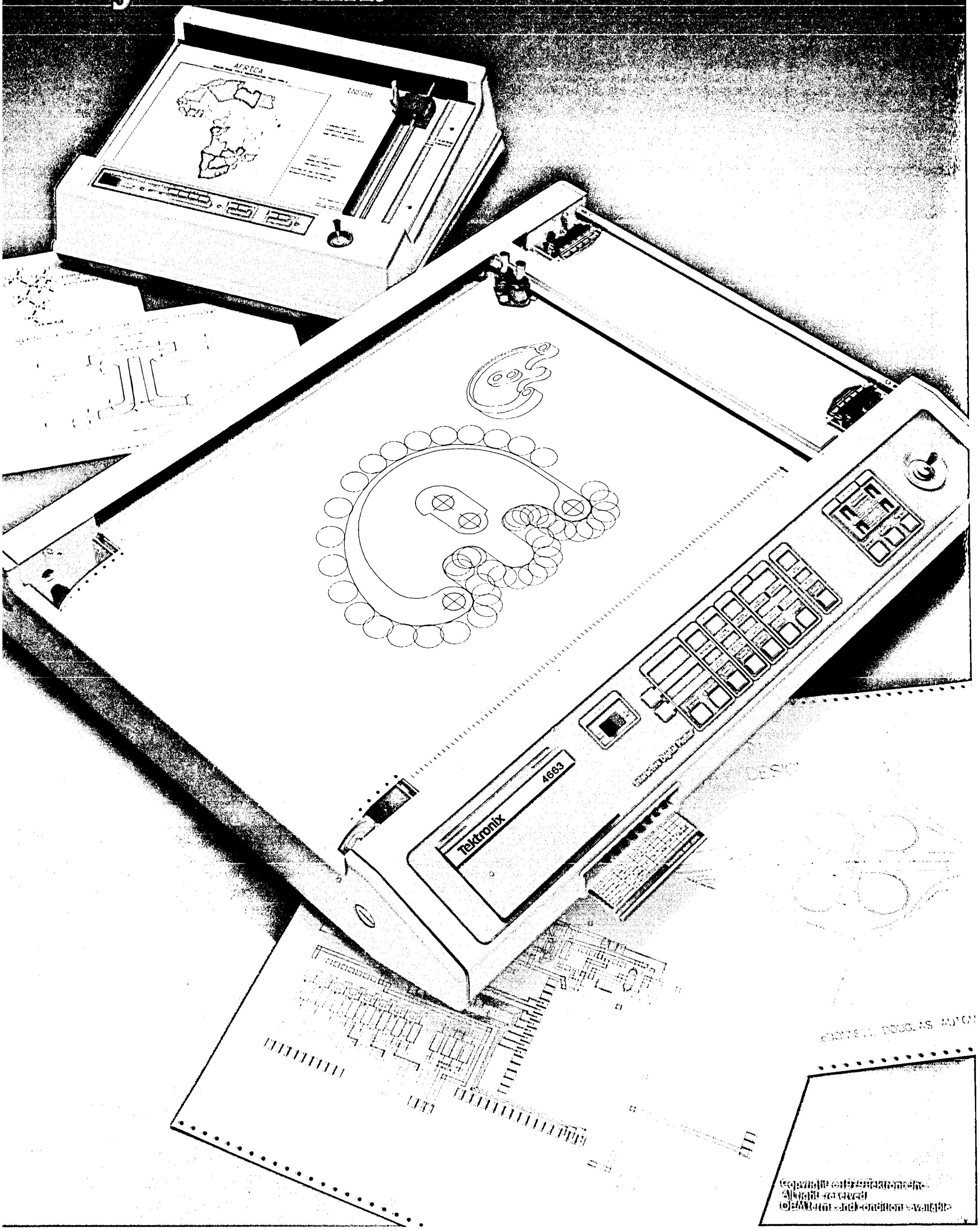
It's true that most corporations are not in business just to run their dp departments. Data processing is only one of the tools that allow a corporation to function, but planning within the dp department must mirror planning within the corporation for the tool to be effective.

The ideal arrangement would be for dp managers to be promoted to positions in top management where they would participate in corporate planning. At the very least, dp managers should be involved in the initial phase of corporate decision-making.

Even now, most corporations have extensive information services and systems at their disposal. The real challenge to the corporations is to manage and exploit the technology to the fullest. That requires integration of dp planning with overall corporate planning. Dp may be only a tool, but it's a tool that can help build a strong, competitive edge for the organization that manages it well. *

From the graphics leader.

The Practical Plotters. By Tektronix.

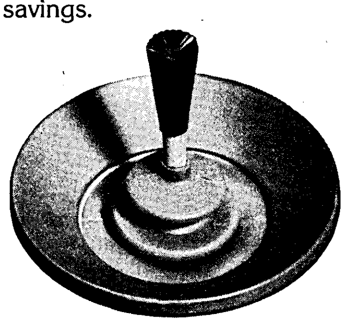


Do your big plotter work. At a small plotter price. That's practical!

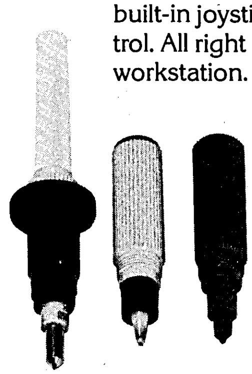
At Tektronix, we build plotters that pay for themselves.

Practicality is why Tektronix pioneered the smart small plotter. Why we led the move to more reliable, digital technology. We're proving that big plotter performance can take a small plotter price, with capabilities like those of our C-size (A2) 4663.

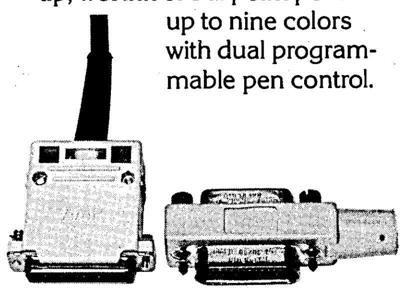
Economy. Instead of waiting in line for large plotter output, you can typically do two-thirds of your plotting on our 4663, with comparable quality. Faster turnaround. Tremendous cost savings.



Interactivity. Microprocessor intelligence not only makes the 4663 semi-independent, it lets you draw real curve forms. Rotate characters. Digitize with built-in joystick control. All right at your workstation.

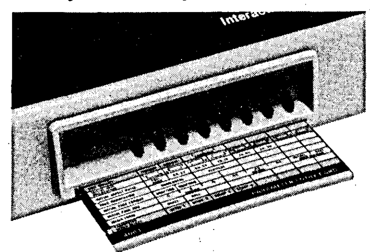


Versatility. The 4663 plots on paper, film or Mylar.® With felt tip, wet ink or ballpoint pens. In up to nine colors with dual programmable pen control.



Compatibility. From its RS-232-C and GPIB (IEEE-488) interfaces, to options like foreign language fonts and circular interpolation, our plotters mesh with your present system and particular needs. Powerful, wide-ranging software routines are both inexpensive and easy to use.

Simplicity. Our parameter entry card replaces rear panel straps and switches with a simple system for setting up to four sets of operating conditions right from the front panel, so one plotter can instantly accommodate four totally different jobs.



Bring Tektronix into your bidding picture. It's the only practical thing to do. Next time you're shopping for plotters, let your local Tektronix representative show you output samples and examples of what our Practical Plotters can do for you. Call him directly, or call our toll-free automatic answering service at 1-800-547-1512. In Oregon, call 644-9051 collect.

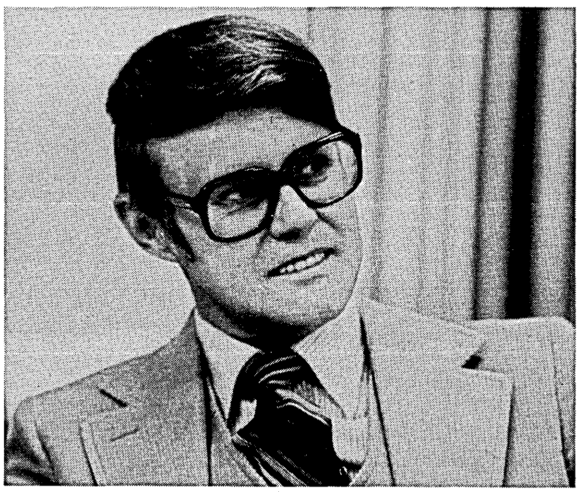
Tektronix, Inc.
Information Display Division
P.O. Box 500
Beaverton, OR 97077

Tektronix International, Inc.
European Marketing Centre
Postbox 827
1180 AV Amstelveen
The Netherlands

The practical plotters

Tektronix®
COMMITTED TO EXCELLENCE

"Productivity is up 50%."



Harry Wolford, Director of Computer Services and Statistical Reports, Ohio State Department of Education, Columbus, Ohio.

Productivity.

"We do all the computing for the State Department of Education in Ohio, plus some legislative support work for the Governor's office, the Ohio General Assembly, and other state agencies.

"When we switched from batch to the DECSYSTEM-2050, the productivity of our programmers went up easily 50%. Programmers like the 2050 so much that if we went back to batch tomorrow, we'd probably lose 75 to 80% of them.

"And for its price, the 2050's communications power is simply unbeatable."

Software Compatability.

"Our applications include oil and gas exploration and financial planning using an economic model.

"We started with a DECSYSTEM-2040, but people found it so easy to use, they just went wild over it—we were doing five times the anticipated workload in just four months. So we upgraded to a DECSYSTEM-2050—another 250K bytes, one more disk and channel, and cache memory.

"The conversion took less than an afternoon—with absolutely no software changes. We just told the machine it had more memory, and that was all there was to it."

H. B. Taylor, Director, Houston Computer Center, Allied Chemical Corporation, Houston, Texas.

The IBM 4300 set astonishing price/performance standards. But we "ain't seen nothing yet!"

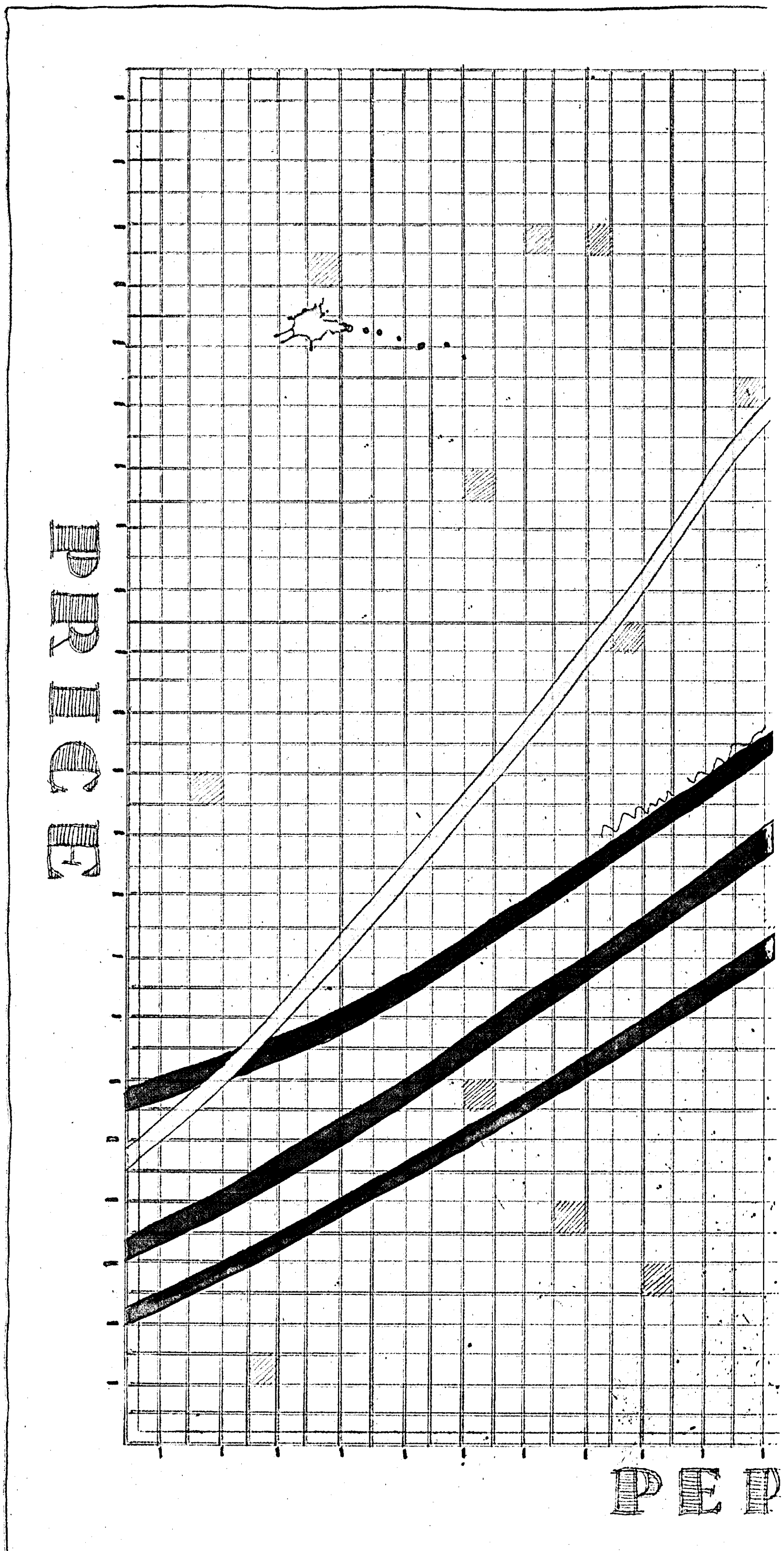
PRICE/PERFORMANCE, SEMICONDUCTORS AND THE FUTURE

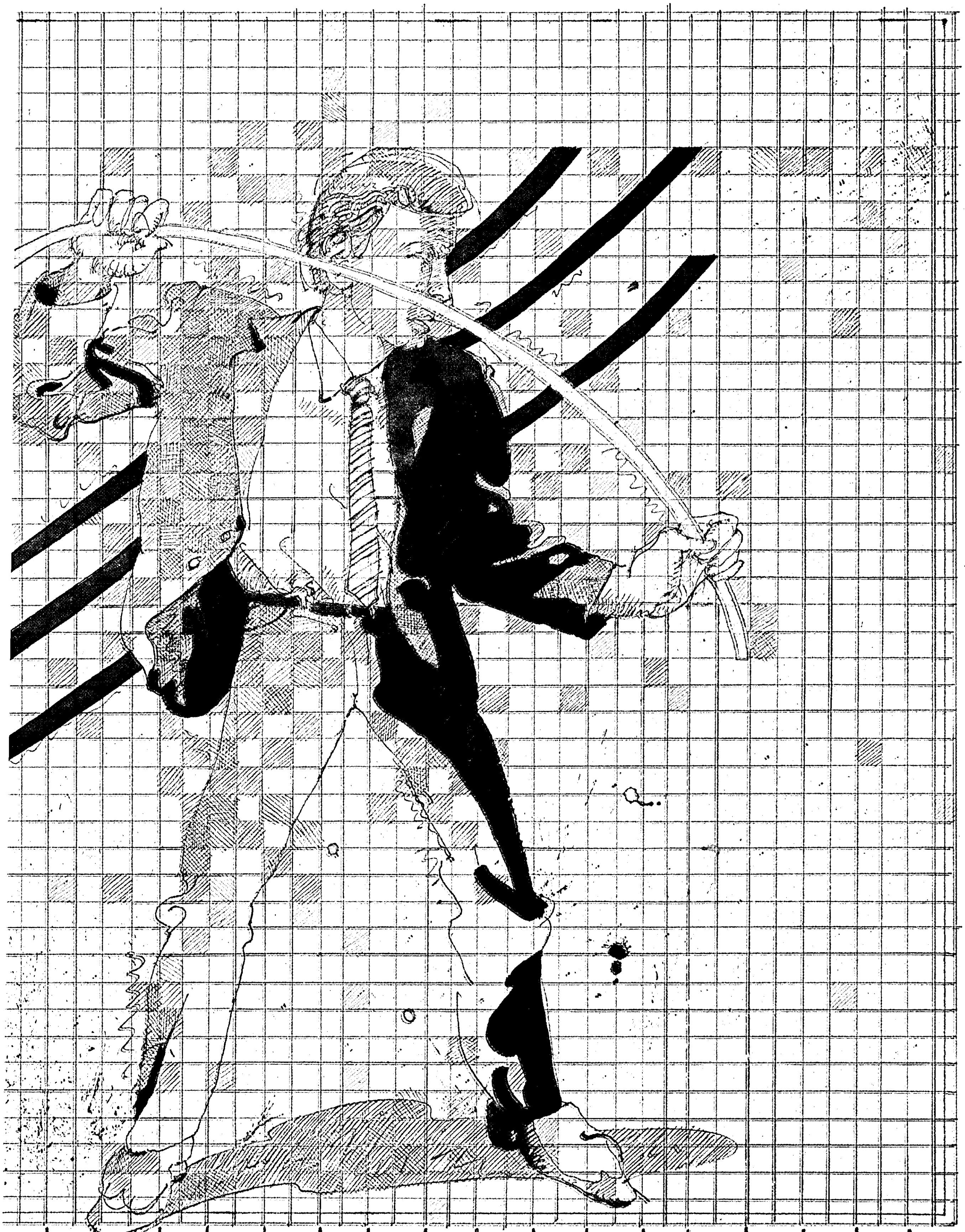
by David L. Stein

By the end of the next decade, the information processing industry will have greatly altered the world in which we live and work. While many factors will be responsible, none will be more of a driving force behind this change than the continuing development of semiconductor technology.

To illustrate, the IBM 3033, presently the company's largest mainframe, has a performance rating of 5 MIPS (millions of instructions per second) and a volume measured in cubic yards. In contrast, IBM has recently postulated a late-'80s machine with 70 MIPS performance and packaged in a 6-inch cube! The primary difference between the two machines—the factor which accounts for the change in both size and performance—is the difference in their semiconductor components.

The role of semiconductor technology has been deemed an important one in computer manufacturing ever since the invention of the transistor but, until recently, conventional wisdom held that the semiconductor industry was dependent upon the computer industry. This notion was popularized in the late '60s by consultants who advised semiconductor firms that they should "get into the computer business to be viable over the long pull!" (Note that HP and TI, to name two of the more successful, did precisely that.) Today, the computer industry is seen to be the depend-





FORMANCE

ILLUSTRATION BY JOE CIARDELLO

By automating the design and manufacturing processes, IBM has married computer manufacturing to semiconductor manufacturing in an entirely new way.

ent, and the same consultants are probably admonishing computer manufacturing clients to "get into the semiconductor business to be viable. . .!"

Why this turnabout? What happened to precipitate this fundamental role reversal, which will eventually have a profound impact upon the strategies of most if not all computer manufacturers? Perhaps the only satisfactory answer is that semiconductor technology has just recently reached the point in its evolution where its full implications for vendors—though not obvious—are beginning to be understood.

4300 LEADS THE WAY

One way to understand the implications of the escalating semiconductor technology is to analyze today's state of the art in that technology. And the best product on which to base this analysis currently is IBM's 4300. It is, quite possibly, the most significant development to occur in the computer business in this decade!

In the new IBM systems, we perceive a dramatic departure—other than price/performance—from prior generation computer hardware. Of primary importance is IBM's new computer manufacturing technology. What IBM calls a Computer Aided *Design* System might just as accurately be called a Computer Aided *Manufacturing* System. The truth is, it is both. By automating the design and manufacturing processes, IBM has married computer manufacturing to semiconductor manufacturing in an entirely new way.

The result is that IBM can now work "top down" from an overall architectural description of a computer system through detailed logic design of the computer subsystems to actual design of the custom semiconductor components required to optimally implement those subsystems. Along the way, IBM can incorporate supporting logic designed to enhance manufacturability and testability as well as performance and reliability, all the while making optimal use of printed circuit "real estate" at each level of the packaging hierarchy.

An example of this capability is the Level Sensitive Scan Design (LSSD) feature of IBM's custom LSI components. By using up to an additional 20% of the chip real estate for interfacing circuits, IBM has designed into its own computers an unprecedented testability. The LSSD feature permits nearly 100% static (DC) testing at the component level and more than 90% static testing at the system level.

As significant as such features are, they do not overshadow the fact that the principal motivation for integrating component design with computer design was to eliminate the waste that results from attempts to use so-called "microprocessors" or other "universal" LSI building blocks. Thus, the

TABLE 1

IBM TECHNOLOGY

CUSTOM LSI/VLSI INTEGRATED CIRCUITS (IC'S)

- ☐ 250 MILS SQUARE SILICON DICE
- ☐ OPEN PART NUMBER SETS/MASTERSLICES
- ☐ 3 CUSTOM CIRCUIT OR "PERSONALIZATION" LAYERS
- ☐ 700 GATES OR 7,000 "COMPONENTS"/IC FOR 3 NS TTL LOGIC
- ☐ 1,400 GATES OR 14,000 "COMPONENTS"/IC FOR 1.5 NS ECL LOGIC
- ☐ 18K, 32K, 64K DYNAMIC SAMOS RAM WITH 140/280, 285/470, 440/980 NS ACCESS/CYCLE SPEEDS
- ☐ 132 SOLDER CONNECTIONS TO CHIP CARRIER

TABLE 2

IBM TECHNOLOGY

HIGH DENSITY PACKAGING OF LOGIC AND MEMORY

- ☐ .06—.16 INCH CERAMIC CHIP CARRIERS WITH UP TO 23 LAYERS OF PRINTED CIRCUITS
- ☐ 1, 1⅜, 2 INCH SQUARE MODULES FOR 1, 4, 9 IC'S WITH 116, 196, 361 INTERCONNECTING PINS PER MODULE, RESPECTIVELY
- ☐ 4⅞ x 7½ INCH PRINTED WIRING CARDS WITH UP TO 8 LAYERS AND 268 INTERCONNECTING PINS
- ☐ 10 x 15 INCH PRINTED WIRING BOARDS WITH UP TO 16 LAYERS
- ☐ ± .001 INCH TOLERANCE ON PRINTED WIRING LINE WIDTHS
- ☐ UP TO 10 TIMES THE DENSITY OF AVAILABLE OFF-THE-SHELF HARDWARE

TABLE 3

IBM NEXT-GENERATION TECHNOLOGY (?)

SUPERCONDUCTING QUANTUM INTERFERENCE DEVICES (SQUID'S)

- ☐ CUSTOM LSI/VLSI INTEGRATED CIRCUITS (IC'S)
- ☐ 250 MILS SQUARE SILICON DICE
- ☐ 400 GATES/IC FOR .06 NS JOSEPHSON JUNCTION LOGIC (JJL)
- ☐ 2K "FAST" RAM WITH 1/2 NS ACCESS/CYCLE SPEEDS
- ☐ 16K "DENSE" RAM WITH 15/30 NS ACCESS/CYCLE SPEEDS
- ☐ UP TO 1,000 SOLDER CONNECTIONS TO CHIP CARRIER OR "CARD"

TABLE 4

IBM NEXT-GENERATION TECHNOLOGY (?)

SUPER DENSITY PACKAGING COUPLED WITH SUPER PERFORMANCE

- ☐ .6x1.2INCH SILICON"CARDS"FOR 4/8(LOGIC/MEMORY)IC'S WITH MORE THAN 300 INTERCONNECTING "MICRO" PINS PER "CARD"
- ☐ 2.6 INCH SQUARE SILICON "BOARDS" FOR MOUNTING UP TO 64 "CARDS" VIA MORE THAN 10,000 INTERCONNECTING "MICRO" SOCKETS
- ☐ UP TO 2,500 PRINTED WIRING CHANNELS PER INCH
- ☐ UP TO 10 TIMES DENSITY OF NEW IBM 4341 HARDWARE
- ☐ UP TO 100 TIMES PERFORMANCE OF NEW IBM 4341 SYSTEM

Building a computer facility is not a do-it-yourself project.

It's too important. And you have too much to do to coordinate the efforts of:

But we do it all the time. And in the last 10 years, we've planned or built facilities for more than 400 customers. Facilities for all sorts of computers.

We know computers. We know construction. We know how to create an environment for the efficient operation of a computer center. And we offer a full range of services, from consultation to the entire job.

We're international, too. With 11 offices in the United States and 15 in other countries, we're ready to serve customers around the world.

We'd like to show you what we can do for you. For more information on our full range of services, contact your nearest Control Data office or write to:

Facility Planning and Construction
Control Data Corporation
HQN11I, P.O. Box 0
Minneapolis, MN, 55440

CONTROL DATA CORPORATION

More than a computer company

IBM's competitors simply cannot rely on the merchant semiconductor industry in the future; they must have that capability in-house.

savings from top-down custom component design are more than enough to pay for the new manufacturability and testability features.

An important side benefit of this vertically integrated approach to computer/component design and manufacturing is the increased performance and reliability that result from elimination of the unused circuit elements built into designs based on more universal components, to say nothing about wasted real estate at other levels of the packaging hierarchy and/or its manufacturing costs.

Some of the parameters of IBM's new semiconductor technology are listed in Table 1. At first glance, there appears to be little in the way of density or performance breakthroughs. Some would even argue that a die size of 250 mils is too large for high yields. Upon closer inspection, however, it can be seen that IBM has quite shrewdly achieved a new level of cost/performance without pushing the state of the art in chip density or speed, thereby reserving significant cost/performance improvement potential for future product enhancements.

By employing a larger die size, IBM is able to trade off material cost against manufacturing yield. Thus, the 64K memory chip contains redundant storage arrays for the purpose of replacing defective arrays detected in the manufacturing process. Similarly, by employing this larger die size, IBM is able to incorporate a more complex interface function on that same 64K memory chip. The complex interface is used in conjunction with a memory access pipeline in the larger computers to achieve significantly higher performance than would be possible without it. For example, in a computer supported by a high-speed buffer (cache) which accesses 4 or 8 consecutive words of storage at one time, the effective memory access time is reduced from 440 nanoseconds to 185 or 143 nanoseconds, respectively, making the overall design superior from both cost and performance viewpoints.

PCMs, BEWARE!

The implications for IBM's plug-compatible mainframe (PCM) competition are clear. The old way of simply copying IBM designs, using "standard, off-the-shelf" IC's, is no longer viable. And even if a single PCM could achieve a relatively optimistic 10% penetration of IBM's customer base, the cost of manufacturing custom circuits for that comparatively low volume would almost certainly be higher than IBM's corresponding cost.

Moreover, there is nothing to keep IBM from improving its own IC's. After all, IBM has succeeded in shortening its own development cycles as a direct result of its highly automated design and manufacturing processes. Furthermore, through the development of a proprietary "interconnect" or "packaging" technology, IBM has achieved an extremely high degree of design flexibility for accommodating newer and more complex IC's as they become available.

Compare the number of interconnections with those now available in off-the-shelf technology. IBM bonds each chip directly to a ceramic substrate or chip carrier with 132 solder connections. This provides for 38 power/ground leads and 94 signal leads. The conventional Dual Inline Package (DIP), on the other hand, typically has from 16 to 40 leads for both power/ground and signal connections. Clearly, the DIP is no match for the IBM chip carrier, and one can conclude without fear of being rash that the days of the DIP are numbered insofar as its application in computer mainframes is concerned.

But this is not the end of IBM's current advantage; on the contrary, it is only the beginning. An examination of the remainder of IBM's new packaging technology (See Table 2) indicates that IBM enjoys a similar advantage in interconnectivity at every level of the packaging hierarchy. For example, employing its largest chip carrier, IBM might well design a "superchip" made up of nine LSI/VLSI chips interconnected through the printed circuits deposited directly on the carrier substrate and, in turn, connected to a circuit card or board through not 16 or 40 but 361 input/output pins.

It is not surprising that the System/38 processor is contained on a single 10″ × 15″ board. Nor is it surprising that the 4300 systems are infinitesimal in size in comparison with the behemoths they are replacing. Furthermore, with the numbers of pins available, IBM can stack the chips in "piggyback" fashion on the same module, thus increasing densities even further. For example, IBM can stack four 64K RAM chips on a single one-inch square module to achieve the equivalent density of a 256K RAM. Is this a new generation of computer hardware or isn't it? We think it is!

"AIN'T SEEN NOTHING YET!"

In fact, IBM has introduced its first really new computer hardware technology since the introduction of the System 360/85 (the antecedent of the later System 370/Models 165 and 168), which was announced in March 1968. Thus, it has been a full 11 years since IBM introduced a computer hardware technology as significant as that embodied in the new 4300 systems. But all indications are that we "ain't seen nothing yet."

IBM is already telegraphing its intentions about the direction of its future computer technology. For example, Dr. Lewis M. Branscomb, an IBM vice president and chief scientist, has publicly stated that IBM considers "Josephson Junction" circuit technology to be an emerging "base" technology on a par with electron-beam (or E-beam) lithography. His remarks were made during a keynote panel session at the IEEE Compcon '78 on Sept. 6, 1978. Those same remarks were recently published in the IBM *Systems Journal*.

Incidentally, he also pointed out that IBM has repeatedly demonstrated its ability to achieve a 25% compound annual rate of improvement in cost/performance for computers of equivalent or similar function during the past 25 years. As if to underscore the point, IBM recently published an article by Dr. Wilhelm Anacker, manager of the Exploratory Cryogenic Technology Department at the IBM T.J. Watson Research Center in Yorktown Heights, N.Y., in the IEEE *Spectrum*, in which IBM described a "hypothetical" computer based on Josephson Junction technology. (While IBM was careful to point out that this was a "hypothetical" computer, the company is well known for its policy of *not* speculating about "futures." Thus, we believe their remarks ought to be taken seriously.)

A few highlights taken from that IEEE *Spectrum* article are listed in Table 3. While some of the other circuit parameters are not all that impressive (e.g., only 400 gates/IC and 2K or 16K bits/IC), it is immediately apparent that the advent of circuits like these with switching speeds roughly 50 times as fast as those employed in the 4300 would presage a whole new generation of ultrafast computers.

IBM FLIRTS WITH THE FUTURE

One might presume that the development of such high performance circuits would require exploitation of the small-geometry potential of E-beam lithography, but Dr. Anacker points out that, "The data and estimates presented in this article are based on experimental results . . . and submicron junctions made with electron-beam and/or X-ray lithographies . . . have not yet been assessed for circuit performance and density." Again, IBM is emphasizing "packaging" at all levels, not just at the chip. Table 4 indicates that the payoff potential is enormous.

Will IBM realize its objectives with respect to Josephson Junction technology? And

NETWORK MANAGEMENT FROM YOUR COMMAND TERMINAL

TbarMASS+

THE LATEST IN DATA COMMUNICATIONS NETWORK MANAGEMENT EQUIPMENT

With T-Bar Mass + an operator isolates line and equipment faults, restores failed service, reconfigures and expands — MANAGES — a worldwide network using a CRT terminal at one or more dispersed locations.

T-Bar Mass + is a microprocessor based, state of the art, data communications line accessing system.

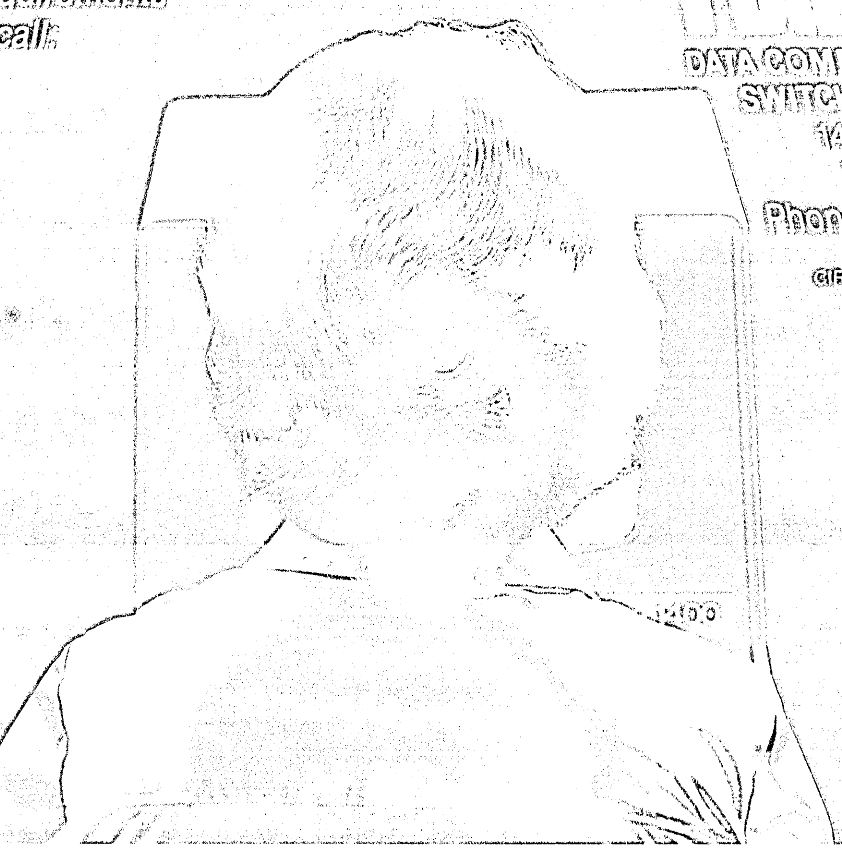
With the addition of Mass +, T-Bar continues to be THE COMPANY able to solve your network control problems and supply all of the equipment required for effective network management. Whether you have to transfer a modem between front end ports in your own room, or monitor and test lines half a world away, there is a T-Bar product designed to simplify your job and economically improve the efficiency of your system.

For all your network management requirements write or call:

Tbar INCORPORATED

DATA COMMUNICATIONS SWITCHING DIVISION
141 Danbury Road
Wilton, CT 06897
Phone: (203) 762-8351

CIRCLE 18 ON READER CARD



IBM has recently postulated a late-1980s machine with 70 MIPS performance and 16 Kbytes of internal memory—and packaged in a 6-inch cube!

if so, in what timeframe will such cryogenic computers become a reality? On the first question, IBM says only that, "The best judgment to date is that although substantial technological improvements must still be made, no major breakthroughs are needed to make Josephson technology feasible." On the second question, IBM says, "Likely not soon."

The next question, then, is what is "soon"? Is 10 or 11 years a long enough time? Apparently the answer is yes, because it took that long for IBM to develop its 4300 hardware technology from the prior technological milestone. Thus, it is not unreasonable to expect that IBM will persevere another 10 or 12 years and produce the next generation of cryogenic computers for introduction sometime near the end of the '80s for delivery in the 1990s.

What this means is that before the end of the next decade, IBM will be able to build a mainframe with an internal performance rating of 70 MIPS, 32 Kbytes of cache memory, and 16 Mbytes of main storage in a single 6-inch cube of carefully laminated silicon. That this mainframe will run only when immersed in a liquid helium bath will be of no greater consequence than the fact that the System 360/Model 8 required a source of chilled water for its cooling.

That leaves only one major question unanswered: where does all this leave IBM's competitors, and particularly those who do not have their own semiconductor manufacturing capability? It's a question of great interest to users and vendors alike.

ALL THINGS GREAT AND SMALL

The answer is still somewhat dependent upon the particular market niche occupied by the competitor. But if IBM's competitors hope to compete at the high-performance end of the computer spectrum, they simply cannot rely upon the merchant semiconductor industry in the future. On the other hand, the situation only improves gradually as one moves down the performance spectrum towards the microcomputer, so that no one, except perhaps terminal manufacturers, is really immune from this threat.

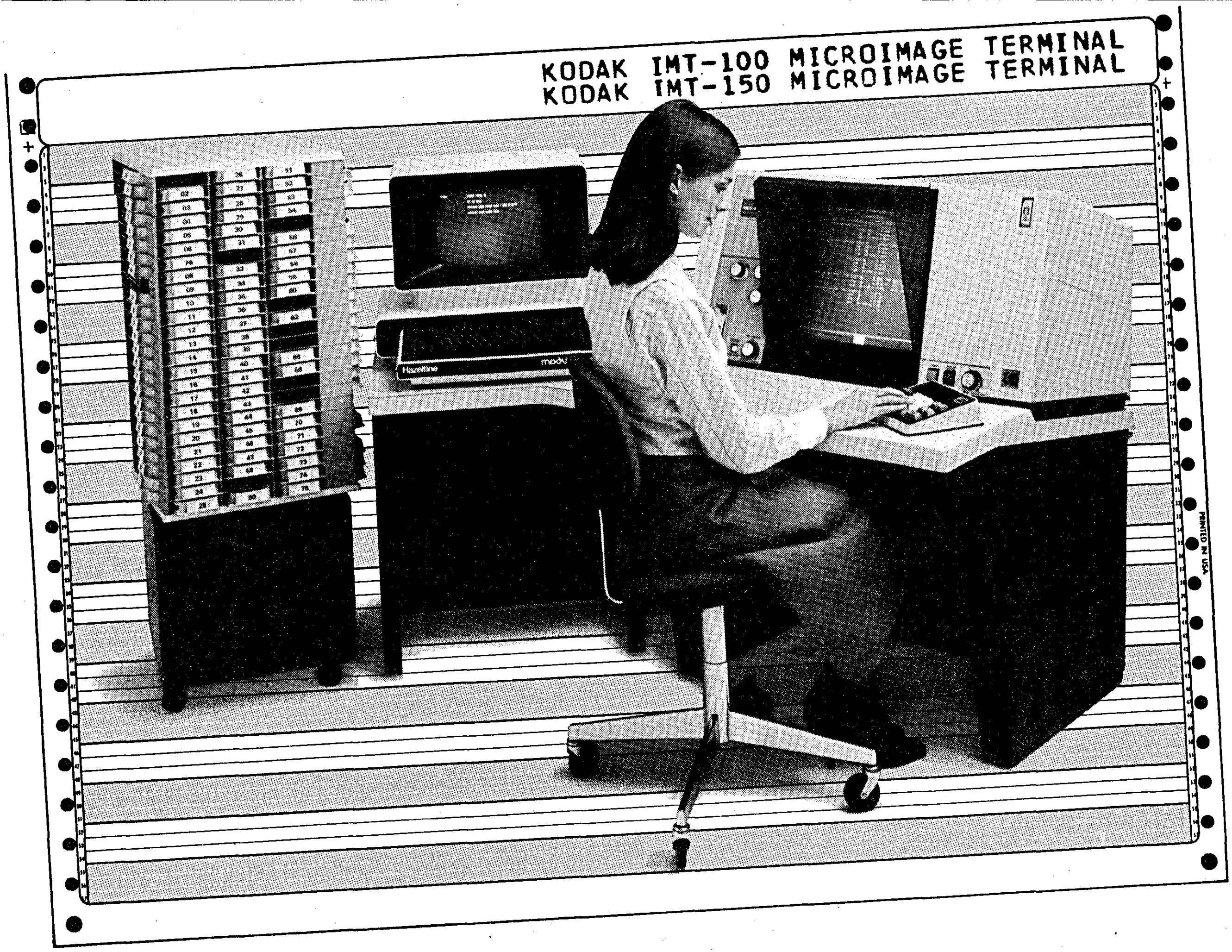
The inescapable conclusion is that the need for in-house semiconductor manufacturing capability will become increasingly compelling for nearly all computer manufacturing companies, with the pressures most intense for those building large-scale systems. Surely, no company can compete with the all-silicon computer unless it has a foothold in semiconductor manufacturing.

It took a 20-year investment by IBM, but the company has now successfully exploited its own vertical integration with semiconductor manufacturing. That gives IBM an important advantage over its competitors. ✻

DAVID L. STEIN

Mr. Stein is executive vice president and a cofounder of the Gartner Group Inc., a Wall Street research firm. Prior to the founding of the Gartner Group earlier this year, he spent 20 years in the computer manufacturing industry, working for such firms as Computer Automation, Control Data, Harris, IBM, Scientific Data Systems, and Univac. In 1969, he was a founder of Computer Operations Inc., the first IBM System/370 plug-compatible mainframe company. Mr. Stein's career has spanned all aspects of both computer systems development and marketing.

A few lines on increasing the productivity of your computer.



You'd find it hard to be productive, too, if you were right in the middle of manipulating important data, and you suddenly received a request for information you hadn't thought about for nanoseconds.

Yet, your very expensive, highly advanced CPU has to put up with interruptions like that all day long.

If your company had a Kodak IMT-150 microimage terminal, however, your computer could spend much more of its valuable time manipulating data. And a lot less time searching for it.

That's because the IMT-150 terminal has its own intelligence—a built-in microprocessor that enables it to perform on-line lookups in seconds. At the touch of a button. Without tying up your mainframe.

The IMT-150 terminal helps your people be more productive, too. They can find needed data quicker and easier, resulting in more lookups per hour/day.

And because source information stored in superdense microimages can be linked to complementary indexes in your on-line data base, you can reduce the cost of keeping non-dynamic information in a dynamic state.

The choice, then, is a simple one.

You can increase the productivity of your computer by buying *more* expensive and sophisticated data-storage equipment, in order to handle growing information demands.

Or you can buy a Kodak IMT-150 microimage terminal.

1880 Kodak *1980*

Eastman Kodak Company
Business Systems Markets Division
Dept. DP9686, Rochester, NY 14650

☐ Please send me more information about the Kodak IMT-150 microimage terminal.

☐ Please have a Kodak representative contact me.

Name

Title

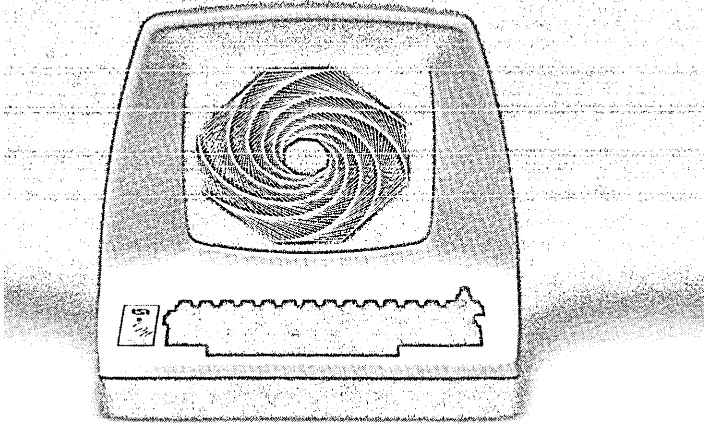
Company

Address

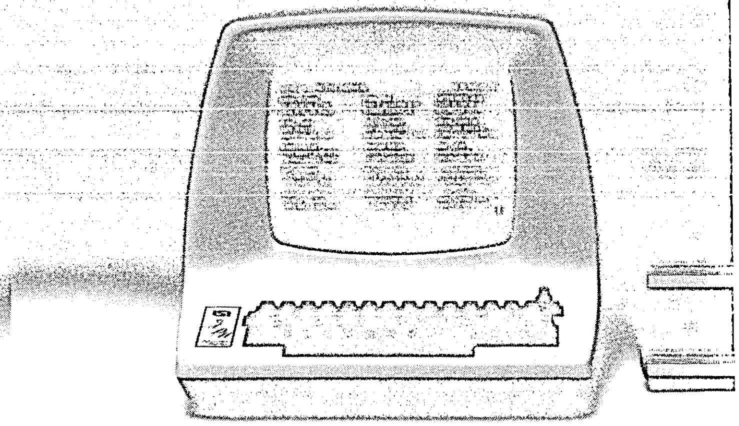
City

State Zip

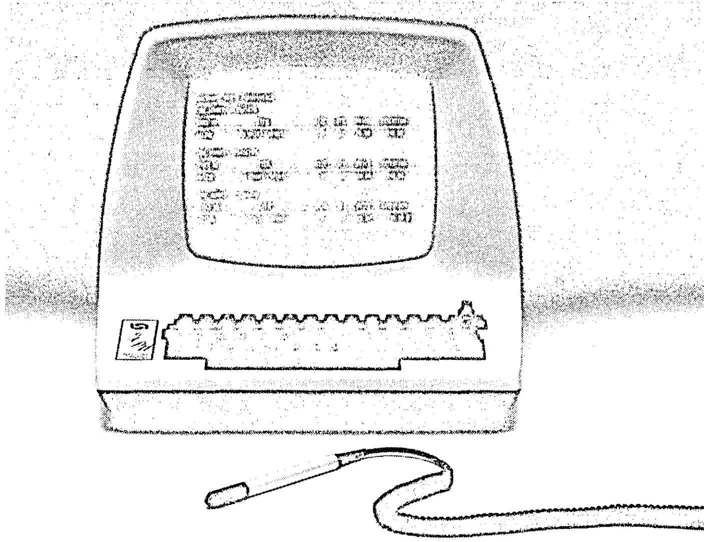
SOPHISTICATED GRAPHICS TERMINAL



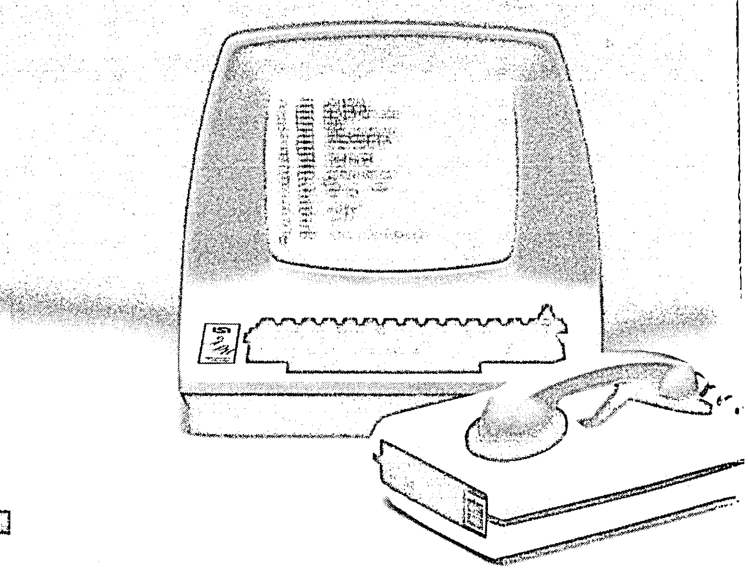
SMALL BUSINESS SYSTEM



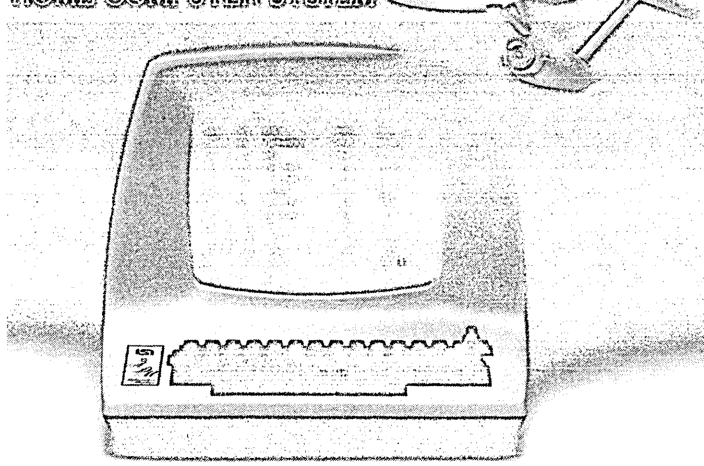
INVENTORY CONTROL



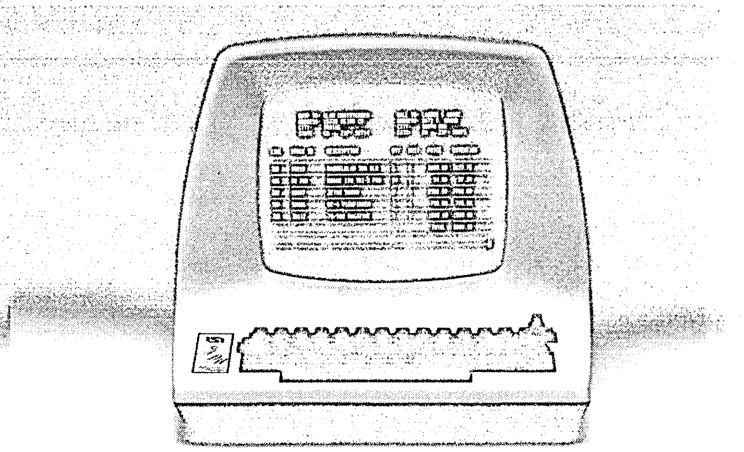
PORTABLE I/O DEVICE



HOME COMPUTER SYSTEM



VERSATILE DATA TERMINAL



What could anyone possibly do with 85,000 Dumb Terminals®?

