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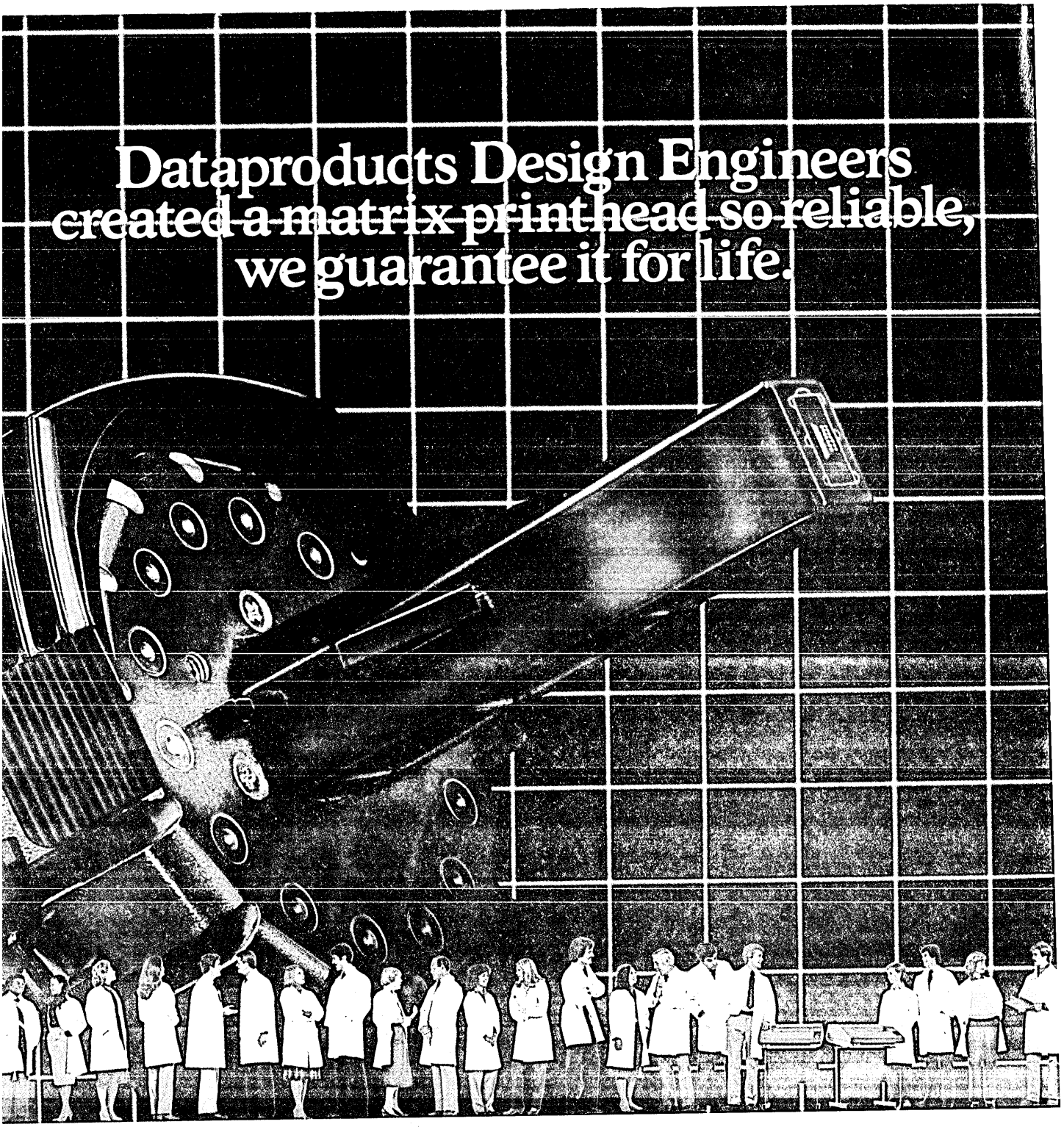

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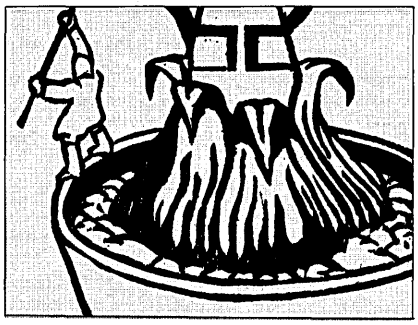

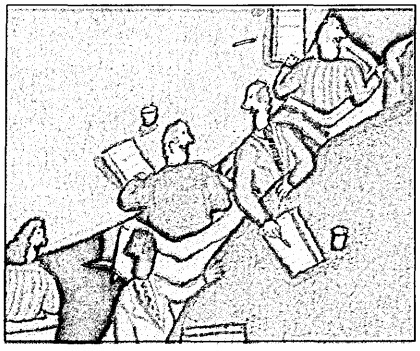

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Headquarters: 875 Third Ave., New York, NY 10022. Phone (212) 605-9400; telex 640-229. **New England:** 1 Chaucer St., RFD 2, Sandwich, MA 02563, (617) 888-6312. **Midwestern:** 3607 Garfield Ave. S., Minneapolis, MN 55409, (612) 827-4664. **Western:** 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. **International:** 6605 Burlington Pl., Springfield, VA 22152, (703) 569-3383; telex 440-413.

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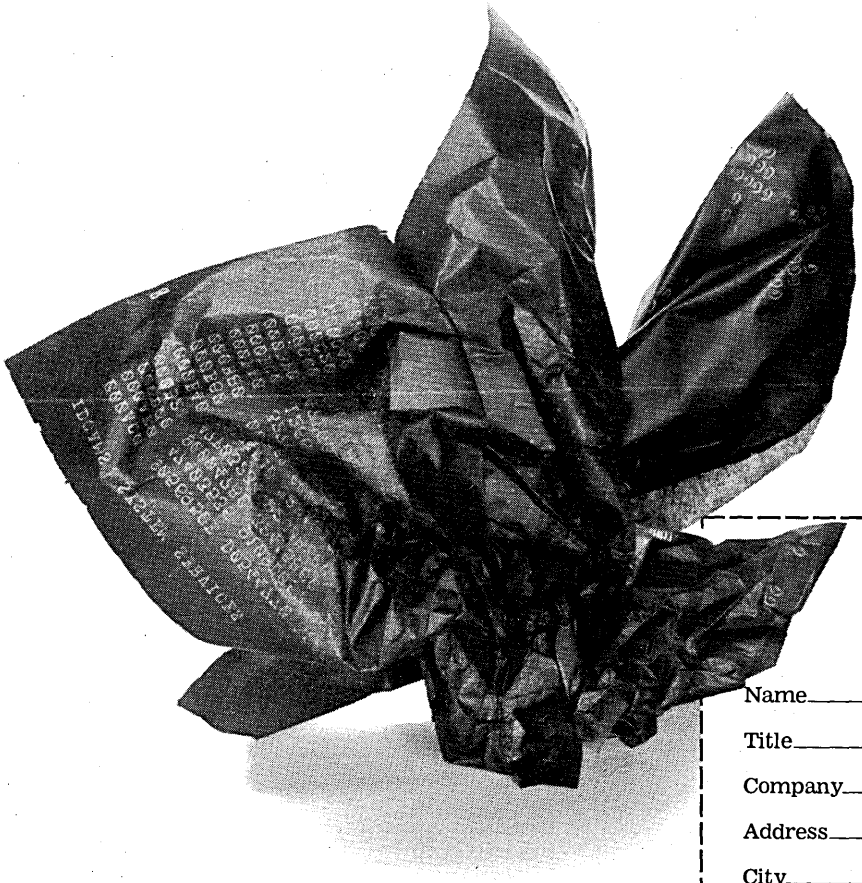

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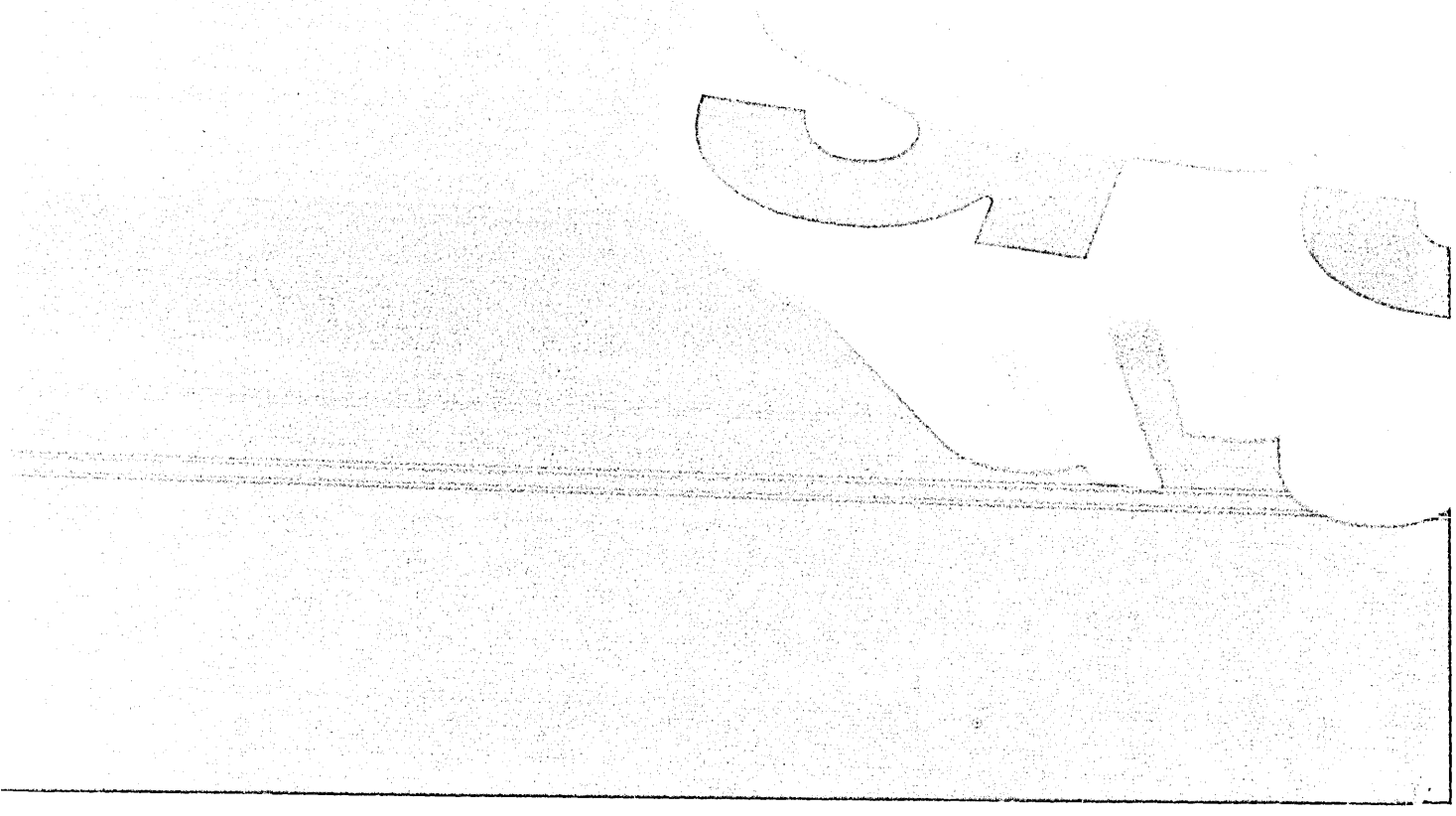

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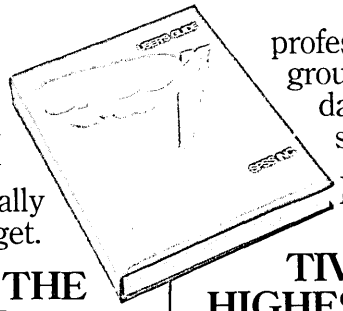

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LOOKING BACK

YOU'VE COME A LONG WAY . . .

January 1963: In an issue devoted to the "people problem," DATAMATION offered a "subjective" profile of the woman programmer. Here's how the distaff side stacked up: even though dp managers were generally believed to care more about education and experience than an applicant's sex, some companies remained hesitant to hire women programmers. Other shops, however, actually preferred females, because their initial investment in training paid a greater dividend in the end in low turnover rates. Women were less ambitious and more content to remain in the same position, especially if they were married or engaged.

The article pointed out that prejudice against women programmers was most likely to occur at promotion time. Employers generally felt that most men and many women resented women supervisors. In some cases, the appointment of a woman rather than a man to an assistant supervisor's job was preferable, since the woman was less of a threat to a male supervisor. However, many women turned down advancement to a supervisory position because they felt that prestige and a higher salary weren't adequate compensation for their increased responsibilities. DATAMATION noted that women preferred jobs with "less strain," would rather not "stand off" from their fellow workers, and considered fringe benefits of more importance than their male peers did.

The article conceded that women did have greater patience and were better at details than men, two alleged prerequisites for the successful programmer, but was undecided whether women had logical, analytical minds. It also dispelled the notion that women programmers were dull, drab, lipstickless creatures; to the contrary, they even enhanced the decor of an office, making working conditions more agreeable.

Incidentally, this article on women programmers was written by a woman, Valerie Rockmael, news editor at the time.

PL/1 PRESCIENCE

January 1973: Mulling the future of PL/1, Angie Pantages, New York bureau manager, assessed the language as ". . . slow, fat, hard to learn, not standardized, suported only by IBM, and known in all its glory by an elite few." Meanwhile, IBM was telling its European users that PL/1 was making great strides in the U.S., though an earlier DATAMATION survey didn't provide much backup for their boasts. Out of 458 IBM 360 and 370 installations, less than 5% listed PL/1 as a primary language, and most of these listed three or more languages.

Even so, Pantages believed respectability was imminent for PL/1 and that it would not be dead by 1977, as predicted by Fred Gruenberger, then at California State University, Northridge.

She gave several reasons for her grudging optimism: PL/1 was well down the road to standardization, all major modifications to the language had been made, and by year-end, the final drafts for three standards—the full language, a large subset, and process control subset—were to be submitted to ANSI and the European Computer Manufacturers Association.

Another good sign was the fact that IBM's competitors had begun to announce their own versions of the language; first Burroughs and then Honeywell had joined the club, and CDC was looking to sign up too. The final reason for hope was that IBM's PL/1 optimizer compiler had passed through its "first year problems" and reportedly made great progress in execution speed and efficiency over the PL/1 F (version 5) compiler.

—Lauren D'Attilo

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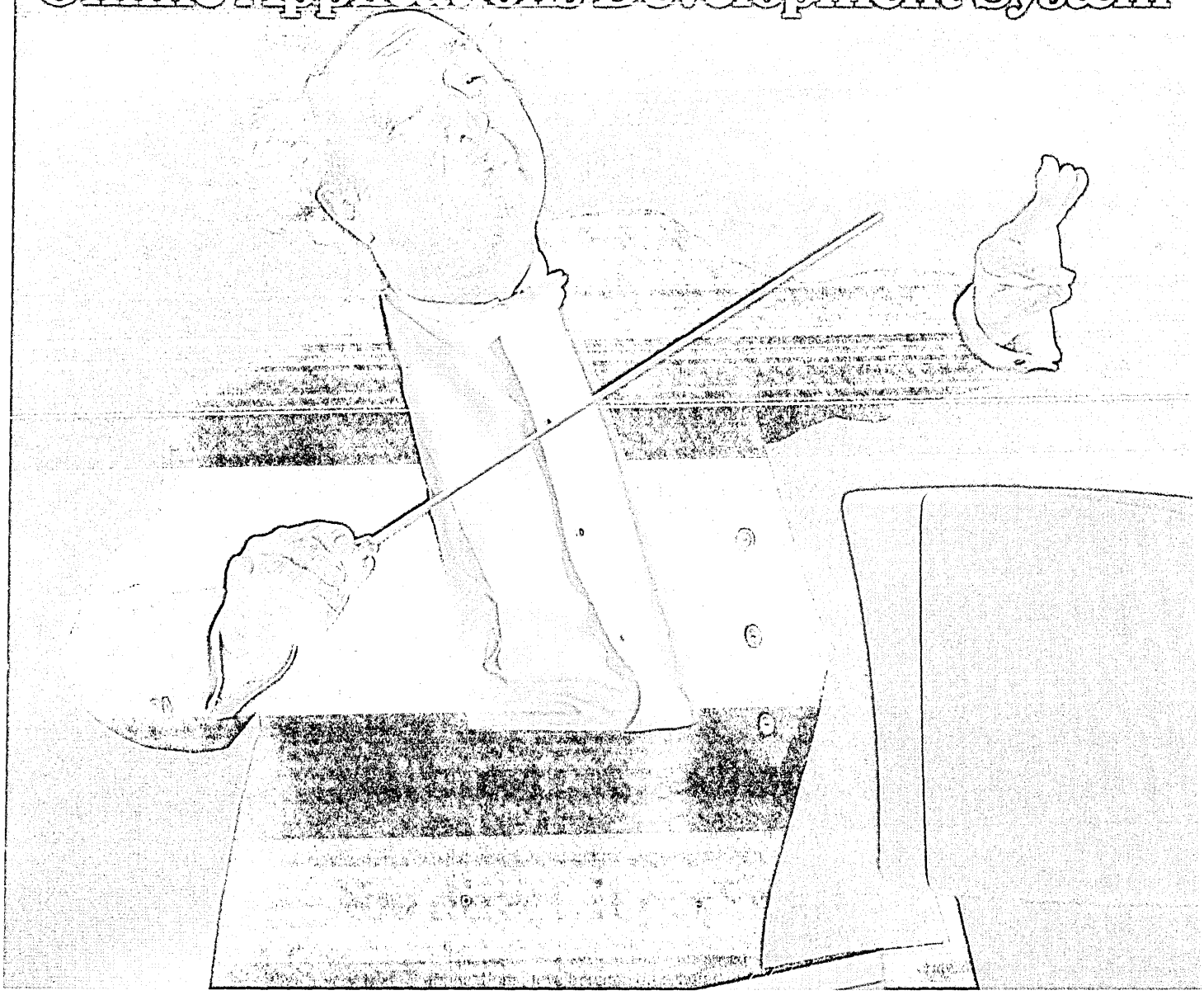

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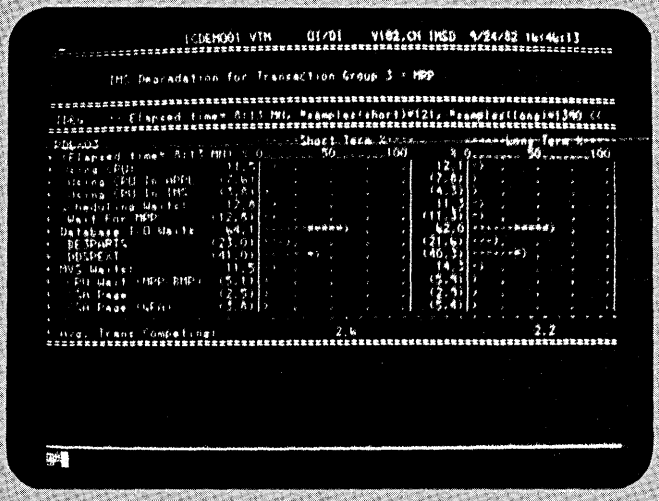

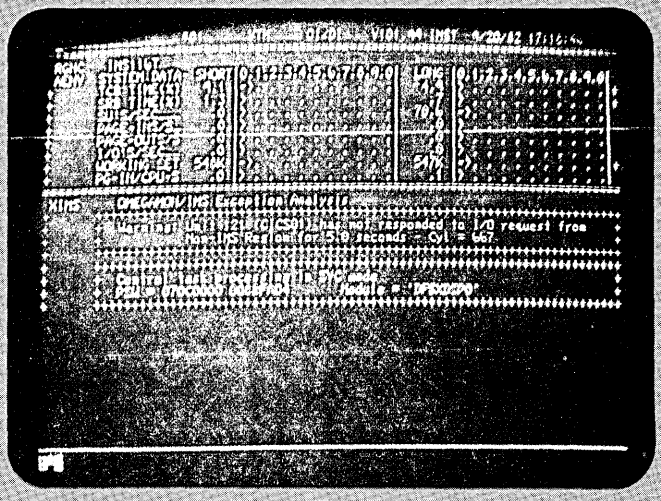

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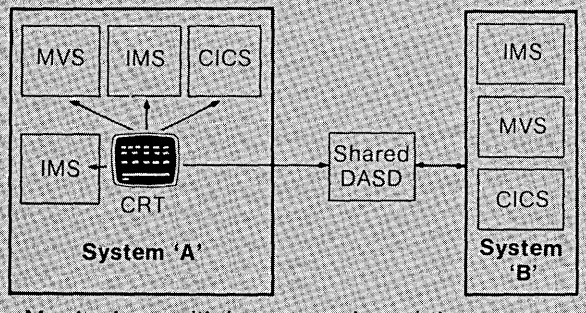

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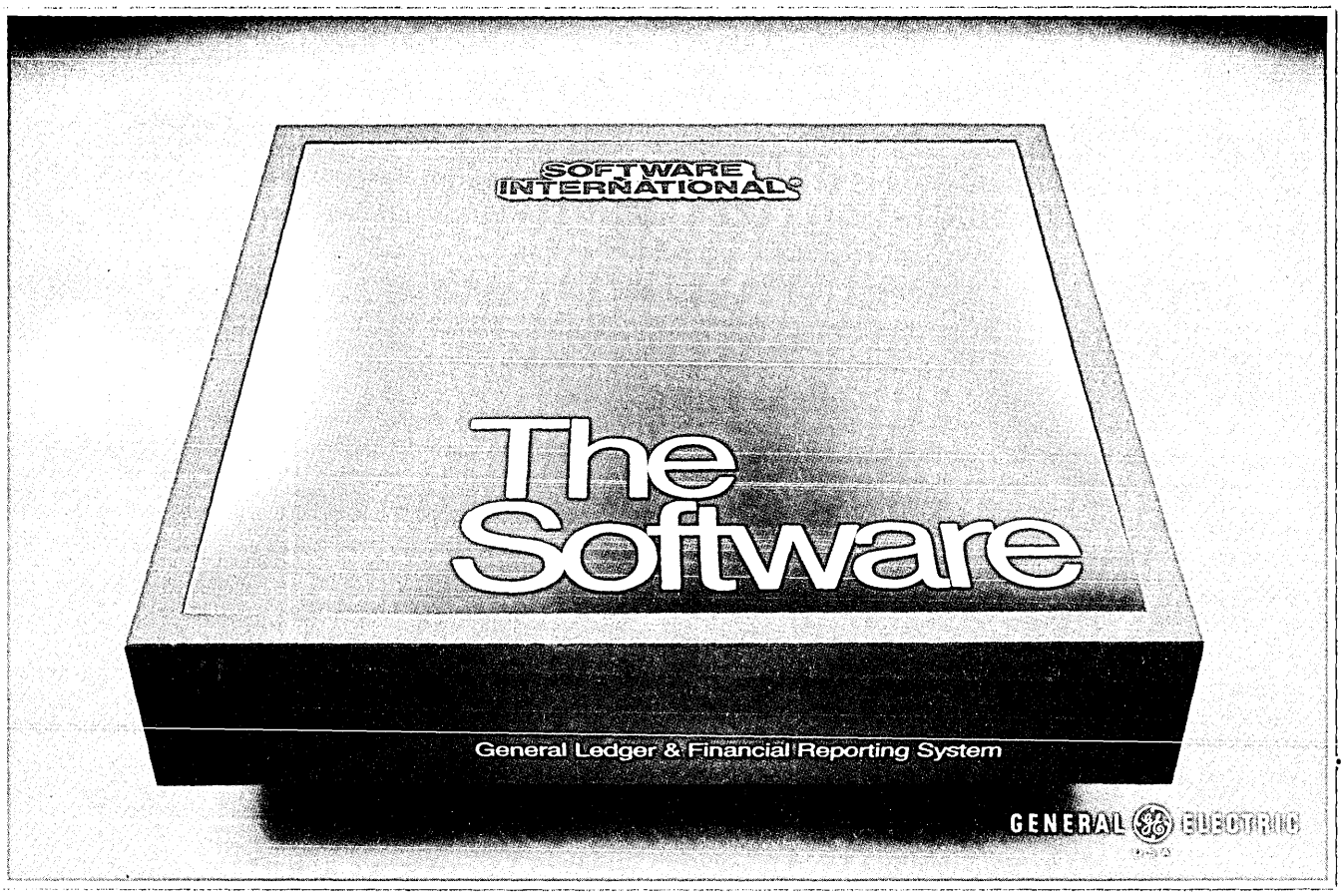

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CIRCLE 13 ON READER CARD

LOOK AHEAD

COMING FROM IBM

What may be the first two members of a new family of 4300 computers are expected to be unveiled by IBM next spring. The machines, known as the Group 3 machines, will offer 2.5 and 4 MIPS of power and probably, sources say, represent the first of the so-called Glendale or GL series. IBM's recent slashing of 4300 prices is thought to have been the prelude to a new wave of mid-range products scheduled to hit the market beginning this year. GL machines are slated to offer double the price/performance of the original E Series of 4300s while another new line, Olympia, will offer three times that price/performance. Olympia machines are expected to extend downwards, towards the personal computer market.

LAUTENBERG'S FIRST MOVE

Some industry eyes are closely watching Frank Lautenberg's entry into the U.S. Senate this month. The former chief of Automatic Data Processing fought his way into office with some millions of his own money and backing by an elite group of computing services executives including Bernard Goldstein, who like Lautenberg is a former head of the ADAPSO trade group. In a letter to Goldstein, now partner at merger specialists Broadview Associates in Fort Lee, N.J., Lautenberg has promised that one of his first proposals in the Senate will be to start "an inquiry into the economic impact computer systems are having on our society." Lautenberg, a Democrat, is expected to push for a temporary national information committee, similar to the TNEC economic panel set up during the Great Depression.

SOUL OF A NEWER MACHINE

Steve Wallach, better remembered as a member of the "Flying Upside Down" team in Tracy Kidder's book Soul of a New Machine, has flown south to take part in a Dallas startup, Parsec Computers. No less ambitious than the Data General Eagle project the book reported, Wallach and company's plan is to build a superfast 32-bit scientific processor. Using gate array and other off-the-shelf technologies, the Parsec machine is expected to outperform the VAX 11/780 by at least an order of magnitude. Shipments are slated to begin in late 1984.

FRETS OVER NETS

Shifting specifications for broadband local networking standards at the IEEE's 802 committee are giving Amdax Corp. of Bohemia, N.Y., enough of a hard time that it may withdraw one of its Cablenet products from the market. Says Amdax chief

LOOK AHEAD

	Ivan Socher, "We just can't keep up with all the changes the committee keeps making. It's become a moving target." The affected product is the switched Cablenet, which falls in the 802 committee's metropolitan area network category.
SOFTWARE ADD-ON	Look for Multiplications Inc., a Cambridge, Mass., software house once known as Multisystems Inc., to introduce next spring a menu-driven report writer designed to compete with natural-language report generators on IBM mainframes. The firm is quietly telling potential customers about Imagine, which was written with help from the company's other major package, Accolade. The latter is an on-line application development system for CICS environments. Multiplications, freshly backed with $2.75 million in venture capital, is also building up a nationwide sales force to better market its products.
SEARCH GOES ON	According to one Cray Research executive, Japanese computer makers have been scouting around the supercomputer market in the U.S., feeling out potential customers and hinting at machines to come. The two most visible vendors are Fujitsu and Hitachi, neither of which has apparently made a firm commitment to market supercomputers here. Cray and archcompetitor Control Data say they aren't worried about the Japanese yet, especially since only "paper tiger" machines have been discussed and "real" mixed scalar/vector benchmarks haven't been demonstrated.
VIDEOTEX HICCUP	After its splashy birth announcement, Keycom Electronic Publishing, a Chicago-based joint videotex venture involving Honeywell, telephone company Centel Corp., and publishers Field Enterprises, seems to have run into some snags. After choosing Honeywell DPS 6 computers and the PLP videotex standard, the company apparently ran into X.25 communications snags while trying to pump data through a public data network. Sources say the project's original third-quarter '83 startup date will probably be missed as a result.
RUMORS AND RAW RANDOM DATA	Watch for Data General to package new 32-bit Eclipse microprocessors in office workstations selling for less than $20,000....We hear that the used computer market dealers are paying kickbacks to dp managers who sell their firms' equipment for less than book value....Three-year-old Data Base Management Associates Inc., Troy, Mich., is close to raising $2 million in venture capital to bring new Hyperchannel-based software to market. ...We hear GM is buying some 1,000 IBM System/38s.

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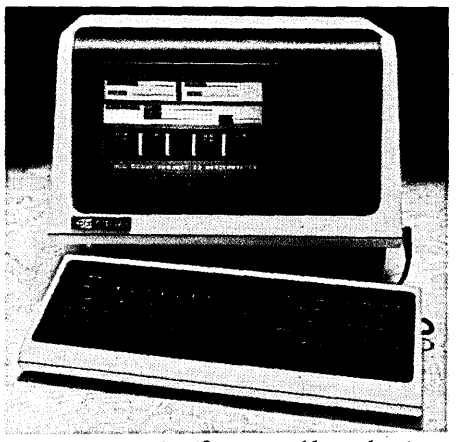

create more significant and long-lasting impressions. Not to mention the subliminal conditioned responses we all have to color. (Red, for example, can be used to flag a problem instantly.)

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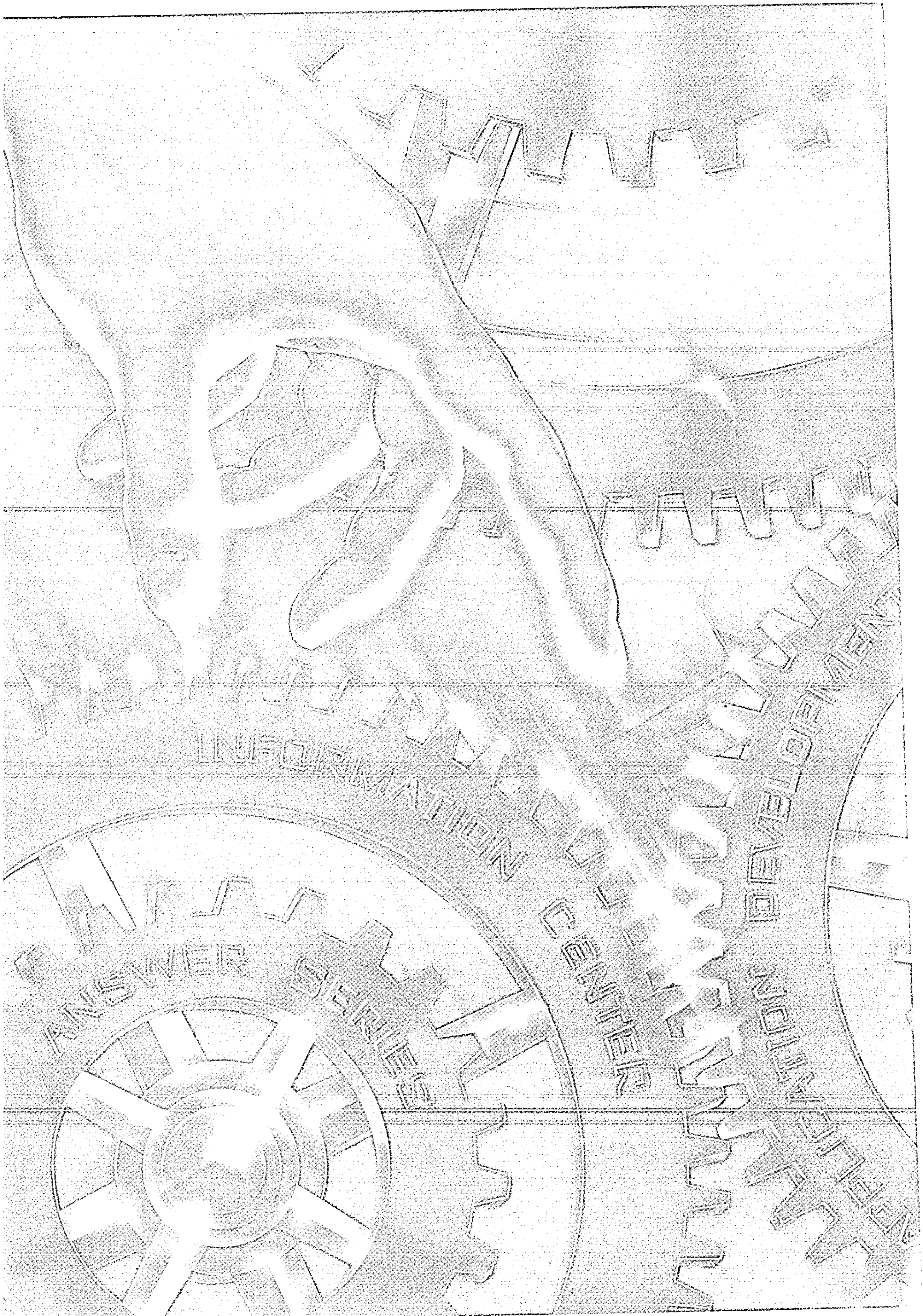
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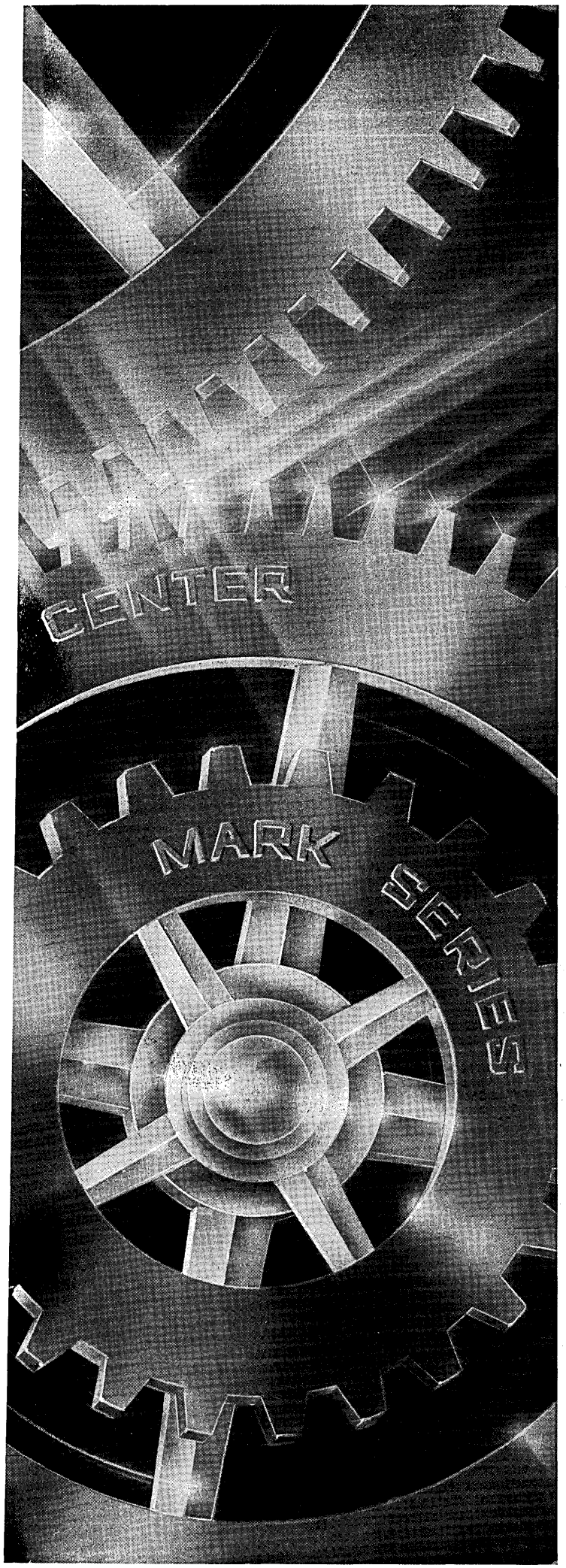

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CALENDAR

JANUARY

Ada Conference.
Jan. 11-13, Atlanta, Ga., contact: Morehouse Ada Tutorial, Box 131, Morehouse College, 830 Westview Dr., SW, Atlanta, GA 30314.

Pacific Telecommunications Council.
Jan. 16-19, Honolulu, Hawaii, contact: PTC, 1110 University Ave., Suite 303, Honolulu, HI 96826.

Southcon/83.
Jan. 18-20, Atlanta, Ga., contact: Southcon, 999 N. Sepulveda Blvd., El Segundo, CA 90245, (213) 772-2965.

Info*West '83.
Jan. 19-21, Pasadena, Calif., contact: Information Processing Group, 350 S. Lake Ave., Suite 113-150, Pasadena, CA 91101, (213) 791-8167.

FEBRUARY

Kuwait Info '83.
Feb. 1-5, Kuwait, contact: Clapp & Poliak International, P.O. Box 70007, Washington, DC 20088, (301) 657-3090.

Caribbean Expo '83.
Feb. 4-6, Paradise Island, Bahamas, contact: Ormand Vee Co., 1430 Miner Rd., Des Plaines, IL 60016, (312) 397-9572.

EDP-USA '83.
Feb. 7-10, Milan, Italy, contact: Carol Ross, Milan Trade Center, American Consulate General, Plazza Repubblica 32, 20124 Milano, Italy.

11th Annual Computer Science Conference and SIGCSE Symposium.
Feb. 15-18, Orlando, Fla., contact: ACM, 11 W. 42nd St., New York, NY 10036.

Office Automation Conference.
Feb. 21-23, Philadelphia, Pa., contact: AFIPS, 1815 N. Lynn St., Arlington, VA 22209, (703) 558-3624.

Bias-Microelectronica '83.
Feb. 22-26, Milan, Italy, contact: Segreteria della Mostra, Viale Premuda, 2-20129, Milano, Italy, telex: CONSEL 334022.

International Solid-State Circuits Conference.
Feb. 23-25, New York, N.Y., contact: Lewis Winner, 301 Almeria, Coral Gables, FL 33134, (305) 446-8193.

Securicom '83.
Feb. 23-25, Cannes, France, contact: Peter Hazelzet, SEDEP, 8, Rue De La Michodiere, 75002 Paris, France, tel. 073-94-66 or 742-41-00.

Computer Expo '83.
Feb. 25-27, Orlando, Fla., contact: Tom Blayney, P.O. Box 1185, Longwood, FL 32750, (305) 339-1731.

MARCH

COMPCON Spring '83.
March 1-3, San Francisco, Calif., contact: Harry Hayman, IEEE Computer Society, P.O. Box 639, Silver Springs, MD 20901, (301) 589-3386.

ACM SIGCOMM '83, Symposium on Communications Architectures and Protocols.
March 8-9, Austin, Texas, contact: Dr. David Wood, The Mitre Corp., 1820 Dolly Madison Blvd., McLean, VA 22102, (703) 827-6394.

8th West Coast Computer Faire.
March 18-20, San Francisco, Calif., contact: Computer Faire, 345 Swett Rd., Woodside, CA 94062, (415) 851-7077.

Interface '83.
March 21-24, Miami Beach, Fla., contact: The Interface Group, 160 Speen St., P.O. Box 927, Framingham, MA 01701, (617) 879-4502.

Office Automation Conference and Exposition.
March 22-23, Zurich-Regensdorf, Switzerland, contact: the Foreign Commercial Service, American Embassy, P.O. Box 1065, CH-3001, Bern, Switzerland, 031/437011.

Future Office.
March 29-April 1, Milan, Italy, contact: U.S.I.M.C., Via Gattamelata 5, Milan, Italy, 39-2-469-6451, telex: 330208.

APRIL

Intergraphics '83.
April 11-14, Tokyo, Japan, contact: Japan Management Association, Kyoritsu Bldg., 3-1-22 Shiba Park, Minato-Ku, Tokyo, 105, Japan, telex: Japan 242-3369 Nitino J.

Hannover Fair '83.
April 13-20, Hannover, West Germany, contact: Hannover Fair Information Center, P.O. Box 338, Whitehouse, NJ 08888, (800) 526-5978.

13th International Symposium on Industrial Robots/Robots 7.
April 18-22, Chicago, Ill., contact: Pat Van Doren, SME Technical Activities, One SME Dr., P.O. Box 930, Dearborn, MI 48128, (313) 271-1500.

National Material Handling Show.
April 25-28, Chicago, Ill., contact: Material Handling Institute, Inc., 1326 Freeport Rd., Pittsburgh, PA 15238, (412) 782-1624.

SCIENCE/SCOPE

A compact liquid-crystal light valve is designed to serve as a real-time light modulator for many optical data-processing and projection uses. The Hughes Aircraft Company light valve uses liquid-crystal and thin-film technology to combine high input-light sensitivity and high image resolution with low voltage and power requirements. Uses include: graphics projection systems for large-screen displays, high-resolution vision for industrial robots, radar and sonar signal-processing, identification of moving objects, high-resolution spectral analysis of wide-band signals, and hybrid optical-digital processing systems.

The electronic rocket engine is ready to be tested aboard a satellite to see how well it functions in the company of other space hardware. Hughes has delivered two engines, called mercury ion thrusters, for installation on a U.S. Air Force research satellite. The goal of the flight test is to qualify the system in space for performing such auxiliary propulsion functions as stationkeeping, attitude control, and orbit maneuvering of spacecraft. The system is designed to replace traditional chemical and gas propulsion systems, saving hundreds of pounds of weight. In operation, the thrusters are powered by the satellite's solar cells, which convert sunlight into electricity.

High efficiency solar cells now being developed could cut substantially the weight and area of some satellite solar panels. These cells, made with gallium arsenide by a special liquid-phase epitaxial growth process developed by Hughes scientists, have shown efficiencies higher than 19% in converting sunlight into electricity. This compares with efficiencies between 15% and 16% for the best available silicon solar cells. In addition, the gallium arsenide cells can operate at higher temperatures and can tolerate more high-energy proton irradiation in space than silicon solar cells.

A series of pulsed injection-locked IMPATT amplifiers, in single-stage or dual-stage configurations with two output power versions for each, has been added to the Hughes line of solid-state millimeter-wave transmitter products. The new amplifiers, designated the 4718xH series, are available in the 34-36 GHz frequency range (Ka-band) in 5-watt and 10-watt versions, and in the 92-96 GHz frequency range (W-band) in 3-watt and 5-watt versions.

Career growth opportunities exist at all levels at Hughes Support Systems for a variety of engineers qualified by degree or extensive work experience. They include systems engineers, applications engineers, software and hardware design engineers for major simulation and test equipment programs, and automatic test equipment engineers. Also, field engineering posts throughout the U.S. and the world offer travel, autonomy, and responsibility. Call collect (213) 513-5238. Or send your resume to Professional Employment, Dept. SE, Hughes Aircraft Company, P.O. Box 9399, Long Beach, CA 90810-0463. Equal opportunity employer.

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LETTERS

OUT OF SIGHT

I am in total agreement with the major topic of Mr. Kimmerly's article in the November issue ("Restricted Vision"): that systems analysts should employ more creativity and imagistic thinking in their work. I must disagree, however, with his dismissal of structured methods. The creative effort, which is absolutely necessary to provide a user with a workable system, must be kept under control, and structured methods provide a mechanism for managing the creative effort. If creative energy is unleashed at all levels in the system development process, the result is a mishmash of (doubtless) good ideas, which serves no purpose except to showcase each of those ideas separately. If, on the other hand, discipline intervenes through the means of structured methods or through other means, all of those good ideas can still exist but they can also be pulled together to form a functioning unit.

Structured methods in no way are meant to limit the input of creative professionals; they are meant to provide coherency to the result. Without such discipline, systems analysts and programmers never reach their goals; often, they are never ultimately sure what the goal is. And without structured methods, a manager of a software or system development project is left helpless; he is often powerless to determine progress and cost.

The foregoing is especially true in a very large development project where no single person is able to grasp all technical details of all modules or units. In smaller systems, with small teams of professionals at work and where good communication exists, it is possible to produce a working system that meets the user's requirements and is made aesthetically and socially sound by simple coordination among people. When the number of workers grows larger, however, the interpersonal web becomes overburdening, so that if no structure is superimposed, each person spends all his time communicating with the other group members. Even in cases where a small group is working on a large project, it becomes necessary to break each task into smaller tasks, tackle one or more of these at a time (whether by an individual or a group), then recombine the results at the end of the development effort.

While it is possible to lose track of the goal by becoming tied up in the structured process, it is the persons involved in the project who are at fault, not the structured methods chosen. These methodologies are not meant to replace insight, creativity, imagistic thinking, or global viewing. They are only meant to provide a means of implementing this collection of good ideas.

PAT S. BLANKENSHIP
Annapolis, Maryland

SEXUAL INNUENDOS?

I was very offended by Oxford Software Corp.'s advertisement for its UFO software in the October DATAMATION. CICS positions are scarce and in great demand, yet Oxford Software indicates that women put their sex lives above their hard-won jobs. Worse, Oxford asserts that women are willing to trade sexual favors for advancement on the job. The company apparently thinks that's a fair trade. I don't think anyone should be coerced into making that choice, and neither does the U.S. government; that's why laws against sexual harassment are finally being enacted and enforced.

I don't read dp literature for sexual innuendos and sexist stereotyping. I'll remember though that Oxford Software tried to exploit anachronistic and unproductive attitudes to sell its software. And I hope that DATAMATION will screen its ads more carefully in this regard.

K. RAUCH
Brooklyn, New York

I am writing to express my strongly negative feelings towards the advertisement run by Oxford Software Corp. in your October issue. I found the ad insulting to women in the data processing industry (i.e., the sexual innuendo in the last panel of the cartoon, as well as the general image of the "helpless woman"), as well as to my own intelligence. I would certainly not purchase an Oxford Software product on the basis of this advertisement.

DATAMATION, as one of the industry's best-known publications, should be more conscious of the image projected by the advertising it accepts. I would hope that your advertising department points out potentially offensive copy to prospective advertisers!

Ultimately, however, the vendor must be held responsible for the image it projects through the type of advertising it chooses. I hope that all vendors will advertise in an informative, intelligent, and nonsexist fashion, and that potential customers will show their approval or disapproval with their patronage.

MICHAEL E. DUFFY
Allston, Massachusetts

MORE NOISE ON "NOISE"

Willie Schatz's article, "Making Noise on the Hill" (November), was right on target. But how to deal with the Washington establishment has been one conundrum the computer industry has not been able to solve. In fact, most computer publications, including DATAMATION, give short shrift to the importance of what goes on and appears to go on in Washington.

A second thought: while various segments of the computer industry are represented in the nation's capital in some fashion, who is to represent the home user of computer products? If the industry itself is not wise enough to make some sort of move in this direction, I suspect that within a few years we may hear a clamor for an FDA- or EPA-like bureaucracy to protect the

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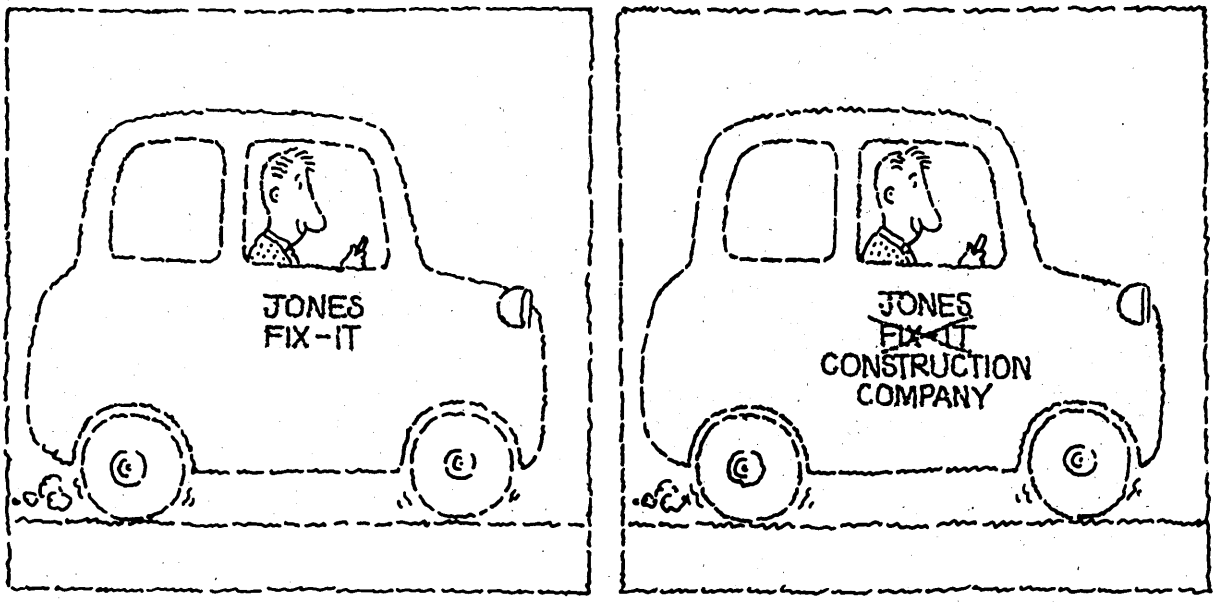

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The IDX-3000 is a third-generation digital data switch with distributed architecture. You can start with a small system—a Network Exchange and enough multiplexers to support a few hundred lines. To grow, just add additional Network Exchange circuit boards and multiplexers. At full capacity, the IDX-3000 provides non-blocking, full-duplex asynchronous communication for up to 3072 lines, all at data rates of up to 19.2 kilobaud. Only two twisted pairs of wires are needed to connect each group of 24 users through distributed multiplexers to the Network Exchange, which can be located up to 1.2 miles away.

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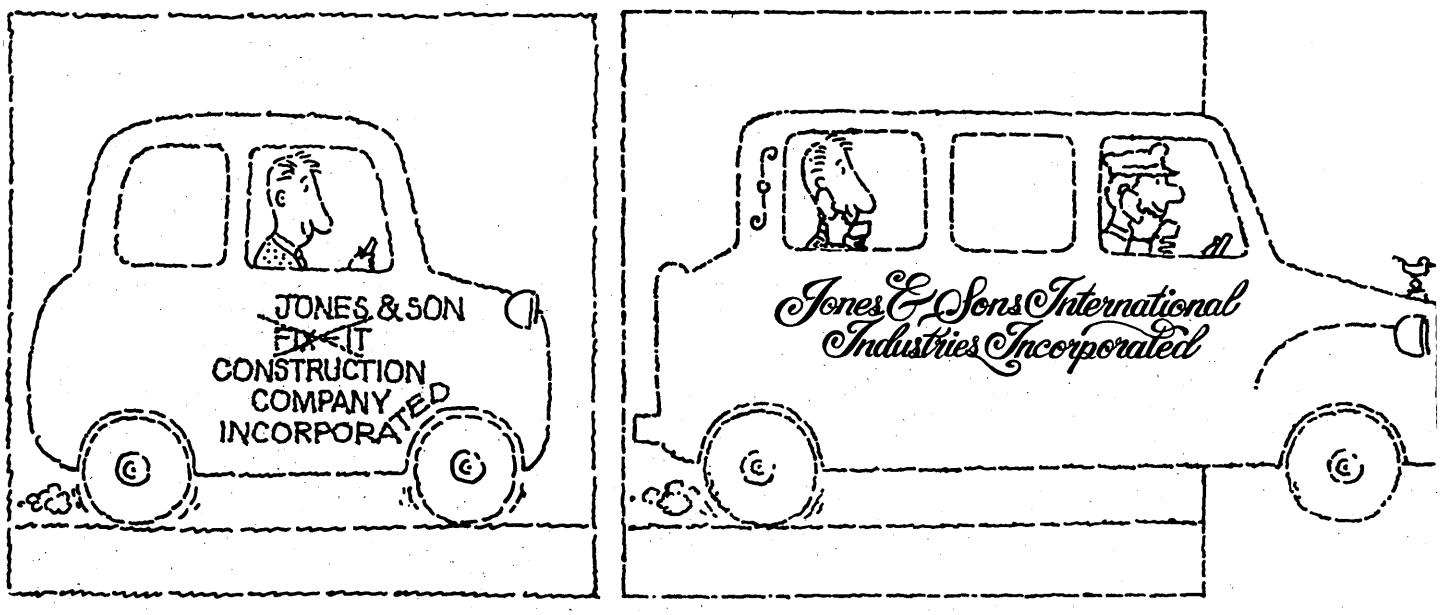
When your facilities become more distributed, the IDX-3000 internal DS-1 data format will interface directly with the Bell North American communications system or with microwave radios so you can extend



your network as far as you want. If you need more than 3072 lines, we are planning a tandem networking capability to give you the number of lines you need. A synchronous capability at data rates of up to 56 KBPS per line is also planned.

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Simple installation, distributed architecture, and practical, fault-tolerant design keep costs down. Optional redundancy features protect you from costly down time. The IDX-3000 isn't one of those products of the future. It's here now—proven, in use, and backed by M/A-COM, one of the nation's largest and most experienced communication equipment companies.

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computer consumer. Either that or existing agencies will get more into the act themselves.

ALAN DRATTELL
Wheaton, Maryland

DAMNATION, DATAMATION!

I've let my subscription run out after three years, but I still want to blow off steam. You've become a manager's magazine. As one who still cuts and curses code, I consider myself rank and file. Management theory sticks in my craw. I've never seen Pert used on a successful project, and I never expect to. Managers I've admired spend their time and energy on the front line and make up the theory as they go along.

Furthermore, your articles are boring. If you have to turn to professionals to get a little sparkle into the text, then bums away! Everybody who writes your articles should be required to memorize all the definitions of "pompous" before publishing.

Next, you're petrified. You deigned to recognize the micro avalanche at least six months after it was the hottest thing on Wall Street. You've grown up with a protected mainframe market, and you're growing out with it.

The final straw was when I landed that dream project that needed in-depth research into comparative system performance. I thought gloatingly of all those stacks of DATAMATIONs I had saved up in the basement. They must have tons of information (though I could never wade through the prose). Wrong. Boar mammaries.

Please let me know if your relevance or readability picks up (since your competition is worse).

TOM FARRIS
Seattle, Washington

OF WORDS ABSURD

A group of us read your article "Battle of the Buildings" (July Special Report) and, after many calls to libraries and university English and architecture departments, we give up. What's "obicular"? Orbicular misspelled? In either case, what's the meaning? And what's the (definitely obscure) joke? I await your enlightenment.

JOAN SAVORY
Berkeley, California

AT&T described the controversial concave peak of its new headquarters building as "obicular" in an official press release. We thought it amusing that a communications company would invent such a word (we couldn't find it either), so we put it in quotes, hoping readers would know we *knew better.*

As for the joke mentioned in the article, we suggest you read Tom Wolfe's 1981 book From Bauhaus to Our House.—Ed.

I enjoyed your Editor's Readout in the November issue. But it's "ichthyologist," not "icthyologist."

WALTER PENNEY
Greenbelt, Maryland

It's one we should have caught, but it got away.—Ed.

A WORD'S WORTH 1,000 PICTURES

The article "Visual Programming" (October) by Alan McDonald was difficult to understand because it had no visuals.

FRED L. FORMAN
Arlington, Virginia

Perhaps that illustrates a point.—Ed.

WISH WE'D THOUGHT OF IT

In your 25th Anniversary Issue (September) I was sorry to see that you did not include any of the amusing articles you have printed over the years. I have been a subscriber to DATAMATION from its beginning and have read many funny stories and articles in your magazine. The funniest and probably the best close-to-the-truth, tongue-in-cheek article I have ever read appeared in your April 1968 issue ("The End of OS"). I made a

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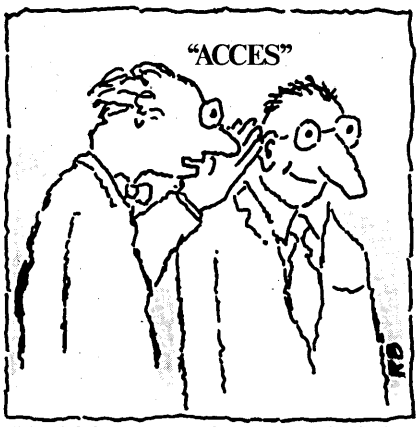
"We've got what makes the difference in Local Area Networking..."



The ACC Exchange System (ACCES) is a product umbrella that incorporates a comprehensive approach for truly distributed networks.

ACC Knows Networking. For over a decade, ACC personnel have set the pace in network product development. Beginning with the ARPANET, ACC has designed and developed a broad range of high performance network access equipment for packet switched and local area networks.

It is this experience that makes the difference in our approach.

Everyone agrees that Local Area Networking is good. But no one seems to agree on much else. Coax versus twisted pair. Baseband versus broadband. Token ring versus random access. The list goes on and on. Our experience, however, has taught us that low level features are only a small part of a functioning network.

The ACCES Approach. Most Local Area Network products today are hardware solutions at the lowest networking levels. Before LANs can become truly useful, network users need to have higher level functions at their fingertips. The ACCES approach provides network services through the upper layers of the OSI model. By following the layered model, the ACCES product line does not rely on specific low level implementation (baseband, broadband, etc).