That's how many ADM-3A's there are out in the field working right now. And more being shipped each day. Now just what accounts for such remarkable popularity?

Sure, it's the definitive dumb terminal, adaptable enough to fit a host of applications. It has a 12-inch diagonal screen. Full or half duplex operation at 11 selectable data rates. 1920 easy-to-read characters in 24 rows of 80 letters. 59 entry keys. An RS232C interface extension port. And direct cursor addressing.

But we wondered if all 85,000 Dumb Terminals were being used for just everyday data entry. So we checked around.

And found that people are using Dumb Terminals for things even we never thought of.

THE ADM-3A GOES INTO BUSINESS.

More and more OEM's are putting the Dumb Terminal into small business systems. They assemble a package that usually contains a disk, memory, a printer, and a video display terminal — the adaptable ADM-3A.

So the chances are that when you buy a small business system from someone, it'll contain, you guessed it, the amazing Dumb Terminal.

IT TAKES STOCK OF THE SITUATION.

Many businesses are using the Dumb Terminal, along with a light pen (Universal Product Code Decoder), to keep track of their inventory. The decoder is interfaced to the Dumb Terminal, and when a piece of merchandise imprinted with a Universal Product Code passes under it, the item is entered into a computer for tallying.

Simultaneously, the item is also displayed on the ADM-3A's screen — so it's instantly available for quick double-checking.

PROGRAMMERS LIKE IT, TOO.

Surprisingly enough, many computer programmers use the ADM-3A as an effective, portable I/O device. They can take it into a back room or, along with an acoustic coupler, to their homes if they wish, and compile programs nearly anywhere.

By using telephone lines, they can have direct access to a computer. Or, with the addition of an inexpensive cassette, the programmer can store the program on tape and enter it into the mainframe at a later date — with no loss of data.

THE DUMB TERMINAL PUTS ON A NEW FACE.

Some of our more ambitious customers have transformed their ADM-3A's into sophisticated graphics terminals. Simply by installing another PCB, they've enabled their terminals to perform complex plotting, graphics, and even draw charts.

And the Dumb Terminal is so adaptable that these industrious people had no trouble with installation — the graphics PCB required not the slightest cutting or soldering. It simply slipped right in and started working, all in a matter of minutes.

YOU CAN EVEN TAKE IT HOME TO MEET THE FAMILY.

We discovered that many computer buffs are using the Dumb Terminal as an inexpensive way to upgrade their systems. After all, the equipment found on most microcomputers leaves a lot to be desired. Such as the tiny five or six-inch screen, for instance.

By upgrading to the ADM-3A, they get a full 12-inch screen that's easy on the eyes. Not to mention a lot of capabilities they wanted, but just didn't get on their systems.

All for only $895.

THE DUMB TERMINAL. THE HALLMARK OF VERSATILITY.

When you get right down to it, the Dumb Terminal's applications are pretty amazing.

It can be interfaced with a staggering variety of RS232 devices. Such as cassettes, disks, floppy disk drives, printers, paper tapes, and readers, to mention just a few.

In fact, the ADM-3A is compatible with just about any RS232 device you can name. Even other video terminals, if you wish.

And people call this a "dumb" terminal?

WHAT WILL THEY THINK OF NEXT?

Who knows? But it seems that as long as there are Dumb Terminals, people will find new, unsuspected uses for them.

Of course, the ADM-3A will continue to be the same dependable data entry terminal that's made it an industry legend.

With good, reliable features and a minimum of frills. Nothing could change that. The fact is, we think that's probably the main reason that so many people have come up with so many uses for the ADM-3A.

Who said you can't teach a Dumb Terminal new tricks?

Lear Siegler, Inc./Data Products Division, 714 N. 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) 968-0112. New York (212) 594-6762. Boston (617) 423-1510. Washington, D.C. (301) 459-1826. England (4867) 80666.

DUMB TERMINAL SMART BUY

LEAR SIEGLER, INC.
DATA PRODUCTS DIVISION

Dumb Terminal® terminal is a registered trademark of Lear Siegler, Data Products Division.
CIRCLE 17 ON READER CARD

MIS management should be a logical stepping-stone to general top management positions.

THE CHANGING ROLE OF THE MIS EXECUTIVE

by Joseph Ferreira and James F. Collins Jr.

"The future is coming. Are you ready?"

This headline in recent national advertising by a large industrial corporation could well be directed to today's MIS executive. For today, management information services (MIS), the wide-encompassing corporate function created in a short 25 years by the spectacular achievements of data processing and communications technology, finds itself at a crucial turning point in its own further evolution. Nothing less than the professional status and organizational power base of the director of MIS operations is at stake.

Ironically, the career predicament in which the heads of large-scale MIS operations find themselves now, or will sortly be confronted with, arises from their very success in applying the new developments in data processing and communications technologies as fast as they appeared. They provided end users in operating departments with systems and equipment that are to a large extent user transparent. This has, in effect, made it possible for operating managements to become MIS managers in their own right, pressing to extend applications to fit their particular needs. Easy-to-use minicomputers and satellite installations, and the services of computer utilities, freed them to a large extent from dependency upon the technical expertise of the central computer staff. Advances in technology made it possible for them actually to disregard technological details, and, by virtue of the flexibility of their "black boxes," to concentrate upon their business needs.

One result is that today many end users of data processing and communications technology are challenging the way the central MIS mission is carried out, as well as how its goals are set. It is important to note that their dissatisfaction transcends the mere competition for available resources: it involves an important change in the way *information*—and not merely the processing of data—will be viewed in the period that lies ahead. This development will have a profound effect on MIS philosophy, on the way the MIS function fits into the corporate structure, and on how its main mission is to be conceived and implemented.

The implication for MIS managers is clear: the wheels of change are turning rapidly, and those who do not turn with them are liable either to be run over or simply left behind.

EVOLUTION OF MIS

The MIS function is no stranger to evolutionary development, and by and large it has adapted well to times of transition. The fact remains, however, that further change is now in the making, and the latest adaptive process may be traumatic for many.

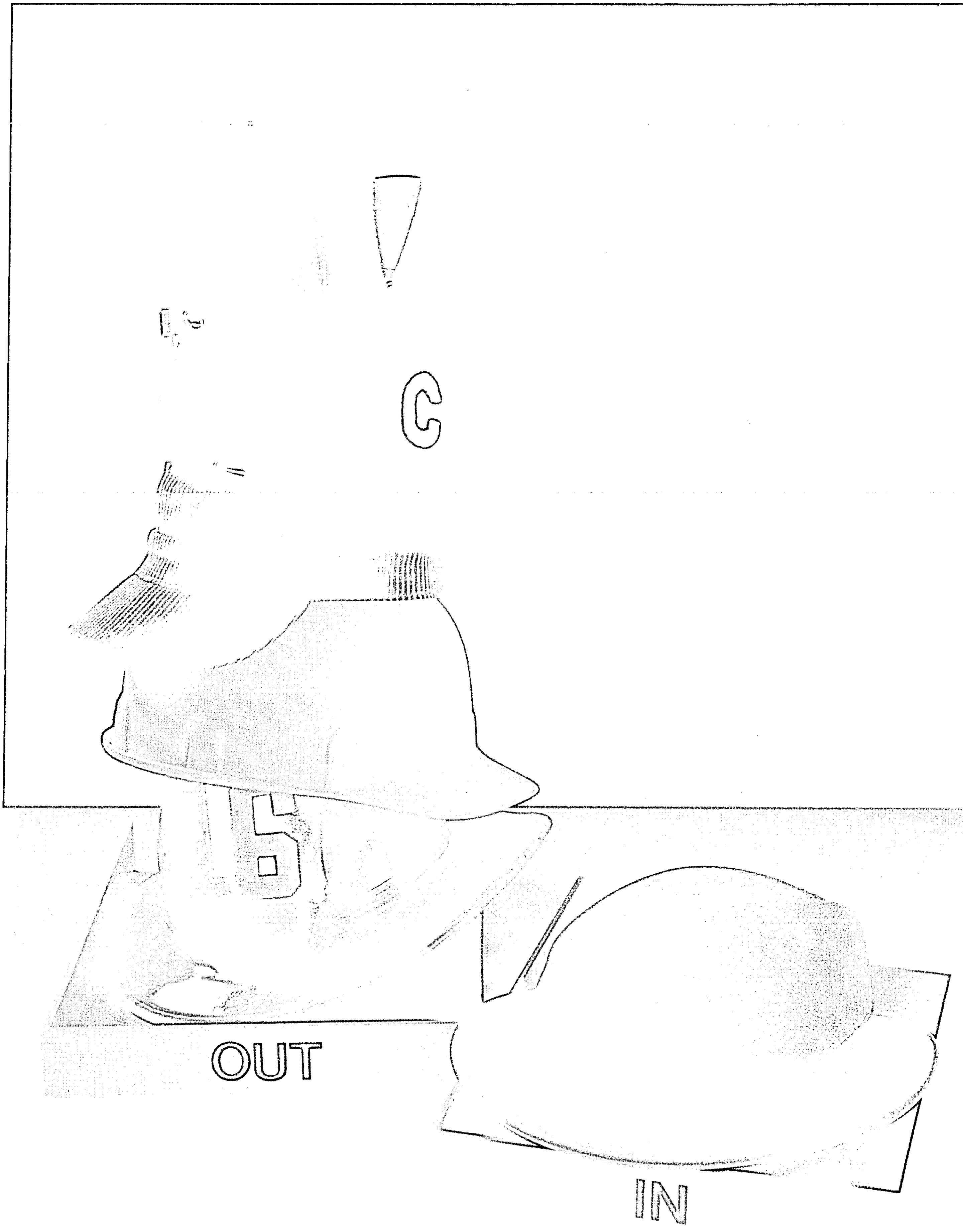
Ten to 15 years ago, the principal requirements for the direction of computer operations were outstanding technical competence and the ability to provide top-grade technical management. Basically, the MIS function—indeed, not yet called by that name—was that of a service, much like accounting, to aid in the processing of transactional data and in supplying collations and summaries of data that would be useful in management decision-making. The MIS function was not, be it noted, to participate in the management decision-making process itself.

But as the function matured, the concept of "management information system" and, more broadly, "management information services" began to emerge, and the head of MIS came to be considered part of the management team. Thus it became apparent about five years ago that top MIS managers had to be good *business* managers. In addition to directing technical managers responsible for components of the MIS function, they were now expected to contribute to the business strategies and operational efficiencies of all corporate functions—manufacturing, finance, marketing, sales, and even research and development. MIS management had to become broad-gauged in its perception of goals and procedures; it had to come outside of the technological cocoon.

The next progression, admittedly thus far achieved in only a minority of instances, is for MIS management to be considered a logical stepping-stone to general top management positions—on an equal footing with other functions such as marketing, finance, manufacturing, and sales. But this will occur only if MIS is accepted as part of the main line of business operations. The challenge to present MIS management is to see to it that this potential is realized.

Computer/communications technology itself has played an influential role in the organization of MIS functions. Each generation of computers, because of its varying technical and economic characteristics, encouraged particular organizational approaches. The cycle of information processing, influenced by developments in data collection, processing, accessibility, and transmittal, has gone from decentralization to centralization, back to decentralization, and then again to centralization. But with each

PHOTOGRAPH BY STEVE COOPER



C
OUT
IN

The emergence of the minicomputer challenges MIS most today.

reversal of the cycle, the MIS function has been characterized primarily by centralized control over hardware and software, and, in many cases, over a telecommunications network. Even where extensive data processing operations have reported to local managements, there has been strong central direction and control.

Current foreseeable technological changes are certain to have further organizational repercussions. The question is, will these changes tend to increase or diminish the centralized control that is now exercised by most corporate MIS structures?

It is clear that today's low-cost computers will eventually place computer power in the hands of almost everyone. Powerful and versatile minicomputers are already appearing in substantial quantities in operating departments all over, independent of central MIS control. Even if MIS approval is denied, these machines will be hidden in organizational closets (perhaps literally) for local managers to play with.

But while much attention is focused on minis, and increasingly on micros, advances in technology are affecting both ends of the computational power spectrum. Computer speeds increased by a factor of 100 million between the 1940s and 1970s, and unit costs decreased by a factor of 30,000. Memories are projected to 100 trillion bytes. In the near future we are going to have increasingly more powerful large processors; the so-called "dinosaur" will not only survive, it will thrive. There is also a cross trend at the other extreme, leading to the one man, one computer environment, or partially towards what has been described as the "electronic workstation." The available choices indicate that MIS is being presented not merely as a faster and less costly means of meeting business needs, but also as the vehicle for totally new ways in which business can be conducted.

MINIS CHALLENGE MIS

In the final analysis, however, it is the emergence of the minicomputer that challenges MIS most today. With it, business is entering a new era of computer utilization. Minicomputers are powerful and relatively cheap. Operating departments can readily afford the hardware but, without strong policy direction, they may not be able to afford the mistakes that can be made in the use of these computers.

Technology is now driving many organizations in the direction of decentralized operation of computers. Today there are hundreds of thousands of small business computers and minicomputers installed in the U.S., a significant portion of them in large corporations. For most companies, minicomputers under the control of MIS have been used more in a system (as opposed to applications) configuration—for example, as communications concentrators, for data entry, and the like. In the last three years, however, MIS managers have increasingly selected minicomputers to enhance their resources, instead of following the traditional route of upgrading to larger systems. Applications are in such traditional areas as inventory control, accounts receivable, payroll, and sales statistics. Apart from cost savings, benefits include direct user interface, ability to control exclusively local information locally, protection against system failure, and distributed accountability.

At the same time, minicomputers and microcomputers are moving heavily into business applications without the control or even the advice of MIS, as more and more line managers demand greater control over the MIS activities which directly support their areas of the business. In addition, vendors—seeing the opportunity to sell more equipment or software—have pushed this trend by providing line managers with narrowly aimed turnkey or time-sharing systems to suit the specific needs of these organizational units. (It should be noted, in all frankness, that many using departments welcome such liberation from the monopoly position of MIS, remembering the days when service levels were uneven, and when MIS orientation was too often inward rather than outward to the user and to the overall needs of the company.)

But there are sound reasons for controlling this recent trend. The growing demand for centralized information evaluation and reporting required by new government regulations pushes strongly in the direction of centralized control over large banks of information. The increasing complexity of corporate planning, monitoring of operating units, and cash management and resource allocation all require centralized data bases fed by compatible systems with common formats.

TIME FOR TRADE-OFFS

These conflicting patterns can only be resolved, and the corporate needs properly met, by developing corporate-wide MIS policy, planning, and control. In the process, there will have to be some trade-offs. The relative size and scope of central processing operations may have to diminish somewhat, and the computer processing of local operating units may need to increase in scope and autonomy.

For the typical MIS manager, this will call for a significant change of emphasis. After organizing and assembling the technical tools for the successful installation and operation of all computer systems, he must then be as *completely supportive* of the end user as possible, enabling the user to operate within the mode most comfortable to him. This means giving the end user as much control and authority over the computer operations as he has over the functions which are normally thought of as line functions. The MIS manager must then organize solely to support the user so that, barring very unusual circumstances, the localized MIS function cannot fail under the user's direction.

Two extreme scenarios exist for the MIS function's sphere of influence. At one extreme, we see the corporation deciding that, with specific limited exceptions, all information technology—both its implementation and management—must be under the control of MIS. At the other extreme, we see the corporation moving to an arrangement in which MIS has no line accountability or control over the bulk of computers installed. The likelihood is that most organizations will find themselves positioned somewhere between these two extremes.

With the dramatic increase in the use of minicomputers and microcomputers, it is reasonable to anticipate that in the next five years, traditional large-scale business computers will be a small minority. But as stated earlier, there is every possibility that developments at the supercomputer end of the continuum will be equally dramatic. Systems with many times the power of current large-scale computers are just beyond the horizon. This raises some interesting possibilities.

In the future, and indeed foreshadowed by existing usage patterns, might not a new supercomputer handle, for example, the relatively stable operational information systems of a number of organizations or divisions of organizations? Such computer utilities could not only be a desirable alternative to central and regional operational systems, but could also provide the data banks for and the dissemination of the ever-increasing volume and variety of textual and other nonnumeric information needed for management decision-making.

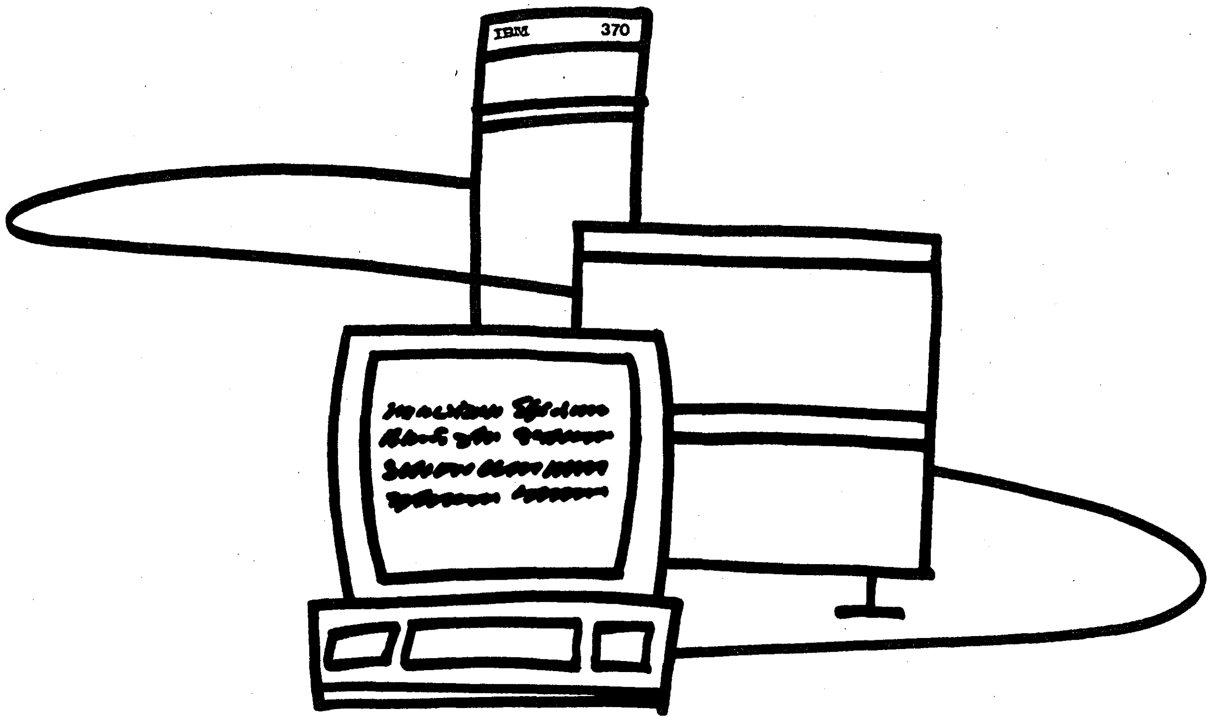
Traditional MIS operating philosophies and organizational relationships, designed for the long-accepted in-house, large-scale operating mode, cannot be effective in the new environment. It would be a serious mistake to try to impose them on an increasingly decentralized, user-controlled operating environment—one in which the user has available an escalating variety of small but powerful and inexpensive computers, as well as the resources of large utilities.

SOME CAVEATS

Clearly, the time has come to distribute some traditional elements of central MIS into user areas. But some caveats must be mentioned.

Unwittingly, we may be arriving at a two-tiered approach to MIS operations, characterized by strict standards in the area under the central control of the MIS manager, but low or even nonexistent standards in the

Put Braegen screen editing in your system and you won't strain your IBM.



Now, you can have big system TSO-type screen editing capability without overloading your mainframe's time or memory—when you put the Braegen Multi-Task Terminal System into your IBM 360, 370, 303X or PCM system.

The Multi-Task Terminal System provides interactive screen editing off-line in the highly intelligent Braegen B40 controller rather than in your mainframe. You get interactive editing which allows information to be created, stored, retrieved, displayed and updated on the off-line data base—all with no mainframe upgrade, no additional memory and minimal change to your present software.

But that's not all, because when you add the Braegen Multi-Task Terminal System to your mainframe you're getting much more than a screen editor. One MTTS system which has multiple functional capabilities can duplicate and upgrade the performance of numerous IBM communications and peripheral controllers. All functions are performed in one software based system without the multiple controllers, redundant peripherals and miles of costly coaxial cable required by less intelligent systems. And, the Braegen MTTS offers such unique features as (1) address switching, which allows all CRTs to have multiple addresses that provide access to multiple applications and multiple computers; (2) up to 16 peripherals connected to a single coax wherein the peripherals may be CRTs, keyboards, printers and card readers; and (3) local processing up to 7500 feet from the host.

So put a Braegen where your IBM is. Get full information on capabilities and configurations from The Braegen Corporation, 20740 Valley Green Drive, Cupertino, California 95014. (408) 725-1252.

I'm interested! Send me more info on your Multi-Task Terminal System.

Name__________
Title__________
Company__________
Mailing Address__________
City__________
State__________ Zip__________
Telephone__________

BRAEGEN

The Braegen Corporation
20740 Valley Green Drive
Cupertino, CA 95014

CIRCLE 18 ON READER CARD

The new MIS executive will have a reduced span of control but an expanded sphere of influence.

area outside his direct control, the area that will grow ever larger.

To avoid anarchy, the MIS function, while acting in a staff and not a line capacity, must retain sufficient authority to enforce the necessary discipline. Standards, as well as uniform procedures, definitions, languages, and file and reporting formats, must be provided and their use enforced. Existing systems, applications, and routines must be made known and available to all units that can effectively use them. This, along with a reasonable amount of systems evaluation (or auditing, to use a more precise term) will help reduce at least some redundancy of effort and duplication of costs.

This concept also presupposes the preimplementation review of equipment planning for all units, and preferably even some form of systems planning review before equipment requirements are formulated. Without computer equipment review and approval under corporate standards for uniformity and transferability of common systems, the feared anarchy will result, and years of costly redirection will necessarily ensue.

Today in a number of companies, MIS managements have already taken the great "leap of faith" and have given up some elements of systems specification and design, hardware acquisition, data input, job scheduling, and the like. Usually this has happened by MIS direction, but quite often it has evolved by user initiative.

From today's perspective, it appears that future organizational approaches will be characterized by some or all of the following:

- Systems development resources will be highly integrated with corporate planning. In some corporations this function will be part of the corporate planning mechanism, with the substantive work done through planning committees, task forces, corporate planning development groups, etc.
- Operational systems development resources will be centralized, to accommodate a predetermined level of bottom-up, user-defined needs that have a broader application than the requesting user area, or that require this specialized resource.
- For local systems, users will assume the whole range of traditional MIS activity, operating within corporate guidelines related to information technology and subject to corporate review, but otherwise limited only by the level of user sophistication and imagination.
- A central operations "utility" for specific needs will be maintained by MIS.
- The MIS executive will have a reduced span of control of MIS, but a much greater sphere of influence in terms of his involvement in the information needs in broad areas of corporate decision-making, and a clearly defined mandate regarding MIS policy implementation. He will be increasingly concerned with external information systems.
- The implementation of major new systems will increasingly be accomplished through task force organizations with limited life cycles.

DANGER AND OPPORTUNITY

Calligraphers tell us that when the Chinese write the word *crisis*, they do it in two characters, one meaning "danger" and the other meaning "opportunity." This is worth remembering when we consider the crisis of change confronting the MIS manager. He may perceive the impending diminished role in line authority as a danger to personal status. But there is also an important opportunity in this identity crisis—an opportunity inherent in the totally new dimensions of information required in corporate decision-making today, and in the new systems and techniques for making information available to meet those needs.

The major concern lies not with the obviously higher degree of complexity in the collection, evaluation, transmittal, and feedback of transaction and control data called for in the management of diversified and far-flung operations. Traditional MIS networks have kept pace with this kind of data processing and communications requirement, and will continue to do so under the new decentralized concepts. Where the real concern does lie is with the problem of getting information of the right kind to the right place and the right individual at the right time and in the right form to insure right decision-making (or decisions that are as right as is humanly possible, given all available pertinent factors).

The kinds of information called for are easily seen in the single factor of governmental reporting requirements mandated by such legislation as ERISA, EEO, OSHA, and such agencies as the FTC and IRS—all of which require massive information assemblage and reduction for compliance. Added to these requirements, which have been with us for some time, are the further informational demands created by new legislation, rules, and orders in such areas as pollution control and energy conservation and allocation.

Governmental regulation is only one aspect of the extreme sensitivity to external information of all sorts—political, social, economic, ecological—that must dominate today's corporate decision-making process. Quality information systems can go a long way towards helping large corporations respond rapidly to the demands of an increasingly complex environment. This is something that the "new MIS manager" cannot afford to ignore.

SHIFT IN EMPHASIS

Till now the emphasis in even advanced management information systems has been on the *systems* that produced the information going to the end user. But now the hardware can accommodate almost unlimited storage of information—textual and graphic as well as data—and make it accessible on call-up to remote users who need no specialized systems skills beyond that of simple terminal operation. The technological wizardry that drives the system is increasingly transparent to the end user, and he can concentrate primarily on the end result—information. The contrast is similar, but magnified manyfold, to dialing a number on the phone and speaking (or listening), rather than learning the Morse code, seeking out a telegraph, and tapping out a message.

What does this mean for the new MIS executive? Freed from the detailed management of the traditional MIS operations now assumed by line managements, he can concentrate on the end results for which all of the elaborate technology has been developed: the management and use of information.

Corporate managements will increasingly realize that in information they now have a new kind of resource at their command, and that this resource requires management. MIS in terms of *systems* of hardware and software and distribution networks is relatively mature. *Information resource management* (IRM) now comes to the fore as something that requires large-scale investment, organization, and follow-through.

What kind of information is required for decision-making at every management level? In what form is it needed? Is it at present internally generated? If not, *can* it be generated by appropriate adjustment to the existing MIS system? What about nonnumeric bodies of information—legislation, rules, political and social assessments, worker attitudes, community discontents? Where and how shall such textual information be stored, abstracted, retrieved, and disseminated? What outside sources are available to provide the desired information? Is it available in commercial data banks and "information utilities?" How can direct access be established for those with a "need to know"? What clearances and sign-offs must be established to assure consistency and adherence to company policy in information outflows? What policies and procedures must be developed to insure the accuracy of the data contained in the data banks, and what controls over the access to these will insure the right to privacy of each individual involved?

This is a sampling of the kinds of questions with which IRM will be concerned. And the following is only a partial list of the subject matter to which top management decision-making must be attuned, and to which it must provide quick response: inflation, energy crisis, raw materials shortages, antitrust intensification, government regula-

Corporate Directors.

The DS990 Models 20 and 30. TI's most powerful business systems yet.

If you've been looking for a large minicomputer system for a wide assortment of demanding business data processing loads, look at TI's DS990 Models 20 and 30.

They're equipped with the business software you need—COBOL, Sort/Merge, a Data Base Management System with query and report features, and TI's unique, time-saving screen formatting language, TIFORM. Other powerful business software languages, like RPG II, BASIC, Pascal and FORTRAN, are also available as well as IBM-compatible communications. And all are enhanced by the proven DX10 Operating System.

The new, high-performance 990/12 CPU provides the throughput you need. In many applications, the Models 20 and 30 can handle 20 or more different jobs at speeds up to three times faster than the proven mid-range members of the DS990 computer family. And the compatibility of the DS990 computer family enables you to upgrade your existing hardware and software to the more powerful Models 20 and 30 easily, at minimal expense.

When it comes to dependable commercial computing worldwide, look to Texas Instruments, the company that has been appointed the official computer and calculator supplier of the 1980 Olympic Winter Games.

For more information, call
800-257-7850.
(In N.J. call 1-800-322-8650)

TEXAS INSTRUMENTS
INCORPORATED

TEXAS INSTRUMENTS
We put computing within everyone's reach.

CIRCLE 19 ON READER CARD

The MIS manager has the technical background; he now must develop management responsibility.

tion, consumer activism, product liability legislation, monetary fluctuations, pollution and ecology, new "corporate ethics" restraints, director liability suits, the "Lordstown syndrome" in work attitudes, quantum breakthroughs in science, and wars and rumors of wars.

In this connection, a challenge to the new MIS executive—as he shifts his focus to information resource management—will be the development of personal workstations for individual decision-makers to serve in optimizing the organization's responses in various ways. For example, consider a purchasing station, where a purchasing agent will be evaluated by his ability to secure a constant flow of reasonably priced supplies, but will have the flexibility to act in response to predicted scarcities, price variations, recycling regulations, and the like by buying sooner, spreading out purchases, hedging, or any other technique.

Similarly, workstations for other functions will be concerned with organizing production, managing cash, foreign trade and foreign currency, energy, etc. The MIS executive and his staff will find out what individual information needs are, uncover and suggest sources of information, determine the form and time parameters in which the information must be produced, and provide the necessary MIS interaction so that the decision-maker can have prompt feedback on the compliance with and effects of his decisions.

NO MORE MYSTIQUE

The MIS "power base" no longer rests on an unchallengeable mystique. Its own technology has transformed its most viable structure into that of a mature staff function. Like other staff functions, its role is to help—either directly or indirectly—the line operations of the corporation to achieve the results they have set out to achieve. Its success will be measured by the contribution it makes to those goals.

The challenge facing today's MIS executive—and more particularly tomorrow's—is the difficult and perhaps even painful decision to guide the spread of information technology throughout the organization, even if it means diminished line control. The alternative is to stunt eventual MIS growth by maintaining overly tight and unnecessary controls on the proliferation of information technology throughout the organization, on the dubious grounds that the new users may not have sufficient experience to use the technology well.

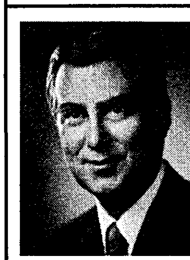
If the latter choice is made, it can be justified on the grounds of maintaining the traditional MIS bureaucracy; but over the long haul, the organization will be the loser. If that occurs, what will be the future of the MIS function or of the MIS manager who was its executioner?

It is the responsibility of the MIS manager to take the initiative in defining the new direction, to move the information gathering process out to the operating units, to the ultimate users, as far and as fast as possible. He has the technical management background; he now must develop the business and general management insight and responsibility. ✻

JOSEPH FERREIRA

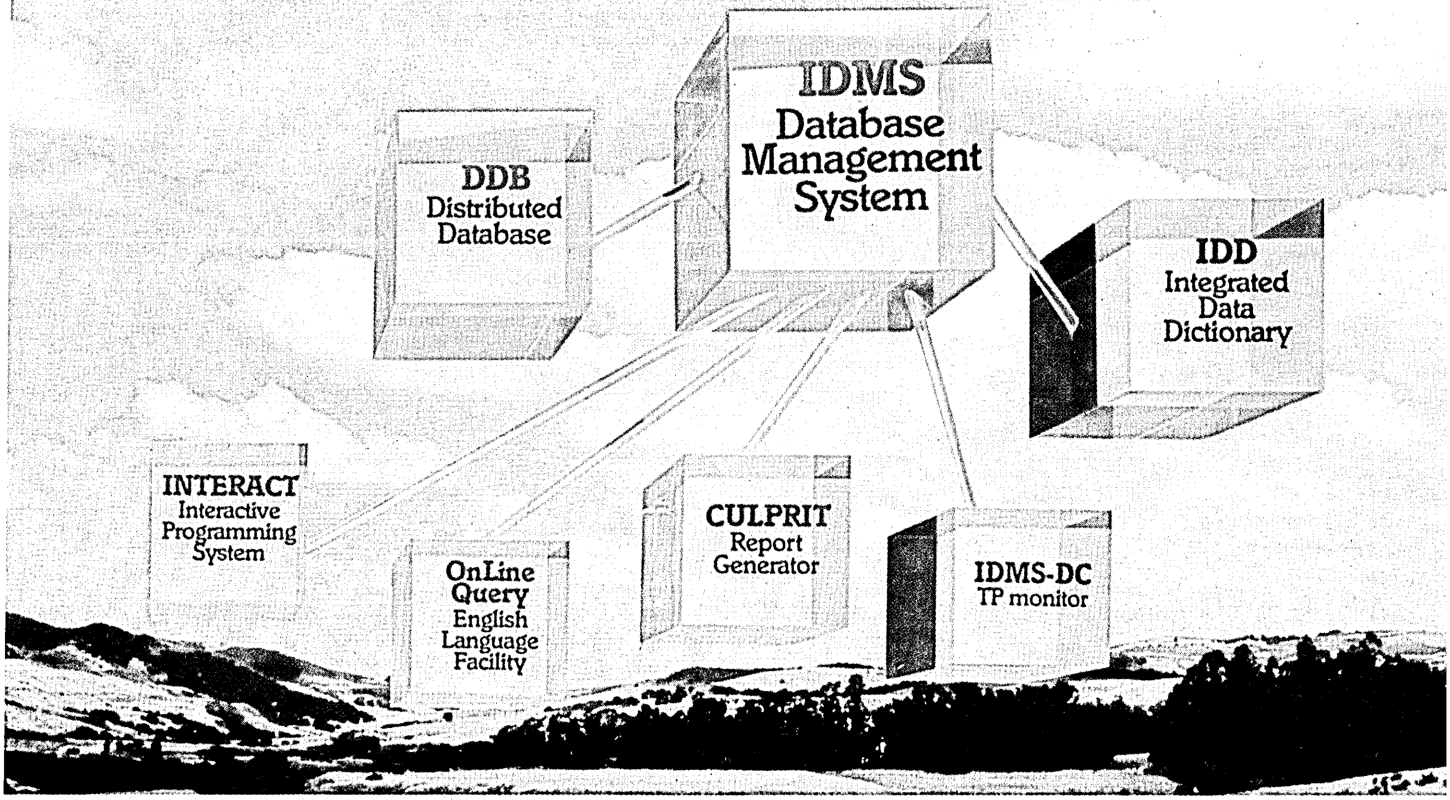
Mr. Ferreira is a vice president of The Diebold Group Inc., New York, where he directs the company's U.S. research program. Prior to joining Diebold 12 years ago, he was manager of systems implementation in the New York area for Sperry Univac. Before that he served as manager of systems planning for Univac, providing technical support to the marketing effort. Mr. Ferreira earned a BS degree in management and data processing from New York University School of Commerce. He has lectured extensively in the U.S. and Europe and is the author of several articles on data processing and the implications of future developments in this field.

JAMES F. COLLINS JR.



Mr. Collins is corporate vice president, management information services, at Johnson & Johnson, New Brunswick, N.J. He also serves as assistant treasurer of the corporation, and was previously director of its Management Services Div. Mr. Collins earned a BS degree in chemical engineering, attending the University of California at Los Angeles and Whittier College, and a master's degree in economics at the University of Chicago. He is a member of the American Chemical Society, the American Association for the Advancement of Science, and the American Management Association, and is a charter member of the Society for Management Information Systems.

You've ordered the new IBM 4300? Now order the database software to make the most of it.



"IDMS is the most efficient DBMS you can buy for your 4300. More important, it is the nucleus of a completely integrated Distributed Database system. At Cullinane, we've been developing and field testing a true distributed database system for over four years. That's why we are the only major vendor that can provide users with this 'future' capability today." – Robert Goldman, Sr. V.P., Prod. Dev.

Now is the time to plan your next five years. The cost of high performance hardware is coming down. That fact and Cullinane database management software means that the control, efficiency and flexibility of distributed database networks is a practical solution to your data management needs – now!

Only Cullinane has it all. The best database management system in the industry, IDMS. A powerful new data communications system, IDMS-DC, the only TP monitor specifically designed to deliver fast throughput, automatic recovery, data integrity and programming ease in the database environment. IDD, the Integrated Data Dictionary that brings a new level of control and consistently high design standards to all your data management activities. INTERACT, the flexible programmer productivity system for online program development, RJE, text editing and word processing. CULPRIT, the report generator that's easy to use and fast even on the complex reports. OnLine Query, the interactive management information retrieval system.

And Distributed Database – to get the most out of your 4300s, wherever they're located.

Like to attend a *free* seminar in your area and learn more about how Cullinane can help you implement your new hardware more successfully? Fill out the coupon, or simply attach your business card to it and send it to us.

Cullinane Corporation

Please send me literature on the following Cullinane Products: (Circle boxes that interest you.)

DDB Distributed Database — IDMS Database Management System — IDD Integrated Data Dictionary

INTERACT Interactive Programming System | OnLine Query English Language Facility | CULPRIT and EDP-AUDITOR Report Generators | IDMS-DC TP Monitor

Name/Title ______

Company ______

Address ______

City ______ State ______ Zip ______

Phone ______ My computer is ______

Mail to: Cullinane Corporation, 20 William St.
Wellesley, MA 02181, Phone: (617) 237-6600

Database: Cullinane

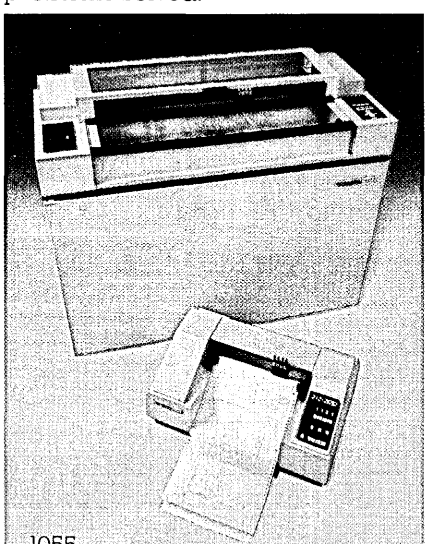
CIRCLE 21 ON READER CARD

WHATEVER YOUR CALCOMP HAS

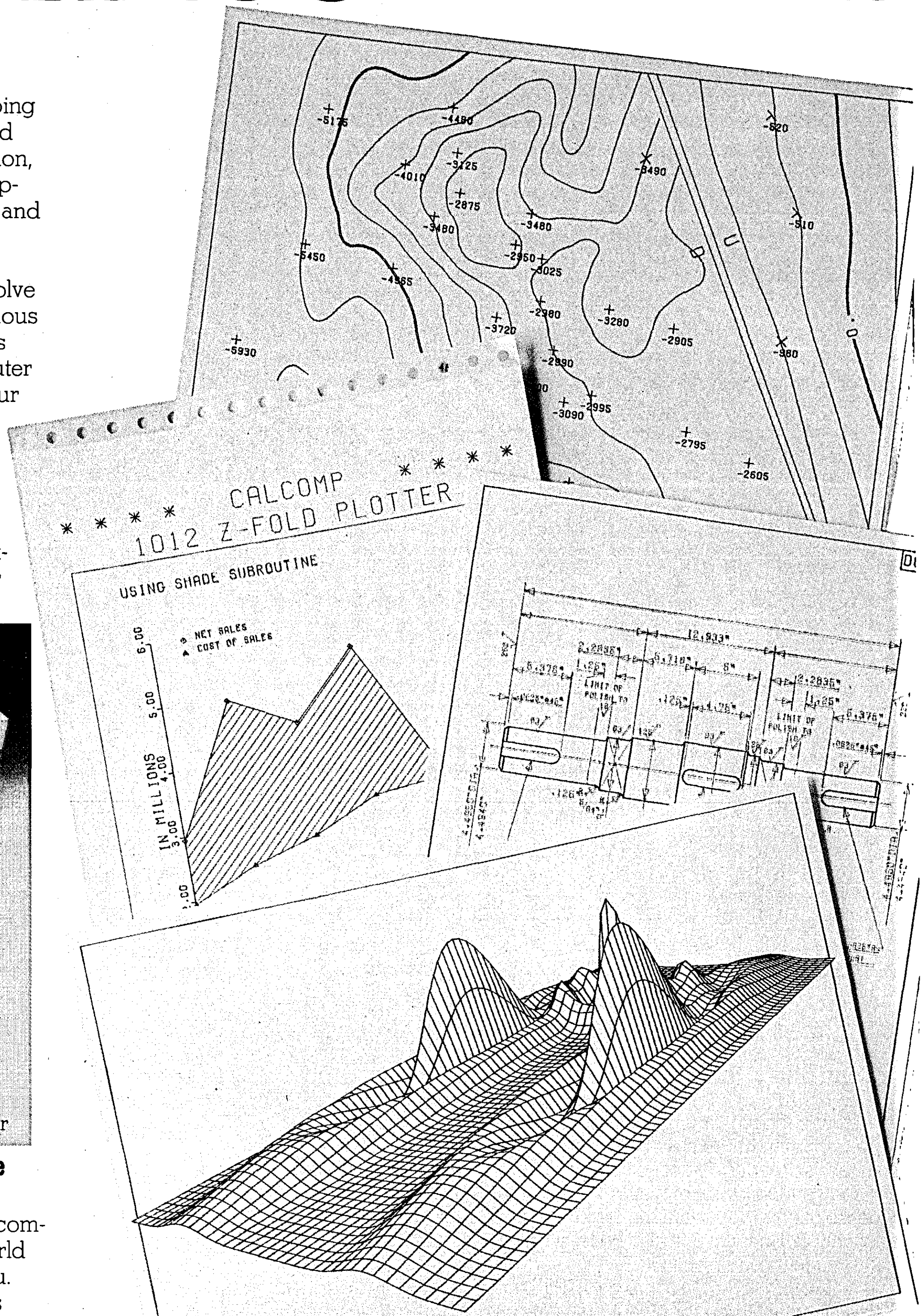
Whether your application is a general one like designing, mapping or schematics, or more specialized like 3-dimensional data presentation, structural analysis, contouring, piping isometrics or business charts and graphs, CalComp offers you the broadest line of plotters.

Nobody offers more ways to solve your graphics problems. Continuous roll, belt-bed and flat-bed plotters for cut sheet applications. Computer output to microfilm. On-line to your CPU. Off-line via tape-drive storage devices. And even on-line/off-line with floppy disk storage.

Add our extensive library of applications software packages to complement our operating software and you've got most of your problems solved.



1055
Drum Plotter/ 1012 Desk-Top Plotter



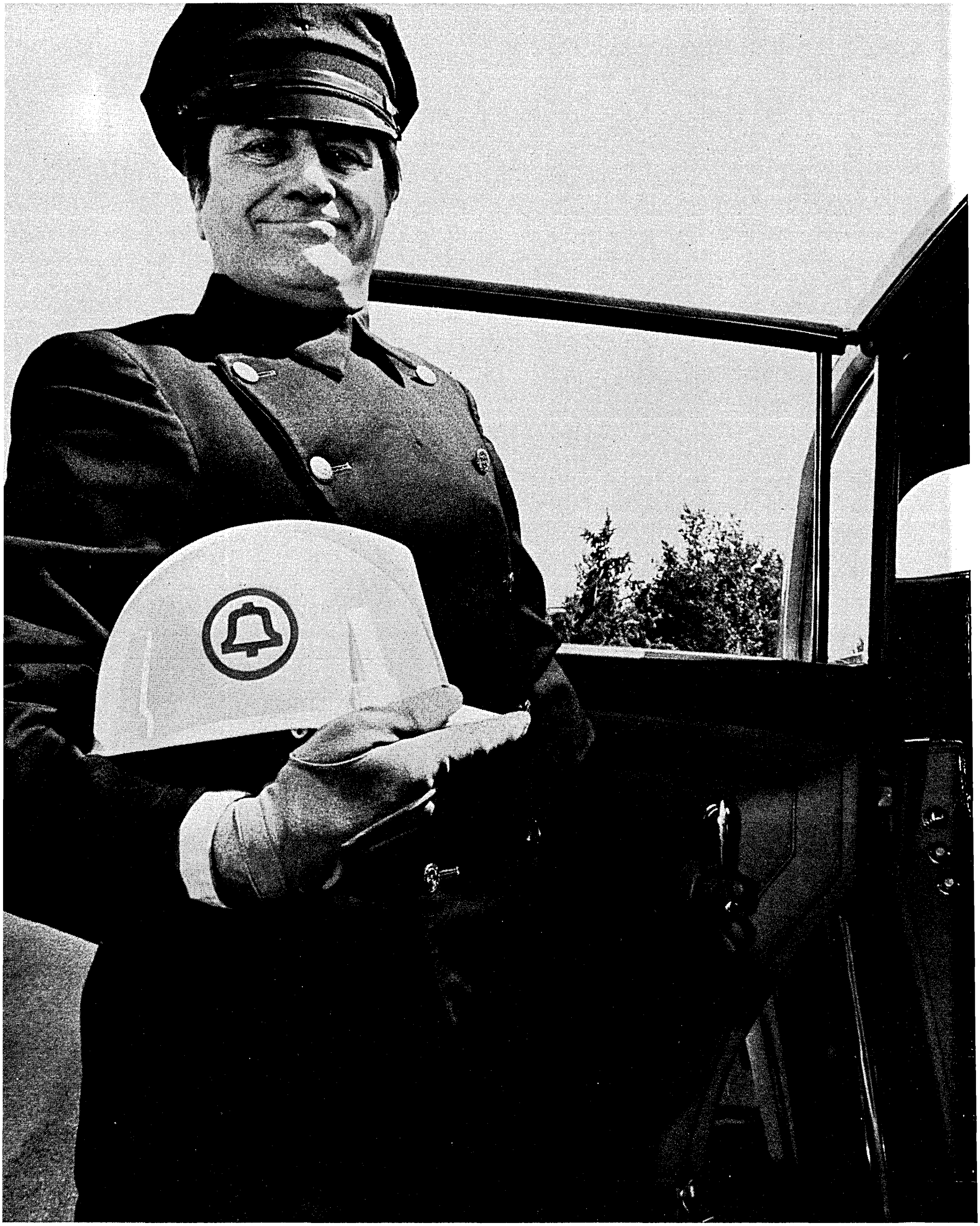
The best answers come from the best people.

Looking at the broadest line of computer graphics systems in the world may still present a problem to you.

Like choosing which solution is right for your particular needs; planning for growth and upgrades; and making sure your system delivers consistently excellent performance.

That's where CalComp's Sales Force can help. Because our sales

24-hr. data pick



WE COULD MAKE JUST MINICOMPUTERS. BUT THERE'S NO FUTURE IN IT.

Not for us. Or for our customers.

The basic V77-600 and V77-800 are super powerful, high performance, Pascal speaking minicomputers. But standing alone they can't do everything for everybody.

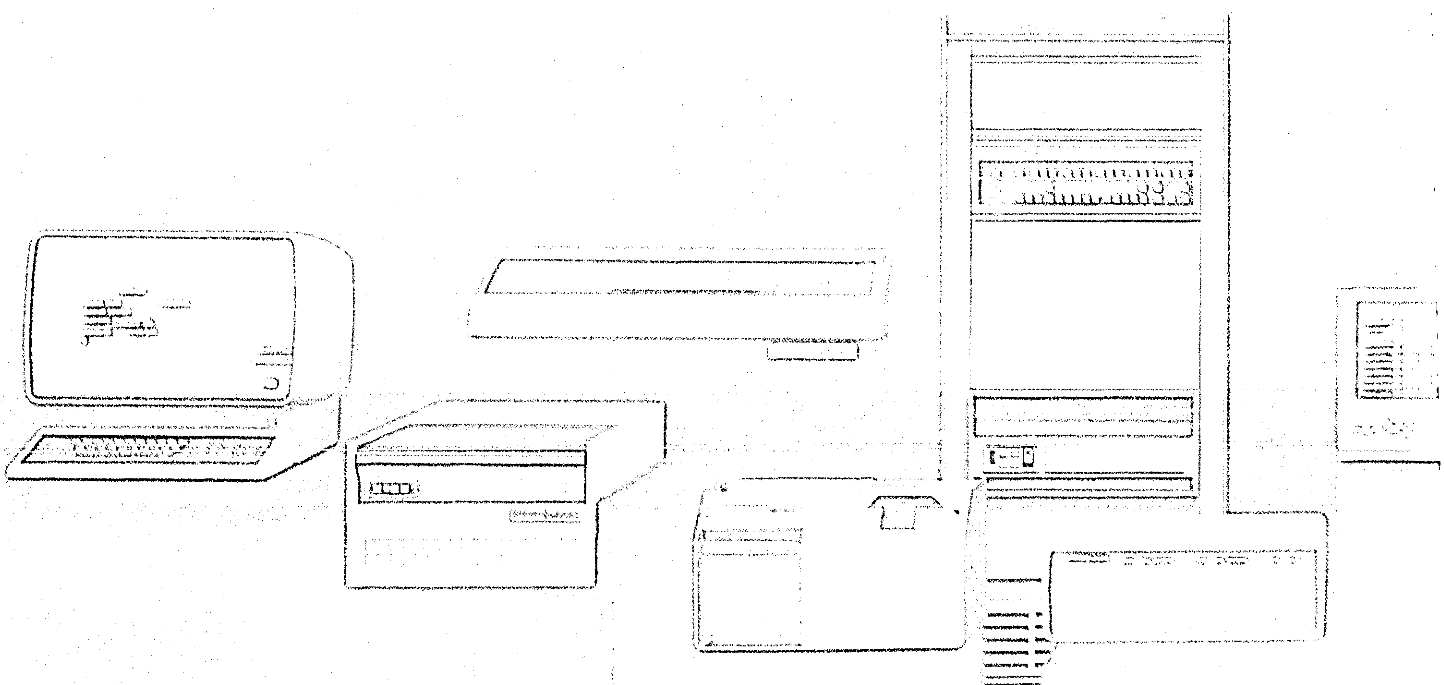
That's why we've designed a complete line of competitively priced support peripherals. With Sperry Univac you can expand the utility of your system and continually provide capacity for growth with peripherals specifically compatible to your Sperry Univac minicomputer.

Now as your data processing needs grow you can forget the hassle involved in adapting peripherals from other manufacturers to suit your DDP system. With Sperry Univac you can standardize your computer equipment from a simple V77-200 minicomputer all the way into mainframes.

INTRODUCING OUR FAMILY.

Our minicomputer customers needed reliable, quality support from one source so we developed a complete line of peripherals. Some of the peripherals we now have available include:

- Diskette storage system
- 10 MB cartridge disk system
- 30 to 232 MB disk storage system
- 800/1600 bpi mag tape units
- Sperry Univac serial printer
- 300/600 LPM printer
- Card reader
- Asynchronous buffered terminal
- Sperry Univac UTS 400 master and slave terminals
- Sperry UNISCOPE 200 terminal
- 3270 compatible terminal



And, of course, we introduced SUMMIT, the interactive, multi-terminal system with transaction processing and data base management. It gives you easy editing, screen formatting, and documentation aids, plus comprehensive program development.

SUMMIT also offers flexibility for software design and allows our system to speak not only Pascal, but COBOL, FORTRAN, and RPG II.

WE TAKE CARE OF OUR CUSTOMERS.

The Sperry Univac sales and service network is one of the largest and most responsive in the world. With over 8000 customer engineers available to keep our systems up and running, we can provide prompt, complete service for both our minis and peripherals on a worldwide basis.

And that service is the finest. We've established a major computer education center in Princeton, New Jersey and several regional training schools throughout the United States and Europe. Our educational system insures the degree of excellence and competency in our service staff necessary to maintain all our equipment at peak performance.

OUR TOTAL COMMITMENT.

At Sperry Univac we have a reputation for quality, performance and service in the computer industry.

That's why we've committed ourselves to a major investment in facilities, research and development, quality control and worldwide service. We want to produce a complete line of dependable, reasonably priced minicomputer systems that are as respected as Sperry Univac mainframes.

We want to keep you in the family.

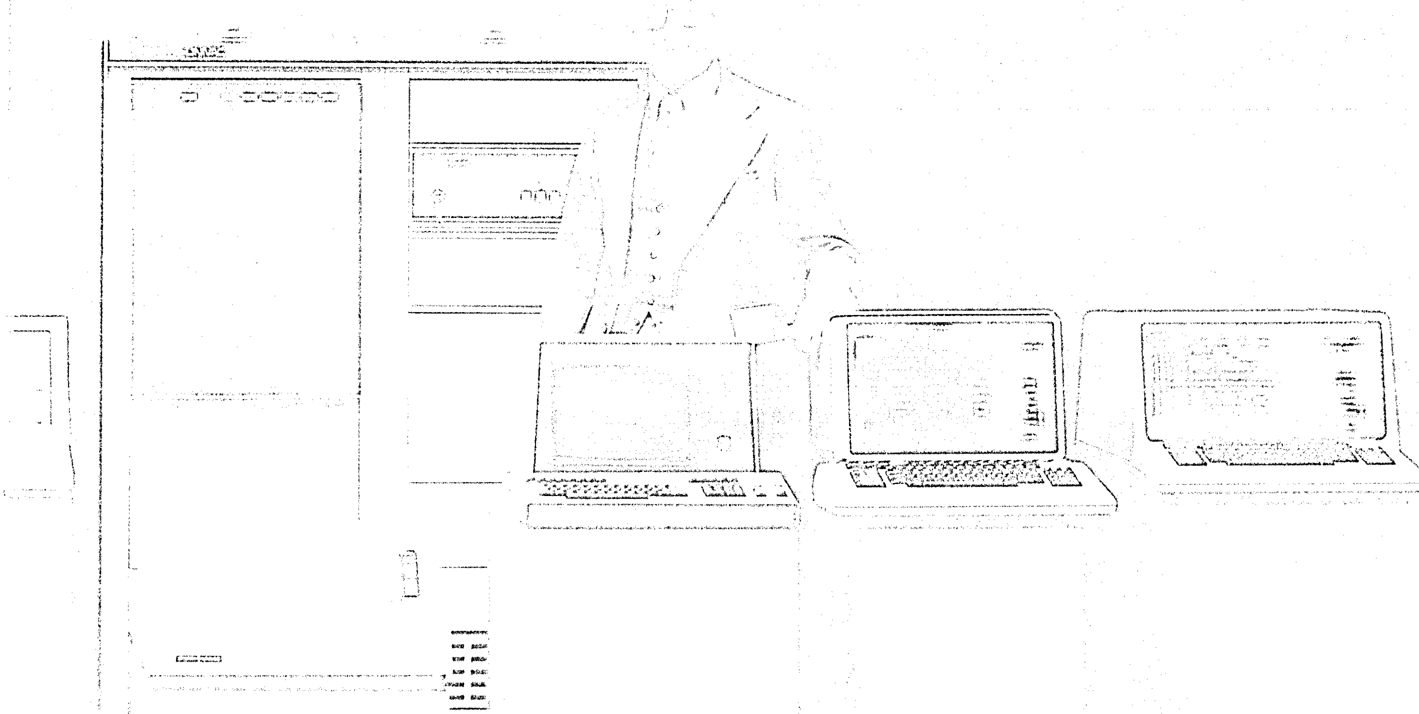
For more information, write to us at Sperry Univac Mini-Computer Operations, 2722 Michelson Drive, Irvine, California 92713. Or call (714) 833-2400, Marketing Communications.

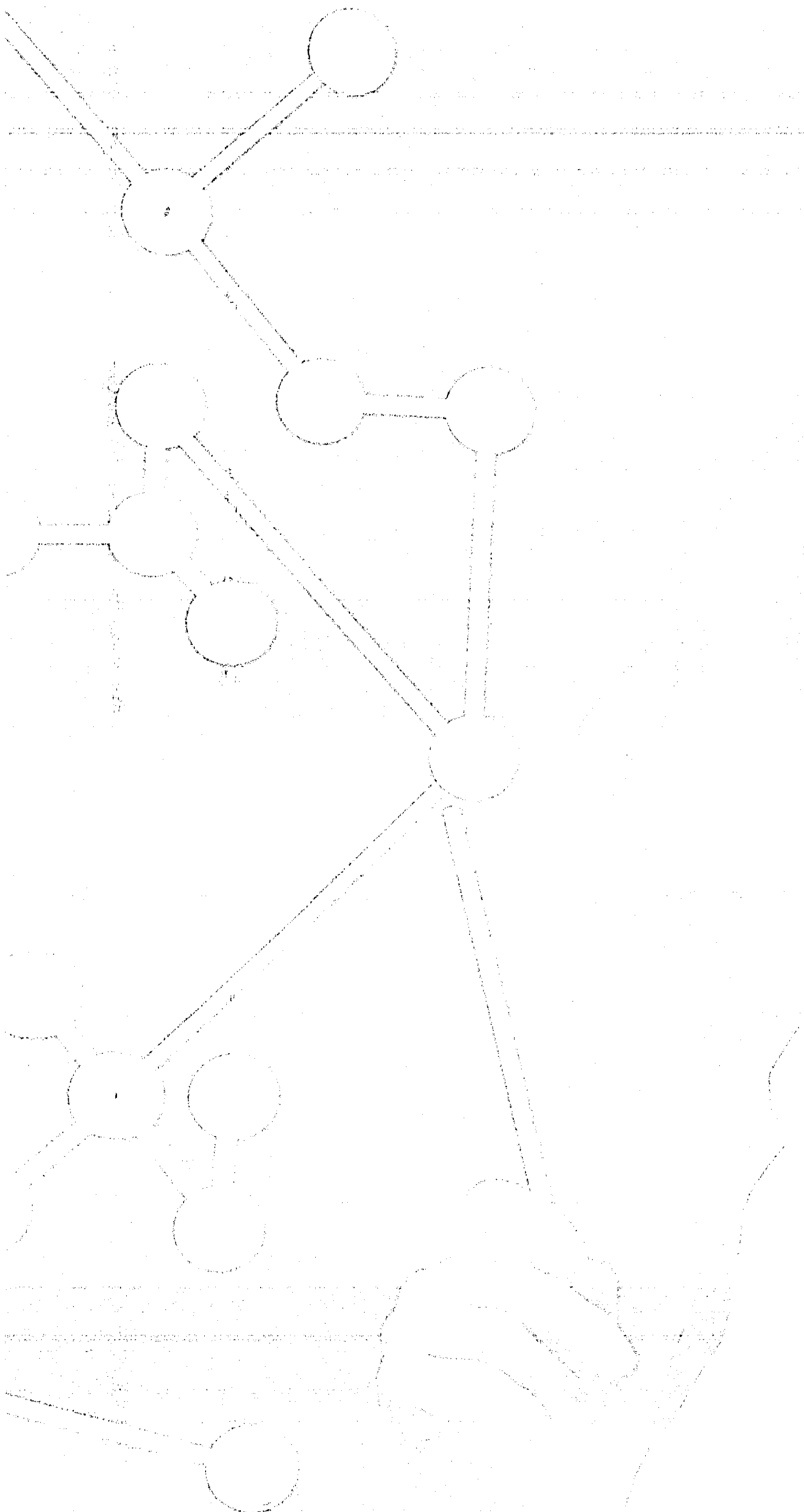
In Europe, write Headquarters, Mini-Computer Operations, London NW10 8LS, England.

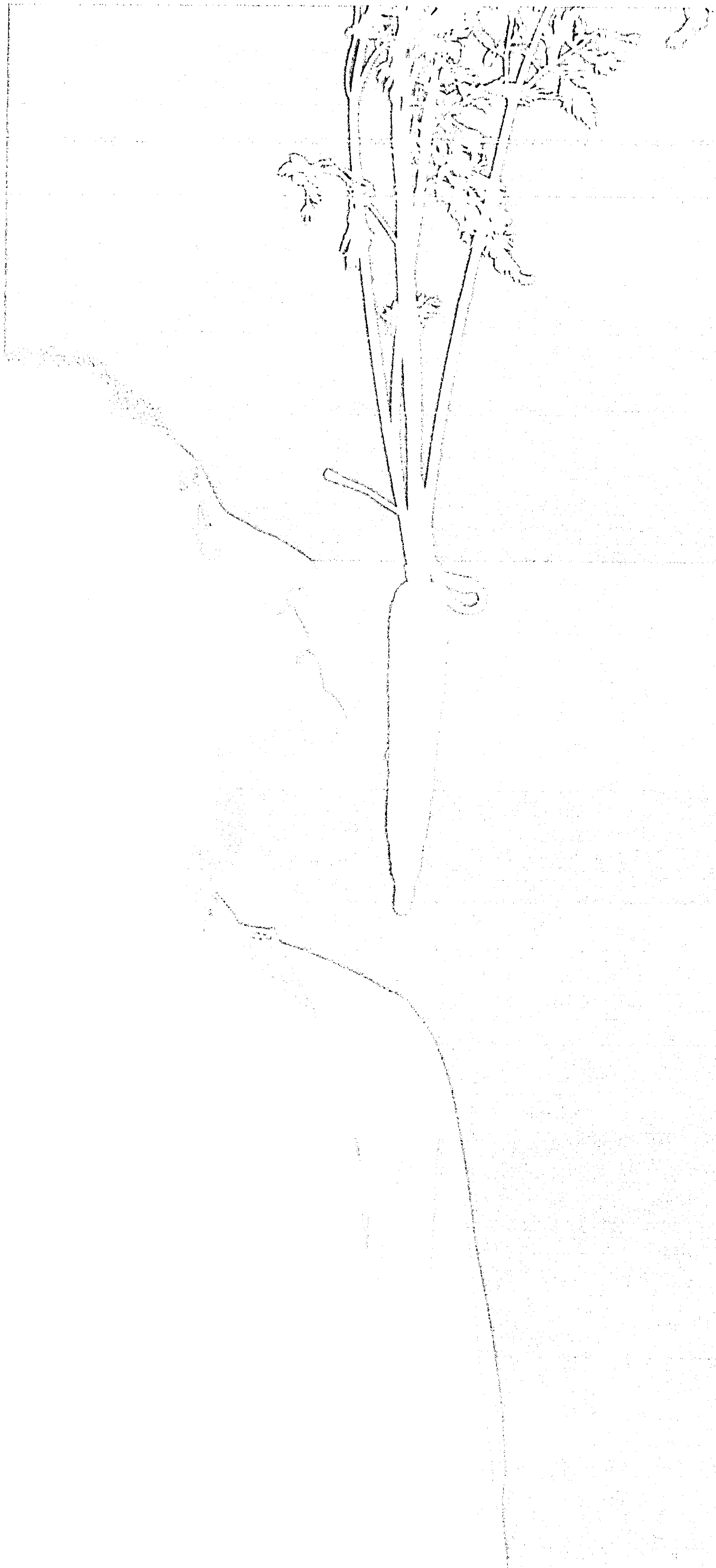
In Canada, write Headquarters, Mini-Computer Operations, 55 City Centre Drive, Mississauga, Ontario, L5B 1M4.

SPERRY UNIVAC

SPERRY UNIVAC IS A DIVISION OF SPERRY RAND CORPORATION







Today's advertising of tomorrow's networks has raised expectations to the point where existing networks must be a disappointment.

WHAT TO DO WHILE WAITING FOR UTOPIA

by Howard Frank

Within the last few years, a variety of new offerings, requirements, and techniques for transmitting information have come close to overwhelming communications and teleprocessing managers. The communications planner must now deal with new techniques such as packet switching, decisions between using public network services or building private dedicated systems, proposed systems such as SBS, ACS, and XTEN, and new demands on communications such as distributed processing, electronic mail, and the office of the future.

Many managers, particularly those in medium or large organizations with substantial data communications requirements, are now in the process of deciding whether to build extensive new private networks or rely on the services of the growing number of public data transmission offerings. Over the next few years, most organizations will be faced with this problem.

Today's advertising of tomorrow's networks has raised user expectations to the point where the reality of today's networks must be a disappointment. Reading the output of vendors' PR departments, today's user may be led to expect that *current* networks provide high system reliability, widespread equipment compatibility, support for both asynchronous and synchronous terminals, easy connection to hosts, full duplex protocols operating on low cost digital lines, sophisticated network control for fault diagnosis and repair, and adaptability to varying traffic types and conditions. *No existing operational*

A key issue is the cost differential between the public network tariffs and cost items other than line charges in private networks.

network, either public or private, provides all these features.

Today's private network offerings come from several classes of vendors including the traditional mainframe manufacturers such as IBM, Burroughs, and Univac; microcomputer and data communications hardware suppliers and processors such as Digital Equipment, NCR/Comten, Computer Communications Inc., Prime, Raytheon, Codex, Digital Communications Corp., Tandem, and TRAN; and carrier organizations such as GTE Telenet, Tymnet, and the Bell Canada supplier, Northern Telecom.

The systems offered by many hardware vendors, quite often identified as "— Network Architecture," provide a variety of approaches ranging from centralized host control to distributed communication processor control. For example, mainframe manufacturers such as IBM and Burroughs offer host controlled procedures, and companies such as Univac, Comten, and Raytheon have distributed systems. Unfortunately, the apparently wide range of available systems is deceptive because many of the "— Network Architectures" (with notable exceptions of SNA, DECNET, and a few others) are "paper tigers" which are poorly documented in the public literature, and neither fully implemented nor widely installed. In 1980 many of these systems will achieve a measure of completeness, but it may be several years before they are available for a broad range of user needs.

Today's public networks have reached a comparable level of development. The U.S. packet-switched carriers, GTE Telenet and Tymnet, provide service in over 150 cities, and further expansion is planned. However, terminal access is primarily low speed (mostly 300 bps, with 1200 bps service growing rapidly). Synchronous 3270-bisync support has only recently (August 1979) become available from Tymnet. It is expected that Telenet will follow suit with such a service in the near future. However, neither carrier provides widespread support for other synchronous terminal protocols, for many polled multipoint line configurations, or for sophisticated host capabilities requiring extensive host software modifications.

The choice between public and private network systems is further complicated by the fact that both GTE Telenet and Tymnet now provide their hardware and software in three modes: through their public networks, in private turnkey networks, and in hybrid public/private configurations. In the third configuration, the user appears to have a dedicated separate system, but network control and management is supplied by the carrier. Additional complexity is added to the decision process by recent marketing penetration into the U.S. by suppliers to the Canadian and European public networks; Northern Telecom and SESA are two examples.

ECONOMIC TRADE-OFFS

Many factors must be considered when deciding between a public or private network implementation. Among these factors are the terminal population and its distribution, the mix of applications, the uncertainty of traffic projections, public network tariffs versus private network line costs, host support, network control and management costs, terminal upgrade costs, and the savings generated by enhanced operations. For example, systems which have widespread distributions of low-activity, low-data-rate terminals are generally served more economically by public networks. Alternatively, a heavy concentration of terminals in a single location communicating to another location is typically handled more economically via a multiplexed leased line.

To illustrate, Network Analysis Corp. (NAC) used to make extensive use of a value-added network (VAN) for interactive access from its corporate headquarters in New York to a remote computer vendor in Boston. As the terminal population at NAC headquarters increased, however, dedicated multiplexed lines became more economical. (At present, there is a 3 to 1 cost advantage between the private line and VAN approaches.)

Similarly, dedicated lines for high activity batch terminals are nearly always more economical than current public networks. This is particularly true of packet-switched networks, which offer economies derived from efficiently multiplexing packets from low activity terminals. This situation will probably continue until the public networks develop sufficient traffic to justify broadband local access from their network access controllers to their primary switching facilities. With such broadband facilities (56 Kbps and above), multiplexing of batch traffic may then prove economical.

In the same way, private networks with balanced mixes of daytime interactive and nighttime batch communications tend to be more economical than public networks. However, in such cases, additional factors may often determine the most economical approach since the public carriers offer bulk discounts that can reduce the cost of adding overnight traffic to the system.

A key issue, often overlooked in many analyses of public versus private options, is the cost differential between the public network tariffs and cost items other than line charges in private networks. Public networks provide line management and network control features which are costly components of private networks. These costs can often be avoided or reduced if public networks are utilized. In addition, public networks, because of their greater scope and more extensive backup facilities, can offer higher reliability than their private network counterparts. This is one of the more complex areas of analysis, since users are rarely able to quantify the benefits of such an increase in network performance.

There are some cases where this impact can be quantified. For example, if the network requires extensive on-line interaction by terminal operators, the improved reliability can be directly related to savings in the cost of operators, which could be substantial. In one such situation examined by NAC, the operational savings generated by the increased reliability of a public network was *equal* to the line cost of the private network. Similarly, enhanced network capabilities, including those which allow unintelligent terminals to emulate more sophisticated devices, may allow cost reductions in other elements of the budget. This often leads to complicated organizational issues, since different budget line items may be under the control of different managers, and one man-

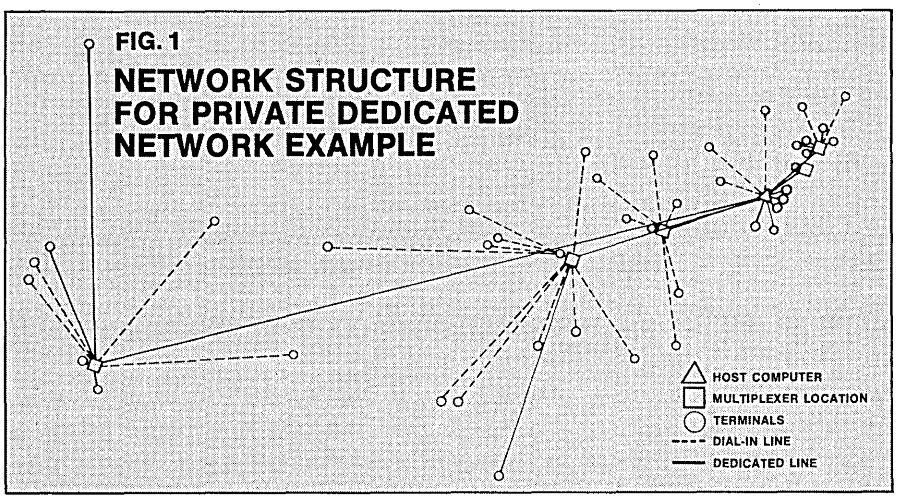


FIG. 1
NETWORK STRUCTURE FOR PRIVATE DEDICATED NETWORK EXAMPLE

FIG. 2

ILLUSTRATIVE COST TRADE-OFFS BETWEEN PUBLIC AND PRIVATE NETWORKS

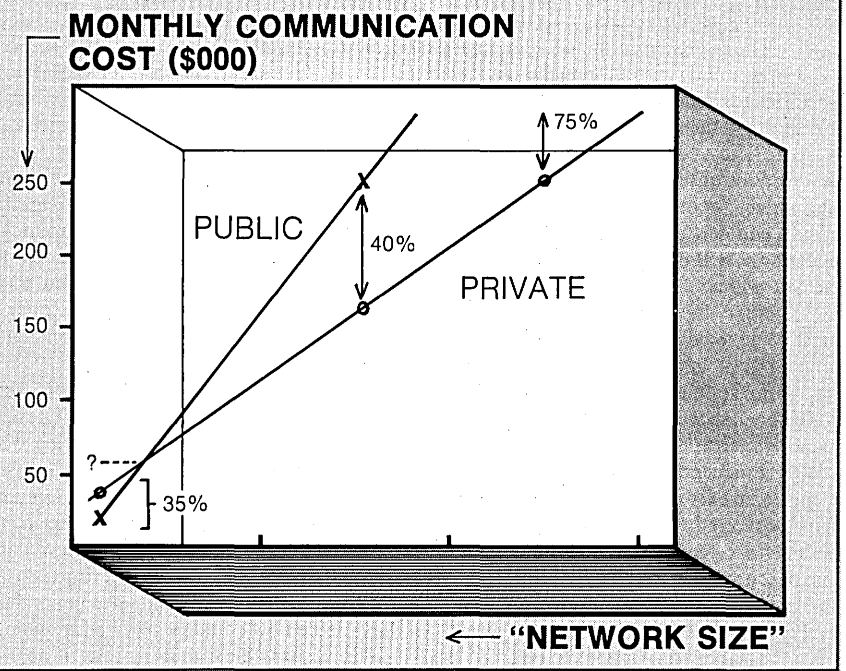
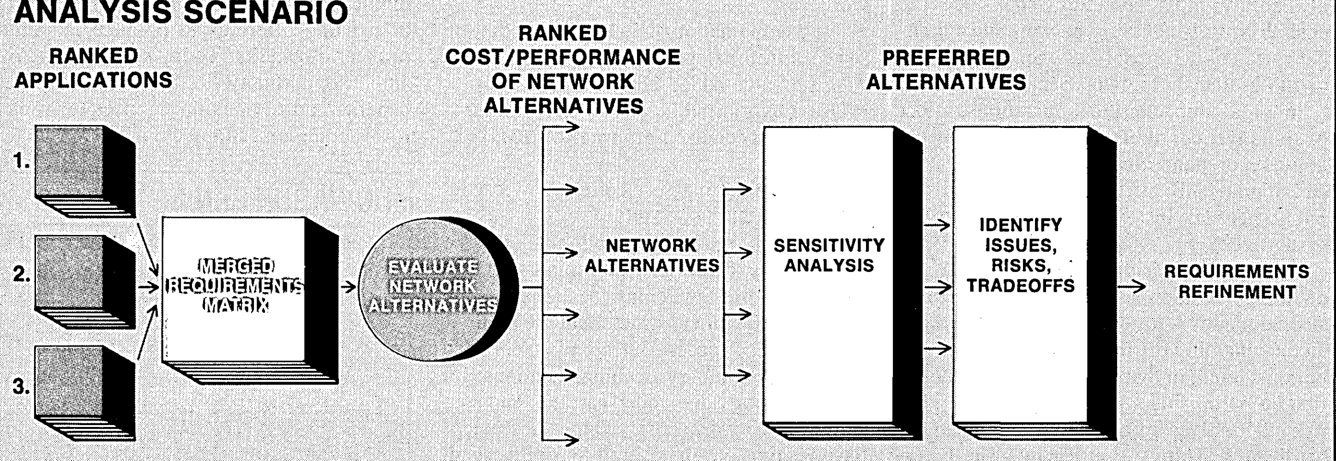


FIG. 3

NETWORK FEASIBILITY ANALYSIS SCENARIO



ager may be reluctant to increase expenditures to reduce costs in another manager's domain. Such considerations are mandatory for proper comparison of public versus private options. However, it is often necessary to perform a detailed network analysis to truly understand cost/performance trade-offs. In the last few years, NAC has performed many such studies with generally consistent findings for a wide range of terminals and traffic requirements. Two such analyses are discussed here.

TWO CASE STUDIES

The first case relates to a relatively small, centralized, terminal-oriented network used for time-sharing. The network consisted of a single host, located on the East Coast, with terminals connected via dial-up and dedicated lines to multiplexors in strategic locations. A representation of the network is shown in Fig. 1. The monthly network costs, including modems, multiplexors, dial-up charges and dedicated lines, and host interface, were $38,600. When implemented via a public network, total costs were $25,300, a 34% savings over the private network case.

The second example relates to a major study conducted several years ago for the Federal Reserve Board. Here, the problem was to investigate the economics of using a private dedicated packet network to connect the 36 Federal Reserve Bank and Branch cities to transmit data for clearing a percentage of the more than 40 billion checks written annually in the U.S. The projected total monthly cost of the private network, including hardware, software operations, and management, ranged from $76,000 to $250,000, depending on the volume of transactions carried during a six-hour-day, five-day-week period. Outside of this period, the funds transfer system carried no traffic and the network would therefore be available for other services. A recent NAC analysis of public network costs for handling the same requirements showed that these costs would be comparable to the private network costs. However, the private network of this example is unoccupied over 80% of the time, and thus available to meet other requirements such as overnight batch and electronic mail. Such traffic, if passed through a public network, would require substantial additional expense.

The two examples cited illustrate a general conclusion that has emerged from many of our studies. For small networks, characterized by widely distributed, low activity terminals, public service is generally the most economical. As network size increases, there is a strong tendency for public networks to become less economical than private networks, even when identical technology is used for both (see Fig. 2).

This conclusion makes intuitive sense because, as the private network grows, costs of management and other labor and overhead factors are distributed over a larger communications line and hardware cost base. Also, the private network achieves line and hardware economies of scale similar to the public network without the added expenses of sales, marketing, and profit burdens which often are

By waiting for the "utopian" services of a proposed "new" carrier, cost/performance benefits that are available now could be largely foregone.

the dominant costs in the public networks. Moreover, the public network carriers are now selling private network systems derived from research and development from their public services. Thus, the private network buyer can gain access to considerable hardware and software already expensed (and part of the public tariff) by the carrier. (Note that the reverse subsidy is also taking place. Software products, in particular protocol handlers developed for private networks, are now finding their way into the public carrier offerings.)

MAKING THE CHOICE

Deciding between a public or private network to serve a complex communications environment requires the rigorous application of a series of analyses to determine feasibility and cost. The first step is to define the environment in basic strategic and tactical terms. Strategic questions to be resolved which impact architectural decisions include the objective of the system (e.g., is it to produce revenue, to support one or more services, or to reduce operational costs for an already existing system?). Once goals have been defined, the functions of the system must be identified. Issues such as required availability must be addressed, since the desirability of including backup and redundancy can only be resolved when the purpose of the system is known. Because a system failure may impact critical operations, affect overall revenues directly, or merely delay the delivery of noncritical services, this factor can dramatically affect the decision to use a public network instead of building a private system.

Major decisions regarding the degree of implementation risk to be tolerated must also be made. A low-risk requirement might dictate that only off-the-shelf equipment will be considered, or that a pilot operation should first be built using a public network. Higher risk alternatives might be developing new hardware or software, either by an in-house effort or through a competitive request for proposals from network vendors. Prior to detailed analysis of options, it is also imperative to address methods of cost recovery through mechanisms such as charging cost centers or projects. If usage charges are appropriate, charge-back schemes must be devised.

The strategic requirements establish guidelines for resolving environmental, technological, managerial, economic, and policy questions including data processing factors such as centralized versus distributed computing. After resolution, detailed analyses of alternatives can begin. These analyses must address such issues as: scope of service, procurement options, provision for latent demand, incorporation of future technology, and phasing requirements and priorities.

The first step in the detailed analysis is a preliminary requirements analysis. Specifics for such an analysis include gathering location-dependent data, traffic characteristics by application, functional descriptions of the hardware to be considered (terminals, communications devices, and hosts), and performance requirements by application. At this stage, the uncertainties in the data gathered, such as the precision, accuracy, and completeness of available data, must be understood. Furthermore, the appropriateness of the available data for the new system must be assessed along with changes which could occur because of increases in demand with time and new services that may be added. Since projections of future requirements from existing data are often unreliable, sensitivity analyses will usually be required before final decisions can be made. An outline of the steps within the feasibility analysis and technical strategy evaluation is illustrated by Fig. 3.

The network options to be considered should include:

- Continue current mode of operation (e.g., separate application networks)
- Build a privately owned, dedicated network
- Use a combination of dedicated and dial-up services from telephone company offerings
- Use a value-added network
- Use a hybrid public/private network
- Use the specialized offerings of IBM, DEC, etc.
- Use an emerging service of a new carrier offering (ACS, SBS, XTEN)

Each reasonable option should be analyzed by creating a preliminary design which identifies switching locations, off-net and on-net facilities, structure of the preliminary network (access lines and interswitch trunks), preliminary recommendations for specialized or value-added carriers, and estimates of network costs. Once these steps have been taken, the overall feasibility analysis can be completed. Outputs of this analysis are:

- Cost/performance analyses
- Recommendation for implementation, where appropriate
- Gross budgetary estimates of cost and implementation schedule
- Description of potential benefits, risks, and limitations
- Identification of potential system vendors

Choosing among building a private network based on today's technology, utilizing an existing public network, or waiting for the "utopian" services of one of the promised new carriers is fraught with difficult technical and management issues. These issues involve technology, economics, the degree of integration of voice and data, and the timing and tariffs of the new offerings.

Numerous descriptions of the proposed services of the new carriers have appeared in the literature, and so these will not be repeated here. However, an element shared by all of these systems is their innovative use of new technology with significant potential services and/or savings to the user. Offsetting this advantage are the uncertainties of the dates of availability of the new services (for technical and regulatory reasons), and the almost total lack of information concerning the costs of their services.

In the near term (the next several years), it is unlikely that any of these new carriers will offer nationwide service to a significant number of users. Because of these factors, it is highly risky for any major user of communications to plan his near-term strategy on the availability of the new carriers since, by waiting for such offerings, cost savings and performance enhancements that are available now could largely be foregone. It is by no means clear that the loss of near-term savings can be justified by the uncertain savings generated over an unknown timeframe.

Thus, the least risky and potentially most cost-effective approach for a large communications user is to work within the context of existing offerings to produce maximum near-term benefits. Today's options provide ample opportunity to achieve both these benefits and to position the user for tomorrow's communications utopia. ❊

HOWARD FRANK

Dr. Frank is president of Network Analysis Corp., Great Neck, N.Y. In this capacity, he is responsible for the management of the firm's activities in network strategy, architecture, planning and design, operations research, and management consulting. Previously, Dr. Frank was special consultant to the Executive Office of the President of the U.S. in charge of network analysis activity. Earlier, he was associate professor of electrical engineering and computer science at the University of California at Berkeley. Dr. Frank is a Fellow of the IEEE, a member of the Financial Affairs Committee of the New York Academy of Sciences, and a member of the Advisory Committee on Information Network Structure and Functions for the Executive Office of the President.

ADVANTAGE: CENTRONICS

the top-seeded 700 Series

...is a team of dot matrix printers that's hard to beat! Each of our twelve models meets a specific application and price/performance need...and every one is built and backed by the world leader in printers. With Centronics, you always have the advantage.

ADVANTAGE: SELECTION The 700 Series covers every inch of the court. We offer speeds from 50 to 180 cps—with throughput up to 400 lpm, a wide variety of forms handling capabilities, a choice of uni- or bi-directional operation, and a choice of 80 to 132 column formats. And we're still growing, with three new models just added and more on the way!

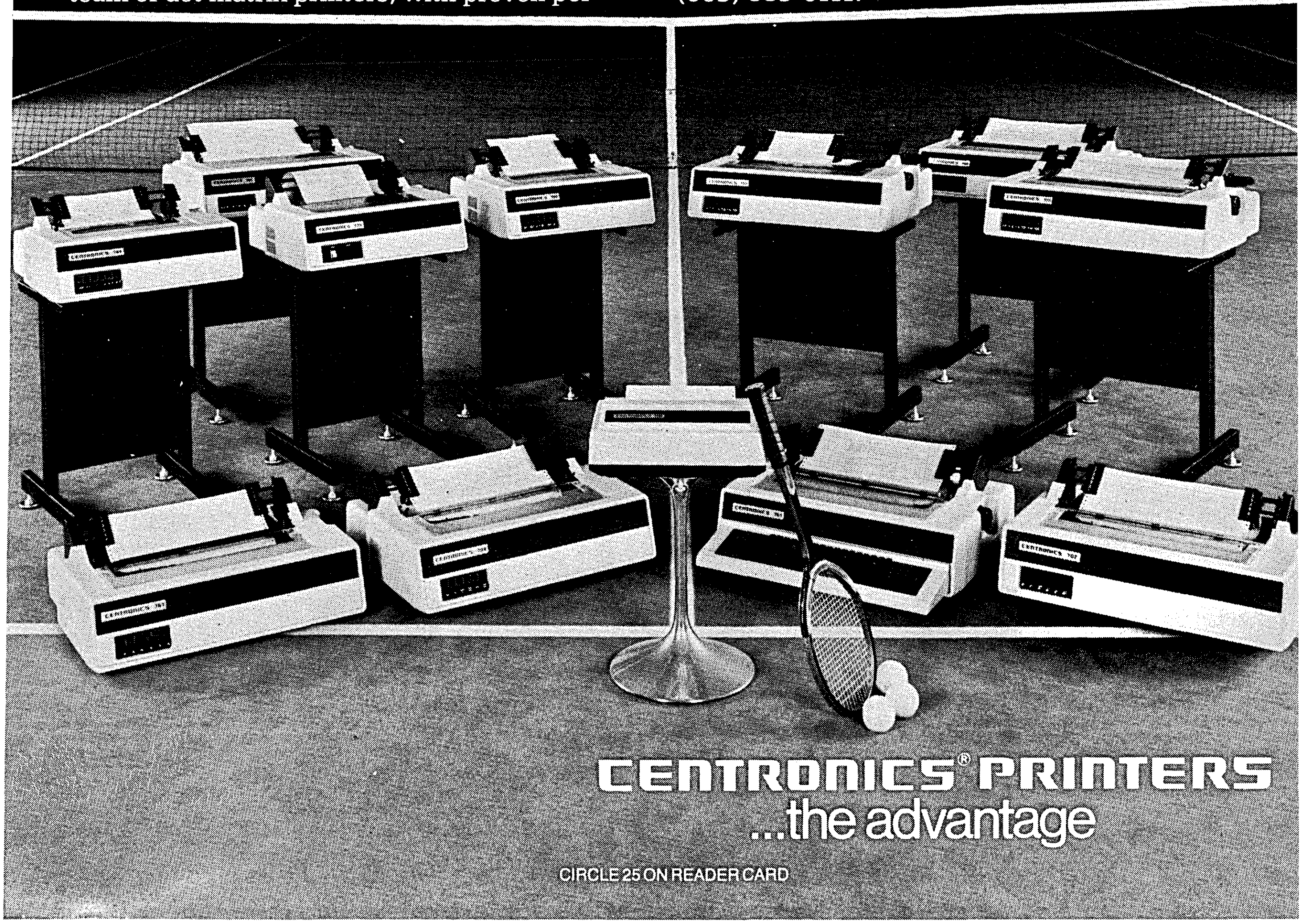
ADVANTAGE: FLEXIBILITY The 700 Series' wide selection gives you the flexibility to move into new applications and emerging market areas. Wherever your business takes you, you'll always have the advantages of the leader.

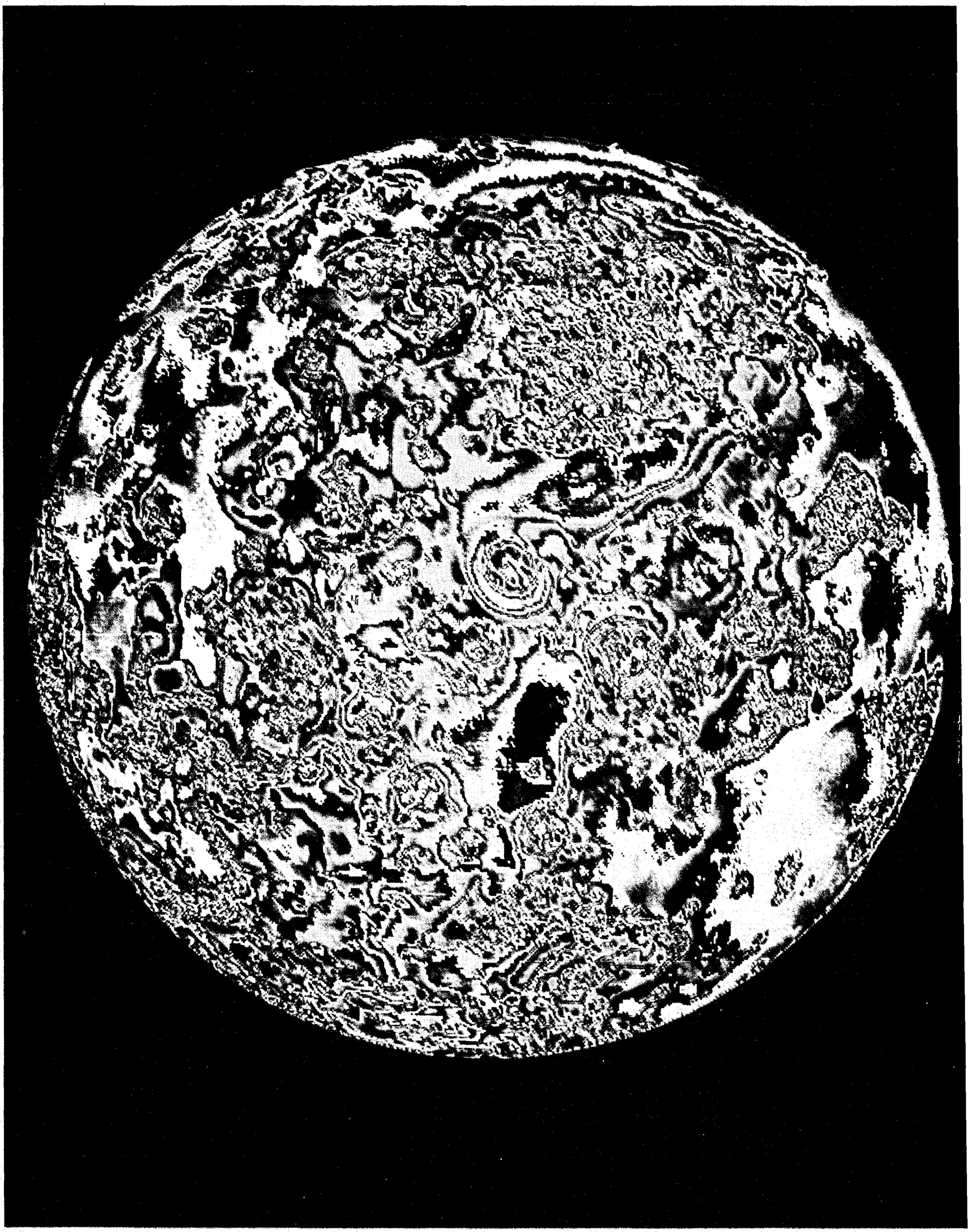
ADVANTAGE: APPLICATIONS The 700 Series is already the industry's most successful team of dot matrix printers, with proven performance for all applications: microcomputer, minicomputer, small business, terminal, text preparation, data communications, and data processing systems.