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- Xerox Network Systems (NS) communications protocol package
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batch of copies at the time because I felt the article would prove timeless. And it has! Any time a programmer tells me about a new operating system or about problems encountered with an old one, I hand him a copy of the article and watch the incredulous look on his face as he wonders if the article is true and, if so, why he's not familiar with its acronyms. As for me, I read it along with them and inevitably laugh each time.

MARVIN GOLDSTEIN
Astradyne Computer Industries Inc.
Garden City, New York

If you missed that article and would like to laugh along with Marv, drop us a line and we'll send you a copy of the piece.—Ed.

OMISSIONS AND COMMISSIONS

I was a little dismayed after reading Mark Quill's article, "A Spin Through Disk Country" (November, Oem Edition). He neglected to mention two very prominent entities in the 5¼-inch Winchester marketplace—Computer Memories Inc. and DMA Systems.

Computer Memories is the leading supplier of 5¼-inch drives with capacities of more than 12 megabytes, having a 65% share of that market. DMA is the leading manufacturer of removable and fixed/removable Winchesters. While we understand this was probably an inadvertent omission, Mr. Quill should have done a little more homework.

ANTHONY DALY
Jansen Associates Inc.
Irvine, California

We apologize for the oversight. And, in one fell swoop, we ask forgiveness for all the following sins as well:

- *In "Comdex New Product Roundup" (September, Oem Edition), we erred in describing the Teleram 3000 portable computer from Teleram Communications Corp. The features listed as standard should have been labeled optional; the starting system includes CP/M and communications, and the cost is $2,995.*
- *Contrary to a listing in "Startup Fever Is Spreading" (September), Charlton Associates Inc., Irvine, Calif., does not make disk drives. It manufactures disk media.*
- *Due to a printing error, the color coding of charts that accompany the "1982 Mini-Micro Survey" (November, In Focus) raises more questions than it answers. In Fig. 2 (p. 35), the percent of sites planning to implement local area networks should indicate 3% from the 1981 IBM Mainframe Survey, 5% from the 1982 IBM Mainframe Survey, and 8% from the 1982 Mini-Micro Survey.*

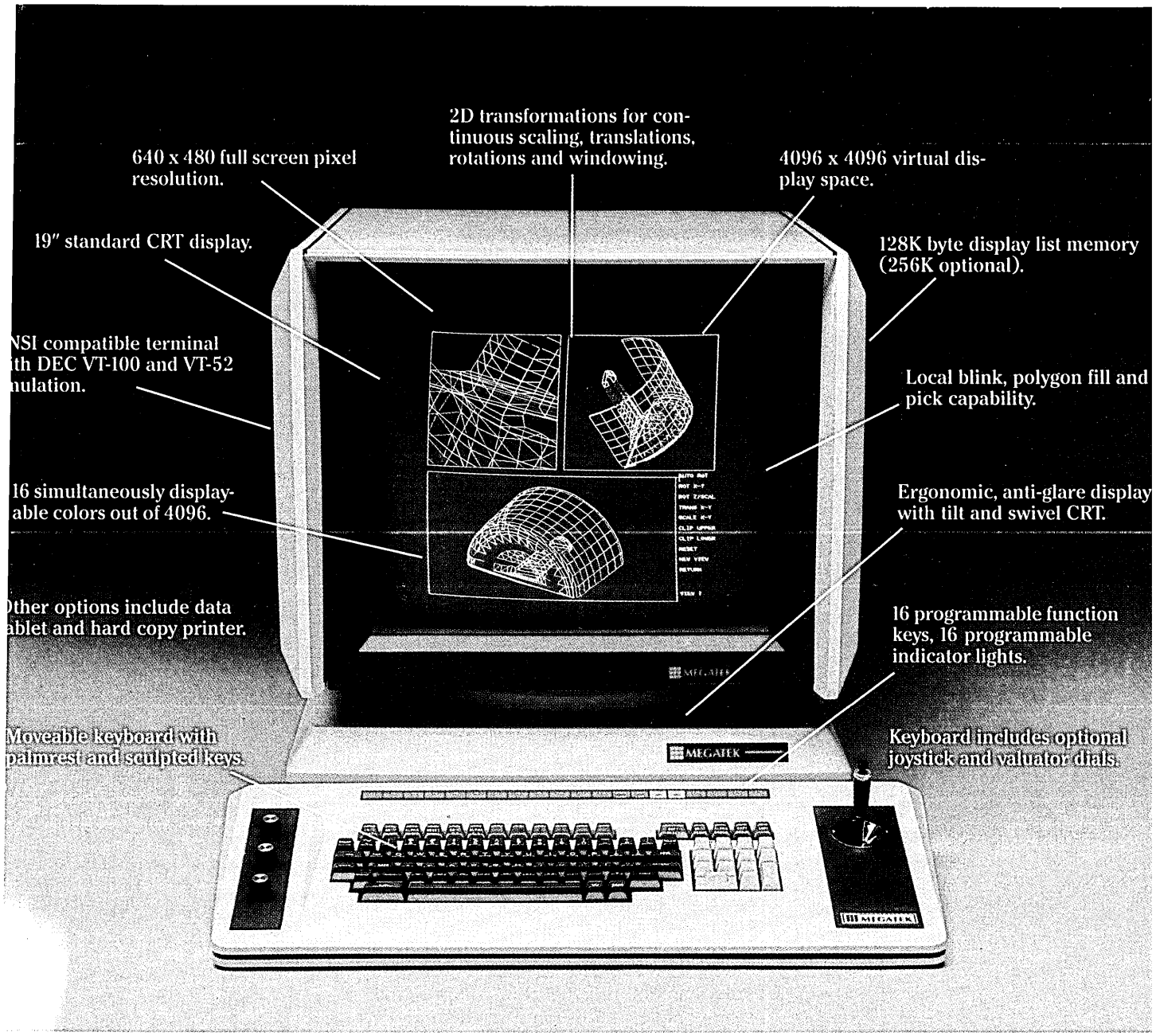
In Fig. 4 (p. 38), the answers to the question "Who primarily develops the applications software for your organization?" are as follows:

Source	Minis	Personal Computers
Central Dp Group	51.9%	19.4%
User Department	12.0	28.4
Individually In-House	14.5	24.2
Systems Vendor	8.3	14.1
Other Outside Source	13.3	13.9

In Fig. 5 (p. 38), the percent of mentions for vendors supplying microprocessor chips are as follows:

Vendor	1/81-6/82	7/82-12/83
Intel	44.6%	41.3%
Motorola	21.7	24.1
Zilog	18.0	18.2
RCA	2.9	3.3
National Semiconductor	1.4	2.2
Rockwell	1.4	1.9
Other	10.0	9.0

In Fig. 6 (p. 40), the unidentified white section labeled 12% should be colored royal blue, indicating Tandy. And in Fig. 7, the white sections again should have been colored royal blue, in this case indicating DEC.—A Penitent Ed.



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*Thaumaturgy (thô´ma tûr jē), n., the performance of miracles.

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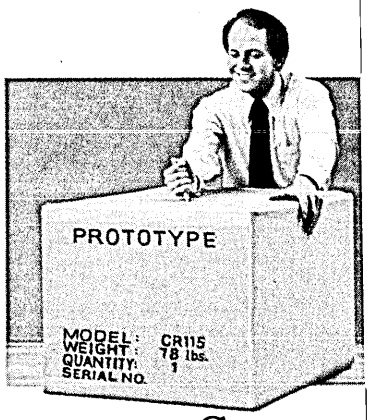

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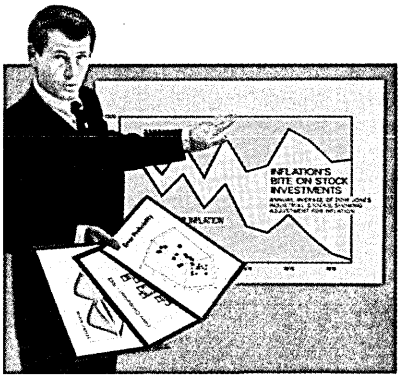

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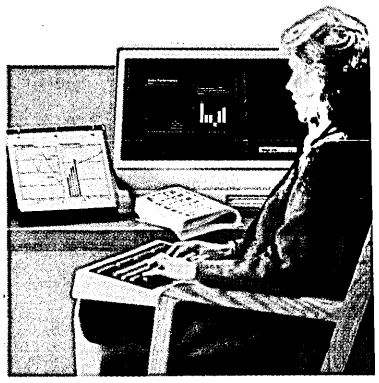

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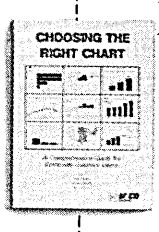

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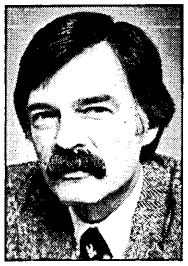
CIRCLE 27 ON READER CARD

John L. Kirkley, Editor

EDITOR'S READOUT



A YEAR OF JOYFUL CHANGE

When the 88-year-old photographer Jacques-Henri Lartigue was asked how he had developed his own distinctive artistic style, he replied, "It is simple. I have done only what amuses me and I like only those things that are new. You must welcome all changes with joy."

Like Lartigue, the computer industry certainly has its own style, it can be quite amusing, and its byword is change. But we must admit that we welcome some industry changes with significantly more joy than others. DATAMATION's advisors, those 12 redoubtable repositories of wit and wisdom, feel the same way. We asked them what changes they would welcome in 1983, and here is their wish list for the new year.

Standards, especially data communications standards, are high on the list. The advisors would like to see specific, well-documented data communications standards that allow most existing equipment to be used without the need for special black boxes, complex conversions, or other legerdemain. The ISO seven-layer model was mentioned more than once. One advisor hoped that, should we fail to reach ISO's "seventh heaven," at least Xerox would complete the publication of its interchange standards documentation this year. Xerox leads the industry in this kind of work, having documented five levels based on the ISO model.

Other wishes involving standards were a trifle more modest but perhaps just as difficult to obtain. For example, a request for a standard recording format for floppies, and a universal terminal that uses regular telephone facilities, operates at a minimum of 9600 baud, and eliminates the need for 3270s.

Hope springs eternal, even when it comes to software. That same advisor wants a replacement for MVS that causes no conversion problems and can be run by someone who costs less than $45,000 a year. Another editorial board member wistfully asked for a hook by which he could drag all the obsolete software into the modern world, complete with data independence, data integrity, and real maintainability. The inefficiency of much of this existing software also hampers efforts to boost programmer productivity, and makes a wish that we live to see James Martin's 1,000% increase in programmer productivity a tough one to realize.

We would like to see a single operating system for personal computers and hope to heaven that we avoid the mistakes we made in allowing OS to become the dinosaur of the mainframe world. One advisor commented that a lack of user education and user friendliness on the part of micro hardware and software is holding back what could be a torrent of micros for the masses. "We need to bring computers to the common man," he said, and he hopes to see touch screens and voice prompting become standard features on the little machines this year.

On the more fanciful side, we received a request for machines that have telepathic input—they do what you intend to do rather than what you actually instruct them to do. Also in the realm of blue sky were hopes for teleconferencing facilities that are actually good enough to replace airplane travel, and for a display that looks as good as the printed page.

Hopefully, growled one member of the board, the American educational system will stop training so many lawyers to muddle our lives and train more information people.

On a more technical note, one wish was for a series of low-cost, well-attended conferences sponsored by the IEEE, ACM, and DPMA that would permit hardware and especially software designers to meet face to face with users from various industry segments.

Several advisors expressed their hope that IBM and AT&T do not trample everyone else in their rush to do battle with each other and Japan. And while we're thinking about the industry, it would be nice if everyone in Silicon Valley stayed in the same job for one year.

Our advisors join us in wishing you, our readers, a healthy and prosperous new year and in hoping that you welcome all changes with joy. We might take note of an additional thought offered by Monsieur Lartigue: "There is one other thing that is very important," he said. "You must breathe correctly and let God take you by the hand." ✻

ILLUSTRATION BY PERICO PASTOR

Whether you realized it or not, this is the PC local network you've been holding out for.

Let's face it. If you manage the information systems in your company, you're one of the few to ask the really tough questions about shiny new PC enhancements and capabilities.

So when your personal computer users started clamoring for a local network, we know just what you said.

"What about data integrity? Why do we have to commit to so much at once? Is it easy to expand the network?"

You probably even asked about multi-vendor compatibility and, as far as your PC users are concerned, a lot of other silly questions.

The sensible solution has arrived.

Considering the slow, proprietary networks put out for PCs, it's no wonder you held out for a more sensible solution.

And now it's here. EtherSeries: a family of integrated hardware and software local networking products specifically designed for personal computers. It's available right now for the IBM PC, with Apple and other popular personal computers not far behind.

The key to EtherSeries as an integrated solution for your networking concerns lies at its very core. Ethernet.

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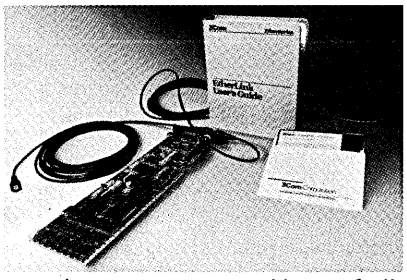

people, equipment, and best of all, your money.

The hot capabilities they need, the control you need.

EtherSeries makes your users instantly more productive by allowing the electronic exchange of files at an amazing 10 Mbps transfer rate. All without ever leaving their workstations, using just standard IBM DOS commands.

Or, they can direct the output from one PC to another PC's printer just as quickly, just as easily, so you won't be faced with buying a printer for each.

What's more, your users can start a local network with just two personal computers. Install it themselves using only a screwdriver to keep your costs down. Then add more PCs one at a time—up to hundreds—all on the same Ethernet.

You get password control, data integrity and easy expandability. All for just $950 a PC. So you never have to pay for more networking capability than you need.

You can expand network capabilities even further by adding our microprocessor-based network server. It gives users common access to hard disks and other resources over the network, so your expensive equipment can be shared by more people, more productively.

With add-on software packages, an unlimited number of users can share letter-quality printers. There's even a comprehensive electronic mail system that will bring your internal communications out of the dark ages of pen and paper.

Remember, every ounce of this is Ethernet-based, and Ethernet-compatible. So you won't be left out in the cold when it comes to compatibility with shiny new equipment your users will want later on.

Send us the coupon below, or give us a call. We bet you have a few more tough questions. And you can bet we have a lot of sensible answers.

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IN FOCUS

HAVING YOUR HEAD HUNTED

Executive search firms stalk their high-priced game in the corporate jungles.

by Merrill Cherlin

Ring . . . Ring.

"Hello?"

"Hello. Is this John Doe?"

"Yes."

"This is Joe Blow at Execusearch Associates. Are you familiar with our firm?"

"No."

"Well, we're executive recruiting consultants. Your name was given to me during the course of an assignment we're working on for a client company. We've been retained by them to find a new vice president of management information services. Do you have a minute to talk about it? I'd like to learn more about you."

This is how it begins. John Doe is having his head hunted.

It's a common scene these days, as more and more of the higher dp positions in the private sector are being filled by executive search firms. According to James E. Hunt, a vice president of Russell Reynolds Associates, New York City, "There's been a dramatic shift toward MIS directors who can get along with top board executives. They must know the business and its problems, not just technology. There's pressure on them to solve short-term problems and, in addition, develop a long-term master plan when they first arrive.

"The guy who's the pure technician who wants to put in a better box every day isn't the guy who's going to rise. He could get to be operations manager or applications manager but not the person who directs overall strategy. There's no 'Hey, this guy's our best night-shift supervisor; let's make him vp of MIS.' I mean, he *could* be, but it takes more than that today."

Herb Greenberg, managing vp of high technology at Korn/Ferry International, New York City, says, "Now data processing is seen as important. The person who occupies the vp of MIS position is a more sophisticated and astute businessperson who reports directly to the ceo. If there were enough qualified people out there, the companies wouldn't need us. They'd run an ad and be able to select people themselves. There are placement houses (*not* search firms) that specialize in MIS and place lower middle management and technical people. As you move up the ladder, the positions are being filled through search firms, partially because there's such a heavy demand that the individuals to fill the jobs are not normally looking for jobs. They are usually happily employed, and the only reason they'd look elsewhere is because of a personality clash or because they had no opportunity for advancement because they had capable supervisors. Other than that, they're usually engrossed in their work, motivated, and so involved that they're not of a mind to respond to an advertisement.

"But if someone should happen to call them they're very likely to want to learn a little more about the situation.

"If the job would represent a challenge and a career move upward for a person, in terms of responsibility, numbers of people, or budgets, etc., you can usually attract him.

"We are not trying to sell people on a situation. If it's a genuine opportunity for the individual to advance his career, then fine. But if it won't take him where he wants to go, we'll tell him that. The marriage has to be right on both sides."

The word "marriage" is mentioned over and over again by different recruiters. Making sure the chemistry is right between candidate and hiring company is a large part of the recruiter's job. That's why they stress the importance of personal contact.

The very first step in the process is a meeting between client and search firm to determine exactly what the client requires in his new MIS director, applications manager, or whatever.

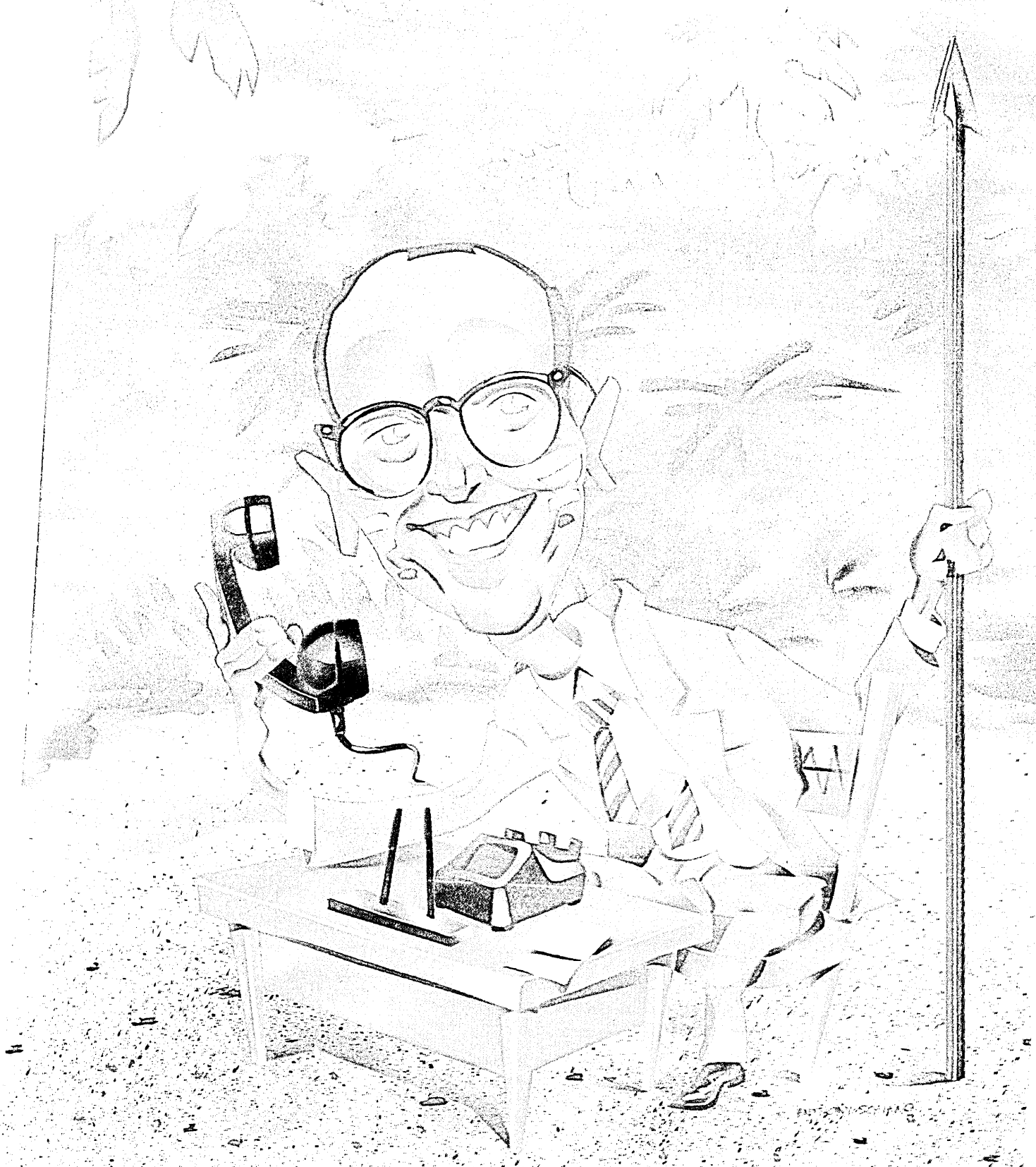
Hunt says, "The most important thing is understanding what their particular problems are and what kind of focus the new person has to bring to help them. Some places may be in need of immediate improvement. Others may have a person currently in the job who is limited in his ability to go beyond where he is today. The client may require certain educational credentials, or 10 years' experience as manager of applications development combined with operational experience, at some point running a data center that included large-scale IBM systems with communications. Each requirement may or may not be absolute.

"The most important thing is understanding what the client's problems are and how the new person will help."

"For an MIS director, most clients want someone who's had a minimum of eight or 10 years' experience, half of which should be in management. This person should have managed not 22 but at least 100 or 150 people. Thirty-five to 45 years old seems to be the magic age they're looking for.

"It's an energy-level thing, too.

ILLUSTRATION BY ANTHONY SCHIANO



Someone who's further along in his career has probably gone into two or three distressed situations and turned them around and made them run efficiently. By that time they say, 'Gee, do I want to do this again?' because that really is a backbreaker."

Herb Greenberg says, "For one position we needed to find someone who'd worked with pharmaceuticals before, in another case we had to find someone with experience with a major conversion and who also had broad managerial skills."

Herbert Halbrecht, president of Halbrecht Associates, Stamford, Conn., explains that there are often subtle, unarticulated specifications. "I have a company down in Texas who really seems to prefer a 'good old boy' type. If the candidate is from New York, he's just not going to fit. When push comes to shove, it's not difficult to find people with the technical credentials for these jobs. It becomes a question of style and of fitting the organization's atmosphere."

Halbrecht uses specific guidelines to help client companies determine exactly what their needs are. "There is some advice I'd give to any company whether they were thinking of using an outside search firm or not. They should do it for internal searches, also. First, what is the scope of the job? Second, what do you consider to be the 'must' requirements? And third, what are the 'desirable' attributes? They should weight those from one to nine, 10 being a must. It forces them to think about the importance of different desirable traits. They should throw out everything under five as meaningless.

"Two other issues are critical: what are the priority problems this person will have to deal with, since he will not have time to learn about them on the job? And trickiest of all: what are the criteria by which you are going to evaluate this person for the job?

"Over the years we find people who are better than average and we keep track of them."

"The client should fill out these forms with all the decision-makers present. I make them justify it in person. Invariably, some of the items that are musts will migrate to desirable, and one or two desirables either migrate to the musts or get thrown out altogether.

"If a company is looking for a chief MIS executive," Halbrecht adds, "we also want to talk to one or two of the largest, most disaffected users within the corporation. I want to find out what things they're bitching about. It's the most politic thing for the company to do, too. "Also, we want the candidate's references to come from the major users in his old company, not just his boss. The major user is going to be the most honest person in the world. He may say, 'I'm glad that miserable SOB is leaving.' I like the letters to show tearstains—to show they're crying at the thought of losing their guy.

"We insist that the client company's major users be part of the interview process. They have to get across to the candidate what their perceptions of their problems and needs are, so the candidate knows what he's getting into."

After the headhunter knows just what he's looking for, he goes to his sources to get leads and recommendations about possible candidates. Jim Hunt says, "I can ask everyone in this firm, 'Who do you know?' Because they all have backgrounds in the business world, not in personnel, they may say, 'We had a terrific guy back there at information services.' So I'll call him up and get ideas from him. Over the years we find people who are much better than average and we keep track of them. We contact them. We solicit ideas from organizations and from senior financial people. We ask, 'Whom have you worked with in the last few years whom you have a lot of respect for? A person who can get things done in the data processing area? Who's really impressed you in the last six months?' They could say, 'I heard this guy on a panel and he was terrific.' He may be great on a panel and may not be able to run a business, but at least you go in that direction and find out more about him. We build a whole network of names and sift through to see if these people have the qualifications we're looking for.

"There's an awful lot of telephone work. In certain circumstances we might write letters describing the position. We may write to chief financial officers and MIS directors and ask for their ideas. We describe the company but not by name. We describe the responsibilities and area of compensation. We do not place newspaper ads; it's all personal contact. We develop new material on every search.

"There are also some people who keep in contact with recruiting firms. The other day I asked one why. He said, 'Very simple, they get the best jobs.' I'm making the distinction between recruiting firms and those that just place people at a lower level for x dollars from the individual."

Search firms also look at the kinds of companies that might house people who would be a good match. For instance, if an insurance company is hiring, they know it's a firm handling lots of transactions. They figure out who would have had experience with transactions, though it may not have been in an insurance company. Or if a client has a number of substations that would have to tie on-line to either a regional or a central computer, a rental car company, with its myriad stations nationwide, might be a good source of candidates.

Various sales reps selling to the companies may also come up with good recommendations. University professors, too, often keep track of outstanding people in the field.

Jim Hunt continues, "We may talk to one hundred or two hundred people at first by telephone and internal resourcing. Of course if I did a search last week and happen to have another identical to it this week, and I have five great candidates, one of whom might be a good fit, then we'll capitalize on our previous work. There's always some of that. But you always try to develop new candidates for each search.

"If the person expresses interest you say, 'If it's convenient now, I'd like to learn more about you on the phone.' You get his background, what he's accomplished and whether he's accomplished it in an area that would be compatible. If we determine that he has the qualifications and he sounds articulate and intelligent, we get together, preferably at our offices. But if someone's very busy we'll go meet him there, anywhere in the country he happens to be. We spend a few hours with him, find out who and what he is and what makes him tick. At that point we tell him more about the company and can identify it, in most cases.

"Getting yourself known is important in being hired for a top position."

"Out of the 200, we meet face-to-face with 10 or 20 people. Out of that we'll introduce three to six people to the client. First we give the client a letter with the background information, chronological resumés, and our observations of the people. Then we arrange for them to get together. We will educate the candidate as to what the client's looking for, but I don't like to coach the candidate. He's got to be himself and be right or not right."

Sometimes, when the client meets the final candidates, he decides they're not quite what he had in mind, and alters his specifications. That's why the recruiting firm tries to send in a likely candidate during the early part of the search—as a sort of benchmark—to make sure everyone's thinking along the same lines.

The recruiter also serves as a middleman so the candidate can tell him things he might be reluctant to haggle over with the client. Perks, salary, and small areas of interest he would like to oversee might fall in this category. Once the candidate is hired, the recruiter usually stays in touch for a year or so to make sure the new person's performing the way the recruiter thought he would and the company is living up to its promises to him.

Sixty to 90 days is the usual length of time it takes to fill the position, with a few taking much less time, a few taking more.

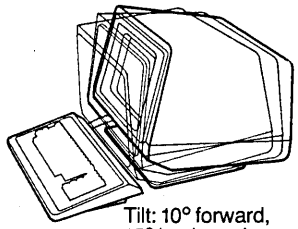
The firms charge the hiring com-

The VISUAL 100 video display terminal is 100% compatible with the DEC VT 100 terminal from identical software right down to the layout of the keys and the sculpturing of the keyboard.

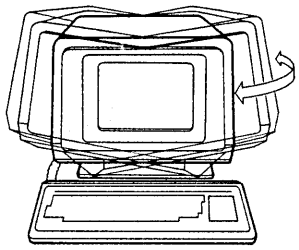
But when it comes to ergonomics, the VISUAL 100 is something else! For example, the VISUAL 100 is designed in lightweight plastic that can easily be swiveled and tilted for maximum operator comfort. A detached, low profile keyboard, and 12″ or 14″ non-glare screen are just a few of the other human engineering advantages of the VISUAL 100.

The Advanced Video package and current loop interface that are optional with the DEC terminal are standard with the VISUAL 100. Plus we've added an optional Buffered Printer Interface with independent baud rate, independent parity and printer busy via "XON-XOFF" protocol. And although the VISUAL 100 is a step up from the DEC VT 100, it is priced a step below. Only $1,345 list. Call or write for full details.

Service available in principal cities through Sorbus Service, Division of Management Assistance, Inc.



Tilt: 10° forward, 15° backward



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pany from 30% to 33⅓% of the person's first-year cash compensation, which includes salary and bonus, as their fee. If the cash compensation doesn't adequately reflect what the position is worth, as in a startup company that would pay less in salary but lots in stock, other arrangements are made. Salaries range from $50,000 for a director of systems and programming for a small company to above $90,000 for the same job at a major institution. A vp of MIS at a small company might earn $60,000 to $70,000, while the same title at a major company could earn up to $200,000.

The fee is usually paid as a retainer over the first three months of the search, and the search firm is paid whether or not the client hires anyone (as long as qualified, interested candidates are provided).

Being wooed by a search firm is a sign that you're pretty hot stuff, and after you reach a certain level, you can expect to be contacted more than once. The search firms are expert at figuring out who will take the bait, too. Herb Halbrecht says, "We know how to fish in troubled waters. A company may go through a major change in direction of its use of information services. They're going from centralized to decentralized or the other way around. The head of MIS is going to be uncomfortable doing the things he was opposed to doing for some time. We know he's going to be more accessible than other people. If you're in continual contact with these types of people you know where these things are going on. Also, you know at every moment in which industry a person is going to feel insecure and will be looking for a safer haven. Right now it's the airlines."

Herb Greenberg adds, "We find that as we contact people in the field we develop a relationship with them. Maybe something we're working on today won't be particularly attractive to them but we certainly go back to them if we find something that would fit them. Most aren't really looking, but they indicate the type of situation they would find sufficiently attractive to consider."

"Most people aren't really looking, but they indicate the type of situation they would find sufficiently attractive to consider."

That's exactly what happened to Jean A. Fowler, now director of MIS for Becton-Dickinson, a Rutherford, N.J., manufacturer of hospital supplies. Fowler says, "In recent years I've accepted the calls from search firms as something that happens once you reach this level. It's good. It means you're known, and that the opportunities are out there. About three years ago, Jim Hunt from Russell Reynolds called me about a different job. I told him I wasn't interested in it. He then asked me what it would take to get me to move to another job. I said a position reporting to the president, with international as well as domestic responsibilities and specific involvement in the operation and strategic planning of the business. Not strictly another MIS function and very definitely an increase in power.

"When Jim called me and recruited me for this job he said, 'I'm calling you to tell you that I have the job you said you wanted several years ago.' "

It is to your advantage to be specific in describing your dream job when a headhunter calls. This is no time to be coy.

Though Jean is completely happy in her new job, she can be sure she won't be left in peace. As Herb Greenberg reminds us, "If I'm doing a search for XYZ company, then one or more search firms are trying to relieve XYZ company of some of their executives. In our business, one search firm's client is another search firm's hunting ground."

Jean Fowler also mentioned two points she feels are important. First, it is to your advantage to be specific in describing your dream job when a headhunter calls. This is no time to be coy. Second, if an executive recruiter contacts you to ask for your recommendations, and you are interested in the job yourself, he expects you to say so.

Not all the top positions are filled by executive recruiters, though. Greenberg says, "A good number of positions will be filled from within the company, but they can't when the client hasn't developed the second-line managerial staff sufficiently to have someone take over the number one spot.

"And a company can use informal word of mouth. They might ask their bankers, their lawyers, and their CPA firm if they know anyone. They may have contacts in the field they can pursue themselves. But the more sophisticated the client, the more worthwhile they'll feel it is to go to a full search so they know they have truly looked at the whole marketplace. Then when they've made their selection, they haven't just found someone who's capable of doing the job, but they've found the most capable someone."

And there are the mavericks who feel that they can do it best all by themselves. Edward K. Zimmerman, an independent information handling consultant based in Falls Church, Va., says, "I've had a wide and interesting variety of jobs, none of which were obtained through search firms.

"I've found no substitute for personal initiative in my own career. The things that help make a person valuable to a company are the same things that help him to be successful in finding employment for himself. A lot is who you know, whether you have your ears up and are putting your best foot forward.

"A career-long impression of mine is that lots of people in dp are not effective communicators. They don't listen well, and don't notice opportunities when they come up and kick them in the shins. Nor do they present themselves very well either orally or in writing.

"You need to know what's going on in other companies. Study them and keep your finger on the financial, product, and personnel pulse. I've found my best jobs through consulting activities."

Zimmerman's previous employment does indeed include several diversified positions. For example, he was executive director of the National Computer Graphics Association, he participated in the design of computer and office automation systems for the White House, and he was a deputy assistant secretary of commerce. Pretty good, especially for someone who has always operated as his own search firm.

"You have to be part of the information management network. If you have any brains, you'll make it your business to know what's going on."

Obviously, getting yourself known is important in being hired for a top position, whether it's through a search firm or not.

Herb Halbrecht offers these guidelines for getting your head hunted:

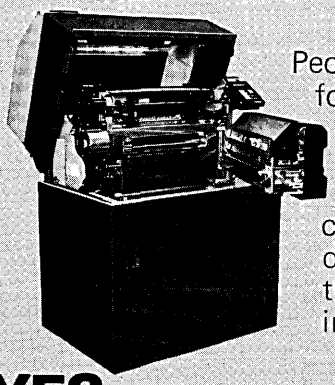
1. Get your credentials into the hands of headhunters who do work in your field.
2. Write interesting papers and get them published.
3. Give talks.
4. Become active in the professional societies.

"These are the ways people get to be seen and known, not just by headhunters, but by other companies. You have to be part of the information management network. If you have any brains, you'll make it your business to know what's going on." ❋

Merrill Cherlin is a freelance writer who lives in Baltimore, Md.

Beginning with the February issue, DATAMATION will be publishing a new department, "On the Job," covering various aspects of the personnel side of dp. The column will range from improving your present position to managing people more effectively, and everything in between. We welcome all comments and queries.

Looking for a quiet, tough printer system? Southern Systems has it. The QT Family.



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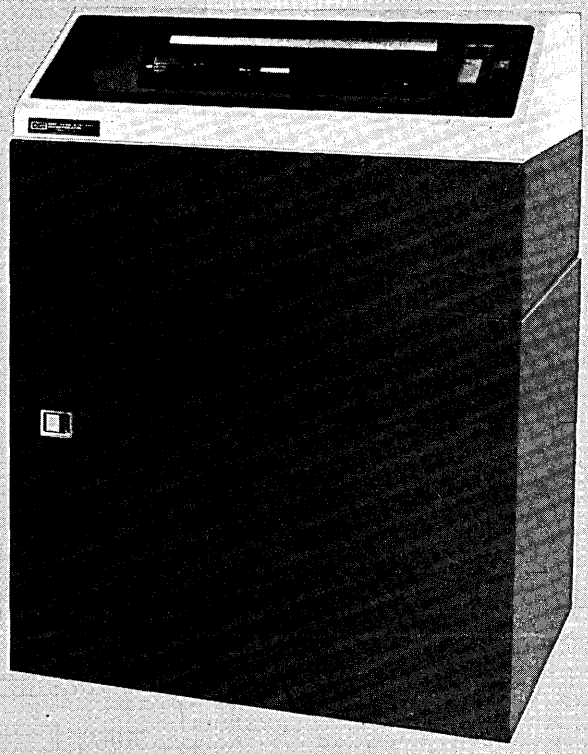
- ☑ Is the print quality top-caliber?
- ☑ Is there a diagnostic display? Internal self test?
- ☑ Towel ribbon? Forms alignment? Membrane touch control?
- ☑ Does SSI guarantee compatibility with my computer?
- ☑ Is service available nationwide?
- ☑ Is the QT line printer family affordable and cost-effective?



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NEWS IN PERSPECTIVE

STRATEGIES

IBM'S NEXT TRICK?

Can the two warring architectures of the System/38 and the 4300 family be reconciled?

IBM's once "clean" 360/370 environment has now yielded to a confusing melee of incompatible products as the company pushes into distributed processing. In the small systems area alone (systems priced below $300,000), users have identified a dozen conflicting offerings, including Series/1, Systems 23, 34, and 38, the 8100, the low-end 4300 family, and the Personal Computer. Following IBM's recent reorganization they are all warring with each other inside IBM's newly created Information Systems & Communications Group (IS&CG). Users are beginning to refer to the struggle as the "architecture wars."

"IBM has always been willing [on non-360 compatible processors] to create generations of mutants that live or die as it sees fit," says George McQuilken, a former IBMer and now president of the IBM pcm systems competitor, Spartacus Computers, Burlington, Mass. As a result, of course, the old incompatibilities of pre-360 days have returned—this time in the distributed processing arena—and IBM seems to have come full circle.

Now, once again, IBM's ability to produce the right kind of software, peripherals, and support has been called into question. As the confusion in IBM's operating environment grows, user application backlogs are stretching into years. Now, as with the 360 harmonization efforts of 20 years earlier, it seems that IBM needs another conjuring trick.

IBM has openly admitted that its current distributed systems provide less than the optimum conditions for applications development. In an uncharacteristic plea for help to the independent software industry, IBM has said that it will simplify its operating environment so that these outsiders can furnish much needed applications software. IBM says it is departing from its traditional pattern of complex, fluid, and changeable operating systems to hunt for the perfect "application machine."

As a start, IBM offered the independents a new user-friendly operating system, SSX/VSE, coupled with its 360 hardware descendant, the 4300, as a stable base for applications development. Other inducements such as software/hardware discounts, exchanges of confidential information, and cooperative marketing, to name a few, were also offered by IBM.

Sources claim that a virtual machine (VM) version of the new operating system coupled with IBM's query and file system language, SQL, will also be offered—probably within the next four months—to ensure even more user friendliness to managers and end users. IBM declined to comment.

Does all this suggest that a VM/4300 is the basis for the perfect "application machine"? Is this the white rabbit waiting to be pulled out of president John Opel's hat?

"Well, it has much to recommend it," says Boston-based Yankee Group researcher Frank Gens. "The VM/4300/SQL combination is the natural heir to the whole OS/360-compatible line—and to the estimated $300 billion base of user software that surrounds it—and so is a right and proper choice for many of IBM's users.

"But in actual fact," says Gens, "there appear to be *two* rabbits in the hat."

The second rabbit that Gens was referring to involves the System/38, which was released in the summer of 1980. While the 4300's parentage is out in the open, so to speak, the 38 has more of an aura of illegitimacy. As DATAMATION revealed earlier (January 1982, p. 50), the System 38 descended from IBM's ambitious attempt to build a revolutionary new virtual machine architecture in the early 1970s known as FS (Future System). The project was ill-timed for two main reasons, say IBM sources who worked on it. "First of all, IBM didn't have the right level of systems expertise at the time. And second, there were too many product lines that weren't ready to migrate," one source contended.

When the project was scrapped in early 1976, a large number of the estimated 2,750 FS work force was transferred over to Rochester, Minn., the birthplace of one of IBM's most successful mutants ever—the System 3. Ostensibly, the FS boys were asked to create a replacement for System 3,

IBM gave the red carpet treatment to software independents for work on the 4300, but offered no such inducements for work on the System/38.

which according to IBM internal figures had racked up an immense 25,000 installations worldwide. What emerged was the 38, whose database architecture and other novel features are an unusually sharp break with 360-like hardware and compatibility.

For this reason, user responses to the system are being watched very carefully by the industry at large, and new information about the machine is becoming a precious commodity. Says John Pfeiffer, who heads a System/38 hot line for Common, an IBM user group, "The machine has proved

to be exceptionally user friendly, has tremendous latent power, and has been universally well received by users."

According to Gens, the 38 is already shaping up to be the same kind of phenomenon as its previous Rochester stablemate. "In its first full year [1981], we estimate that IBM shipped 3,000 systems worldwide. In 1982 IBM did even better by more than doubling its base to upwards of 7,000 users," said Gens. When queried about the figures, IBM declined official comment.

Noting that the 38s typically sell at from $135,000 to $360,000 each, Gens commented, "They now overlap and compete with around one third to one half the members of the 4300 family." Representatives of several software companies who have attended IBM's 4300 applications conference in White Plains, N.Y., have remarked in confidence that IBM is very worried about this overlap. Said the head of one independent software company: "They don't relish the prospect of juggling two parallel and incompatible contenders for the applications machine. One minute they have to hit the gas pedal with one and brake with the other. The next minute they'll have to do the reverse."

Added the executive, "One senior IBMer told me that he would much rather put the System/38—and related products such as the System/34—onto a boat, set fire to it, and shove it out to sea, or sell off the development division."

As McQuilken has stressed, IBM would normally just kill off the mutants by pulling support or announcing incompatible successors so that user application programs become obsolete. McQuilken says that independents who develop applications for such machines "should bear in mind that they might last only for the life of one machine generation."

IBM so far has offered no inducements to those software companies that aspire to work on the System/38, or the 10-year-old System/34, similar to the red carpet treatment offered to independents who want to work on the 4300.

"We have plenty of inducements of our own," says Brian Sullivan, marketing manager at RTC Systems, North Attleboro, Mass., "and besides, the 38 technology is too good to pass up." RTC Systems is one of a select but growing band of software companies that have emerged to write applications solely for the 38—which, as Gens points out, is mostly used in manufacturing and production environments in these early stages. Sullivan says that many of the customers are new to the computer business or have undergone just one conversion. "They are mostly concerned about whether the machine will handle their application and whether it will be easy to use. They care much less about its compatibility with IBM's mainframes and the 4300s."

Harold Fields, a technical specialist at one System/38 customer site, Frontier Airlines, Colorado, points out that the product doesn't have to be compatible with the IBM mainstream for a user to build networks. "The 38 now has added features that allow you to build networks with the Series/1 minicomputer, which is exactly what we're doing," he said.

Pfeiffer added that the networking capability has lured several big users, such as GM, Bechtel Corp., and Shearing Plow, into the ranks of System/38 customers. "The main difference with larger multinational users is that their System/38 networks will be worldwide."

Gens said that the interest of large and powerful users could be a significant factor in improving the performance of the machine quickly. "In the past, the typical GSD customer has been a small company and has had little influence on IBM's general strategic direction. He has tended to take what IBM wanted to give him. To an extent this has been reflected in the System 38's power when compared to the 4300. The MIPS level of the four System/38 models ranges from .11 MIPS to .45 MIPS, whereas the Group Two 4300 ranges up close to 2 MIPS.

"There is no telling what may happen if large System/38 users start putting some pressure on IBM."

"In the past," Gens continued, "IBM has shown us MIPS curve graphs that suggest that there will be no dramatic surge in performance levels on upcoming models for some time." Sources confirm this by saying that the next System/38, the model 9, will have twice the model 7's main memory, eight megabytes instead of four, and the MIPS level will climb gently to around .75 MIPS. They predict that the machine will arrive late this year.

"There is no telling what might happen if large System/38 users start putting some pressure on IBM," Gens concluded.

This theme was also taken up by Robert Fertig, founder and head of Enterprise Information Systems, Greenwich, Conn., which has just completed a 120-page report entitled "System/38 Past, Present, and Future." Fertig expects GM to push for, and get, whatever it wants, including new high-level languages.

New source information just received by DATAMATION goes even further by pinpointing these languages. Over the next two years, says the source, IBM will announce three high-level languages in succession for the 38—BASIC, FORTRAN, and PL/1. Adds the source: "There's been a hot debate within IBM about PL/1. Many marketeers preferred Pascal. But PL/1 won out." When asked about the claims, IBM said it didn't care to speculate on future offerings.

In addition to the software, sources pointed to a host of other new features that the Rochester team is preparing. They include color graphics, a new scientific language, tightly coupled data sharing, more DBMS, and a new SNA-like networking innovation. For the latter, the IBM design team has built a network controller, believed to be similar to a Series/1 machine, for the 38.

Pfeiffer declined to comment on this information on behalf of Common. "Speaking as a user of the 38 [Southwestern Publishing, Ohio], I can just reiterate what I said about the machine's tremendous latent power. Clearly it can accommodate many new and advanced functions."

Just how many of these features hit the streets over the next couple of years will probably depend on how much pressure IBM's large 38 users bring to bear, as Fertig intimated. A power surge on the 38 will clearly affect the 4300 applications machine plan and make IBM appear more divided than ever. Can the two warring architectures be reconciled? The answer, according to Yankee Group research director Dale Kutnick, is "yes, but not by hardware bridging.

"IBM will look for commonality in software and cross-compilers," he says. "But the most critical software interface that the user addresses is the database. There is already some similarity between the file structures on 4300/SQL and the 38 database structure. In addition, IBM's VM/MVS hybrid operating system, which hosts the 4300, is beginning to look like the 38—that is, like a virtual I/O machine.

"My guess is that the full flowering of SQL, and its relational parent, System R, will provide the common ground for an MVS-System/38 marriage in the late 1980s," he predicted.

As sources earlier revealed (August, p. 40), IBM is in the last stages of developing an MVS/SQL offering as a first step in this direction, and that software is due this year.

Fertig, in his new study, predicts that both 4300 and System/38 engines will coexist under the hood of the same system by late 1984 or early 1985. He expects what he calls a multimachine version of the System/38 (the model 11?) to be released at this time. "The user's two engines will share the same disk and communications, and he will be able to switch modes. One minute 370, the next, 38."

Fertig claims that IBM's upcoming new chip technology will allow it to offer two engines for the price of one. It must be said that there are many who doubt this will happen. Said one observer, "So much of the system software would be chewed up in providing a resident 370 engine that little would be left for the user's programs."

Whatever the outcome, the immediate trend is set. Applications from independents will flow on *both* machines. Whether

NEWS IN PERSPECTIVE

IBM will extend the red carpet treatment to those software companies choosing the 38 over the 4300 is uncertain at this time. "There are information exchanges, and we'll look at their products to see if we want to buy them, but that's all at this time," said an IBM spokesman.

As RTC Systems' Sullivan said earlier, the company can live without such overtures and has inducements of its own. One of these has been the awesome (if little publicized) response to another mutant in the

System/34 to 38 conversions have begun in earnest, especially in Europe.

tradition of the System/3, namely, the System/34. This 10-year-old system has racked up "at least" 60,000 installations worldwide, and is the top-selling general purpose computer in the U.S. (An estimate from Computer Intelligence Corp. put its U.S. installations figure at 48,650 in mid-1981.)

"It's important to realize," says Sullivan, "that both System/3 and System/34 are largely programmed in the RPG language. The System/38 is programmed in the more modern RPG 3 and offers a tricky but consistent migration path from the other two machines."

Sullivan claimed that a "conservative" guesstimate is that some 40% to 50% of the older RPG machines will migrate to the System/38. That is upwards of half of about 90,000 installed machines.

Fertig added that System/34 to 38 conversions were beginning in earnest, especially in Europe. "That is what really opened my eyes to the 38 phenomenon."

Full circle indeed. Back in 1975 the prospect of migrating several OS/360 and 370 lines to a "paper" RPG/Future System didn't seem very appealing to IBM's management. The System/34 existed, as did some System/3 models—but that was all.

Now, as the 38/Future System emerges, with its tantalizing promise of greater programmer productivity and user friendliness, the picture looks different. Maybe now the migrations can begin?

"They won't be widespread until 1986," predicts Kutnick. "IBM must first harmonize its four mainframe operating systems—DOS, VS, VM, and MVS—into one VM/MVS hybrid so that there aren't too many migrating streams.

"But by 1986, when maybe half of IBM's mainframe base has adopted the extended MVS operating system, MVS/XA, it will look very much like the future System/38," he claimed.

Or, as McQuilken would put it: the mutant will have gone legitimate, and there will be but one rabbit in the hat.

—Ralph Emmett

THE INDUSTRY

LOOKING INTO 1983

The computer industry has been through one of its worst years ever, and there is still little light at the end of the tunnel.

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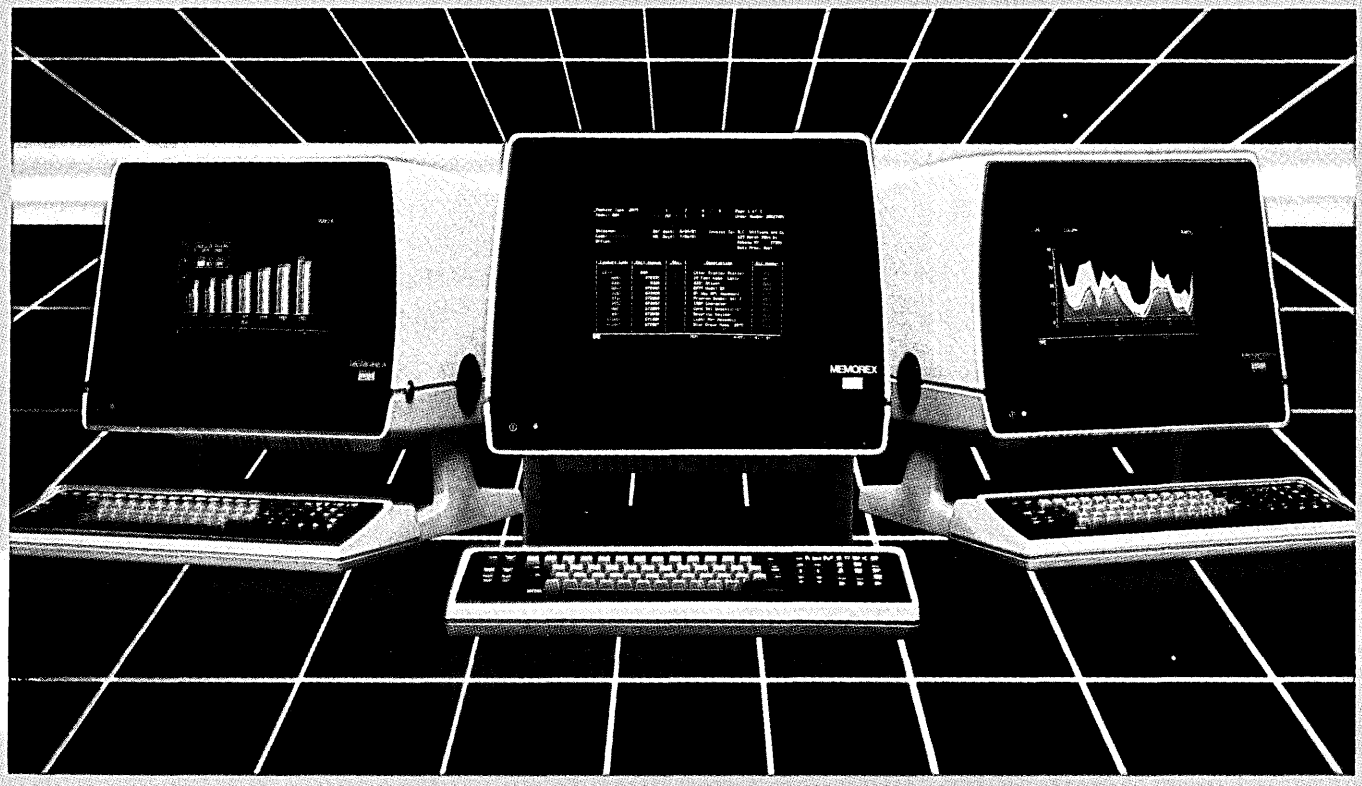

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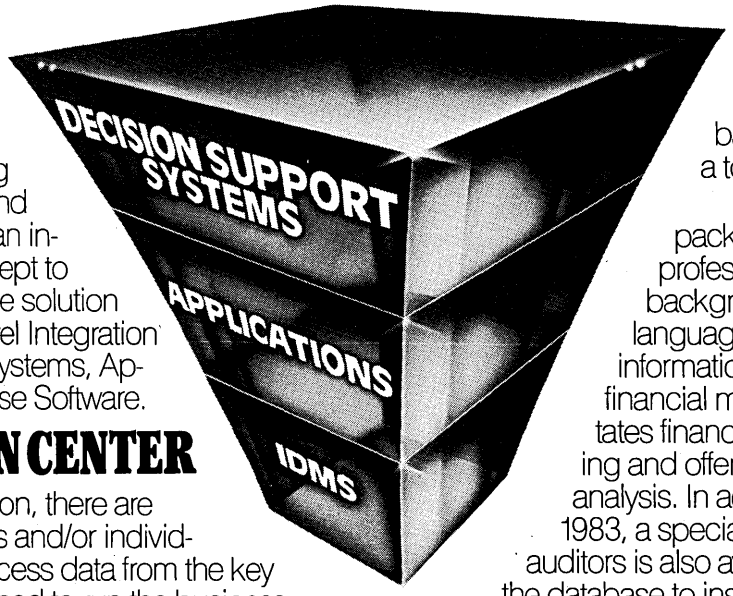

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Boston-Westwood, MA	March 1
Boston-Danvers, MA	March 15
Bridgeport, CT	February 8
Buffalo, NY	March 9
Burlington, VT	March 23
Calgary, ALT	March 16
Charleston, WV	March 3
Charlotte, NC	January 12
Charlotte, NC	March 17
Chicago-Rosemont, IL	January 26
Chicago, IL-Downtown	February 22
Cincinnati, OH	January 27
Cincinnati, OH	March 24
Cleveland, OH	January 20
Cleveland, OH	March 22
Columbia, SC	February 10
Columbus, GA	February 15
Columbus, OH	January 13
Columbus, OH	March 16
Dallas, TX	February 17
Dearborn, MI	February 2
Denver, CO	February 16
Des Moines, IA	March 22
El Paso, TX	January 25
Ft. Wayne, IN	March 8
Ft. Worth, TX	March 22
Grand Rapids, MI	March 15
Greensboro, NC	January 27
Hartford, CT	January 11
Houston, TX	January 20
Indianapolis, IN	February 23
Jackson, MS	March 31
Jacksonville, FL	March 22
Kalamazoo, MI	February 2
Kansas City, MO	March 17
Lansing, MI	January 11
Las Vegas, NV	January 27
Lexington, KY	January 27
Lincoln, NE	February 16
Little Rock, AR	January 13
Los Angeles, CA	January 18
Los Angeles, CA	March 15
Louisville, KY	January 20
Macon, GA	February 22
Madison, WI	January 20
Madison, WI	March 17
Meadowlands, NJ	January 11
Memphis, TN	March 24
Merrimack, NH	January 13
Miami, FL	January 13
Milwaukee, WI	February 9
Minneapolis, MN	January 18
Mobile, AL	March 29
Montgomery, AL	February 1
Montreal, QUE (French)	January 12
Montreal, QUE (English)	January 13
New Haven, CT	March 15
New Orleans, LA	March 8
Newport Beach, CA	February 16
New York, NY	January 18
New York, NY	February 24
New York, NY	March 24
Norfolk, VA	January 25
Oklahoma City, OK	March 8
Omaha, NE	January 5
Omaha, NE	March 23
Orlando, FL	February 24
Ottawa, ONT	January 27
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CIRCLE 33 ON READER CARD

Few companies actually failed, as happened in the last bad slump in the early '70s, but a nervousness was present even in those companies maintaining adequate growth. The length and severity of the recession went beyond most predictions.

In previous recessions, orders may have softened but, in general, manufacturing chugged along. The reason was that users, also affected by the recession, would continue to buy cost-saving computer equipment as a means of keeping their own heads above water. The computer, after all, helped improve productivity, eliminated overhead jobs, and brought new efficiencies to producers of goods and services.

That clearly hasn't been the case in the last year or so. Several large semiconductor and systems manufacturers have been forced to lay off thousands of workers at a time. Honeywell, for instance, has laid off 3,700 workers since the summer of 1981. Texas Instruments gave notice to more than 10,000 workers worldwide in the past two years. National Semiconductor, negating a long-standing "no layoff" policy, cut back its work force by 1,000 persons in August. Intel, seeing profits plunge in its semiconductor business, imposed in November salary cuts and a wage freeze across the board for its 20,000 worldwide employees. Even Atari, flush in its video game business, found need in August to put 140 workers on a four-day work week.

Layoffs hit hard at Honeywell, Texas Instruments, and National Semiconductor, among others.

A Nov. 27 story in the San Jose *Mercury* reported that in Santa Clara County alone, 65,900 people were out of work, a large portion of whom came from the electronics industry. Some 2,200 people in the county's electronics industry, known to the rest of the country as Silicon Valley, lost their jobs in September and October, the story said.

The main reason for the freezes, layoffs, and plant closings is a growing vulnerability the semiconductor and computer industries are showing to cyclic economic trends. The recession-proof days gone by were ones when, in general, computer projects were centered around large mainframes. Those projects, centrally organized by corporate management, often took longer to complete than it took for an economic recession to come and go.

Now, however, computers are smaller, cheaper, and used in a wider variety of organizations and are therefore subject to more short-term purchase decisions.

"What we're seeing is partly the level of saturation in large systems implementation," says Oscar Rothenbuecher, senior staff member at Arthur D. Little in Cambridge, Mass. "Today computers and terminals and small business systems are being used by a broader population of users. Often those users make their purchases on a short-term basis. They make immediate plans to buy or not to buy."

The analyst also pointed out that the length and world scope of the recession have caused a deeper gouge than usual from computer industry profits. Many companies in the business depend on foreign operations for a large portion of their earnings but since the recession has hit so hard in Europe and elsewhere, those earnings have not come through. What's more, foreign currency valuations have been such that in analyzing growth in terms of U.S. dollars, many companies have not achieved the traditional spurt from overseas.

"The computer market is an international one," Rothenbuecher states. "The French franc lost 28% of its value from Jan. 1, 1982, to early November. The Japanese yen lost about 20% of its value."

Echoing Rothenbuecher's sentiments, Robert Fertig, head of Enterprise Information Systems Inc., Greenwich, Conn., stated: "It's pretty scary out there. Companies with much business in Europe, like [Sperry] Univac and Honeywell, are being forced to lay off people. It's difficult to make layoffs in Europe because of strict national laws regarding corporate benefits, so these are drastic moves."

According to Peter Cunningham, president of Input, a Mountain View, Calif., market research company, many U.S. data processing budgets for 1983 will be flat or even smaller than those recorded in 1982. Due primarily to general economic conditions, the leveling of budgets will probably affect order rates for computers, peripherals, and computing services.

"Usually we find companies spending for the future, but now more companies are planning for the short term. Some users can afford to invest now in information systems. Banks, for instance, are spending much more on computing because it helps them reduce staff. Some users are preparing two budgets for the year. In the past, they've usually submitted the positive budget and kept the negative one as a contingency plan. This year it's the opposite. The negative budgets are presented first," Cunningham says. His information, he adds, comes from a limited informal survey of several dozen large corporations.

The major force in the market, IBM, has come through the year relatively unscathed. While the company doesn't publicly predict its expected earnings, in a recent presentation to security analysts in San Francisco, IBM vice president of planning and chief financial officer Allen J. Krowe said the company is "confident" it can "bring 1982 in at a substantially improved performance over 1981." IBM expects to report its year-end earnings in late January, delayed by a week due to a change in its accounting methods made to more profitably show foreign-currency translations. The change, under what is known by accountants as FASB Rule 52, is expected to increase fourth-quarter and full-year earnings roughly 10%.

The industry leader did show depressed growth rates for its second and third quarters of 1982, but Krowe told analysts in mid-November that IBM's "order and shipment rates have been very satisfactory year-to-date in 1982," particularly against what he termed "the backdrop of a very difficult economic climate both here in the U.S. and around the world." The world economy, he noted, shows some signs of recovery here and there—the British economy's inflation rate is down by one half from two years ago; Japan's inflation rate is even lower—but "it is premature to talk about an upturn outside the U.S."

Calling any recovery in the near future "painfully slow," the IBM executive said, "We look forward in 1983 to a real GNP growth in the range of 3½% and we look for the fragile growth [we've] seen in the second and third quarters of this year to continue in the fourth quarter."

He added, "We will continue as we have throughout 1982 to examine investment and resource decisions carefully in an attempt to be prudent in our investments against the economic climate. . . . We will not compromise our future growth prospects by employing heavy-handed cutbacks in our investment programs."

IBM's growth has come largely from heavy shipments of large-scale mainframes, the 308X series, and from shipments of the 3380 disk drive. Krowe noted to analysts that "in excess of 4,000" of the 3380 drives had been shipped from the San Jose, Calif., plant since the fall of 1981. IBM also makes the disk drives in Mainz, Germany.

A changing mix of products and markets has made the industry more vulnerable to economic cycles.

As for mainframes, Krowe said that "in 1982 we will ship every 308X system we can build and we are planning to ship appreciably more high-end processor products—in terms of both capacity and units—in 1983." Personal computer shipments, too, he said, promise "excellent" growth in 1983.

IBM is thought by industry analysts now to be in one of its strongest positions vis-à-vis other mainframers and small computer makers. The company clearly has the lead in large-scale mainframes and disk drives and is making a large dent in the personal computer market. Its office systems have taken off dramatically and, according to the DATAMATION/Cowen & Co. survey (November, p. 34), the firm's Se-

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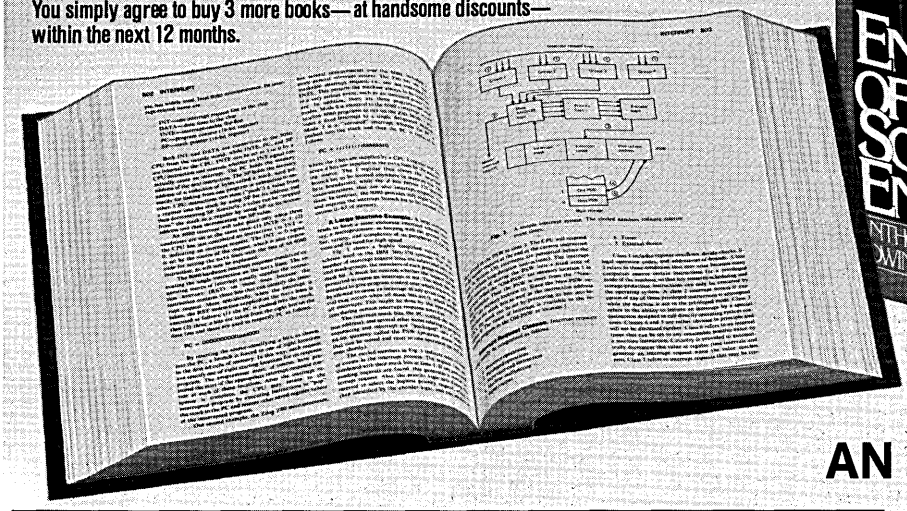

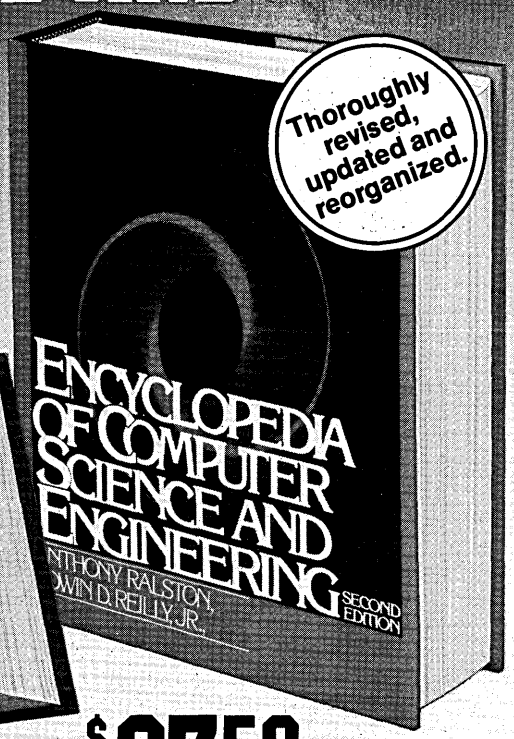

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CIRCLE 34 ON READER CARD

ries/1 minicomputer is selling second only to Digital Equipment's VAX and PDP-11 lines. In 1983 IBM is expected to introduce a wave of products that will set new price/performance curves and help stave off competition in the increasingly important, at least to IBM, small computer arena.

Judging by IBM's record in 1982, a year when it cut prices dramatically, introduced a series of new fixed-rate leasing options, and entered several new businesses, the company intends to increase its drive for control of traditional and emerging markets. The company has spent hundreds of millions of dollars in new manufacturing machinery and facilities and is ready to ship product at high volume. Moreover, IBM has shown that it will go wherever it needs to in order to have the products its markets demand, as indicated by the use of outside software for its Personal Computer, its deal to gain 64K RAM know-how from Intel, and its joint development deals with Texas Instruments and Mitel Corp.

IBM has come through the past year relatively unscathed, thanks to a variety of marketing moves and previous investments.

As for the rest of the industry, the outlook for 1983 is brightest in the areas of small computers and office systems. Although both Honeywell and Sperry introduced large-scale computer families in 1982, sales of those machines are expected to be primarily to current customers. Sperry has also entered the office systems arena, but again, it is not clear how well it can do with products outside its traditional mainframe base.

Those companies such as Data General, Control Data, and Texas Instruments that are heavily dependent on sales of small machines and peripherals to oems and systems houses have felt the impact in 1982 of high interest rates. Resellers have been forced by the high cost of money to cut back on inventories and, as a result, sales have been slow for manufacturers. Profits have been even worse.

At press time, fourth-quarter financial results were not yet available for scrutiny, leaving open the possibility that delayed orders could come in during the final days of the year. In any case, 1982 will be a year remembered by the industry as putting the lie to recession-resistant growth. With computers becoming more consumer-oriented, hardware margins shrinking, and software gaining importance, the dynamics of the market is changing. Only those with the right numbers plugged into their VisiCalc models can hope to survive.

—John W. Verity

MICROCOMPUTERS

BIG PUSH IN MICRO SOFTWARE

Users are starting to demand integrated software packages for micros, and that's great news for Micro Data Base Systems Inc.

If 1982 marked the year the micro matured into a serious machine, then 1983 is likely to be the year micro software comes of age. For Micro Data Base Systems Inc., that's great news. But then, MDBS has been taking micros seriously since 1979.

In that year the little Lafayette, Ind., company introduced its namesake, MDBS, the industry's first database manager for micros. Problem was, the product was an anomaly in the microcomputer world, and few seemed to know what to do with it.

Too complicated to be sold over the counter to end users and so powerful that micro software developers weren't yet so-

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phisticated enough to have use for it, the MDBS product fell into a marketing limbo. Meanwhile, it remained the smartest kid on the block, competing against more simple-minded ISAM-type file managers such as dBase II from Ashton-Tate and Condor from Condor Computer Corp.

Users say MDBS rivals or surpasses products like Intel's System 2000, Cincom's Total, or IBM's IMS. Mainframe chauvinists are amazed to find such features as real-time transaction logging, interactive data manipulation language, and recovery capabilities in a micro-based database manager. What's more, the system is designed around an extended network structure.

"The extended network structure is considered to be the most sophisticated method computer scientists have come up with for accessing records in a sorted or organized fashion," commented Bill Machrone, a vice president at Sales Productivity Systems Inc., a White Plains, N.Y., software house that specializes in writing applications for microcomputers.

"Put MDBS in the hands of an amateur and it could be a real disaster," agreed Diane Haelsig, president of Peopleware Inc., a Bellevue, Wash., company that is designing an integrated conference registration and accounting system around MDBS. "Frankly, though, I can't think of anything I need that [MDBS] doesn't have."

Too complicated for over-the-counter sales and so powerful that micro software developers weren't ready for it, the MDBS product fell into a marketing limbo.

Haelsig, a 20-year veteran of an IBM 794 and CDC 7600 shop, knows her way around MDBS' mainframe counterparts, products like System 2000, IDMS, and Adabas. Like most MDBS users, Haelsig wasn't willing to settle for less when she entered the micro world. "I wanted to develop microcomputer software, but I refused to use anything but professional tools," she said. MDBS fit the bill.

Ultimately, though, the person who benefits most from MDBS is the end user of an application. When an application with multiple programs is integrated around MDBS, information is entered only once.

Finally, software developers everywhere seemed to discover the joys of integrated applications—after end users discovered what a hassle it was to change multiple floppies to update multiple records. And with that discovery, the market for MDBS has busted wide open, but . . . so has competition.

MDBS Inc. is a classic case of a company with a leading-edge idea but trailing marketing know-how, a fault with deadly consequences in the face of increasing competition. The MDBS founders, two Purdue University professors—Andrew Whinston, who continues to teach in addition to serving as chairman, and Gary Koehler, who has taken the more active role of the two by serving as company president—took on the task of covering that Achilles' heel last April.

The company set up a separate subsidiary, ISE-International, to handle all domestic and international sales and marketing. When asked if ISE would be marketing other types of applications developed either in-house or outside, Koehler indicated that was not in the plan.

"ISE, in our mind," said Koehler, "is not the right channel, at least not right now. That would take a different type of marketing approach. ISE, like MDBS, is dedicated, primarily, to database managers and related software. We certainly recognize the importance of the mass market for end-user oriented software and turnkey customer software. We will be pushing hard in all three areas, although the number one push will continue to be on the database manager from MDBS."

Recently, ISE-USA, the marketing arm for the U.S., relocated from Lafayette to Chicago. One of the prime reasons behind that move was to be in an area with better phone service. "A big part of our marketing effort is the telemarketing group," explained Koehler. "Their main job is to qualify leads to the point where it is worth an account rep's time to visit and give a demo. Or, if they can, they close the deal over the phone."

The foreign affiliates, most of which are joint ventures with established Cullinane Database Systems distributors, are collectively referred to as ISE-X, the X being the name of the foreign partner. "The arrangement gives [the foreign affiliate] an entry into the micro market and opens the door to the data processing market for us," said Koehler. With the ISE-X program in place, MDBS Inc. is actually better positioned to penetrate the dp market in Europe than it is to penetrate that market in the U.S. There are indications, though, that the company has yet to develop a sharply focused marketing strategy.

Koehler claims that sales to Fortune 500 companies account for 50% of MDBS' total sales, while oem sales are somewhere in the 7% range. When a user list was requested, however, all the names supplied were oem software houses, folks who buy the MDBS product and build an application around it. According to an executive with one of those software houses, it is not uncommon for an oem to sell direct to its clients, often small- to medium-size businesses.

When Koehler was questioned about the importance of oems to his company, he said: "They are important; I'm not going to hide that at all. But we still like to think of the product as being directed at

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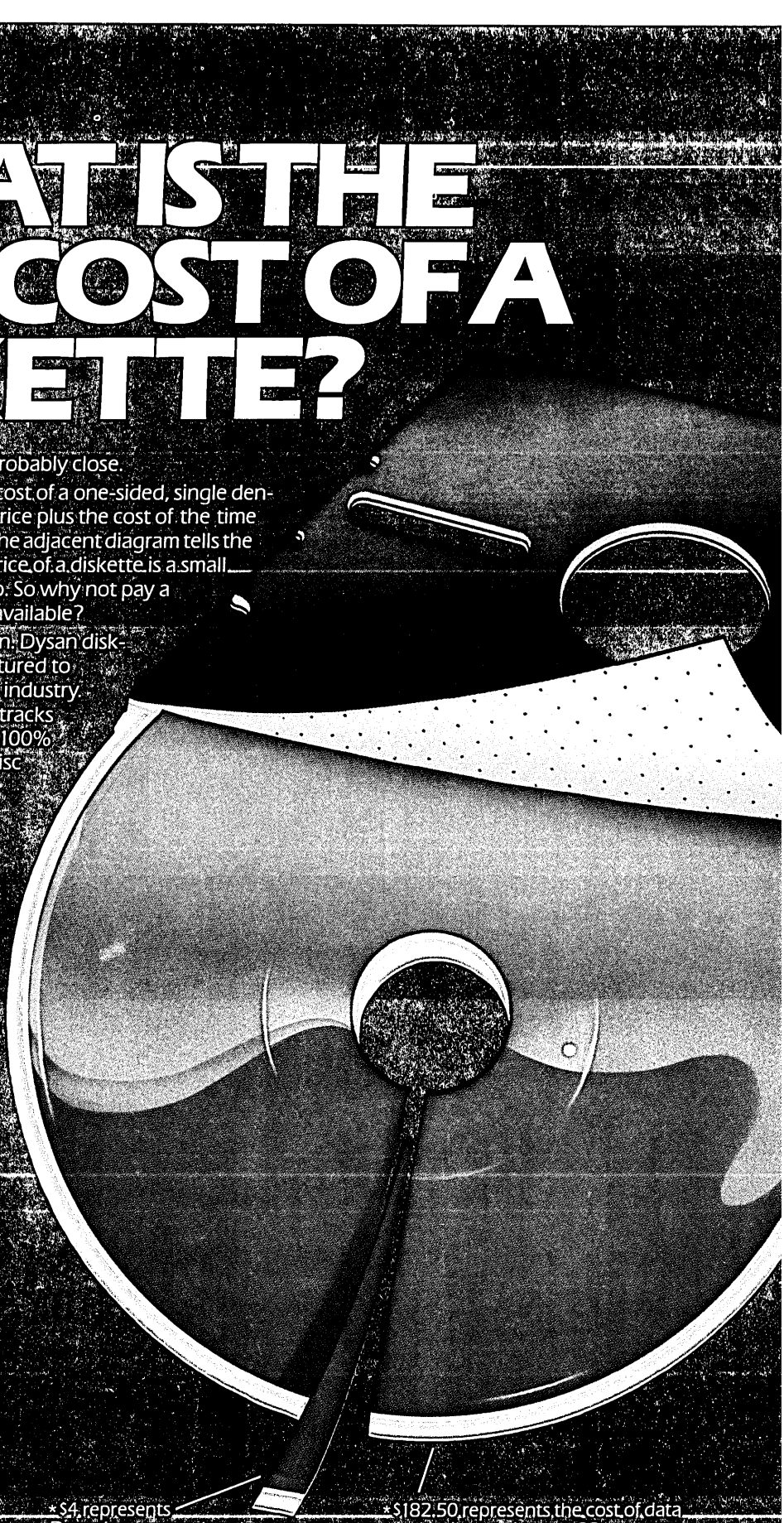

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CIRCLE 38 ON READER CARD

software developers within Fortune 500 companies." The company's pricing policy—or, as customers say, its lack of a well-thought-out policy—is a particularly sore spot with the oem crowd. Prices can range anywhere from $3,400 to upwards of $70,000. The bargain rate of $3,400, a system that runs on the Z80, includes a data definition language, a data manipulation system, the company's QRS query reporting system, and service and maintenance for one year.

If a buyer is looking for the "full boat," as Koehler puts it, the price jumps to $13,000. That package includes the basics plus a multi-user version of MDBS, recovery transaction logging, an interactive data manipulation language, a design modification utility, a screen manager, and training. A VAX/VMS version, which, Koehler conceded, should be out "soon," will cost at least $70,000.

"On top of the purchase price, we have to pay a 15% royalty," grumbled John MacGuffie, president of Sales Productivity Systems. "We can't live with that pricing. Besides, with some of the new competitors coming out, if the MDBS folks don't get more price competitive, they are going to price themselves out of the market," MacGuffie predicted. Koehler said the company has just amended its royalty requirement. Royalties will now range from 15% to 0.3% of the list price, depending on volume.

"Right now MDBS is the only kid on the block, and and that affords it certain liberties in pricing," observed Machrone of Sales Productivity Systems. "That is going to change within the next six months," said David Ferris, a San Francisco-based software industry consultant. One of the clouds of competition blowing over the horizon is the emergence of database managers built into the operating system. Several users believe this trend will force MDBS prices down. A little more to the point, Machrone said: "We hope they [the competition] will knock a hole in MDBS' prices."

Users claim that MDBS bogs down in an 8-bit multi-user environment.

Also rolling in over the horizon is software created for the mini world. Industry watchers expect a number of database managers that presently run on minis to be migrated down to micros within the year. Two new products that Ferris has his eye on are Ingres from Relational Technology, Berkeley, and Oracle from Relational Software, Menlo Park. Ferris believes these will give MDBS a run for its money. Koehler agreed, saying that "Ingres and Oracle and things like that cause us to give some consideration in product line and pricing."

While pricing issues unquestionably rank as the chief bitch among oem users, there was one technical issue causing concern in user camps: MDBS bogs down in a multi-user environment. "For 8-bit machines, the product is fast. But the multi-user version is noticeably slower, and I find that scary," observed Machrone.

"What they are seeing is the speed of the 8-bit multi-user operating system," countered MDBS president Koehler. "We do all our accounting using MDBS in a Z80 multi-user environment. One time it took 24 hours to run. So we dumped to tape, erased the disk, and reloaded. With a cleared-up directory, the same application ran in just two hours."

Koehler and company also turned up other noticeable run-time discrepancies. "We found a 20-to-one run-time difference between two very popular 8-bit-based operating systems running on the same piece of hardware. Even more dramatic, when we ran the same application and operating system on two different processors we got a 50-to-one difference," claims Koehler.

Complaints aside, MDBS supports what the market demands. This includes interfaces to Pascal, PL/1, COBOL, FORTRAN, C, BASIC and Compiled BASIC, and assembler. As for operating systems, the list includes Oasis, RSX, TRSDOS, CP/M, CP/M86, MP/M, MS/DOS, PC/DOS, and, most recently, several versions of Unix. Not to be forgotten is the hardware. Here the scope includes the Z80, the Z8000, the 8080, the 8085, the 8086, and the 68000.

What's more, MDBS Inc. appears to be in the business for the long haul. The formation of ISE-International attests to that. The company's commitment to internal growth stands as another milepost. Here in the States, the company has grown from one full-time employee and 1,200 square feet in facility space in 1979 to today's 120 employees and about 30,000 square feet spread across five facilities, including locations in Chicago and Dallas.

Keeping on top of the latest industry developments and trends has also been one of the company's strong points. For example, MDBS was right in step with IBM's P.C. announcement, as well as with the emergence of Unix and the 16-bit microprocessor, say users.

Continuing that tradition, one of the current products in development is a network-oriented database manager. Called DBnet, it is slated for release "sometime soon," confirmed Koehler. While the release date has slipped a bit, he insisted it was not because of technical problems, but rather because of corporate reshuffling and the arrival of a new head of R&D.

Linking micros to mainframes is yet another industry interest that MDBS says it is turning into a product. "We will probably pick one or two mainframe database systems," said Koehler, "and make it so a guy on a micro can access data from that mainframe and put it in his local database."

—Jan Johnson

CONFERENCES

COMDEX: GROWN TOO BIG?

In the four years since its inception, the show has exploded to the point where it has twice as many exhibitors as the NCC. What's more, it's still growing.

If anything at all will be remembered about the recent Comdex/Fall show in Las Vegas, it will be that the upstart conference has firmly established itself as a premier showcase of manufacturers' wares, rivaling even the National Computer Conference as the most glamorous of occasions at which to make a big splash or a product announcement.

The show's numbers stretch the limits of true comprehension. More than 1,100 vendors exhibited at the show, far outnumbering the most expansive of NCCs. The 320,000 square feet of booth space extended farther than the eye could see, even from the tops of the two-level Honeywell and Texas Instruments booths. And the hundreds (or was it thousands?) of new products seemed, in the end, almost indistinguishable from one another: with few exceptions, a product introduced in the morning seemed to have five competitors by midafternoon.

The show has changed dramatically in the four years since the Interface Group first sponsored an exhibition intended to introduce small, emerging vendors to dealers and distributors. The changes in the show have been a barometer for the industry, as companies have begun to concentrate as much on marketing their wares as on manufacturing them, as corporate dp managers have in some senses become more like internal systems integrators or dealers to end users, and as the microcomputer revolution has exploded beyond all bounds. Today, the show attracts dp managers and end users in almost the same numbers as it attracts independent sales organizations.

"I need to know what's new in micros because so many people in my organization are bringing them into the company," said one MIS director, who was worried about how to handle micros in his shop. He wasn't alone. While the show's attendance was not analyzed by its producers, a quick sampling indicated that the show presented a crowd similar to that found at NCC. There were many dp managers there and some end users; there were the dealers who

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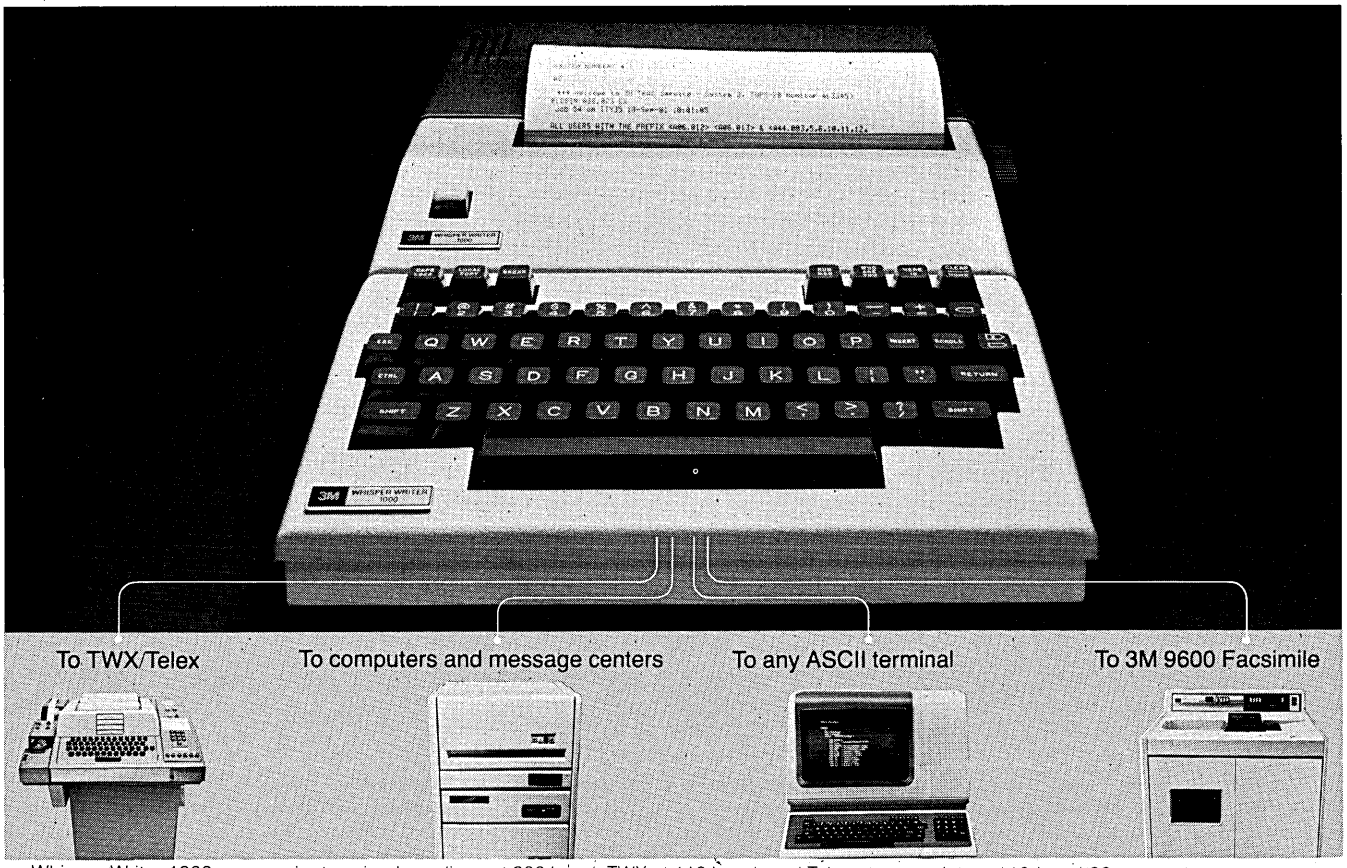

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were the show's original intended audience; and there were the large oems, which many new companies on the exhibit floor wanted to attract as their entrée to the big time.

Indeed, a majority of the exhibitors were young companies, reminiscent of the early days of the NCC's predecessors, the joint computer conferences. Some observers reckoned the average age of exhibiting companies to be about three years.

These young companies were almost exclusively the products of the microcomputer industry's tremendous growth. More than 50 microcomputer systems were announced or shown for the first time at the show, and even more vendors supplied disk drives, networking products, graphics capabilities, other peripherals, and software for these microcomputers.

A majority of the exhibitors were young companies, the products of the microcomputer industry's tremendous growth.

And if you think that this Comdex was big, wait until next year, boast the show's producers. The Interface Group, based in Framingham, Mass., already has firm Comdex/Fall contracts for 4,600 booths in 1983—compared to 3,200 this time around. The Las Vegas Convention Center, Las Vegas Hilton, and Riviera Hotels have already sold out their entire exhibit facilities, and the Sahara was half booked by the end of the show. "We're looking for a total of more than 5,500 booth units," said an Interface Group spokesman. The show is scheduled to run from Nov. 29 to Dec. 2, but "we're hoping for more time, since nobody can cover this big a show in four days."

Is this good or bad? For the producers, "it's a problem we love to deal with." For exhibitors, the answer is not so simple. Said one, "The people who come by are qualified and serious. There are no kids dripping ice cream on our keyboards." Others felt that Comdex, much like NCC, has surpassed its optimum size and needs to be smaller. "There were lots of kids on the last day and there are gimmicks—magicians and dancing girls—showing up in booths. A gimmick is needed in a show this big, and that's too bad."

One industry observer who has been watching trade shows for more than 10 years commented, "They're doing it to themselves just like the NCC did." He gestured to a large, elaborate booth. "That's a startup company. Is that what's needed to get into the business?"

Perhaps it is; perhaps it is the sign of an industry that has grown too quickly and has spawned too many competing companies. "Everyone knows there's going to be a shakeout," said Mark Garetz, president of CompuPro, Oakland, Calif. His company introduced a cpu board running the 10MHz Motorola 68000 processor at the show. "We've got the highest performance in the low end of the market and that will keep us in it," he added.

Bill Godbout, president of CompuPro's parent company, Godbout Electronics, was even more optimistic about CompuPro's success. "We're the first to be committed to Unix with a 32-bit machine. We think we have a winner." (Never mind that CIE systems, Digilog, Altos, Codata, Convergent Technologies, Pixel, TeleVideo, Victory, and possibly others announced microcomputers running Unix under a 32-bit processor—several also using the 68000. It's hard to be alone in this industry.)

Nowhere is it more difficult to be alone than in the IBM marketplace. While the company itself wasn't exhibiting products at the show, its presence was still felt; its Personal Computer was shown in some booths running a vendor's latest software, in other booths attached to the latest peripheral, and in still other booths connected to a network or a mainframe. Because IBM's shadow is so big, even in the microcomputer world, there is, at least for now, enough room for these companies to sell into the plug-compatible marketplace.

There were computers claiming to be IBM P.C.-compatible ranging from the Compaq, Corona, and Eagle systems, which run all diskettes written for the IBM machine, to the Computer Devices Dot system, which will run IBM software only if it is reformatted onto 3½-inch diskettes.

Other companies were pushing communications vehicles for the P.C. and its look-alikes: Protocol Computers, of Woodland Hills, Calif., showed a package that permits the transfer of files between a P.C. diskette and an SNA/SDLC mainframe host; International Anasazi, of Phoenix, Ariz., has a local area network based on SNA; and Technical Analysis Corp., Atlanta, has a printed circuit board that allows the P.C. to emulate a 3278 terminal while handling local processing.

Other microcomputer products of note included a local area network for Vector Graphics' computer, which uses telephone wire and modular jacks; a local area network, diskless network workstation, and 15MB Winchester drive from North Star for its Advantage series; Nestar's Plan 4000 system, which allows IBM Personal Computers and Apples to be connected to the same network concurrently; and Shugart's 1⅗-inch tall, 3½-inch microfloppy disk drive and half-height 5¼-inch Winchester drives.

The emphasis was so heavy on microcomputers during Comdex that the Association of Data Processing Services Organizations (ADAPSO) chose the occasion to announce its newest subassociation, the Microcomputer Software Association (MCSA). Said Dan Fylstra, founder and chairman of VisiCorp and one of the association's organizers, "I attended an ADAPSO meeting two years ago thinking the mainframe and micro markets were worlds apart. I soon learned we have the same basic issues to deal with."

The software was as visible as hardware at the show. The most popular software, perhaps, were the packages that integrated several functions into a single program and, again, there were several. These included the 1-2-3 package from startup Lotus Development Corp., in Cambridge, Mass., which delivers spreadsheet, graphics, and database management on a single disk; and the MBA package from Context Management Systems in Torrance, Calif., which enables users to use spreadsheets, graphics, and word processing simultaneously in different windows on the same screen and which was enhanced with telecommunications capabilities at the show.

There was also Jack, a program from Business Solutions, Inc., of Kings Park, N.Y., which integrates a personal filer, some spreadsheet capability, word processing, and a mailing list management package; and the Medallion Collection from Timberline Systems, Inc., in Beaverton, Ore., which includes five accounting packages and two personal productivity programs. Then there was the Sumicom 830 personal business computer, whose software integrates word processing, general business applications, database management, financial planning, information retrieval, communications, and graphics.

The software causing the biggest stir at the show, however, was the VisiON package from VisiCorp. VisiON integrates several applications into a single program, and employs a mouse instead of a keyboard as the user interface. The initial offering of the machine-independent operating environment includes spreadsheet, database management, word processing, and graphics applications. Both the mouse and the ease with which users can move information from one application to another were lauded by visitors to the San Jose, Calif., vendor's booth.

"The people who come by are qualified and serious. There are no kids dripping ice cream on our keyboards."

Naturally, the package did not appear to faze VisiCorp's competition, particularly since the package will not be ready for delivery until this summer. Said an insider at one competitor, "It's a defensive maneuver; the delivery date is a long time off, and it's no secret that others in the industry have been working on integrated software as well. We will be announcing something in the first half of the year, before their delivery date."

As at any show, there were also

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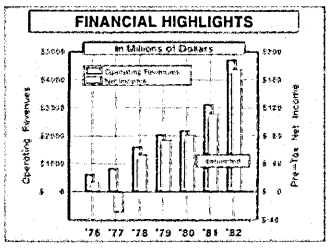

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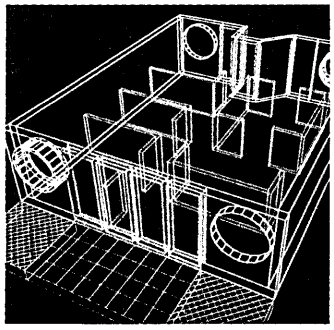

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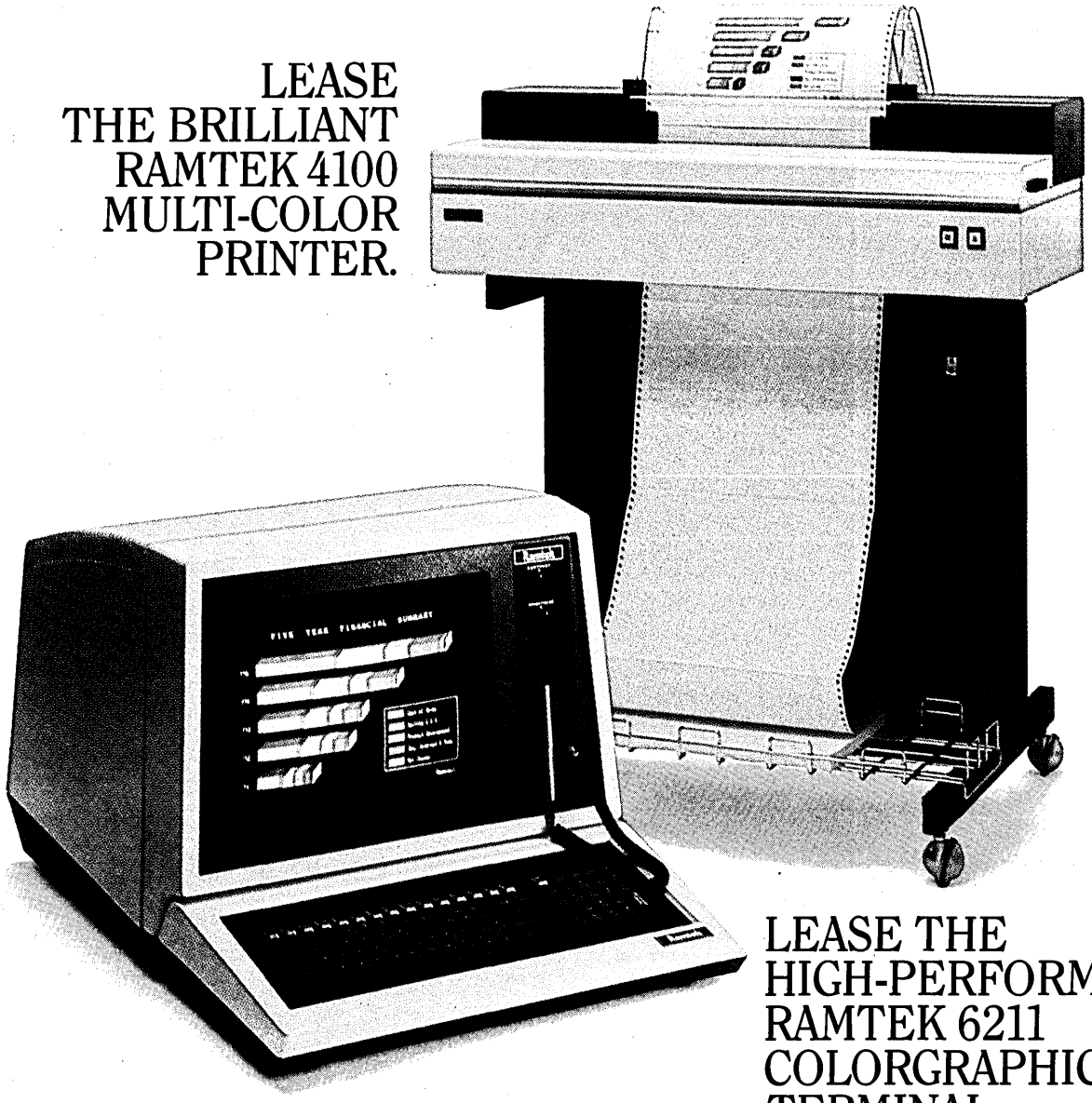

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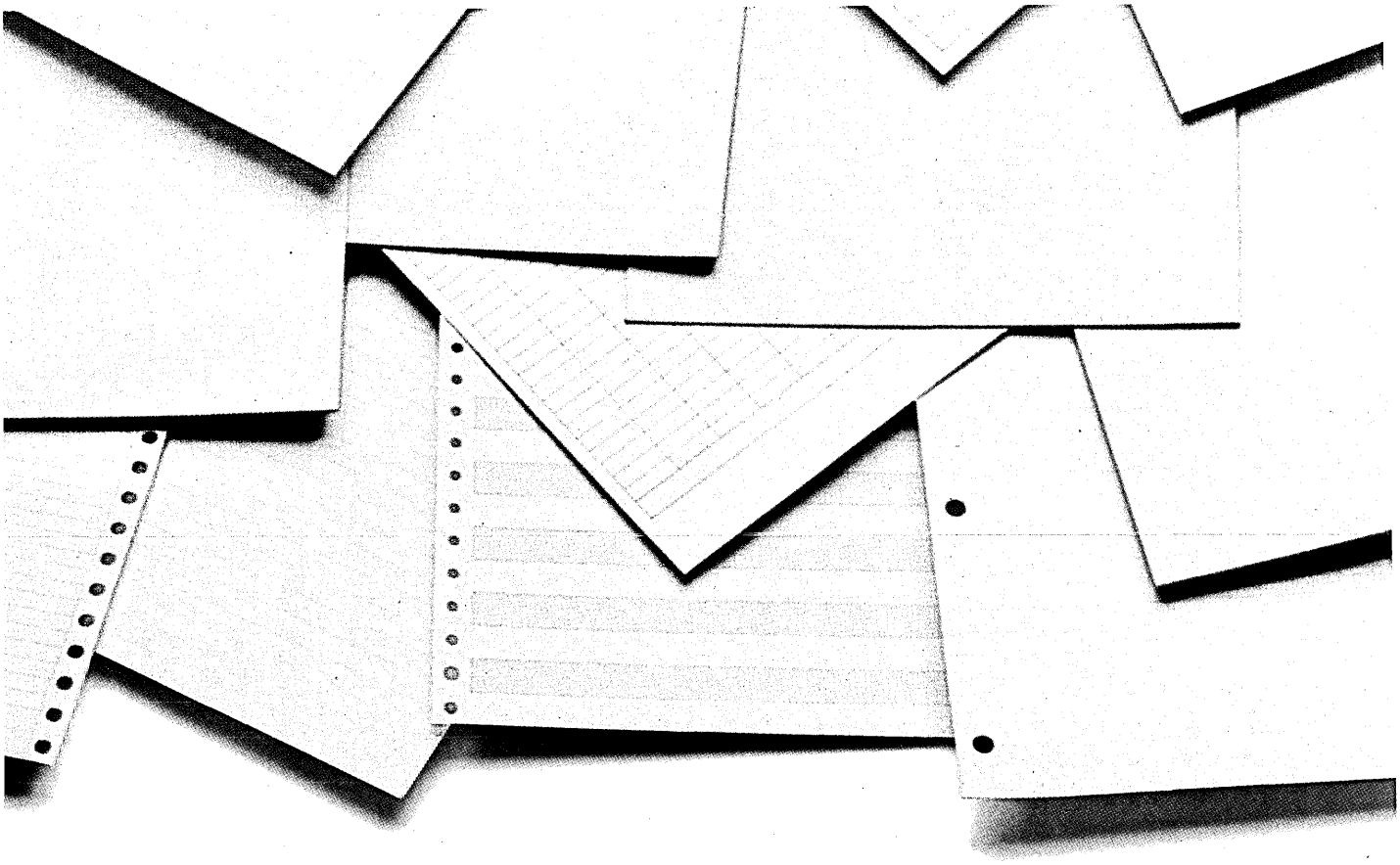

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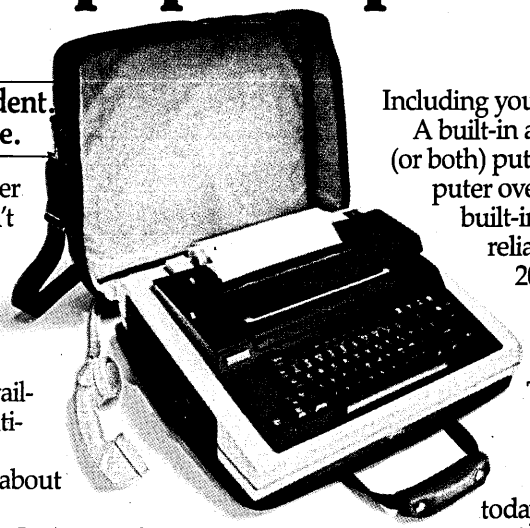

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products that could most accurately be called gimmicky. Yet even these products, in areas where the competition is less fierce, provide users and dealers with useful tools—they're just not very conventional. For instance, Peachtree Software introduced a microcomputer-based speech system called Speachware. The Atlanta vendor hopes to sell Speachware to its dealers and distributors to enhance and simplify the presentation, sale, and understanding of existing Peachtree software. The interactive system can store about eight hours of speech on a 20MB disk through speech compression techniques. The speech digitizer, the heart of the system's hardware, is supplied by Centrigram Corp. of Sunnyvale, Calif.

Finally, there were two new handwriting recognition terminals. Both makers, Pencept Inc., Waltham, Mass., and Cadre Systems, Downsview, Ontario., of course claim to be the first. Each is a digitizing tablet that has been programmed to recognize the basic orthographic characteristics of each letter or numeral and many examples of the way they are written. For example, the letter B is recognized if the user writes a vertical downstroke, followed by a lighter upstroke (or none at all) and two semicircles closed on the right. A pressure-sensitive pen is used with terminals that are designed to work with most mainframe, mini, and microcomputers.

—Michael Tyler and Edith Myers

SOFTWARE

SOFTWARE BUS PICKS UP SPEED

Executec is tackling the micro software world with not only ease-of-use criteria, but ease-of-support as well.

After IBM stepped out with its 16-bit P.C. last year, sanity seemed to step into the world of manic micro growth at large corporations. MIS directors who had worried or waffled about how to handle "this micro thing" today are talking about volume buying strategies, networking, micro/mainframe links, and corporate standards. But with control comes responsibility for such things as training and support. A new flock of problems has come to roost on the shoulders of MIS.

Software integration addresses part of the problem, in that an integrated software application is easier to learn to use than an application in which data have to be reentered multiple times on multiple diskettes. Most of the major vendors, including Digital Research, VisiCorp, Microsoft, and Peachtree Software, and several of the names newer to the game, such as Lotus Development and Context Management Systems, are capitalizing on that concept.

Support, however, has received noticeably less attention. One MIS director tells a good story about Apple and its inability to provide operating system level support. At a subsidiary company, he said, the staff "had entered three days' worth of data, then turned their machine off instead of going to end-of-job. So the VTOC never got updated," recalled Wayne McCollum, MIS director for Seligman & Latz Corp., New York. "I ended up going all the way to California because it was one of those things where we either get it fixed by 3 p.m. or call in a crew to reenter the data all night. The report had to go out the next morning. I called Apple and they said they would get back to me.

"In the meantime, I looked in the book and figured out what needed to be done to reconstruct the VTOC. I got back everything but three records. The next day Apple called and said, 'We're very sorry but it can't be done.' I said, 'wrong.' " Mainframe veterans like McCollum know the value of a well-supported product.

For the most part, support is not a concept close to the hearts of micro vendors. Their roots are in the "one guy at a retail store buying one application," observed Ken Parker, president of Executec, Dallas. It's a "status of mind" thing, he continued. "Micro software was written as if there were one user buying it for use on one machine that he would never outgrow."

Parker thinks he has a better idea. His company markets a product called the Software Bus. (If that conjures up images of a hardware bus, it should. But more on that later.) Like other companies, Executec talks about "ease of use" when it talks about its applications packages. But unlike other companies, Executec devotes a lot of time to "ease of support" in coping with rapid growth and change in micros.

Executec was founded in October 1981 by Parker, Larry Moyer, its vice president of technology, and David Caplan, who serves as Executec's chairman and is president of Aristadata, a New York-based market research firm specializing in the computer software and services industry. Between 1974 and 1978, Parker and Moyer played similar roles in a company called Insyte, which specialized in database and data communications systems. Insyte was sold to Applied Data Research of Princeton, N.J., in 1978. Parker's background also includes seven years with IBM and a stint at a startup venture called Information Management Associates, which was involved in

minicomputer applications. IMA was eventually sold to Singer Co.

Executec, which is privately held, completed its second round of private placement last summer. Although Parker won't talk about revenues, he did say the company sold about 70 evaluation copies of the Software Bus during last November. By this March, he expects to have 28 people on board.

And Executec's target market? The micro mavens within the MIS environment. The company is not going after the small business marketplace.

Executec's approach to software design appears to be unique to the micro industry, at least at present. Think of the Software Bus as a strip of programming that sits between the operating system and application programs, so that all applications interface to the bus and the bus interfaces to the operating system and to all outside devices. At present, the company supports the 8086, 8088, and Z8000; operating systems include CP/M, CP/M86, MS/DOS, DEC's POS, and will probably be adding Olivetti's PIOS, said Parker. Unix support is slated to begin this spring.

The company's target market is the micro mavens within the MIS environment; it's not going after the small business marketplace.

To accommodate new operating systems, Executec pulls out a specific section in the bus that talks to the operating system and replaces it with a new section. Changing the interface is not a "trivial" task, said Parker, "but from a user perspective, if he wants to move to a new machine or change operating systems, it's a lot easier than changing 100 programs."

There is a section of programming in the bus that contains the tables that handle peripherals, such as screens and keyboards. To accommodate new peripherals, Executec simply changes or adds new tables. Yet another section of the bus handles the interface to the application program.

Later this month, the company will announce tools that will allow users to develop their own applications under the Software Bus. As for old programs, Parker says they can coexist on the bus but not as fully integrated applications able to pass information back and forth among themselves.

Many of the applications presently offered are standard fare, such as a spreadsheet, a word processor, a personal records manager, and a communications package. That latter package, which supports 3270/3780 emulation, is more than meets the eye.

When the communications package is combined with several others, the following can be done. Using a toggle switch function, to be announced late this month, a user can compare data developed in the spreadsheet application with data on the mainframe. To copy data from the mainframe down to the micro, the user employs the "Import" function and the data are sent to the micro. With the aid of a feature called the interprocess file descriptor, the imported data are formatted into a usable form. As for SNA, the company is keeping an eye on IBM to see what it does on the P.C.

Another advantage to the bus structure is that the consistent user interface, the screen formats, menus, basic command functions, and help functions are all the same across the different application programs. "We've integrated all the user presentation service," said Parker.

Executec's second level of integration is data integration. "A user enters his data once and they flow through to the other applications," commented Parker. He described his file handler as "relational-like."

"It is relational in that it is described by tables with relational-like operations. MDBS [Micro Data Base Systems, Lafayette, Ind.] is a different order of magnitude. It is something to write over. We are not writing accounting systems. What we are doing here is giving the user personal productivity tools."

Executec offers two packages at present—one aimed at the data processing professional, the other at the banking industry. The banking series includes an investment analysis, fixed asset accounting, safe deposit accounting, loan organization, and asset/liability management.

The dp package offers all the standard tools mentioned—word processing, spreadsheet, and the like—plus an automated version of PromptDoc, the software documentation methodology that's been around for years but only in written form.

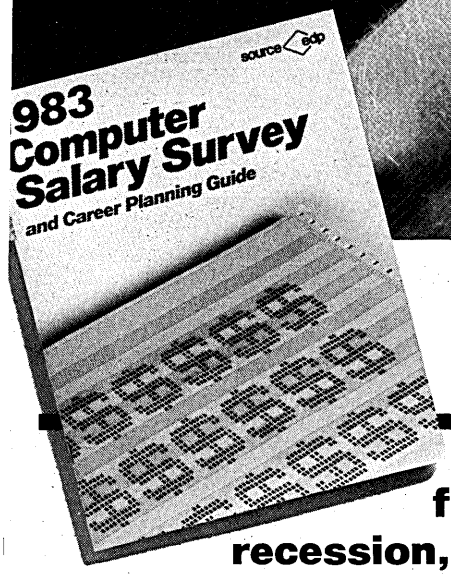
Later this month, Executec will announce tools to allow users to develop their own applications under the Software Bus.

Parker admits that the company hasn't sold as many PromptDoc applications as it would have liked, but he attributes the sluggish reaction to the fact that the product takes a lot of explaining. The automated PromptDoc "is such a new concept," he added.

User reaction to PromptDoc was mixed. "PromptDoc interested me when I first heard about it. Their manuals, however, which were written using PromptDoc, were a little hard to follow, and there is no index," said Phil Chamberlain, manager, Kodak processing lab, Eastman Kodak, Dallas. Chamberlain did emphasize, however, that he had not had much hands-on experience with the product yet.

Chamberlain also commented that

Somehow, Did Your Last Raise Seem Insignificant?



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Whatever computer specialty you're in, or plan to explore—programming, software, systems design, data communications, mini/micro systems, data base, computer marketing, sales, management or others—our Survey can help you make the most of your career. You'll be able to keep up with changes in the profession, establish career goals, develop action plans, evaluate your progress, spot potential dangers, take corrective action when needed, and in general, keep your career on the best possible course for growth.

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DataGeneral

CIRCLE 51 ON READER CARD

the Executec software "takes up more disk space than it needs to." He was running on an IBM P.C. with two 320K drives and 128K memory. "There is a lot of disk switching. For example, the system will not hold the software bus program and the utility program required to do file handling and file directories. They [Executec] did tell me over the phone they plan on reducing the size of one or both of the programs so they would fit on one 320K disk."

Another user, Joel White, principle designer of business systems for Martin Marietta Aerospace, Michoud Operations, New Orleans, said he liked Executec's approach with PromptDoc. "The manual has been around for years and the concept is well founded. I like the idea of establishing standards for documentation and being able to automatically call up section templates that you can put into a section of your own documentation." Overall, White said he gave the product high marks in the ease-of-use category.

Other products in the pipeline are applications for producing proposals, business and marketing plans, office procedures, guides, and laboratory abstracts. By the end of next month, the company intends to announce at least two general business applications, then continue announcing additional applications at the rate of one every two months for the balance of '83. Two applications definitely planned before year-end are a graphics package and a report generator.

Another specialized series the company hopes to expand into is applications for the CPA. "We are working with specialists in the CPA industry now," said Parker. "They will provide the specialized software and market it to the CPA industry. We are looking for other partners who have specific expertise in a vertical industry."

—Jan Johnson

TERMINALS

ROMAN MEETS FARSI

A new company thinks it has the answer to bilingual communications in the world of Arabic.

Electronic communications is hardly considered a problem in the day-to-day job of an employee, especially here in the United States where only one alphabet is used. In the 32 countries where Farsi, the alphabet used by Arabs, Iranians, and many other Islamic societies, predominates, however, it's a major problem.

It all has to do with entering Arabic text into a telex or computer terminal. Farsi characters not only run from right to left, but, depending on their location within a particular word (i.e., at the beginning, in the middle, or at the end), they take on different shapes. Obviously, the alphabet was not "designed" for computers. It evolved over the centuries for moving hands that, having writ, move on.

The modern day trouble comes, though, when Farsi and Roman characters, mixed in the same text, are entered into an electronic system; which way is the terminal's cursor to move as it switches back and forth from alphabet to alphabet?

A startup company in Elmsford, N.Y., says it has come out with a telex terminal designed to solve just that problem. It is, the company claims, the first Farsi-Roman terminal able to make the transition on the fly, so that a bilingual operator need only hit one key to change character sets. The machine, based on a microprocessor, takes care of which characters go where and in what direction.

Founded in 1979, International Digital Electronics Associates took its name from its acronym. The company is

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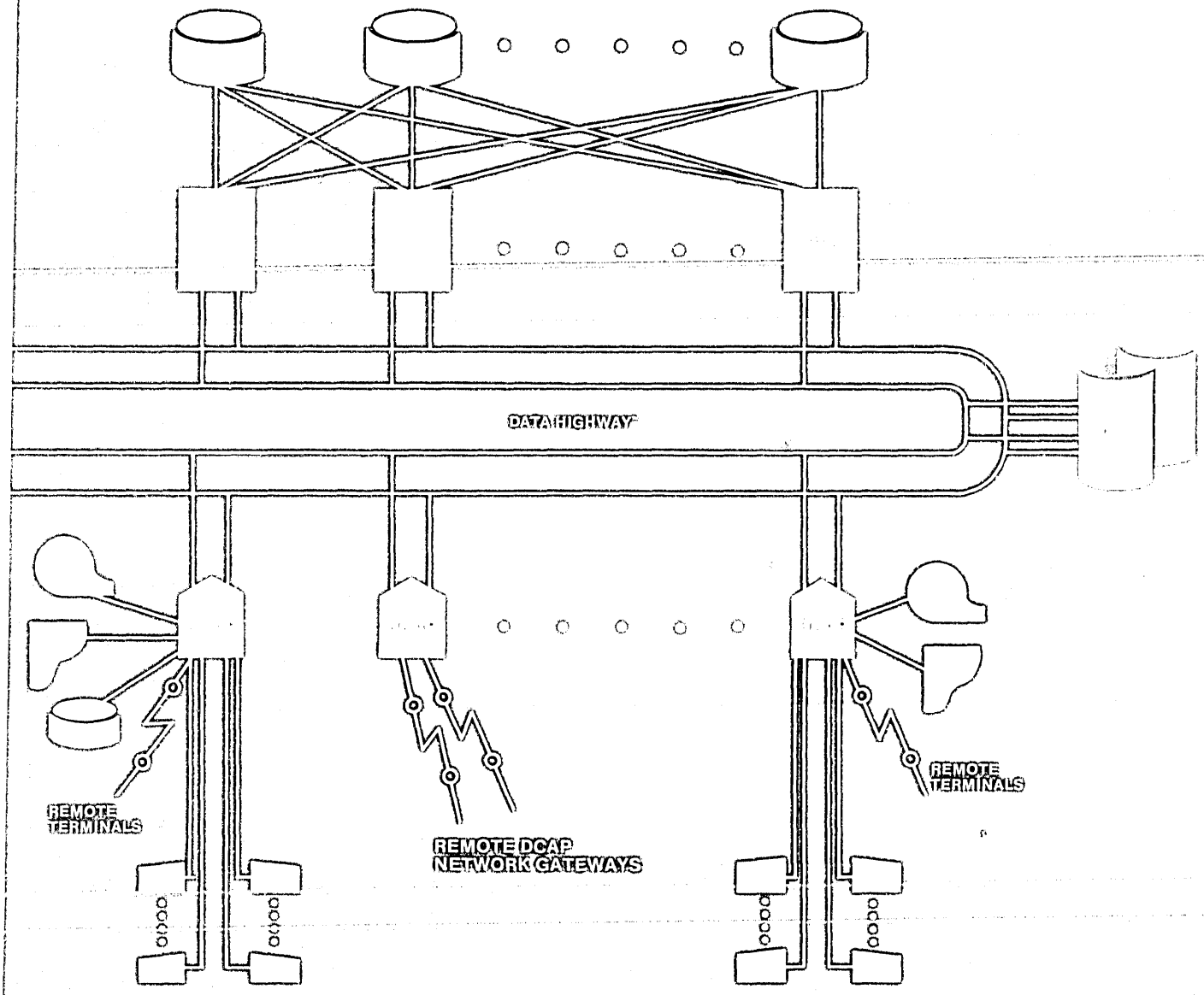

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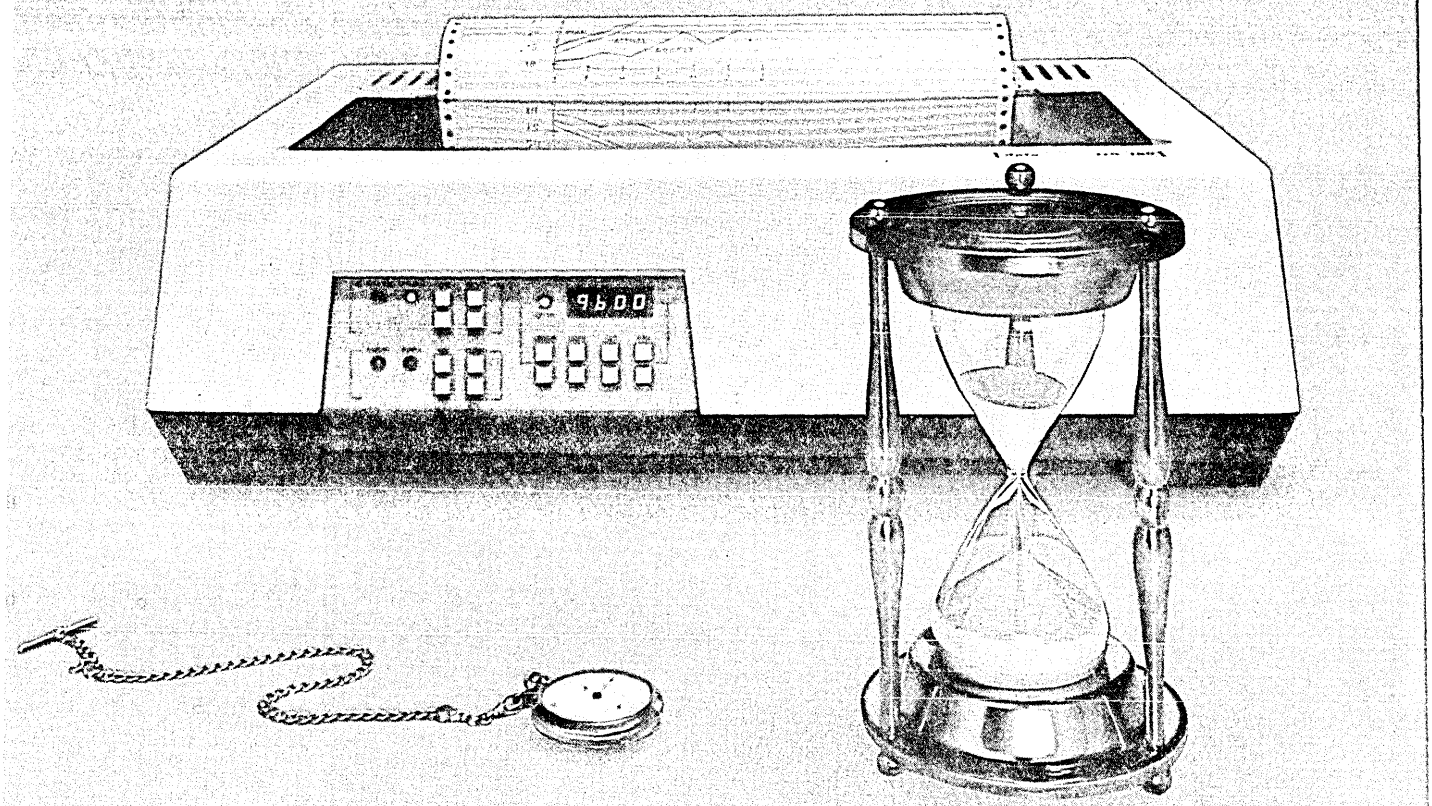

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CIRCLE 55 ON READER CARD

operated by a group of partners who all at one time or another worked in the field of computing in Iran. Most left in a hurry during the revolution of 1979. Hooshang Kaen is executive vice president and the lead founder of the firm. He remembers telex services as the only reliable means of communicating within Tehran, no less in the country of Iran itself.