ADVANTAGE: COST OF OWNERSHIP Even though they perform like superstars, our team doesn't make big-money demands. They're highly reliable in any environment. And they're ready for any tour, with the largest worldwide service organization of any printer company backing them up.

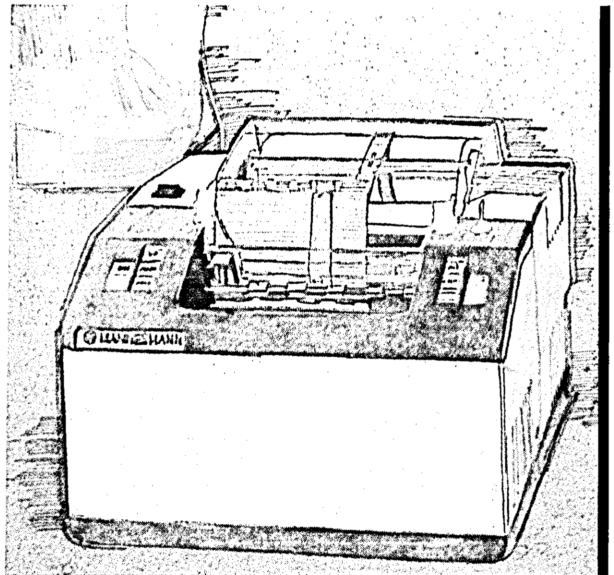
ADVANTAGE: LEADERSHIP Each member of our 700 Series team shares the Centronics tradition of leadership. We pioneered dot matrix printing, and have been ranked #1 ever since. No other company can match our strong serve in selection, performance, and value. Plus, because of our high-volume manufacturing capability, we won't fault on your delivery.

For more information on products or employment opportunities, call or write today: Centronics Data Computer Corporation, Hudson, New Hampshire 03051, (603) 883-0111.



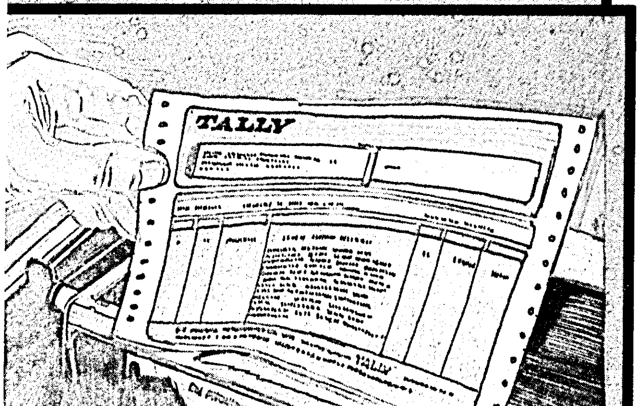


Actual-size reproduction of a Polacolor 8 x 10 hardcopy of Io, moon of Jupiter, taken by Voyager satellite. An example of remote sensing. Photo courtesy of JPL/NASA.



M79-3 Pass Book Printer

Here's a problem solving printer targeted for banks that meets the challenge of printing entries in bulky passbooks. It simultaneously prints a separate journal for the bank's records. It has a locking device to protect the printed information. Designed to increase operator efficiency and customer convenience, the Tally Pass Book Printer operates at a fast 200 characters per second. It offers automatic forms thickness control and both expanded and condensed type size to meet various forms requirements.



T-1602 Quick-Tear Printer

Ideal for customer check-out counters, the Tally T-1602 serial printer combines high speed printing with fast and efficient forms handling capability. Featuring 160 character per second optimized bi-directional printing, this easy to use machine lets you tear off a completed form immediately above the print head—no wasted forms! The paper tractors adjust easily from either side of the carriage to accommodate different width forms. Printing is quiet and dependable.

T-1612 Printer Terminal

Upgrade your data communications network with the Tally T-1612 1200 Baud Printer Terminal. Fast and functional, the T-1612 keeps pace with line rates from 300 through 9600 Baud. Easily programmed by the operator or downstream loadable from a computer program, both the KSR and RO models let you control 42 distinct functions. Tabletop or stand mounted, the exceptionally quiet Tally T-1612 has outstanding print quality and features 6 different type sizes for forms efficiency or enhanced readability.

T-2000 Hush-Tone Printer

For the serene office setting where noise is a nuisance, you'll want the whisper quiet performance of the Tally T-2000 Hush-Tone line printer. Run it continuously around the clock and never hear from it. It never requires preventive maintenance nor adjustments of any kind. Available at 125 or 200 lines per minute, the Tally T-2000 has the highest reliability and lowest cost of ownership of any printer on the market.

TALLY® PRINTERS WORLDWIDE

8301 So. 180th St., Kent, WA 98031
Phone: 206-251-5500,
Cable Address: Tally, Seattle, WA
Telex: 320-200

Tally Corporation is a member of the Mannesmann Group.

In Washington, the more things change, the more they remain the same.

THE SURREALISTIC WORLD OF WASHINGTON

by John Eger

To understand the federal regulatory morass, observers of Washington should perhaps take the philosophical approach well known to Latin scholars: "mutatis mutandi" (the more things change, the more they remain the same). But understanding is one thing; coping is quite another. The latter requires a certain intestinal fortitude, or as those illustrious Latin scholars would say, "illigitimi non carborundum" (don't let the bastards wear you down).

Admittedly, this is not an enlightened or optimistic approach to analyzing regulatory, legislative, and policy developments affecting this business we increasingly refer to as the "information industry." Out of this mire, however, there are four conclusions which can be drawn:

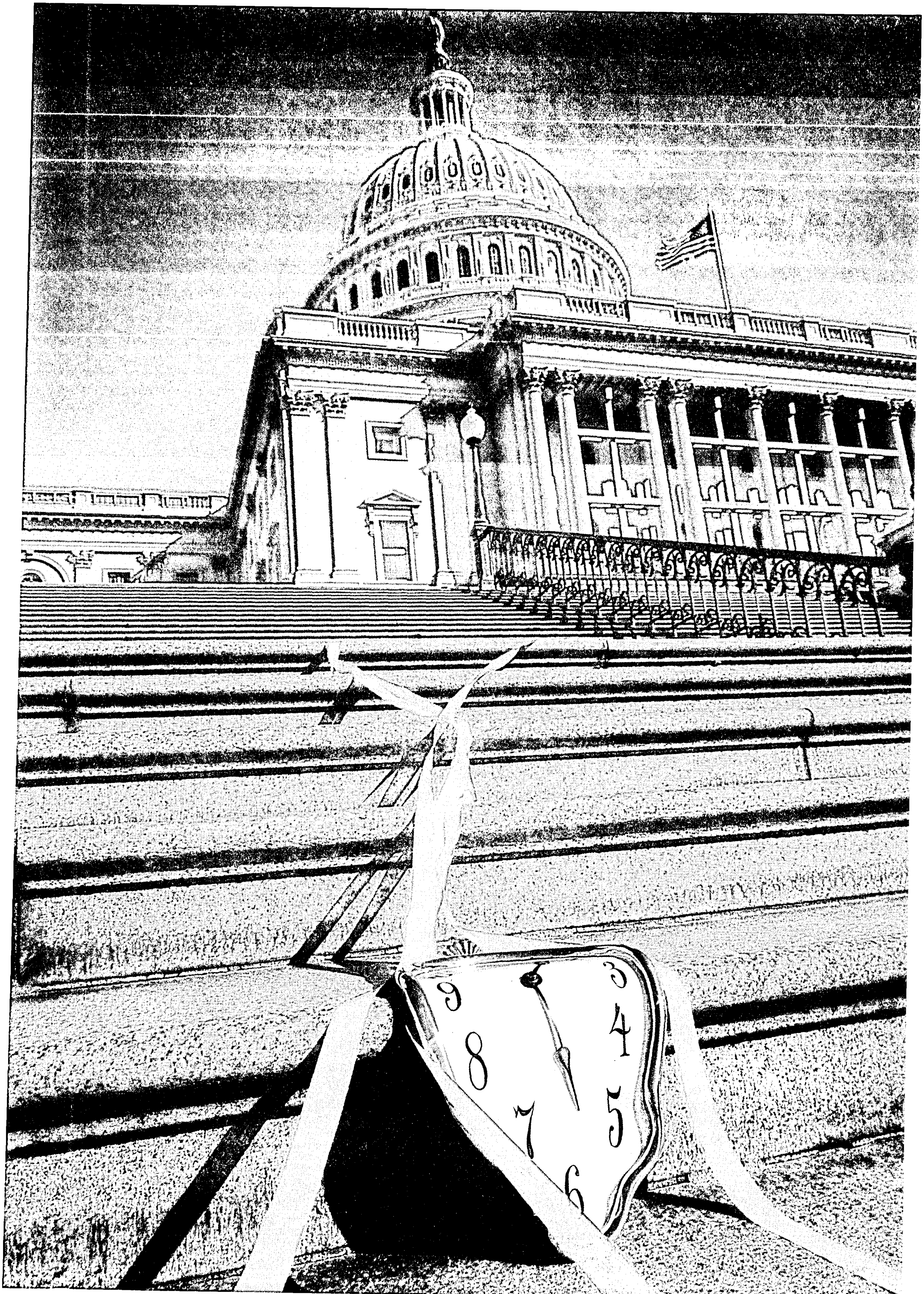
• Despite the revolutionary advances in technology, the movement of law and policy is evolutionary at best and is never more than half a step ahead of the threat of technological obsolescence;
• The system of checks and balances, with its push-pull between the Executive, Legislative and Judicial branches, is a process we may fault, yet respect and perhaps even welcome on sober reflection of our advocacy for change; after all, it provides for a ratcheting in regulatory policy through a sort of "common law/common sense" approach;
• The development of any coherent "national policy" occurs only in a period of crisis, not calm, when constituent groups, manufacturers, suppliers, and users alike take arms against the ad hoc, bureaucratic approach to solving the nation's ills; and lastly,
• In spite of Washington, where "sound travels faster than light" (as one Bell scientist has noted), the emergence of an information society and an information-based economy is like the flow of a river: politicians and laws may influence its course but can never deter or destroy its movement. The inevitability of an information-based society is and will be the reality of the 1980s.

To briefly illustrate the regulatory and judicial albatross hanging about the neck of the computer/communications marketplace, consider just a few areas where the gap between promise and performance seems to have widened over the years, or where the promise of reform itself shifted as the technology continued (and continues) to outstrip the law:

• In 1956 the Justice Department "successfully" concluded the so-called "punch-card" case against IBM—but at a time when the medium for source data and computer input had already outmoded the use of cards, and the market for tabulating machines had changed drastically. The cost of the suit was in the millions, or perhaps billions, of dollars. Senator Charles Mathias (R-MD) recently questioned whether this was "any way to run an economy?" He observed that "in 1932 the Department of Justice had antitrust suits pending against AT&T and IBM and had just signed consent decrees with General Electric and Westinghouse. In 1952 Justice had monopolization suits pending against AT&T and IBM and had just signed consent decrees with GE and Westinghouse. And in 1977 Justice had monopolization lawsuits against AT&T and IBM and had filed proposed modifications to consent decrees against GE and Westinghouse." All this is in the name of progress?
• In 1956, the Federal Communications Commission's so-called *Hush-a-Phone* decision upholding Bell's prohibition against the attachment of acoustical couplers was reversed by the U.S. Court of Appeals. Three years later, in the *Above 890* decision, the FCC made point-to-point microwave frequencies available to railroad, pipeline and other companies for communications systems which often interconnected with carrier facilities. Then again in the *Carterfone* decision of 1968 and the *Specialized Carrier* decision of 1971, the commission acted to settle the interconnection disputes despite telephone company allegations of technical harm and threats of soaring rates. However, in 1979, the debate over access and interconnection continues, and a proposal was even reintroduced to establish a "primary instrument concept" (P.I.C.) to protect telephone companies' interests in the "first phone in every home."
• In 1970, the FCC initiated a Computer Inquiry, seemingly conceived to stay the sweep of its regulatory reach into the data processing arena. Although broad in scope, the basic thrust of this action was to define "data processing" and "data communications" with such precision that only the latter would be regulated. In 1976, however, the commission had to reopen the inquiry (now called Computer Inquiry II), because it acknowledged that the lines between the technologies had already blurred, making such distinctions meaningless. Why the commission continues these semantic exercises is another subject. In the meantime, however, the Dataspeed 40 terminal offering from AT&T and other similar offerings from regulated companies were making their way into the unregulated dp marketplace—in spite of the niceties of regulatory attempts to keep the fences standing between the technologies.

SWING TOWARDS DEREGULATION

It makes sense to be prudent when forecasting drastic changes in the framework for regulation of the telecommunications



Despite revolutionary advances in technology, the movement of law and policy is evolutionary at best.

industry. Yet the pendulum appears to be swinging towards deregulation at the moment. Despite some setbacks, the promise and prospect for reform and hence a robust, wide-open market for enhanced computer, telecommunications, and information goods and services never looked better.

Although technology itself, the declining unit costs of microelectronics, and the basic changes in the economy are the driving forces which will define the landscape of the 1980s, awareness of the importance of these new tools to America's future was clearly evident in both the House and the Senate during 1979. H.R. 3333, a total rewrite of the 1934 Communications Act, was introduced by Congressmen Lionel Van Deerlin (D-CA), James Collins (R-TX), and James Broyhill (R-NC); S. 611 was introduced by Senators Ernest Hollings (D-SC) and Howard Cannon (D-NV); and S. 622 came from Senators Barry Goldwater (R-AZ) and Harrison Schmitt (R-NM). All these bills proposed to deregulate significantly the present environment, to open the way for unfettered entry by new manufacturers, suppliers and brokers, and to increase experimentation with value-added services by users and others on the periphery of "information" activities, such as publishing, insurance and banking.

These proposals for regulatory reform reflect the accumulated concerns of a decade of lawsuits, protracted regulatory proceedings, and thoughtful proposals by earlier administrations. The former White House Office of Telecommunications Policy, for example, produced Cabinet committee recommendations for the development of cable television, an "open skies" policy for employment of satellite technology, and legislation to enhance the freedom of broadcast news and entertainment. Among other initiatives, it also proposed a Common Carrier Competition Act of 1975, which, due to the heavy stakes and natural politics of telecommunications reform, never found its way into the Office of Management and Budget clearance process in the Executive branch, let alone the Congress. Yet those early efforts pushed the nation onto a more elevated plateau where issues and politics were finally joined.

It is not at all certain that H.R. 3333 will result in legislation in 1980 or even 1981. It has already been abandoned in favor of ad hoc amendments because of the cloak of vested interests and the general want of a clear constituency for its passage. Nor is it clear that the efforts of the slower moving but theoretically more deliberate Senate will resolve competing interests for its proposals in the near term either. In any event, since it requires both houses of Congress to act, and to act in basic agreement, the outlook grows dim for any major legislation this term.

USERS PROMOTE REFORM

While the debate grinds on in the Congress, advocates of regulatory reform may find support in the emergence of a private information sector. Here, a consensus is developing among the user community which is gaining momentum in promoting evolutionary reform. And these users are taking their case directly to the regulatory agencies.

Consider just a few actions of the FCC which bear a striking resemblance to recent Congressional proposals:

Congress: Both houses propose to override the 1956 Consent Decree prohibiting the Bell System from providing anything other than regulated common carrier services.

FCC: Computer Inquiry II issues a "tentative decision" and further notice of proposed rulemaking, which would apparently shift the burden of enforcing the Consent Decree to the Department of Justice (Justice earlier refused to define the decree for the FCC with respect to the Dataspeed 40) by allowing AT&T the option of providing "enhanced non-voice" (or read differently, "data processing") services on a tariff or nontariff basis.

Congress: In proposing to allow AT&T to provide new, potentially unregulated and noncommon carrier services, the House and Senate insist that Bell do so at "arm's length" to its monopoly by establishing separate subsidiaries to insure against cross-subsidy and predatory pricing.

FCC: Proposes that carriers (Bell and others) owning transmission facilities may provide "enhanced non-voice" services, which normally would be offered on an unregulated resale basis, if they set up separate subsidiaries to do so.

Congress: Moves toward deregulation in the provision of terminal equipment.

FCC: Concludes that only basic media conversion equipment could be offered as part of a voice or non-voice service. Provision of such terminal equipment in conjunction with information processing capabilities should be separate from other offerings of the monopoly side of the business.

Congress: Decides to redefine interexchange and long distance services, and deregulate all intercity carriers except for so-called "dominant" carriers (defined so as to apply only to AT&T).

FCC: Proposes a two-stage proceeding to consider eliminating the filing requirements, including economic and support data, for specialized and competitive common carriers, and exempting such carriers from regulation altogether.

Other similarities between Congressional proposals and Commission proceedings are evidenced in the broadcast, cable tv, and international areas, lending credence to the supposition that the system of checks and balances works not only among the three primary branches of government but affects the "fourth branch" of federal regulatory agencies as well.

The President and his executive agency chiefly responsible for information policy, the National Telecommunications and Information Administration, have joined the Congress in calling for regulatory reform. Together, their influence and support creates a favorable climate for new market entries. Moreover, whether legislation emerges to deregulate or redefine the communications marketplace or industry structure, reform will be forthcoming as long as the momentum and enthusiasm for change continues.

SOME SAFE PREDICTIONS

The 1980s promise to be an exciting period in America's economic history. Large-scale integration, fiber optics, and microelectronics are finding their way into almost every conceivable product or service. Satellite technology is being exploited for the transmission of every conceivable media mix—controlled and designed increasingly by a more sophisticated user community. All this means that the regulatory fences must either give way to an orderly shifting and relocation or crumble in the wake of another surge of progress as computer/communications technologies, already blurred, are employed by industries whose very existence will be determined and shaped by their skillful, agressive use of the information technology available.

In the short term, it is safe to suggest that:

- All terminal equipment will be deregulated; the regulation of communications does not dictate the need to regulate terminals any more than the regulation of electric utilities requires regulation of stoves or hot combs;
- Widespread interconnection of all interstate private and public networks will be permitted, provided that "access" charges (or fair compensation) for the use of the public network are paid. This will be true regardless of the medium (i.e., data, fax, video, or voice) or regardless of whether all interstate services are competitive;
- Resale and brokerage of communications lines will become attractive to many users, as they are encouraged by an environment of minimal regulation;
- The Bell System will be permitted to enter the "enhanced non-voice" or data processing field by offering, albeit under tariff, the Advanced Communications Service (ACS); Bell will also enter the resale field with offerings of its underlying digital data facilities;
- The Postal Service will be constrained by Congress, the FCC, and the Postal Commission from owning electronic transmission facilities or marketing its proposed Electronic

Computer Originated Mail (ECOM) service; but through others or with large users directly, such services will be available.

In the longer term, the scope and degree of regulation, the role and influence of the government in national and international forums, and the vision which America adopts as an information society will not depend primarily on present debates over computer/communications boundaries, the 1956 Consent Decree, or FCC regulation. The primary factor will be our view of ourselves in a changing world economic order, and how we respond to international pressure on our telecommunications freedoms. Privacy and data protection laws, taxes on information, and increased tariffs and restrictions on telecommunications facilities are already emerging in Europe, Canada, and Japan; more direct control of international information flows everywhere appears likely as tensions rise over trade, unemployment, and inflation.

THE INFORMATION ECONOMY

Coupled with the barriers to the free flow of information already erected by the Soviet Union and many lesser developed countries, the U.S. and all nations dependent upon global information flows confront what may be one of the most complicated, convoluted issues of this century. Censorship laws, data protection laws, tariffs, standards, information taxes, nationalization, theft by computer-satellite link, information sabotage by "hunter-killer" satellites are all part of this global arena, where nations are awakening to one of the world's oldest but most important resources: information. These developments present an imminent threat to the world economy and to all nations dependent upon the free flow of information across national borders.

Less clear is what these barriers portend for the future of our "information industry." Information no longer refers to conventional bodies of statistics, academic knowledge, or daily news; it includes anything from the electronically sensed, computer-analyzed human heartbeat to the electronic transfer of funds to and from a bank account. We are increasingly dependent on this broadly defined "information" for the functioning and growth of our economy and the quality of our lives. Simply, information has become a marketable, exportable commodity in which more of us are engaged every day. Information means national and individual income—money and profit to producers, jobs to workers.

The struggle over the tools of computers and telecommunications and of information itself should not necessarily be viewed as tactics in an information war; nor is it productive to suggest there is a conspiracy to control the free flow of information in the world and cripple America's particular brand of freedom and its concept of the free flow of information. Yet a persistent Achilles' heel for the U.S. has been its predisposition to rely on the marketplace, believing in America's technological preeminence and proverbial "Yankee know-how" to solve all problems, large or small, national or international.

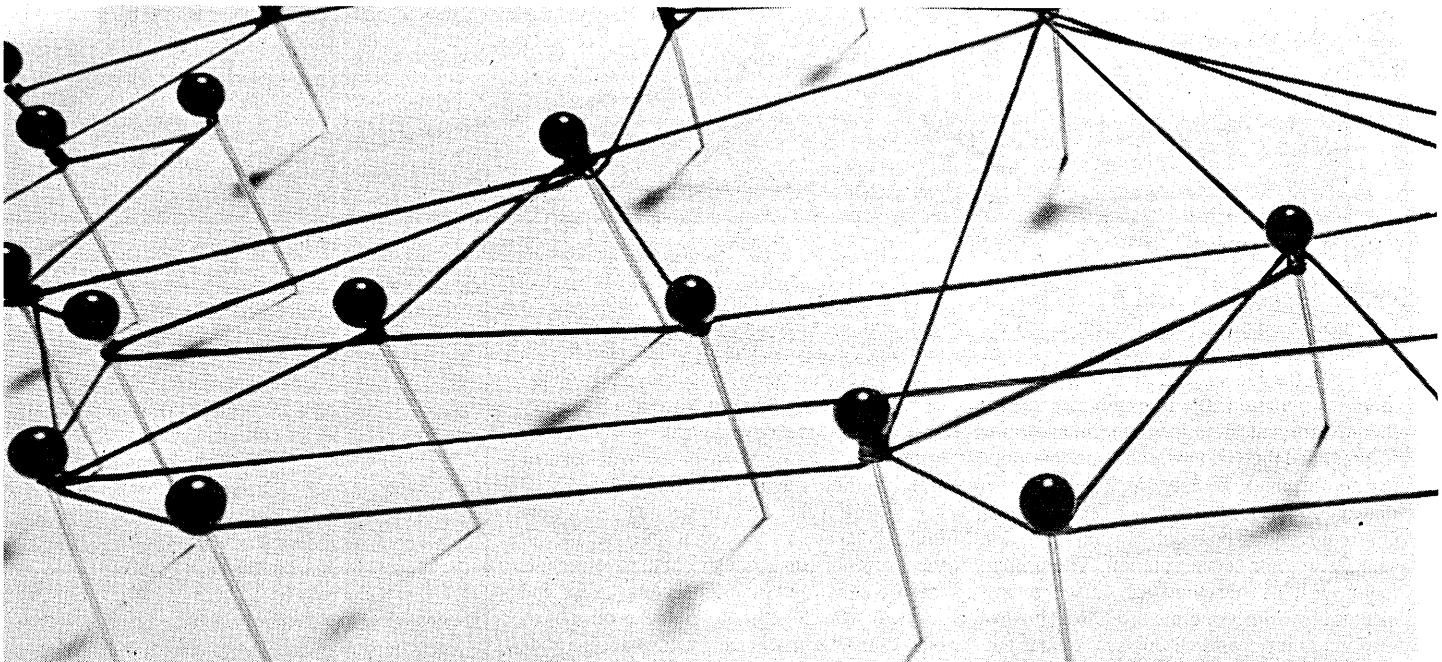
But a fact of 20th century life—now that advances in transportation have shrunk the world—is that industry and government, the private and the public sectors, must find ways to work together to create at once a robust domestic market for information goods and services. At the same time, the U.S. must develop an aggressive, creative strategy for penetrating foreign markets.

The need to negotiate away invisible barriers to invisible trade, to share our technological wealth with developing nations, to work constructively with all nations to harmonize existing and emerging national laws, and to foster the development of world law on communications and information makes such cooperation imperative.

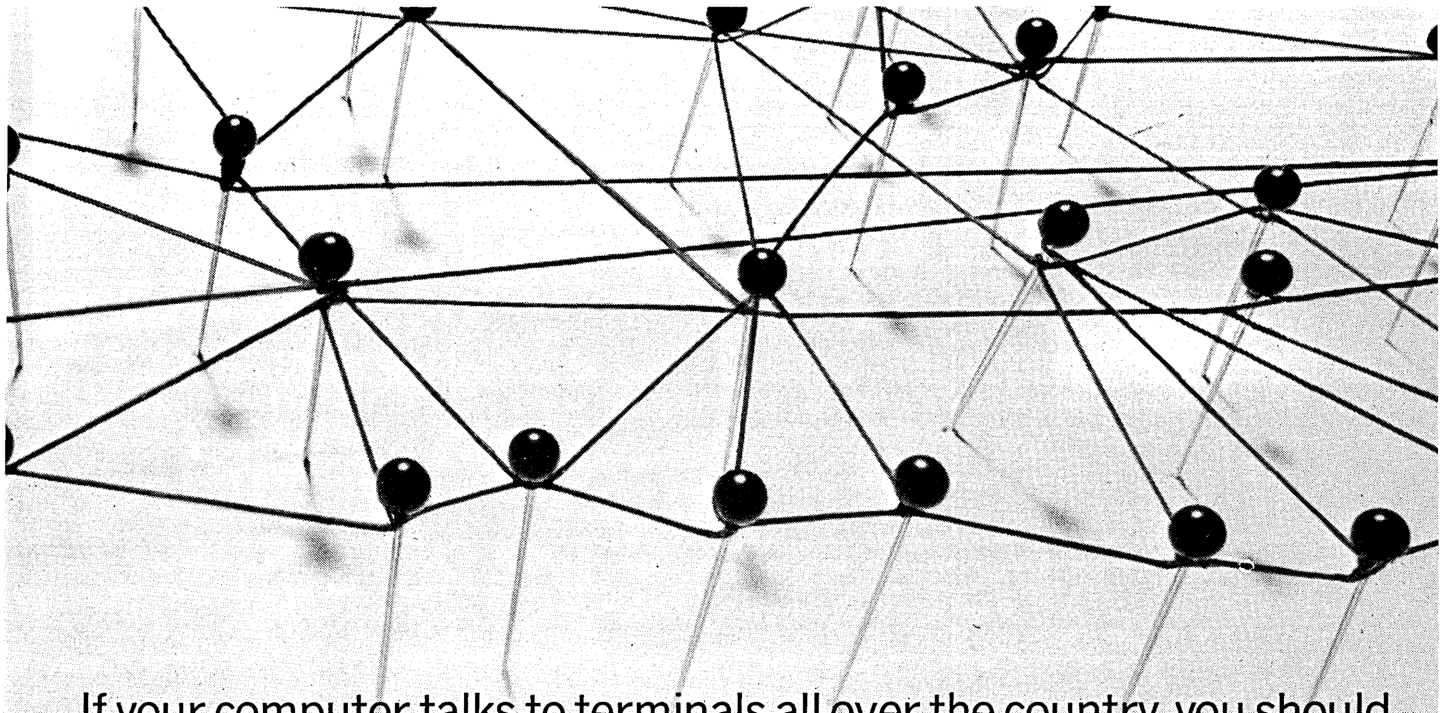
A more compelling argument for a U.S. national/international communications policy cannot be made. ❋

JOHN EGER

Mr. Eger is a Washington, D.C. attorney and a consultant on communications law and regulatory policy. He has been a telecommunications advisor to Presidents Richard Nixon and Gerald Ford. He was also head of the White House Office of Telecommunications Policy from August 1974 to July 1976. While head of OTP, Mr. Eger was chairman of the Interagency Council of Government Telecommunications Users and a member of the President's Ad Hoc Committee on Regulatory Reform and the President's Cabinet-level Domestic Privacy Committee. He is presently a consultant to the government on communications, information, and regulatory policies. Mr. Eger is also a contributing editor to DATAMATION, and is counsel to the Washington law firm of Lamb, Halleck & Keats.



The GTE Telenet data network. It's affordable, and it's here today.



Small Business Systems Surveyed

Microdata Reality Gets Top User Rating

Microdata Corp.'s Reality, Basic/Four Corp.'s Model 400 and the IBM System/3 models 6, 10 and 15 reaped the highest marks in Management Information Corp.'s (MIC) fourth annual small business systems users survey.

To assess how well small business systems are meeting users' needs, MIC polled 568 companies that use 689 small business CPU's.

Each respondent was asked to subjectively rate the vendors and their products on performance (whether stated equipment specifications have been realized), reliability (uptime vs. downtime), ease of use (amount of time necessary to train new personnel), service (maintenance) and vendor support (such as advance training and program assistance).

A four-point rating scheme was used (1 = poor, 2 = fair, 3 = good, 4 = excellent). The survey results were given as averages of the ratings assigned to each product in each of the five categories.

The Microdata Reality, Basic/Four 400 and System/3 Model 10 and Model 15 were the only small business systems to receive ratings of 3.0 or higher in all five categories.

Taking the average of all five categories, the Microdata Reality topped the field with a score of 3.66 (based on 27 respondents using 55 units). The Reality earned 3.8 in performance, 3.8 in reliability, 4.0 in ease of use, 3.4 in service and 3.3 in support.

Based on nine respondents with nine units, the average for the IBM System/3 Model 15 was 3.6. This system was rated 3.6, 3.8, 3.6, 3.7 and 3.3 in performance, reliability, ease of use, service and support, respectively.

Eight users with 17 Basic/Four 400's gave that system an overall rating of 3.5. In performance, reliability, ease of use, service and support, the system was rated 3.5, 3.4, 3.8, 3.4 and 3.4.

Following this order, the IBM System/3 Model 10 was rated 3.3, 3.5, 3.3, 3.3, and 3.3, respectively, by 34 users with 45 units. The System/3 Model 6 received 3.4, 3.7, 3.7 and 3.1 ratings in performance, reliability, service and support, respectively, by eight users with eight units.

Copyright © 1979, CW Communications/Inc., Newton, MASS 02160

In Case You Missed It,

OUR COMPETITORS JUST CAME FACE TO FACE WITH REALITY.®

A recent MIC survey published in Computerworld asked small business computer system users to evaluate their equipment.

The result: our competitors lost. They lost in performance. They lost in ease of use. They lost in overall user satisfaction.

If you don't want to make the same mistake our competitors' users made, face Reality. Call your nearest authorized Microdata representative.

Microdata Corporation Direct Sales Offices:
Atlanta 404/266-8900
Chicago 312/981-1440
Cleveland 216/234-7318
Los Angeles 714/540-6730
Miami 305/592-0770
New Jersey 201/964-6700
New York 212/695-6509
San Francisco 415/697-0430

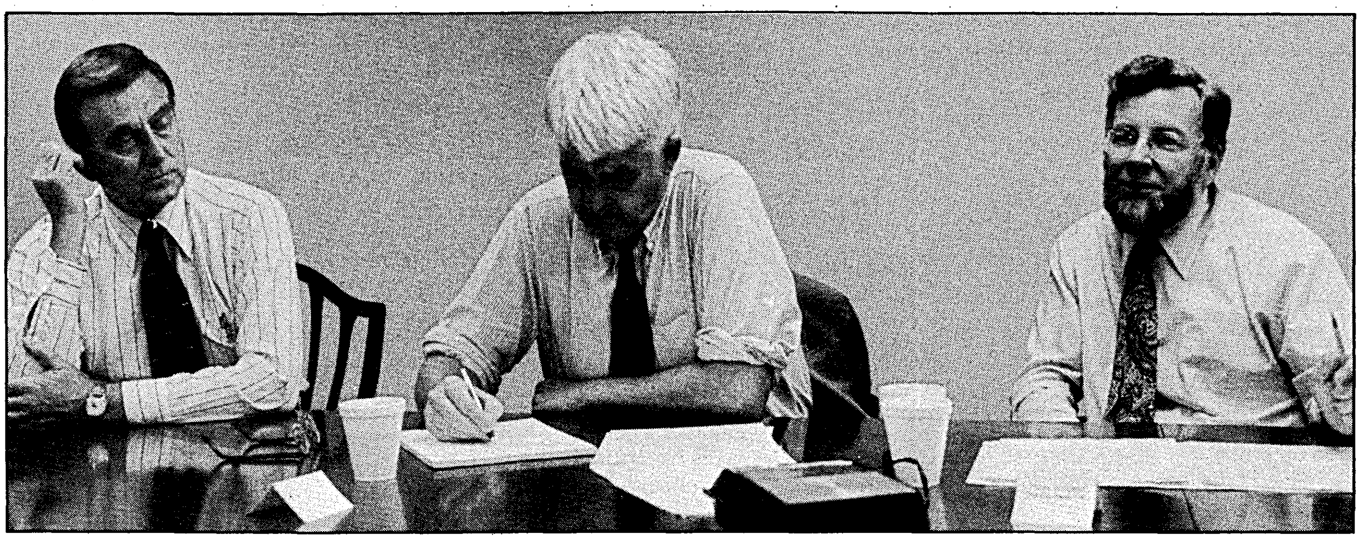
Authorized Microdata Dealers:
Anchorage 907/276-2431
Bernaby 604/438-7361
Boise 208/345-3560
Boston 617/273-2920
Dallas 214/243-6350
Denver 303/773-1510
Detroit 313/358-1950
Edmonton 403/487-0871
El Paso 915/772-8126
Fayettsville 501/756-0970
Houston 713/440-6111
Honolulu 808/521-8011
Indianapolis 317/257-1426
Kansas City 816/483-6900
Los Angeles 213/685-8910
Memphis 901/346-0088
Monroe 318/325-9618
Montreal 416/862-0125
Nashville 615/373-3636
Oakland 415/547-6565
Philadelphia 609/779-1901
Portland 503/245-7714
Puerto Rico 809/844-3020
Raleigh 919/782-6020
Salt Lake City 801/531-1122
Seattle 206/641-4990
Spokane 509/624-1308
Toronto 416/862-0125
Washington, DC 703/549-4300

Reality® by Microdata

CIRCLE 30 ON READER CARD

Three corporate MIS executives take time to tell us what's happening in the whirlwind world of managing information. On one point they all agree: today's end user wants "fast food" solutions.

CALLING A SPADE A SPADE...A CHAT WITH MIS EXECUTIVES



Corporations are constantly clamoring not for more information, but for better ways of managing it. The new decade will no doubt usher in a spate of new information services and systems that promise to aid in management decision-making, to improve worker productivity, to bring corporate information under control.

To find out how companies will approach the management of information in the '80s, we invited in three MIS executives from corporations that are large users of computers and communications. After a lively exchange of disparate and challenging views, we came to one major conclusion: the ways to manage a corporation's information resource investment are as varied as the information systems themselves.

Our guests for the afternoon's candid conversation were James F. Collins Jr., vice president, corporate staff, Management Information Services at Johnson & Johnson; George J. Feeney, vice president, Advanced Development at Dun & Bradstreet Corp.; and John Gosden, vice president, Telecommunications at the Equitable Life Assurance Society.

We had initially planned a question-and-answer session, but once our guests got going, they needed very little prodding from us.

DATAMATION: Off the top, do you have any general comments or observations on what you see as the major challenge or problem to be faced in the next few years?

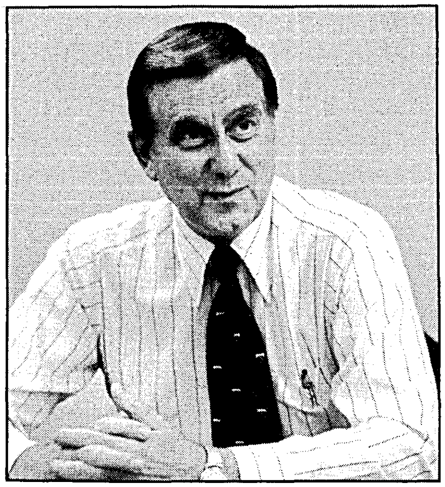
Collins: Let me just arbitrarily pick one of my favorite themes. That is, that it's up to top level management in information services to take the lead in driving the systems and services out to the end user as far and as fast as possible. We've mastered the technology and we've surrounded ourselves with competent technical staffs. But we have been slow to get our associates and ourselves moved up into the ranks of general top management, where we can be truly equivalent members of the total operations management team within the corporation. The next logical step is for the information services manager to move up to operating general manager or president of the company. But that hasn't happened in very many places.

In fact, the only way we will achieve the rise through the ranks is by giving up some of our turf in information services, even though that might mean diminished control over operations or budgets. It's far more important that we maintain the lead in policy and control. Low-cost minis and micros are now available to everyone. But if we allow everyone to go out and get them, and use them in whatever way they want, then we are going to end up with a very costly hodgepodge.

The challenge to us is to direct the applications and usage of all information services. We have to take the lead, to control this transition towards distributed processing. What we have to realize, though, is that the distribution has to be of authority and responsibility as well as of equipment.

Feeney: I think our greatest challenge in the next few years lies in the fact that we are responsible for processing not only data, but effectiveness, relevance, and value as well. As the share of the corporate budget representing information systems and services continues to soar, there comes an increasing need for accountability. My big fear is that we are spending more and getting less. The key to determining the relevance, productivity, and value of the data processing dollar lies in an accountability for three main areas: service, scope, and balance.

In the first area, service, I'll stick my neck out and say that the typical data processing department has been less concerned about the needs of its end users than it ought to have been. The success of outside service organ-



COLLINS: "We have to exercise control over this transition to distributed processing. And we must realize that the distribution has to be of authority and responsibility as well as of equipment.

izations and minicomputers is a testimony to this deficiency. There is only one reason why outside service organizations have been so very effective in pulling in substantial flows of corporate money: they do a better service job than is done in-house by the corporation. It is essential that there be a change in the service-mindedness of our organizations.

Scope is the second area ripe for scrutiny. Data processing organizations have barely begun to comprehend their main function in their own organizations. They are still thinking of themselves as the executor of things prescribed by circumstance or by outside authority. It's time we look on ourselves as the agent of innovation and growth within the company.

And finally, I see a pressing need for balance among three groups within most organizations—the users, the data processing organization, and the corporate management. There is a conflict of interest among these three groups that supersedes simply misunderstanding each other's functions.

End users want functionality and capability. They don't care about costs, architecture, standards, tomorrow, or any of a dozen other concerns that consume us in dp. These users want things done, and done now. Management, on the other hand, cares a great deal about costs, but usually has very little idea of the practicalities involved in meeting user needs and even less idea of just what those user needs are. This group wants only to lower the budget. Then we get to the dp organization with its factory mentality. The dp group only wants to get the work out; never mind what the work's for. They tend to respond rather than to initiate.

That is perhaps the biggest challenge to the data processing professional in the next 10 years—to establish the leadership that strikes some reasonable balance between the budget-mindedness of management, the production-mindedness of data processing, and the function-mindedness of users.

Gosden: I see great diversity in the way different companies and different industries use and exploit data processing, communications, and all information services. But there is a common thread among all this variance: a department that is essentially dp-oriented cannot tell the rest of the company how to run the business. Innovation within an organization comes from people who are concerned about the business angles. We capitalize on the innovative qualities of our people who have systems capabilities by putting them into business slots.

When I hear it said that we in information services need to get business-oriented, I say it's too late. We had to get business-oriented five years ago in order to move out into line organizations. In today's business world, it makes no sense to look at dp as a separate entity; it is one part of the corporate system of doing business. You cannot even look at one computer system and say it is productive or not productive. It must be examined in its working mode—running all the way through the production, marketing, and delivery of services or products to business customers—before the system's worth can be judged.

Looking down the road a bit, I see a social change coming that will make life very different, if not difficult. It's what I characterize as the I WIN situation, an acronym for I Want It Now. Today's 25 to 35 year olds grew up with the telephone. In the next 20 years, we aren't going to have many people left who are skilled in the art of corresponding. These people are used to picking up the phone and getting a pizza delivered, making airline reservations, and even being diagnosed by a doctor.

There is a tremendous drive for this kind of convenience, and the trend is moving into industry more and more. Large companies will increasingly compete on this basis as they move towards people-convenient service oganizations. That's the glamour of minicomputers—they're like "fast food." To meet this challenge we need well-organized data, networks that are physically compatible, and a new style of faster-reacting management.

So, what I view as the major challenge in the '80s is dealing with the I WIN situation, the I-Want-It-Now syndrome, both in the customer environment and in the corporate environment by internal management. Our responsibility is to develop the management that can deal with that fast response world.

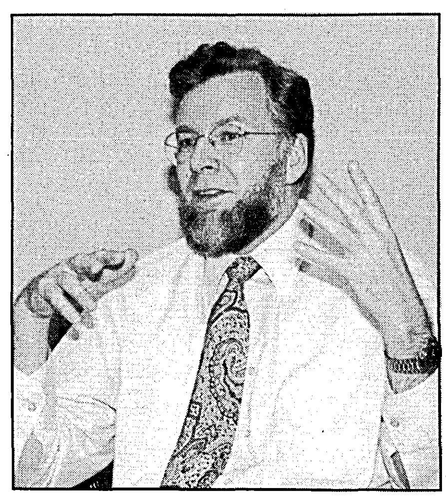
DATAMATION: We seem to have a concensus on the idea that the manager of information services needs to push the equipment out to the end users faster and further than ever before. Just how much control does the MIS manager relinquish in the process?

Collins: One thing we have to realize is that information resources are a tool and should be managed as such for the benefit of whatever business we're in, and not for the benefit of the growing technology. In trying to force more and more of these tools out and at a faster pace, we're driven into a decentralized mode because of the technology and the low-cost equipment that is available. On the other hand, we're driven at the same time in the opposite direction towards centralized control because we have government reporting regulations to satisfy, we have central planning, financial planning and control, and we have large data base and data bank needs.

What I'm saying is that we have to have both—centralization and decentralization. We have to have the discipline that accompanies central control to guarantee compatibility in languages, formats and equipment. We also have to have decentralization in the sense that we must drive the use of these systems out to the end user, no matter how small his operation or how distant from central headquarters.

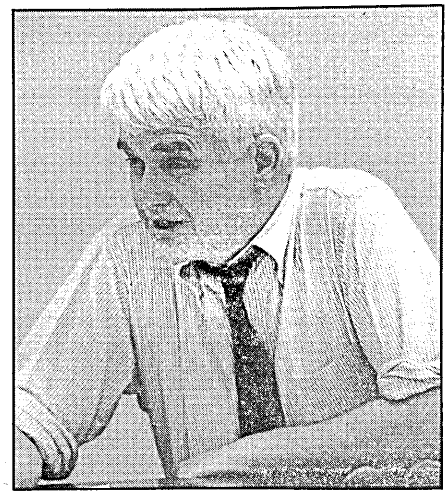
Gosden: Perhaps these end users don't want all this technology and equipment forced on them. If a corporation has done its job in moving systems-oriented people into the functional departments, then those departments already have the capability in-house to exploit the technology—and at their own pace and in their own interests. They don't need some central dp boss to tell them what they need and when. Let the line organization put in its own system, make it run, and then be accountable for its value to that group.

What we need to do is get the bodies



GOSDEN: "In today's business world, it makes no sense to look at dp as a separate entity; it is but one part of the corporate system of doing business."

FEENEY: "The typical data processing department has been less concerned about the needs of its end users than it ought to have been."



out there in the line organizations who are capable of exploiting the information systems. And the top dp people should encourage that move.

Collins: I disagree. If corporate information services does not have strong, central, well-directed policies, the end result will be chaos and very expensive redundancy. I never witnessed an operating unit that did not want to have as much information services capability as could possibly be driven to it. They will suck it up like a vacuum. But I say we must drive it out there in a very orderly manner to avoid chaos and incompatibilities.

Gosden: Yes, you need some policies, but you have to be careful. Central policies are the same as saying, "You may have something, but there are strings attached." Policies produce strings, and you need the minimum number of strings.

Collins: I prefer to look at it as a structured environment, rather than one with strings attached. You must remember that every user out there does not necessarily have an abundance of technical experience.

Gosden: I don't believe an abundance of technical experience will be all that necessary. Moreover, some of today's users have more technical expertise than we have.

Collins: Perhaps, but do you want to run the risk—and an expensive risk—of having to redesign all the existing, available software?

Gosden: Yes, if that would produce a net benefit for the company. At issue is not what is an ideal form of control, but what is actually beneficial for the company. It might turn out that replacing a huge central system with millions of minicomputers—and at great expense—is the right thing for a company to do. You just can't decide that a priori. It's possible that the hodgepodge created by different operating units going in different directions is what's right for the company. If we're going to move our systems people out into business slots in the line units, then we have to back them up with confidence in their decisions. Strong policies and plans preempt that.

Feeney: I think our big problem is impatience—on the part of both the end user and the system vendor. Users are enticed by the low-cost, high-performance promises from minicomputer vendors. The two leading vendors of distributed processing systems have pushed the concept of a minicomputer in every office. They found they could end-run the central dp department and go directly to the end users, where they were indeed greeted with a great deal of enthusiasm, endorsement, and acceptance. But now those users are finding that the costs are higher than expected, and the performance less than satisfactory. The end result has been chaos.

The challenge to the data processing industry is not only to serve users, but to serve them in an economical way. The vendor that can make the user happy over the next month is an instant hero; the vendor that can make the user happy over a much longer period of time is a business partner.