"Telephones were so scarce they were being sold on the black market," he recalls. "The Tehran phone itself was totally saturated. You couldn't dial two digits before the system went dead."

The founders of Idea all worked in Iran at one time or another, but left because of the revolution.

Kaen at the time was heading Iran Digital Computers, the official distributor of Digital Equipment computers in the country. Business was good, until the Ayatollah arrived, but "sitting behind those damn telex machines for so long gave us hands-on experience. It was then that the idea for a bilingual telex system came to our minds."

The market for such a terminal would seem to be vast. Think of it: 32 countries, some of them the richest in the world on a per-capita basis, moving all those telex messages back and forth. The first iteration of Kaen's bilingual algorithm, which handles the cursor movement and character formation, was put on an Ontel intelligent terminal. Now the company has introduced a terminal it designed itself, which features an Intel 8085 microprocessor, floppy disk drives, and a variety of add-on features.

The terminal, designated Bitelex-1, will sell for between $3,500 and $4,900, depending on features ordered, according to William J. Frankhuizen, vice president of Idea. He noted that the machine has been designed around a direct memory access (DMA) architecture so that I/O is not a problem. Four ports in the system can be used to attach printers, communications lines, crt terminals, and disk drives. The system has 64K bytes of RAM, 32K bytes of erasable ROM, and up to 2K bytes of EPROM, which handles telex answer-back protocols and configures the system when it is turned on. Floppy disk storage is configured to resemble logically the traditional paper tape used in telex machines, Frankhuizen notes.

The Bitelex is based on an Intel 8085 microprocessor, which helps format messages and handle communications functions.

The company said initial customer shipments of the terminal are set for the first quarter of this year. Financing has come from "multinational sources," Kaen claims, but he declines to provide specifics. The terminal's design also lends itself to handling Japanese characters, so that market will be approached as well. The company expects to sell at least 2,000 units this year, primarily to U.S. and Middle Eastern customers.

The company expects most of its sales to come from the U.S. and Middle East, but Japan is a potential market as well.

Heading sales will be vice president of market development Walter C. Terbrusch, who joined the firm from Western Union, where he was manager of national systems sales. Also on board is Charles Reilly, who was a manager of Informatics General's former Iranian operations and serves Idea as vice president.

The closest competition for the Bitelex terminal, says one official, is a Siemens device that sells for more than double the price. Idea hopes to gain most of its sales through distributors and common carriers and has already signed up several of the latter in the Middle East.

—John W. Verity

NEWS IN PERSPECTIVE

BENCHMARKS

REVERBERATIONS: Itel Corp.'s computer business fell to its knees in 1979 after IBM pulled the rug out from under it with the 4300 Series of mainframes. Lawsuits from shareholders were filed swiftly. A recently released report by a court-appointed examiner says the collapse of the leasing company was caused by decisions of its top management and failure to act by outside auditors. The report stated that Itel should consider suing its former top management and the auditors, as well as a former law firm, for breach of contract, negligence, and breach of fiduciary duty. "Significant facts and developments" were hidden from auditors Peat Marwick, Mitchell & Co. by management and the law firm Brobeck, Phleger & Harrison of San Francisco, the report said. Peter S. Redfield, cofounder, president, and chief executive of Itel, was noted in particular for his "dominating" management style. Adequate financial controls, the report said, were precluded by Redfield, who thought they would "stifle entrepreneurship" and threaten Itel's high-flying "ambience." A few days after the report was released, Itel disclosed that it had agreed in principle, along with Peat Marwick, two underwriters, and 22 individuals, to pay $40 million to settle 13 class-action lawsuits that had charged Itel and others with defrauding shareholders.

TOP DOG: Frederick R. Adler, the entrepreneur who helped get Data General off the ground and who has since been involved in many startups, has been elected chairman of Micropro International Corp., a San Rafael, Calif.-based software supplier. Adler had been a director of the company, which specializes in personal computer software, and now succeeds Seymour I. Rubinstein, who continues as president and chief executive. Micropro laid off 10% of its employees in an attempt to reduce overhead and achieve its first profits. It is not clear if Adler's chairmanship is related to those moves, but it would seem he brings a large reserve of entrepreneurial savvy to the company. He is understood to have a 19% stake in Micropro, which sells the popular Wordstar word processing package. Reportedly, Micropro is shipping $3 million of software a month, with annual revenues for the year ended Aug. 31, 1982 of about $25 million. The company is expected to post its first profit in the current fiscal year.

PC SECRETS: IBM last September charged three employees with forming a company to market add-on devices for the IBM Personal Computer while the three were employed by the company. The products the men proposed to market were based on proprietary knowledge of future IBM developments, IBM claimed. The company said it had evidence that the three—Lewis C. Eggebrecht, Peter J. Stearns, and William W. Erdman—had conspired to misuse trade secrets. In late November, IBM won a tough injunction against two of the men, forbidding them to use any proprietary knowledge of IBM business information. Observers pointed to one phrase of the injunction's definition of trade secret as showing the wide scope of the order: "all ideas . . . related to . . . actual or anticipated business or research and development of IBM." As for Erdman, IBM settled trade-secret-theft charges against him when he agreed to repay a portion of his past IBM salary and to testify when the other two men come to trial.

BAIL-OUT: A group of private investors came to the rescue of Magnuson Computer Systems by buying $21 million in secured debt from Bank of America for $4.59 million in cash and warrants. Magnuson has been fighting since early 1982 to stay in business after financial results slipped badly and its loans became due. The group of investors was led by William R. Hambrecht, partner in venture capital company Hambrecht & Quist, of San Francisco. Hambrecht is a director of Magnuson's board. Reportedly, Magnuson is still not out of the forest. It must come up with more money to finance future growth since current investors have merely given it enough to keep it afloat. The firm's business, selling mid-range IBM-compatible computers, has come under severe pricing attack by IBM in recent months.

IT'S A FACT: IBM has entered the facsimile market with Scanmaster, a device designed to digitize images and communicate them to mainframes and other similar fax machines. The introduction marks IBM's entry into a market that has long had promise but only recently taken off. Japanese companies, Xerox, and Burroughs currently control much of the world market that is gradually making a transition from analog to digital technology. IBM's unit works with the firm's 8100 distributed processor, the Displaywriter word processor, and the 5520 administrative system through new software introduced with the Scanmaster. The new machine uses an electrostatic printer with resolution of 200 dots per inch and is priced from $11,880 to $14,880. The machine scans and prints pages at a rate of about one per minute, the company said. Print and scanning assemblies are supplied to IBM by Toshiba in Japan. IBM said initial production shipments are slated for March 1983. Leasing for the Scanmaster will be supplied through IBM Credit Corp.

SUSPENSION: Industry leader IBM and National Advanced Systems said they agreed to suspend proceedings and seek an out-of-court settlement of civil racketeering and unfair competition charges brought by IBM against NAS. IBM had filed suit against NAS as part of its crackdown on allegedly stolen trade secrets. NAS agreed to hand over several IBM documents detailing product plans and to supply information to IBM about each and every person at NAS who had had access to the documents. In return, IBM said it would work out of court to find a settlement and said it would not pursue any court action in the civil matter until 20 days after completion of a criminal case against Hitachi on similar charges. Hitachi supplies NAS with several models of IBM-compatible mainframes and was charged with criminal possession of IBM documents in a widely publicized "sting" operation early last summer.

ON-LINE: One of the first users of Xerox's model 1050 digital scanning equipment is Landart Systems, Inc., New York, which has set up a timeshared laser printing service with nationwide access. The company's LaserLink service is designed for fast-turnaround jobs like reports, manuals, newsletters, direct mail, and books. Users compose text on terminals and, depending on the type of job, can have printed copies ready in 24 hours, according to John Gilmour, president. Photographs and other graphics can be used by digitizing them through the 1050 system, which Xerox introduced last spring as an add-on to its electronic printing offerings. Copy is stored in a DEC-20 mainframe until the time of printing, when it is transmitted to a Xerox 9700 for output, Gilmour explains. The cost per page is said to be less than half that for standard offset printing and is charged for on a per-unit basis. Gilmour said the system produces up to 7,000 pages per hour and gives users the ability to print only as many copies of a document as they require.

DISK DRIVES: Storage Technology was the worldwide leader in 1981 among pcms in shipments of rigid disk drives with revenues of $320 million, or 60% of the total, and Control Data led the oems with 51% of the total, or $568 million. According to the 1982 Disk/Trend Report, shipments last year of IBM 3380 drives, featuring thin film heads, reached 11,000 spindles, and will grow to 28,000 in '83. Worldwide revenues for rigid disk drives in '81 and '82, of course, were affected by the poor economy, but they were expected to increase last year by 24%, reaching almost $8 billion, and grow to $15.4 billion in '85. James N. Porter, publisher of the annual study, observes that removable-media drives are declining in popularity and should account for only 15% of the total in '85. But the best growth rate is being shown by 5¼-inch fixed Winchesters of less than 30MB, shipments of which are forecasted to grow from 269,000 units in '82 to a whopping 1 million in '85. Credited for this popularity is the upgrading of desktop computer capabilities. ✻

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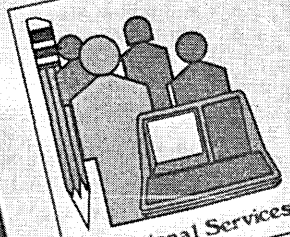

Student Opinion Form

Educational Services/Quality Assurance Program

Course Name: _____

Course Number: _____

Course Ending Date: _____

Training Center: _____

This Student Opinion Form is designed to help Digital assure the quality and usefulness of its training courses. Please respond carefully and objectively as indicated below.

- Complete the course information above. Do *not* write your name anywhere on this sheet.
- The other side of this sheet consists of two sections: *Background Information* and *Evaluation of Course*. In the *Evaluation of Course* section you will find a list of numbered statements that may or may not describe your opinions about this course. Please indicate whether you agree or disagree with each by selecting the appropriate lettered box from the following choices:

SA = Strongly Agree
A = Agree
U = Undecided

PLEASE READ DIRECTIONS ON THE OTHER SIDE. SELECT THE *ONE* BEST ANSWER.

BACKGROUND INFORMATION

- What is your relationship with Digital? (a) customer (b) employee (c) other — a b c
- What is your primary job area?
  (a) hardware (b) software (c) management (d) education (e) other — a b c d e
- How many years of experience have you had with computers?
  (a) less than 1 (b) 1–3 (c) 4–6 (d) 7–9 (e) 10 or more — a b c d e
- Did you meet all the stated prerequisites? (a) Yes (b) No — a b
- Why did you take this course? (a) general interest (b) required for current job
  (c) required for new job (d) to help get new position — a b c d
- What is your native language? (a) English (b) Spanish (c) French (d) German
  (e) Italian (f) Japanese (g) Chinese (h) Dutch (i) Swedish (j) Other — a b c d e f g h i j

FEED

EVALUATION OF COURSE

SA=Strongly Agree A=Agree U=Uncertain D=Disagree SD=Strongly Disagree NA=Not Applicable

COURSE DESIGN AND RESOURCES	1.	I learned a lot of valuable skills and information.	1	SA	A	U	D	SD	NA
	2.	The course content met my expectations.	2	SA	A	U	D	SD	NA
	3.	The course was well organized.	3	SA	A	U	D	SD	NA
	4.	The course materials were easy to understand.	4	SA	A	U	D	SD	NA
	5.	I needed all the information contained in the course materials.	5	SA	A	U	D	SD	NA
	6.	The course emphasized the real job.	6	SA	A	U	D	SD	NA
	7.	My test scores accurately reflected what I learned.	7	SA	A	U	D	SD	NA
	8.	The lab exercises were useful for learning.	8	SA	A	U	D	SD	NA
INSTRUCTOR	9.	The instructor was very knowledgeable in the subject.	9	SA	A	U	D	SD	NA
	10.	The instructor answered difficult questions easily.	10	SA	A	U	D	SD	NA
	11.	The instructor's presentations were easy to understand.	11	SA	A	U	D	SD	NA
	12.	The instructor made the course interesting.	12	SA	A	U	D	SD	NA
	13.	The instructor managed class discussions well.	13	SA					
	14.	The instructor took the time to answer questions.	14	SA					
	15.	The instructor was patient and helpful.	15	SA					
	16.	The instructor emphasized the objectives of the course.	16						
	17.	The instructor made effective use of the available time.							
TRAINING FACILITY	18.	The training center provided all the services I needed.							
	19.	My workspace in the classroom was comfortable.							
	20.	The classroom was well laid out.							
	21.	The lab was functionally laid out.							
	22.	The lab time was adequate for this course.							
	23.	My housing was satisfactory.							

24. Please indicate your *overall* impression of this training experience.
E=Excellent VG=Very Good G=Good F=Fair P=Poor

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Early birds thought full-motion video was the niftiest thing since corporate jets, but simpler systems seem to have the edge for now.

TELECONFERENCING COMES DOWN TO EARTH

by Laton McCartney

Your company's ceo puts down his copy of the *Harvard Business Review* and starts to compose a memo. He has just discovered teleconferencing. The benefits look impressive: greatly reduced corporate travel costs, more productive managers, and a competitive edge that could boost company sales. No more 7 a.m. shuttles to Boston or "red-eyes" back from the coast. With teleconferencing, the most distant field office is no farther away than the conference room in corporate headquarters.

And who does the ceo turn to when he wants a posthaste analysis of various teleconferencing offerings, a breakdown of projected costs, and the like? Chances are, that memo is headed your way. "The chief executive becomes enthusiastic, and suddenly the data processing people or the telecommunications people find they have to become instant experts on teleconferencing," says Thomas P. Cross, president of Cross Communications in Boulder, Colo.

Of course, teleconferencing is nothing new. It has been technically feasible for more than a decade and economically feasible, in some forms at least, since the mid-1970s. Yet until recently, teleconferencing—defined as two or more remote locations communicating via electronic and/or image producing facilities—has failed to gain wide acceptance despite its highly touted benefits. "There have been real problems, and the technology is only just starting to catch on," asserts Philip F. Pagano, a principal with Comnet, a communications consulting group in Garden City, N.Y.

Part of the problem has been cost. The price tag for a full-blown teleconferencing system complete with full-motion, color transmission capabilities, high resolution graphics screens, and high-speed, high-definition intelligent copiers or facsimile units can cause even the biggest corporate spenders to think twice before reaching for their checkbooks. For example, at the behest of its president, Robert O. Anderson, Atlantic Richfield (Arco) has spent an estimated $20 million upgrading its terrestrial intracorporate network to a satellite system with extensive teleconferencing capabilities.

Costs for installing each teleconferencing room in an intracorporate network can easily exceed $1 million after all the bells and whistles have been added, and the earth stations needed at each site if satellite is used can run as much as $1 million as well. Full-motion video coder/decoders, better known as codecs—the units that convert analog video to digital form and vice versa—cost over $100,000 apiece. Manufactured by two companies, NEC America, Inc. of Fairfax, Va., and Compression Labs, Inc. in San Jose, Calif., codecs are needed in each teleconferencing room using the full-duplex T1 channel required for full-motion transmission.

Transmission costs themselves can also prove prohibitively steep. A one-hour transmission by a company with its own teleconferencing facilities between Los Angeles and New York runs $1,640 over AT&T's Picturephone Meeting Service (PMS). Charges for the same meeting for a customer who uses AT&T facilities—PMS public rooms—would run almost twice that sum.

At the same time, users who jumped on the teleconferencing bandwagon early on perhaps looked for too much from the technology. Its promoters depicted the teleconference as a smoothly run meeting in which the participants articulately and concisely expressed their views while adhering to a strict agenda. In reality, users found this wasn't always the case. "They expected the Johnny Carson show, and that just isn't the way it happens," observes Comnet's Pagano.

Moreover, in some instances at least, teleconferencing was force-fed to the managers, engineers, and other corporate users who were expected to benefit most from it. The result was a backlash against the technology. Managers *liked* flying off to San Francisco for a three-day meeting at the St. Francis. The trip was one of the perks that went with the job—one they didn't want to give up.

USERS RESIST FORMAT

Teleconferencing advocates also encountered resistance from users who felt uncomfortable or ineffectual in a meeting with a format and structure that was dictated by the limitations of a particular technology. "You can't arbitrarily start imposing styles on people in a meeting situation where behavioral dynamics come into play," asserts Joseph Ferreira, vice president of the Diebold Group, Inc. in New York. "Each manager has his or her own way of getting things done and communicating, and the teleconference, unless it's done properly, can often inhibit or diminish the effectiveness of the participant."

When the early report cards came in, many users of teleconferencing—in its full-motion video form, at least—were less than enthusiastic. "Nearly half our members have tried out videoconferencing and almost all of them have rejected it," says John J. Connell, who heads up the Office Technology Research Group in Pasadena, Calif.

This initial disappointment has led to a reevaluation of the technology on the part of vendors and users alike. What's emerging as a result is a more realistic view of what the technology can and cannot do and a growing awareness that the teleconference does not necessarily have to be a multimillion dollar Hollywood production to prove effective. "Today there is a variety of different approaches and options open to the teleconferencing user," says Glenn Southworth, president of Colorado Video, Inc. in Boulder, Colo.

"And you don't have to be a top U.S. company with an enormous budget to use teleconferencing today," adds Greg Paulsen, director, consulting, services and training with VideoNet of Woodland Hills, Calif.

Frequently, users who want to experiment with teleconferencing without having to commit to a system of their own will try ad hoc or special event teleconferencing. Just as the name implies, this kind of conference usually focuses attention on an important corporate event—a press conference or a national sales meeting, for example. Here the vendor will generally "produce" the conference, providing everything from tv cameras and satellite links to encryption if needed to ensure transmission security. Major competitors include the AT&T PMS offering, Netcom International of San Francisco, VideoNet, Video Star Connections of Atlanta, and Western Union, which recently entered the

ILLUSTRATION BY ANDREA BARUFFI


ANDREA ZIRUFFI '82

Teleconferencing does not have to be a multimillion dollar Hollywood production to prove effective.

field with Western Union VideoConferencing, Inc., Upper Saddle River, N.J.

Holiday Inns, Inc. also offers special events teleconferencing at some of its hotels and motels, as does Hilton. Hyatt is reportedly thinking about entering the business, while Marriott has installed satellite dishes on seven of its hotels and has acquired additional transportable dishes for teleconferencing applications. And recently Intercontinental Hotels Corp. and Comsat General Corp. announced a joint venture that will link Intercontinental Hotels in London and New York with audio, video, and document display facilities.

FROM A VW UP TO A CADDY

Prices for special event teleconferencing vary from $10,000 or so to as much as $500,000, depending on the components utilized. VideoNet, for example, provides a whole spectrum of offerings including preproduction assistance with slides, tapes, and speeches. Then there's the actual production, which may involve a single tv camera or a battery of cameras and elaborate production facilities reminiscent of a network tv special.

The cost of satellite transmission varies according to the hour of the teleconference and the location of the teleconference sites. Customers who want to ensure confidentiality will also have to pay for encryption.

The type of projection equipment needed at the sites—a giant screen for a large group, normal size tv console for a small group—is another factor in pricing, as is return audio. Generally, ad hoc conferencing is point-to-multipoint transmission, meaning, say, that the senior management of a company addresses reporters at several cities around the country. Participants at the remote sites receive a video picture from the central site and respond audibly with questions or comments. If a number of cities or remote sites have to be connected so that all participants can hear the speakers at the other remote sites, the cost of return audio can prove significant.

For some companies the ad hoc conference serves as a first step toward a private system. "We've had a number of customers who've used the special event conference as a pilot for their own programs," says Beverly Johantgen, VideoNet's program director. VideoNet, Western Union, and AT&T have all established consulting groups to help customers make the transition.

Audioconferencing is another way of reaping some of the benefits of teleconferencing without having to shell out the big bucks for full-motion video. An outgrowth of the traditional corporate conference call, audioconferences are generally carried out by outside companies such as Darome, Inc. of Harvard, Ill.; Kellogg Communications Corp., Littleton, Colo.; and Connex International, Danbury, Conn. These companies use sophisticated bridging equipment to link the various sites together. Users call a central telephone number at a prearranged hour and as many as 80 locations can be tied in.

AUDIO AS A STEP TO VIDEO

Many companies use audioconferencing as a preliminary step to videoconferencing. Bank of America, as an example, has operated a dedicated audioconferencing facility between Los Angeles and San Francisco since 1974, but only recently began experimenting extensively with color video between the same two sites.

Clifford F. Moss, vice president of field engineering with Storage Technology in Louisville, Colo., is probably a typical audioconferencing user. He would use video if the price came down, but in the meantime holds regular audioconferences with his six field managers as a means of monitoring their activities and pinpointing potential problems early on. "I find audioconferencing very convenient," Moss says. "It's improved communications and cut down on all our travel time. It's extremely cost-effective."

Moss estimates a typical audioconference linking Louisville and six field sites runs about $200. He emphasizes, however, that for the audioconference to prove effective a strict protocol is required, with one person acting as moderator. "Otherwise the participants are all stepping on each other's feet," he explains.

Audioconferencing is often supplemented by live graphics such as facsimile and electronic bulletin boards or electronic blackboards. The cost of these additions is within reason. For example, Tom Cross estimates the use of an electronic bulletin board such as AT&T's Gemini unit runs about $66 a hour, and as a result so-called "enhanced audio" or "audiographic" conferences are becoming more widespread. "We find audioconferencing supported by live graphics gaining far wider acceptance than live video," John Connel notes.

Slow scan, or freeze-frame, conferencing is another cost-effective alternative to full-motion video. Transmission costs for freeze frame, in fact, run about the same as those for audio, and for a private network a freeze-frame transceiver can be acquired for under $25,000.

Freeze-frame detractors argue that the technology is inherently distracting because the frame changes only twice a minute (as opposed to every one thirtieth of a second with full motion) and the voice and the picture are often out of sync.

Pagano of Comnet believes that too much is made of this argument, however, pointing out that companies such as IBM and Ford have had success with freeze-frame systems. "Most applications can be put on freeze-frame as long as the user knows what he's doing," he says. "It's not glamorous, but it works."

The experience of Corning Glass Works of Corning, N.Y. bears this out. Corning decided it needed some kind of teleconferencing capability in 1981. Its operations were geographically diverse and situated in relatively remote areas. "We make television tubes in Bluffton, Ind., and automobile headlights in State College, Pa., as an example," says Kevin V. Shannon, a telecommunications network analyst with the firm. "Our people were spending an enormous amount of time traveling back and forth between these places just so they could sit down and hold a regular meeting."

Initially full-motion video was considered but was counted out for two reasons. Operating as it did outside a major metropolitan area, Corning found that access to satellite bandwidth was a major constraint. And senior management simply didn't believe the cost of full motion was justified. "With the economy as it is, we worked under a strong guiding hand which ensured our teleconferencing system had to be cost-effective," Shannon says.

Audioconferencing also received the thumbs down sign at Corning. "Audio was a step in the right direction, but you need pictures when you're dealing with products," Shannon explains. "If you have a problem with a piece of glass, for instance, you need to be able to show the mold mark where the cut was made. To describe it verbally would take hours."

Corning is so pleased with its slow scan facility that, as a pilot project, it has added an additional link between headquarters and its Greencastle, Pa., plant and is using the system for regular sales and production meetings.

VIDEO SUCCESS STORIES

Of course, full-motion video has its success stories as well. Dr. Lawrence Gould, chairman and chief executive officer of M/A-Com, uses teleconferencing to implement a lean, efficient management approach in running the 26 companies that report to him. M/A-Com's system links the nine-room suite in a small office building in Boca Raton, Fla., that serves as the company's headquarters with four major M/A-Com centers in San Diego, Calif.; Catawba, N.C.; Germantown, Md.; and Burlington, Mass. Through a subsidiary, Macomnet, the company is also a vendor of turnkey teleconferencing systems that make use of its satellite link. As of November, howev-

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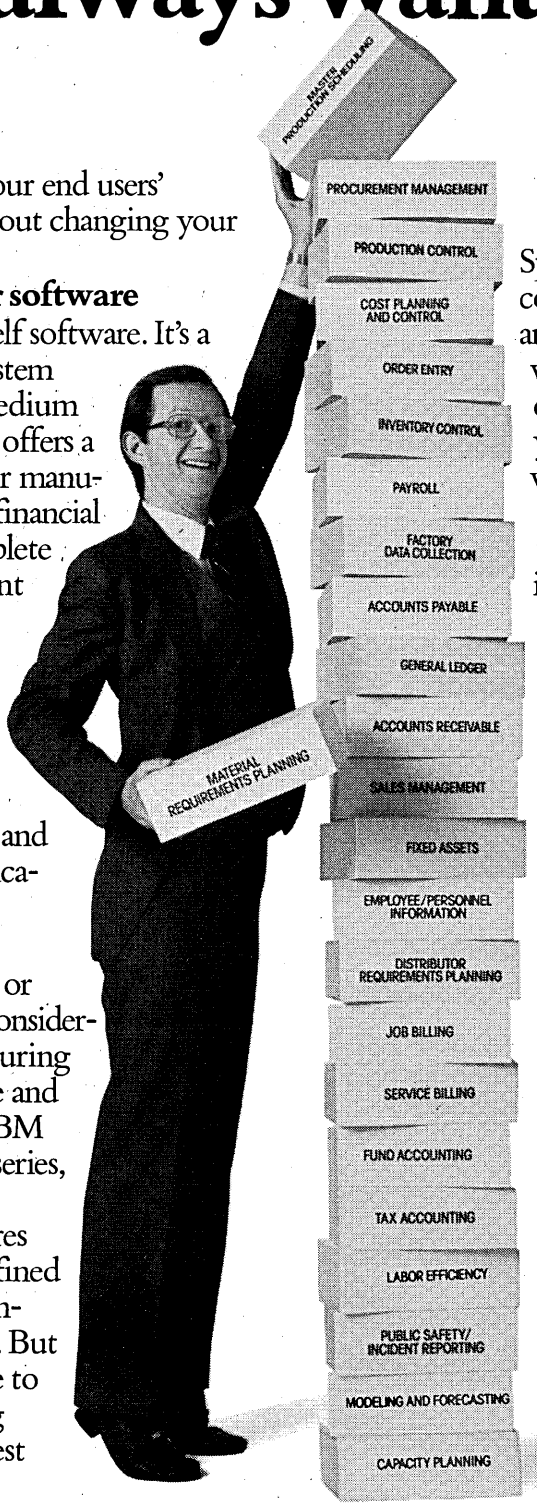

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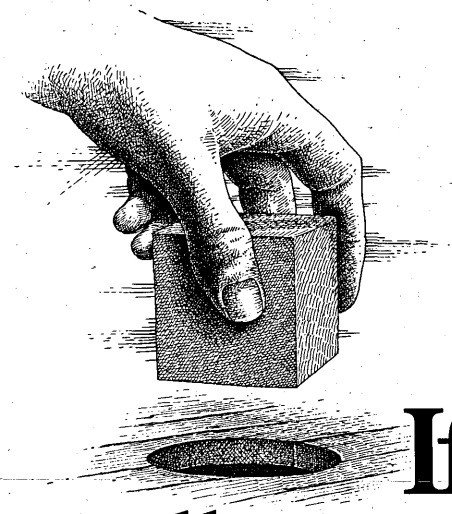

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CIRCLE 61 ON READER CARD

HOW TO TELECONFERENCE

No matter what teleconferencing approach you choose, there are certain important points to consider in evaluating and installing a system. Among them:

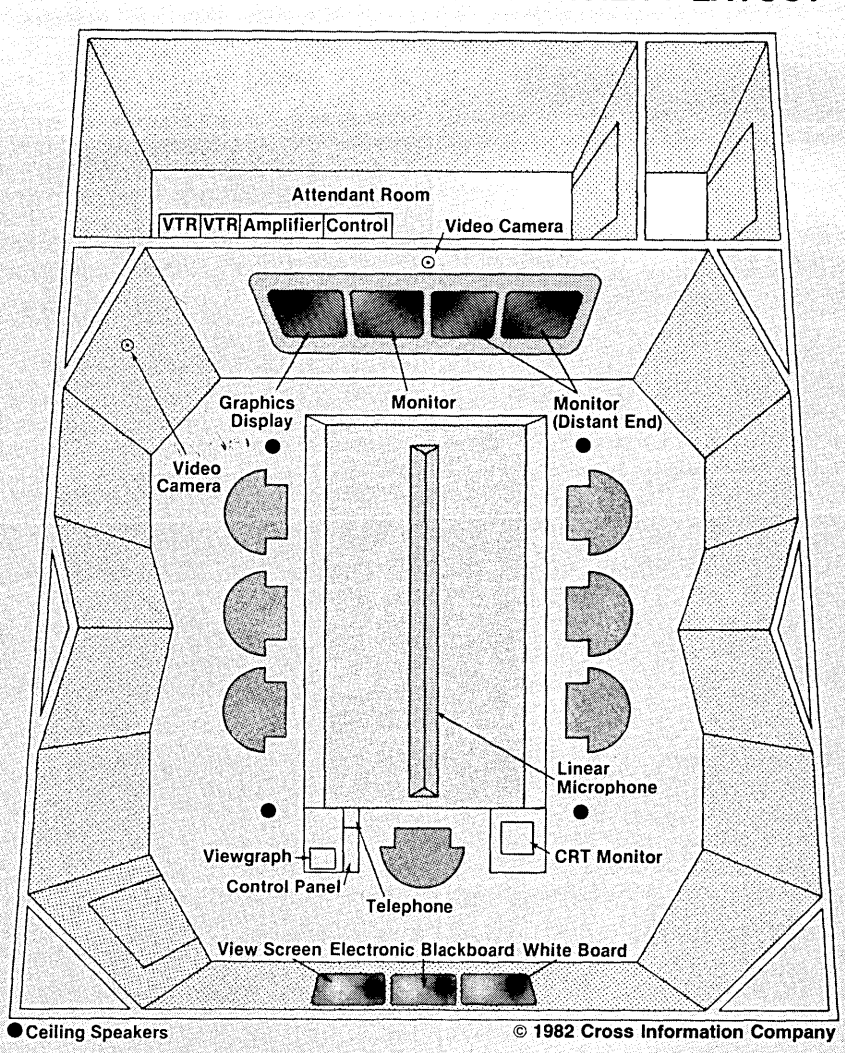
- Try to make the technology as unobtrusive as possible by enclosing transceivers in cabinets, using hidden microphones, etc. "When you don't subordinate the technology, it can prove a distraction to your meeting," says Kevin V. Shannon of Corning Glass Works.
- Don't present the people in your organization who will be using teleconferencing with a finished system and expect them to endorse it enthusiastically. "Anything that smacks of too organized an approach, and is imposed on people without first getting their feedback, won't be accepted," asserts Joe Ferreira of the Diebold Group.
- Try to incorporate teleconferencing into your existing network rather than bring it in on a standalone basis. As a recent Diebold report on teleconferencing points out, most organizations will need high-capacity local lines as well as regular satellite access in order to accommodate full teleconferencing capability.

It is unlikely that teleconferencing alone can justify these costs. But the incremental cost of adding teleconferencing to existing or planned high-capacity networks is relatively small.

- A teleconferencing project requires some hard analysis and a good deal of trial-and-error development, all of which take time, the Diebold report emphasizes. Preliminary analysis and planning can proceed relatively quickly, but once pilot tests have been completed, you can probably expect to spend another year to 18 months getting a system up and running. Aetna, as an example, required 15 months to open its first teleconferencing rooms, and Arco's system has been in development more than two years.
- Often users who are security conscious about their data communications network forget that a teleconferencing system may require equal or even more stringent safeguards. Consider encryption and other security measures at the outset, particularly if you plan to use a satellite link.

The need for security was brought home recently to one company that was holding a proprietary sales meeting with distributors around the country using a special events teleconference. In the course of the meeting, one of the company's marketing people announced an 800 number over which orders would be taken for the not yet announced product. Almost at once, the firm began receiving calls from people around the country who'd picked up the meeting on their private satellite disks and wanted to place orders.

A TYPICAL TELECONFERENCING FACILITY LAYOUT



er, no systems had been sold.

M/A-Com uses its own earth station for transmission and employs a time division multiple access (TDMA) transmission technique that enables each site to adjust effective bandwith in response to changing requirements (i.e., if the user site should switch from facsimile to video transmission).

In use since 1981, the network has received high marks from Gould. "More useful information is exchanged in a disciplined atmosphere," Gould says. "Besides scheduled routine meetings, we can exchange ideas quickly when the need arises. It does not take two or three days anymore to get a meeting together while our people make travel arrangements and fly cross-country. If need be, we can get a cross-country meeting together in half an hour or less."

Aetna Life and Casualty, which links its Hartford and Windsor, Conn., facilities via coaxial cable, is also pleased with its system. Since March 1981 the company has used the link for hundreds of meetings and estimates it has saved close to $300,000 just in reduced local travel time. It intends to tie its Chicago operations into the network via satellite soon.

Both M/A-Com and Aetna were featured in a Satellite Business Systems/Booz Allen & Hamilton survey indicating that nine of the 10 users involved were "satisfied" or "very satisfied" with teleconferencing. Users cited a perceived increase in worker productivity, a decrease in travel time, and improved communications among the benefits.

Significantly, however, SBS and Booz Allen could only find 10 companies who met their criteria for established teleconferencing users (companies had to have been using teleconferencing for more than one year and had to use it for at least 20 hours per month). In addition to M/A-Com and Aetna, the companies included Exxon, Hughes Aircraft, Deere & Company, General Telephone & Electronics, IBM, Mutual Insurance, Procter & Gamble, and Sperry.

Equally telling is the fact that several large-scale users—Arco and Allstate, for example—are looking to defray costs by sharing their capabilities with outside organizations. As a number of early teleconferencing users have found, the technology in its most extravagant form resembles J.P. Morgan's description of a yacht. The company that has to ask how much it costs can't afford it. ✻

Laton McCartney is a New York-based freelance writer and a regular contributor to DATAMATION.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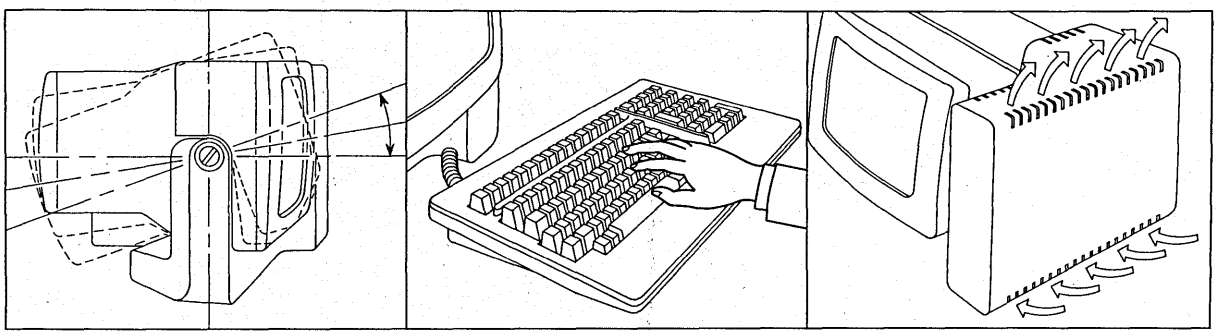

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CIRCLE 62 ON READER CARD

How Lextron Corp. developed a functional specification for evaluating manufacturing resource planning software.

CHOOSING AN MRP SYSTEM

by Harvey Gand and Milt E. Cook

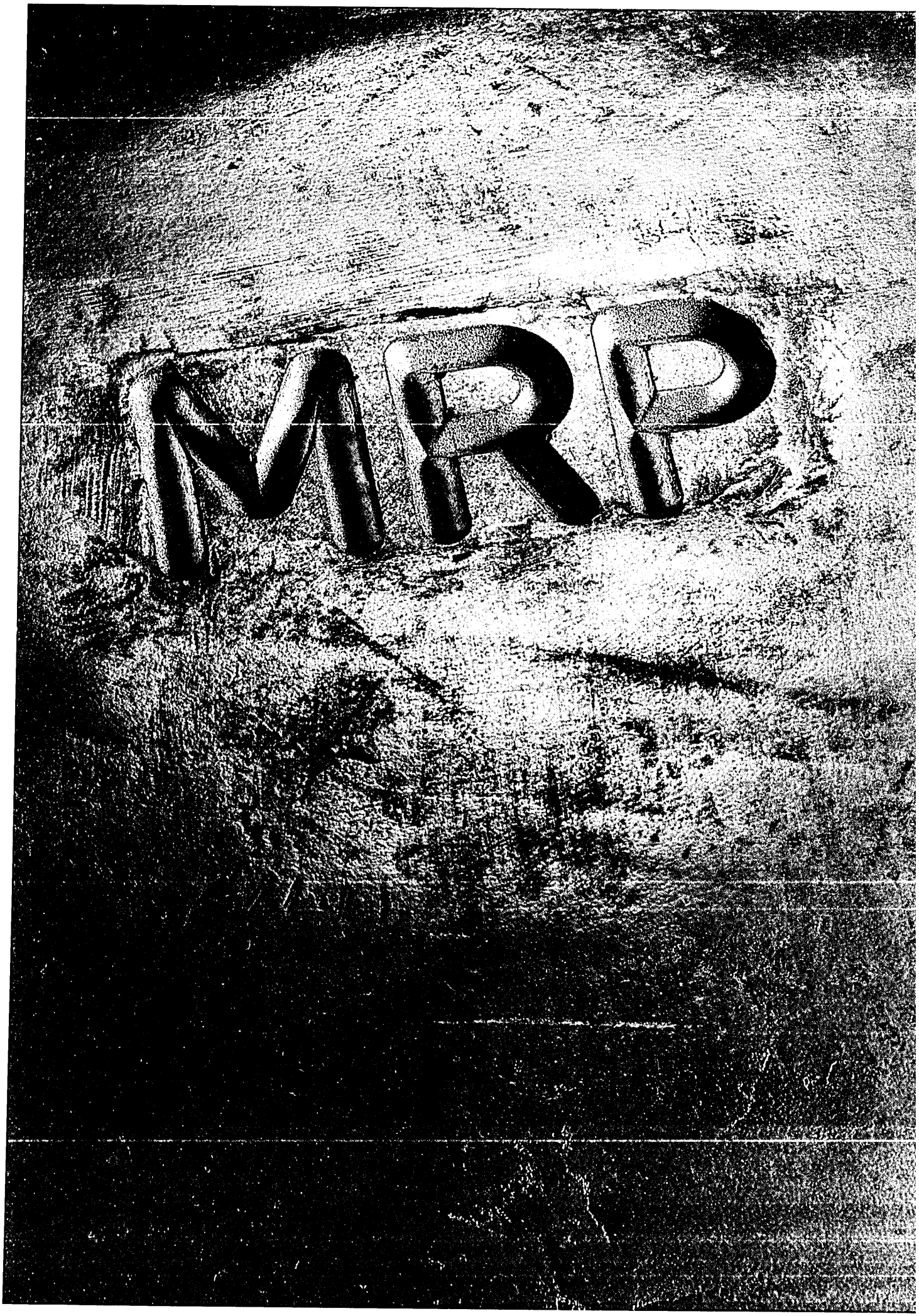
Resource planning is at the heart of a manufacturing company's business. Choosing MRP software is thus one of the most important and complex decisions a DP professional will ever make. The following article, excerpted from Auerbach Publishers' Computers in Manufacturing series, describes how one company approached this major task.

A functional specification determines the type of software system that should be purchased or designed to solve business problems and support daily activities. The functional specification is actually a list of system features that aids in resolving problems and provides the kind of information users need to operate the business.

Lextron Corp., manufacturer of word processing equipment, and Raytheon Data Systems Co., manufacturer of intelligent terminals, used the functional specification development process described in this article. Both companies are manufacturers of electronic equipment and therefore have similar manufacturing control systems requirements.

The functional specification effort at Lextron started as an informal investigation launched by individuals within the manufacturing and data processing groups. Their efforts were prompted by a desire to improve upon a rudimentary inventory record-keeping system running on outdated hardware. Several serious problems were readily identifiable:

- The system lacked master production schedule (MPS) and purchasing modules.


MRP

While a detailed specification presents a clearer picture of an organization's needs, it stretches the vendor's selling cycle, increasing sales costs.

• The sytem was not integrated; for example, the bill of material (BOM) and item master files were maintained separately;
• Turnaround on key reports was slow and many of the report formats were unsatisfactory;
• The material requirements planning (mrp) module had major logic flaws;
• Software was written in a nonstandard programming language, which made it hard to modify. (It was also difficult to find programmers who could keep it running.)

Preliminary development of the functional specification was undertaken without top management's sanction, and without the benefit of management directives calling for company-wide cooperation. Thus, the challenge that faced the project team was to demonstrate that an objective and detailed functional specification was the first step toward acquiring a manufacturing control system that would provide support and relevant information to manufacturing supervisors and middle- and executive-level managers.

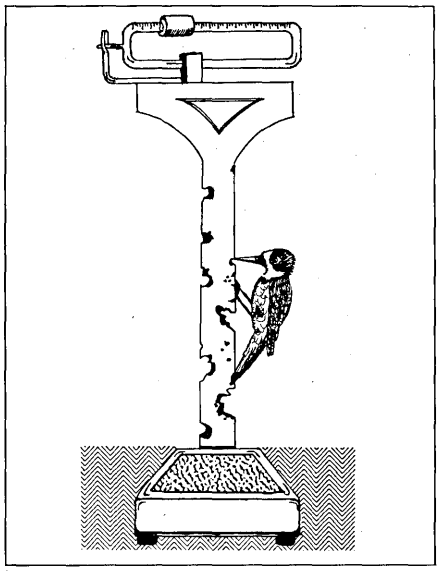
Lexitron's functional specification was structured around the major modules of a manufacturing control system. A specification designed in this way gives the vendor a clearer picture of what is required, because the vendor's system has been designed in the same general module-by-module manner.

Lexitron required an integrated manufacturing system that would meet the requirements of all functional areas while providing a base for future needs. The system defined in the functional specification provides for complete on-line planning and control of material and labor with interfaces to other systems such as financial and order entry. Included in the Lexitron functional specification are the following manufacturing resource planning (MRP) system modules:
• Manufacturing standards, which establish the basic system master file: the item master, product structure, standard routings, work center master, and engineering changes.
• Inventory records control, which maintains the perpetual inventory balance, the open order status (customer, shop, and purchase), and the time-phased requirements (allocations).
• Master production scheduling, which ties the business plan to the operating system, uncoupling the forecast from the factory. It provides management with a quick reference as to how well the plan is being executed. Master production scheduling satisfies the need for extended forecast horizons, service parts forecasting, automated master production scheduling, order bills or material support, forecast consumption, order promising support, and rough cut capacity planning. It also generates the major input to material requirements planning.
• Material requirements planning, which translates the MPS into a detailed material plan for all parts in the bill of material.
• Procurement management system, which controls the purchase procedure and the "dock to stock" inventory.
• Shop floor control, which monitors, via feedback activity, the actual events on the shop floor in support of the capacity plan.
• Cost management system, which converts the production forecast to dollars, projecting costs and profits across the entire planning horizon, item by item. Orders in process are monitored by comparison of actual-to-date costs to earned standards. Valuation of the work in process and finished goods inventory is supported by the cost management system.

The preceding structuring method worked well for Lexitron. Most vendors reported that the company had submitted a very complete and detailed specification. In addition, one vendor indicated that the general trend for companies to perform detailed or sophisticated evaluations can present both benefits and problems. While a detailed specification presents a clearer picture of what an organization needs, it stretches the vendor's selling cycle, thus increasing sales costs.

Lexitron started with a functional specification developed at another company and tailored the specification to its own requirements (and eventually to those of Raytheon Data Systems). The project team held meetings with key department managers and reviewed the preliminary specification in detail, adding and deleting requirements to satisfy Lexitron's needs.

The project team also planned a design review with key users; however, a timing problem was encountered. Users lacked the knowledge needed to participate in such a review. If the project team had taken the time to educate them, the project would have been delayed. Instead, it was decided that the project team and key managers would define the requirements. In the interim, users could learn manufacturing systems by using the in-house manufacturing system that was running on Raytheon hardware and by attending internal education programs. The plan called for education of users in time for their participation in the front-end study and actual implementation of the selected software.



STAFFING THE PROJECT

The development of the functional specification began as a part-time project. Lexitron's business environment dictated that its products be built as quickly as possible and shipped according to schedule. The general philosophy—unless shipping schedules are met today, there may be no tomorrow to be concerned about—left little time for manufacturing department managers to discuss long-term requirements. As a result, the only full-time project team members were the manufacturing business analyst and representatives from management information services (MIS). Other key players were brought into the specification process as needed.

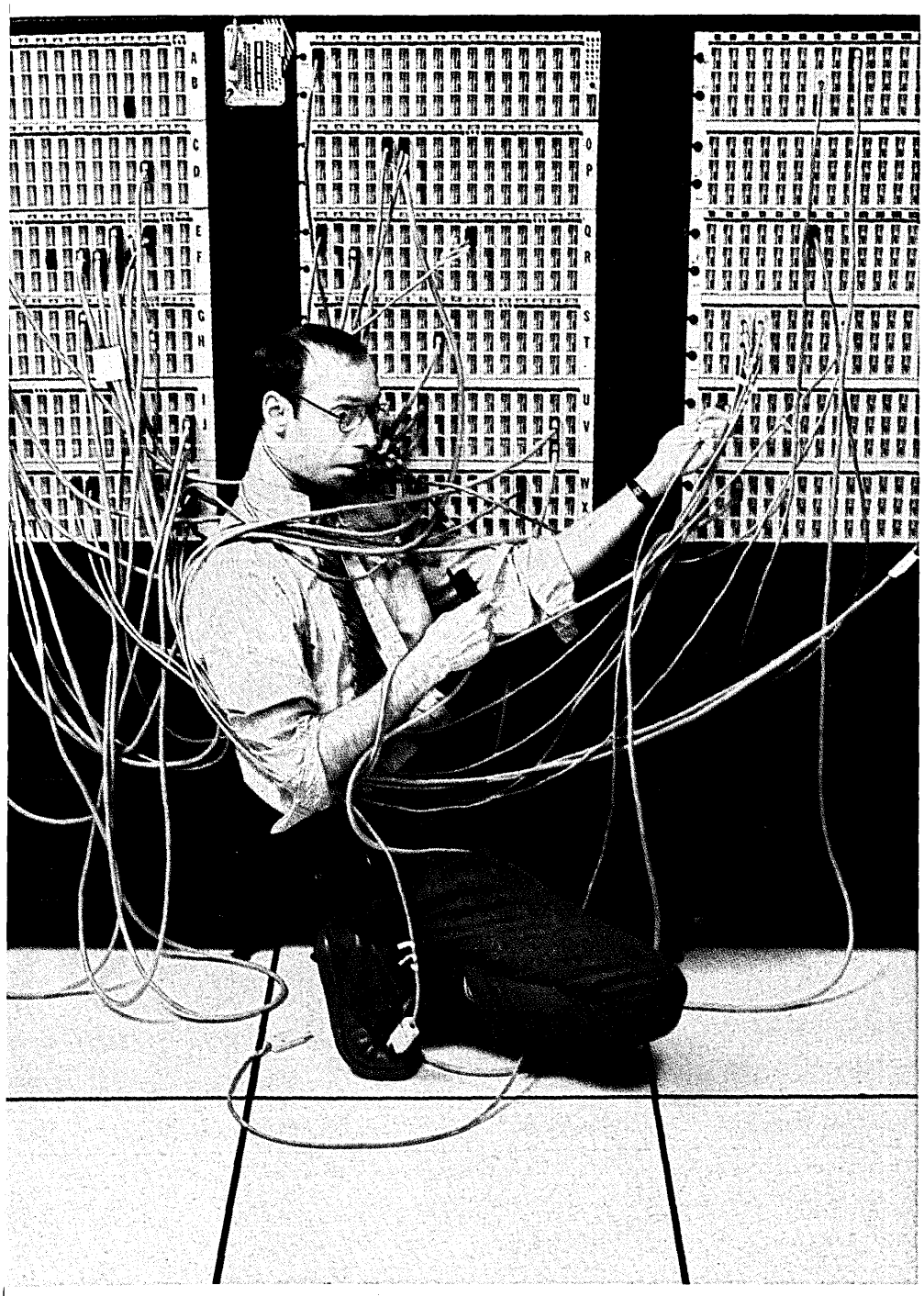
Even though the three members of the project team were active full time, they did not relinquish their other job responsibilities. The manufacturing business analyst was involved with correcting existing systems for the short term, coordinating all user activities between the manufacturing department and MIS, and resolving daily system problems. The newly hired MIS director was involved in shaping the department, especially in such areas as staffing and planning. The systems development manager shared many of the same responsiblities and was also charged with servicing user requests.

The small size of the project team contributed to the relatively quick development of a quality specificiation. Arranging schedules, coordinating efforts, and allocating assignments were facilitated. In the final analysis, a large team representing all functional areas would have blocked speedy completion of the specification.

Project control was assumed by the MIS director. Meetings were held every week and lasted no more than one hour. The MIS director summarized the meetings in formal minutes that keyed action items, the team member responsible, and the due date. Open action items were the focus of the following meeting, and the previous week's action items prompted new ideas that precipitated additional action items. This cycle was repeated at each meeting and ultimately created the finished product.

Overall procedures for the group were informal. A very general milestone chart with four or five significant dates (e.g., user inter-

Tech control out of control?



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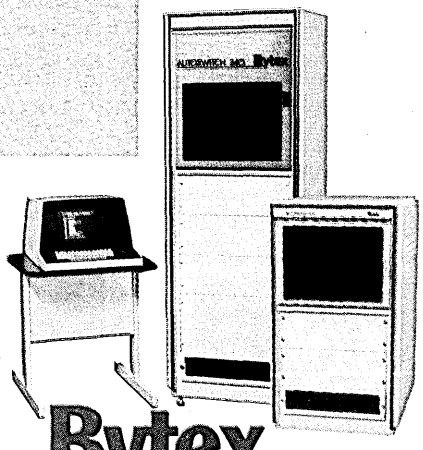

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CIRCLE 63 ON READER CARD

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A rating system allows the evaluation process to be conducted objectively.

views complete, rough draft specification finished, final review) was prepared to guide the group's activities. As meetings progressed, the team concentrated on short horizon action times (i.e., one or two weeks). In this way, rapid progress was made.

As project leader, the MIS director was also responsible for setting and meeting deadlines, assuring quality results, and motivating creative ideas at the macro level. The manufacturing business analyst and the systems development manager provided the detail of the functional specification; both were active in generating all sections of the specification and in ensuring that the manufacturing users agreed with and supported the effort.

The manufacturing functional specification was generated in approximately 150 calendar days. The most significant cost associated with the functional specification development was project team member and department manager time for review of the initial and final drafts. Lexitron did not incur out-of-pocket expenses such as consulting, plant visits, seminars, or travel.

As the functional specification took shape, the team reported its findings to executive management in a formal presentation, stressing both the objectivity and control that had been exercised. The presentation included a historical overview of the effort along with a summary of the team's findings. Management was then asked to approve a survey of the software market based on the functional specification. The team then received executive commitment to proceed with the survey.

CHECKLIST FOR VENDORS

The functional specification was Lexitron's primary software evaluation tool. It listed basic requirements for Lexitron's manufacturing control system and provided a documented trail of vendor responses to that list. Lexitron's full functional specification (starts on facing page) is offered as a checklist for other organizations developing a functional specification for an MRP system. In actual use, the desired features are set beside four columns for the vendors to record their responses:

Y = Yes, currently a feature
N = No, not currently a feature
P = Partial, feature not fully supported
F = Future, feature planned for release in future (request release date from the vendor)

Vendor responses are scored with a point value system developed for rating the features. Not all features in the functional specification are "must have" requirements, so each is rated as having high (10 points), medium (5 points), or low (3 points) priority. Features planned for future release were given a full complement of points if the release date fit Lexitron's time frame. Partially supported features that vendors planned to upgrade were handled the same way.

Certain critical features in each module had to be included in the vendor proposal or the offering was automatically eliminated from the evaluation. No points were assigned to these critical features.

As a second level of rating, the major system modules were weighted to reflect relative importance in the decision-making process. An example of the weighting scheme applied to the total number of points for each module is shown in Table I. Note that the total is derived from assigning to each feature a high, medium, or low priority. The example shows that the master production schedule (MPS) and procurement management modules are most important to the selection process, while the shop floor control module is of least relative importance.

As a last level of rating, a functional feature percentage score was established. The project team as a group chose an arbitrary percentage as the minimum acceptable score; systems that did not achieve 75% of the total possible points were eliminated from the evaluation.

Table II is an example of the full rating scheme applied to the functional specification forms completed by three competitive vendors. The Lexitron project team found that the rating system allowed objective evaluation of alternative software systems based on equivalent terms. The formality of the process reduced the opportunity for subjective evaluations and discouraged the introduction of intangibles such as political issues.

SUMMARY OF LESSONS

The benefits of the specification development exercise proved significant:

- The resulting specification correctly reflected Lexitron's manufacturing requirements. With minor modification, this document was used at other divisions to evaluate manufacturing software.
- Operating and reporting deficiencies were recognized in existing manufacturing control systems. The specification development effort identified current processing environment deficiencies, thus enabling the enhancement or addition of those capabilities in the future.
- The objective and organized way in which the specification development effort was conducted drew the user community from a position of skepticism to one of active support; this attitude prevailed during subsequent phases of the software development process.
- The quality of the final product helped secure executive management's endorsement for future action.

While the project team's positive frame of mind minimized any setbacks encountered during development, several changes would have facilitated the effort:

- Executive commitment from the onset. Since the project did not start with a directive from executive management, interest and participation among the user community was initially a hard-fought sales battle. Executive support would have changed user apathy to active participation.
- User representation on the team. Full-time, dedicated user representatives from the manufacturing functions should have participated in building the functional specifications.
- Full-time team participation. Since the team members were committed to key projects in their respective functions, the development of the specification was not a full-time effort. Dedicated activity would have quickened the generation of the end product.

Overall, however, the quality of the end products as perceived by the users, executive management, and the team members themselves attests to the value of the effort. The techniques for generating the functional specification could have been improved upon. To do this, the Lexitron project team learned that the project needs to be raised to a high visibility status within the company's activities. In addition, the purpose and goals of the project must be clearly communicated to all affected personnel.

In summary, the specification development project pointed out the importance of front-end planning in optimizing the use of sophisticated software solutions. ✻

Harvey Gand is director of management information services at TRW-Fujitsu, Los Angeles. He has been involved with MIS for 15 years, mostly with manufacturing companies. Before joining TRW-Fujitsu he worked at Lexitron Corp., a division of Raytheon, and Victor Business Products, a division of Walter Kidde.

Milt E. Cook is an applications systems engineer for the Hewlett-Packard Corp. in Westlake Village, Calif. Prior to joining HP he was a manufacturing systems specialist at Lexitron. He teaches production/inventory control techniques at California State University, Northridge.

The Computers in Manufacturing series, from which this article is excerpted, is a five-volume supplemented information service designed to provide manufacturing managers and dp professionals with guidance in the use and management of closed-loop manufacturing control systems. The series is published by Auerbach, 6560 N. Park Drive, Pennsauken, NJ 08109, (800) 257-8162.

LEXITRON'S FUNCTIONAL SPECIFICATION FOR MRP SOFTWARE

I. Manufacturing Database
- A. Bill of Material (BOM)
  - 1. Ability to store and maintain parent-component relationships
    - a. Add, change, delete single-level BOM
    - b. Update where used when changes are made
    - c. Perform multiple deletes/additions, same-as-except, and multiple replacements
    - d. Fractional quantity per
    - e. Copy add capability
  - 2. BOM reporting
    - a. Automatic printout of BOM when changes are made (on-line vs batch)
    - b. Single-level BOM
    - c. Single level where used
    - d. Multilevel BOM or indented BOM
    - e. Multilevel where used
    - f. Summarized explosion/implosions
  - 3. Automatic low-level code
  - 4. Engineering change control capability
    - a. Two-date effectivity
    - b. Use-up
  - 5. Provide special BOM structures
    - a. Production phantoms
    - b. Purchase part with structures
    - c. Nonstocked items
      - 1) Packaging material
      - 2) Tooling
      - 3) Test equipment
      - 4) Minimum/maximum
  - 6. Common manufacturing and engineering BOM file, with separate retrieves
    - a. Engineering to maintain other BOM
  - 7. BOM history file
- B. Item Master (I/M)
  - 1. Special features required
    - a. Three cost fields
      - 1) Frozen costs (standard)
      - 2) Liquid costs (current actual)
      - 3) Target costs (purchase only)
    - b. Three cost types
      - 1) Material
      - 2) Labor
        - a) Labor hours (standard/actual)
      - 3) Overhead (multiple)
    - c. Purchase part lead time
    - d. Manufactured part lead time
      - 1) Calculate manufacturing lead time using routings and scheduling rules
      - 2) Accumulated lead time (rolled up)
      - 3) Fixed
      - 4) Mid-period offset
    - e. Safety lead time
    - f. Multiple stockroom locations nettable/nonnettable
    - g. Multiple bin locations within stockroom locations
    - h. Product line code
    - i. Commodity code
    - j. Multiple unit of measures
      - 1) Buying versus stocking
    - k. Revision level
    - l. Planner code
    - m. Buyer code
    - n. Class code
    - o. Part type code
  - 2. Customer report capability (user specified)
    - a. Sort by various fields of I/M
- C. Routing/Work Center File
  - 1. Add, change delete
  - 2. Alternate routing
  - 3. Store tooling, etc. on routing file
  - 4. IBM card shop routing
    - a. Move ticket

II. Inventory Records Management
- A. Ability to Track All Inventory Activity
  - 1. Receipts from
    - a. Purchase order
    - b. Assembly order
    - c. Interplant order
    - d. Another stock location
    - e. Project
  - 2. Issues to
    - a. Assembly order
    - b. Rework order
    - c. Another stock location
    - d. Project
    - e. Finished goods
    - f. Outside location
  - 3. Cycle count adjustments
  - 4. Scrap (multiple accounts)
- B. Provide Audit Trail of Transactions
  - 1. Maintain history file, with on-hand balances
  - 2. Retrieve by part number and time period
- C. Provide Stock Status Report
  - 1. By part number, location
  - 2. By dollars, part number, location
  - 3. By planner, part number, dollars, location—all reports to reflect subtotals/grand totals
  - 4. By planner, dollars (high to low)
- D. Provide Inventory Analysis
  - 1. Inventory accounts
    - a. Active
    - b. Inactive
    - c. Excess to requirements
    - d. Week's supply (equivalent)
  - 2. Inactive inventory accounts
  - 3. Work in process
  - 4. Minimum/maximum inventory (order point)
  - 5. ABC analysis
    - a. Provide value analysis from future requirements
    - b. Automatically update ABC code in item master
    - c. Is/Was report (shows before and after analyses of data)
- E. Dollarize Material Plan and Master Schedule to Project Gross Inventory Levels
- F. Cycle Count System
  - 1. Physical inventory capability
    - a. Tickets
      - 1) Dollar value
      - 2) Class code
    - b. Work sheets
    - c. Two step with variance/tolerance
- G. Calculate Economic Order Quantities (EOQ) on Active Production Parts
- H. Automatic Accounts Assignment (chart of accounts)
- I. Create Multiple Inventory Account Table
  - 1. To be netted in mrp
  - 2. Not netted in mrp

III. Master Production Schedule (MPS)
- A. Equipment
  - 1. The MPS will operate in the following manner
    - a. Master scheduler inputs quantities into weekly buckets (option to input monthly/convert to weekly)
    - b. Customer orders will automatically consume the MPS
    - c. Customer orders that overconsume the MPS will result in an exception notice—the schedule date will reject or the order will be automatically rescheduled to the next available time period.
    - d. Propagation capability
  - 2. Assist master scheduling in evaluating proposed changes
    - a. Simulation through the logic of mrp to evaluate the material requirements for a proposed change to the production plan
    - b. Detailed simulation of output requirements
    - c. Rough cut capacity requirements planning
  - 3. Available to promise (only if order entry is implemented)
  - 4. Group forecast or model planning BOMs.
  - 5. Is/Was reports
  - 6. Provide performance reporting against the plan
  - 7. Assist master scheduling in evaluating proposed changes

LEXITRON'S FUNCTIONAL SPECIFICATION FOR MRP SOFTWARE

a. Simulation with mrp
b. Simulation of output requirements
8. Dollarized material and labor plans by period
a. Assembly
b. Test
c. Inspection
d. Work center

B. Spares
1. Ability to manually maintain MPS file
2. The MPS will operate in the following manner
a. Master scheduler inputs quantities into weekly buckets (option to input monthly/convert to weekly)
b. Maintain plan year-to-date field
c. Record deliveries year to date (plus and minus)
1) Stock location or WIP transfer to spares
2) Transfer from spares to manufcturing stock or WIP
3. Provide performance reporting against the plan
4. Provide a spares production plan for output planning—plan consists of standard labor hours required by the MPS per period
5. Assist master scheduling in evaluating proposed changes
a. Simulation with mrp
b. Simulation of output requirements
6. Dollarized material and labor plans by period
a. Assembly
b. Test
c. Inspection
d. Work center

IV. Material Requirements Planning (mrp)

A. General Requirements
1. Calculate material plans necessary to achieve production as input by the MPS system, production/spares
2. Perform netting calculations on the basis of perpetual inventory records and gross requirements, planned, firm-planned, and released order statuses
3. Perform explosion calculations on the basis of information in the item master and product structure files

B. Entry into the Planning Sequence for Processing
1. Unlimited planning horizon
2. Enter all parts that require processing into the planning sequence—parts with requirements, allocations, or orders
3. Through the use of low-level codes or some other device, perform netting and order planning on a part only after all gross requirements have been posted

C. Netting and Exception Logic
1. Store requirements, planned orders, and released orders information and process lead times by day, not by bucket
2. Notify planners with rescheduling exception messages
a. Expedite
b. Reschedule
c. Order
d. Cancel
3. Notify planners with additional exception messages
a. Past-due released order
b. Planned order due for release
c. Parameter violations
d. Exception notices backlog with no action
4. Dampers to suppress exceptions that fall within predefined ranges

D. Order Planning and Explosion
1. Time-phased order point capability
2. Order policies
a. Fixed lot size
b. Period order quantity (weekly, monthly, etc.)
c. Lot for lot
d. Scrap allowance (I/M field)
e. EOQ
3. Through the process of explosion, reflect the planned orders in the component gross requirements
a. Start date offset from due date by item master lead time
b. Engineering change effectivity accessed for explosion process from product structure file
4. Reschedule criteria for planned and released orders
a. Identify by exception the need to reschedule a released or firm-planned order
b. Automatically reschedule planned orders
c. Automatically reschedule assembly orders (AOS) but not purchase orders (POS)
5. Ability to code a part so that orders are not planned (i.e., obsolete part)

E. Reporting Display of the mrp Planning Information
1. Exception messages
a. List all exceptions on a part, and group parts by planner
b. Print messages listed in sections C.2 and C.3
2. Time-phased display
a. Gross requirements
b. Open or released orders
c. Planned and firm-planned orders
d. Time-phased projection of on-hand balance
e. Descriptive information on the part
3. Supporting details
a. Pegging information
b. Material availability of assembly order components
4. Use of calendar dates and full English messages on all reports

F. Pegging
1. Single-level pegging information
2. Provide on demand a detailed listing of gross requirements and allocations showing date, quantity, and parent part number

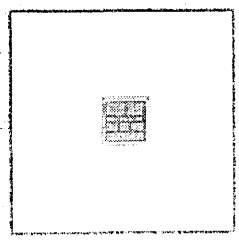
G. Firm-Planned Order
1. Ability to freeze a planned order at a date and quantity
2. Ability to add, change, and delete firm-planned orders

H. Released Order Capability
1. Ability to add, change, and delete released orders
a. Add by
1) Creating an unplanned order
2) Releasing a planned or firm-planned order
b. Capacity to change due date or order quantity within predefined constraints
2. Component allocation or requirement file
a. Ability to manually delete component allocations
b. Component availability check (prestatus prior to pull)

V. Order Release

A. Purchase Part Orders
1. System generated purchase requisitions (PR)
a. PR is considered a released order in mrp
b. Multiple delivery schedule
c. PR not generated from the mrp explosion—turnaround report only
2. Provide listing of outstanding PRs
3. Provide ability to change PR quantity and/or schedule

In 1981, Hewlett-Packard announced the world's densest single chip 32-bit CPU.



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We've also made the CPU more efficient by assigning many of its time-consuming tasks to our Input/Output Processors. And to give you even more speed, the HP 9000 has a backplane bandwidth of 36 Mbytes/second. That's enough to support all three CPUs, each backed up by its own IOP. You can imagine the effect that has on throughput!

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Our HP-UX is an enhanced version of this increasingly popular operating system. It supports FORTRAN 77, Pascal and C language. And lets you take advantage of the many programs and utilities already available for UNIX. In addition, HP-UX offers significant extensions like 3-D graphics, virtual memory, IMAGE Data Base Management, a variety of data communication products and enhanced file capability.

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Powerful networking made easy.

Even our stand-alone models won't have to work alone. Each can be part of a network of powerful, dedicated, interactive workstations. They'll support several different networking options, including Ethernet.™ And in late 1983, LANs based on the industry-standard IEEE-802. So you can share peripherals and data files locally.

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LEXITRON'S FUNCTIONAL SPECIFICATION FOR MRP SOFTWARE

B. Manufactured Assembly Orders
1. Manufactured at _____ (name of company)
a. Assign assembly order number
b. Generate shop packet
1) Routing
2) Feedback or tracking documents
3) Stores pick list (sorted in location sequence) and part number list for planner
4) Traveler/inspection sign-off
c. Multiple delivery schedule
2. The assembly order must include the following features
a. The quantity on order can be increased or decreased if no material issues have been processed
b. Rejection of a component will result in the opening of an allocation for the rejected part
c. Over issues will result in an error message
d. Completion with open allocations will result in an error message
e. Split order locations capability
f. Partial close capability
3. Subcontract orders
a. Ability to manually alter BOM
b. Generate pick list

VI. Purchasing

A. Provide Capability to Maintain POS for the Following Types of Material
1. Inventory items
a. Purchase part
b. Subcontracted manufactured part
c. Drop shop part
d. Material returned to vendor for replacement
2. Noninventory items
a. Projects
b. Facility and service
c. Maintenance repair and operating supplies (MRO)
3. Capability to replace one purchase requisition with multiple POS
4. Multiple delivery schedule on a PO per line item

B. PR Requirements
1. Computer generated PR to contain the following information in addition to basic order data
a. Annual usage
b. Planned purchase commitments from mrp
c. Open order detail
d. Approved vendor list
1) Schedule performance rating
2) Quality rating
e. Quote history
f. Planner remarks

C. Provide Open Requisition Report
1. Aged
2. Sort by buyer and planner
3. Part number
4. Inventory/noninventory items

D. Provide a Vendor Follow-Up Tool
1. Allow buyer to establish a follow-up schedule and to be reminded as the follow-up dates become current
2. Assign follow-up date when PO is placed
3. Comments column

E. Purchase Order File Status and Maintenance
1. List of open POS and schedule
a. Buyer
b. Vendor
c. Part number
d. Inventory/noninventory
2. Automatic closure
a. When quantity received is within predefined limits of planned quantity
1) Report to material control
b. Closure not permitted until rejections are cleared/open PO to reflect material rejection report (MRR) number
3. Maintenance changes to quantity, dates, and price (PR/PO change notice)
4. Accept feedback from receiving department
a. Quantity received and date
b. Quantity accepted and date
c. Quantity rejected and date
1) Awaiting disposition
2) Dispositioned
d. Quantity scrap
e. Lot number assignment

F. Maintain Vendor History Files
1. Delivery performance
2. Quality performance
3. Under/over shipment performance

G. Provide Summarized Purchasing Performance Reporting
1. Delinquents
2. Buyer
3. Aged

H. Provide Capability to Subcontract Released Order
1. Vendor to perform all manufacturing operations
2. Vendor to perform some manufacturing operations

I. Financial Reporting
1. Commitments
a. Vendor
b. Time phased
c. Subtotal/grant totals
e. Year to date
2. Purchased price variance reporting

VII. Receiving/Inspection/Material Review Board (MRB)/Stores

A. Receiving
1. Report daily receipts
a. Production
b. Nonproduction
c. By department or account
2. Receiving information input to purchasing system
3. Identify destination of material (inspection, etc.)
4. Ability to handle two units of measure
a. Purchased unit of measure
b. Stocking unit of measure

B. Inspection
1. Provide a dispatch list for prioritizing lots
a. By PO due date
b. By backorder
2. Split lot capability
a. Rejections
b. Split-lot production items
3. Identify inspection level required (future PO review)
4. Provide list of lots in inspection
a. aged
5. Provide notification of first article receipt
a. Input by purchasing
6. Provide vendor tooling inspection records and tracking
7. Tracking of rejected lots by vendor
a. Vendor rating

C. MRB
1. Receive material from
a. Receiving/inspection
b. Production rejections
c. Manufacturing purges
d. Field overhaul/repair (O/R)
2. Report disposition on rejected material and orders
a. Use as is
b. Rework at _____ (name of company)
c. Rework at another vendor
d. Return to vendor for replacement/credit
e. Scrap

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It's an ad for NEC's APC™ Advanced Personal Computer. A solutions-oriented system that solves business problems in the simplest, most cost-effective way. The APC supports both CP/M-86™ and MS-DOS.™ It can store more information than any system in its price range. In short, it's got the best price/performance of any personal computer. That's why our competition would p[illegible]t you never see our syst[illegible]

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"That APC of yours is th[illegible] most powerful computer of a[illegible]es I saw. I don't know hov[illegible] for that price."

"Now that I've used it fo[illegible] awhile, I see why you name[illegible] *Advanced* Personal Computer."

And that from bus[illegible]ssmen who have tested t[illegible]etition! When you see the [illegible]vou'll understand why, at[illegible]e others, all of these bu[illegible] picked NEC.

Our business software was optimized to take advantage of the APC's unique hardware features. That makes system operation faster and easier.

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We're the only company to back our software with a unique [illegible]nconditional guarantee. It will [illegible]rk or you get your money [illegible]ck.

Our high-resolution color graphics run circles, arcs and lines around everybody else. The AP[illegible]screen images—line[illegible] characters p[illegible] are unprecedented in their clarity.

[illegible]olors against resolution [illegible]petitive systems often must.

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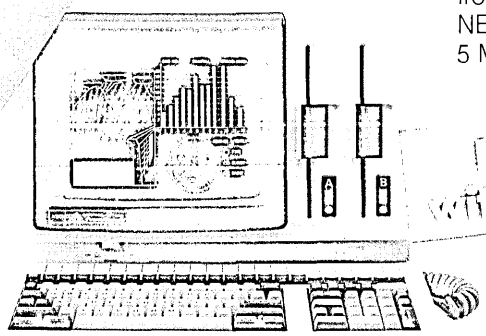

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CIRCLE 66 ON READER CARD

LEXITRON'S FUNCTIONAL SPECIFICATION FOR MRP SOFTWARE

3. Report dispositioned material awaiting debit memo authorization
4. Assign responsibility code to dispositions
   a. Sort by planner
5. Provide scrap reporting
   a. Field (O/R)
   b. Production

D. Stores
1. Receive material into stores
2. Provide backorder system
   a. Backorder aging
   b. Pegging to assembly order
   c. Report backorders filled daily
   d. Backorders with positive on-hand balance
   f. By planner code
3. Provide location system
   a. Multiple stockroom locations per part
   b. Multiple bin locations per stockroom location
   c. Add/change and delete maintenance
   d. Audit reports
4. Issue material
   a. Pulls sorted in location sequence (stores)
      1) Bin location
   b. Provide dispatch list of orders in stores to be pulled
      1) Due date
5. Shelf-life tracking log
6. Kit staging inventory location
   a. Aging
   b. AO number
   c. Date entered
   d. By component
   e. Assembly

E. Residual Inventory
1. Inactive material moved into separate inventory account
2. Identify material with activity—move to active inventory account
3. Identify material in residual for x months without activity
4. Material with x months of no activity to be dispositioned
   a. Scrap
   b. Rework to another part number
   c. Transfer to spares/refurbish stock
   d. Transfer to active stock

F. Activity Reporting
1. Number of kit pulls

G. Performance Reporting

VIII. Shop Floor Control

A. Maintain an Open Assembly Order File
1. Attach snapshot of routings
2. Accept order status maintenance (add, change, delete)
3. Accept operation feedback maintenance
4. Accept changes to order to date
5. Computer generated move ticket(s)
6. Provide split-order capability

B. Provide a Daily Dispatch List Showing the Shop Schedule or Priorities
1. Planner
2. Work center

C. Provide Status Report of All Open Assembly Orders (by planner, AO)
1. Order status
2. Order location (quantity and work center)
3. Operation status
4. Component shortages and status
   a. By planner
5. Rejections
6. Close short

D. Audit Trail for Reconciliation

E. Provide Capability to Measure Work Center Input and Output

F. Report Acitivity Levels
1. Work center output

G. Report Performance
1. Scheduled versus available hours

IX. Cost Control

A. Cost Standards
1. Maintain standard product costs by implosion of production cost components
   a. Direct labor costs
   b. Calculate overhead costs multiple
   c. Direct material costs
2. Provide priced, indented bill of material for top level down to lowest assembly
3. Provide capability to recalculate or simulate standard product costs to top level based on configuration changes

B. Actual Costs
1. Maintain history or detail file of actual costs
   a. Material costs through PO buy history

C. Labor Reporting
1. Report by work center
2. Report to indirect charge accounts
3. Edit labor transactions

D. Measure Productivity (standard versus actual)

E. Report Average Labor Rates for each Work Center Each Month

X. Financial Interface

A. Manufacturing Database Module
1. Supply standard cost data

B. Inventory Management Module
1. Track all inventory activity

C. Order Release Module

D. Shop Floor Control Module

E. Finished Goods Inventory

F. Shipping Module
1. Order processing/billing

G. Direct Labor Control

H. Purchasing Module
1. Accounts payable interface

I. Receiving

J. Stores

K. MRB

L. General Ledger

XI. Marketing Interface

A. The MPS Module Should Have the Capability to Interface with an Order Entry System

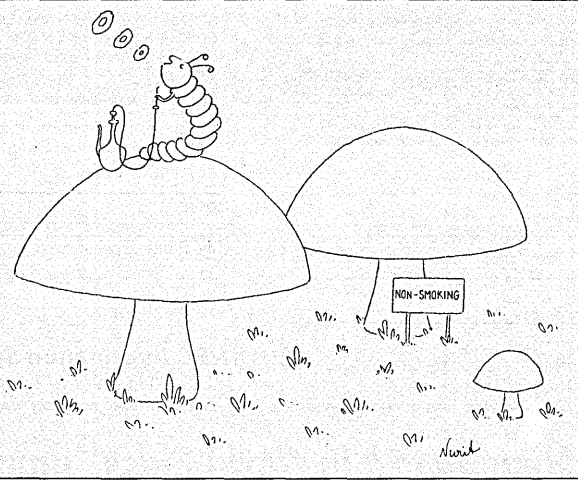
B. Finished Goods Inventory Interface

C. Shipping Module Interface

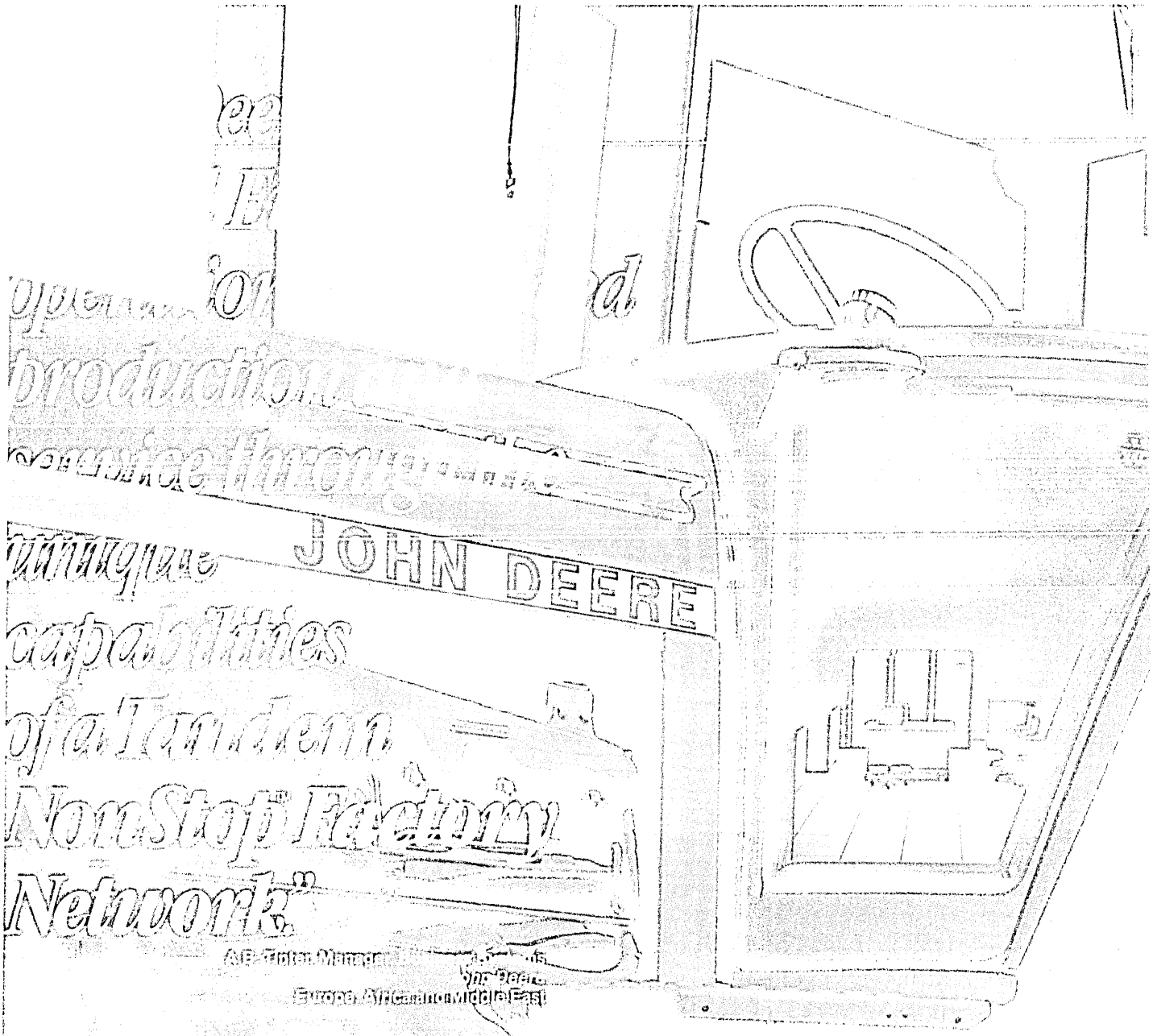
XII. MIS Requirements

A. Software Must Run on our Configuration Computer or on a Minicomputer that Will Communicate with Our Host

B. Programs Must Be Written in a Universal or Standard Programming Language



DRAWING BY NURIT KARLIN



"Manufacturing operations at all John Deere European facilities will be tied together on a network of Tandem NonStop Systems. This has enabled us to cut our computer costs for shop floor control in half and we maintain inventories on parts, labor, materials and work-in-progress without waste and without shortage.

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The NonStop System. The only system on the market today that can provide a distributed network of up to 255 systems, each ranging from 2 to 8 processors,

supporting [illegible] man on-line NonStop [illegible] rity, reliability and system fle[illegible] this capability.

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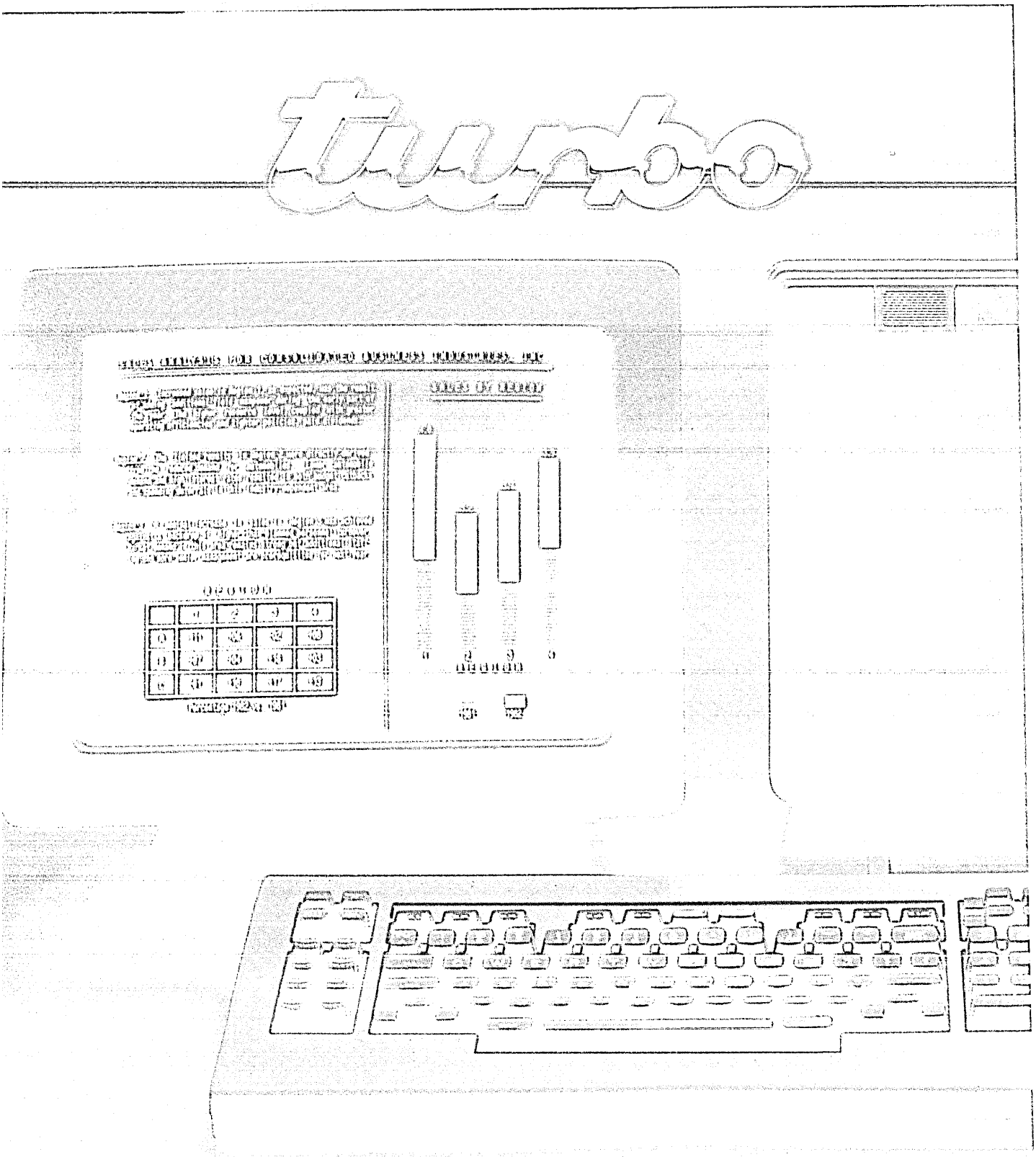
For inform[illegible]ndem NonStop Computing System can improve your company's productivity and P/L stat[illegible]ally your local sales office or Tandem Co[illegible]ated, 19333 Vallco Parkway, C[illegible]a 95014, U.S.A. Toll Free 800-538-[illegible]8) 725-6000 in California.

TANDEM

NonStop Computing Sy[illegible]



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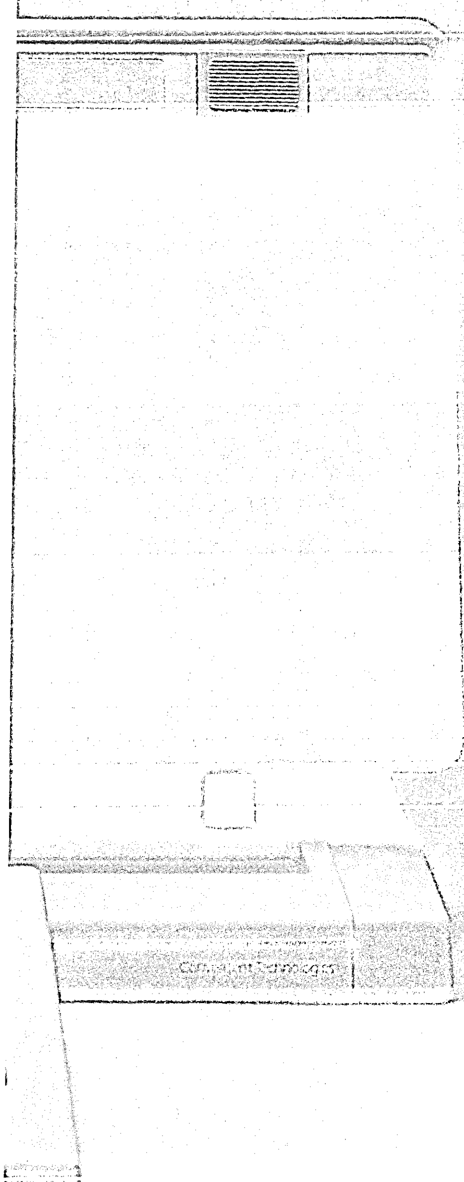

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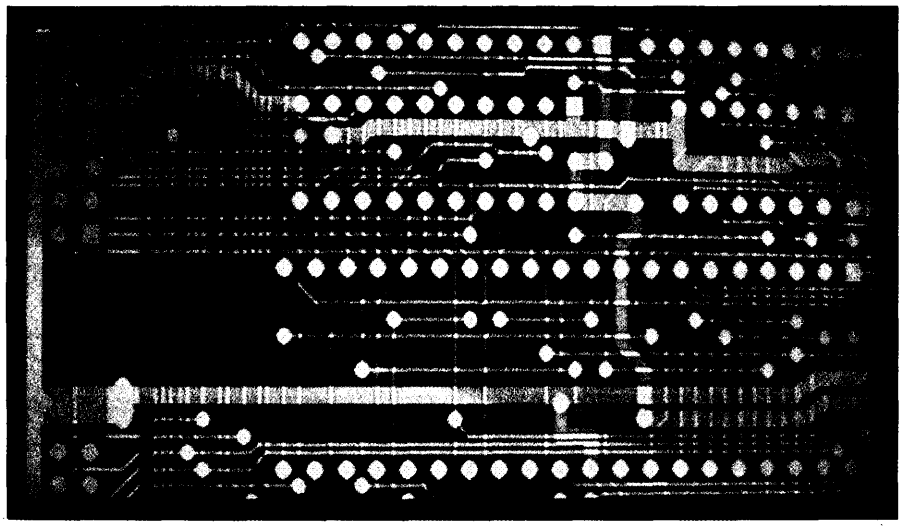
Users discuss their experiences with computer aided design and drafting systems that cost under $100,000.

LOW-COST CADD AT WORK

by Eric Teicholz and Peggy Kilburn



A printed circuit board design is displayed by Triad Engineering Corp., Burlington, Mass.

"We've just undertaken a job that requires generating about 1,100 road cross sections; we couldn't have attempted to do it manually at the price."—Mike Kitaif, Southern Resource Mapping.

"The system can repeat similar printed circuit board designs, make corrections, move components or whole areas of the circuit on the screen, display grids, assign different colors to different layers to make them more discernible, and display all the connections as they are indicated on the schematic to enable the designer to determine if and how they should be rearranged."—Frank Haigh, sales manager, Triad Engineering Corp.

The computer aided design and drafting (CADD) systems these people are talking about have at least one thing in common: they cost under $100,000 and can thus be defined as low-cost CADD systems.

Low-cost CADD systems may be either microprocessor- or minicomputer-based and may be configured as discrete-compotent or desktop systems. The features included will of course determine how close to $100,000 the price will run, but most vendors offer the following basic elements: a cpu, floppy disk or 10M-byte to 20M-byte hard-disk secondary storage, application software, training, installation, and hardware and software maintenance for the warranty period. The more expensive systems include additional Winchester hard-disk storage and other I/O equipment such as digitizers and plotters.

There are currently over 40 companies selling these low-cost systems in markets such as general mechanical drafting, electronics, printed and integrated circuit (PC/IC), architecture, engineering, metal working, and mapping. Users tend to be technically unsophisticated and generally prefer to deal with a single (turnkey) vendor for hardware, software, and support. Most of them are either small design and drafting firms or drafting departments within large companies. Software has concentrated on general electronics; IC and PC board design; and architectural, engineering, and mechanical design applications. The packages tend to be sharply focused; users do not often require the full software capabilities of general purpose CAD/CAM systems.

According to International Data Corp., a market research firm in Framingham, Mass., low-cost systems accounted for only 5% of CADD system revenues in 1981 (580 systems worth $35.8 million). By 1986, the firm expects this figure will grow to 20% of all CADD sales (10,600 systems with a dollar volume of $543.5 million). Architecture will occupy the largest sales niche, followed by PC board design, IC design, and mechanical design.

There are several benefits of using CADD that apply to both large and small systems. These include:

Improved drawing management and maintenance. Most systems operate more efficiently when standard drawing details and operating procedures are present. CADD software necessitates explicit input, edit, output, and management procedures—thereby forcing a firm to be precise about drafting procedures.

Early discovery and reduction of errors. CADD tends to result in greater drawing accuracy than manual drafting methods. At least 16 drawing layers are available with most low-cost systems. Layers can be used to store different aspects of a drawing such as multiple building stories, mechanical layouts, reflected ceiling plans, and electrical and structural information.

CUTTING TIME, MISTAKES

Both time savings and error reductions are derived from storing, retrieving, and combining these data. In addition, an overlaid display will visually depict interferences and inconsistencies in the data. Finally, errors will be reduced since most CADD systems have at least semiautomatic dimensioning capabilities that determine line and arc lengths.

Integrated design. A single, central database, used for both design and analysis, usually results in a cohesive and integrated, rather than fragmented, design process. This, in turn, has the additional advantage of encouraging the use of cost-saving repetitive details.

Simulation. Most large (and some small) systems have 3-D database representa-

Low-cost systems accounted for 5% of CADD system revenues in 1981; by 1986 the figure is expected to grow to 20%.

tion capabilities, thereby allowing isometric or perspective visualization of a drawing without building physical models.

Time reduction. Efficiency gains for automated, rather than manual, drafting range from 2:1 to 8:1 for most applications.

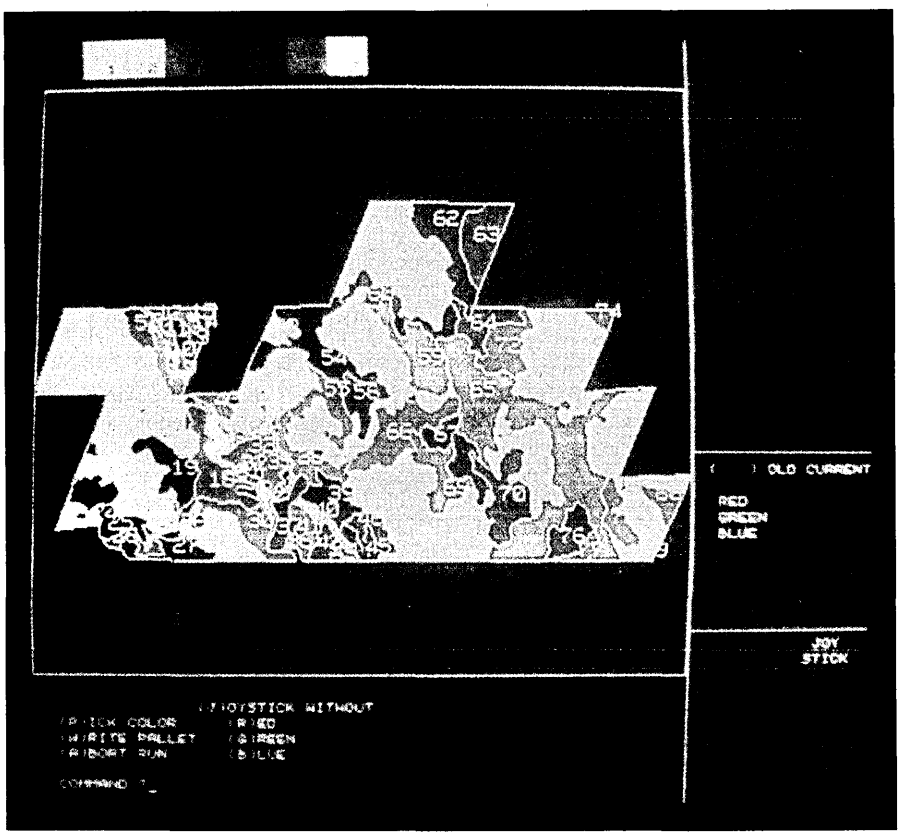
Training. CADD operator instruction provides more direct training procedures since the training involves an explicit preestablished set of techniques related to the system's operation.

There are several reasons why firms are selecting low-cost systems, rather than traditional larger systems. Price is the most obvious, but ease of use is also important. The six- to nine-month learning period often required before an operator reaches his or her projected efficiency rate on a larger system is cut to one third or one half with low-cost systems.

Application features are another plus for low-cost systems. Some analytical software capabilities, mostly in electronics, are quite powerful (e.g., design rule checking, routing, net list generation) and are less expensive to operate on smaller systems. Low-cost systems can also handle specialized design and drafting tasks, and are well suited for decentralized use. Consider the company that has a large CADD system in one place but various potential users elsewhere. The company could purchase smaller systems for remote locations and the users would communicate with other small systems or the host computer to access a centralized drawing database or application package.

Although some firms can initially afford only low-cost CADD systems, these systems can serve as bridges to procuring larger CADD systems at a later date. This way a firm can be educated in basic CADD techniques—drawing overlays, menuing, and computer drawing creation, editing, and output—while it gains insights into the management implications of using CADD. If a low-cost system is used this way, particular attention should be paid to telecommunications so that the small system will be capable of growth and future integration. Because several low-cost system vendors offer functional and database compatibility with larger CADD systems, the low-cost system can also serve as an inexpensive data entry and edit station for the larger one.

In spite of their many advantages, low-cost systems cannot handle the total drafting and design requirements of a large firm. Microprocessors simply do not have the speed or computational power of larger computer systems. Additionally, most current micro-based systems support only 2-D databases; applications software, except perhaps for PC board and IC applications, is quite rudimentary; and software drivers for I/O equipment tend to be limited in scope.



Mapping of a typical forest stand, by color and number, is shown here by James W. Sewall Co., Old Town, Maine.

TYPES OF VENDORS

Surprisingly, only about half the companies selling low-cost CADD systems are startups. Most of these new companies were founded by previous employees of existing minicomputer CADD firms. They try to fill a market niche not met by the parent company.

Many software companies have developed general purpose applications software that they subsequently integrate and sell as part of a turnkey CADD system. If the company is large enough, it will buy hardware from an established manufacturer on an oem basis, perhaps develop additional proprietary hardware, and market and service the entire system.

Several manufacturing/engineering supply companies seeking new high-growth markets have turned to low-cost CADD systems—particularly for architects and engineers, a market that's expected to expand by 90% in the next five years.

Traditional minicomputer vendors (Computervision, Calma, Auto-trol, Applicon, Intergraph, Calcomp, and Gerber) with strong hardware and software capabilities are offering entry-level streamlined systems priced competitively with micro-based systems (streamlined refers to use of low-end cpus, without a plotter or digitizer, etc.).

Lastly, computer peripheral equipment vendors have jumped aboard and are now supporting integrated turnkey systems for design and drafting.

Prices for all CADD systems (micro, mini, and large computer) range from about $20,000 for some micro-based systems to over $1 million for large, multiworkstation systems. The average price for a four workstation minicomputer system, currently the most popular set on the market, is approximately $350,000. This has remained constant over the last five or six years despite decreasing hardware costs. The drop in hardware costs has been counteracted by increased personnel costs and by the relatively stable price structure for graphic I/O devices—which are, however, becoming more intelligent by the inclusion of microprocessors.

During the same five or six years, minicomputer CAD/CAM vendors have started selling an increased selection of applications software, including packages for geometric modeling, piping and instrumentation design, finite element modeling, printed circuit/electrical schematics, numeric control, mapping, wiring diagrams, and architectural/engineering applications.

Six basic types of problems are solved with low-cost systems:

1. *Mechanical Drafting.* Basic to any

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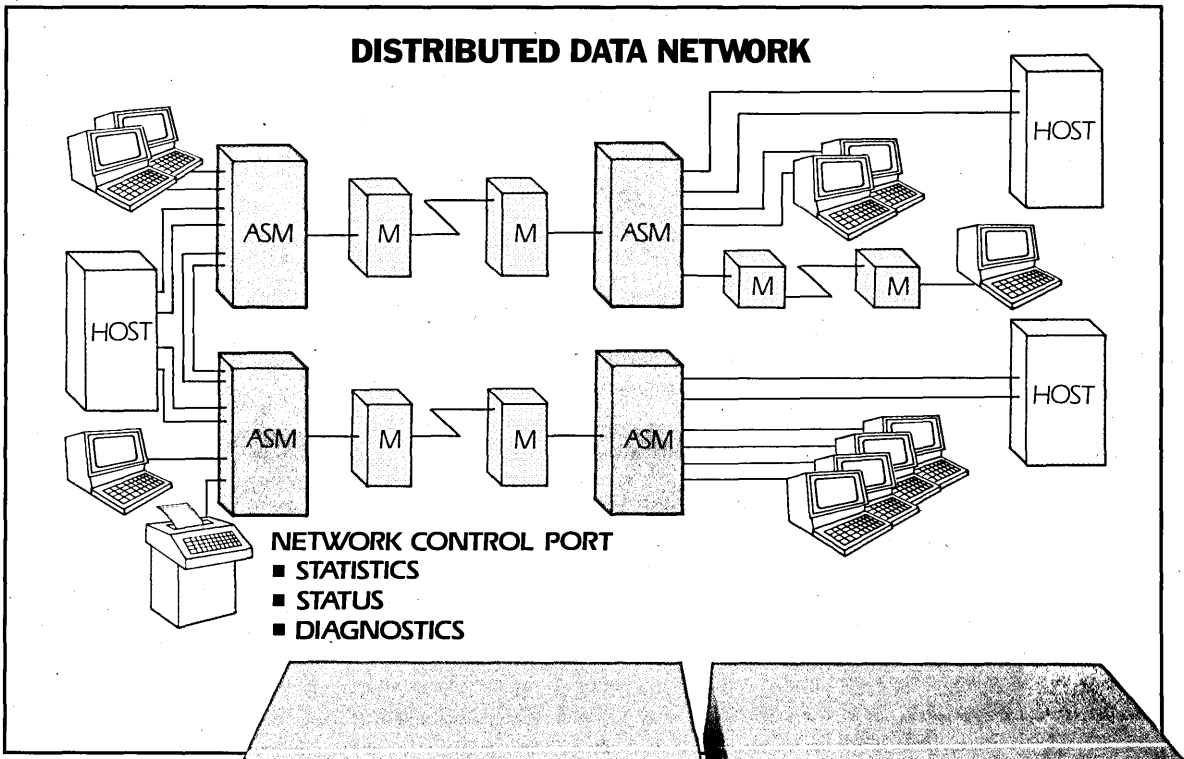

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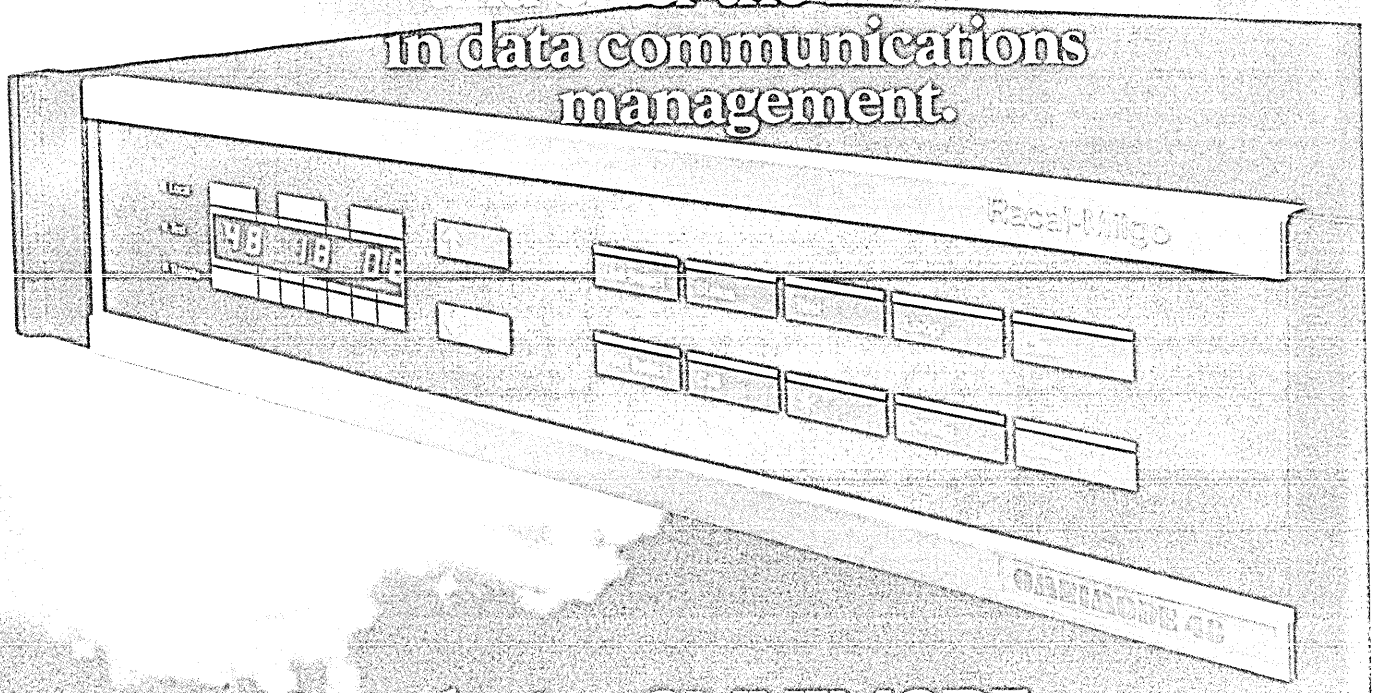

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CIRCLE 71 ON READER CARD

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CIRCLE 74 ON READER CARD

A low-cost CADD system can serve as a bridge to procuring a larger CADD system.

CADD system is mechanical drafting software, consisting of capabilities for graphical data input, manipulation, and analysis. Input relates to the types of building blocks or primitives offered the user by a particular package (e.g., points, lines, arcs, circles, splines, curves, surfaces, etc.). Manipulation relates to graphic transformation capabilities such as the ability to move, mirror, stretch, merge, scale, delete, and perform group operations on a drawing. Typical analytic capabilities of a drafting package include point, angle, centroid, perimeter, area, volume, and moment calculations.

One East Coast equipment manufacturer is using Bausch & Lomb's Producer CADD system for general drafting of ferrous and nonferrous industrial furnaces. The system is used by three CADD drafters, each working five hours a day to create a 15-hour workday for the computer. Each shift works on its own project, rather than picking up where the previous shift left off. When not working on the system, the operator devotes his time to planning and creating a relevant symbol library for furnace equipment.

B&L's producer sells for $58,000 and consists of a DEC LSI 11/23 16-bit word cpu, dual density floppies (a 5M- to 10M-byte Winchester is optional), a digitizer, plotter, and a Tektronix 4010 crt (soon to be upgraded to a monochromatic raster refresh crt) edit workstation with a tablet menu. For service reasons, system sales or rentals are restricted to sites within an hour and a half's drive from sales offices.

SPEEDS UP WIRING DIAGRAMS

The chief operator of the furnace equipment manufacturer says, "The producer system is most helpful in making electrical wiring diagrams. We can already produce these twice as fast as we did manually. It produces picture-perfect drawings with great accuracy." Drafting applications work best where there is repetition—either in terms of features within a drawing or for modifying previously stored drawings. The firm states that so far, complex, one-of-a-kind, drawings are best accomplished manually. Finally, it says that the system "would not replace any of the people we have, but we are expecting not to have to hire as many people as we have in the past."

2. *Electronics*. The Nelson Electric Marine Division of General Signal uses an Interactive Computer Systems (ICS) CADD 2000 series system for electrical switchboard design on ships and submarines for the U.S. Navy. The ICS system has software to support electrical ladder diagrams, schematics, and control circuit analysis. ICS systems cost between $50,000 and $93,000 and are based on DEC LSI microprocessors; Altec, Calcomp, or Summagraphics digitizers; a Tektronix 4014 crt edit workstation; and Calcomp, HP, Glaser, or Tek plotters.

According to Larry Bowles, computer graphics operator, "The overwhelming advantage of the system is having a parts library. With this, anything on a drawing that is going to be repeated on future drawings can be called up from memory, edited if necessary, and inserted." Bowles reports that the library of assembly parts has reduced drafting time in design layout by 35% to 40%. He maintains that complex drawings can undergo substantial revisions in quality control with minimal effort. As for limitations, Bowles says, "The speed of drawing displays, edits, and load times is significantly slower than with larger systems," but the low-cost system's advantages outweigh its lack of speed.

3. *Printed circuit board design*. Triad Engineering Corp. is a PC design service bureau. They own four Gerber Scientific Instrument (GSI) CADD systems. GSI applications software includes tape plot generation, tape output for numerically controlled drills, a database language package, component insertion, and design rules checking software. GSI's basic drafting package has the ability to generate parts lists; solder masks; and silkscreen, pad, and art masters for PC boards. GSI's PC 800 Series CADD systems cost from $35,000 to $45,000 (exclusive of plotter or digitizer) and are based on an HP 2109EK 16-bit word mini.

Triad's staff uses the GSI systems for printed circuit board (PCB) digitizing and design, and operates in three shifts. Each shift picks up on the projects started by the preceding shift to provide a continual digitizing effort. PCB design is a labor-intensive task that lends itself especially well to volume production, automatic testing, and automatic assembly. The payback on CADD in PCB design is almost immediate. It can increase speed, accuracy, and productivity in virtually every phase of design—from conception to delivery of the product.

BOTH SIDES DISPLAYED

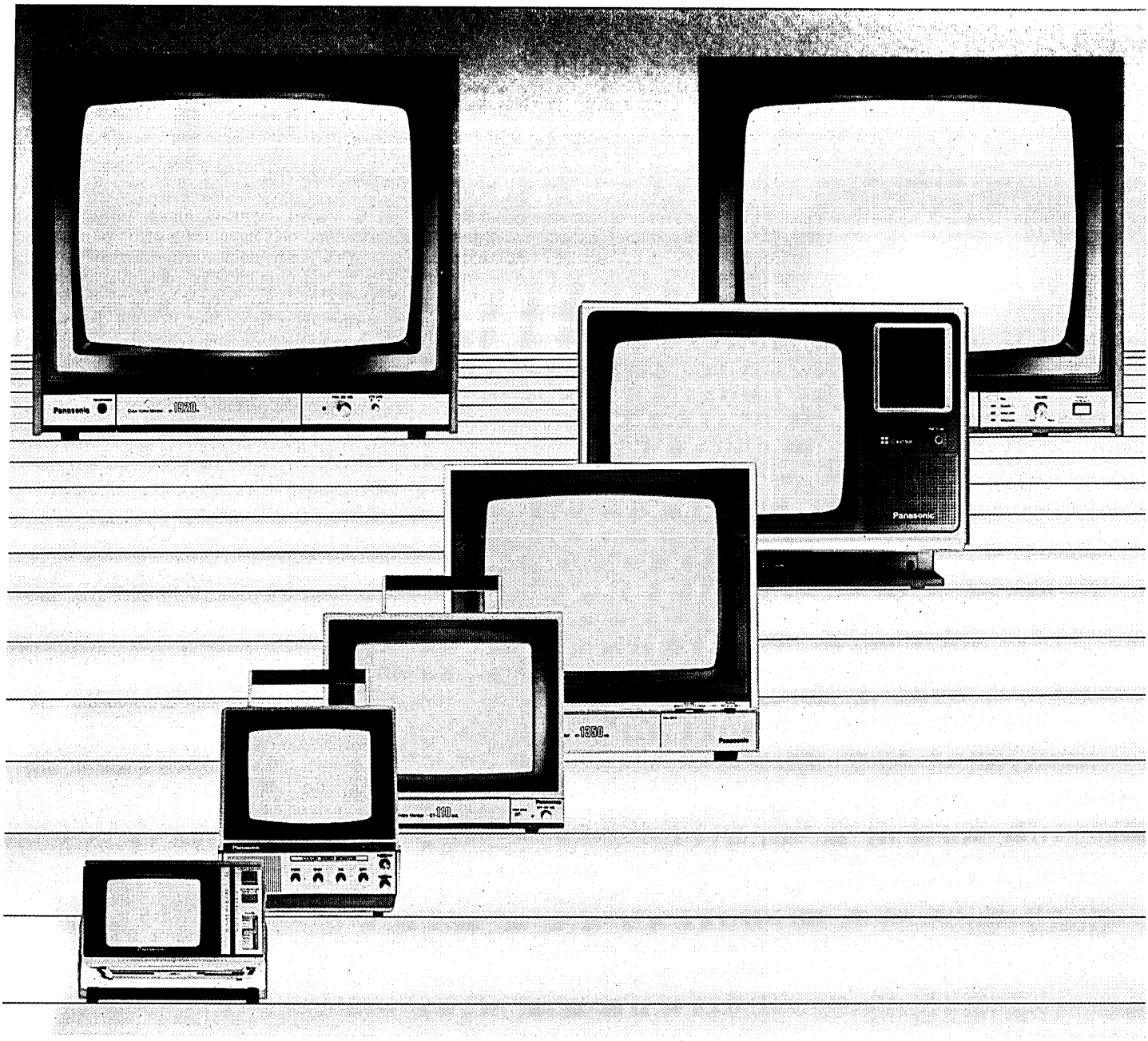
Frank Haigh, sales manager at Triad, says that the low-cost GSI system can automatically interconnect points and provide design checks (e.g., note clearances between two conductors and report if there is any violation of design standards). Haigh says that the system's forte is in assisting in the actual design of digital circuits. "The system can display both sides of the PCB at the same time, to enable the designer to view the interconnections from side to side. It can automatically repeat similar patterns; make corrections; move components, or whole areas of the circuit on the screen; display grids; assign different colors to the different layers to make them more discernible; and display all the connections, as they are indicated on the schematic, to enable the designer to determine if and how they should be rearranged. Not only does the system generate film masters, but the same database can produce the associated documentation (drill drawings, drill tapes, assembly drawings, etc.) with absolute accuracy."