Gosden: I think it is the responsibility of top corporate management to exploit the dp industry and adapt its technology to their needs; it's not the other way around. And it is our responsibility as information resource managers to advise top management in that regard.

Now, none of us professes to have a crystal ball to help in that respect. But if top management of a company integrates technology into the entire corporate structure, then there is a whole range of alternative strategies from which to choose—and many of them can work. It's stupid to decentralize if you don't have the capability to take advantage of it; it's stupid not to decentralize if the capability is there. That's what I meant earlier when I mentioned the diversity in exploiting information resources. It is the responsibility of top corporate management to position the company to exploit a range of alternative strategies. It is our responsibility to help top management by seeing that a whole variety of technical solutions exists.

Collins: I think we have to take on that responsibility ourselves. Furthermore, we should be thinking of ourselves as top management. Also, you have to watch out you don't run the risk of returning to the good old days when all departments had their own files, but none of them matched. There are some real reasons why control is necessary.

Another point that is often missed is the relative cost-effectiveness of systems. A user out in the boondocks may look at the low cost of a piece of equipment and think it's a dream come true. What that user hasn't yet discovered, and what he needs us to help assess, is what are the real costs of using that piece of equipment. Equipment costs are about 20% of the identifiable, assignable, total information services costs. The other 80% of the cost is in people. I take the cost of equipment and multiply it by five to determine the total yearly costs. And it turns out to be about right. Again, my point is that information resources must be controlled in an effective manner.

Gosden: That's the approach almost always taken by people who have lived only in the dp world—that we must guide our users. But other approaches do work. For example, our treasurer recently put in a minicomputer to control the float. I doubt if it runs more than two hours a day, and it probably cost tens of thousands. It's most inefficient. All that it does is tell him at any point how much money we are making by controlling our float. To a data processing professional, his system looks like careless waste. But there was no way I was going to force him to program in COBOL on a big machine or time-share a machine with someone else. It wasn't worth the pain. Considering the size of our float, he has a system that pays off; there was no point in worrying about alternatives. After all, a great deal of waste takes place in constant analysis of alternatives.

If you take my point to the extreme, then you would have anarchy. I will concede that much. However, any need for consistency and control must come from an operational need, not from a need for symmetry or beauty on the part of the dp department.

Feeney: From where I sit, the problem is one of productivity. We boast about our increasing systems capacity, and yet we still are not doing very well in terms of output per person. I think part of that blame must be shouldered by the data processing industry.

Here we have an industry that has taken a huge chunk of money from society, and I can't see that society has gotten very much in return. Our dp budgets go up every year, but I don't perceive a proportionate rise in productivity.

A director of a cancer research center recently made a statement that I believe is unfortunately applicable to our situation. He said that we had finally turned the corner in cancer research; there are now more people living off it than are dying from it.

Gosden: In some ways I agree with you. Data processing is not as terrific as some would have us think. It is a business tool. Remember, though, that you are looking at it from the center. The challenge is to place the people who are running the business in a position to expoit these tools. We have developed marvelous tools, and we have very clever people who are "toy" conscious and "toy" proficient, but who have no sound business sense.

Collins: One way to improve the usage of computer technology is to reduce the number of people that are assigned to it. Productivity

"We have developed marvelous tools, and we have very clever people who are 'toy' conscious or 'toy' proficient, but who have no sound business sense."

is a problem. In the last 15 years, we have witnessed an increase of at least 100,000 to 1 in electronic effectiveness. During that same time, the lines of code put out by programmers have barely increased enough to pay for their increased salaries.

Eventually we will see a reduction in the need for programmers. While we have a scarcity today, tomorrow we will alleviate this problem by truly high-level languages, by truly effective microcode imbedded in the equipment, and by doing less internal programming while making better use of available packages.

DATAMATION: One factor that has not yet come up for discussion is IBM. It has been said that computer users are extremely resistant to ever questioning anything that IBM does. Do you think that is a fair assessment?

Gosden: No. An excellent example was when IBM tried to shove PL/1 down our throats and abolish COBOL. They weren't able to do it. They completely underestimated how important COBOL was to us.

Collins: Also, there are a lot of companies chipping away at IBM's market share. Digital Equipment, for one example, does a much better job in remote access time-sharing. So, DEC is walking away with that market. IBM does not control it all.

Feeney: I think that we are headed for less competition in data processing than there is now—and that isn't much. Now that's a very undesirable state of affairs. I don't like the philosophy that when I view the United States, my only options are love it or leave it. I would like to think it's possible to change it. And that's how I feel about IBM.

DATAMATION: How do you view the Justice Department's antitrust suit against IBM?

Gosden: A number of things can happen and none of them will change a thing. Eight IBMs will be a lot tougher for the competition than one.

Collins: Whichever way it goes, I don't think it will change the course of history. I merely resent my money being poured down the drain. It's an inordinate waste of taxpayer dollars.

DATAMATION: What do you consider to be the greatest need of the user today?

Gosden: If I were to ask users what was the most dramatic need in dp today, I am assured they would settle on the statement, "Why the hell does it take so long for things to get implemented?" Users would happily pay twice as much to get things implemented in half the time. The big thing that would help reduce that lead time is the use of packages, even if they aren't close to what was actually wanted.

There are two wonderful benefits to using a package. First, if you are estimating changes to a package, the slippage factor is much less than estimating the whole development from scratch. The second benefit is that you can introduce a package to a user and he can ask for the necessary changes or develop them himself. And for every change suggested, a price can usually be quoted. The user can make an intelligent choice.

What we haven't yet seen are really good packages. Naturally, as we break things down into smaller systems, we will see managers using more and more packages.

Collins: I agree completely. In addition to the packages available from commercial vendors, every organization develops over a period of time a collection of workable applications. In fact, we have an application book five inches thick.

Gosden: There's another, more pressing problem. That is writing a package that will be useful to a lot of different people. We could certainly stand great improvement in the learning curve for packaging.

Collins: There's something else that is happening. Operating managers are becoming a little more tractable and a little more knowledgeable. They no longer insist that everything be redesigned exactly to their desires. They are beginning to be more interested in economics and timeliness.

Gosden: That's one advantage of the new generation, the I WIN generation. They will take it now, the way it is, rather than sitting back and waiting. The generation of people in top management today is accustomed to having things done exactly as they want them done. And they will continue to want things that way. But the new generation will make do with what exists and adapt it to their needs.

Feeney: I think that today's user is not getting what he should in the way of throughput, particularly for the dollars that are being spent. The cost effect is much like the situation of the farmers. The farmer receives 12 cents for his product, but by the time it reaches the consumer there is a $5 price tag. We are faced with the same situation. Most of the expense tends to get swallowed up by the operating systems programmer, who is actually the major beneficiary of most of the technological improvements that have taken place in the past 10 years.

Then comes the applications programmer who takes a sizable scoop from the pot. Then finally comes the system itself, where the thinking seems to be, "Gosh, the system's so cheap, we really ought to have two—one for backup." We seem to have the principle of the factory getting more and more efficient in order to compensate for the growing inefficiency of the front office. The fact is, the user gets very little out of it. ✻

JAMES F. COLLINS JR.

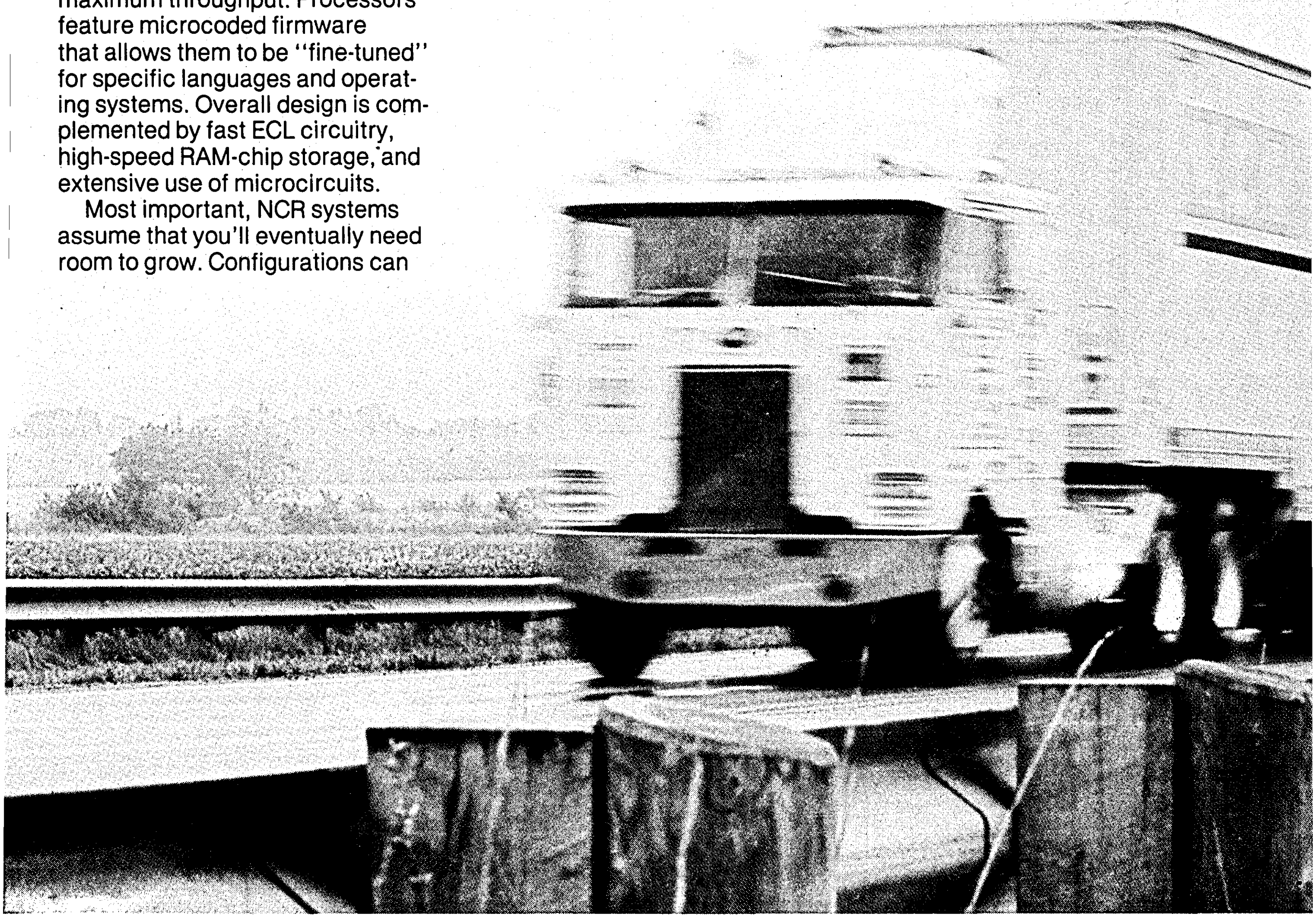
Mr. Collins is vice president, corporate staff, Management Information Services at Johnson & Johnson. He has also served as assistant treasurer of the company and was formerly director of its Management Services Division. Mr. Collins joined the company as a chemical engineer at the Chicago operations. He subsequently served as assistant director of quality control, production superintendent, plant engineer, and chief engineer. In 1965, Mr. Collins was transferred to the home office in New Brunswick, N.J., as assistant director of the Management Services Division, and was promoted to director in 1968.

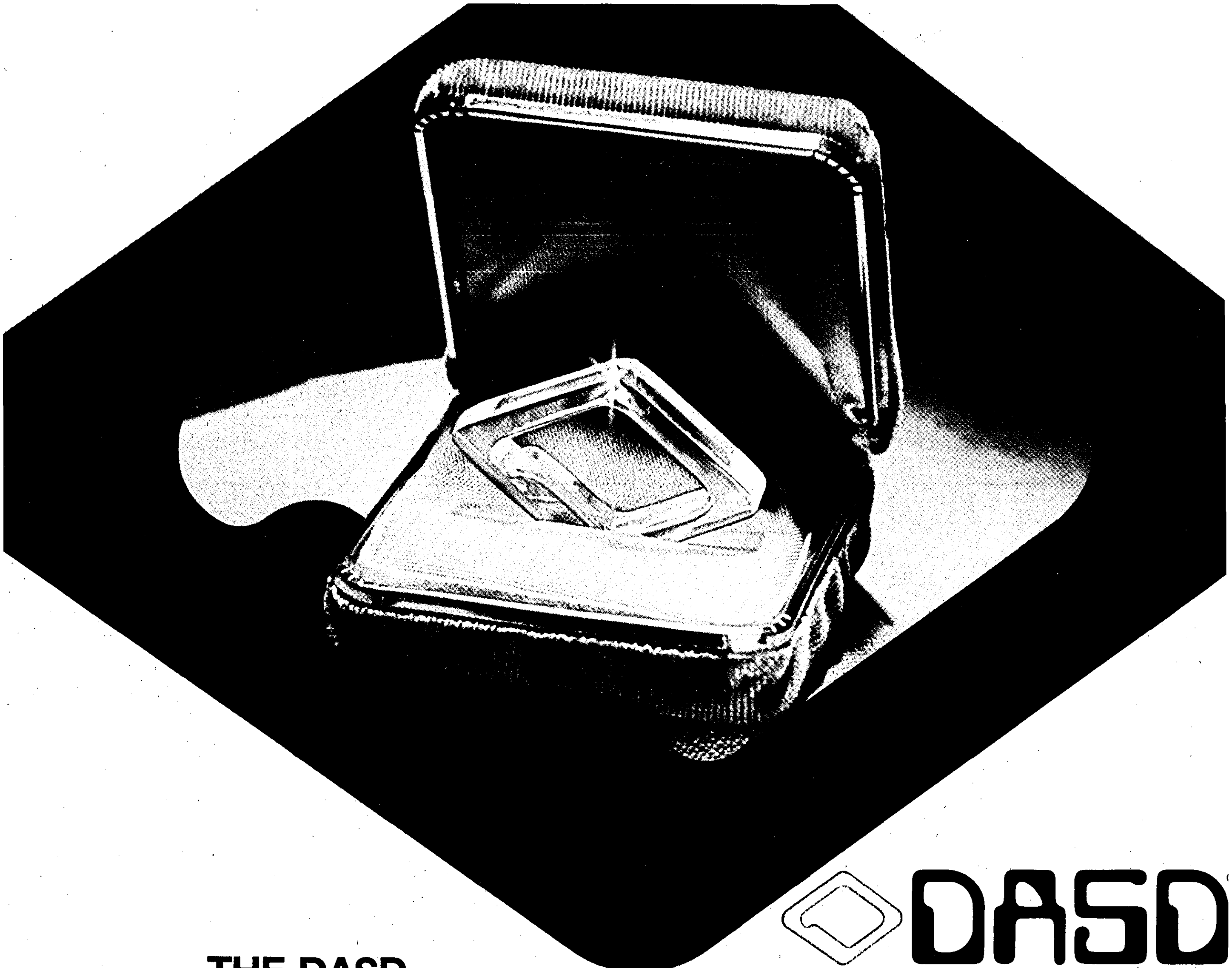
GEORGE J. FEENEY

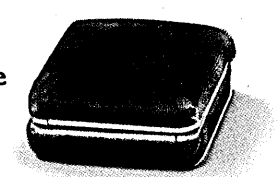
Mr. Feeney is vice president, Advanced Development at Dun & Bradstreet Corp. He joined D&B in October 1977 and was elected to his present position in January 1978. Before joining D&B, he was with General Electric, where he was vice president and general manager of the Information Services Division. He has also held several important positions in corporate planning. He has served as senior mathematician in logistics for the Rand Corp. and as manager of Stanford Research Institute's Operations Research and Data Processing Group.

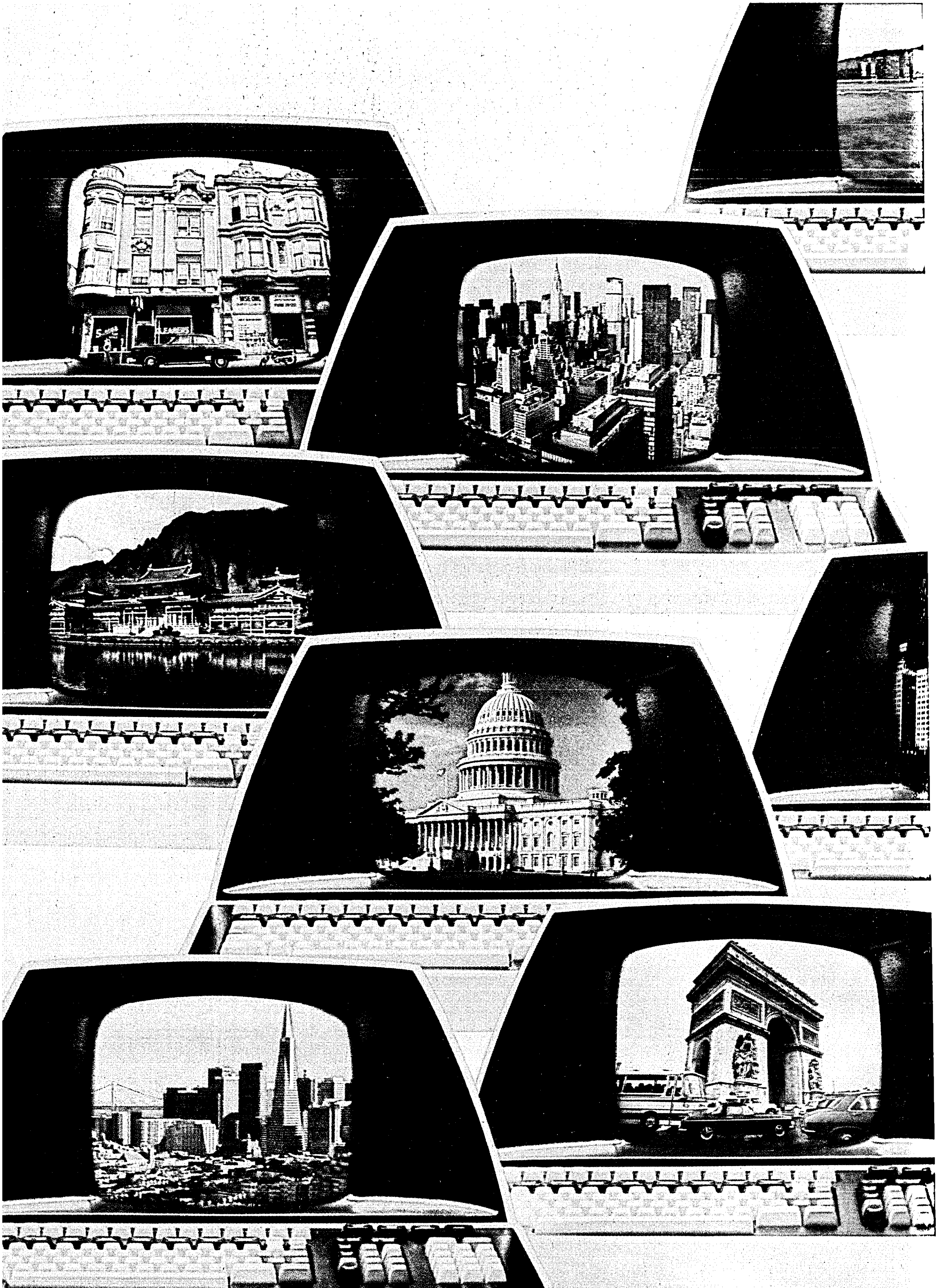
JOHN GOSDEN

Mr. Gosden is vice president, Telecommunications at the Equitable Life Assurance Society. He joined Equitable in 1970 as second vice president in charge of the Technical Support Group. From 1975 to 1978 he was in charge of corporate computer services and chairman of the dp policy committee. From 1966 to 1970 he was head of program systems for MITRE and led studies and evaluations for the National Military Command System and National Library of Medicine. From 1961 to 1966 he worked at Auerbach Associates as program manager and participated in special studies groups for the National Library of Medicine and the Manned Orbiting Lab Support System. In 1977 he was chairman of the Federal Advisory Group on the White House Information System, formed to improve the decision-making processes of the President.

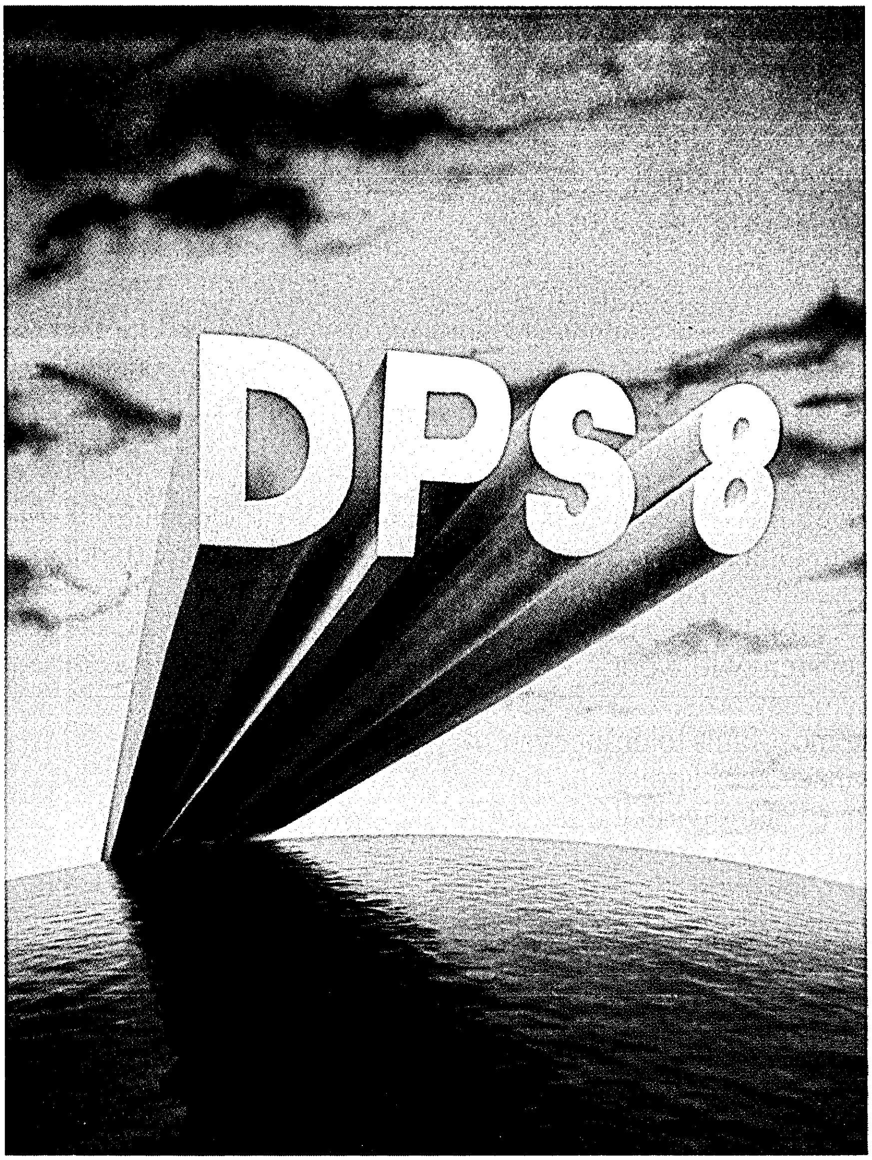




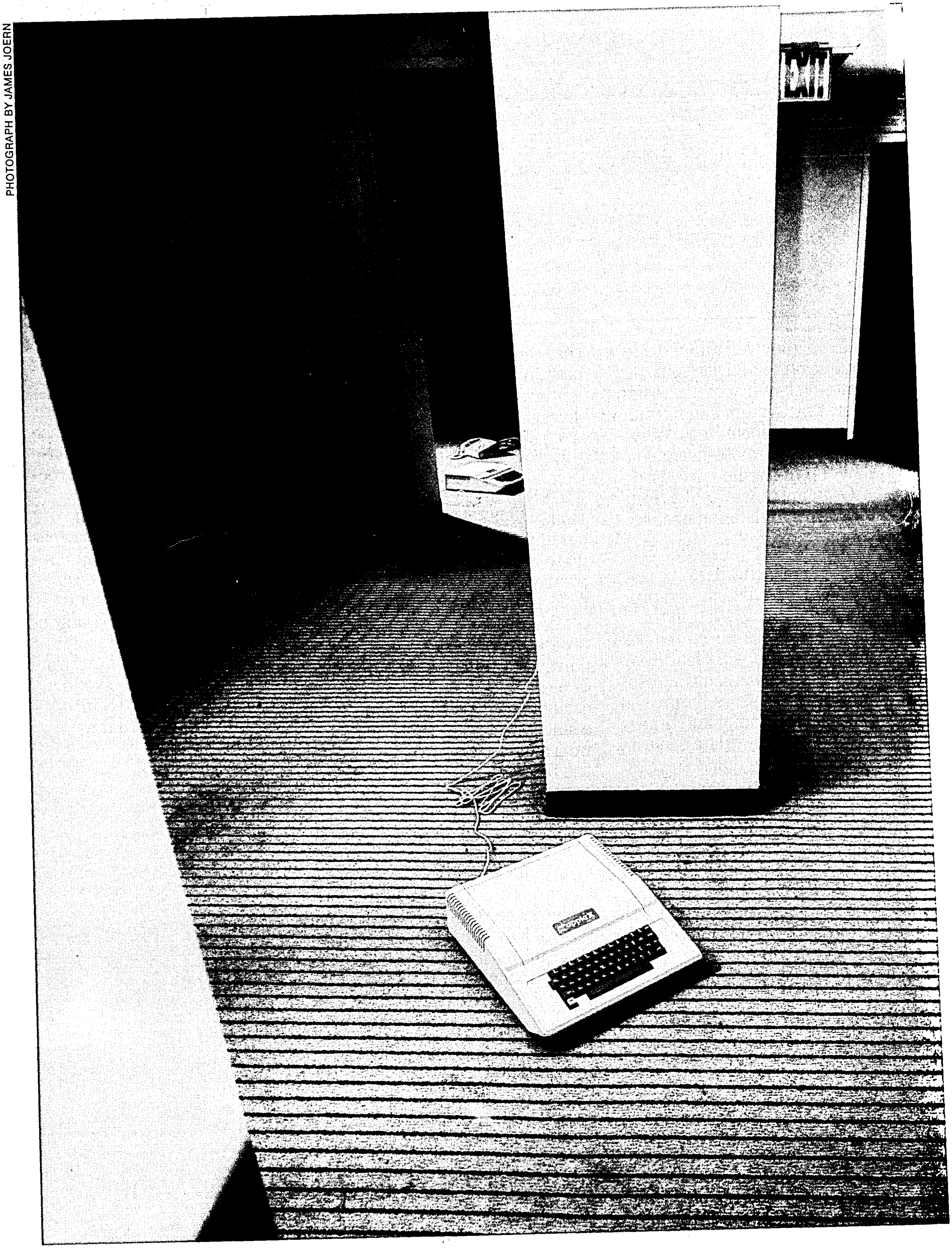




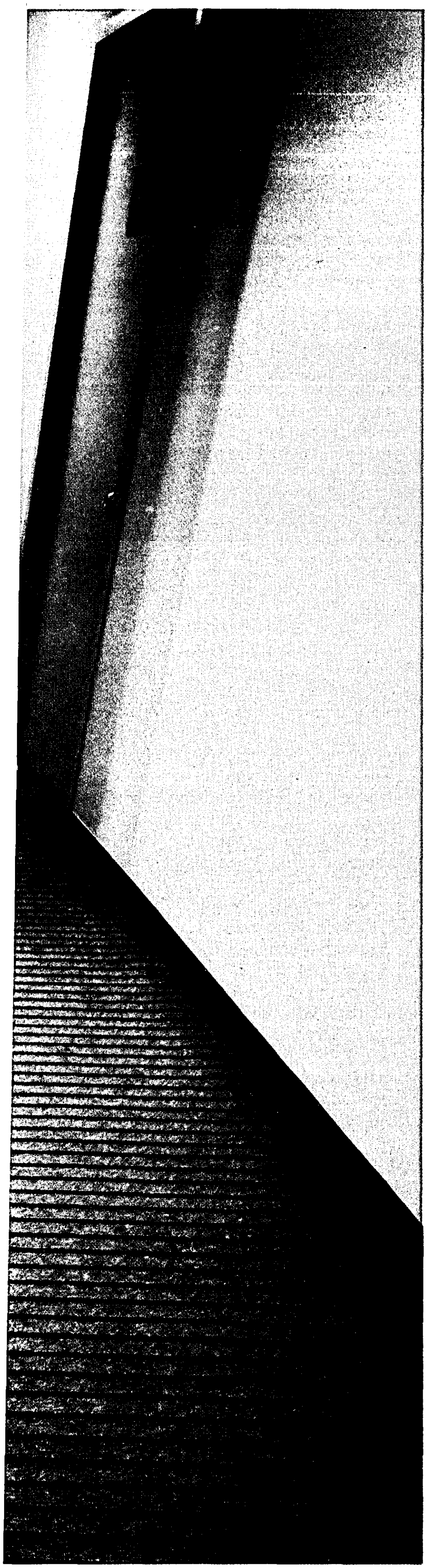
GROWING POWER.



PHOTOGRAPH BY JAMES JOERN



Managers and professionals spend 25% of their time on clerical and support work.



THE AUTOMATED OFFICE MOVES IN

by Harvey L. Poppel

The excitement ignited by the rapidly evolving electronic integrated office has begun spreading slowly from those on the leading edge of the new system's development all the way up to the corporate executive suite. Although senior management often has been more mystified than dazzled by the implications of bubble memory capacities, megabit transmission capabilities, and the like, top executives are now beginning to sense the enormous potential productivity gains to be won.

As more and more analyses of return on investment in the new office technology spread, the touted payoffs in profits and enhanced management capabilities are convincing many of those who have the clout to commit the necessary assets to new office organization and structure.

Our studies show that U.S. businesses will spend $800 billion this year to support office-based white collar workers ranging from board chairpersons to file clerks (Fig. 1). The overwhelming share of this cost, nearly $600 billion, will be spent on managerial and other professional classifications of the white collar work force.

Despite the proven capabilities of current information resources, mostly computer or communications based, only $21 billion is expected to be spent on those resources this year to support the management and professional levels. By comparison, some $50 billion of computer/communications resources will be purchased to support clerical and other nonprofessional level workers.

The contrast sharpens when viewed against studies that indicate managers and other professionals spend as much as 25% of their time on essentially clerical and support work. These chores include looking for filed reports, proofreading, checking the status of ongoing operations, handling routine correspondence, trying—often unsuccessfully—to reach and schedule people, and tracking down previously published information from internal and external sources.

While detailed figures on office productivity still have not made their way to most executive suites, senior management's awareness of the need for productivity improvement among professional white collar workers is rapidly mounting. Increasing numbers of those in top management are coming to see that the installation of computers to handle accounting and other repetitive clerical operations addresses only a small part of the problem and of the potential for productivity gains.

What is needed to win top management's commitment to the new office automation technology is more concrete cost/benefits data. We anticipate that such statistics may be quickly forthcoming, particularly in the wake of dramatically rising costs in office-based white collar operations in the 1980s. Our studies show that the direct costs of white collar operations could rise to $1.5 trillion by 1990 without the adaptation of integrated office technology (Fig. 2). If such technology is exploited, we estimate that the

Office automation technology could pare the cost of white collar operations by more than $300 billion annually.

cost could be pared by more than $300 billion annually by the end of the next decade.

Moreover, the electronic office holds out even more promise than simply streamlining routine office operations. For executives, the new technologies will help expand the scope of managerial supervision significantly. In the near future, executives will be able to track events, programs, and results electronically through interactive deskside computer terminals.

Electronic office systems also offer tantalizing possibilities for evolving management techniques to meet today's vastly complex and demanding business environment. Automated tools can improve the quality of new strategies and tactics while reducing the effort required to develop them.

Yet despite potential gains in office productivity, decisions to commit the company on the course toward the electronic integrated office have been slow in coming. Our studies show that the major obstacle is often the lack of experience related to office systems management. Top management also appears to have serious questions about the level of maturity of current products and services, doubts that are being fueled by the bewildering array of technical "solutions" fraught with unfounded claims.

OFFICE-BASED APPLICATIONS CLASSIFIED

To help dispel the confusion and some of the uncertainties surrounding the electronic office, we have developed a taxonomy that classifies the future office-based applications. Divided into six categories, the taxonomy provides a menu for those scoping the electronic office.

1. *Conferencing*. The traditional two-party telephone call will be augmented in two important ways to increase the frequency, flexibility, and impact of interactive, participatory exchange among professionals. First, simple voice communications will be enhanced by the addition of visual media such as data, document, image, and drawing displays, as well as still-frame and slow-scan video. Second, the number of participants in electronic conferencing will be enlarged to the point that either full-scale video or visually assisted meetings can be conducted among persons at widely separated locations.

While some more sensitive meetings will, of course, continue to require travel time and expense to ensure success, a large number of less critical, more routine gatherings such as periodic project reviews and monthly internal committee meetings will be handled increasingly without the need for participants to leave their office buildings. Professionals in smaller office locations may still need to travel a few miles to a conference center, but that is much less expensive in time and dollars than air travel. Those who have pioneered advanced conferencing systems report that the frequency and quality of interpersonal communications and decision-making actually improve with the removal of inhibiting travel requirements.

2. *Information Transfer*. Perhaps as many as one-half of all business telephone calls are placed primarily to transfer information rather than to discuss it interactively. The time consumed to complete a one-way call, coupled with the deterioration in the postal service's price and performance, are providing great motivation for managers and professionals to seek less time-consuming, more direct, and sometimes more accurate ways to convey their ideas, impressions, decisions, and information requests.

Desktop input/output devices, including the telephone, enable users to originate, format and edit, and transmit/receive a wide variety of relatively simple materials. The broadening selection of systems include those that can transfer information electronically in document-image, character-encoded, hand-drawn, and even speech-message forms. The term "electronic mail" is often loosely and imprecisely used to describe any or all of these systems.

3. *Information Retrieval*. During the late 1960s and the early 1970s, much effort was focused on development of maxi- and minicomputer-based management systems that lend themselves to on-line information retrieval. Most of this work has dealt with only a small fraction of the full information retrieval spectrum, that is, the access to accumulated transactions processed by the computer internally. At least two new and much larger opportunities now exist.

The first opportunity is access to timely information through data bases regarding the external environment. There are now several hundred computerized external data bases filled with information ranging from general to highly specialized material. The range includes scientific and legal abstracts, corporate financial data, currency exchange rates, and news libraries. Also, micropublishers are producing dozens of microfilmed data bases which often can be purchased and used with low-cost microfilm readers.

The second major new information retrieval possibility relates directly to management productivity and the need for fast retrieval of specific documents, most of which are not routinely fed into a computer. These include office reports, memoranda, contracts, purchase orders, and the like. A corporation often houses pertinent and even crucial documents that managers and professionals either have forgotten about or are simply unaware of. An electronic search of an indexed system for all pertinent information on a given topic can ensure that no such information gaps arise in the evaluation and decision-making processes.

These information retrieval applications may form the backbone of future integrated offices since management can easily cost/justify the desktop terminal upon which so many other applications can be piggybacked.

4. *Transaction processing*. This is the area where most of the office automation action has been for the past 20 years. And although the spotlight may be shifting, there are several important links between transaction processing and other categories of the electronic office. Transaction processing systems are increasingly expanding to include document as well as data handling. The data and documents captured for transaction processing may provide the basis for one or more of the data bases for information retrieval and/or for personal processing.

5. *Personal processing*. By making computer processing and data storage resources interactively available, the origination, interpretation, and analysis of information by managers and other professionals can improve greatly. For instance, one manufacturer reported a tripling of engineering productivity through the use of interactive equipment in connection with graphic designs. A key to the application is that once captured, electronic drawings can be summoned, modified, and disseminated error- and delay-free, without any intermediate paper steps.

Word processing is another form of personal processing, and is perhaps the most pervasive. Most managers and professionals spend far more time working with "words" than data. While most managers and professionals, other than academics, scientists, and journalists, are not willing to use a computer keyboard to compose original texts (other than short "buck slips"), some are now beginning to rely on interactive terminals for format, review, editing, and annotation of word processed documents originated on keyboards by typists. For maximum effectiveness, these electronically captured documents can subsequently be filed or disseminated using information transfer or retrieval tools.

Another form of personal processing is the use of portable terminals by traveling sales personnel, engineers, and others to reach remote computers by conventional telephones. Applications include information retrieval, information transfer and access to decision-support models.

6. *Activity management*. The previously mentioned categories have dealt with user applications and tools, which are essentially passive in nature. During the 1980s, equipment systems will assume a more active role in "making things happen." They will

TABLE 1
OFFICE AUTOMATION BENEFITS MENTIONED

	All Executives	Those With Very Successful Experience Only
ENHANCE DECISION-MAKING	77%	90%
RAISE MANAGERIAL PROFESSIONAL PRODUCTIVITY	67	70
RAISE CLERICAL PRODUCTIVITY	54	70
IMPROVE COMPETITIVE POSITIONING	48	67
REDUCE EDP COSTS	37	41
REDUCE SYSTEMS DEVELOPMENT CYCLE	35	34
PINPOINT MANAGERIAL ACCOUNTABILITY	32	35
RAISE ASSET UTILIZATION	26	34
MEET EXTERNAL REPORT REQUIREMENTS	22	22
AVERAGE MENTIONS PER RESPONDENT	4.0	4.6

SOURCE: BOOZ, ALLEN & HAMILTON

TABLE 2
USERS' PERCEPTIONS OF OFFICE AUTOMATION OBSTACLES*

QUESTIONS	RESPONSES
INADEQUATE LINKS BETWEEN BUSINESS AND SYSTEMS PLANNING	61%
INSUFFICIENT INTERNAL EXPERIENCE	61
IMMATURE HARDWARE/SOFTWARE	56
UNREALISTIC OR OVERLY RESISTANT END-USER ATTITUDE	39
SYSTEMS ROLE TOO NARROW	31
UNCLEAR ROLES AND RESPONSIBILITIES	28

*OVER 300 QUESTIONNAIRE RESPONSES FROM USER SYSTEM EXECUTIVES (6/79)
SOURCE: BOOZ, ALLEN & HAMILTON

initiate activities based on time and event triggers. The activity management systems break down into three distinct classes covering people, information, and physical facilities.

Organizations committed to matrix or highly participatory forms of management will find calendar tools useful. They offer the ability to maintain master as well as individual lists of all meetings, appointments, deadlines, and other time-sensitive events. With proper programming, the calendar system also can guard against conflicts and automatically send out reminders at specified intervals, right up to the time of each scheduled event.

Such a calendar system could ultimately be tied into the planned conference tools described in the first category to ensure their efficient use. When programmed to track a specific project, the equipment can send out automatic prods at deadline to those responsible for each element until all work is completed. What must be guarded against, however, is overly aggressive use of such a system, which could quickly make it a major irritant and thus counterproductive.

A related application is information tracking that permits quick checks into the status of requests for information and, when necessary, automatic reminders to those whose answers are tardy. Such tracking applications usually are by-products of information transfer or word processing systems.

In the area of facilities activity management, there are systems to handle such functions as energy conservation, security, and comfort control.

CROSS-ELASTIC FLOWS

The above taxonomy provides an orderly way to classify applications and to map important cross-elastic flows from nonautomated to automated information sources (Fig. 3). The taxonomy may help office analysts develop the right mix of applications for a given company as it studies its special situations and needs. It also offers a framework within which suppliers can select the markets and services they should provide.

Now comes the broad question of why more companies and government agencies have not adopted these modern office information systems. The answer can be broken down into five areas.

1. *Behavioral*. The use of automated information systems to help executives and their subordinates make more informed and faster decisions has not been fully experienced in the executive suite. Rather, executives who are only dimly aware of these new systems often see them as a potentially disruptive and degrading development, one to be adroitly avoided at all costs. But many newer systems promise quite the opposite—less chaos and disruption in the office environment plus the potential for upgrading the professional. Senior management education programs might help in altering these preconceived and unfounded notions among executives.

2. *Financial*. Given the intense competition in many companies for capital, it is imperative that systems advocates clearly demonstrate the benefits and productivity gains possible with automated office equipment. Unfortunately, many of them have been unable to produce hard data on cost/benefits. One approach taken by several companies is a program of opting for evolutionary projects, each of which offers measurable and quick payback and is self-liquidating. Each project is preceeded by a stringent cost/benefits analysis, although soft as well as hard benefits must be evaluated.

3. *Technical*. A major fear among those in top management is that they will buy integrated office equipment that will be quickly outmoded technologically. In truth, the technical state of the art has passed the pioneering stage in most areas, although software maturity is still questionable. Suppliers need to demonstrate to potential users that modular hardware and software offer the capacity to evolve and grow with advancing technology, and without making previous investments obsolete.

4. *Organizational*. We have noted that top management often fails to grasp the nuances and opportunities of integrated office technology. This problem is compounded at many companies by the fact that managers of data processing, telecommunications, and office equipment do see the widening possibilities but consider them a threat to their turf. They fear those already in the field will try to run off with the new programs in isolation of others in the organization. Thus, these managers try to quash or denigrate office automation as either premature or too hot to handle. It is clear that a broad, interdisciplinary corporate approach is required, with those now in the field playing a supportive rather than dominant role in the expansion of the electronic office.

5. *Implementation*. The final obstacle to success is also the most serious one in the sense that the implementation step brings to the surface all possible failures in the previous four considerations, while adding new ones. The crucial decision here is to ensure that a thorough feasibility study and detailed planning analyses have been made well in advance of implementation.

Selecting the actual method of implementation has proven something of a problem for many companies. Should a fully integrated set of tools be provided to one pilot department, for instance, giving that unit the full spectrum of new equipment as it goes into place? Or, should one application or tool, such as word processing, be picked for the entire company in the initial phase? These options can be viewed as either horizontal or vertical development. Sometimes a combination of the two approaches works best. Then no one department is isolated from the rest of the company, and the use of its systems should, optimally, include communications to and from other segments of the company.

Picking one application for an entire company, on the other hand, does not address the synergistic opportunities inherent in the merging of applications. The formulation of vertical and horizontal implementation approaches cannot be prescribed in advance, but should be an outgrowth of an office automation planning process geared to the unique needs of the organization.

STEPS IN STRATEGIC PLANNING

In a broad context, the planning stage involves much more than a technical evaluation of the proposed equipment and cost considerations. The necessary steps involved in the strategic planning for systems begin with a careful analysis of the firm's business strategies, some of which may not be static. The critical success factors involved in the systems implementation must be weighed and a determination made that key hurdles can be cleared if the project is to go forward.

In a further refinement, the critical success factors should be measured against management's information needs. This would juxtapose the content, timeliness, accuracy, and form of the information involved with the users themselves and what their analytical and decision-making needs are at present and what they are likely to be in the future. To insure against unwieldy rigidity, allowances for vagaries in personal behavior and style should be considered since, over the long term, this will affect information consumption patterns.

Basic assumptions then must be made about availability, price, and performance of hardware, software, telecommunications, and related items. Individual company solutions can then be blended in terms of architectural requirements. This is done by matching the expected information flows and technology assumptions with the list of potential applications described in the taxonomy.

The system's ultimate architecture can be described in terms of three sets of resources: input/output, or the devices performing media conversions; functionality, or processing capability, storage and software;

FIG. 1

BREAKDOWN OF THE ESTIMATED $800 BILLION U.S. BUSINESSES WILL SPEND IN 1979 TO SUPPORT THEIR OFFICE-BASED WHITE COLLAR WORKERS

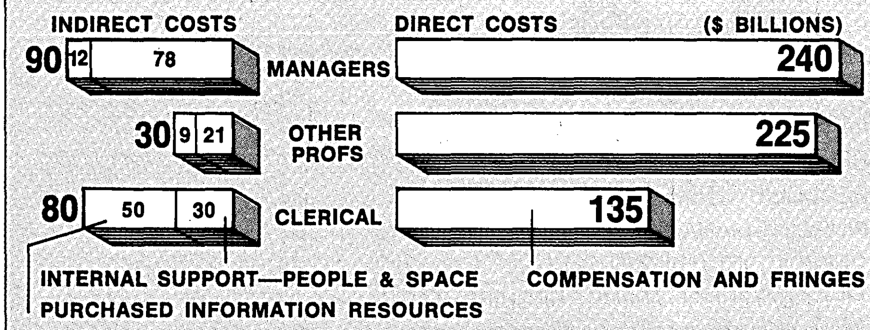
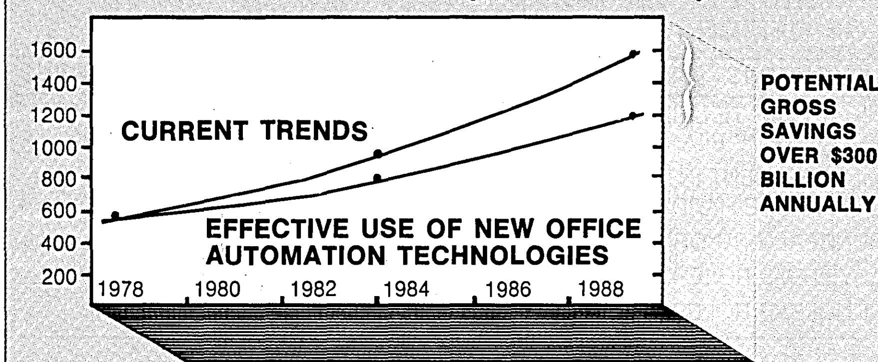


FIG. 2

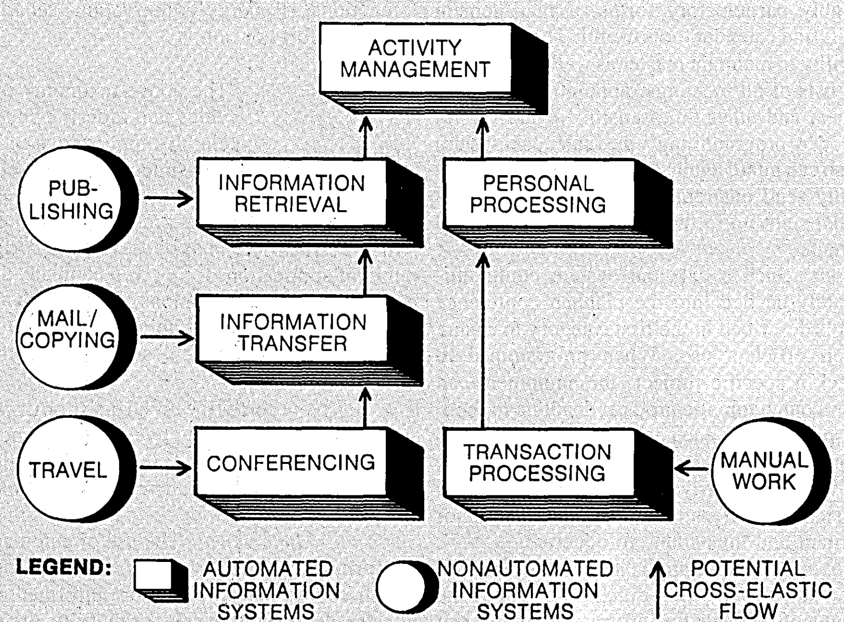
PROJECTED DIRECT COST OF U.S. OFFICE-BASED WHITE COLLAR WORKERS ($ IN BILLIONS)



SOURCE: EXTRAPOLATIONS OF HISTORICAL EMPLOYMENT AND INFLATION TRENDS; BOOZ, ALLEN PRODUCTIVITY ESTIMATES

FIG. 3

CROSS-ELASTICITIES IN MAJOR CATEGORIES



Many managers consider the integrated office technology a threat to their turf.

and transport, or the electronic and other means used to move the information. These elements are deployed in several alternative ways that consider at least three physical levels where input/output devices can be located and/or where functionalities are provided. These are primary—at the managerial, professional, and/or secretarial workstations; secondary—at the department level or in clusters; and tertiary—remote to the end user, as in a computer room or accessed from an outside source.