4. *Architecture, engineering, construction* (AEC). Crosier, Kilgour and Partners, Ltd. has five offices in western Canada. The Calgary office consists of 14 people (mostly structural engineers) using an Omnitech ERGOS 240 CADD system. The $87,000 to $150,000 system uses a CA 240 16-bit mini; a Summagraphics digitizer; a vendor manufactured crt as part of the dual screen edit workstation; and either an HP, Calcomp, Zeta, or Versatec plotter. Application software from Omnitech includes automatic bill-of-material extraction, FEM for mechanical parts and buildings, drawing management, central database or distributed network support, and chart booking (record keeping of a project over time).

At Crosier Kilgour the system is primarily used for structural, architectural, and precast concrete and steel drafting and detailing. Production drawings constitute 50% of the CADD system use, and steel and precast detailing another 50%. Five operators work on three systems; each operator works four days on and three days off, yielding approximately 200 hours per week from the three systems.

Rick Scheidt, a partner at the Calgary office, reports that the system is best for repetitive drawing. "Revisions can be reflected in new, original drawings, eliminating the need for low-quality sepias. Corporate details—client logos, for example—can be put into memory and reprinted on a drawing. The system greatly improves accuracy and quality; lettering and numbering appear uniform, rather than being subject to different drafter's styles. The system can draw at any scale and dimension using either metric or English standards. Complex and nonrepetitive jobs are more efficient and cost effective when done manually. The only liability I'd associate with the system is that we need to maintain a constant flow of work to justify the cost of the machine."

5. *Mapping*. The James W. Sewall Co. is a consulting firm of some 100 civil engineers and foresters. Their GeoBased Systems low-cost STRINGS (Storage and Retrieval of Informative Graphics) CADD system consists of a PDP 11/23 16-bit word cpu, a Talos digitizer, Houston Instrument and Soltec plotters, an AED 512 color crt, and three digitizing stations—one interfaced to a Kern PG2 stereoplotter. GeoBased Systems cost from $25,000 (for a digitizing station) to $180,000. Applications software includes



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"What we're doing on the system would have been prohibitive or impossible by hand."

parcel mapping and timber information management systems.

USES IN FORESTRY ANALYSIS

One of the primary applications of STRINGS at Sewall is for forestry. Using the stereoplotter, a base map showing planimetric detail is compiled; forest data delineated from aerial photos (e.g., types of tree stands) is then superimposed on the base map. Attributes of stands—such as the value of the stand reflected in the cords of wood it contains, the stand number and type, zoning, soil and slope data, etc.—are encoded. The CADD system can then analyze the information and draw a map showing any combination of file attributes requested.

Earl Raymond, director of field surveys and photogrammetry at Sewall, says, "What we're doing on the system would have been prohibitive or impossible by hand; for instance, we have not been able to afford to do color maps since the mid-'50s. The system's ability to replace reams of tabular data with a color map to display the same information graphically is invaluable, as is its ability to reduce, enlarge, and change data."

6. *Photogrammetry.* Photogrammetry is the science of making precise measurements by means of photographs. Output primarily consists of maps for use by engineers, city planners, and government agencies for such applications as highway design, tax mapping, and mining studies.

Southern Resource Mapping (SRM) is a 25-person aerial mapping and survey firm located in Ormond Beach, Fla. The company uses two HASP systems (costing from $30,000 to $90,000) consisting of an HP 9825 desktop cpu; a DataTech plotter; a HASP data controller for digitally encoding data from the X,Y, and Z axes of the steroplotter; and a Tektronix 4006 crt edit workstation.

SRM uses the systems primarily for cut-and-fill applications, generating cross sections on the stereoplotter, putting together design templates from the engineers, and making hardcopy plots.

Mike Kitaif, a stereoplotter operator and computer programmer with SRM, says, "The system aids in all three steps involved in compiling a model: map sheet preparation—the computer grids the manuscript and plots control points; orientation of photographs—the operator enters coordinates and elevations from the field and the computer does a least square adjustment so that if there is any inaccuracy the computer will allow for it within certain tolerances and spread it evenly between all the control points, thus increasing the map's accuracy; and map compilation—by generating messages, annotation, dashed lines, and giving constant readouts of elevation data.

"Before we installed the computer, orientation of the stereo model had to be done through a trial and error method; now, all information is entered into the computer, which creates a 3-D model and transfers this to a 2-D map. The system has saved us 20% to 30% over manual methods." ✻

Eric Teicholz is president of Graphic Systems, Inc., Cambridge, Mass., a CAD/CAM consulting group. His book, *Low Cost CAD Systems for Design and Drafting*, was recently published by McGraw-Hill.

Peggy Kilburn is president of the Program Advisory Board, a consulting firm based in Newton, Mass.

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For a couple of years now, American robot manufacturers have appeared to be on the verge of astounding growth. What's taking so long?

MIGHTY OAKS TAKE TIME

by Leopold Froehlich

In many ways, the company is emblematic of an entire industry. Its offices are in the former headquarters of Allenwood Steel in Conshohocken, Pa., a chip shot away from the maroon-colored plate-rolling mills of Lukens Steel. The Schuykill still flows out beyond the mill, but there's hardly any industrial use for it anymore. The bustle and smoke of 30 years ago are mostly a memory. Now U.S. Robots, Inc., a small, technology-intensive company in a fledgling industry, conducts its business where seemingly invincible steel executives once trod.

Robotics is an industry currently garnering a lot of attention from investors and the press alike. The field has come to be regarded as a sort of technological Lourdes, a place to look for industrial and economic miracles. Stocks trade for 20 or 30 times earnings, and predictions can be as wide open as a proverbial Montana sky. New companies seem to enter the business almost weekly.

But robotics is also an industry poised and trembling for a shakeout. For companies like U.S. Robots, the problem is twofold: lots of competition and a market that hasn't expanded as quickly as expected. According to Laura Conigliaro, an analyst with Prudential-Bache Securities, the industry had U.S. sales of $180 million to $195 million in 1982. In a good economy, she says, the total might have been $270 million. Given the number of plates on the table and the hunger of the competition—particularly the foreign competition—that's no banquet. Even with numerous estimates of a $2 billion market by 1990, the industry is currently threatened with overcapacity. Mergers or bankruptcies await more than a few of the companies selling robots today.

Yet U.S. Robots expresses no fear. It intends to be solidly positioned in the industrial robot (IR) market in the future. Of its 38 employees, 18 are engineers. Its major product, the Maker, is a small, flexible, five-axis robot with applications in assembly and lightweight (under five pounds) part manipulation. The company has placed 15 robots since its inception in March 1981 and is soon

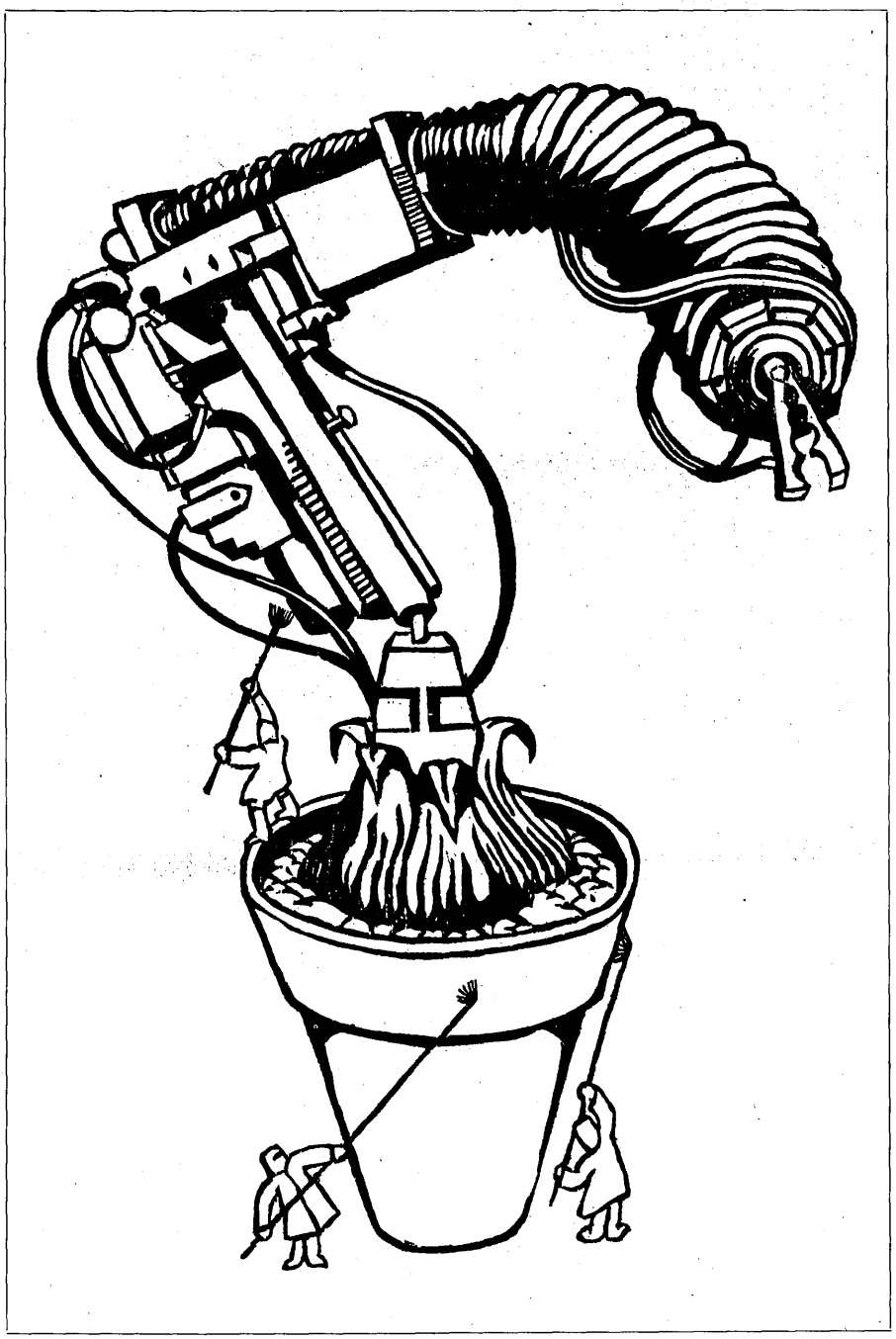

ILLUSTRATION BY LARS HOKANSON

Given the number of plates on the table and the hunger of the competition, the robotics business is no banquet.

to undergo a second level of financing with the Hillman Group.

Peter Chance, president of U.S. Robots, likes southeastern Pennsylvania and feels his chances are good there. The company is planning to move to new headquarters in nearby King Of Prussia soon. "What's going on at MIT, Stanford, and Carnegie-Mellon," says Chance, "will assure us a position in robotics." Meaning that innovations from university laboratories will enable the U.S. to maintain a technological preeminence. Chance even professes not to be discouraged by the big companies now threatening to crowd small firms like his out of the business.

The big names started showing up in earnest at Cobo Hall in Detroit in March 1982, when General Electric, IBM, Bendix, Westinghouse, and United Technologies showed their wares. The Robotics VI Conference and Exposition became so crowded that city fire marshals were forced to halt entrance to the hall.

Only a handful of U.S. robot manufacturers, with U.S. Robots and market leaders Unimation (at 34% of 1982 U.S. market share) and Cincinnati Milacron (at 16%) among them, are set with a product they've designed and built themselves. Other companies use licensing or cross-licensing as a way of catching U.S. and foreign competition.

USE OF FOREIGN LICENSES

IBM signed agreements with Sankyo Seiki for the selective compliant arm for robotic assembly (SCARA) for its 7535 series manufacturing system. GE, which is aiming for 20% of the U.S. market by 1986, has hooked up with Volkswagen, DEA of Italy, and Hitachi for its own line of robots. Westinghouse licensed with Olivetti, Komatsu, and Mitsubishi; United Technologies shook hands with Kuka and Nimak Maschinen Automation. GM, which claims there won't be sufficient U.S. capacity to meet its potential needs (14,000 IRs) by 1990, has joined with Fujitsu Fanuc to manufacture robots. Bendix, which George Powch, general manager of Bendix's robotics division, says is without "nationalistic bias," had negotiated with Fanuc before GM, but didn't find anything suitable. Bendix recently announced an agreement with Yaskawa Electric Manufacturing to distribute three of the latter's robot systems.

The Japanese, as readers of *Time* magazine know, have passionately embraced robotics and now pose the greatest challenge in an industry that had its origins in the U.S. during the early 1960s. They lead the world in IR application with 14,000 units, compared with 4,000 in the U.S. Japan should begin exporting some 17% of its total IR output by 1985, and some analysts predict that Japan will have 45% of the U.S. market by then.

Numbers like these tend to inspire economic nationalism, and some roboticists are downright sore at U.S. companies for seeking technology abroad when they could meet their needs in this country. One such critic is Stanley Polcyn, president of the Robot Institute of America (RIA), a trade association. It is his duty there to further the development of robotics in the U.S. He is also vice president at Unimation, where it is his job to make robots.

It is probably understandable that Unimation's competitors are loathe to purchase technology from the top IR company. Why help the leader? But why team up with foreign companies, many of which enjoy government subsidies, and make the competition that much tougher for U.S. firms? Polcyn wonders. "There's nothing archaic about nationalism," he says, noting that other nations, particularly Japan, are adept at practicing it. "I've believed in the free enterprise system for years. But it's not a fair fight today."

Some have scoffed at Polcyn's lamentation as sour grapes. As the prize subsidiary of perpetually beleaguered Condec, Unimation has had its share of problems. *Fortune* magazine ran an article critical of chief executive Joseph Engelberger's managerial abilities. A reputation for troublesome, bug-ridden product doggedly persists. Of Unimation's fiscal 1981 sales, 57% were to the automakers, a precarious customer base. The firm budgeted only $4.5 million for R&D in 1982, and in the first half of fiscal 1982 its earnings were only about $700,000.

But there's still plenty of activity at Unimation's manufacturing shops in hilly Danbury, Conn. With facilities already totaling 330,000 square feet, the firm plans to open a new plant in nearby Waterbury soon. The company claims to have installed some 5,000 robots since 1961, its first year in business. Its PUMA, developed with GM, is the industry's standard assembly robot. The firm employs 800 and claims revenues of $72 million for fiscal 1982. Its high-level robot programming language, VAL, is perhaps second in quality only to IBM's AML. A new PUMA, Series 760, featuring a 49-inch reach and a 22-pound payload capacity, has recently been introduced. Univision, its $35,000 vision system developed with Machine Intelligence Corp., has potential applications in automatic arc welding and inspection.

ROBOTS BUILDING ROBOTS

Chrysler expects to have 987 programmable robots operating in its stamping, assembly, and diversified operations plants by 1988. It has begun by ordering Unimation's first two-arm robot, which has a back-to-back arm configuration for faster production. And Unimation is intending to improve its vertical integration by building more of its own components. It plans to use robots to build other robots—its Apprentice welding robots currently produce only robot bases—which should make the salesman's pitch a little more convincing.

In early December, as this article went to press, there was news of a dramatic change in Unimation's fortunes. Westinghouse announced it had agreed to acquire Unimation from Condec and other stockholders for $107 million, and intended to merge the firm with its other robotics operations. The acquisition, which combines the number one IR maker with one of the U.S.'s biggest corporations, is the latest and largest instance of a giant firm moving into a market pioneered by smaller ones.

One man who will have to give some thought to this development is Michael Radeke, manager of Cincinnati Milacron's IR division. Milacron's industrial robot operation, begun in 1977, is located in Lebanon, Ohio, an old town northeast of Cincinnati. Even though robotics probably only accounts for some 10% of Milacron's $934 million 1981 sales, Radeke is confident that IRs will someday approach the earnings now generated by its machine tool division. Founded by Frederick Geier to make taps and screws as the Cincinnati Milling Machine Co. in 1884, Milacron is still closely held by the Geier family. This allows the company to take a long-term view of its market. Its robotics R&D budget for 1982 was around $30 million, its capital spending another $50 million. The firm last year opened a $9 million plant in Greenwood, S.C., for the manufacture of robots. Its in-house development of electrical components and software is legendary. The firm has introduced a small parts-assembly robot, the T3-726, for handling of payloads up to 14 pounds. Even so, all is not perfect for Milacron. Economic conditions have caused the company to lay off 1,000 of its 8,000-member southwestern Ohio work force.

One reason Radeke feels his firm is well positioned in an increasingly international marketplace is Milacron's recent agreement with Dainichi Kiko for the joint manufacture of robots. Dainichi will supply the mechanical components, Milacron the software and electrical controls.

Milacron, Unimation, and U.S. Robots are three firms figuring to ride out any rough phases in the IR market growth. Their greatest immediate challenge is likely to come from abroad. The U.S. currently enjoys a substantial lead over the Japanese in the development of software and controls, but it is not an insurmountable one.

"The level of software that currently exists," says James Albus of the National Bureau of Standards, "except in the laborato-

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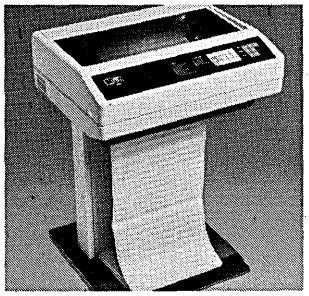

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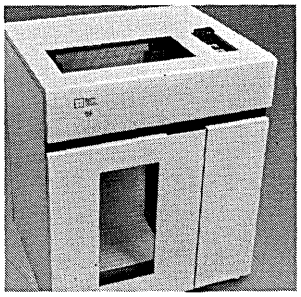

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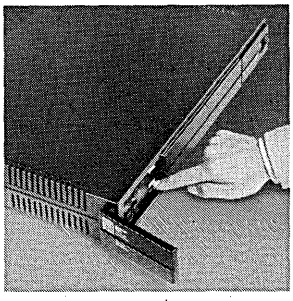

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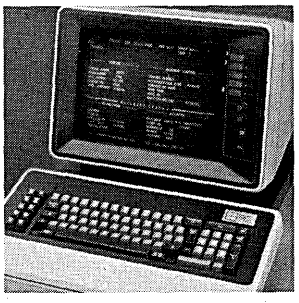

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The U.S. enjoys a substantial software lead over the Japanese, but not an insurmountable one.

ry, is quite primitive. If the Japanese mounted a serious effort to improve software, we'd be in trouble." Nor can German, French, or Scandinavian efforts be ignored. Even the U.S.S.R. has begun to make some noise in the field. How the U.S. will fare in this world market is unknowable, but it is worth some contemplation.

LIMITED GROWTH RATE

In 1970 there were some wild predictions about IR use in the U.S. in 1980. Devotees offhandedly announced the likelihood of 35% compound annual growth rates. Why hasn't that happened? There are various reasons, but one interesting explanation comes from Kenneth Susnjara of the Thermwood Corp., an Indiana-based robotics firm. During the 1970s, he argues, labor was still relatively plentiful in the U.S. and it was substituted for the capital expenditure of robots. Labor-short Japan chose to take the salty capital plunge. Hence Japan's lead in applications, and hence the delay in fulfilling those sanguine predictions.

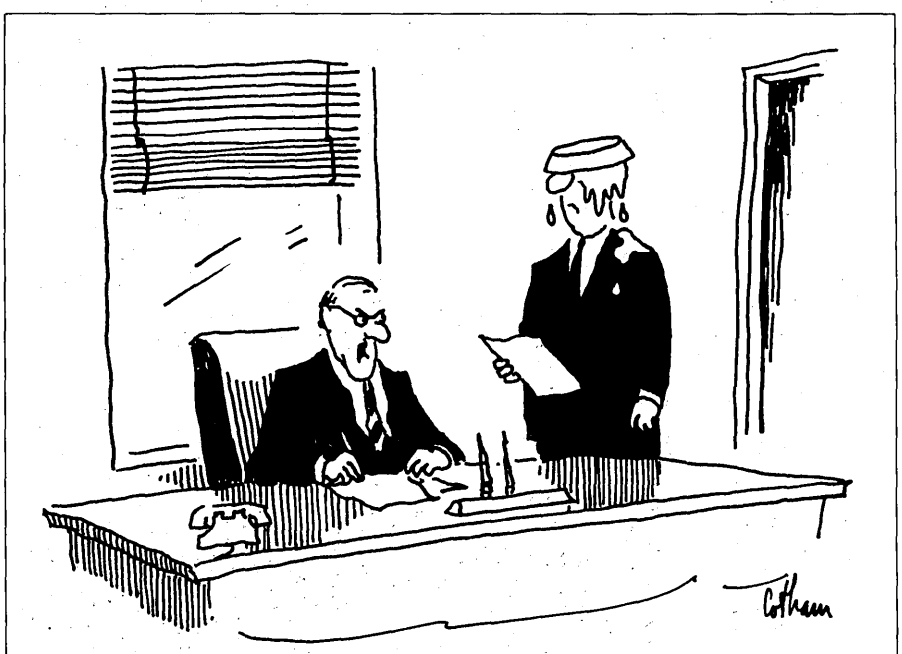
Worldwide, robots are now seriously applied in spot welding, spray painting, press feeding, material handling, and, to a lesser extent, die casting and investment forging. But batch (low volume) parts assembly, which was to announce the millenium, has yet to pan out. Unlike hard, dedicated automation, IRs would supply a soft automation that could be readily reprogrammed for batch assembly. Obviously, this would be a big advantage: economy of scale could be achieved without the cost of retooling, and the capital expenditure of the robot would not be limited to one task. James Albus predicts, however, that robots won't have a "significant impact on mechanical assembly" until 1990.

As things stand now, that's probably good for the Japanese and bad for the U.S. Peter Chance of U.S. Robots puts it this way: "The U.S. is better at the technology, but the Japanese may have a better understanding of the manufacturing process." Albert Sciaky of IIT Research Institute concurs: "We have more clever gadgets—smarter robots, more powerful computers—but we haven't taken all these things and put them in a system."

The Japanese are good at using simple, fast, and cheap devices. They can integrate manipulators and variable or fixed sequence robots, for example, with belt conveyors and other peripheral equipment to achieve the same result an intelligent, adaptive control robot might in the U.S. Many of these simple devices are not reprogrammable, which means that by RIA standards they're not robots. The Japanese don't seem to care.

The Japanese are not infallible, of course, nor have they ignored the high end of robotic technology. Fujitsu Fanuc's $38 million Mt. Fuji plant for IR manufacture is perhaps the most conspicuous example of the unmanned factory. There are two human workers on the night shift; much of the rest of the work is done by robots, machine cells, and an automated storage/retrieval system. About 90% of all mechanical processes, it is claimed, are automated at Mt. Fuji. But the Fanuc effort is still incomplete, and in many ways is more a publicity gesture than an actual manufacturing concern. One American engineer reports that there's nothing at Mt. Fuji that could not be accomplished in the States, given the money: "*The New York Times* makes it sound like the thing's running full bore. There are still machines in crates. It's an experimental venture, not a fait accompli." The technology for such complex operations does exist, and has been demonstrated in the lab, but bringing it to the shop floor is a different matter.

If U.S. engineers grow testy at intimations of Japanese success, they still often pursue problems that might be avoided altogether. The bin-picking problem, a holy grail for many roboticists, is a good example. Bin-picking is the as-yet-unattained ability (despite promising work at the University of Rhode Island) of a robot to remove unordered parts from a bin. In order for a robot to pick parts from that bin, it must have vision sense, maybe an orientation model, perhaps tactile sense, or a peripheral device to reorient parts for the IR. But, as Joseph Engelberger has pointed out, there isn't any need to worry about bin-picking at all when such parts are initially oriented as they come out of the stamp press. Why contribute to entropy by tossing fixtured parts into a bin? Why bother with a bewilderingly complex solution to a problem that could be easily avoided?



"I'm not interested in another one of your pie-in-the-sky schemes!"

THE SEARCH CONTINUES

But the search for the intelligent robot continues in laboratories, with complex systems studies receiving about the same money as studies of applications. The primitive nature of the results has discouraged some observers. A prominent researcher in touch sensing, Leon Harmon, professor of biomedical engineering at Case Western University, tries to put the efforts into perspective: "It's not necessarily a vain hope to pursue intelligent robots, but it is a very difficult task. It's a long-range problem. Ultimately, one would like to have automata completely autonomous. That deserves to be worked on."

It has been predicted that by 1990 parts will be designed for IR assembly. Part shapes will be simplified via group technology, and the design graphics database will describe the shape of parts to be made and the configuration of assemblies to be constructed. If all this comes to pass, the intelligent robot might not be necessary at all.

There remain, however, a few other matters that will have to be cleared up before robotics can become a practical and flexible science. Some will be corrected soon, others may be at least a decade off.

A big, immediate problem with IRs is

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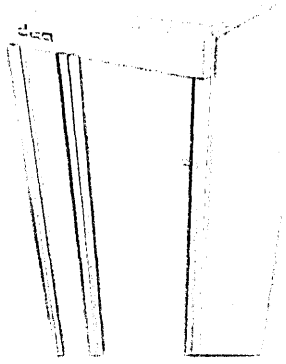

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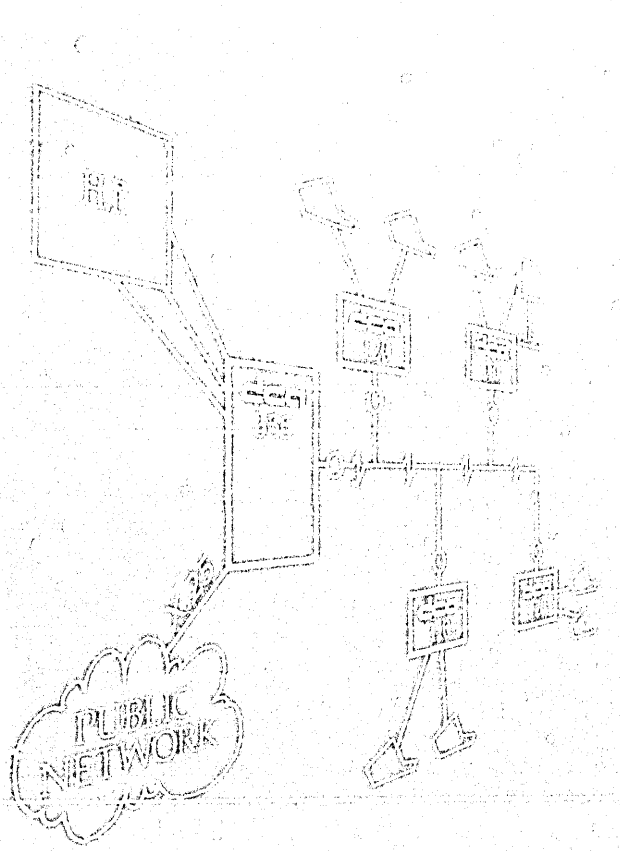

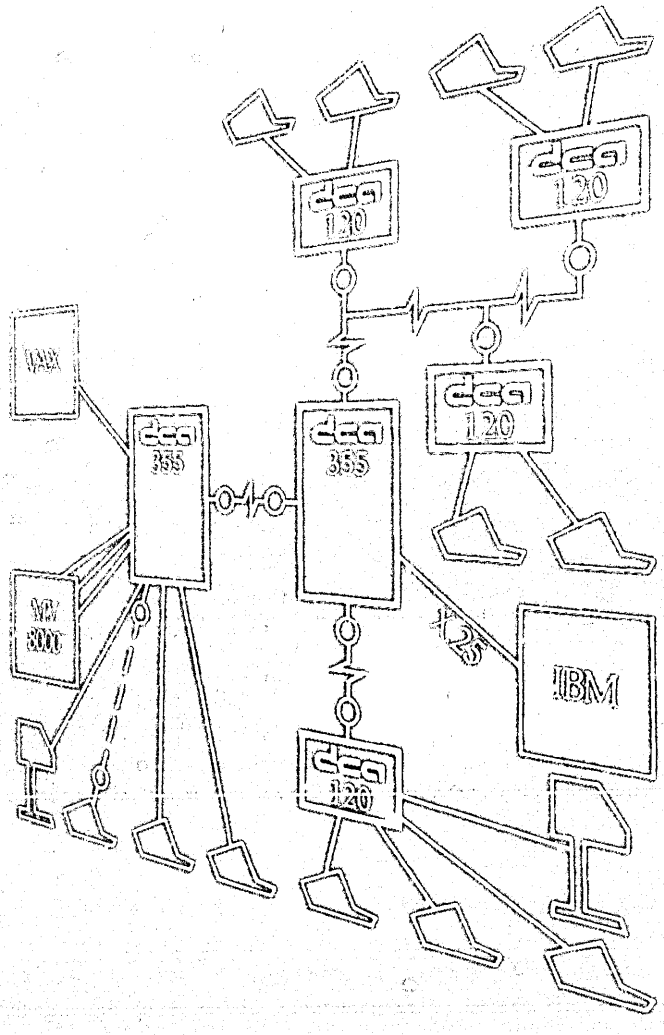

"If only we could build a robot as strong or as fast as an ant."

the poor accuracy of end effectors, or "hands." Most robots have excellent repeatability accuracy, but accuracy of absolute positioning is still a problem. When a robot hand is directed to move to point A, the resulting position may be as far as half an inch off. Obviously, this makes programming difficult. Better electrical motors, such as the brushless DC, should improve accuracy.

Dynamic performance must also be improved. Robots have to become faster, stronger, and more dexterous. Strength-to-weight ratios are now very poor: few robots can lift one tenth their own weight. Most complex operations are hindered by slow cycle times. Lighter arms and better end effectors are needed. "If only," says James Albus, "we could build a robot as strong or as fast as an ant."

But work is being done: Takeo Kanade and Haruhiko Asada have made the Carnegie-Mellon Direct Drive Arm, which has no gears, hence no friction. With this arm, compliance is a direct function of the feedback gain, allowing for better control and accuracy. When arms are made of composite materials, speed should improve.

One area where robotic "intelligence" is important is in vision, the ignis fatuus of many roboticists. Vision has been heralded as the missing link to establishing assembly robots. With a fast, cheap vision system that can process vast amounts of data, the robotics industry would presumably take off like a dog after a rabbit. Everyone seems to be waiting for such a system, and it may well arrive by the end of the decade. But the academics who have designed current vision systems and who speak of connectivity analysis or contrasting backgrounds frequently aren't familiar with factories. Fixturing of parts is cheaper; better orientation or precise locating of parts might solve the problem. Touch sensing provides an option, but a high-resolution, fast, and durable tactile system is still wanted. Eddy-current technology (which senses a seam width by disruptions in the magnetic field) or ultrasonic systems can be used in place of vision in many routines. Thus, robotics need not be put on hold until the practical vision system is brought to market. Better sensors are needed. But work can be accomplished with existing alternative methods.

Off-line programming, the task of programming an IR via remotely generated point coordinate data, could really help small batch manufacturing because of its speed and ability to reprogram various robots with ease. Current efforts are still somewhat rudimentary, but off-line programming should become increasingly important in the future.

A system for the parallel processing of input data is another area that needs work. The processing of data must become faster. The automotive industry has stressed the need for a monitoring process to allow for dynamic modification. This would permit IRs to be programmed off-line and then adjusted without serious interruption in manufacturing output.

NEED FOR INTERFACE STANDARDS

At a meeting at the National Bureau of Standards in September, roboticists agreed there was a "long overdue" need for a wrist-gripper interface standard. Interfaces that permit robots, machine tools, sensors, and control tools to be integrated will also be necessary, but not for a while. "There is no real need," say Bradford Smith of the NBS, "to standardize any off-line programming language." Better interfaces between the robot and its environment would help, as would an interface between general purpose software and special purpose robots. But these are still distant concerns.

Finally, a great deal of work remains to be done in manufacturing planning, which is still in its chrysalid form. The entire manufacturing process must become better rationalized before robotics and other sophisticated tools can realize their potential.

U.S. management and government have both been excoriated by some roboticists for their attitudes toward robots. Strict quantization of risks and benefits and an insistence upon short-term return on investment are cited as examples of American management's myopia. Japanese firms are better able to justify cost for IR installations and can afford to take a longer-term view.

The U.S. government has not been too keen on helping robotics. In a staff study prepared for the Congressional Subcommittee on Monetary and Fiscal Policy, "government bribes" for the enhancement of robotics are not recommended: "It would probably be undesirable to further robotic development by artificial government stimuli, such as special subsidies for robotic use."

Special subsidies are the thing in Japan, of course. Where they have the well-known MITI, the U.S. has, perhaps, the Department of Commerce. Where Japan offers a 112.5% three-year depreciation of robotic equipment, breaks on export royalties and employee benefits, the U.S. has the Economic Recovery Tax Act of 1981. The Japanese government spends about $35 million per annum to support robotics; the U.S., some $18 million. Little has been done in the U.S. to ease the movement of capital and assist in retraining labor. The U.S. can't match the Japan Robot Leasing Co. (JAROL), which aids in capital advancement. Although the Department of Defense recognizes that the U.S. is falling behind in robotics, it does not like the top-down, centrally regulated approach of the Japanese. While the Air Force has earmarked $250 million over a six-year period for its fabled factory of the future, and the National Science Foundation, NASA, and NBS have been helpful, there really hasn't been much else. "Legislators just don't feel comfortable dealing with matters of technology," says Stan Polcyn. "There's been a real lack of concern on their part." Although it's generally agreed that an American MITI would probably turn into a bail-out agency, Polcyn and many of his colleagues feel that a national directive and perhaps some additional hard encouragement are in order from the federal government.

GROWING STUDENT INTEREST

Perhaps the most encouraging trend for the U.S. manufacturers is the growing number of students taking an interest in robotics. There is a shortage of roboticists today, but indications are that this is changing. Mechanical, electronic, and industrial engineering departments are noticing increased enrollments. "Manufacturing previously had been a second-class department," says IIT's Albert Sciaky, "but now it's gaining prominence and corporate recognition."

Industry and academe have frequently joined for purposes of research and education, but robotics has been a particularly fruitful field for cooperation. Cincinnati Milacron has donated numerous TR3s to Ohio State, Purdue, Georgia Tech, and others. IBM has granted $40 million for CAD/CAM research at 20 schools. Robotics is taught not only at MIT, Stanford, and Carnegie-Mellon, but also at Purdue and Macomb County Community College in Warren, Mich. Professor James Lawlor of the Stevens Institute of Technology in Hoboken, N.J., (where F.W. Taylor took his mechanical engineering degree in 1883) sees a burgeoning interest in robotics among his students. And the University of Rhode Island in Kingston received a $700,000 grant from the NSF to establish its University-Industry Cooperative Center for Robotics this spring. There are now 35 students in the program.

So while there's still a lot of work to be done in robotics, as well as a few battles to be fought, people who can meet the challenges will at least be in adequate supply. That's about the most one can ask of "an industry still in its infancy," as Milacron's Michael Radeke describes it. After all, robots still represent less than 2% of machine tool sales in this country. That's a business comparable in size to the archery equipment industry, but with a bit more potential. ❋

Leopold Froehlich, a New York-based freelance writer, is DATAMATION's robotics adviser.

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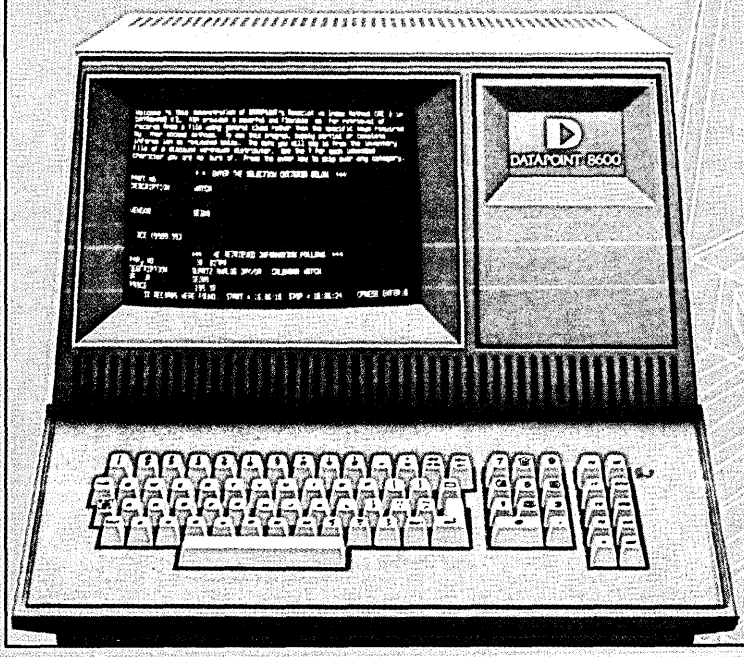

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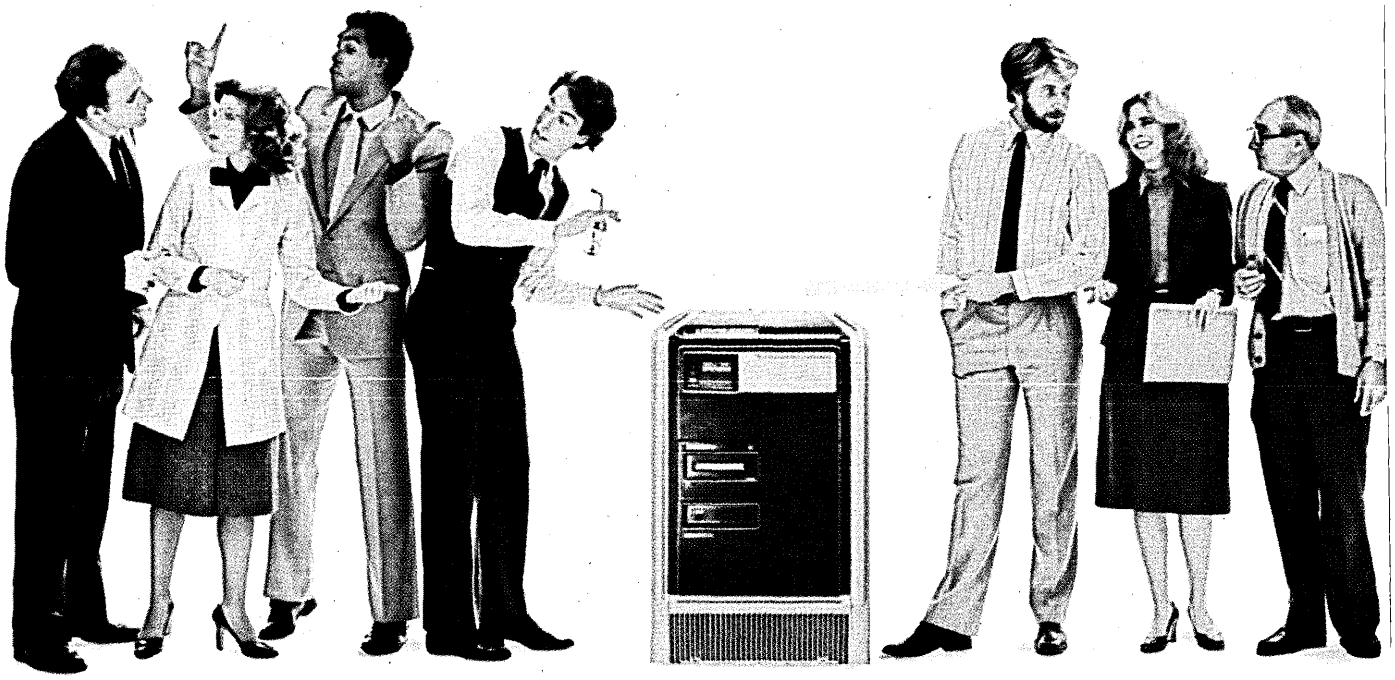

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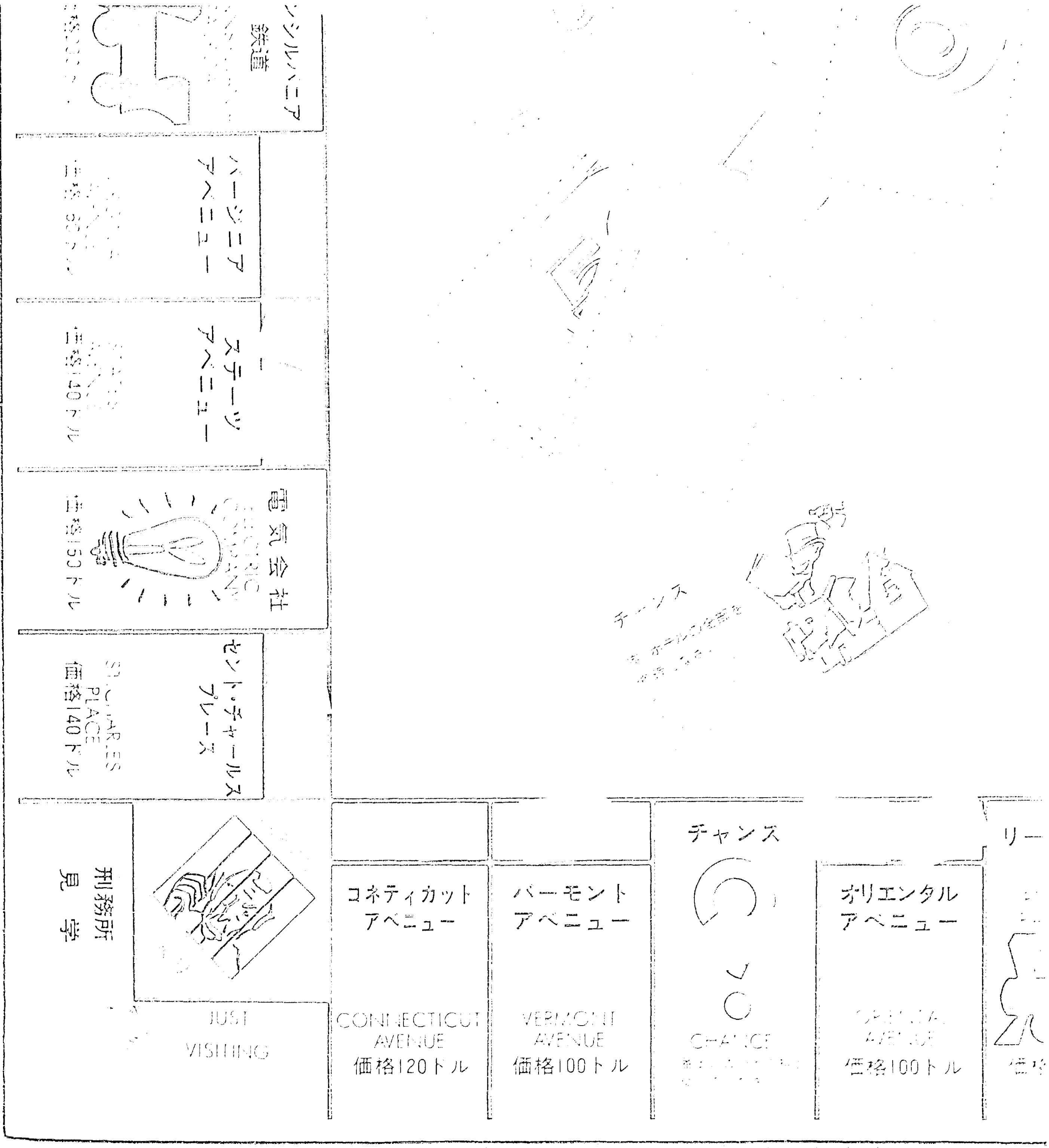
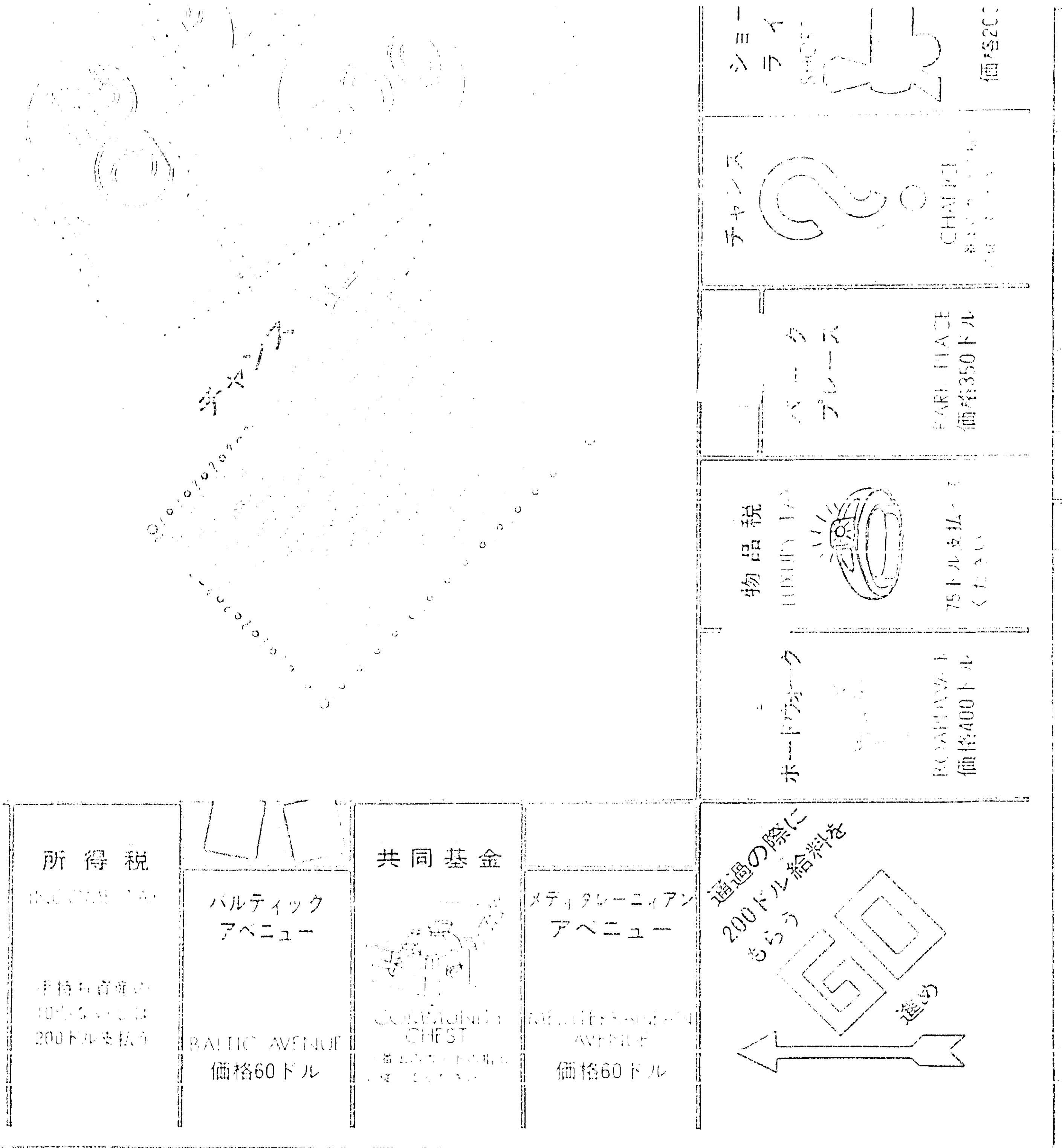


EVALUATING THE JAPANESE CHALLENGE

U.S. companies currently own some choice properties in the worldwide systems market, but the Japanese expect to do well by playing their own version of the game.



by Ulric Weil

Are the Japanese for real in the high-growth, worldwide computer and telecommunications market? Are their overseas successes in selected product areas the beginning of a tidal wave of Japanese systems destined to submerge the U.S.-based computer industry? Or is the steadily building flow of Japanese-made electronic black boxes merely another demonstration of that country's unmatched excellence in mass production of high-quality, low-cost hardware?

At present, Japan's computer export goals are largely limited to supplying certain hardware items to American and European resellers—an original equipment manufacturer (oem) marketing strategy. The Japanese are expected to expand their efforts to encompass most of the big-volume hardware products. Their superior manufacturing technology could give them a distinct cost advantage in this product category. In 1986 the Japanese should be able to export at least 20% of their estimated to-

Japan may be exporting about $2.5 billion worth of dp equipment by 1986.

tal production, which will then be worth about $12 billion on an if-sold basis.

A number of U.S. and European information processing companies may get hurt unless they form alliances with the Japanese. While some firms are likely to link up with Japan, others will go it alone. Leading hardware producers such as IBM, Digital Equipment, Hewlett-Packard, and Wang Laboratories, for example, can undoubtedly cope satisfactorily.

In the case of Japan, the past is merely a prolog. Later in this decade the fully integrated Japanese computer/telecommunications companies, along with several of their specialty houses (Sharp, SORD, Casio, etc.), plan to become systems vendors. To reach this goal, they must first solve their present software development problems—problems that probably will be resolved in the next five to seven years. Once this software gap is closed, the Japanese can compete in the overseas systems arena through direct end-user marketing deals or ties with Stateside or European partners.

Thus, the Japanese may increase their currently scant market share in the systems business (which includes software packages developed locally or copied from the West) to about 6% as early as 1987. That is when the real battle will be joined, because as soon as the Japanese can compete effectively in programming, worldwide software prices will begin to drop.

Fueling this trend will be software portability—a concept that will have taken firm hold by the end of the '80s. As a result, software may acquire quasi-commodity pricing characteristics not unlike those of today's hardware. This has important implications, since the American computer manufacturers currently derive their highest revenue growth and increasing profits from the sale of software. By 1990, the Japanese are likely to cut into these sales, causing the U.S. computer industry's revenue growth rate, currently set at 15% to 20% per year, to slow. Honing software skills (including finding a way to overcome the programming productivity bottleneck), however, will not be easy for the Japanese, who have a tough time with the conceptual nature of software development and the English prerequisite of standard programming languages such as COBOL, FORTRAN, PL/1, and BASIC.

In the meantime, Japanese vendors will continue to capitalize on their superior know-how in factory automation (including the use of intelligent robots in flexible manufacturing systems). Thus, their competitive edge on the hardware side will sharpen. As a result, the second-tier companies on both sides of the Pacific will be under the gun, while the third-tier firms may end up going to the wall. Clearly, the margin for error in the emerging tough environment of super efficient mass production and streamlined distribution is shrinking rapidly.

BUNCHING WITH THE JAPANESE

The BUNCH companies—Burroughs, Univac, NCR, Control Data, and Honeywell Information Systems—may want to align themselves with the Japanese, taking advantage of a natural division of labor. Under such a setup, the U.S. companies could concentrate on worldwide distribution, while their Japanese partners manufactured on the basis of their stipulated design specifications.

Of course, there is always room for well-managed, innovative, and entrepreneurially run niche firms. Today's Tandem and Cullinane and tomorrow's Apple are in this category. Such dream companies exist on both sides of the Pacific. The U.S., however, remains a more hospitable environment for startups and venture capital.

Japan's international trading practices, which include such allegedly aggressive export marketing tactics as predatory pricing as well as import restrictions in the form of selective quotas and relatively high tariffs, have created friction and encouraged latent protectionist sentiments in the U.S. and Western Europe. This article's assessment of the Japanese computer industry's potential for threatening America's current dominance of the worldwide dp market does not take into consideration the fallout from economic warfare, should the U.S. and Western Europe, frustrated by Japan's export-import policies, decide to adopt stringent protectionist measures of their own.

Partly to forestall such moves, some of Japan's high-technology firms are currently shifting some of their manufacturing operations to the U.S. and Western Europe. In any case, the dp industry is becoming internationalized at such a rapid pace, thanks to the increasing number of Japanese partnerships in America and Europe, that any significant legislated partitioning would do much harm and little good. In other words, the economic principle of comparative advantage is working and, except under conditions of military hostilities, cannot be denied in the industrialized world as we know it.

Japan will become an increasingly important factor in the worldwide dp arena. In several product areas, such as convenience copiers, facsimile machines, and handheld computers, the Japanese already dominate the market. This is also true of semiconductor devices such as 16K RAMs, 64K RAMs, and certain ROM parts. In addition, the Japanese are beginning to take a significant share in such important, high-volume, and price-sensitive submarkets as matrix printers, PABXs, IBM plug-compatible central processors, crt-based terminals, and medium-speed copiers/duplicators.

Ominously, there is evidence that the Japanese, with their usual care and diligence, are preparing to encroach upon some still relatively untouched overseas submarkets: intelligent reprogrammable and adaptive (self-learning) robots, personal computers (using second-sourced U.S.-developed 16-bit and 32-bit microprocessors), disk drives, supercomputers (very large-scale, scientific number crunchers), all kinds of office automation gear (word processing equipment, intelligent copiers, laser printers, and graphics devices), and voice recognition units. Unless stopped by superior U.S. products that can be manufactured in volume at very attractive costs or delayed by unforeseeable design problems, the Japanese are likely to become forceful competitors in these areas within three years.

Besides asserting themselves in computer hardware, the Japanese computer vendors are also making substantial strides in mastering a few important application systems, such as flexible manufacturing systems (FMS), computer integrated manufacturing (CIM), computer aided design and computer aided manufacturing (CAD/CAM), computer generated graphics, and electronic banking.

According to Morgan Stanley estimates, computer production by vendors operating in Japan (including foreign companies) will achieve an average growth of approximately 18% a year on an if-sold value basis. Exports of computers and related equipment, however, are likely to grow faster than that, possibly 30% a year on average over the next five years. Key reasons for this rapid export expansion are:

- High (30% a year or better) projected growth in the market for small business systems, personal computers, and intelligent terminals
- Brisk increases in demand for telecommunications products such as PABXs and other digital switches
- Growing worldwide acceptance of Japanese products (including large-scale, often IBM-compatible mainframes and associated peripherals)

If the Japanese computer manufacturers can sustain these growth rates, they will be exporting as much as 20% or about $2.5 billion worth of their annual production of computers and related equipment by 1986. According to informed estimates, the 1986 value of worldwide computer shipments by U.S. manufacturers will exceed $60 billion. Therefore, by 1986 the Japanese would have only a 5% share in the North and South American and European markets, compared with a 55% stake in their home market.

Of course, there are those who argue that these assumptions regarding production and exports, which are derived from esti-

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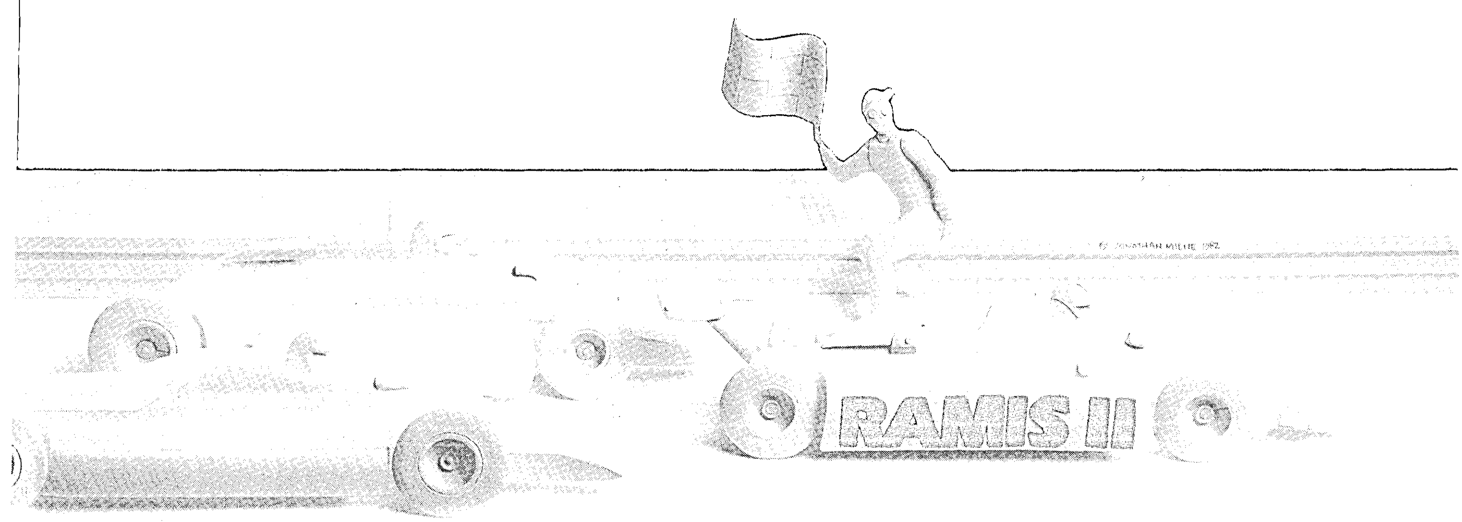

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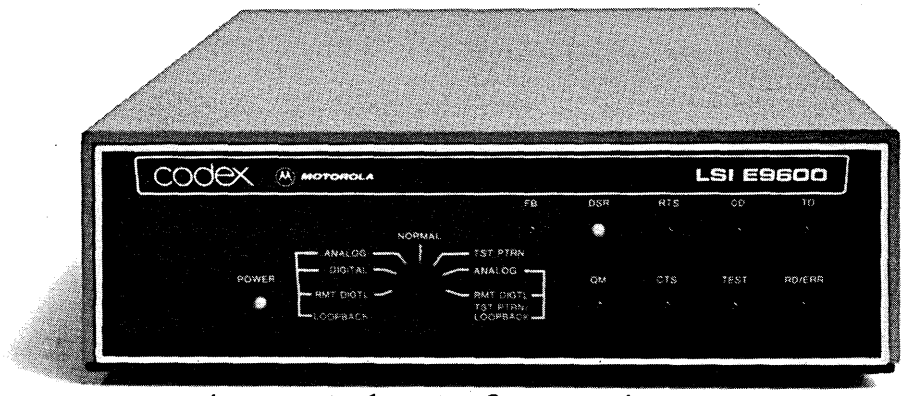

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Being profit oriented, the Japanese know they must close the software gap.

mates supplied by the Ministry of International Trade and Industry (MITI), are too conservative and that, in fact, the Japanese's goals are more aggressive. This is possible, if not likely, but in any case it's doubtful that the Japanese can take more than a 5% market share (as defined here) by 1986. By the end of this decade the Japanese may attain roughly a 15% market share, if all goes well—if, for example, the Japanese can maintain compatibility with IBM's extended architecture.

THE TOTAL SYSTEM SOLUTIONS

The Japanese still are well behind the U.S. computer industry in offering competitive total system solutions to meet North American and European customer needs. Fujitsu and Hitachi are pursuing an IBM software-compatible strategy; the firm's overseas marketing is being handled by U.S. or European firms under varying contractual provisions. In the States TRW has linked up with Fujitsu, which owns significant equity in Amdahl, while National Advanced Systems (NAS) markets Hitachi systems, and Univac recently entered into an agreement with Mitsubishi. In Europe, Hitachi markets through NAS and Olivetti, while Fujitsu uses ICL and Siemens. These arrangements have had limited success—the most rewarding one being Fujitsu's oem relationship with Amdahl.

Astute industry observers have known for some time that pursuit of an IBM plug-compatible strategy (central processing units or major peripherals) is fraught with peril. IBM itself is trying hard to shorten the new product life cycle—its emphasis on purchasing (as opposed to leasing) facilitates this effort. Purchase price cuts are one of IBM's weapons to implement this strategy; another is long-term, full pay-out leases, which are treated as sales in accordance with normally accepted U.S. accounting standards.

At the same time, having expanded its capacity very significantly in recent years (over $6 billion was spent on plant, property, and equipment from 1979 to 1981), IBM is now able to ship substantial volumes of its new products within a matter of months following their announcement. Previously, the plug-compatible manufacturers had sufficient time to decipher the design characteristics of IBM's new offerings as the company initially shipped only relatively small quantities of the new equipment. By the time IBM shipped in volume, the plug-compatible vendors were ready to respond.

Under IBM's current mode of operating—a shortened product cycle and faster volume shipments—the pcms are under severe pressure to keep up. If they wait until they can reverse-engineer from the new IBM hardware, they may only begin volume deliveries when IBM announces a new version of the currently marketed product or a new offering that replaces it, thereby nullifying much of the effort.

This pressure was dramatized recently when certain employees of Hitachi and Mitsubishi were charged by the U.S. Department of Justice with engaging in a conspiracy to steal IBM's computer designs and technology, particularly those relating to the M3081 large-scale computer and M3380 high-performance disk subsystem. If the plug-compatible manufacturers can obtain design documents prior to or concurrent with IBM's first customer shipments of a new product, their ability to respond in the marketplace on a timely basis is much enhanced.

What happened in the case of Hitachi and Mitsubishi may indicate just how successful IBM has been in making itself a moving target and how difficult it may become for the plug-compatible manufacturers to maintain true compatibility. Sooner or later the managements at some of these companies will have to ask themselves if it is indeed really worth it.

Nippon Electric (NEC), on the other hand, is trying to go the independent or non-IBM-compatible route. To this end, the company is establishing its own overseas marketing capabilities, a costly and time-consuming chore. NEC may eventually join forces with one of the U.S. or European mainframe vendors such as Honeywell Information Systems, NCR, or Sperry Univac. In effect, NEC is the Japanese version of America's BUNCH companies, although it is probably the best of the bunch. The company's real appeal stems from its strong position in semiconductors and telecommunications (today a sine qua non for success in the information processing world).

Hitachi's willingness to tolerate relatively low (7%) net margins enables it to squeeze by, while Fujitsu, with its net margins scraping the bottom of the barrel at about 3%, barely survives. Both companies' longevity depends on their ability to maintain IBM software compatibility—a task that is getting tougher all the time.

"I don't seem to have any aspirin. Would a banana help?"

CARTOON BY BRENDA BURBANK

Of course, in Japan itself these two vendors, along with NEC, should hold on to their hefty market shares (Fujitsu 20%, Hitachi 15%, and NEC 14%) by virtue of the implicit local buying preference in the important government and quasi-public sectors. Also, in the home market, Fujitsu's and Hitachi's commitment to maintaining compatibility with IBM's H Series, albeit with a one- to two-year lag, is quite acceptable. In any case, Fujitsu offers its own OSIVF4 operating system. At the application interface, this system is compatible with IBM's de facto 24-bit standard that, practically speaking, will be the prevailing computer architecture for several more years. While OSIVF4 is well accepted in Japan, Fujitsu has been unable to market this operating system overseas.

Fujitsu, Hitachi, NEC, and Mitsubishi under their own logos will not be big factors in the international market for broad-based integrated systems for virtually the rest of the '80s. In other words, IBM, Digital Equipment, Hewlett-Packard, and Wang Labs, the leading broad-based U.S. vendors, have little to worry about, provided they do not let their guard down—something they are not likely to do. Over the next several years and especially later in the decade, however, the Japanese computer industry is likely to hurt the BUNCH companies and force one or more of them to take on a Japanese partner.

While the Japanese will be increasingly successful in selling electrical/electromechanical hardware and components to oems in North America and Europe, they have no foothold at all in the overseas software (systems and applications) market. As everyone knows, separately priced software (along with software-driven application systems or problem solutions) is becoming the true value-added component, while much of the hardware is becoming a quasi-commodity product. The Japanese understand this only too well. Being profit oriented, albeit much more patient than their overseas peers, they know they must close the software gap in order to participate in this lucrative submarket. This will require continuing high (by Japanese standards) R&D spending. To give you an idea about Japan's R&D outlays, Table III shows recent R&D expenditures for most of the major Japanese computer/communications companies.

By boosting R&D funds, the Japanese hope to remedy their acknowledged software deficiency, particularly in the applications area. This will not be easy. Fujitsu, Hitachi, and NEC operate numerous so-called software factories where the usual programmer productivity schemes (including application generators) are used. As has been the case in the U.S., none of these tools produce signifi-

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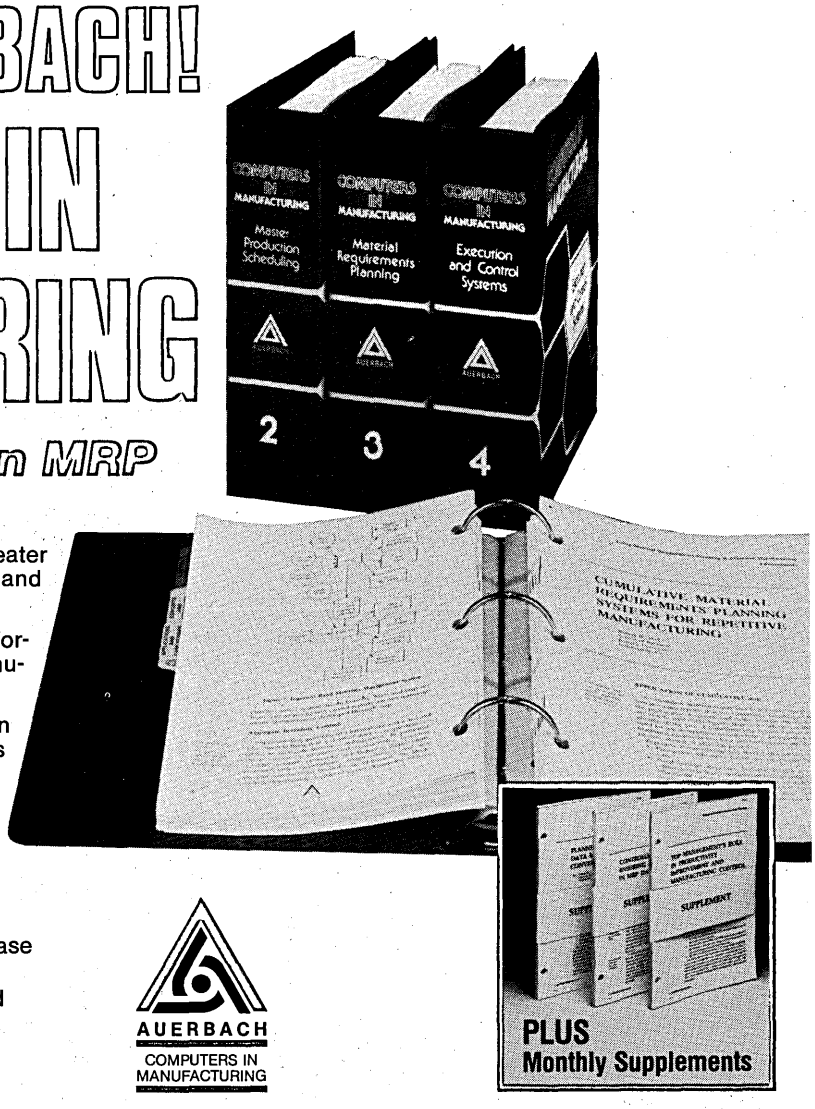

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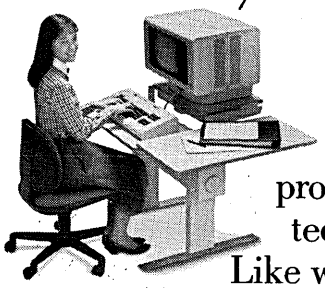

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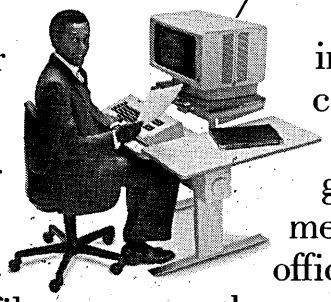

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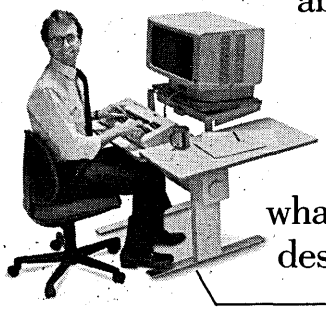

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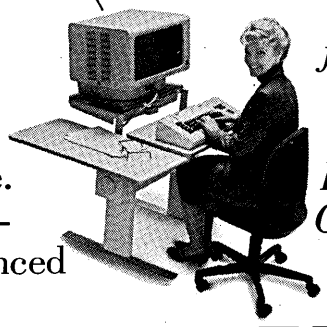

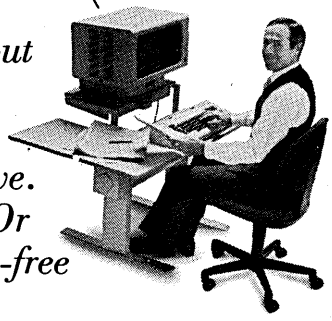

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By 1990 the economics will be right for Japan to invade the overseas systems market.

cant results. Moreover, despite these steps, the Japanese are no closer to a breakthrough such as a methodology for automatic programming. Last but not least, while the Japanese computer manufacturers have developed many excellent and sophisticated application programs for their own market, by and large they still lack the know-how and in-depth understanding to develop applications that satisfy the constantly changing needs of overseas customers.

ENGLISH LANGUAGE PROBLEMS

English language problems help explain why the Japanese have trouble in software development. Most software (system and applications) in the public domain uses symbols, mnemonics, and documentation in English, not Japanese. This makes the learning process tedious for most Japanese programmers who are no better at English than American programmers are at French.

Also, the design and development of system software, especially very advanced, complex operating systems, is an art, not a disciplined science. It requires a high level of conceptualization—something the Japanese are not nearly as proficient in as they are in developing physical factory automation systems. Not surprisingly, Hitachi's own operating systems for its M-Series of IBM-compatible mainframes are thinly disguised copies of IBM's 370, DOS, VS1, VS2, and MVS, while NEC's Acos operating system is a derivative of Honeywell's (formerly General Electric's) Gecos. Therefore, for the next five years, the Japanese will not be able to offer software outside their home market that is functionally superior or significantly lower priced than their overseas rivals.

The Japanese, however, will soon learn to copy selected foreign packages for resale at prices below those of the original. Unless legal means can stop or delay the Japanese from selling these copies in overseas markets (probably via U.S.-based partners), the present high revenue growth (about 30% a year) now enjoyed by most U.S. computer companies will start to slow down.

Then, perhaps by 1987 software will take on a quasi-commodity status—the same status that some hardware items had begun to attain in the mid-'70s. Industrywide adoption of a number of interface protocols and acceptance of certain operating systems standards will encourage the trend toward software portability, allowing many packages and operating systems to run on a variety of computers manufactured by different vendors.

By the turn of the decade, the Japanese may have mastered the software development process, marketing very low-cost packages (systems and applications) of their own design that conform to industry standards. After all, once the software design and development expenses have been amortized or expensed, the manufacturing cost is virtually nothing, and maintenance fees will also be minor, thanks to the advanced diagnostic procedures that should be on tap by 1990. By then the economics will be right for Japan to invade the overseas systems market, using price and quality as the wedge to gain entry and acceptance.

In the '90s software may indeed become a quasi-commodity just as hardware is becoming one in the '80s. Accordingly, revenue growth of the computer industry will slow, and there will be a profitability squeeze due to the impact of reduced prices. The fully integrated, broad-based companies with worldwide distribution and highly automated manufacturing facilities that permit low-cost, high-quality mass production will have the advantage. The well-run, innovative firms will also still have a place in the sun. Meanwhile, the staid BUNCH companies will come under increasing pressure from IBM, the deregulated AT&T, Digital Equipment, Wang Labs, Hewlett-Packard, the specialized personal computer vendors, and, of course, the Japanese.

There are a number of relatively small, often privately held computer companies in Japan. One of these is SORD, a successful and highly regarded maker of software-rich personal computers. The existence of firms like SORD shows that the cliché regarding the Japanese inability to be entrepreneurial or innovative is just that—a well-worn cliché. It is undoubtedly true, however, that the entrepreneurial juices are flowing much more freely in the U.S. than in either Japan or Europe.

BETTER MANAGED COMPANIES

At the same time, the large Japanese firms like Sony and Matsushita are managed more effectively and in a more disciplined and motivated manner by hands-on executives than equivalent U.S. companies. And, as everyone knows by now, the Japanese workers are more dedicated, industrious, loyal, and quality-conscious than the employees in the U.S. or Europe. These attributes and the concomitant harmonious management style based on consensus rather than adversary relationships amplify Japan's longer term threat to the U.S. and European computer industry.

That is not to say, however, that everything the Japanese computer/communications industry touches automatically turns to gold. An examination of the country's fifth generation computer project, for example, raises serious doubts about the program's feasibility, at least within the specified time frame. In magnetic storage devices (tape, disk) as opposed to input/output gear, the Japanese do not appear to be going very far, although they may grab the lead in the emerging vertical recording and laser-based video disk technologies.

Why are the Japanese so good at making quality hardware in volume at highly competitive costs? Numerous books have been written on this general subject, so there is no need to repeat the now familiar arguments. But one should recognize that while the U.S. computer and telecommunications industry is taking steps to get manufacturing quality up and costs down, the Japanese are also continuing to move ahead. In other words, the relative cost-quality gap may narrow some over the next several years as the efficient, dominant U.S. competitors tweak the underlying positive price elasticity of demand (by lowering their prices) and automate their production processes.

Japan, nevertheless, will probably stay ahead in manufacturing technology. They must; their population is aging (their birthrate declining), and the people's drive for less monotonous work and shorter hours is becoming a political issue that can only be handled by the fullest use of available technologies. Benefiting from a nonadversarial management-labor relationship, Japanese companies can assign and transfer employees to varying tasks on the basis of need, adopt the latest techniques, and develop a knowledge-intensive society using information systems sooner than their counterparts in the West.

No assessment of Japan's computer export strategies would be complete without a reference to MITI. Ministry officials are readily accessible and willing to discuss issues—real and perceived.

As previously pointed out, the Japanese computer and communications industry does not operate as part of the mythical Japan Inc. Instead, each of the dozens of large-, medium-, and small-sized companies compete fiercely with each other. They aggressively discount prices to snatch an order and feel free to disregard MITI, which gives them annual government subsidies and grants that are still relatively small by U.S. standards. It is fair to say, however, that given Japan's strong commitment to building a knowledge-intensive society, the government will protect its major computer industry assets and continue to stimulate appropriate investments to achieve the national goals. ✻

A principal and vice president at the New York investment banking and brokerage firm of Morgan Stanley, Ulric Weil took a fact-finding trip to Japan last spring. His recent book, *Information Systems in the '80s—Products, Markets, and Vendors,* is published by Prentice-Hall, Englewood Cliffs, N.J.

JAPAN'S TOP 10
(ALL FIGURES IN $ MILLIONS)

1981 RANKING	1980 RANKING	DP REVENUES		DP REVENUES TO TOTAL %		FOREIGN REVENUES TO DP TOTAL %		TOTAL REVENUES		NET INCOME		YEAR ENDING
		1981	1980	1981	1980	1981	1980	1981	1980	1981	1980	
1 Fujitsu	1	2,063	1,730	68	65	12	10	3,050	2,644	104	84	Mar. '82
2 IBM	2	1,950	1,538	100	100	25	20	1,950	1,538	178	165	Dec. '81
3 NEC	3	1,489	1,160	31	29	11	6	4,791	4,058	97	82	Mar. '82
4 Hitachi	4	1,309	1,138	13	13	10	7	9,730	8,850	304	281	Mar. '82
5 Toshiba	7	432	347	5	5	8	6	7,942	7,035	215	201	Mar. '82
6 Oki	5	425	358	44	42	14	8	974	846	15	18	Mar. '82
7 Nippon Univac	6	413	357	100	100	2	2	413	357	7	6	Mar. '82
8 Mitsubishi	8	332	282	6	5	10	8	5,980	5,552	101	105	Mar. '82
9 Burrough	9	260	230	100	100	2	2	260	230	10	10	Nov. '81
10 NCR	10	225	219	71	67	4	5	317	328	15	21	Nov. '81
TOTAL		8,898	7,359					35,407	31,438	1,046	973	

Note: Figures in table are based on an exchange rate of $1-220 yen.

HOW WE RANKED THEM

In determining the top 10 rankings, dp revenues were defined as including the following product categories:

- Mainframes
- Minicomputers and microcomputers, small business systems, and personal computers
- Terminals and peripherals
- Software and services, including service bureau operations and database services
- Data communications equipment

In Japan the government and most corporations follow a fiscal year that runs from April 1 through March 31, and the last complete fiscal year began in 1981. As can be seen in the table above, Japanese companies uniformly follow this practice, while IBM, Burroughs, and NCR have different reporting periods. (IBM's accounting follows the calendar year, and Burroughs and NCR wrap things up in November.)

The table also shows that the top 10 firms had combined dp revenues last year of almost $9 billion. It is estimated that these leaders also account for about 80% of the total dp revenues in Japan.

While relative positions tend not to change much from year to year, it is interesting to see how much emphasis the vendors place on export activities. In the latest full year, NEC increased its income 124% from sales abroad, this component now accounting for 11% of dp revenues, compared to only 6% the year before (see center table). Oki Electric doubled its revenues from exports, while Hitachi showed an 85% jump, Toshiba a 74% increase, and Fujitsu a 57% gain.

EXPORT GROWTH OF DOMESTIC FIRMS
(IN $ MILLIONS)

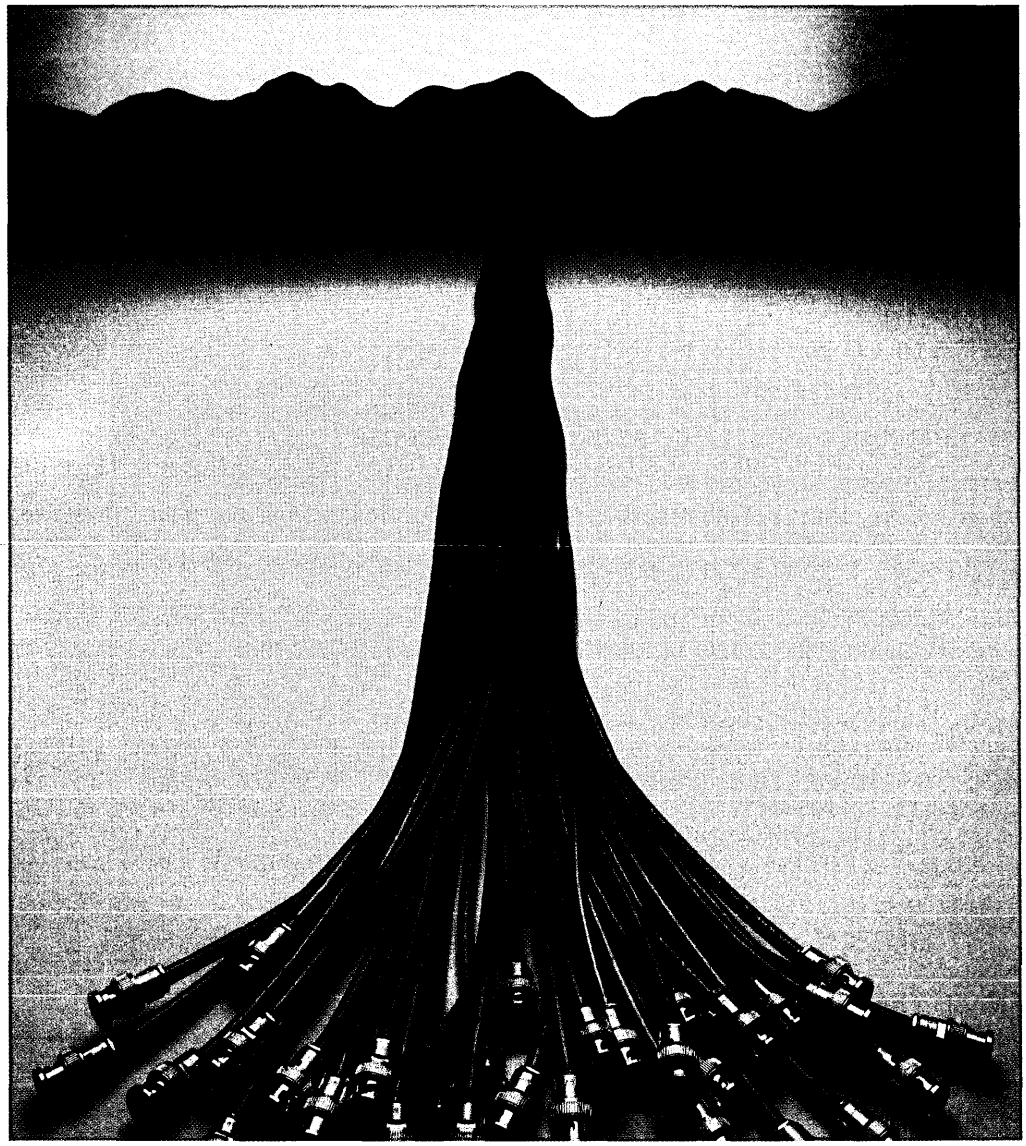
	EXPORTS 1981	% CHANGE FROM 1980	EXPORTS AS % OF DP REVENUES 1981	1980
Fujitsy	264	57	12	10
NEC	173	124	11	6
Hitachi	131	85	10	7
Toshiba	58	74	8	6
Oki	35	100	14	8
Nippon Univac	9	0	2	2
Mitsubishi	32	40	10	8

Note: Figures in table are based on an exchange rate of $1 = 220 yen.

JAPANESE COMPANIES RANKED BY 1980 R&D EXPENDITURES*

COMPANY	R&D EXPENDITURES (IN $ MILLIONS)	% OF NET SALES
Hitachi	466	5.8
Toshiba	325	4.8
Matsushita Electric	236	2.9
NEC	203	6.0
Mitsubishi	203	4.0
Sony	155	7.0
Fujitsu	144	6.1

*Figures include all corporate R&D, not just for computer operations.
Source: Nihon Keizai Shimbun



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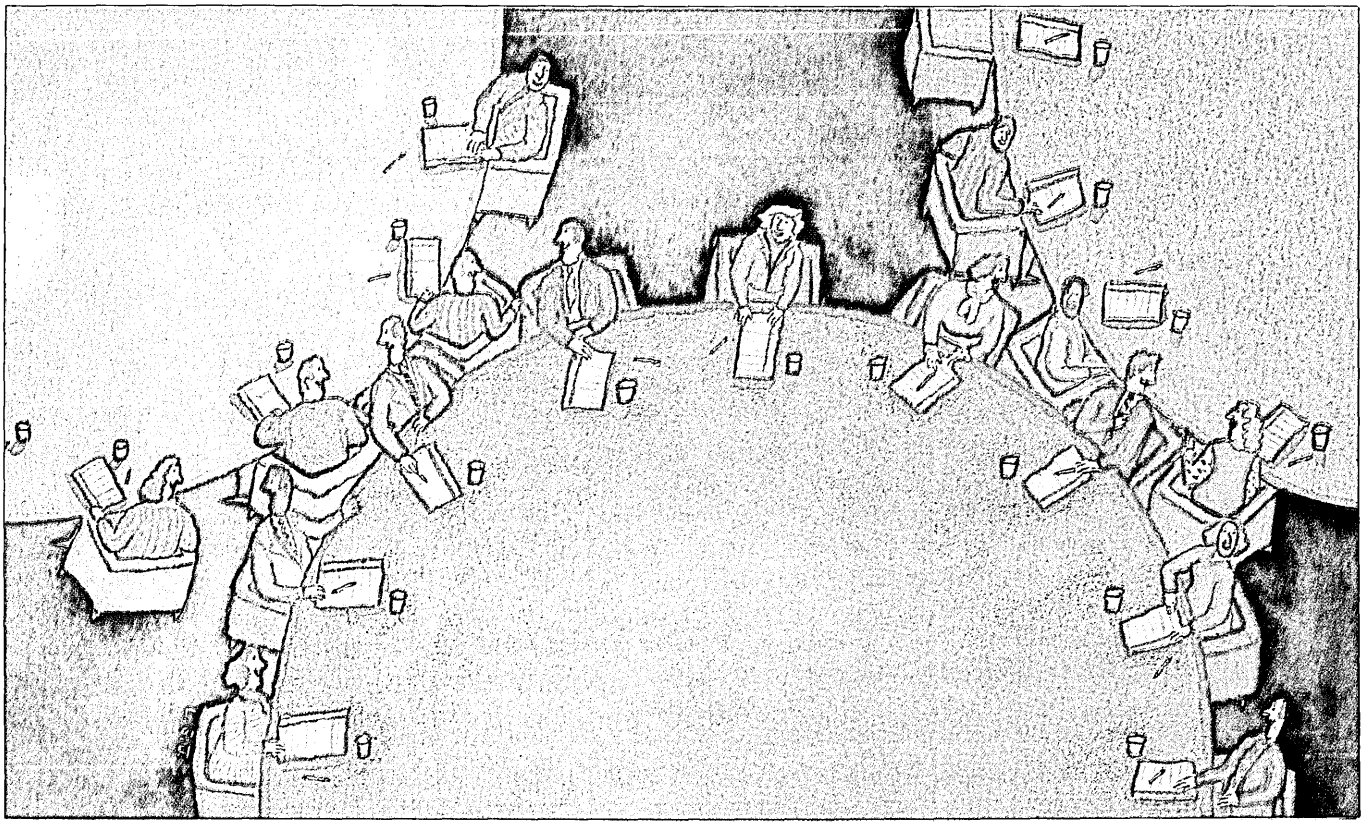
CIRCLE 91 ON READER CARD

Quality circles work for Japanese manufacturers, but can they work in American data processing?

CIRCULAR SOLUTIONS



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by J. Daniel Couger

The quality circle—a team of eight to 10 volunteers who meet regularly to identify and solve problems—is perhaps the most transferable of the management techniques that have helped bring Japan to economic prominence. It is also one of the most beneficial: the Japanese Ministry of International Trade and Industry (MITI) attributes savings of $25 billion since 1963 to the use of the quality circle (QC).

These two facts would seem to bode well for the use of QC techniques on this side of the Pacific. Success with quality circles, however, has not been as widespread here as one might expect. Consider the comments of the head of all dp activities for a large West Coast bank: "The quality circle is just another name for the task force approach to problem solving. Every so often our profession must come up with a new label to rejuvenate an old problem-solving approach."

Quality circles are not productive in this man's organization and the reason is clear. He doesn't understand the technique and hasn't trained his personnel in the special procedures necessary for an effective program. On the other hand, organizations that train their people well and implement their QC programs properly are realizing significant benefits, including a return on investment of around 6 to 1—about double that of traditional task force techniques. So although there are potential problems for dp shops that use quality circles, the rewards are equally real. A bit of history should shed some light on both.

Most people are aware of the political influence of General Douglas MacArthur, commander of the U.S. occupation of Japan; not as many people are aware of his influence on the Japanese economic recovery. One area where MacArthur aided Japanese industry was in statistical quality control (SQC). He arranged for a U.S. expert in SQC, Dr. Edward W. Deming, to be a consultant to Japanese industry in improving the quality of its products. In 1951, the Union of Japanese Scientists and Engineers (JUSE) honored him by creating the annual Deming awards, the highest honor an individual or firm can receive in the field of quality (see Sud Ingle's *Quality Circles Master Guide*, 1982, Prentice-Hall Inc., Englewood Cliffs, N.J.).

Deming's successor in "aid to Japan" was Dr. Joseph M. Juran. In 1952 Deming introduced Juran to K. Koyanagi,

the founder of JUSE after World War II. Koyanagi extended an invitation to Juran to lecture in Japan. Two years later, Juran spent two months in Japan lecturing on the subject "Management of Quality Control," and subsequently returned to lecture about eight more times. Juran's approach to quality involved management, not just engineers and quality control personnel, and formed a basis for the quality circle program that emerged several years later. From that background evolved the work of Dr. Kaoru Ishikawa, a professor at the University of Tokyo, and board member of JUSE. Ishikawa is generally credited with formalizing the quality circle technique as it is used today in Japan.

The data on American use of quality circles substantiate my assertion that cultural differences are minimal in the use of this technique, compared to other successful Japanese management practices. According to the IAQC (International Association of Quality Circles), over 1,000 U.S. companies are using the quality circle technique, with over 10,000 circles in operation.

The growth has been exponential. The first American publication on the subject was Juran's 1967 article, "The Quality Circle Phenomenon." In 1968 JUSE sponsored a visit to the U.S. by a QC team that was invited to speak in a number of U.S. firms. Nevertheless, it was not until 1974 that the first U.S. quality circle program was installed at Lockheed Corp.'s Missile and Space Division, Sunnyvale, Calif. Lockheed employees Wayne Reiker and Donald Dewar were the principals in that successful installation. Lockheed credited the QC technique with saving over $72 million. Table I lists typical QC projects at Lockheed as well as two high-return projects at American Airlines. These and other projects established the ROI norm of 6 to 1 for quality circle projects.

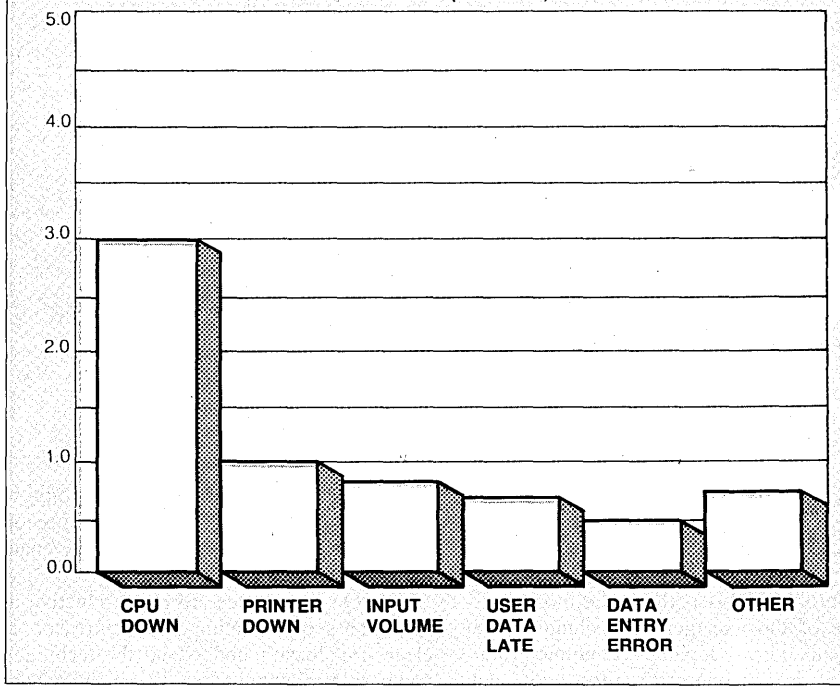
TABLE I

DOLLAR SAVINGS OF SOME TYPICAL QC APPLICATIONS

Lockheed Corporation	
• Improved styles and types of test boxes	$ 65,600
• Recommended spray-coating PC boards instead of flow-coating them (reduced defects)	380,000
• Developed process to desolder and remove hybrids from PC boards without damage to hybrids	388,000
• Implemented "buddy check" systems; this systematized team effort in assembling cables substantially reduced the number of errors	54,000
• Developed a method of applying silver solder to triaxial cables, thereby reducing the number of cable rejects	6,250
American Airlines	
• Analyzed reconditioning hand grinders—saved man-hours and money versus using old ones	115,000
• Redesigned shop area to eliminate $50 per hour downtime on machinery and provided supervisory office space on shop floor	250,000

FIG. 1

SAMPLE PARETO CHART SHOWING RELATIVE IMPORTANCE OF DP PROBLEMS



FIRST QC USE IN DP

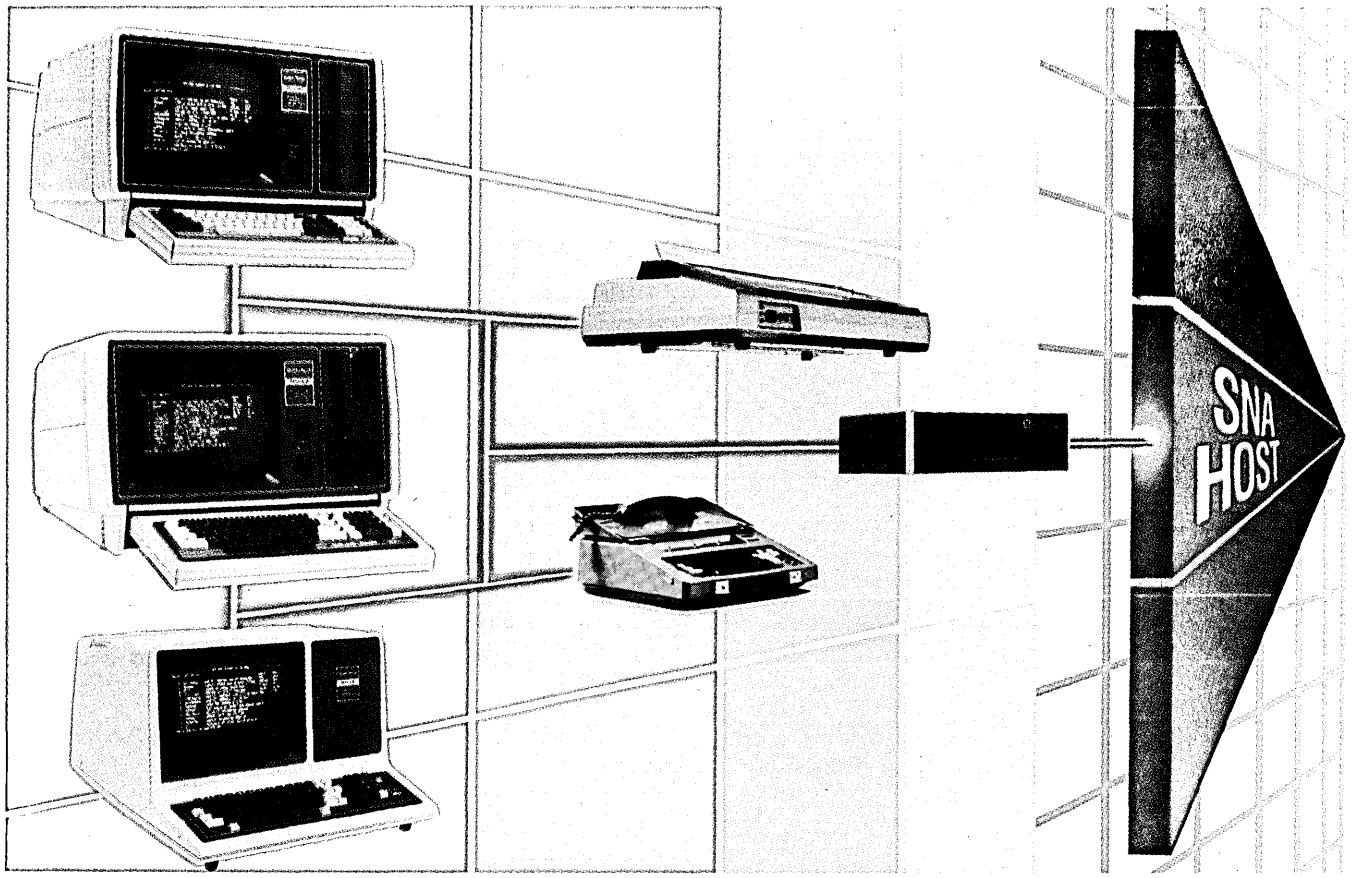
It is only fair to the reader to reveal my own bias toward quality circles. Although I am primarily a computer scientist, one of my doctorate fields was behavioral science. In addition to membership in IAQC, I've had close interaction with both Japanese managers and nonmanagers through 12 years of teaching in the Japan-America Institute of Management Science. My conclusions are based on those interactions along with two other sources: a telephone survey of managers and QC facilitators and a review of the published literature on quality circles.

IAQC has released a bibliography with over 100 entries on quality circles.[1] Not one of those publications describes QC use in the computer field. Nor could IAQC identify QC use in computer departments; all they have is a list of computer manufacturers who had installed quality circles. Therefore, I began a telephone survey by calling the manufacturers. I found that Hewlett-Packard and IBM had installed a few circles in data processing departments. These references led to others, and during the next two months I called over 60 companies and identified QC use in 32 dp departments.

The survey revealed mixed results in the use of quality circles in dp, as the following quotes illustrate.

Con: "It is almost impossible to input those [Japanese] techniques to pull U.S. businesses and dp shops out of a productivity rut," according to Henry Nanjo, a Japanese American, director of dp for the City of San Francisco. "Quality circles were a disaster in our organization," reported a QC facilitator (who asked that his name not be published) in

[1]To obtain a copy of Kathleen Terry's "A Bibliography on Quality Circles," contact IAQC, P.O. Box 30635, Midwest City, OK 73140.



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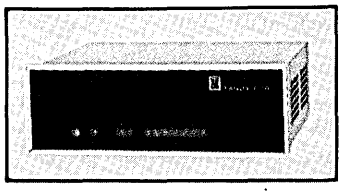

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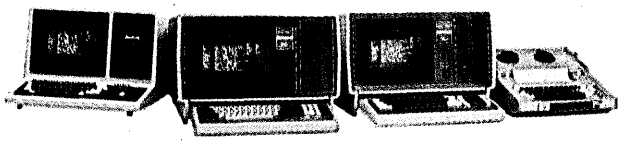

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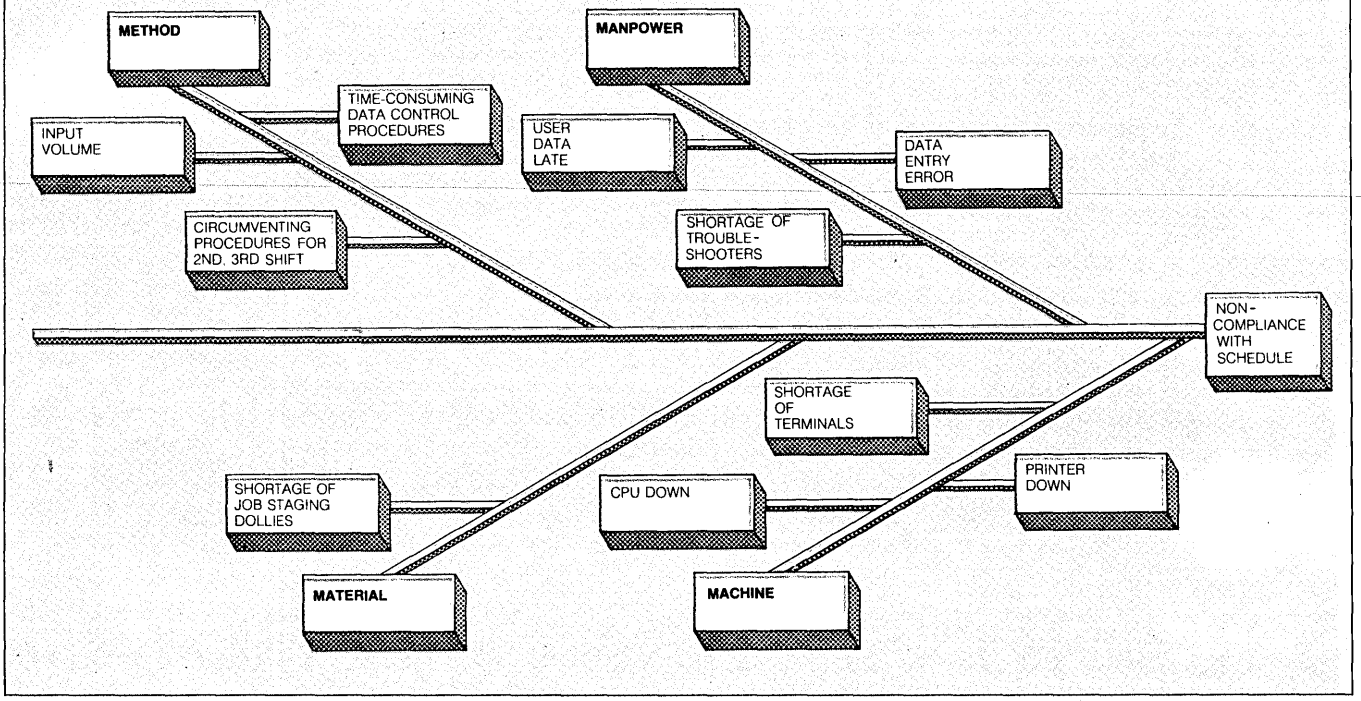
One bank's data entry quality circle redesigned the batching approach for data entry jobs and saved $40,000 per year.

FIG. 2
SAMPLE CAUSE AND EFFECT OR FISHBONE CHART



a large dp organization in St. Louis.

Pro: "We've realized many benefits from our 15 quality circles," says Paul Karr, QC facilitator in the computer area of Boeing Wichita. "While many benefits are less tangible, such as improved employee attitude and morale, others were quite tangible. We saved over $100,000 on one project alone."

To understand the reasons for these conflicting results, it is necessary to consider the QC program in detail. The 11 guidelines for quality circles are:

1. The team consists of a regular work unit and its supervisor.
2. Participation is voluntary.
3. Team meetings are held once a week, for one hour.
4. Team members are trained in problem solving, including communications and behavioral techniques and analytical techniques.
5. One team member serves as facilitator and is trained in special techniques for that purpose.
6. The team selects the problems it wishes to resolve.
7. Problems are prioritized and analyzed.
8. Solutions are developed, along with implementation recommendations.
9. A control system for tracking results is designed.
10. A formal presentation is made to management.
11. The team has primary responsibility for implementation of its recommended solutions.

The tools used in steps seven and eight (analysis and resolution of the problem) include some techniques normally used in dp and others new to dp. They are:

1. Data gathering. Taking samples, and other data collection techniques.
2. Data representation. Use of Pareto charts. Pareto is the European scholar who in the 19th century developed a charting method to attract attention to the narrow distribution of wealth. Pareto analysis differentiates the important from the less important problems or problem characteristics. A histogram is plotted, where each column represents a different problem. The height of the columns indicates the relative importance of the problems. Columns are plotted in descending order, from left to right, and problems on the left are attacked initially because that's where the biggest payoff is. Fig. 1 shows a Pareto chart for several dp problems.
3. Stratification. Data are separated into two or more groups, to be examined separately. This approach enables the problem to be divided into smaller, more easily solved subproblems.
4. Scatter diagrams. Scatter diagrams will identify any relationship between variables. Data on different variables are plotted on one graph, to determine if some connection exists.
5. Cause and effect diagrams. The cause and effect technique facilitates identification of the true cause or causes of a problem. The effect (problem) is stated on the right-hand side of the chart. All of the possible causes are listed to the left. A cause and effect analysis diagram resembles a fish skeleton and is occasionally referred to as a fishbone diagram. Fig. 2 is a cause and effect chart for a typical dp problem.
6. Brainstorming. The brainstorming technique employs group or collective creativity. QC use of this procedure specifies stressing quantity of ideas; avoiding evaluation of ideas until a subsequent session; and, after the initial surge of group response, asking participants to submit one more idea per turn.
7. Control charts. Control charts depict control limits around the standard. They track results over a period of time. Control charts are updated on a regular basis so the QC team can monitor progress toward a solution.

The survey results showed that companies that used the guidelines and analytical techniques achieved positive results.

BENEFITS OF THE QC APPROACH

One proof of the value of the QC approach is its application to a perpetual dp problem—documentation. First, it is surprising that quality circles would choose to work on this problem. Few people enjoy documentation; most consider it

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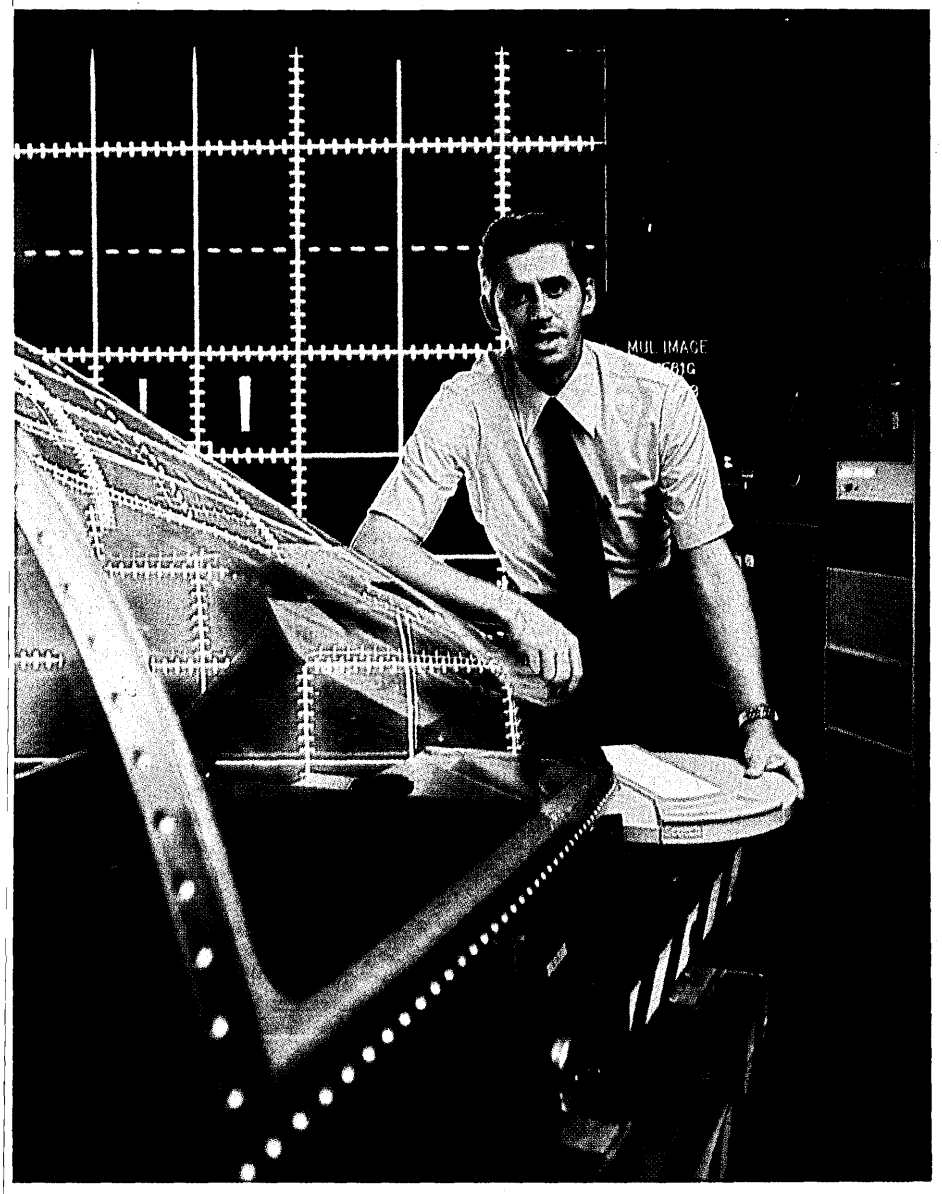

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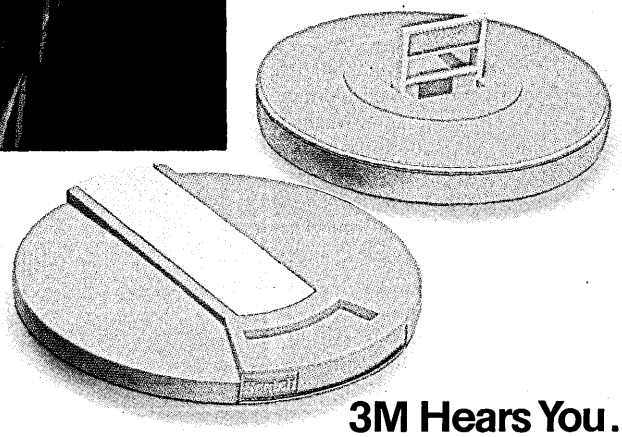

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Dp managers have a low need for social interaction and therefore require special training and practice in team-building activities.

nonchallenging and time-consuming. Second, it is surprising how many of the initial quality circles in a dp department put this problem high on their priority list for solution. This trend alone should demonstrate the value of the QC.

An example of positive results is the Boeing-Wichita QC activity. Their first quality circle chose to develop standards for documenting old systems. Their second QC chose to mechanize the documentation of new systems. An average of two hours per week was saved per analyst, resulting in over $100,000 in savings per year.

Other examples of QC benefits identified in the telephone survey include a data entry quality circle at Bank of America, San Francisco, that redesigned the batching approach for data entry jobs and saved $40,000 per year. A computer operator QC at Union Bank, Los Angeles, identified equipment that could be discontinued, and saved $35,000 a year in leasing costs. A data entry QC at the same company designed an improved timekeeping system that reduced staff cost by $35,000 per year. A distributed systems QC at Packaging Corp. of America, Evanston, Ill., designed a new disk allocation scheme that saved $25,000 in the acquisition of additional disk capacity. (Respectively, these companies are now running 15, 5, 21, and 3 quality circles.)

Dp organizations that deviated from the guidelines listed previously had far less success with quality circles. Reasons for failure include:

- *Inadequate preparation.* The QC approach appears easier to implement than it really is. The guidelines are straightforward and the analytical tools are easy to learn. As a result, the tendency is to bypass formal training. Three days of training for circle leaders and facilitators and eight hours of training for circle participants is the norm for companies with good results.
- *Involuntary participation.* Although few organizations openly violate the QC principle of voluntary participation, some managers implicitly pressure their subordinates to participate.
- *Application on inappropriate problem.* Some problems are not within the purview of quality circles. Company policies, supervisory personality issues, salary issues, and union/management issues are examples of problems that should be excluded from QC consideration. On the other hand, quality of work life (QWL) issues are most appropriate, despite absence of quantitative benefits. Quality circles have tackled QWL problems as momentous as the overall working environment and as mundane as the potholes in the parking lot.
- *Application in an unhealthy organization.* In companies where general dissent or unrest

A QUALITY CIRCLE IN ACTION

The following describes the formation of a quality circle and its subsequent activities through completion of the pilot study.

Kickoff minus 9 weeks:	Top-level manager reads DATAMATION article on benefits of quality circles. He reproduces copies for each member who attends the weekly managerial staff meeting. At the meeting he requests that they be prepared to discuss the subject the following week.
Kickoff minus 8 weeks:	Managers discuss pros and cons of quality circle concept, agree to begin program. Steering committee is appointed (two managers, two nonsupervisory employees) and charged with responsibility of presenting an action plan the following week.
Kickoff minus 7 weeks:	Steering committee reports to managerial staff meeting, recommending pilot quality circle in a unit with supervisory support and a good candidate for the facilitator role.
Kickoff minus 6 weeks:	Supervisor and facilitator attend three-day quality circle training session (available from a variety of sources). Upon their return, an announcement is made on the formation of pilot quality circle with request for volunteers.
Kickoff minus 4 weeks:	Supervisor and facilitator begin training quality circle team two hours per week for four weeks.
Kickoff:	Pilot quality circle develops list of possible projects. A high-visibility, short-term project is selected to enable the pilot program to be evaluated within three months.
Kickoff plus 4 weeks:	Team gathers data, develops Pareto charts, scatter diagrams, and cause and effect charts.
Kickoff plus 5 weeks:	Team brainstorms solutions, selects most appropriate approach, assigns responsibilities for developing solution.
Kickoff plus 8 weeks:	Over next three weeks, team develops solution.
Kickoff plus 9 weeks:	Team prepares proposal to submit for management approval.
Kickoff plus 10 weeks:	Team makes formal presentation to top management, obtains approval to implement solution.
Kickoff plus 14 weeks:	Over next four weeks, team implements solution. Method to track benefits is derived.

Although the pilot study is a low-risk approach, it forestalls widespread benefits for almost one year. The schedule is tight; nevertheless, it consumes almost five months. By the time the second round of circles begins producing results, approximately one year has lapsed from the time of the initial management discussion. This may have been appropriate for the companies who were the first to use the QC technique in dp, but today sufficient experience exists to question the need for a pilot study. If the 11 guidelines are carefully followed in QC implementation, there is little risk of failure.

But there are alternative approaches for the management that feels uncomfortable without a pilot study. The multiplexing technique employs several pilot studies in parallel, e.g., one in operations, one in applications programming, and one in the systems software group. With the overlapping approach, instead of using sequential processing (waiting until the pilot study is completed), subsequent circles are started as soon as the advantages and problems of initiating a circle are ascertained. The cycle stealing method requires meeting twice per week or for several hours instead of one hour per week in order to complete the pilot study much sooner.

A variation of these approaches is to start several circles simultaneously in one department where there is considerable interest from both managers and subordinates. Although all areas within dp are appropriate for QC application, the best marketing strategy is to begin where interest in the concept is highest.

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CIRCLE 96 ON READER CARD

A QC run by a facilitator instead of a unit supervisor produces poor results.

exists due to major managerial or budget/schedule problems, QCs have produced few benefits. Examples are federal agencies where huge budget reductions are occurring. QC emphasis by management in these organizations is perceived by the workers primarily as an attempt to reduce labor cost.

- *Lack of management support.* Few QC programs have been successful as a grass roots movement. As in most other successful practices, top-down commitment is required.

These mistakes are not peculiar to dp; the literature shows they apply to any organization. The dp survey, however, revealed one problem unique to this field. It is not unusual, in dp organizations where the QC approach produces minimal results, to find the quality circle being run by the facilitator instead of the unit supervisor. In many of the poorly producing circles, the supervisor no longer—or only infrequently—attends circle meetings. In other cases, the facilitator has been in charge from the outset.

This may surprise QC facilitators and supervisors in other parts of the company, but it simply reinforces earlier research by Dr. Robert Zawacki and myself that identified the low need for social interaction of dp management. Our studies of over 2,000 dp managers (at three levels) revealed that their need for social interaction is significantly lower than that of their peers in other parts of the firm.

We should not ignore the calamitous consequences of this abnormality in QC practice. With their low proclivity for interaction, dp supervisors need training and practice in team-building activities to a much greater extent than their counterparts in other areas of the firm. Yet, when they get the opportunity to acquire these important skills through active participation in the quality circle, dp supervisors are inclined to delegate the responsibility to the team facilitator.

Facilitators typically have a high need for social interaction. They are naturally inclined to acquire in-depth knowledge of the behavioral tools taught in the QC training sessions. First-line supervisors have strong technical skills and are naturally inclined to acquire in-depth knowledge of the technical tools taught in the QC training sessions.