A system of priorities must then be established that initially addresses the level of criticality for each potential solution in terms of achieving interrelated business strategies.

Next, the planners must determine resource requirements in terms of funding development and operations as well as people needs. Then the availability of technical, human, and financial resources must be considered for the real-world constraints they will impose on the "ideal" solution. With these parameters, the actual solutions can be sequenced and a pace of implementation set that takes into account the available resources and the resources the organization can justify adding. A danger in this stage is that managers will take a rigidly shortsighted view of their firm's ability to fund and support needed systems rather than to weigh fully the strategic necessity for the new equipment and its capabilities.

A final planning step would be the definition of the management process. While the most common cause for consigning thick systems plans to dusty back shelves has been their lack of strategic relevance, the second most common cause has been the assumption that in-place systems management processes could support the new system solutions. Instead, entirely new management processes are critical in the establishment and maintenance of cost-effective and efficient electronic office systems.

During planning, methodologies should be devised for feasibility studies, implementation programs, operations, costing, and post-installation review. The process should emphasize the development of management and other professional productivity measures. This is an issue that is the rationale for many of the new electronic office systems and at the same time a potential barrier to full implementation. This is because of active and passive resistance to the concept that managers and office-based professionals can be rated by productivity yardsticks in any way similar to production line standards.

HOW PRODUCTIVITY IS MEASURED

This brings us to the issue of how one measures productivity. Management productivity can be measured in two dimensions. Most managers do two things—maintain surveillance over certain operations and take responsibility for a series of improvement objectives. The two dimensions provide a basis against which time and cost factors can be recorded and allocated. And if measurements can be carried out, then a baseline for performance improvement can be established. New self-recording time measurement techniques are evolving rapidly, but their application requires a deep sensitivity to organizational behavior.

Final operational details usually are worked out by an interdisciplinary committee that might include key personnel from data processing, telecommunications, human resources/personnel, corporate planning and facilities/administration.

The question then comes: who will manage the newly automated office and who will have supervisory responsibility? There are no pat answers since the systems, their relative importance in the firm's operation, and the scope of the systems activities will necessarily be unique for each company. In general, systems analytic capabilities will be vitally important, and those now in the information systems field will be sorely needed and tested in the development of the integrated electronic office of the coming decade and beyond.

Booz, Allen recently surveyed senior U.S. executives to learn what they thought of the trends, what major benefits and drawbacks they felt the systems might have, and what management issues are intertwined (Tables 1 and 2). Of more than 500 respondents to the survey, roughly half generalists and half systems specialists, 77% reported that they considered the most important benefit to be enhanced decision-making. A close second was perceived managerial and professional productivity improvements. Competitive positioning also was rather widely recognized as a major potential benefit, especially among those who claimed to be more experienced and successful. Such recognition represents a major step toward wielding information systems as an important weapon in a firm's product and market strategies.

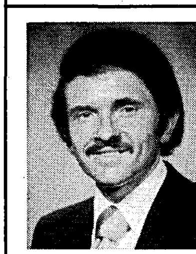
Asked about perceived obstacles, the respondees said lack of experience and lack of confidence were the most serious. About 50% of the respondees said that senior corporate responsibility for dealing with the strategic issues in the information processing field should be shared. The senior executive for information/computers was, not surprisingly, mentioned most often as one of the parties in the proposed partnership. That raises the point that the steering committee, or any other group charged to oversee the new systems, should be comprised of members from up and down the hierarchy as well as across the top levels of management.

Those now in the field of information management should expect to increase their level of expertise dramatically as companies move along the evolutionary path from such traditional office systems as PABX and key telephone systems, copiers, and standalone computers into the modern electronic office systems, and later into the advanced systems. State-of-the-art technology indicates that more sophisticated telephone systems with audio conferencing ability will soon appear, as will shared word processors, interpremise information transfer systems using communicating word processors and store-and-forward facsimile machines, and personal computers. These systems will pave the way for the more advanced systems of the early 1980s, which will include desktop access to external data bases, video conferencing and visually assisted audio conferencing systems, speech mail, and integrated word processing-based information transfer and retrieval systems.

As complex as the issues may now seem in adapting electronic office technology to modern businesses, there appears to be no serious debate over whether the technology will be applied. Early equipment in the data processing field soon may be considered almost as primitive as the paper-based systems they replaced. When the competitive demands of the future are considered, there simply are no viable strategic alternatives for most large and medium companies to embracing the new technology and devising ways to exploit its potential fully.

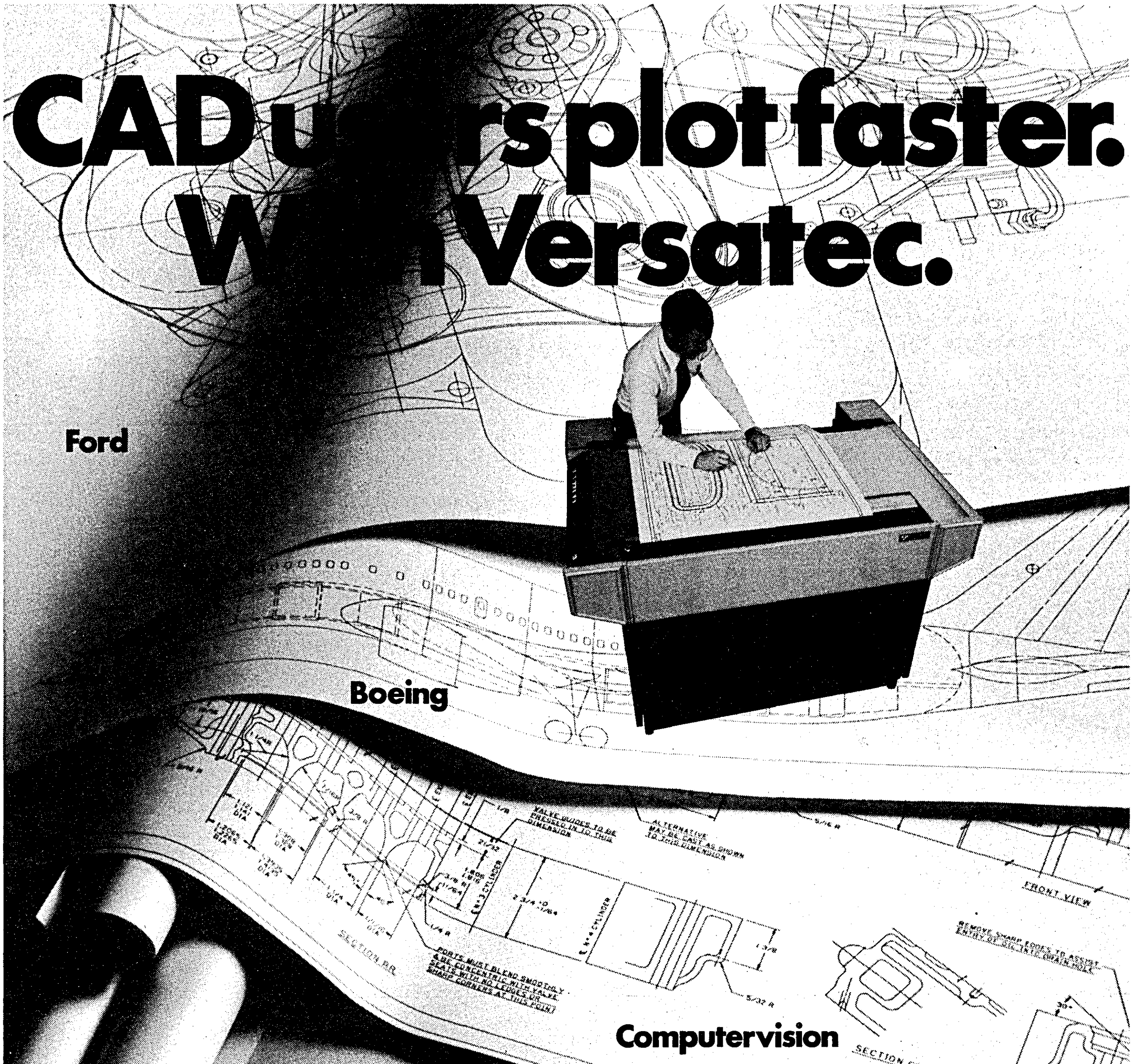
The pivotal management issues have moved decisively past whether, to when and how. ❊

HARVEY L. POPPEL



Mr. Poppel is a senior vice president of Booz, Allen & Hamilton Inc., a member of its board of directors, and managing officer of its Worldwide Systems practice. Prior to joining Booz, Allen in 1967, he was manager of industry systems for the Commercial Projects Div. of the Western Union Telegraph Co. Mr. Poppel is a certified management consultant, a member of the Institute of Management Consultants, and currently serves on the Executive Council of the Society for Management Information Systems. He holds a BS degree in chemical engineering and an MS degree in management from Rensselaer Polytechnic Institute.

CAD users plot faster. With Versatec.



Engineers at Ford get their drawings fast. Plot time for an E-size drawing is 34 seconds. For typical plots, total turnaround time is one-fourth that of a pen plotter.

Engineers at Boeing get more drawings. One Versatec plotter has delivered up to fifty plots in ninety minutes. They get more throughput with Versatec's Vector-to-Raster Converter.

Engineers at Computervision build interactive design systems. Their minicomputer must drive multiple terminals and a plotter. Versatec gives them fast plots with low computer overhead.

What about your drawings? Can you use your plotter in an interactive mode? Is your plotter keeping up with the demand for drawings? Are you worried about overloading your computer? Versatec has some fast, cost-effective answers.

Versatec plotters draw up to 34 *square* feet per minute. In paper widths to six feet. On opaque or translucent paper. And they keep plotting. No pen plotter made is as reliable as a Versatec electrostatic.

And whether driven by a big IBM 370, a mid-sized PDP or a small Nova, Versatec plotters make cost-effective use of computer time. Vector processing hardware and pen plotter-compatible software keep computer costs down.

In fact, Versatec plotters cost less to buy, less to operate than pen plotters. Paper is comparably priced. But most important, Versatec performance cuts total design time and cost. It could be the best investment you ever made in CAD.

So why wait for pen plots? Circle our number for literature, plot samples and the application report—"Plotting engineering drawings with Versatec." You can plot faster. With Versatec.

2805 Bowers Avenue, Santa Clara, California 95051 (408) 988-2800 TWX: 910-338-0243

VERSATEC
A XEROX COMPANY

CIRCLE 36 ON READER CARD

EDPAC Process Cooling... first in on-line protection.

Protection from downtime. That's the name of the game in the computer room. That's why your best defense against downtime due to environmental problems is an EDPAC Process Cooling System with Dyna-Monitor. Because it's specifically designed to meet the high standards required by computer mainframes.

An EDPAC System prevents intermittent failures due to silver migration... static spikes... circuit chip distortion. In fact, EDPAC means protection against a whole team of other problems unique to computer environments. It even keeps close control of underfloor humidity.

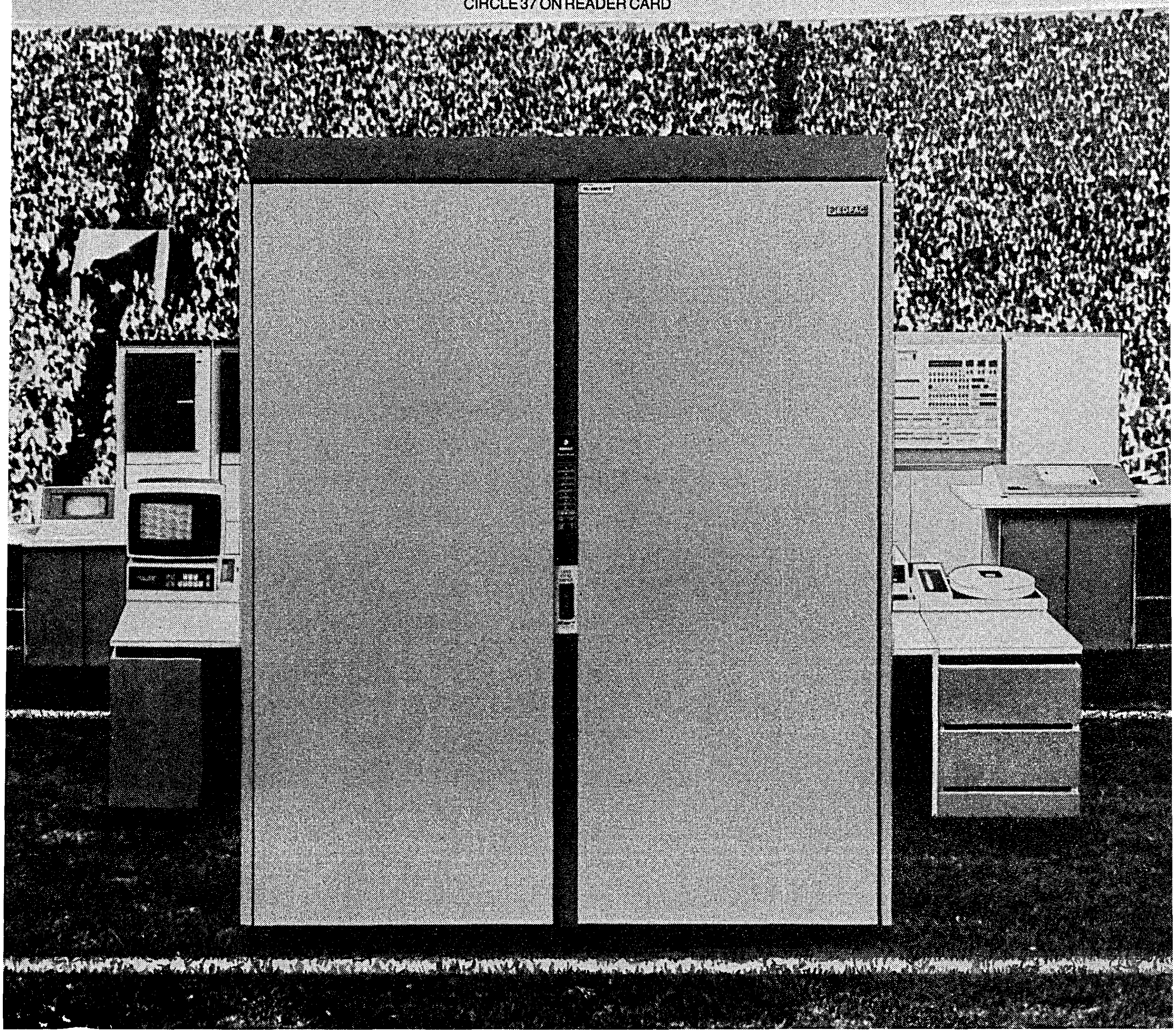
EDPAC Systems are the result of a commitment. A dedicated commitment to provide the computer room manager with ultimate protection against environmental downtime.

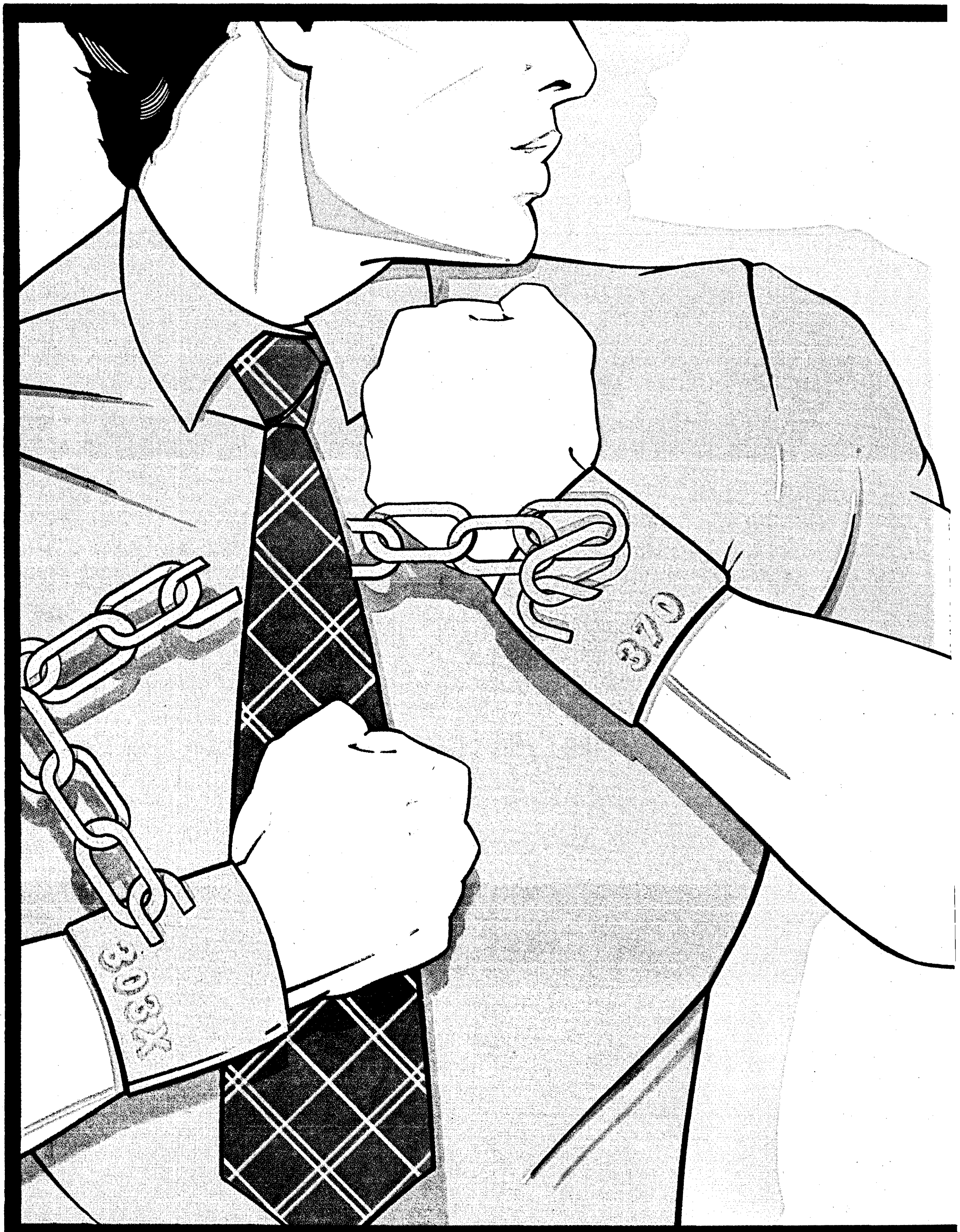
We'd like to tell you the whole story. Please write to: AC Manufacturing Company, Cherry Hill, New Jersey 08034. Or phone **(609) 428-9800.**

EDPAC®

ENERGY EFFICIENT PROCESS COOLING FOR COMPUTERS

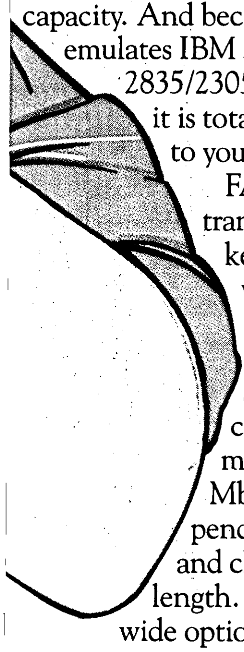
CIRCLE 37 ON READER CARD




370
303X

CPU Unchained

Intel introduces FAST-3805, the Semiconductor Disk that unleashes the full paging power of IBM CPUs.



Until now, the weakest link in IBM 370 and 303X systems has been the slow response of electromechanical disk drives. Today Intel delivers FAST-3805, the solid-state paging device with access speeds ten times faster than even the best performing disk.

Free I/O bound systems

Now you don't have to upgrade CPUs or main memory to increase throughput in I/O bound systems. By removing the virtual paging bottleneck, FAST-3805 can triple, even quadruple, disk traffic on your present system. You won't even have to add channel or controller capacity. And because FAST-3805 emulates IBM 3830/3350 and 2835/2305 disk subsystems, it is totally transparent to your CPU.

FAST-3805's transfer rates help keep your CPU working at full speed, too. With our standard single-byte wide capacity, you'll move 1.5-2.0 Mbytes/second, depending on the CPU and channel cable length. Our two-byte wide option will double capacity to 3.0-4.0 Mbytes/second. And since FAST-3805 can be optionally attached to as many as four channels, you can achieve optimum transfer rates to 16 Mbytes/second. Choose an overall storage capacity between 12-72 Mbytes.

How we made it FAST

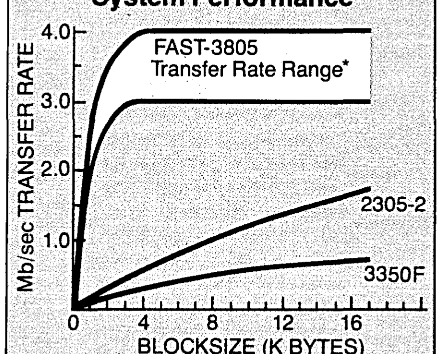
FAST means Fast Access Storage Technology—a virtual paging technique based in high speed MOS technology. Primary component in FAST-3805 is a high density, low power 16K dynamic RAM with access times far faster than disk technologies.

Dynamic RAMs have seen over a decade of service in computer memory. RAM is the primary component in the main memories of every major computer manufacturer, including IBM. Today the world's leading manufacturer of semiconductor memory applies this proven technology to high speed virtual paging.

Reliability through "self-healing"

Beyond the inherent reliability of solid state circuitry over electromechanical devices, FAST-3805 gives you unparalleled lines of defense against uncorrectable errors —all on-board. Double-bit error checking and correction (ECC) provides "self-healing" capabilities equal to those specified in the military's highest reliability systems. Additionally, a powerful iSBC 86™ single board computer performs continuous sweeping error detection and relocation of data to spare storage, if necessary. The entire FAST-3805 system is supported by motor generator sets to ensure data integrity in case of power fluctuations.

FAST-3805 Two-Byte Wide System Performance



*Note: FAST-3805 transfer rate dependent upon CPU, channel capacity & cable length.

PERFORMANCE COMPARISON

	INTEL	3350F	2305-2
Avg. Seek Time (msec)	0	0	0
Avg. Latency (msec)	0.4	8.4	5.0
Transfer (Mb/s)	1.5-4.0	1.2	1.5
Capacity (Mb/s)	12-72	1	11.2

Increase throughput today

We're delivering FAST-3805 now. For more information on how it can increase virtual paging throughput in your system, contact Intel Commercial Systems, P.O. Box 35900, Phoenix, Arizona 85069. Or call (800) 528-0590.

intel® delivers.

HANGING IN

by Marvin Grosswirth

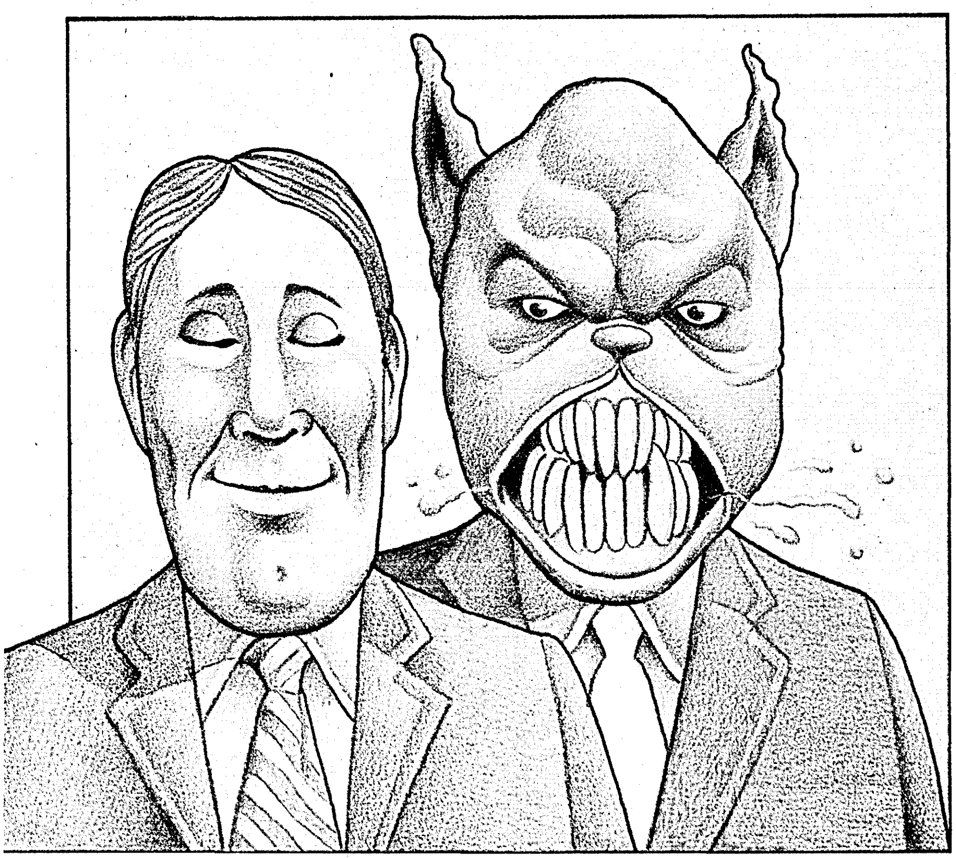
(This essay is another in a series prepared especially for data processing executives to assist in maintaining viable positioning within the corporate hierarchy while simultaneously developing their sensitivities to and awareness of opportunities for involvement in the decision-making processes, coupled with both tangible and intangible remuneration and recognition. Plans are currently under way for the publication of the entire series in a single volume, tentatively entitled The CYA Manual. *(CYA is an acronym for Cover Your Asterisk.)*—M.G.

Every data processing executive with even the merest shred of perception is keenly aware that what was once his ivory tower has become the company fish tank. Other departments and their managers, only recently categorized under the somewhat perjorative term "users," are becoming depressingly sophisticated about the intricacies of what was only recently categorized under the somewhat esoteric term "data processing." These days, with desktop terminals as commonplace as paper-clip cups and coffee carafes, with "office automation" on the lips and budgets of every department from marketing to maintenance, with everybody's secretary's typewriter turning into an Electronic Work Station, "data processing" is no longer arcane; everybody is either doing it or will be doing it soon.

Data processing managers are confronted with two alternatives: either they can go along with the tide, or they can control and direct that tide. Those who go along will ultimately be swept up on the beach and abandoned like so much flotsam. Those who choose to seize and maintain control, however, will sail on to broader horizons.

Let us begin with basics: the best way to *control* a situation is to *create* a situation. Inasmuch as familiarity breeds contempt, it is essential that the foresighted dp manager create a situation which is not only under his control but which also discourages familiarity. Both aims are readily accomplished with a single, simple word: reorganization.

It makes little difference *what* you reorganize; however, in the interests of safety and with a view toward gaining a little practice, it is probably best to begin by reorganizing your own department. That simple act will generate a sufficient quantity of memoranda, perpetrate enough wrongly dialed telephone numbers, obliterate enough lines of responsibility to create exactly the proper degree of frustration and dependency outside the department to insure confidence and security within the department.



Anticipate resentment—often deep-seated and vicious—from the heads of those departments whose reorganization you are suggesting, but take comfort in the knowledge that such resentment is born of fear.

ALIAS IRM One of the techniques that contributes effectively to reorganization might be referred to as the "What's-My-Line? Device" (WMLD). To implement the WMLD, it is only necessary to change everyone's title and job description. Find new ways to describe old jobs, beginning with your own. If you can get your superiors to agree, on the basis of corporate prestige alone, to change your title from Data Processing Manager to Information Resources Manager, you will soon notice a subtle but clearly discernible change in your status among your peers in other departments. None of them are likely to admit that they have not the remotest concept of what Information Resources are (being totally unaware that it is a new name for the same old reports), and it will be months before they work it out. In the meantime, you can hang all sorts of suffixes and prefixes to the title for your subordinates—assistant to, administrative associate, IRM coordinating specialist (librarian), IRM encryption technologist (programmer), etc.—and only you and your subordinates will be aware that nothing has changed very much.

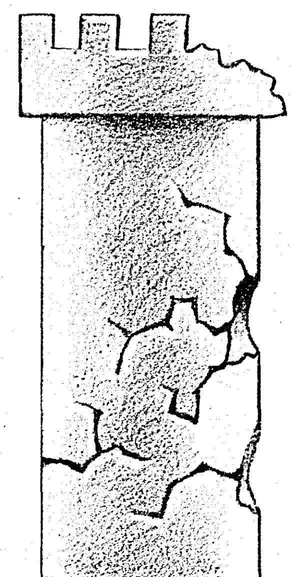
A refinement of the WMLD is the use of words and phrases that suggest—but do not actually effectuate—infringement on the authority of others. Be liberal with such terms as "manager," "director," "supervisor," "project leader," "facilitator," each of which should be accompanied by a job description as detailed (and therefore as incom-

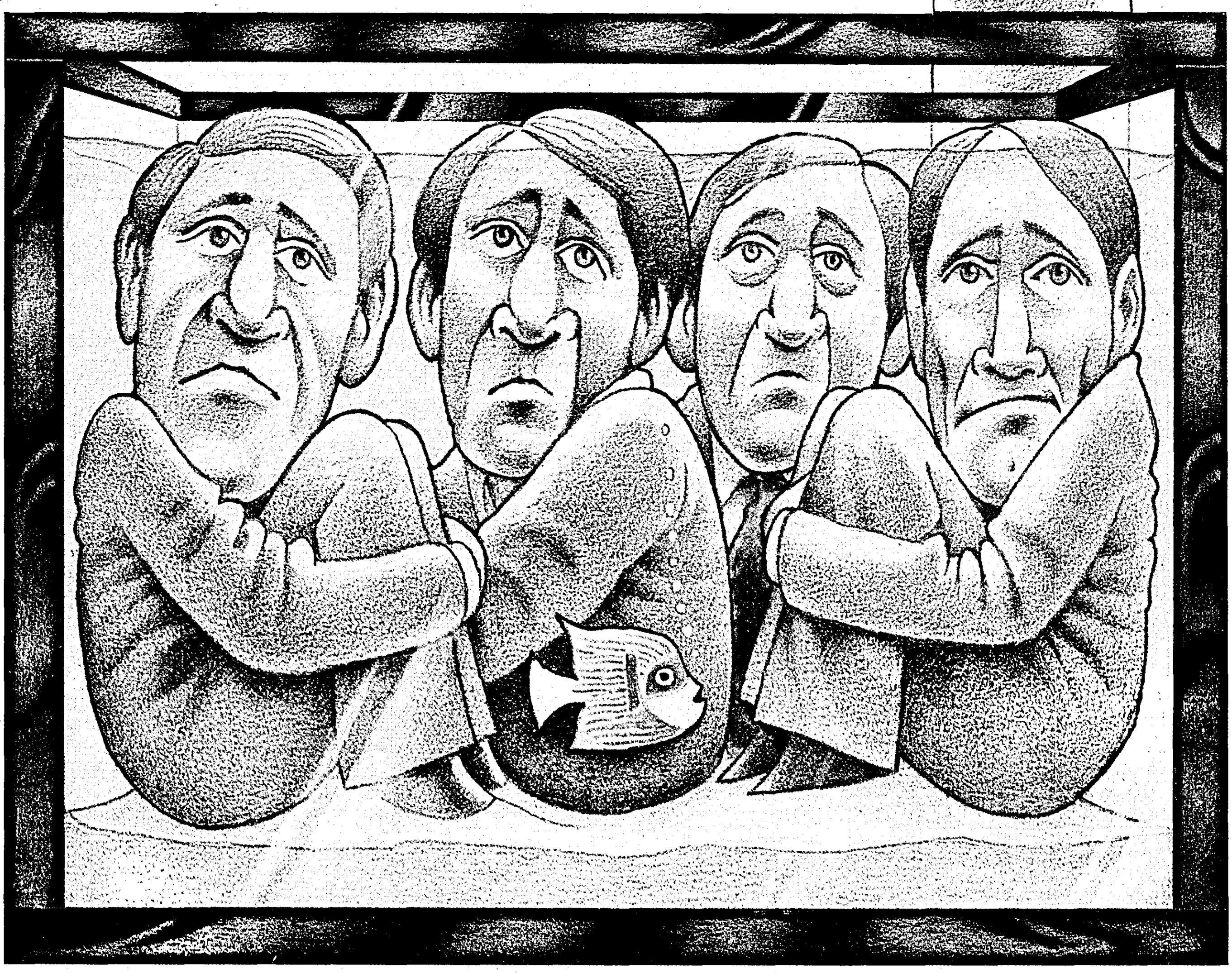
Every data processing executive with even the merest shred of perception is keenly aware that what was once his ivory tower has become the company fish tank.

prehensible) as possible.

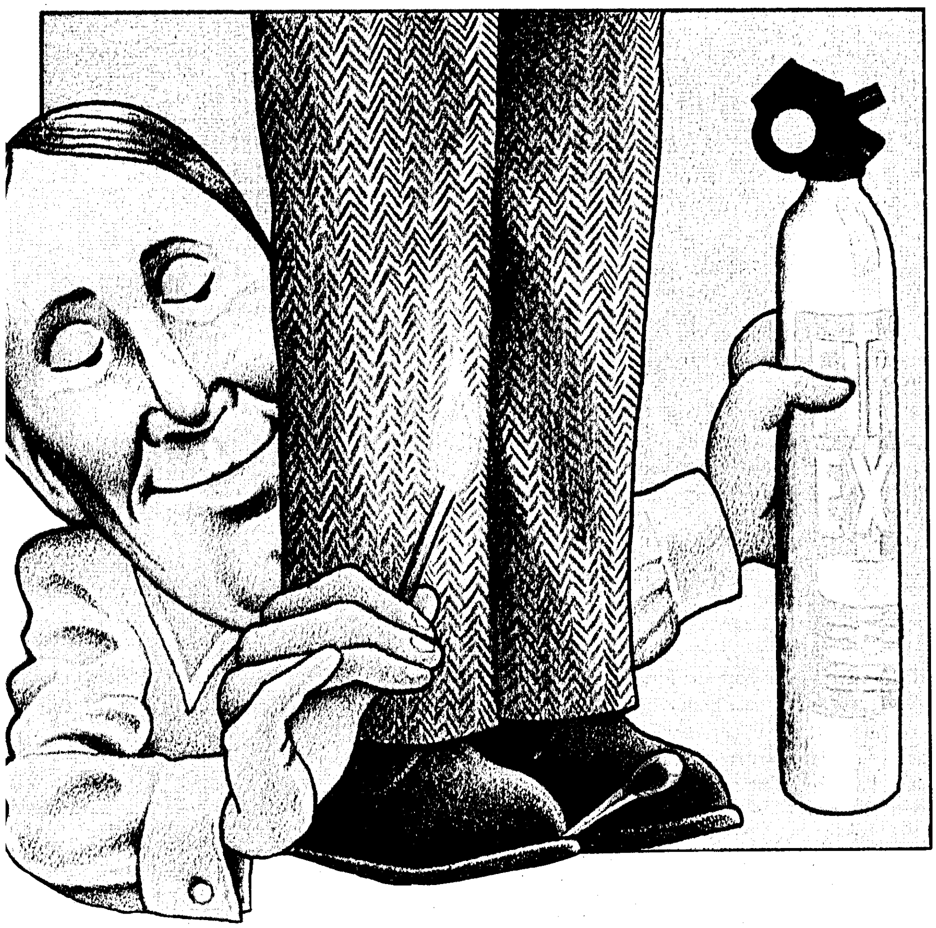
A reorganization is viable only as long as it perceived as such. Eventually, of course, every reorganization becomes a familiar segment of the system, and insofar as familiarity is to be avoided, no reorganization should be allowed to stand so long that it becomes stagnant. If you are reluctant to reorganize the same department too frequently, branch out. After all, Information Management involves the entire corporation. What could be more desirable than to reorganize, let us say, Sales, or Corporate Finance, so that its information resources can be more efficiently managed? And who is better qualified to supervise that reorganization than the Information Resources Manager? Anticipate resentment—often deep-seated and vicious —from the heads of those departments whose reorganization you are suggesting, but take comfort in the knowledge that such resentment is born of fear. Entirely justified fear, at that.

If you can manage to survive your own and other departmental reorganizations, then you are ready for the Major Move: reorganizing the entire corporation. The basic premise that applies here approaches the sublime in its purity and simplicity: whatever system your company has, recommend the exact opposite. If you have centralized data processing, make a case for distributed processing, and vice versa. You will have no difficulty finding support for either position. Academicians, consultants, corporate executives—all have eagerly unburdened themselves about how centralized data processing saved a foundering system, and just as many will pronounce, with equal enthusiasm, how distributed processing rescued a company





ILLUSTRATIONS BY BILL NELSON



First, identify a problem. If none exists, create one. Remember that in this regard, the computer industry stands ready to assist.

sunk in the morass of centralized processing. Seek, and ye shall find, with no trouble at all.

It will take years to accomplish the changeover, by which time the state of the economy, the development of technology, shifts in corporate goals and objectives, and new corporate officers will all combine to enable you to recommend going back again. You could keep your job for decades, merely vacillating between centralized and distributed processing, together with all the variations on those themes. To accomplish this without being obvious requires skill, practice, and, most important, daring—but the prize is surely worth the game.

METHODS FOR THE MEEK

The measures discussed above are admittedly bold and require a degree of foresight and courage which is, regrettably, lacking in some data processing managers. Still, there are methods that even the meekest dp manager can employ. In fact, he or she is expected to employ them as part of the job. It must be understood, first, that the basic responsibility of any manager is to solve problems. With that in mind, here is a sequence of activity that anyone with a little experience in the corporate world can effectively employ to create an atmosphere of productivity, indispensability, and confusion.

First, identify a problem. If none exists, create one. Remember that in this regard, the computer industry stands ready to assist. You need only report to top management that some new machine has appeared on the market that has the likelihood of increasing efficiency and reducing costs (despite the fact that its price may be equal to the board chairman's annual bonus), and you have what amounts to an identifiable Problem.

Once the Problem has been identified, it must be studied. It is necessary, therefore, to appoint a Task Force to study the problem. The Task Force members will probe deeply into all aspects of the Problem, which means, of course, that your subordinates will be interviewing other peoples' subordinates. Never underestimate the value of fear and suspicion among your peers; it is a basic principle of CYAism.

When the Task Force has completed its work, it is then necessary to appoint a Study Group to evaluate the Task Force's Study. Inevitably, the Study Group will find some fault, however minor, which the Task Force will have to rectify. Eventually the Study will be acceptable.

An Acceptable Study is one that can be put to use. Enter the Implementation Committee, which is charged, obviously, with the responsibility of studying ways in which the findings of the Task Force and the Study Group can be implemented.

Although this process takes only a minute or two to describe, surely you can envision the amount of time it will require to implement (if you will pardon the expression) the entire procedure. Meetings must be held, memoranda must be circulated; preliminary, intermediary, and final drafts of preliminary, intermediary and final reports must be distributed.

By the time you are ready to proceed with the Implementation Committee's recommendations to actually do some implementing, new technology will have emerged, or circumstances will have eliminated or severely altered the original Problem in some way. There is then only one course of action: start all over, with a new Task Force. Again for managers of courage and daring, it is even possible to appoint a Task Force to study task forces, with a view toward determining why nothing ever seems to get implemented. The philosophical effect is not unlike the optical effect one achieves when holding two mirrors face to face: they reflect each other into infinity—along with your position in the company.

IF ALL ELSE FAILS . . .

On occasion, dp managers are confronted with high-echelon executives who cannot or will not understand that what you are doing is (a) Highly Significant and (b) essentially unintelligible. In such instances, drastic measures—devoid, alas, of any subtlety, and subject to relatively short-term effectiveness—are in order:

Buy a new machine that nobody but you understands. By checking the pages of computer journals, you should be able to come up with a piece of equipment that is within your budget and therefore requires no outside approval. When you present the machine as a fait accompli, you also present yourself as an executive with supreme confidence in your knowledge and ability. If possible, buy the machine for the executive who is giving you the most trouble. It will do him good to be dependent upon you, for however long you can sustain that relationship.

Exchange jobs. Invite the corporate executives into the data processing department and allow them to take over, in much the same atmosphere as Boys' Day at City Hall, complete with the same patronizing, condescending attitude on your part. Allow them to remain just long enough to become thorough-

Cultivate a friendship with an Arab. Make certain that your companion is one who dresses impeccably in expensive clothes and has a propensity for ethnic headgear. This will create the impression that you have the inside track on a proposed takeover of the company.

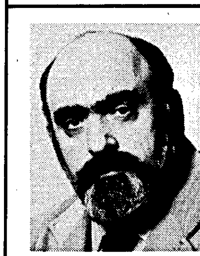
ly confused, but not so long that they actually learn something about what is going on there.

Cultivate a friendship with an Arab. Make certain that your companion is one who dresses impeccably in expensive clothes and has a propensity for ethnic headgear. This will create the impression that you have the inside track on a proposed takeover of the company. If the company has already been taken over, it will appear that you have a special relationship with the powers behind the Executive Suite. I have said it earlier, but it bears repeating: never underestimate the value of fear and suspicion.

And finally, we must consider the worst: suppose something goes amiss. It seems inconceivable, I know, but it is nevertheless possible that top management will become familiar with what you are up to and thereby make your position in the company untenable. Try not to worry. The field of management is wide open and there is always room, somewhere, for a good manager. Even if you should be forced to leave data processing to find your fortune elsewhere, you need only adapt the methods and techniques discussed here to fit your particular circumstances. You will be pleasantly surprised to discover the ease with which such adaptations can be made.

Remember, management, after all, is management. ❋

MARVIN GROSSWIRTH



Mr. Grosswirth is a freelance writer whose monthly consumer column appears in *Argosy*. He is a frequent contributor to *Science Digest* and has authored a number of articles for DATAMATION. His latest book, *Beginner's Guide to Home Computers*, is a Dolphin/Doubleday paperback.

ACS America announces... total office automation.

The system of the 1980's is here!

PRIMACS is total office automation. It combines word processing with a comprehensive management communications and information handling system *plus* data processing on Prime minicomputers.

The executive using the CRT in his office is reading his "In-tray." He will probably underline and annotate the document on the screen and electronically file it. Then, he may send a memo on this subject over the PRIMACS system to his personal diary or to one or more selected addressees with complete confidentiality. The memo might arrive at the recipient's desk by CRT, a letter, a Telex, or a TWX. It's his choice.

Its destination might be the office next door, down the hall, across town, or around the world. No problem. It will arrive electronically, usually in a matter of seconds. If he wishes, the text will have been computer proof read, with multilingual processing where necessary. He can order it stored in an almost unlimited number of confidential files, available for instant retrieval. Next, he may arrange for a conference with other users of the PRIMACS system, which has a constantly maintained schedule grid. At his choice, a "next available meeting" will be generated by the system.

This is only a fraction of PRIMACS' potential. It is the most powerful, advanced office automation system available. In fact, it is the only *total* system available.

PRIMACS is the office automation system of the 1980's. Yet its per-station economy makes it cost-effective *now.*

- word processing
- list processing
- electronic mail
- document filing, retrieval, archiving
- electronic diary and "In-tray"
- appointment scheduling
- text proof reading, including hyphenation.
- multilingual processing
- text indexing
- Telex, TWX message switching
- data processing
- data networking

......on one minicomputer based system!

Security and confidentiality. Extensive security and password control features are contained in the PRIMACS system. Only the originator determines who can access a document in the system. Only the originator determines who can see or print or change or reroute a document. Thus each originator can have a confidential diary, link his CRT with a secretary on an "eyes only" basis, and limit the availability of data in his file.

PRIMACS users include major New York City banks, a noted publishing house, an international investment banking firm, a leading insurance company, a major Scandinavian financial institution, and Federal Government agencies.

PRIMACS is designed for Prime computers...Prime Computer, Inc. minicomputer models P350 and up. A Prime computer can start with 12 million characters of on-line disc storage and grow to 2.4 billion characters per central processing unit (CPU). PRIMACS co-resides with any existing or new applications software on the computer written in COBOL, PL/1, FORTRAN, RPG II, BASIC or Assembler. PRIMACS will operate with one to 35 CPU's in a network, each Prime CPU servicing as many as 63 users simultaneously.

ACS America will install the PRIMACS system on existing Prime hardware. Or we can furnish the hardware and software on a "turn-key" basis.

For more information or to arrange a demonstration of this revolutionary advance in state of the art in office automation technology, call or write ACS America, Inc., 633 Third Avenue, New York, N.Y. 10017. Telephone 212-867-0870

ACS AMERICA INC.

CIRCLE 42 ON READER CARD

NEW...from Benson-Varian

MODEL 1342:

Ultra high-speed, 4-pen plotter. Plots from 7.9 to 31.5 inches/sec with 6g acceleration—50% better than conventional models.

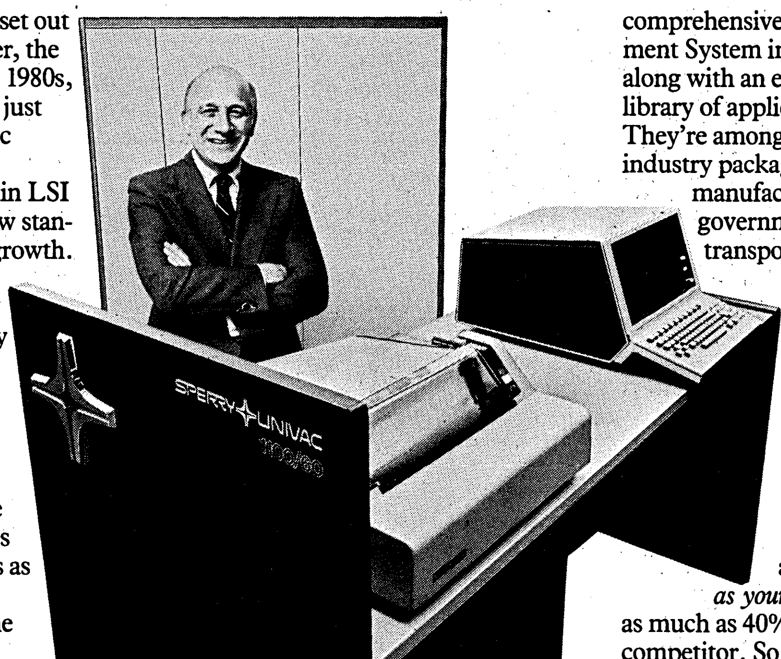
MODEL 5342:

High-speed drum plotter with 4-pen carriage, plots on any size paper from "A" to "E". Unique auto-adhesive loading—no sprockets. Rack-and-pinion drum drive for long-lived accuracy—no belt drive.

Both models feature microprocessor controlled *linear and circular* interpolation... a major industry first.

THE CHIPS ARE STACKED

A totally new technology that puts computer reliability a giant step ahead...



Five years ago, we set out to build a new computer, the vanguard system of the 1980s, if you will. And we did just that—the Sperry Univac 1100/60 system—a breakthrough, not just in LSI technology, but as a new standard in reliability and growth. We did it by stacking the chips in your favor. These chips are actually microprocessors put together in a totally unique way, so *they* become a large scale mainframe themselves. In a very real sense, the 1100/60 harnesses scores of miniature computers as a team to perform the work of a giant. And the benefits are just as big:

Reliability... The 1100/60's multiple microprocessor architecture makes it the most reliable general purpose large-scale computer commercially available. For instance, it's the first system that can afford to calculate everything twice, then compare the results—all through 100% paralleling of instructions. The 1100/60 hardware detects, resets and retries automatically, eliminating more than 95% of all single-chip failures...a new industry standard for system availability.

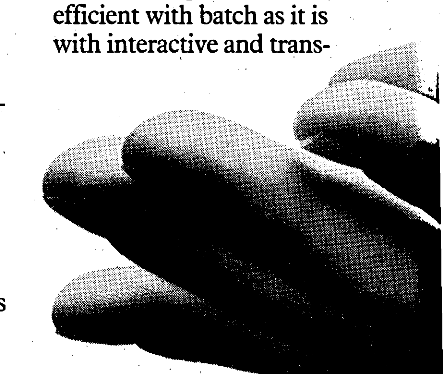
Growth Path... With the 1100/60, you can get only the power you need *as you need it.* There are six processing levels within the series, from entry level all the way into our 1100/80 range. That's a five-fold increase in capacity just by adding modules at your site. No swapout and no interruption. Overall, it can grow twelve-fold with easy migration into the top-end 1100/80 series.

Investment Protection... State-of-the-art technology...extended growth potential...systemwide compatibility. It adds up to investing in a sure thing: a computing capability that'll continue paying dividends for years to come.

And the highly acclaimed Series 1100 Operating System is just another plus. It supports the most comprehensive Data Base Management System in the business... along with an extensive, expanding library of applications software. They're among the best specialized industry packages available today—manufacturing, airlines, government, energy, transportation—just to name a few.

Price/Performance... More uptime through higher reliability, alone, might be enough to give the 1100/60 its edge. But there's more. You get a price/performance advantage that grows *as your requirements grow,* to as much as 40% over the nearest competitor. So it pays you to come in, but it pays you even more to stay.

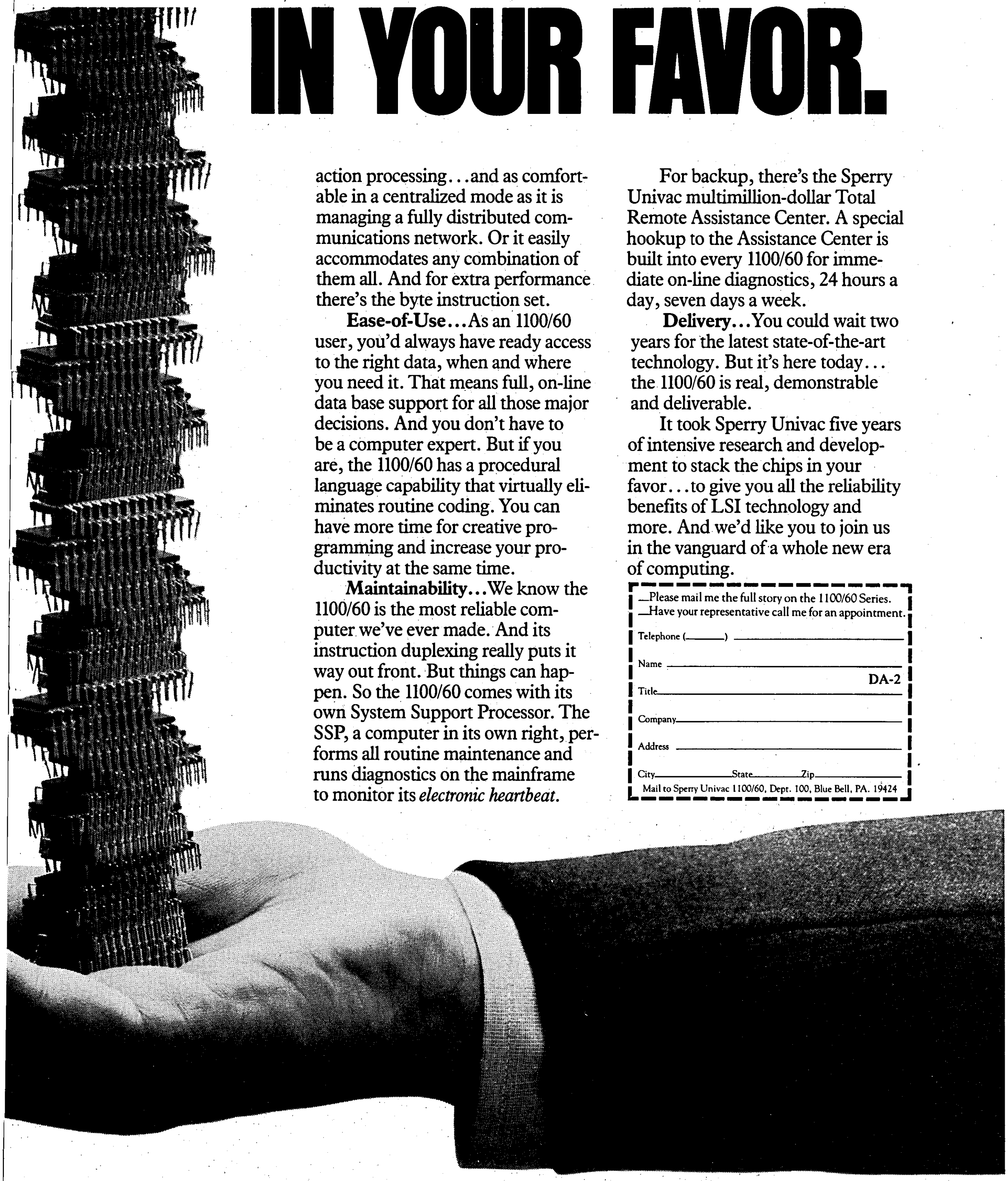
The 1100/60 performs well and economically, no matter what the task or configuration. It's just as efficient with batch as it is with interactive and trans-



MEET THE SPERRY UNIVAC®

SPERRY UNIVAC IS A REGISTERED TRADEMARK OF THE SPERRY CORPORATION

IN YOUR FAVOR.



action processing...and as comfortable in a centralized mode as it is managing a fully distributed communications network. Or it easily accommodates any combination of them all. And for extra performance there's the byte instruction set.

Ease-of-Use... As an 1100/60 user, you'd always have ready access to the right data, when and where you need it. That means full, on-line data base support for all those major decisions. And you don't have to be a computer expert. But if you are, the 1100/60 has a procedural language capability that virtually eliminates routine coding. You can have more time for creative programming and increase your productivity at the same time.

Maintainability... We know the 1100/60 is the most reliable computer we've ever made. And its instruction duplexing really puts it way out front. But things can happen. So the 1100/60 comes with its own System Support Processor. The SSP, a computer in its own right, performs all routine maintenance and runs diagnostics on the mainframe to monitor its *electronic heartbeat.*

For backup, there's the Sperry Univac multimillion-dollar Total Remote Assistance Center. A special hookup to the Assistance Center is built into every 1100/60 for immediate on-line diagnostics, 24 hours a day, seven days a week.

Delivery... You could wait two years for the latest state-of-the-art technology. But it's here today... the 1100/60 is real, demonstrable and deliverable.

It took Sperry Univac five years of intensive research and development to stack the chips in your favor...to give you all the reliability benefits of LSI technology and more. And we'd like you to join us in the vanguard of a whole new era of computing.

__Please mail me the full story on the 1100/60 Series.
__Have your representative call me for an appointment.

Telephone (______) __________________

Name __________________

DA-2

Title__________________

Company__________________

Address __________________

City________ State______ Zip______

Mail to Sperry Univac 1100/60, Dept. 100, Blue Bell, PA. 19424

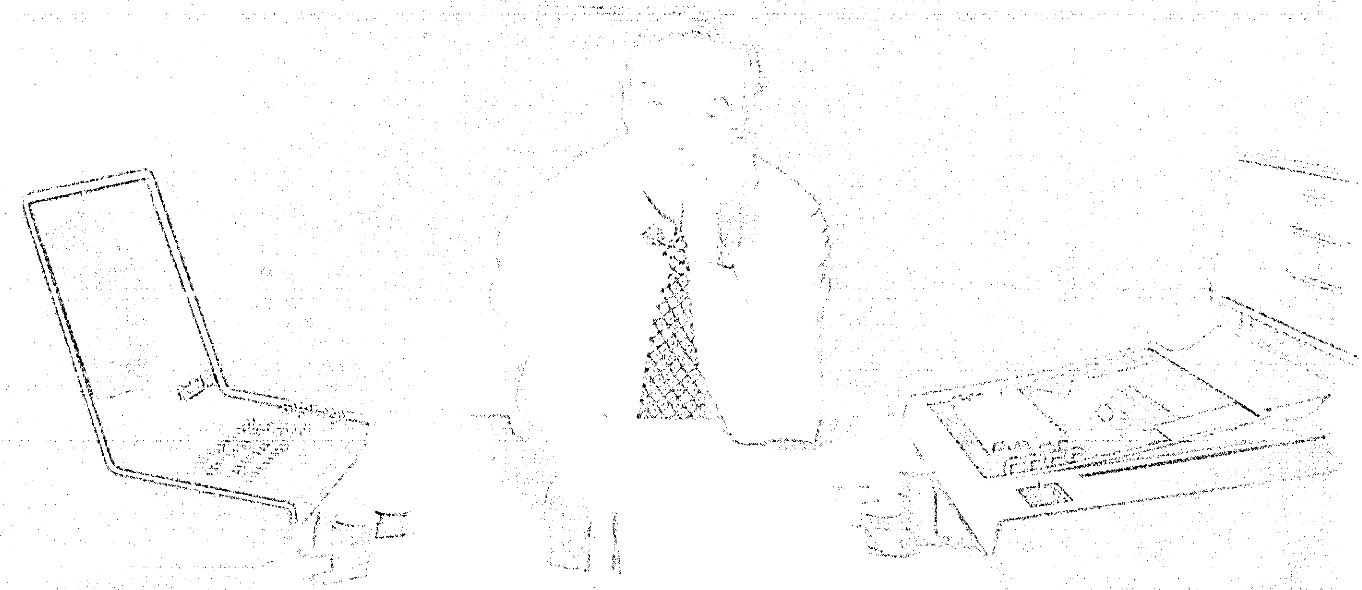
1100/60 COMPUTER.

SPERRY UNIVAC

SPERRY UNIVAC IS A DIVISION OF SPERRY CORPORATION

CIRCLE 45 ON READER CARD

You don't have to gamble with terminals anymore.



The days ... terminal use ...

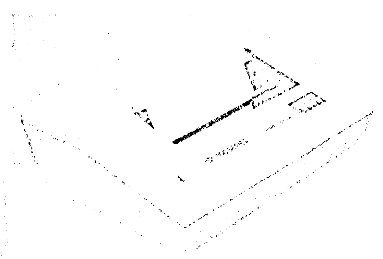
Now, ther... com all larg... minals or wait ... delivery of ... late and obsolete ... has become ... past.

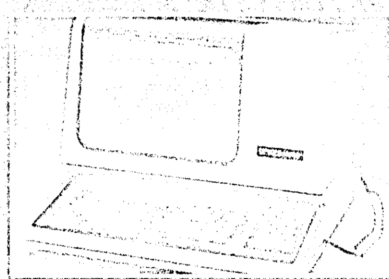
At Electro Rent, we keep you ahead of the game. First, we objectively evaluate your needs and plans.

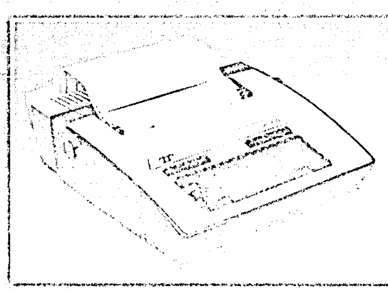
Then, working with the largest selection of I/O equipment available anywhere, a nationwide network of service centers and a rent/lease/purchase flexibility second to none, we tailor a plan specifically to you.

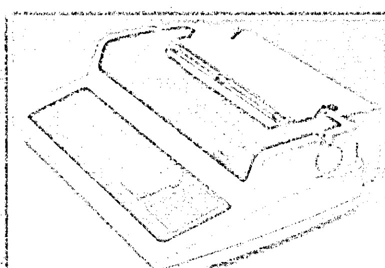
Our budget-stretching benefits have surprised even the most devoted gamblers.

So, fill out and send us this ad or call toll-free. We'll rush you our FREE FULL COLOR I/O CATALOG.









Name

Organization

Address

City

State/Zip

Title/Phone

ElectroRent
4161 Vanowen Pl.
Burbank, CA 91505
Call toll-free 800-423-2967
(In Calif. 800-262-2178)

CIRCLE 45 ON READER CARD

Declining prices and new hardware offerings make minicomputers an ebullient market, DATAMATION survey shows.

A SURVEY: THE SMALL SYSTEMS MARKET

• Minicomputer industry growth over the next year should continue at about the same rate as in 1979.
• Price of the system is not the most important factor in determining a small systems supplier.
• Over the past five years, the compound growth of the minicomputer user base in the U.S. amounted to 20%.
• In terms of applications, the most rapidly growing area of small systems usage is business data processing (distributed applications even more so than the standalone variety).
• Users tend to stay loyal to their current principal supplier; dissatisfaction with software support continues to be the most common reason for switching vendors.
• The average memory size of systems most recently purchased was 172 Kbytes this year, compared to 110 Kbytes in 1978; for disk storage, the average size was 90 Mbytes compared to 64 Mbytes a year earlier.
• Average system prices are declining for small business systems, traditional minicomputers, and data entry systems; only for intelligent terminals is the average price on the upswing.

These are a few of the findings from the 1979 Minicomputer/Microcomputer Survey, conducted by DATAMATION in conjunction with G.S. Grumman/Cowan & Co., the Boston-based investment research firm. This year's survey is based on responses from 4,923 user/buyer sites with over 35,000 minicomputers or mini-based small business systems, intelligent terminals and/or data entry systems in place as of July 1979. The survey also included responses from 167 European users with over 1,200 units installed.

"New user expansion of the minicomputer market shows no signs yet of flagging," the report states. "Some 19% of all the U.S. respondents were first-time mini users in 1978 and, based on partial-year data, a percentage about as high appears likely for the current year."

In aggregate, the U.S. respondents reported taking delivery of 14,500 minicomputers during the 12 months preceding the survey, with a total dollar value of $670 million. In the 12 months following July 1979, they planned to acquire 20,600 units with an indicated purchase value of $815 million.

Roughly 62% of the respondents reported purchasing minicomputer hardware during the year ending June 1979, and 56% expected to do so during the subsequent 12 months. End-user respondents expressing minicomputer buying intentions planned to spend 13% more on average per site than they spent during the prior year; on this same basis, oem/systems house respondents projected a year-to-year step-up in minicomputer-related expenditures of 36%, which compares with a 45% average per site increase foreseen by them a year ago.

"After an upward adjustment for first-time end-user expansion of the marketplace, worldwide unit purchases are projected to rise by close to 50% in the year ending June 1980," the report states. "Given the decline in average unit price indicated by the survey, to $39,600, this translates into a projected increase in dollar shipments of slightly more than 28% year-over-year."

Looking ahead one year, that is, to July 1980, 35% of the U.S. respondents anticipated higher spending during the next 12-month period than in the preceding period; that percentage is about the same as in the 1978 survey. About 23% of the respondents expected their spending next year to decline.

Price was supplanted by vendor reputation in this year's survey as the factor most important in the respondents' choice of supplier. Price was ranked second by the total respondent audience, but field maintenance was viewed as more important by the small business systems user segment, as was operating software, where traditional mini

TABLE 1

MINICOMPUTER-RELATED SPENDING 1978/79

PERCENT TOTAL SPENDING	END USER	OWN USE IMPLEMENTER	OEM	SYSTEMS HOUSE	DEALER/DISTRIBUTOR	TOTAL SITES
A. DIRECTLY WITH SYSTEMS SUPPLIER						
1. CPU'S, MEMORY, PERIPHERALS	70.6	75.8	69.0	84.0	87.3	72.8
2. SOFTWARE/PROGRAMMING	8.2	5.4	2.3	2.6	4.6	5.9
3. MAINTENANCE/SPARES	8.3	7.1	2.6	3.9	2.2	6.3
B. WITH INDEPENDENT SUPPLIERS						
1. MEMORY, PERIPHERALS	6.5	4.5	25.2	7.7	1.4	10.3
2. SOFTWARE/PROGRAMMING	6.4	7.1	0.9	1.8	4.5	4.7

• LION'S SHARE OF USERS' SPENDING GOES TO SYSTEMS MANUFACTURER FOR CPU, MEMORY, AND PERIPHERALS

• ONLY IN THE CASE OF OEM RESPONDENTS ARE OUTLAYS FOR INDEPENDENT MEMORY AND PERIPHERALS A SIGNIFICANT PERCENTAGE OF TOTAL SPENDING users were concerned.

Regarding miniperipherals, strong shipment growth was evidenced in the survey data for virtually every category except low speed serial printers, where only small growth is expected. The largest percentage increases were indicated for graphic display terminals (leading supplier: Hewlett-Packard), high speed serial printers (leading supplier: Digital Equipment Corp.), and add-on memory (leading supplier: DEC). In terms of units and number of sites buying, the standout was alphanumeric crt terminals (leading suppliers: Raytheon, Applied Digital Data Systems, Lear Siegler).

Unlike the mainframe systems universe, batch is not the primary operating systems orientation among the minicomputer users. Instead, the principal overall orientation for mini users is real-time (30%), followed by batch (24.6%), timesharing (24.4%), and multiprogramming (21%). The survey points out, however, that batch is most heavily used for small business systems.

The survey also indicated that data base management software usage is relatively widespread among minicomputer users, and that its use is growing. Among small business system sites, 22.7% indicated DBMS usage; at traditional minicomputer sites DBMS usage was 26.3%. Another finding was that DBMS usage is particularly heavy among Microdata, Hewlett-Packard, and Tandem customer sites.

Although network software is in more limited use than DBMS, the survey found that its use is rising discernably. Among respondents specifying small business systems as the type of system most recently acquired, 7% use network software (compared to 6.2% in the 1978 survey). Where traditional minicomputer was the type of system last acquired, 11.8% of respondents currently use network software (compared to 8.3% in last year's survey).

"Despite the possible longer-term trend toward network based systems, standalone still remains the predominant mode of minicomputer usage," the report states. Asked what the primary mode is in which minicomputers are used, 73.8% of respondent sites indicated standalone, 15.4% said in a mainframe host network, 8.4% cited in a mini peer network, and 2.4% stated other usage. Looking to 1980, the projected percentages change to 66.1% for standalone, 18.6% in a mainframe host network, 12.8% in a mini peer network, and 2.5% for other usage.

Network orientation was evidenced most prominently among Four-Phase, Honeywell, ModComp, and Harris users. Standalone orientation was the greatest for Microdata, Basic Four, Wang, HP and NCR users.

TABLE 2

TOP 10 SYSTEMS 1978-79

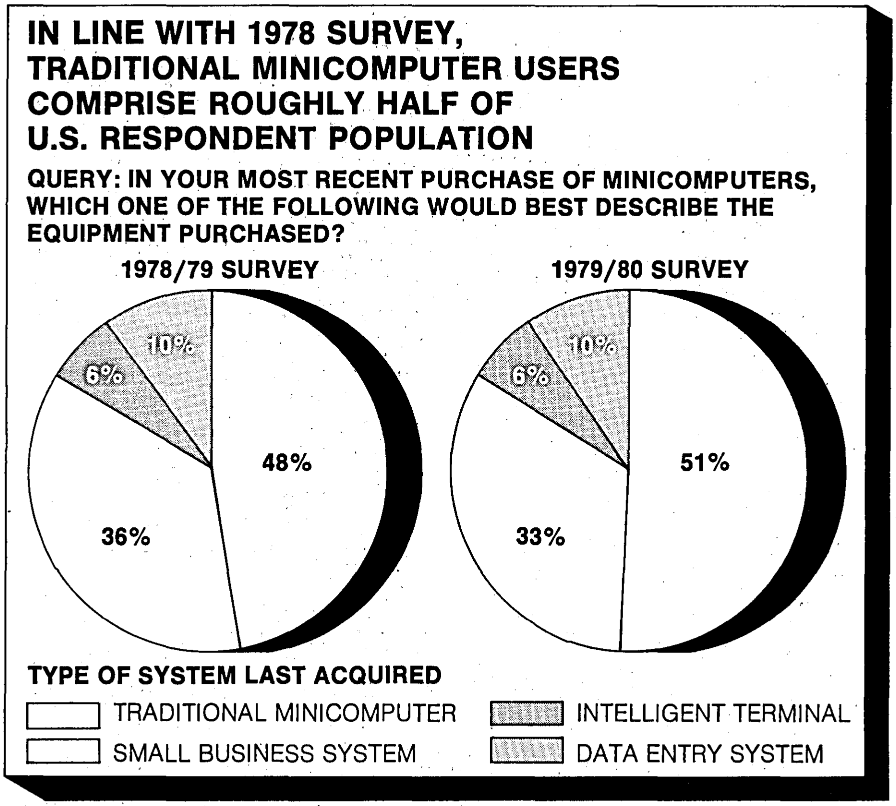
A. BASED ON NUMBER OF RESPONDENTS WHO BOUGHT SYSTEMS.

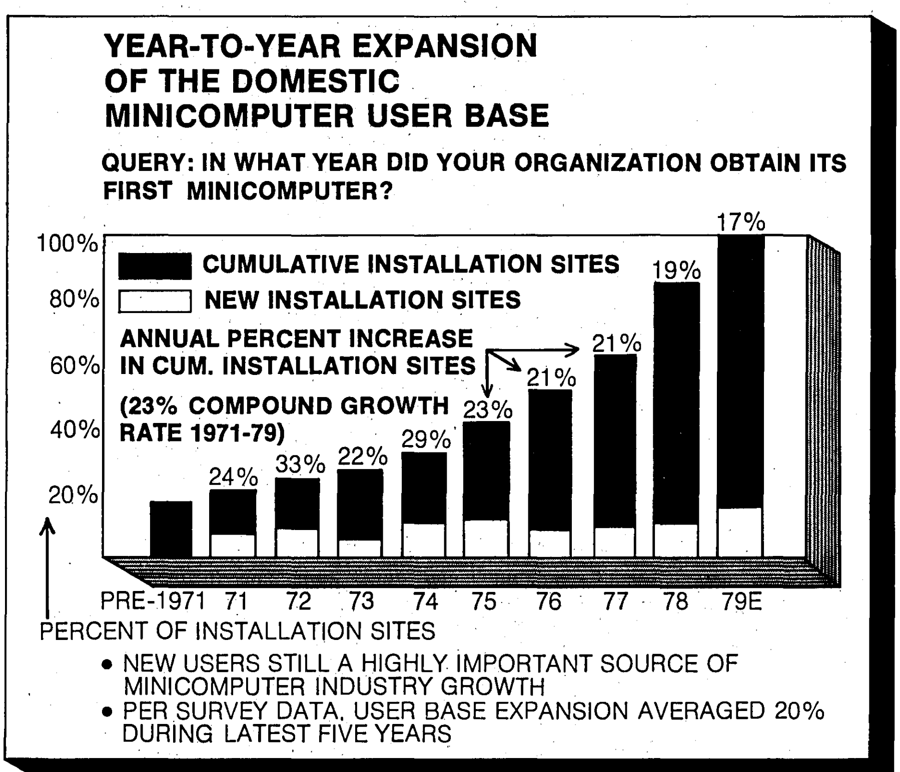
MANUFACTURER	SYSTEM	HOW MANY SITES BOUGHT	PERCENT FIRST-TIME MINI USERS IN 1978/79
DEC	PDP-11/34	297	25.9
DEC	PDP-11/70	277	22.0
IBM	SYSTEM/34	197	26.9
HEWLETT-PACKARD	3000	162	38.9
IBM	SERIES/1	124	30.6
DATA GENERAL	NOVA 3	109	25.7
DEC	VAX-11/780	75	17.3
DEC	PDP-11/03	74	18.9
DEC	PDP-11/60	65	18.5
DATA GENERAL	ECLIPSE C-3XX	61	34.4

B. BASED ON NUMBER OF UNITS ACQUIRED.

MANUFACTURER	SYSTEM	HOW MANY UNITS WERE ACQUIRED	PERCENT BY FIRST-TIME MINI USERS
RAYTHEON	PTS SERIES	1,258	2.4
DATA GENERAL	NOVA 3	1,109	5.0
DEC	PDP-11/34	842	14.8
HEWLETT-PACKARD	21MX	638	0.5
DEC	PDP-11/70	595	13.5
DEC	PDP-11/03	508	4.7
DEC	PDP-8	471	3.5
WANG	2200	469	4.7
IBM	SERIES/1	399	15.8
HONEYWELL	LEVEL 6/43-47	380	17.4

- NEARLY 70 RESPONDENTS INDICATED PLANS TO ACQUIRE 4331, WHICH EVIDENTLY THEY DEEMED TO BE A MINICOMPUTER-CLASS SYSTEM RATHER THAN A MAINFRAME
- IN TOTAL, 3,034 RESPONDENTS (62%) REPORTED THE ACQUISITION OF 14,477 SYSTEMS WITH A PURCHASE VALUE OF $670 MILLION BETWEEN 7/78 AND 7/79





"The minicomputer marketplace remained highly competitive," the survey states, "with 77% of all end-user respondents considering two or more suppliers in their most recent procurement."

Among the respondents DEC ranked first by a wide margin in the dollar value of systems acquired during the 18 months preceding the survey. Data General was ranked second, followed by IBM and Hewlett-Packard, respectively. (The latter two firms were ranked fourth and third, respectively, in the year-earlier survey.)

Digital Equipment also ranked first in the respondents' spending intentions for the ensuing 18 months, with IBM in a very strong second-place position on the strength, at least in part, of prospective 4331, System/38, and 8100 deliveries. Data General and Hewlett-Packard occupied the third and fourth positions.

"Looking at the small business systems segment of the market separately, the survey shows DEC with the largest share of shipments to respondents for the 18 months ending June 1979, but shows IBM gaining the leading position for the June 1979 to December 1980 time period," the report points out.

Of the respondents who had bought or planned to buy the IBM Series/1, 52% already considered IBM their principal mini systems supplier, while 13% considered DEC as such. In a like vein, 58% of those acquiring the IBM 8100 and 78% of those obtaining the System/38 viewed IBM as their primary small systems source. The 4331, an IBM 370-compatible system, derived three-fourths of its booking orders (in the context of the survey) from IBM mainframe user organizations, which were not necessarily also IBM minicomputer users.

Only 7% of survey respondents expected to switch to a vendor other than their current principal supplier during 1979/80 (down from 17% so planning when surveyed last year), and 12% were seriously considering a switch. The principal end-user reason given for the prospective switch, as in last year's survey, was dissatisfaction with software support. Oem/systems house respondents, when dissatisfied, were concerned primarily with price and secondarily with software support, although increasing displeasure with delivery schedules appeared to be resurfacing.

The highest degree of customer loyalty was evidenced at sites specifying Tandem as the current principal supplier. Out of 18 such sites, none was considering a switch. The survey showed Prime with the second greatest degree of customer loyalty; out of 84 sites reporting Prime as principal supplier, only 8.3% are considering changing suppliers. Other vendors with loyal customers were Texas Instruments (85 sites, 9.4% considering switch); Hewlett-Packard (388 sites, 10.8% considering switch); DEC (1,282 sites, 12.1% considering switch); and IBM (678 sites, 12.7% considering switch).

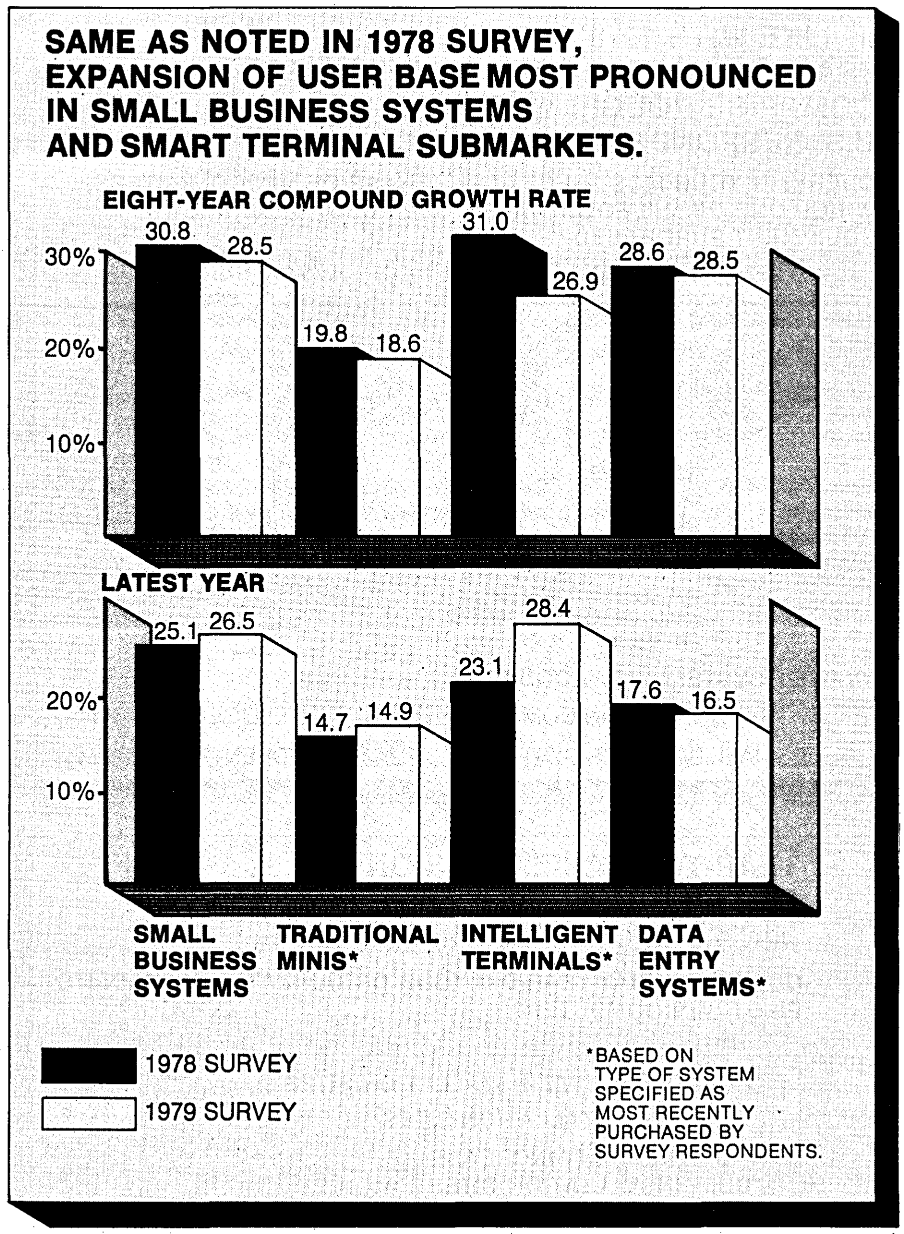
In the context of the survey, the least amount of customer loyalty was expressed by respondents specifying Raytheon as the principal supplier; of 12 such sites, 41.7% are contemplating a vendor switch. Other suppliers that did not rank so well in customer loyalty were Sycor (22 sites, 36.4% considering switch); Burroughs (90 sites, 32.2% considering switch); Microdata (56 sites, 28.6% considering switch); and General Automation (53 sites, 28.3% considering switch).

Customer sites considering a switch from DEC indicated that dissatisfaction with delivery schedules is resurfacing. In the 1977 survey, 23.6% of DEC "switching sites" were unhappy over delivery schedules. By the 1978 survey, DEC had lowered that dissatisfaction to 13.3% of the "switching sites." But in the most recent survey, dissatisfaction over delivery schedules was expressed by 21.9% of the "switching sites."

As for IBM, the 1979 survey indicated that 18.6% of sites considering a vendor switch were dissatisfied with delivery schedules. The report points out, however, that such dissatisfaction may be even greater now since IBM's delay of System/38 initial customer deliveries was disclosed after the survey was completed. Nonetheless, the single most frequent reason cited for considering a switch from IBM as the principal supplier was price; 50% of "switching sites" gave price as the reason.

Survey respondents obviously consider the IBM 4331 to be a minicomputer. Sixty-six respondents indicated specific intentions to acquire 117 IBM 4331s. Another 77 respondents expressed intents to acquire 111 System/38s. On the strength of these two systems, IBM's share of total minicomputer spending should rise sharply in the next 18 months over the previous 18 months. For the period January 1978 to June 1979, IBM captured 8.5% of the respondents' minicomputer spending. For the next 18 months, respondents' expected spending would give IBM a 13.5% share.

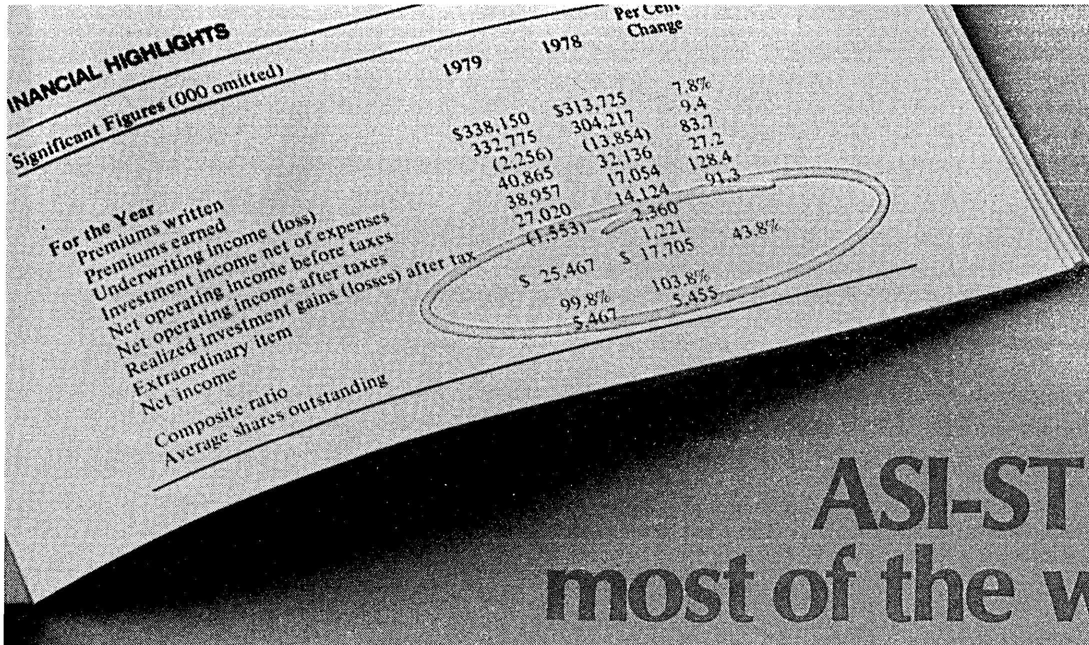
As IBM gains ground, in the context of the survey, the other major mini suppliers would experience an erosion. From 29.2% of respondents' spending over the past 18 months, DEC's share would drop to 26.5% over the next 18 months. During the same time, declines in dollar shares would also be experienced at Data General (from 9.4% to 8%) and at Hewlett-Packard (from 8% to 7.3%). Nonetheless, there would be some significant share gains during the same period. Texas Instruments' dollar share would climb to 3.1% from 1.5%, and Wang's share would rise to 4.8% from 3.2%. If the IBM 4331 and System/38 were excluded from projected spending, there would be relatively little share erosion for other leading suppliers over the next 18 months.



Compatibility with the IBM System 370 was deemed even more important than price/performance by respondents with actual plans to acquire the 4331. The 4331 was one of the Top 10 systems (eighth) in the 1979 survey as ranked by the 68 sites planning to acquire during 1979/80. The DEC PDP-11/70 ranked first, followed in order by the DEC PDP-11/34, the IBM System/34 and Series/1 and, in fifth place, the DEC VAX-11/780. At the time of the survey, 44% of the DEC customers questioned had evaluated the VAX for purchase during 1979/80 and 14% (up from 6% a year ago) had already bought the VAX or were planning to do so.

Of all respondents, 27% considered 370-compatibility "very desirable," although only 12% were considering mini-based 370 plug-compatible systems as possible alternatives for future applications (13% had considered but had no interest; less than 1% had such a system installed, on order, or planned to order).

As for personal computers, 10% of the survey respondents had purchased such systems through retail outlets. Roughly 70% of these were for organizational purposes, with the balance intended for personal use. Tandy was the most frequently cited supplier (43%), followed by Apple (17%). Business dp (standalone), education, and office systems were most often mentioned as prospective applications. ✻



ASI-ST does most of the work; YOU reap the profit!

Easy to use

More organizations are using ASI-ST more heavily than any other data management system. Why? Because ASI-ST is so easy to work with. You simply enter language statements and parameters; there are few rules to learn and remember. You can even omit many parameters entirely; ASI-ST picks the most commonly selected condition for those entries.

By eliminating up to 90 percent of the programming effort usually required to perform data management functions, ASI-ST is saving time and money for hundreds of users. Typical examples:

- COMBUSTION ENGINEERING, INC. (CE) currently executes from 18,000 to 22,000 ASI-ST runs every month. Some runs produce more than 100 reports in a single pass of one or more TOTAL data bases and conventional files.
- Using ASI-ST, AMERICAN EXPRESS COMPANY recently required only four minutes of CPU time to process over 12 million records. AMEX also uses ASI-ST with IMS.
- CORNING GLASS WORKS now executes an average of more than 16,000 ASI-ST runs monthly against TOTAL data bases and standard files.
- UNION CARBIDE's usage of ASI-ST averages over 6,000 runs per month at each of its worldwide data centers where ASI-ST is used with IMS.

Uses less machine time

Although not originally intended as a complete replacement for higher-level computer languages, ASI-ST can solve 70 to 90 percent of your commercial data processing problems. And ASI-ST can process your IMS or TOTAL data bases more economically—because it uses less machine time. In a single run, for example, it can create and update related or independent files; retrieve, manipulate, calculate, and display data; and generate detail and summary reports. How's that for versatility—and efficiency?

Isn't it time you reduced your data processing costs while performing your data management functions more effectively? Isn't it time you learned more about ASI-ST? For complete time- and money-saving details, call or write today.

Applications Software, Inc.
21515 Hawthorne Boulevard
Torrance, CA 90503
(213) 540-0111

Member SIA Software Industry Association

CIRCLE 47 ON READER CARD

NATIONAL COMPUTER CONFERENCE

PRESENTS

JUST WHAT THE DOCTOR ORDERED!

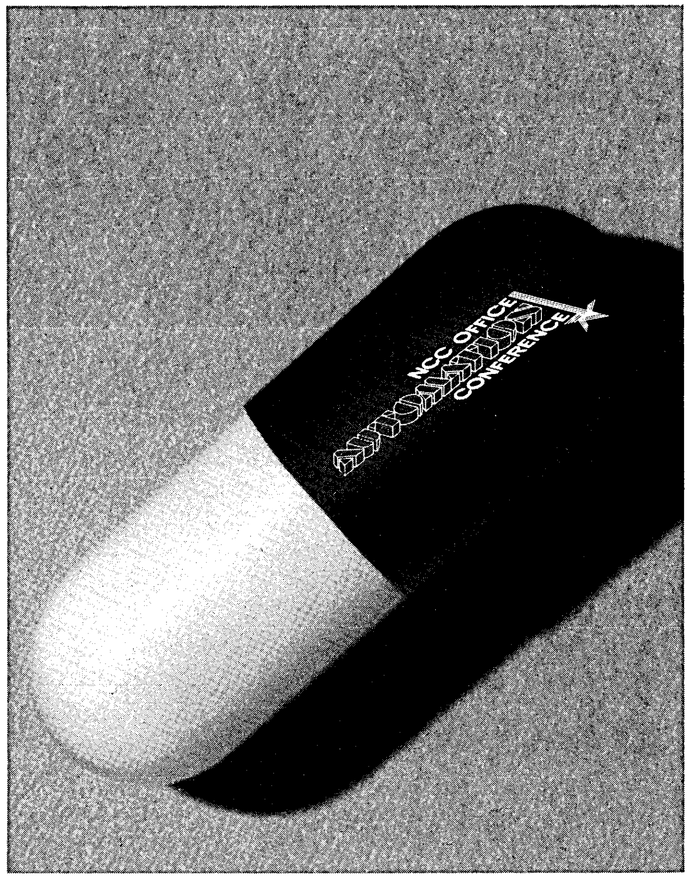
For the company whose office systems are stunted by too much paperwork, swollen files and the fever of catch-up overtime, the new NCC Office Automation Conference offers

grow power in a capsule

OAC is a first-class, full-blown dose of the NCC way to successful growth for automated office systems. An exciting new annual conference with exhibit showcase specifically formulated to provide the healthful effects of education and direction to the business community, today and beyond.

All self-contained in the Georgia World Congress Center, in Atlanta. Be there March 3-5, 1980, for the sweetest medicine ever prescribed.

Fill out the coupon for more information.



℞ NCC OFFICE AUTOMATION CONFERENCE
210 SUMMIT AVE.
MONTVALE, N.J. 07645

Please send me information on the following:

- ☐ My company is interested in exhibiting at OAC
- ☐ I am interested in attendance information
- ☐ I am interested in participating as a speaker or panelist

Name ______________________

Address ______________________

____

Telephone ______________________

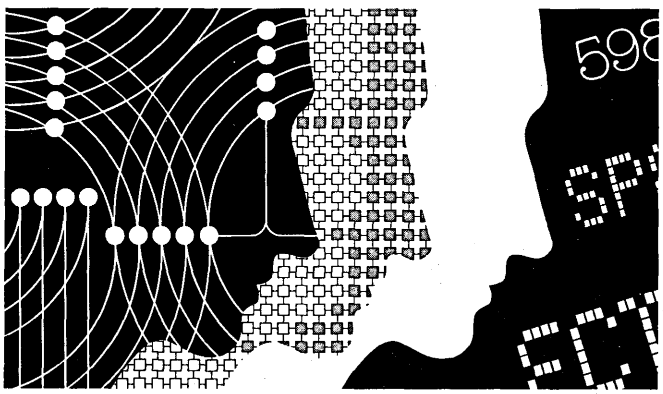
D

NCC OFFICE AUTOMATION CONFERENCE

American Federation of Information Processing Societies • 210 Summit Ave., Montvale, N.J. 07645 Tel.: (201) 391-9810

It's Time For Partners For Profit/Part II

Time's 5th Special Section on New Office Technologies



PARTNERS FOR PROFIT

Here's a unique advertising opportunity for manufacturers of business equipment and furniture. *Partners for Profit/Part II* is sponsored by the International Word Processing Association. This special section is scheduled for publication in the March 3, 1980 issue of TIME B.

An Ideal Advertising Environment

Profit/Part II will concentrate on people and productivity. Four well-known authorities, assembled by the distinguished firm of Arthur D. Little, will show you how you can work with your customers to help them integrate new technology successfully...overcome people resistance ...use human resources effectively.

These top professionals will also provide your prospects with valuable case histories and success stories from end user markets.

The Biggest and Best Business Buy

TIME B is TIME Magazine's famous demographic edition that reaches over 1,600,000 executive decision-makers in business and industry all over the country. It's efficient... it's effective. That's why industry leaders such as Eastman Kodak, Lanier, Olivetti, Saxon, Xerox and Wang have advertised in TIME B's special sections on new office technologies year after year.

Special Added Benefits for Advertisers

When you advertise in Partners for Profit/II, you'll receive, FREE of charge:

- valuable new sales leads generated by two postpaid reader service cards (computerized weekly updates);
- a confidential analysis of responses to your advertisement;
- a demographic/geographic analysis of section respondents including the results of a follow-up questionnaire;
- full color reprints to send to dealers and prospective customers.

In addition, reprints of Partners for Profit will be distributed to IWP members.

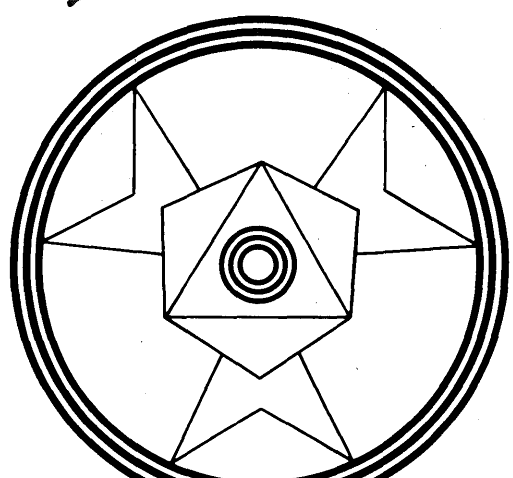
Why not put TIME to work for your products and services? For further information on Profit/Part II, contact your local TIME sales representative or call Charlie Craig, Business Equipment Supervisor, at (212) 841-2831.

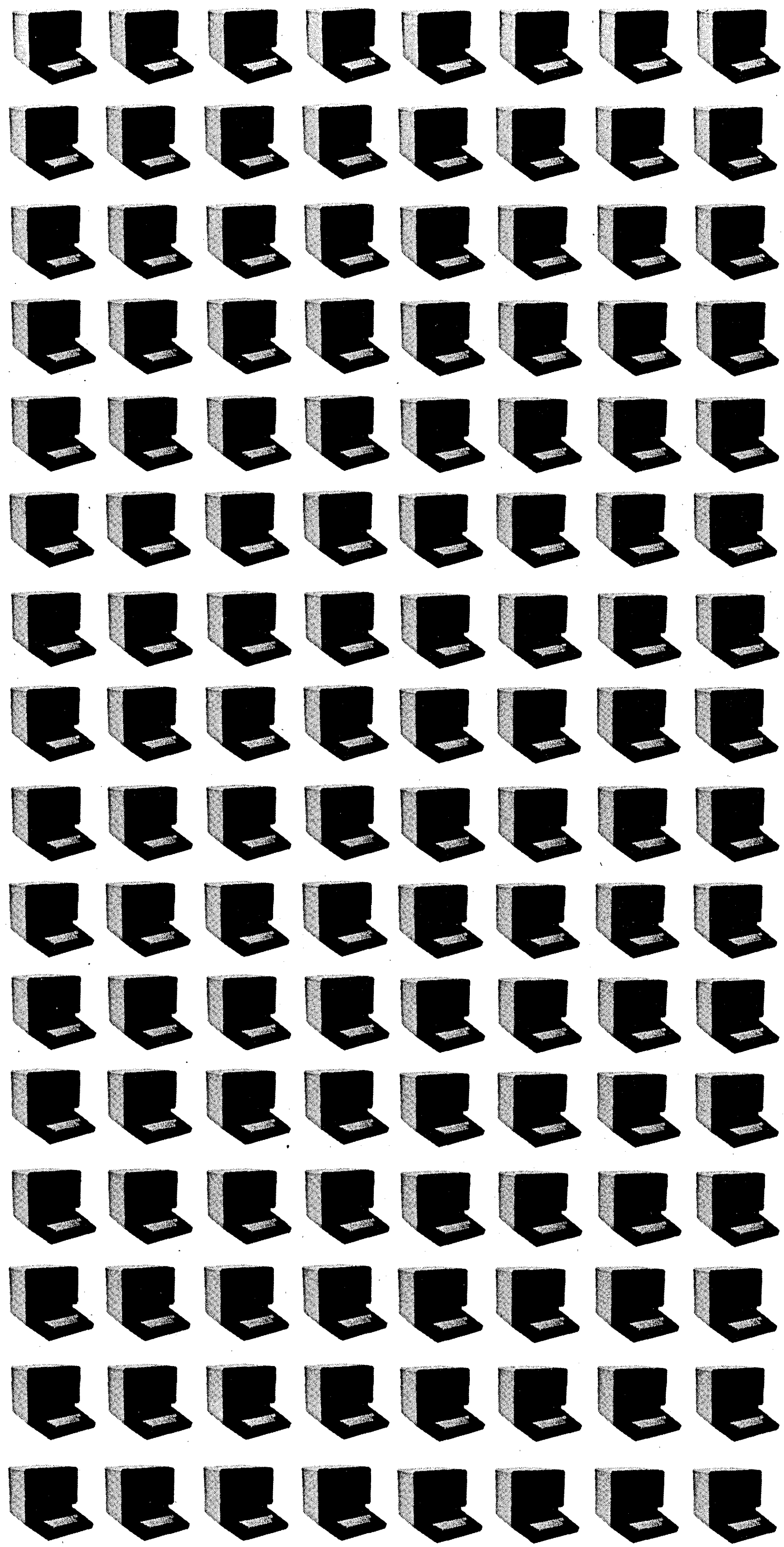
Don't miss Partners for Profit/Part I in the November 12, 1979 issue of TIME B.

TIME

WHERE ADVERTISING GETS RESPONSE

CIRCLE 49 ON READER CARD





129 reasons to buy the new Perkin-Elmer 3220 supermini.

You can build an ultra-high-performance, 128-terminal system on Perkin-Elmer's powerful new 32-bit Model 3220. That's 128 good reasons right there.

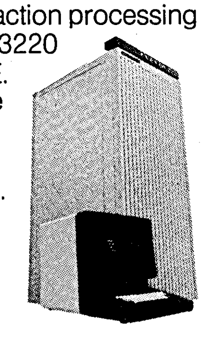
The 129th reason is our RELIANCE software—the transaction processing package that makes it all possible. The instantaneous terminal response. The ability to handle a variety of complex operations all at once. The unmatched throughput for a massive number of transactions. Even with all this power, a RELIANCE system is easy to operate.

RELIANCE integrates COBOL, data management, and transaction processing software. It's explicitly designed to deliver the reliability, integrity, and security so critical to applications requiring large amounts of on-line file processing. And RELIANCE protects your commercial data base from media faults and system failures.

Your application programmers can do all their development work, batch or transaction processing, in COBOL. With its enforced modular structure and built-in recovery routines, RELIANCE makes it easier to write, implement, and modify application programs.

The Perkin-Elmer Model 3220 is a supermini with built-in growth. Its memory can expand to meet the broadest system requirements. What's more, the low starting price of $33,500 (U.S. only) is subject to OEM terms and conditions unmatched in the industry. Get all the reasons for building a transaction processing system with the 3220 and RELIANCE.

Call toll-free 800-631-2154. In New Jersey, (201) 229-6800.



PERKIN-ELMER

CIRCLE 51 ON READER CARD

ADVANCED COMMERCIAL APPLICATIONS IN THE '80S

by Martin A. Goetz

Quality programming tools are abundant; people trained to use them are not.

Computer programming has always been viewed as a major problem by both the computer hardware manufacturer and the commercial user. For the manufacturer, it has restricted his potential market since sales are based on the ability of the user to utilize the computer. For the user, programming an application not only is costly but also is difficult to accomplish successfully. Thus, for the last 25 years both the computer hardware manufacturer and the commercial user have ardently wished that the "programming problem" would vanish or at least be minimized.

To deal with this problem, the hard-

ware manufacturer in the 1950s consistently underestimated the user's programming effort and provided programming assistance and bundled programs to lighten the user's programming load. In the 1960s, the user was told that new operating systems, JCL, and the upward-compatible 360 series would reduce the programming burden. In the 1970s, the manufacturers continued their wishful promises. They alluded to the possibility that new "future systems" would somehow become more intelligent and that the needed "software" would be put into hardware. The manufacturers also implied that "programmed chips" and firmware might mysteriously be put together to solve the programming problem. While these hopes have not materialized, the 1970s have shown that a number of user applications can be satisfied with off-the-shelf application packages used "as is" or slightly customized. By the same token, however, the 1970s have also demonstrated that most user applications cannot be satisfied by these standardized packages and that professional programmers must develop the applications.

The programming problem has not gone away. It never will. Also, it is not a

Many top dp managers have neither the clout nor the resources to change an organization's programming structure.

problem. Programming a commercial application is a professional, technical endeavor which represents an investment by a corporation to automate part of its business. Thus, programming should be viewed as an "automated solution" rather than a problem.

This article addresses those applications that will be "programmed" by the user in the 1980s; those that will be recognized as complex in nature; and those that may require an initial development effort of as little as one year, but more often will require at least five to 20 man-years. For want of a better name, I have termed these applications "advanced commercial applications."

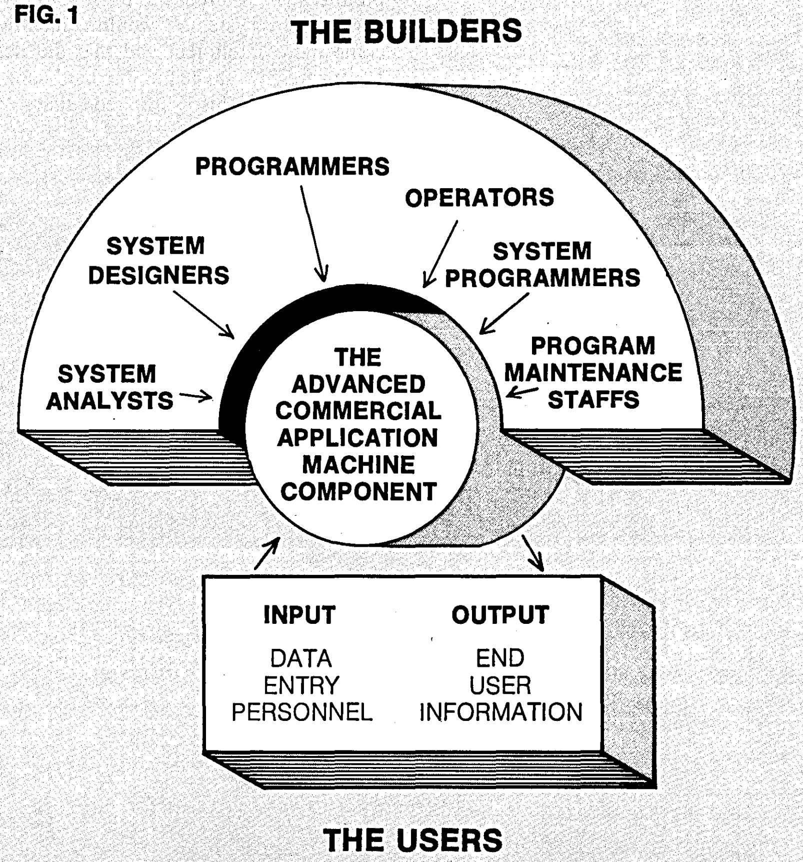
THE PAST IS PROLOGUE Experimentation, development, and experience over the past 20 years will determine the way advanced commercial applications will be shaped in the 1980s. To better understand what will happen in the future, it is important to review the history of commercial applications development in the 1960s and 1970s. Many of the problems that users encountered during the past 20 years still persist and probably will continue. Some of these problems are often education-related, people-related, organization structure-related, or profit-related and have little to do with the technical challenge. In essence, they are management-related problems which, in turn, contribute to the difficulty in the development of these applications. To build viable advanced applications, management, as well as technicians, must have a better understanding of what computerized applications are. There are still too many people in the field who do not realize what it means to build a complex (or large) commercial application.

History will view the 1950s as a period when the user did not understand the technology necessary to develop commercial applications. It will view the 1960s as a time of chaos when many users attempted to develop complex commercial applications and failed. The 1970s will probably be viewed as a mixed bag. The many successes were matched with at least an equal number of failures. These successes and failures provide, however, an excellent insight into how to successfully build advanced applications in the 1980s.

In the 1970s, there has also been the realization that the caliber of the programming staff is as critical to project success as the programming tools available. Of course, defining the problem, developing a good specification, and properly managing the projects are still the most important parts of the programming process. But that is beyond the scope of this article.

Both the successful and unsuccessful applications of the 1970s have provided four

FIG. 1



very important characteristics of commercial applications:

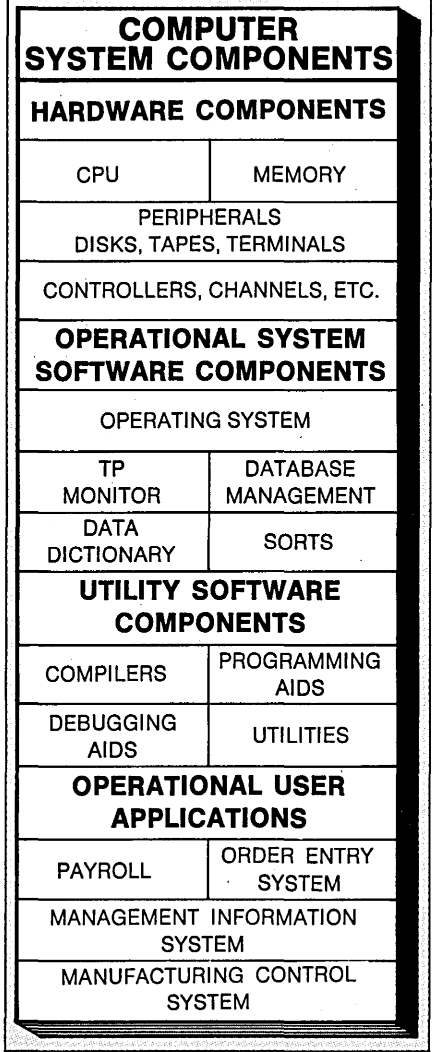
1. Most commercial applications should have long lives. Applications represent policies, data processing requirements, practices, and strategy of an organization. Second- and third-generation applications have remained active within corporations for as long as 10 to 15 years. *Properly developed applications in the 1980s should have a life span of 20 years or more. And that should be an important factor in their implementation strategy and the amount of their funding.*

2. Applications are very volatile. Applications are continuously enhanced, modified, and converted because of a large variety of factors. These factors range from new computer technology (i.e., communications/on-line facilities, operating system changes, DBMSs) to changes in the organization's data processing requirements due to such aspects as growth, corporate revisions, and government regulations. *Applications in the 1980s will be even more volatile as the hardware/software and communications technology continues to change at an accelerating rate.*

3. The original designers and programmers often are the only ones that can maintain the application. Many applications in the 1970s did not remain viable because there were no long-term design specifications; documentation was not kept up to date; the original programming team left; and/or the application was not constructed in a modular, top-down fashion. *Successful applications in the 1980s will be engineered and independent of the original development team.*

4. Maintenance often represents 30% to 80% of a company's data processing efforts. Early in the 1970s, users identified the "maintenance iceberg" as a somewhat hidden but enormously large amount of time that installation personnel had to spend on existing applications. At that time, it was estimated that the average installation spent about 50% of its costs maintaining existing applications. Maintenance today for many installations has risen to 80%, while others have experienced a decrease to the 30% to 40% range. The proper use of higher level languages, precompilers, data base management systems, and data dictionaries have had a positive and profound effect on maintenance. *Successfully developed applications*

FIG. 2



in the 1980s will demonstrate that maintenance efforts can be reduced to as low as 20% to 30%.

SOME SUCCESS IN THE '70s

As previously mentioned, many successful advanced commercial applications are operational today. While there may be some dissatisfaction with the applications, they do represent a complex and successful effort that can be examined and analyzed. These applications exist in the more progressive dp installations and traditionally are in the larger dp organizations, such as the larger airlines, banks, and insurance, service, and manufacturing companies throughout the world. Such applications, however, represent a very small percentage of the total applications developed during the 1970s—probably less than 5%. Most of the successful applications used other software or software components in building or operating the applications. Therefore, these applications can be viewed as systems which are themselves composed of subsystems or components.

Most of these successful 1970-era applications have made extensive use of operating system facilities, system software packages, and programming tools. Without such building blocks, there is no question that these installations would *not* have been successful and that the time, cost, and overall development effort would have been significantly increased. Let's review the characteristics of these essential software components or subsystems.

• *Operating System Components.* The operating system interfaces directly to the hardware and manages the resources of the computer complex. With the hardware, the operating system forms a virtual environment to provide many services that advanced applications require. Some of these services are space and time management, job and step execution, subtasking, computer-to-computer communications, terminal control, and program execution management.

• *Operational System Software Components.* The data base management systems, teleprocessing monitors, data dictionaries, network control programs, and other programs that execute as part of the commercial application have provided the "guts," or major control components, which serve as the "engine" for the application. Without such embedded software components, the cost, time, and reliability of building and maintaining the successful systems in the 1970s would have been considerably more difficult.

• *Programming Tools Software Components.* The programming tools software components of the 1970s are those subsystems used to build or construct the application and are not part of the operational application. These tools include precompilers, online programming aids, source program maintenance systems, and utility systems. There are also other tools that fall in between the operational system software components and the program tools components; these are interpretive query systems and ad hoc report generators. These components are available to the end user to extract information from a file or data base and can fall into either category, depending on the application and how they are used.

The successful developer of the 1970s constructed commercial applications in a disciplined and highly structured manner. The use of top-down design permitted the system to be defined and debugged in a modular manner. Structured programming techniques helped both to minimize the interaction between modules and to create an engineering-like atmosphere for the building of these systems. The use of the chief programmer or chief architect to oversee the entire effort was instrumental in bringing the development effort more in line with the building of a complex piece of machinery.

But, there was still much lip-service and apathy even at these successful installations of the '70s. It is true that the decade heralded the structured programming revolution —i.e., modular programming, standardized interfaces, data dictionaries, structured design, improved programming techniques (IPT), the chief programmer, structured walkthroughs, precompilers, test data generators, program standards auditing, HIPOs, and a host of other techniques, disciplines, and programs. But, while some of the applications technicians in the 1970s used these facilities, they still did not have the corporate commitment and the overall management control that they should have had. So, at best, when these applications have to meet "the test of time" in the 1980s, they may also fall by the wayside.

COMMERCIAL APPLICATIONS IN THE '80s

Before discussing how successful "advanced commercial applications" will be developed in the 1980s, it is important to examine what a computerized commercial application actually is.

Computerized commercial applications are composed of literally hundreds of thousands of instructions that are processing information and data within a computer. Many people interact with this application both before and after it is put into production. There are end users or dp personnel within the organization preparing the input and using the output. There are computer operators and system programmers that ensure that the application performs properly. There are system analysts, system designers, programmers, and testing personnel that are responsible for delivering a "workable" and "operational" application. There may be "maintenance" staffs that must keep these "applications" operational and viable during the life of the application—which may be many, many years (Fig. 1). Therefore, to properly "construct" a computerized commercial application that performs satisfactorily over its lifetime is not a simple or insignificant job. It requires a great number of personnel and programs that continuously interface and interact with one another.

Another way to examine the computerized commercial application is to view it in the context of the physical environment in which it operates—the entire computer system. The computer system is made of many hardware and software components and is viewed today as one of mankind's more complex machines. Simply stated, a computer system is a machine that processes data and information. And a computerized commercial application is one of the components of that computerized system. Depending on the complexity of that component, the "construction" or "engineering" of that component, and its subcomponents, may fall into

Properly developed applications in the '80s should have a life span of 20 years or more.

the category of "high technology." Fig. 2 shows many components of a typical computer system of the 1970s.

Words such as "components," "high technology," "engineering," "machines" are not usually used to define a commercial application. They do, however, represent a technical view that has been espoused for many years. Back in 1965 and 1968, the NATO Software Engineering Conferences discussed the complexity of building applications. While the questions under consideration at that time were directed toward military and large applications, they also addressed the crux of the problem which centered around the difficulty in building, testing, and maintaining these complex applications. It was concluded that the development of a complex or advanced application is analogous to the building or engineering of machines. Said another way, an engineering-type discipline must be observed in the building of applications if they are to be successfully implemented and maintained.

If we look today at the kinds of applications that commercial installations are trying to build for the 1980s, we encounter large programming efforts oriented toward the use of data bases, terminals, distributed processing, real-time, on-line communications, and networking. Such systems differ widely from yesterday's simple batch applications. Thus, today's and tomorrow's successful application will be constructed in an engineering-like environment and will be viewed as a "component" of the computer system.

As mentioned earlier, all the tools, techniques, and subprograms needed to properly develop the successful advanced commercial applications in the 1980s are already here today—everything except the discipline, the training, and the understanding. As Pogo stated, "We have met the enemy and he is us." The enemy, for many, is a combination of poor technical training, lack of leadership at the top management level, strong resistance to change, and short-term fire fighting instead of long-term planning.

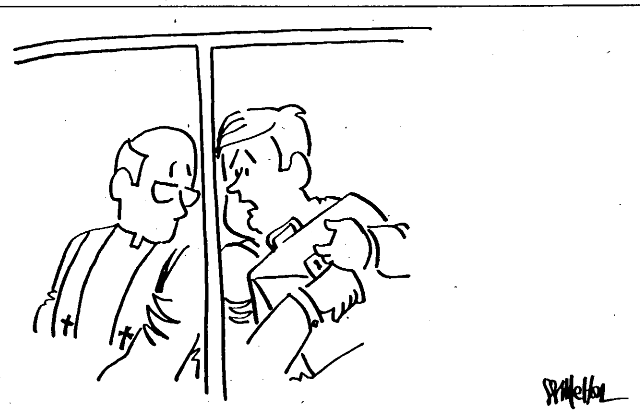
Certainly, there is more software technology to come in the 1980s in the form of better programming tools. But that is not the problem. There is more technology and methodology available in the marketplace today than is needed to make quantum leaps toward increasing programmer productivity, improving applications reliability, and providing more flexibility for developing, maintaining, and enhancing the advanced application. The missing ingredients are people trained to use these tools and overall understanding within top corporate management of the long-term implications of their short-term goals—goals which usually force dp managers to take short-term views of their data processing application development efforts. Unfortunately, much of today's top dp management has neither the clout nor the resources to change an organization's programming structure.

STEPS TOWARD SOLUTION

But there is some light at the end of the tunnel. Today there is a growing awareness about what the problem is and where its solution lies. The answer, in my opinion, lies in the following steps:

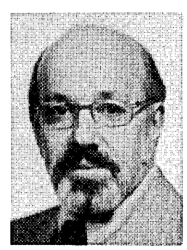
- *Massive training and retraining of personnel.* It is of critical importance to train personnel in the methodologies of the 1970s—from top-down programming to structured programming tools. While some computer science graduates are trained in these areas, it is the responsibility of management to provide in-depth, in-house training to their staffs and to allocate the time for such training.
- *Increased operational system software in advanced applications.* The operational system software of the 1970s should be used as the building blocks for the development of the advanced applications of the 1980s. Many of these systems have proven to be reliable, efficient, and easy to use. Most of them have survived in a competitive environment and have a demonstrated capability. Examples of such software are TP monitors, data base management systems, data dictionaries, and report generators.
- *Recognition that programming is more a science than an art.* An advanced application must be built in a professional environment and with professional programmers. It must be completely documented and built to be enhanced. Treat development maintenance personnel as professional engineers and require them to use structured programming techniques, top-down programming, and other methodologies to ensure that the company will produce more reliable applications.
- *Use of higher level languages.* The use of precompilers to augment COBOL, PL/1, and assembly languages can reduce the time to develop and maintain applications. Such languages can improve programmer productivity significantly and should be a requirement in the 1980s.
- *Use and investigation of programming tools.* The use of programming tools will not only reduce the cost of developing and maintaining applications in the 1980s but will improve their overall reliability and effectiveness as well. There are literally hundreds of programming tools available, and these tools should be examined since they represent a very small portion of the cost of application development.

A final word: in the 1980s the proper functioning, design, quality, and reliability of the commercial application will be the determining factor in many corporations' viability, growth, and profitability. So, management must give the development of advanced commercial applications one of the highest priorities within the corporation, for it may make the difference between success and failure of the organization. ❊



"Father, I've lost my faith in technology."

MARTIN A. GOETZ



Mr. Goetz is senior vice president and director of the Software Products Div. of Applied Data Research Inc., Princeton, N.J. He holds the first U.S. software patent and is a coauthor of *High Level COBOL Programming*, published in 1977. He began his career as a programmer with Sperry Rand in 1954 and, in 1959, was a cofounder of ADR. Mr. Goetz holds BBA and MBA degrees from City College of New York. He was recently appointed contributing editor of DATAMATION.

ADVERTISING OFFICES

Sales Manager
John M. Gleason
Greenwich, CT 06830
35 Mason St (203) 661-5400
Telex 996343

Eastern District Managers
A. Treat Walker,
Warren A. Tibbetts:
New York, NY 10019
420 Lexington Ave.
(212) 682-7760

New England District Manager
Warren A. Tibbetts:
Manchester, NH 03104
112 W Haven Rd.
(603) 625-9498

Midwest District Manager
William J. McGuire
Chicago, IL 60611
444 No Michigan Ave.
(312) 644-3970

Western District Managers
Alan Bolté, Jr.:
Los Angeles, CA 90035
1801 S. La Cienega Blvd.
(213) 559-5111

James E. Filiatrault:
Mountain View, CA 94043
2680 Bayshore Frontage Rd.
Suite 401
(415) 965-8222

U.K., Scandinavia, Benelux
Intergroup Communications, Inc.
Wallace K. Ponder, European Director
Paul D. Dimmock, Regional Manager
31 Lyncroft Avenue
Pinner, Middx, HA5 1JU
England
Tel: (01) 868 9289
Cables: PACOM, Pinner

Germany, Austria, Eastern Europe
Tullio Giacomazzi
130 Jermyn St.
London SW1 Y4UJ
Tel: (01) 839 3916

France, Italy, Spain
Gerard Lasfargues
32 rue Desbordes Valmore
750 16 Paris
France
Tel: (1) 288 90 22

Japan
Shigeru Kobayashi
Japan Advertising Communications, Inc.
New Grinza Building
3-13 Ginza 7-chrome
Chou-ku, Tokyo 104, Japan
Tel: (03) 571-8748

James B. Tafel, Chairman
John K. Abely, President
Robert L. Dickson, Exec. Vice President
Calverd F. Jacobson, Vice President-Finance
Walter Harrington, Vice President and Controller

TECHNICAL PUBLISHING COMPANY
A DUN & BRADSTREET COMPANY
Business Magazines
Consumer Books
Training Systems

OEM America Meets

at the Invitational Computer Conferences

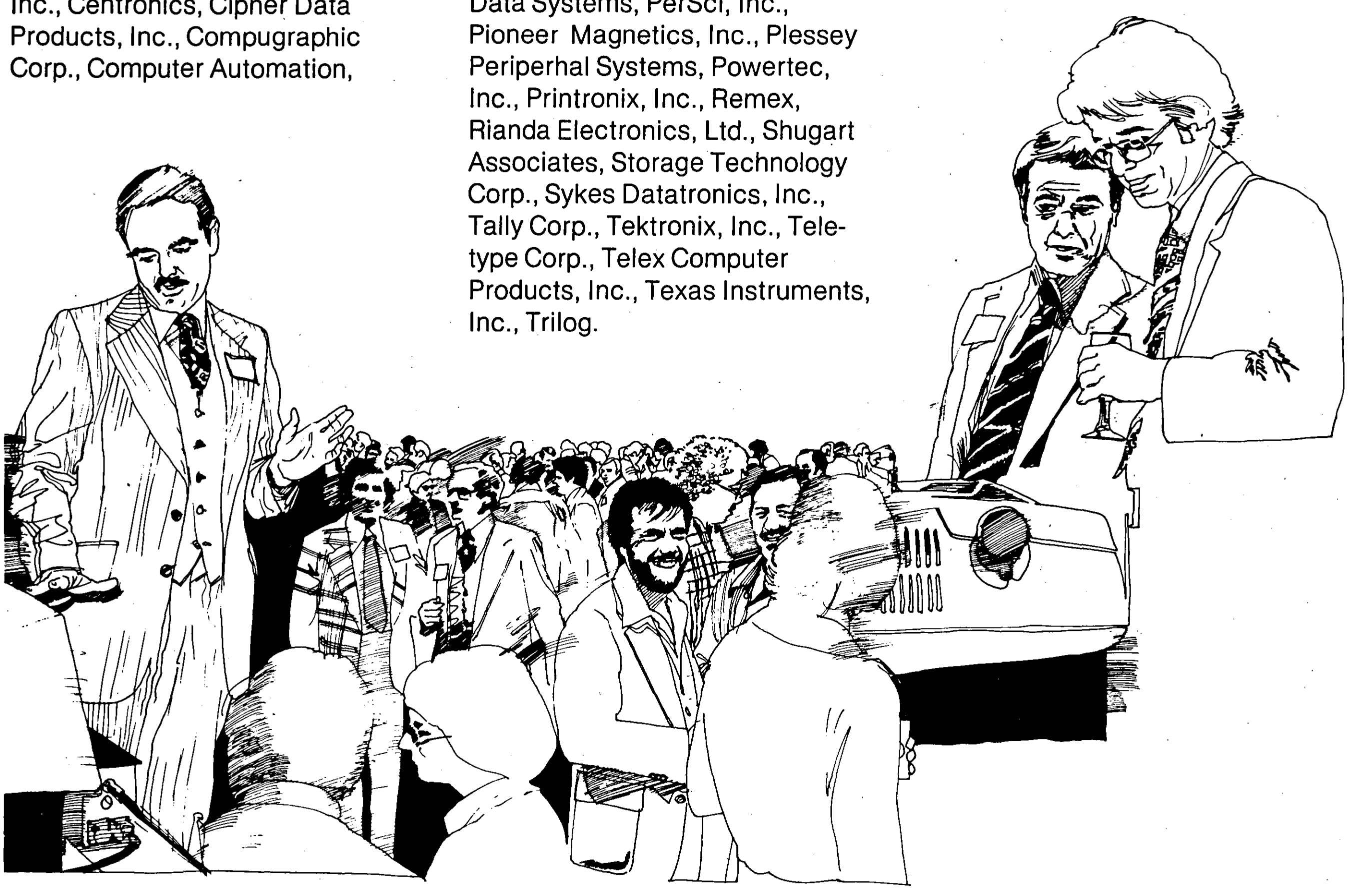
In Boston...in Ft. Lauderdale... in Palo Alto and seven other cities, OEM decision-makers meet the country's top computer and peripheral manufacturers at the Invitational Computer Conferences — the only seminar/displays designed specifically for the unique requirements of the quantity user.

In one day, at each 1979/80 ICC, guests will receive a concentrated, up-close view of the newest equipment and technology shaping our industry. Some of the companies which participated in the 1978/79 ICC Series were: CalComp, Cambridge Memories, Inc., Centronics, Cipher Data Products, Inc., Compugraphic Corp., Computer Automation, Inc., Computer Design, Computerworld, Control Data Corp., Data 100 Corp., Datamation, Datamedia Corp., Dataproducts Corp., Dataram Corp., Data Systems Design, Inc., Datum, Inc., Diablo Systems, Inc., Digital Design, Electronic Engineering Times, Honeywell Information Systems, Houston Instrument, ISS/Sperry Univac, Kennedy Company, Lear Siegler, Inc., MDB Systems, Inc., Microdata Corp., Mini-Micro Systems, Monolithic Systems Corp., National Semiconductor, NEC Information Systems, PCC/Pertec Division, Perkin-Elmer Data Systems, PerSci, Inc., Pioneer Magnetics, Inc., Plessey Periperhal Systems, Powertec, Inc., Printronix, Inc., Remex, Rianda Electronics, Ltd., Shugart Associates, Storage Technology Corp., Sykes Datatronics, Inc., Tally Corp., Tektronix, Inc., Teletype Corp., Telex Computer Products, Inc., Texas Instruments, Inc., Trilog.

The schedule for the 1979/80 Series is:

Sept. 6, 1979	Palo Alto, CA
Sept. 27, 1979	Minneapolis, MN
Oct. 10, 1979	Newton, MA
Nov. 1, 1979	Cherry Hill, NJ
Nov. 15, 1979	Southfield, MI
Jan. 15, 1980	Orange County, CA
Feb. 6, 1980	Ft. Lauderdale, FL
Mar. 25, 1980	Dallas, TX
Mar. 27, 1980	Houston, TX
April 28, 1980	Atlanta, GA

Invitational Computer Conferences



Invitations are available from participating companies or the ICC sponsor. For further information contact: B.J. Johnson & Associates, 2503 Eastbluff Drive, No. 203, Newport Beach, CA 92660. (714) 644-6037

ADVERTISER'S INDEX

CALENDAR

JANUARY

Sixth Semiannual ATE/Exhibit January 7-10, Pasadena.

A program of workshops, technical papers, and courses. Contact Karen Knope, ATE, 1050 Commonwealth Ave., Boston, MA 02215, (617) 232-5470.

Communication Networks '80, January 28-30, Washington, D.C.

The national business communication conference and exposition. Contact William Leitch, Conference Co., 60 Austin St., Newton, MA 02160, (617) 964-4550.

FEBRUARY

Data '80, February 12-14, Toronto.

Featuring panel sessions, audiovisual presentations, workshops, and technical sessions. Contact Laurie Whitsed, 2 Bloor St. West, Suite 2504, Toronto, Ontario M4W 3E2, (416) 967-6200.

MARCH

Fifth West Coast Computer Faire, March 14-16, San Francisco.

Will focus on inexpensive computing power for home, business, and industry. Contact Computer Faire, 333 Swett Rd., Woodside, CA 94062, (415) 851-7075.

The Middle East Business Equipment Show, March 16-20, Bahrain.

The first major international event of this kind held in the Persian Gulf. Will contain a comprehensive and modern range of products and services from the entire spectrum of the business equipment industry. Contact Stephen Powell, Arabian Exhibition Manager, 11 Manchester Square, London, W1M 5 AB, 01-486-1951.

APRIL

Federal DP Expo, April 28-30 Washington, D.C.

Update on trends, applications, and state of the art of all facets of dp. Contact Sheldon Adelson, Conference Director, 160 Speen St., Framingham, MA 01701, (617) 879-4502.

MAY

NCC, May 19-22, Anaheim.

Will cover the broad areas of management, applications, science and technology, and social implications. Contact AFIPS, 1815 North Lynn St., Arlington, VA 22209, (703) 243-4100.

NAECON '80, May 20-22, Dayton.

The National Aerospace and Electronics Conference is the oldest and best-known specialized national forum for the exchange of information on aerospace electronics. Contact Gordon Rabarus, Air Force Avionics, 140 E. Monument Ave., Dayton, OH 45402, (513) 255-2802.

Introducing the Tape Transport that thinks for itself.

Now, Datum innovation brings you the next generation in mini-computer magnetic tape transports, the D-451. A [illegible] single-board microprocessor.

Self-diagnostics, a reduced electronic component count and hybrid chip read amplifiers are examples of Datum's entirely new microprocessor design architecture.

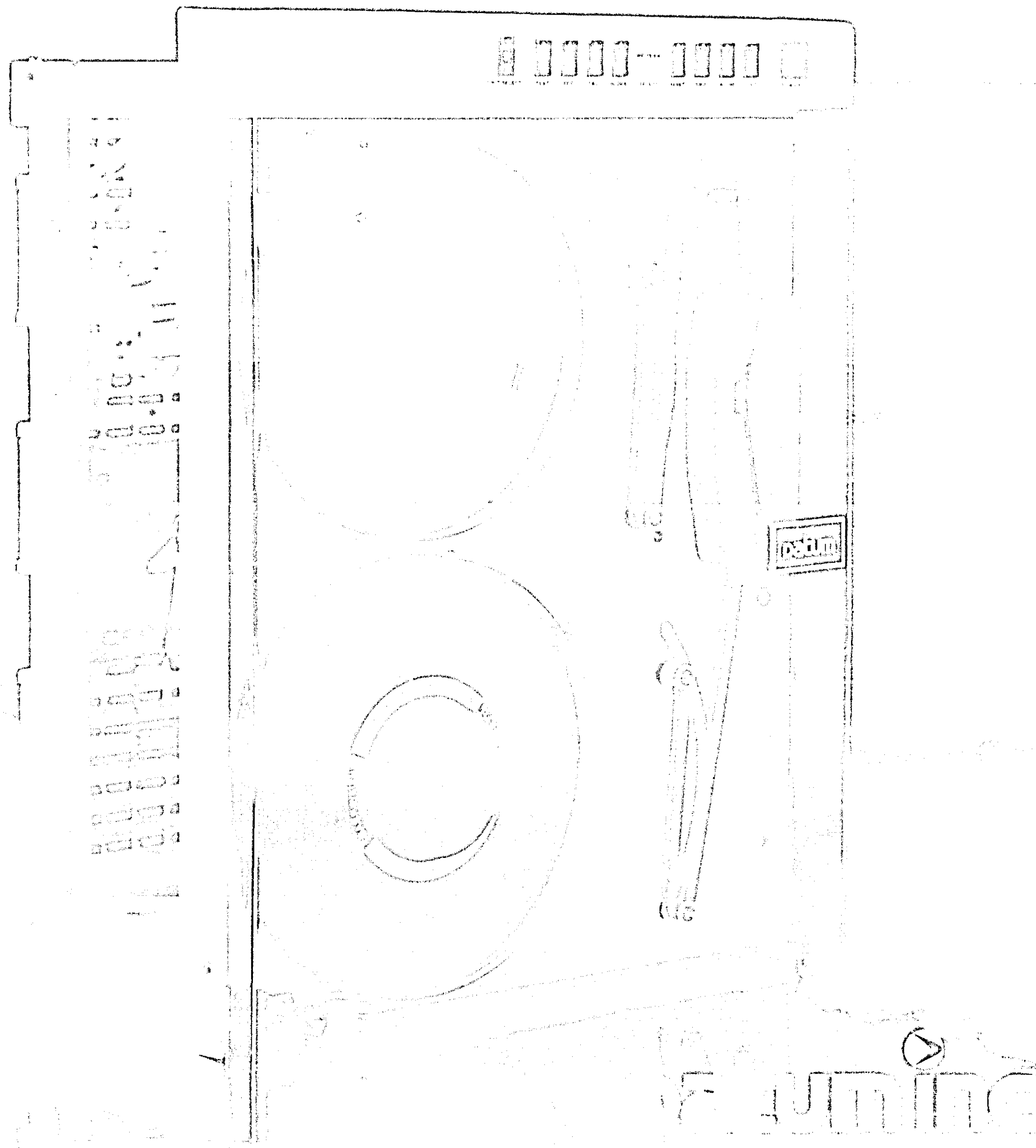
You won't need an external test box with the D-451. Fault isolation, and skew verify alignment are among internal microprocessor controlled self-test diagnostics.

An embedded Dual/Density formatter controls up to four tape transports.

Every aspect of the intelligent D-451's design and engineering makes its contribution in superior performance and reliability when reading and writing IBM/ANSI-compatible, ½" magnetic tape. [illegible] NRZI and PE formats [illegible] Encoded density is 1600 BPI, while densities of 800, 556 and 200 BPI are available for NRZI.

And Datum's painstaking research provides the D-451 with IBM tape path geometry, ceramic blade tape cleaners, photoelectric write ring detection, low-inertia capstan drive and digital write deskew control.

Find out more about the reel thing, the tape transport that thinks for itself. Call or write your local Datum representative or Datum Inc., 1363 South State College Boulevard, Anaheim, California 92806 (714) 533-6333.

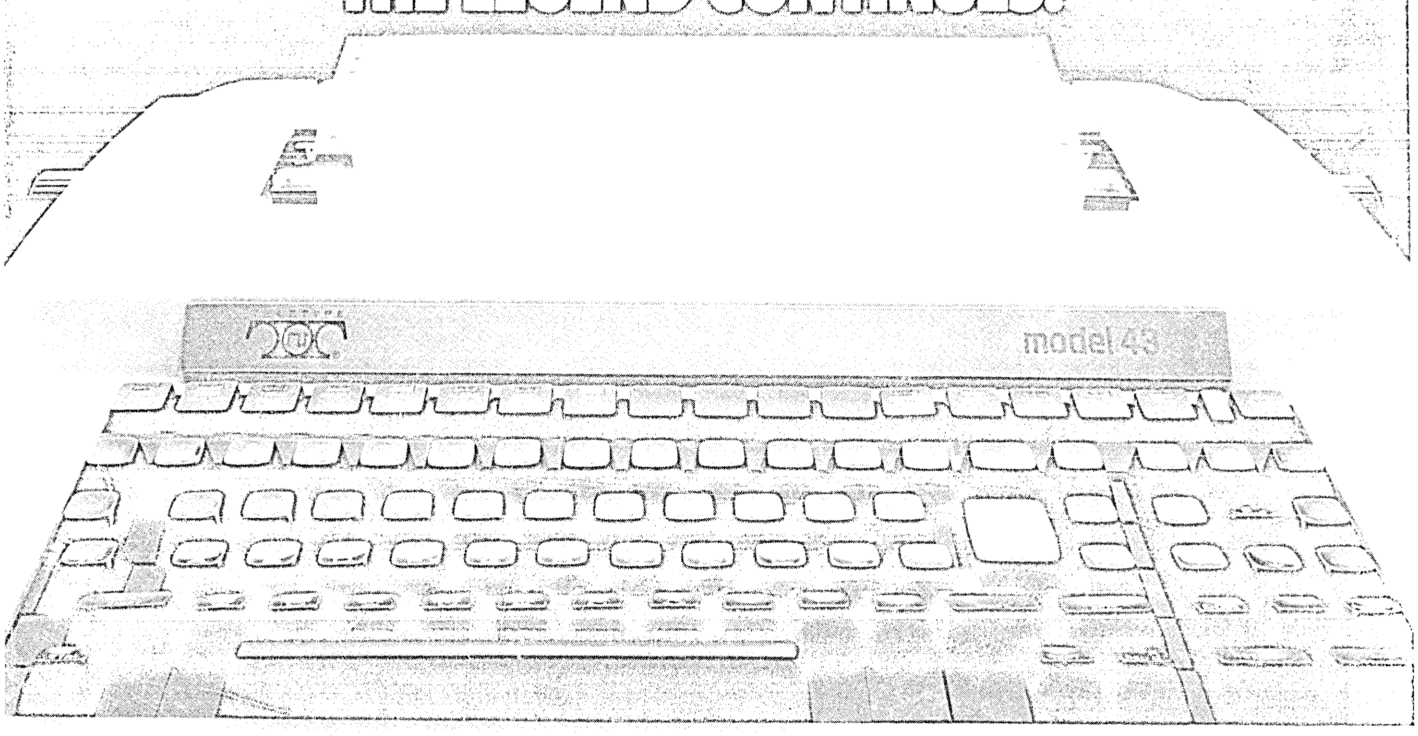


CORPORATE HEADQU[illegible] Blvd., Anaheim, C[illegible] Tel 714/5[illegible] EUROPEAN HEADQUARTERS: DAT[illegible] DATUM House, [illegible] Telex 935-398 • DATUM SALES OFFICES: CANADA, W[illegible] Denver, Colorado 80232, Tel 303/693-3414 EAST COAST: Mountain[illegible] MIDWEST: Des Plaines, Illino[illegible] SAN JOSE: San Jose, CA 95117 Tel 408/249-5370 NEW[illegible]

PRO103

CIRCLE 2 ON READER CARD

THE LEGEND CONTINUES.



By continuing to exceed all expectations for versatility, reliability and economy, the Teletype* model 43 teleprinter family has earned a reputation that is tough to live up to.

However, the new tabletop buffered 43 bears that burden with ease. This remarkable terminal reduces transmission costs by reducing transmission time.

Information can be keyboarded off-line and stored in the 16K buffer for subsequent high speed transmission. And editing capabilities correct errors off-line before they can enter the system.

At the same time, the buffered 43 is just as reliable as any member of the 43 family. Backed by a nationwide service organization to make installation and maintenance simple and quick.

It's so affordable for most any application. And it's quiet and compact. More reasons why model 43 teleprinters show up to work in practically every kind of office environment.

Call or write for more about the entire line of model 43 teleprinters. Learn about the legend that continues to get better as it gets bigger. **THE TELETYPE MODEL 43 FAMILY.**

Teletype Corporation, 5555 Touhy Avenue, Dept. 3141-A, Skokie IL 60077. Tel. (312) 982-2000.

*Teletype is a registered trademark and service mark of the Teletype Corporation.

CIRCLE [illegible] ON READER CARD