TWO TYPES MAKES A GOOD TEAM

Therefore, these two types make a good team for implementing the pilot quality circle. The supervisor (team leader) performs the project management function and the facilitator ensures that team members are communicating well. The supervisor improves his behavioral knowledge through observing the facilitator's good behavior skills. By the end of the first project, the supervisor has improved his behavioral skills and starts to perform a greater share of the facilitative role. The facilitator then assumes a coordinating function for a number of circles and conducts most of the training of new circles.

Another variation in dp application of quality circles is to place less emphasis on cost and benefit measurement. QC practice in other parts of the company places high emphasis on "before and after" comparisons. By contrast, the dp organizations that have established sound measurement approaches are few and far between. As cited earlier, a few progressive organizations have established measurement systems, resulting in the 6 to 1 ROI guideline.

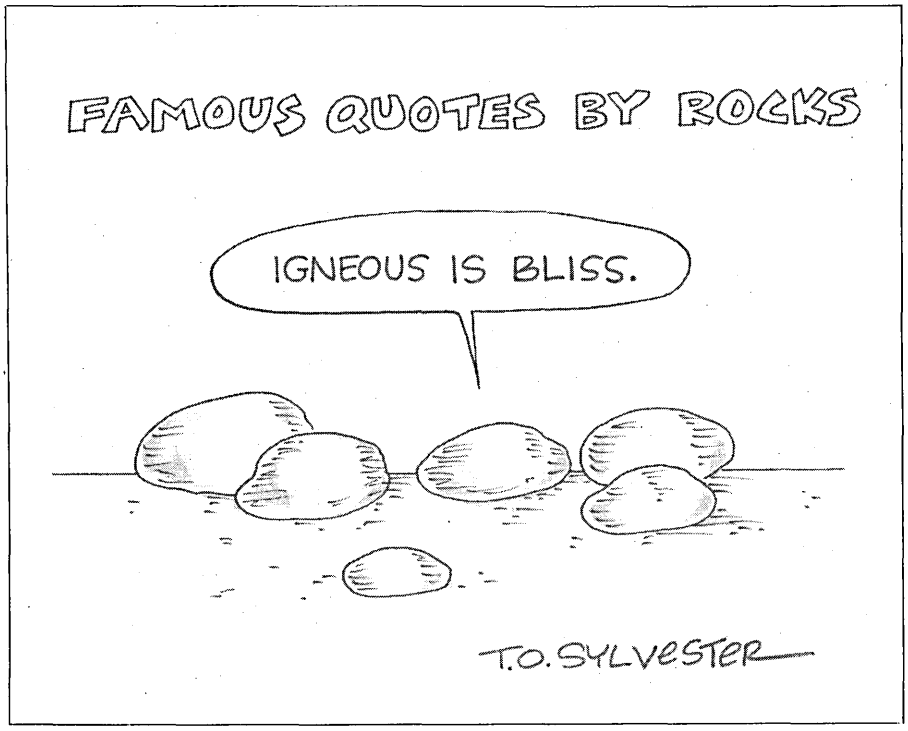
Many dp departments using the QC program are convinced of its value even though they have not emphasized cost/benefit analysis. Their view on use of QCs is illustrated by the comment of Bill Raymond, a QC facilitator in the Health Services Division of McDonnell-Douglas in St. Louis: "We began in 1980 with three circles and now have 12; it's obvious to management and everyone else that the circles have been very beneficial." Jim Shunk, a QC facilitator for Hewlett-Packard, Cupertino, reports a similar attitude in his company: "There is management philosophy and management support for QC at HP and not high priority for cost/benefit analysis."

Unlike the "zero defects" program that originated during the earliest manned space flights, the quality circle program is not designed to "psyche us up" but rather to provide a highly proceduralized approach for improvement in quality and productivity. The QC approach uses a special set of analytical techniques to examine a problem, a special set of group dynamics techniques to generate creative solutions, and finally, a set of evaluative techniques to compare alternatives. The group must convince management of the value of its solution, and then take charge of its implementation.

Quality circles have proved quite beneficial to data processing organizations that have adhered to QC guidelines and utilized QC analytical techniques. But despite the 6 to 1 ROI potential, the greatest benefit of quality circles may not be quantifiable. It is the opportunity for low-social-need supervisors to learn to interact more effectively with subordinates. Improving the mutual problem-solving capability of supervisors and subordinates, through the vehicle of the quality circle, may be the most important return on investment.

Perhaps the delay in adopting QC programs is due to the lack of publications on its applicability to the dp department. It is hoped that this paper will encourage discussion and use of quality circles in our field. ❋

J. Daniel Couger is Distinguished Professor of Computer and Management Science at the University of Colorado. His national studies of key motivational factors resulted in motivation norms for 15 jobs in the computer field. He and his coresearcher, Robert Zawacki, have over 15 publications on the subject, including their book *Motivation and Management of Computer Personnel* (Wiley Interscience, 1980).



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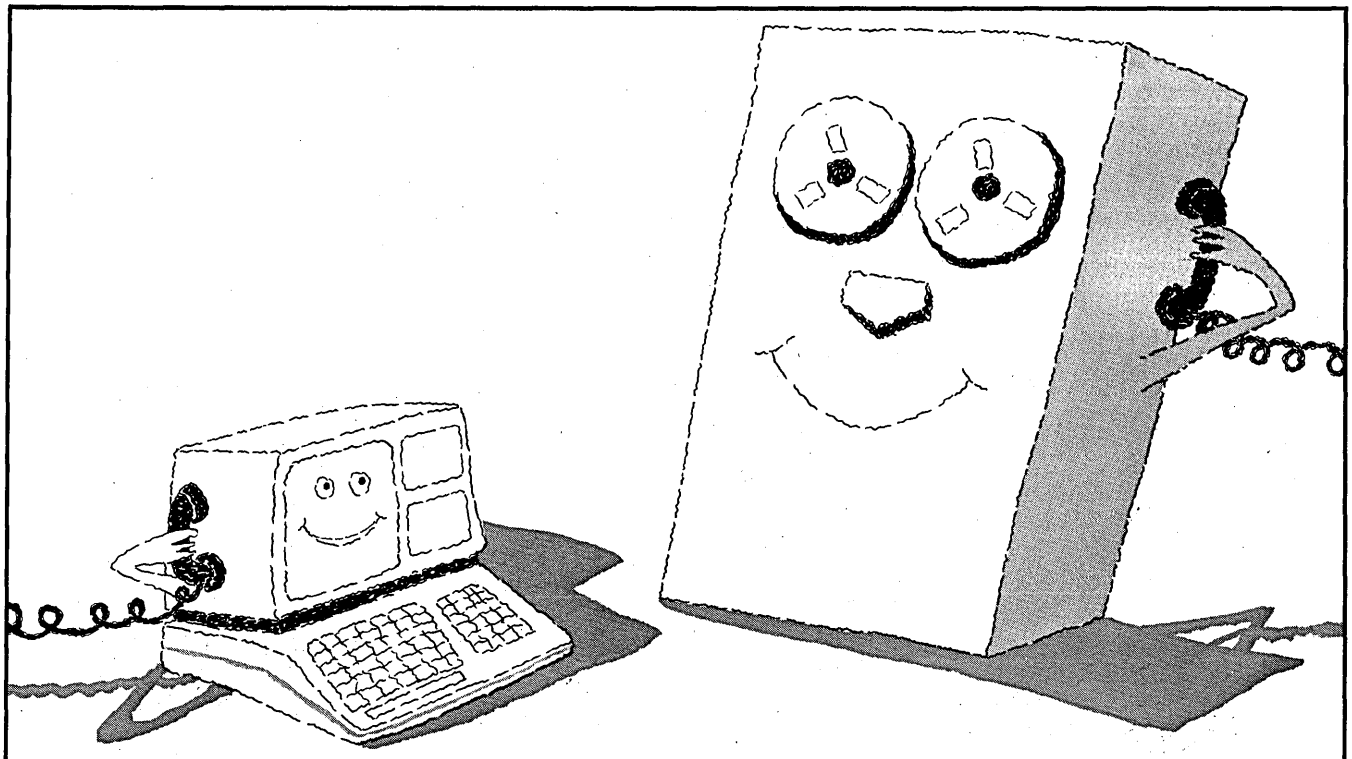

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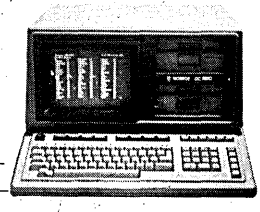

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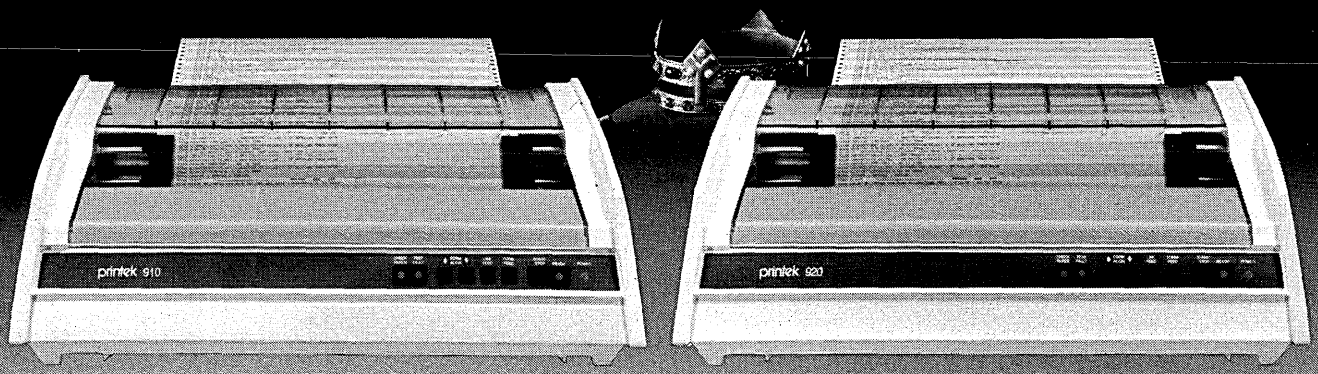

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CIRCLE 94 ON READER CARD

HARDWARE

OFF-LINE

At first glance it's just another personal computer, but the Seiko 8600 supports six operating systems and six programming languages. The cpu cabinet, separate from the keyboard and display, is completely modular. If a disk drive fails, for example, no tools are needed to replace it; just unsnap the cover, pull out the drive, and snap in a new one. The $6,000 computer is available from Intech Systems Corp. in Reston, Va.

If you think you're the only person who can't read fanfold printouts without having them spew all over the floor, you're wrong; many people can't. So Transmatic, in Roxbury, Conn., figures it must have a sizable market for its continuous forms display. The product can control up to 800 folds, displaying one page at a time at a readable slant. A foot or hand switch can be used to flip through printouts quickly.

Xerox Computer Services timesharing customers can use the Los Angeles vendor's 820-11 personal computers as an intelligent terminal so that local and remote computing can be done with the same hardware. Up to three of the micros can communicate with the network over a single 2400 baud line.

One of the reasons that the Osborne computer has been such a hot seller is that it comes bundled with extensive desktop micro software. Not to be outdone, Kay Computers of Solana Beach, Calif., has enhanced its Kaypro II portable computer to include a variety of software from Perfect Software in Berkeley, Calif., and other sources. Included in the $1,795 purchase price of the computer are Perfect Writer, Perfect Calc, Perfect Speller, Perfect Filer, CP/M 2.2, SBasic, and Profitplan.

DIAL-UP SECURITY

People may not want to admit that it can happen to their system, but computer crime is big time these days, as hackers, disgruntled employees, and others get away with as much as $300 million a year in computer theft. Among the various solutions offered is this vendor's PriveCode Computer Sentry, which is designed to secure systems from unauthorized entry via telephone.

The $1,400 computer sentry operates between the phone line and the modem and prevents unauthorized people from establishing a modem connection. The authorized user plugs in the system and establishes which six-digit codes will be considered valid. A key lock prevents unauthorized persons from changing or displaying the valid codes.

When a user calls the modem, a synthesized female voice answers and requests entry of the access code, which can be made from any telephone. Entry of a valid code will complete the modem connection, and the computer can be accessed normally. If a hacker enters the incorrect code, the phone is disconnected and the sentry tallies the incorrect code. Once a user-set number of incorrect code entries has been reached, the unit goes into "alert mode," which sounds an alarm. Normal operation by authorized users is not affected unless a second level of security is added by the user. In the second level, once the threshold number of incorrect codes is reached, no users, regardless of whether they have the correct code, will be connected. IMM CORP., Philadelphia, Pa.

FOR DATA CIRCLE 301 ON READER CARD

LIMITED DISTANCE MODEM

The 982 Data Set is a compact device available either as a standalone unit with cabinet or as a plug-in model for rack mounting. It is designed for point-to-point applications, using telephone company facilities, for an in-house system with private lines or for network extension applications. It is effective over line lengths of up to 32 miles.

The unit operates transparently in full or half duplex modes. Built-in automatic equalization adjusts input sensitivity and eliminates the need for specialized test equipment or any adjustments during installation, and continually compensates for line variations during everyday operation. Three models are available, each with four switch-selectable data rates. They range from 1,200 to 9,600 bps, 2,400 to 19,200 bps, and 19,200 to 64,000 bps. Prices start at $500, with oem discounts available.

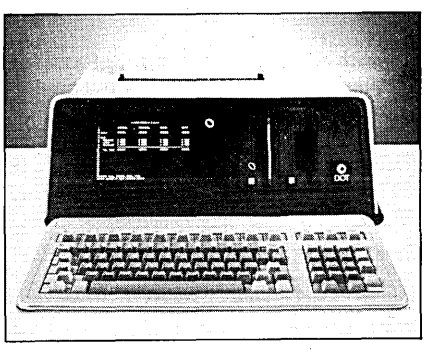
The 982 has all-modular connectors on the rear of the unit for easy installation. Local and remote loop test capabilities are built in to permit fault isolation to the line, terminals, or modem. One unit can be used as the master unit with its own internal clocking, or as a slave deriving its clocking from a remote 982. The unit supports all standard interfaces. The vendor has also set up a toll-free phone hot line for installation and service help. AMDAHL CORP., Marina del Rey, Calif.

FOR DATA CIRCLE 302 ON READER CARD

PORTABLE COMPUTER

The Dot computer offers 16-bit addressing, up to 704KB RAM, bit map graphics, printer, communications capabilities and system software in a box roughly the size of an Osborne. The machine is based on the 8088 microprocessor running the MS/DOS operating system, with a Z80 chip available as an option for users who want to run CP/M 2.2. Dot has a minimum 32KB RAM, which can be expanded on a single board to 256KB. A second board can add an additional 448KB.

Separate logic and control circuitry are provided for the graphics, which are



implemented through a 32KB video RAM, mapped one-for-one to the 5 × 9-inch monochrome crt. The printer can map anything displayed on the crt. Its thin film thermal printhead produces 5 × 10 dot matrix characters with full ascenders/descenders. The bidirectional printer's top rate of 160 cps is fast enough to print incoming data directly from a 1,200 baud line.

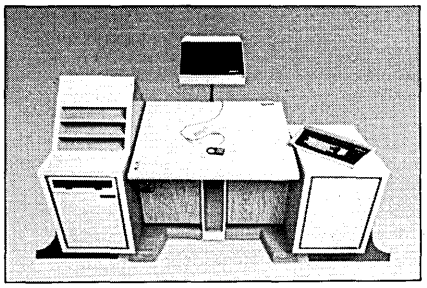
The Dot is billed as being fully IBM compatible, but the 287KB Sony 3½-inch disk drives cannot accept software for IBM's Personal Computer, which employs 5¼-inch drives. The basic machine, with 32KB RAM, monitor and graphics, keyboard, two option slots, one disk drive, and 90-day warranty, costs $3,000. The basic package plus two RS232C ports, an additional 32KB memory, MS/DOS, printer, and controller costs $4,000. COMPUTER DEVICES, INC., Burlington, Mass.

FOR DATA CIRCLE 303 ON READER CARD

DIGITIZING WORKSTATION

The GWS Model 3 is a digital database construction facility for digitizing maps, drawings, photographs, strip charts, and other graphic material. The system is designed for use in forestry, mining, resource management, municipal government, civil engineering, and medicine applications that require mapping and drawing capabilities.

The system, based on the DEC LSI-11 processor, includes a graphics/alphanumeric terminal, a digitizing table, and disk storage. The STRINGS (Storage and Retrieval of Informative Graphics) digitizing programs



support interactive use. They employ both stream and point feature collection and construct database structures that track points, lines, polygons, and symbology in the same format. A universal database translation program is included to reformat STRINGS databases to meet user requirements.

The $25,000 system is expandable. Hardware options include color graphics, larger digitizers and disk storage capacities, flatbed and drum plotters, printers, and a multi-user environment. The STRINGS software can be upgraded to include user-defined display and plotting programs, a map librarian, and utilities to allow tables and graphs to be displayed together. The GWS Model 3 can also be integrated into an existing CAD/CAM or DBMS system. GEOBASED SYSTEMS, Raleigh, N.C.

FOR DATA CIRCLE 304 ON READER CARD

OEM MINICOMPUTER

Designed to be the vendor's first serious effort to capture a segment of the oem minicomputer marketplace, the Tower 1632 offers a 16-bit Unix environment for under $12,000. The engine is the MC68000 running at 10MHz and offloading I/O functions to up to six controllers with direct memory access; this provides power comparable to a DEC PDP 11/70, the vendor says. Up to 16 local or remote users can be connected to the system simultaneously.

Main memory on the system is expandable in 256KB increments to 2MB; offline mass storage ranges from 10MB to a gigabyte, using 5¼-inch floppy or Winchester drives. (An 8-inch Winchester drive is available as an option.) Two RS232C ports are provided in the basic configuration for ASCII TTY or bisync communications; SDLC/SNA and Unix networking are also supported. A PowerFail Recovery feature, which allows processing to resume immediately after power is restored without having to boot up again, is also included.

System software includes the vendor's enhanced full-scale Unix with menus, programming aids, and an applications generator. The menus have five different "personalities," or levels of sophistication, so that casual users and sophisticated users can each have the proper level of menu help. The system supports COBOL, BASIC, FORTRAN, and C. About 200 utilities are also included in the software package. NCR CORP., Dayton, Ohio.

FOR DATA CIRCLE 305 ON READER CARD

20,040 LPM PRINTER

The 3800 model 3 printing subsystem provides more than twice the print density of the 3800 model 1. It can produce pages, combining text and graphics, with finer lines and better character definition. The model 3, which can print in correspondence quality, offers more type styles and greater line spacing flexibility than the previous models.

The nonimpact printer, the fastest in the vendor's product line, merges electrophotographic and laser technologies to produce original documents at speeds up to 20,040 lines per minute. The model 3 enhances this process by using a split-beam laser to create high resolution documents suitable for text processing, in-house publishing, and business graphics, as well as computer systems printing. The subsystem can print on plain paper, preprinted forms, or forms created simultaneously during the print process.

Model 1 users can upgrade to the model 3 with little or no programming changes. The newer model has a print density of 240 × 240 pixels per square inch and includes 59 character sets. With future software offerings, the model 3 will be able to operate in "all points addressable" mode. Text, images, and graphics can be positioned anywhere on the printable area of the paper; users will not be restricted to printing data in sequential order on a line-by-line basis or positioning characters in uniform matrix cells.

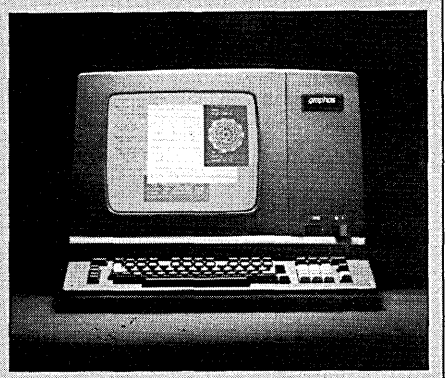
The model 3 can operate with the

HARDWARE SPOTLIGHT

COLOR GRAPHICS TERMINAL

At the heart of the Graphos color terminal is the vendor's "shiftable cell" architecture, a concept that combines elements of alphanumeric and bit map architectures. RAM cells are assigned dynamically to 16 fixed windows on the screen. Text and graphics can be smoothly scrolled vertically, horizontally, and diagonally under any window; the windows can be manipulated independently of one another without the need to rewrite the display memory. Segments are retained in the terminal's 128KB graphics RAM, so they can be transformed—removed, recalled, shifted, rotated, and highlighted—without retransmission from the host cpu.

The multitasking terminal incorporates an MC68000 microprocessor to implement its device independent firmware, permitting direct output to drive printers, plotters, film recorders, and other peripherals, as well as the terminal's 14-inch diagonal screen. Input support includes tablets, mice, joysticks, trackballs, and keyboard cursor controls. Three I/O function modules can be incorporated into the terminal to provide for future expansion, allowing RS232,

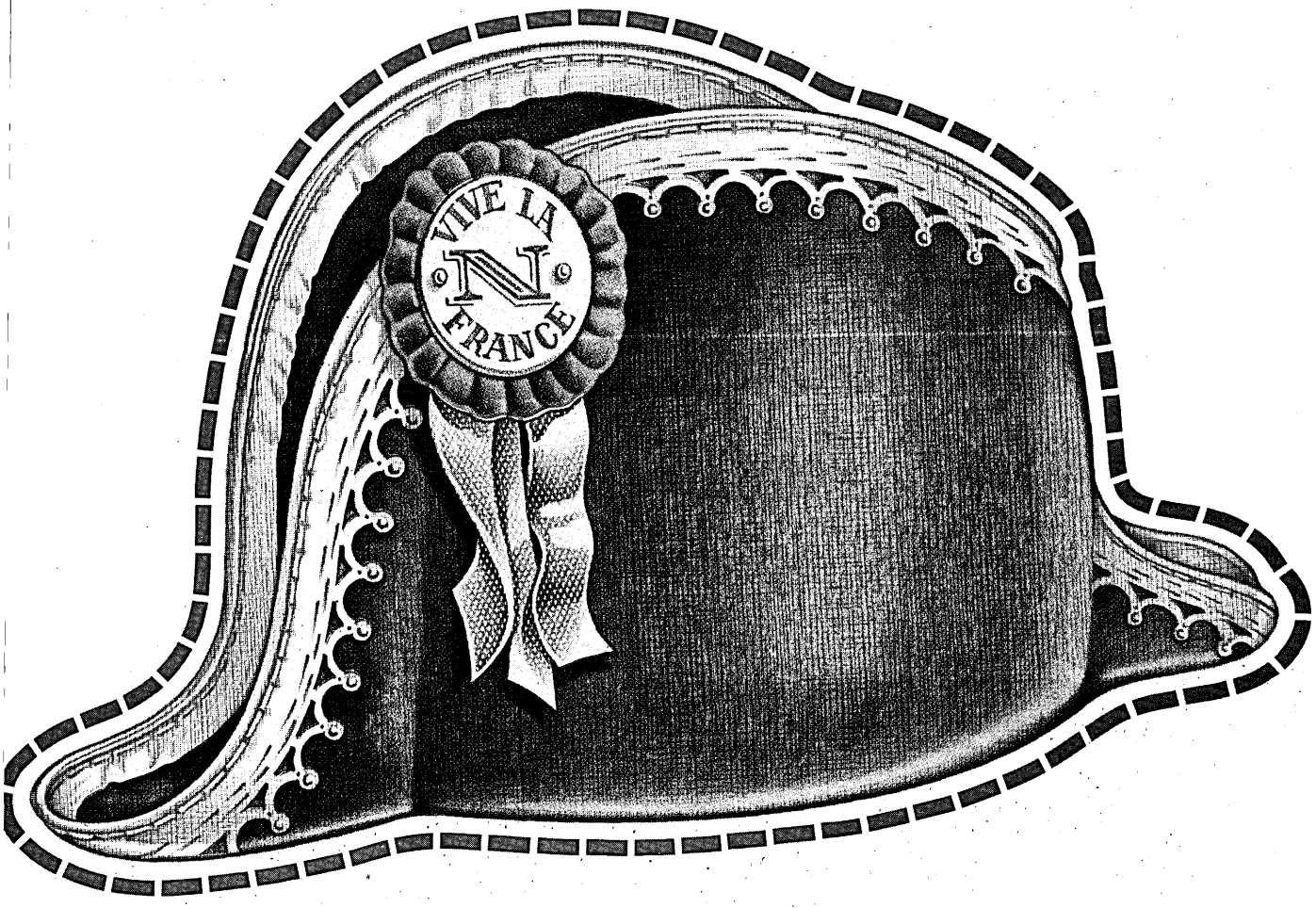


RS422, HDLC, and other interfaces.

The independent color lookup tables permit display of 16 different colors in each window from a palette of 32,768. The screen's resolution is 640 × 480, but it can be rescaled for output to hardcopy devices with higher resolution. The machine also offers individual pan and zoom for each of the windows, with graphics overlays for each window. The $8,000 terminal can be expanded to a maximum of 256KB RAM and 112KB PROM. ITHACA INTERSYSTEMS, INC., Ithaca, N.Y.

FOR DATA CIRCLE 300 ON READER CARD

TEMPORARY INSANITY IS NO EXCUSE FOR BUYING THE WRONG DBMS.



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The reason?

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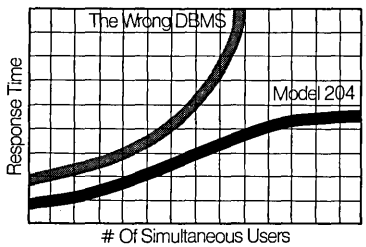

But let's say you ignore our logic. And some salesman talks you into a DBMS that takes forever to get up and running. You may want to tell your management something like, "We're taking our time, sir, to get this thing right." And hope for the best.

And when the subject of performance comes up, just plead ignorance. "Who knew we'd need more capacity and faster response time?" you could say. "Who knew?"

Referring, of course, to the fact that your DBMS is struggling to carry a few million records and a few hundred users, while a DBMS like MODEL 204 can handle up to 513,000,000,000 records and still have 999 users doing simultaneous updates. And where MODEL 204 responds almost instantly to complex queries under heavy loads, you could grow a long beard waiting for some systems to respond.

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CIRCLE 97 ON READER CARD

vendor's S/370/158 and 168, 4341, 303X, and 308X processors. It costs $315,000 or can be rented monthly for $13,000 with a $4.10 usage charge per 1,000 feet of paper. IBM CORP., Town of Rye, N.Y.

FOR DATA CIRCLE 307 ON READER CARD

16-BIT PROCESSOR WITH 8-BIT BUS

The iAPX 188 has a 16-bit central processing unit but interfaces to the outside world via an 8-bit data bus. Performance of the microprocessor is said to be double that of the vendor's 8088, but it costs half of the combined price of the 8088 and the numerous peripheral devices needed for 8088 operation. The microprocessor is a member of the same "cpu board on a chip" family as the iAPX 186 16-bit microprocessor, which has a 16-bit data bus.

The microprocessor integrates the functions of 15 to 20 support chips onto a single chip. These include an enhanced 8088-2 cpu, two-channel direct memory access controller, an 8 MHz clock generator, timers, interrupt controller, chip select logic, and ready generator. The chip optimizes the integration level of the iAPX 186 to take advantage of a direct interface to lower-cost 8-bit peripheral devices and memories. A minimum iAPX 188 system can be implemented with eight 64K dynamic RAMs, compared to the 16 chips that are required for a 16-bit system.

The iAPX 188 is software compatible with the vendor's full range of 16-bit architecture products, including the 8086, 8088, 186, and iAPX 286. The microprocessor is also compatible with the vendor's 8087 numeric coprocessor, the 8089 I/O channel processor, the 80150 CP/M-in-silicon, and the 80130 iRMX-86 operating system-in-silicon. The iAPX 188 costs $50 in quantities of 100, with deliveries starting this month. INTEL CORP., Santa Clara, Calif.

FOR DATA CIRCLE 306 ON READER CARD

FIBER OPTIC GRAPHICS COMMUNICATIONS

The T/R-2012 is a fiber optic computer graphics communications system that transmits high resolution video up to 100 times further than is possible with conventional coaxial cable, the vendor says. Typical applications include CAD/CAM, process control, and image processing.

The units are plug-in transmit/receive modules that send RS-170 video up to 7,500 feet over fiber optic cables. The fiber optic system bandwidth accommodates either 640 × 512 or 512 × 512 pixel resolution. The cable eliminates problems associated with electromagnetic noise pickup, hum, ground faults, lightning, and communications security.

Both RGB color and monochrome video signals can be handled by the system. Dual BNC input/output connectors are plug compatible to most monitors and display generators. The modules perform automatic self-monitoring, self-testing, and alarming on-line without program interruption and without extra test equipment, the vendor says. Automatic gain control and DC clamping features aid in maintaining the stability of color and picture levels. Each set costs $2,150. ARTEL COMMUNICATIONS CORP., Worcester, Mass.

FOR DATA CIRCLE 308 ON READER CARD

BUSINESS MINICOMPUTERS

The 800 series of minicomputers rounds out the high end of the vendor's Business System series and replaces the high end of the DS990 family. The computers use a custom high-speed processor with from 512K to 2M bytes of error-correcting memory for a processing speed twice that of the 600 series.

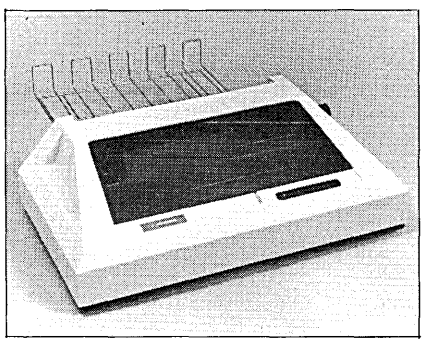
The 990/12 cpu used in all 800 series configurations offers 16-bit memory-to-memory architecture. Its performance is enhanced through overlapped operations, faster integrated circuitry and memory cycle time than previous processors, and a high-speed cache memory for improved instruction execution and peripheral operation. The machine also has a larger instruction set and more memory protection features than its predecessor, the 990/10A.

Prices of the six systems comprising the series range from $57,500 for the 861, with a 13MB removable cartridge and a 67MB fixed disk, to $86,000 for the 884, with two DS300 Winchester drives capable of storing 476MB. The computers support the DX10 and DNOS operating systems. DX10 is a multitasking system that supports COBOL, BASIC, FORTRAN, RPG II, and Pascal, as well as a data dictionary, DBMS, query language, and word processing capabilities. DNOS, which is compatible with DX10 and offers the same languages and utilities, also includes enhanced device support, job accounting, and an output spooler. DNOS also supports network applications. TEXAS INSTRUMENTS, INC., Austin, Texas.

FOR DATA CIRCLE 309 ON READER CARD

MULTIMODE PRINTER

The DP-9625A dual-pass dot matrix printer employs the same printhead and print mechanism as the other members of the vendor's Silent/Scribe family. The multimode printer has a maximum speed of 200 characters per second in its data processing mode and 50 characters per second in its near letter-quality mode. Intermediate speeds of 150, 120, and 100 cps provide correspondence quality.



The printer is capable of high-speed graphics with either 72 or 144 dots per inch in both horizontal and vertical dimensions. Double width printing is also possible, as is horizontal and vertical tabbing, and serial and parallel (Centronics) interfaces.

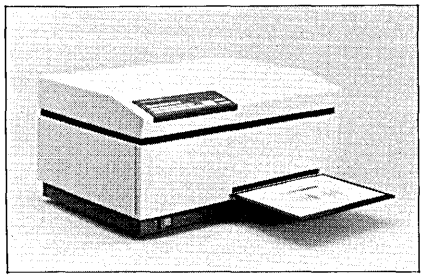
In the dual-pass technique, the printhead makes a first horizontal pass across the paper in one direction, printing dots in accordance with the supplied data. Then the paper is moved a small increment vertically and the printhead reverses direction and makes a second pass over the same line, printing dots that fill in the spaces between dots painted in the first pass. The printer lists for $2,000. ANADEX, Chatsworth, Calif.

FOR DATA CIRCLE 310 ON READER CARD

COLOR COPIER

The D-Scan 5201 produces single pages of full-color hardcopy on standard paper in under one minute. The eight-color device uses standard roll paper and readily available ink sheet rolls, and produces durable, markable, and fade-resistant copies. The device is intended for use by researchers, technologists, and designers who incorporate interactive graphics into their illustrative and analysis processes and who use color graphics terminals.

Color copies are formed over a line-type thermal head that transfers singular dots of pigment coating from a wax-coated



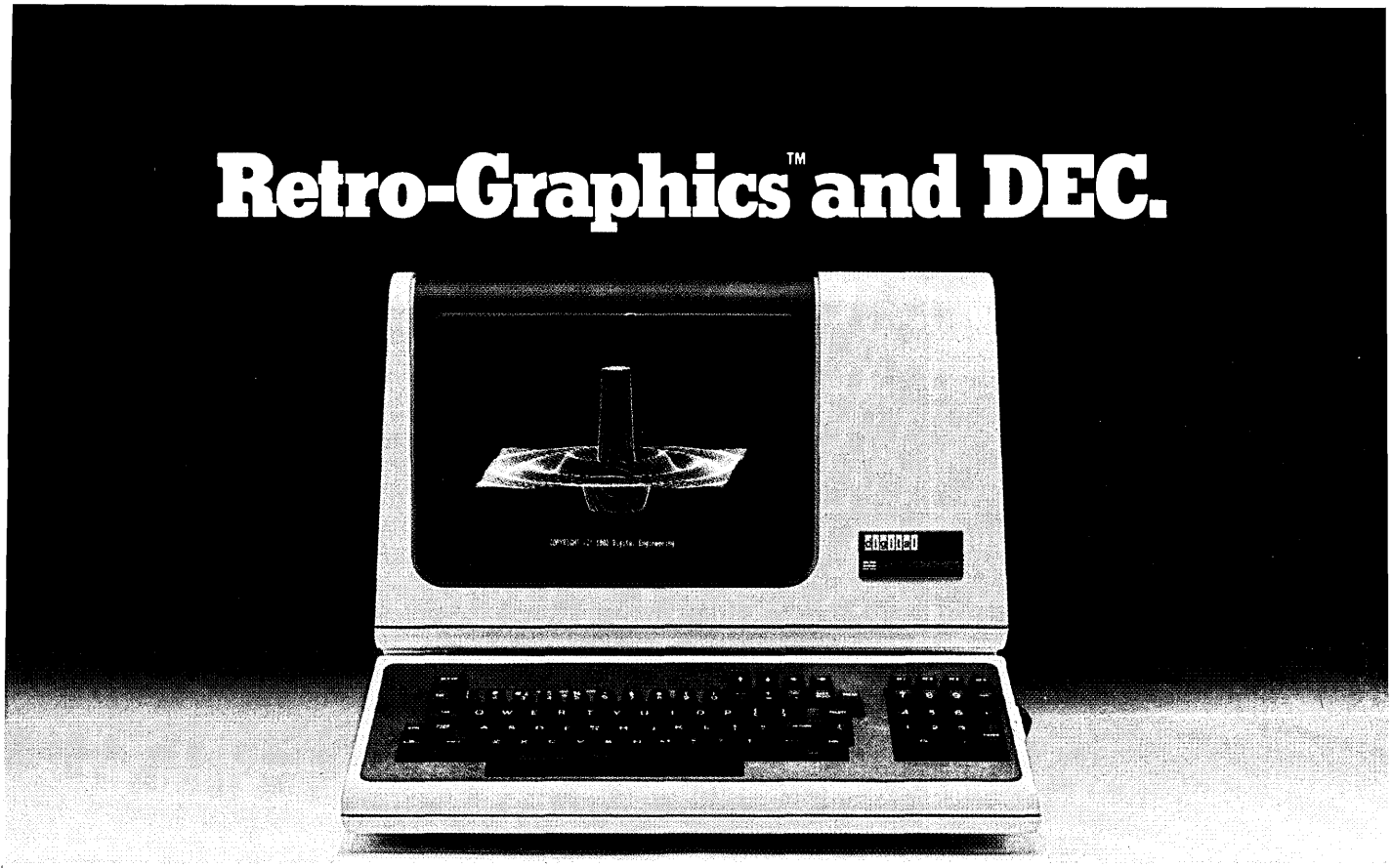
three-color banded ink sheet. The normal grade paper comes in a standard-size roll and is easily replaced. Final copies are cut automatically to 8½ × 11 inches. The 5201 will print images from most color crts used in scientific and CAD/CAM applications.

While other color hardcopy output devices can take up to three minutes to complete an image, the vendor says, the 5201 takes only a minute, which allows for greater interactivity. The 5201 also has a local video memory to store images prior to generating actual output on paper; this frees the crt for other use.

The unit, which will begin shipments in the first quarter, costs $13,000. SEIKO INSTRUMENTS U.S.A., Santa Clara, Calif.

FOR DATA CIRCLE 312 ON READER CARD

Retro-Graphics™ and DEC.



Now GEN.II™ delivers Tek 4010/4014/4027 compatible graphics on your VT100, VT101, VT102, VT103, VT131, or VT132.

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And for extra power — and compatibility with your existing or future Tek 4014 applications programs — *GEN.II for DEC also features one-color 4014 simulation.* With little or no software modification.

In addition, GEN.II's 32 Kb's of "local" intelligence ensures that images come up quickly — and costly terminal-host data transmissions are held to a minimum. And because GEN.II is based on industry-standard Tektronix protocol, graphics programming and operation are considerably eased. Case in point: by entering from the keyboard or computer the following command string

!PIE 100, 0, 360, 45

an eight-sided *polygon* with a radius of 100 will be plotted and its interior will be *filled* with a shading pattern (GEN.II maps 4027 colors to dithered shades).

With similar high-level command strings, GEN.II will also perform *arc* and *vector drawing. Define* and *shape text characters. Store* and *recall* graphs. And, while in 4014 mode, *perform additional graphics annotation using all four 4014 character sets.* And you get all this with no loss of existing terminal features.

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CIRCLE 98 ON READER CARD

"The merger of Victor and Sirius creates a nique combination of advanced technolog marketing and worldwide distribution."

Chuck Peddle, designer of Victor 9000 microcomputer and Presid of the new Victor Technologies,

The combination of ctor Business Products d Sirius Systems Technol- y, Inc., creates a new com- ny designed to meet the most manding needs of the modern siness office. It unites the ad- nced technology capabilities of rius with the distribution, support and arketing strengths of a company with er 65 years of experience in solving busi- ss application problems.

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The new Victor: Streamlined for success.

The Chairman of the Board of the ew Victor Technologies is Fred Sullivan, hairman and Chief Executive Officer of idde, Inc., a diversified $3 billion com- any. The financial support of this giant onglomerate will help focus Victor's goal f becoming one of the three leading com- uter companies in the world.

President and Chief Executive Of- cer of the new company is Chuck Peddle. was Chuck Peddle's focus and insight hich led to the design and manufacture f the Victor 9000, the first and most owerful of the "third generation" of mi- rocomputers. Acknowledged as the "fa- her" of the personal computer concept, Peddle introduced this useful and very affordable third generation microcomputer in the European market with startling results.

The Victor 9000: Number One in Europe, in a class by itself in America.

In Europe the Victor 9000, sold under the name of Sirius 1, is the best selling microcomputer in the market. As a matter of fact, it was recently named "Computer of the Year" in West Germany.

There are demonstrably good reasons for this success. As in the United States, the Victor 9000 is the most powerful microcomputer available, offering substantially more internal memory, storage capacity and engineering advances than any other comparable product. And the Victor 9000 library of business application software and innovative line of peripherals and accessories make it a business tool of great versatility.

A vital part of the new Victor is a total commitment to the development of new software, both internal and by third parties. Th reputation of Chuck Peddl and the proven success c the product family will cor tinue to attract the effor of the brightest minds in th high technology industry.

Over 10,000 outlets throughout the world.

Victor, long established as a worl leader in desktop calculators and innova tor of electronic cash registers, will b accelerating and expanding the distribu tion channels for these products. An with the outstanding acceptance of th Victor 9000 desktop computer, the ne company is committed to make substan tial new product offerings and support fc all product lines through its large branche and dealer networks.

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CIRCLE 101 ON READER CARD

SOFTWARE AND SERVICES

UPDATES

A software development tool is available for users of Panasonic's Link handheld computer. The tool, which runs on Apple II and II Plus computers, lets users write SNAP and Assembler programs on the Apple, with testing and debugging done on either the Apple or the Link. The package is available from Panasonic, Secaucus, N.J.

As 16-bit personal computers become more popular, more and more software vendors are upgrading their products to run on CP/M-86 and MS/DOS, among other operating systems. One recent case is MicroPro, whose WordStar, MailMerge, and SpellStar are now available on both CP/M-86 and MS/DOS.

As if just to prove the Osborne computer can travel, from Norway we hear of four utilities designed to aid the user in avoiding loss of data from its disks. Elektrokonsult's DTest checks disks for bad sectors; UnEra recovers accidentally erased files; DDup recovers files with damaged sectors; and DDump allows users to examine and patch data on any sector. Each program costs $30, with an $8 air shipping charge from Drammen.

To reduce the amount of post-sale hand-holding often required by personal computer users with new software, Cdex Corp., of Los Altos, Calif., has created its first in a series of interactive tutorial programs: a three-disk package for VisiCalc. Currently available for the Apple II Plus, the package costs $50, including reference manual.

The BRS Search Service, in Latham, N.Y., can now be used by home computer enthusiasts as well as by corporations, schools, and research houses. BRS/After Dark is available from 6 p.m. to midnight.

BUSINESS GRAPHICS

Grafmaster is a panel-driven presentation graphics package that provides standardized interface panels for interactively generating both simple and sophisticated presentation charts on a broad range of graphics display devices. Users who need a "user specific" interface can have appropriate panels tailored by the vendor, using the proprietary panel definition language.

At the touch of a cursor key, users can quickly navigate through entries on standardized panel sets—the windows into the graph's description—and either accept the defaults or fine tune the picture by supplying different values. This multiple-choice technique eliminates keystroking of statements required by most command or prompt driven graphics systems, since the user employs only the cursor keys to set up the graphs.

The panel definition language, currently offered only as a service by the vendor, allows a user to make his panels reflect the terminology used in his office. This language will be available for sophisticated oems in the future, the vendor says.

Because the system is fast, it can be used in an iterative manner to develop and refine the required graphics, with data input from either the keyboard or external files. Users can experiment with layouts, parameter values, and other characteristics of the graph with little keystroking. The package, available in February on VAX systems and in April on IBM systems, costs $18,000. PRECISION VISUALS, INC., Boulder, Colo.

FOR DATA CIRCLE 326 ON READER CARD

INTEGRATED APPLICATIONS

TaskMaster integrates word processing, data communications, database management, telex, typesetting, printable bar graphics, and on-screen math into a single package running under the RT-11 and TSX-Plus operating systems. The package has been in existence since 1975, when it was created in Canada to assist in publishing the letters of 19th century British Prime Minister Benjamin Disraeli, but it has only been on the market since December.

TaskMaster's list processing supports sort, select, merge, and label printing functions. The data communications facility supports asynchronous ASCII communications up to 19.2K baud. The database manager allows selection of specific records, fields within specific records, calculation on those fields or records, and tabulation of specific fields or records. It also allows the creation of database files from word processing files and vice versa.

Telexes may be sent or received using ITT Worldcom's Timetran service. Under this service, only the actual transmission time is payable; the telex number and computer mailbox are free. The word processor features on-screen calculation, super- and subscripts, scientific notation, proportional spacing, and a multilevel hyphenation facility. The printable bar graphics require a VT100 terminal, although others are supported. The package costs $4,000, or $2,500 without the database manager. DAWN COMPUTER CORP., Studio City, Calif.

FOR DATA CIRCLE 327 ON READER CARD

SNA-DEC INTERFACE

The Network Services Facility (NSF) is a communications gateway that provides multiterminal and applications access from non-IBM systems to SNA. As a node within a communications network, the NSF is able to connect multiple interactive sessions to multiple IBM hosts. It is available, under license, on Digital Equipment's VAX series of computers for $50,000.

The NSF provides for up to 64 terminals simultaneously to access IBM multiple hosts and a wide range of DEC applications, including timesharing and networking via DECNET and X.25. The package offers full emulation of 3278 and 3287 devices on most ASCII asynchronous terminals and several printers; full support and emulation of 3274-51C control for the connection of IBM systems is offered via SNA PU type 2.

Terminal access to the NSF is via dial-up, leased, or direct connect lines; printers can be attached via separate lines or through the auxiliary port on the crt. Up to six IBM hosts can be supported simulta-

neously, with load balancing when multiple SNA lines are connected to the same host. No special requirements exist for the VMS operating system to run NSF. PARAMIN, INC., Wellesley Hills, Mass.

FOR DATA CIRCLE 328 ON READER CARD

LEGAL DATABASE

The Laborlaw database provides access to U.S. labor law information including judicial decisions, arbitration awards, and agency rulings. The database is based on six printed services that cover labor relations, fair employment practices, wages and hours, labor arbitration, occupational safety and health, and mine safety and health. The database includes indexing and abstracts from federal and state court decisions, as well as rulings from the National Labor Relations Board, the Equal Employment Opportunity Commission, the Occupational Safety and Health Review Commission, and the Federal Mine Safety and Health Review Commission, as well as arbitrators and others.

The database allows users to search across all six services simultaneously. Prior familiarity with the various indexing classification systems is not necessary, since Laborlaw offers both descriptor terms and codes as aids to effective retrieval. Continuous and automatic updates matching preestablished research criteria are supplied monthly on an optional basis. New decisions, parallel citations, and case histories can also be added monthly.

The full texts of labor law decisions are not available on the database; but for fast searches of the legal literature, these are rarely needed. The only hardware necessary for access to the database is a terminal (or communicating word processor or microcomputer) and a telephone, since the database is available through the Dialog Information Services collection of databases. The only charge for use of Laborlaw is the $120-an-hour usage fee. BUREAU OF NATIONAL AFFAIRS, INC., Washington, D.C.

FOR DATA CIRCLE 329 ON READER CARD

MENUS FOR CP/M

MenuMaster is a human interfacing system for CP/M that will make any CP/M computer completely menu driven. The program displays what the computer can do at any point on the screen, so that a single keystroke can execute any command given to the operating system.

The package contains a set of menus that may be used as is or as a basis for a customized menu system. The user, dealer, or manufacturer can create menus to meet any requirement exactly; defining a menu can be done in minutes using any text editor, the vendor claims. The menu designer is not restricted to any predefined screen layout or any number of predefined functions, but may design menus with total functional and graphical freedom.

MenuMaster incorporates a Menu Definition Language designed specifically for the purpose of menu design. The language is intended to be useful to the novice as well as to the professional programmer. The software comes with a phototypeset tutorial user's guide and a technical reference manual. The product carries a list price of $200. BORLAND INTERNATIONAL, Dublin, Ireland.

FOR DATA CIRCLE 330 ON READER CARD

MICRO DBMS

Derived from the vendor's PRISM package, MAG/base differs from competitive database management systems primarily because it utilizes a fill-in-the-blank approach rather than a command approach. This enables users to create their own files, reports, and special forms without the need for a specialized computer language. The package comes in one of three versions.

The MAG/base-1 Personal Filing System is designed for users who want to keep their database activity simple. The software can generate most list-oriented applications, including customer lists, real estate listings, data entry, and direct mail. Files may be indexed and cross-referenced; reports can show information selected from a file with totals. Mail-merge capabilities are also provided. MAG/base-2 includes a full MAG/base-1 and a report writer, which gives the user control over the appearance and content of reports, queries, and special forms. Calculations, totals, and subtotals are provided. Checks, invoices, statements, and financial reports can be produced, and report definitions may be saved and recalled to eliminate repetitive use.

The MAG/base-3 option is designed for the advanced end user. It includes all of the MAG/base-2 features and a set of programming aids. Menu definition, password protection, screen management, and entry and edit functions are included. MAG/base, which is compatible with CP/M, CP/M-86, MP/M, and MP/M-86, costs between $300 and $800, depending on which version is purchased. MICRO APPLICATIONS GROUP, Canoga Park, Calif.

FOR DATA CIRCLE 331 ON READER CARD

VISICALC INTERFACE TO DATABASE

VisiLink electronically transfers selected business information over the telephone from the Data Resources private business database to users, in the form of VisiCalc worksheets. There worksheets, called DataKits, can be used immediately with the VisiCalc program or with the vendor's oth-

SOFTWARE SPOTLIGHT

STOCK ANALYSIS

Four packages mark the entry of this vendor into the software publishing business. The Market Analyzer is a technical analysis tool for the serious investor who uses charts and graphs for decision making. The program collects historical and daily market quotes from the stock ticker and stores them for later viewing. Users can construct relative strength and analysis charts or individual price and volume charts with moving averages, oscillator charts, and straight line constructions. The program allows for input of special indicators and can store data on 104 stocks for 128 days or 52 stocks for 256 days on one data disk.

The Market Microscope collects, stores, and updates information on extensive lists of companies and industry groups. Users can follow the progress of individual companies, rank lists of companies with respect to indicators followed, specify screens for buying and selling, and set support and resistance levels for automatic notification when stocks reach critical points. Some 68 indicators are available, and up to 50 lists, each with up to 20 stocks or industry groups, can be stored on a data disk.

The Market Manager maintains security portfolios; users have access to prices and financial information and can track stocks, bonds, options, mutual funds, and Treasury issues. In addition to automatic valuation of positions, users can obtain printed reports for individual accounts and

an overall securities holding report. The package includes year-to-date transaction audit trails and realized gains/losses tax records, as well as an automatic cash entry system for buys and sells.

The Connector is just what its name implies: an interface to the vendor's News/Retrieval videotex service. Included are business and economic news, stock quotes, financial and investment services, and general news and information. The package also includes a 33% discount on non-prime-time usage of the News/Retrieval service.

All four packages include an hour of free nonrestricted usage of the News/Retrieval service. The Market Analyzer lists for $350, the Market Microscope for $700, the Market Manager for $300, and the Connector for $95. DOW JONES & CO., INC., New York, N.Y.

FOR DATA CIRCLE 325 ON READER CARD

CIRCLE 102 ON READER CARD

er software products, simplifying the task of integrating external information with information known only to the manager or executive.

DataKit worksheets are regional, national, or international in scope and include financial, industrial, and special purpose data. Also available are profit and loss statements, income statements, and other financial data about public corporations.

A user registers with Data Resources by using the VisiLink program. The program automatically connects the user with the Data Resources family of databases after he completes an on-screen order form. The program transfers the selected information. The user pays only for the information received. The registration and selection of information are performed offline so that there are no connect charges.

A catalog is included on one VisiLink diskette, which includes prices for each DataKit available. VisiLink itself costs $250, and prices for each DataKit range from $35 to $200. VisiLink currently runs on Apple II and II Plus computers with 48KB memory and two disk drives. A modem is required. VISICORP., San Jose, Calif.

FOR DATA CIRCLE 332 ON READER CARD

CORPORATE LAW AIDS

The Corporate LawPack system enables a corporation's legal department to track outside legal costs, monitor internal costs, and control docket scheduling. The software includes six major subsystems, which can be purchased individually, and operates on Wang VS and IBM 4300 Series (or larger) computers.

The Docket Control subsystem maintains the corporate database of all matters handled by the legal department. It produces a diary of events for upcoming court appearances, filing dates, and other events in pending litigation; it also records histories of past litigated matters. The Budget/Financial Reporting subsystem provides management analysis reports comparing actual costs against budget and to the prior year.

The Time Recording subsystem provides a detailed narrative of all tasks performed by the in-house legal staff and allows the department to plan for increased work loads or requirements for additional in-house personnel. The Disbursement Accounting package reimburses employees for all out-of-pocket expenses and records employee advances. The program charges all expenses to the appropriate accounts and maintains a ledger of all invoices and payments.

The Interdepartmental Charges subsystem provides the law department with a detailed analysis of the true costs of each project undertaken and charges appropriate user departments for legal services involved. The File Maintenance package manages the master files common to the subsystems. On-line documentation for users is included with the subsystems. A complete system costs about $18,000. COMPINFO, New York, N.Y.

FOR DATA CIRCLE 334 ON READER CARD

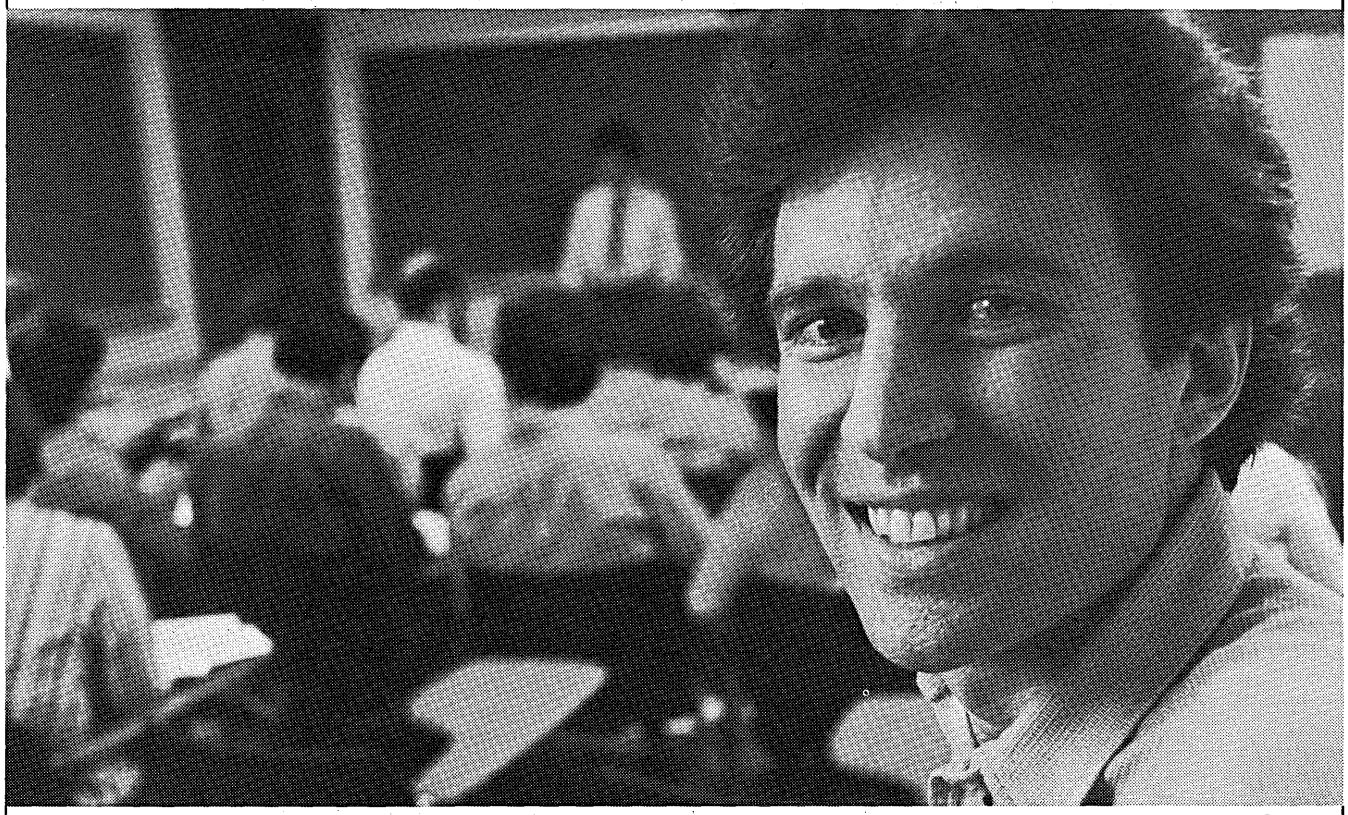
WP FOR MICROS

The Tronware family of office automation software is designed on the premise that word processing is a window through which all other applications should pass, its vendor says. Besides word processing, applications include arithmetic, electronic mail, list processing, automatic merge, and a security/encryption system. The entire package is written in Pascal and runs under CP/M, CP/M-86, MP/M-86, and Unix. Versions for MS/DOS and the UCSD p-System will be available soon as well.

The Scriptron word processing package includes the usual wp features as well as multicolumn printing, automatic realignment, storage and recall of formats, a forms processing utility, and a concurrent printing/editing capability. The arithmetic module can accept, edit, sort, and print columns of numbers, in addition to basic computational abilities.

Scriptron also includes a three-level security system. An external device denies

"It would take years at work to master the techniques we learn at the Wang Institute in three semesters."



The Wang Institute is an independent, non-profit graduate school which offers software professionals a unique opportunity to earn a Master's degree in software engineering.

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CIRCLE 104 ON READER CARD

access to users who fail to match a preprogrammed algorithm; a hierarchical password structure further restricts users from getting on the system subversively; and a sophisticated encryption technique deters tampering with files. The package, which costs $800, also includes a mapping function, which can be used to map commands to function keys, redefine command names, assign a machine representation to keys on the keyboard, and map the help command file to any set of instructions. SOFTCORP, Overland Park, Kans.

FOR DATA CIRCLE 333 ON READER CARD

HANDHELD BASIC

The BASIC Language System (BLS) simplifies creation of customized application programs for the vendor's handheld source data entry terminals. The software, which is contained on two 5¼-inch floppy diskettes, creates, modifies, edits, tests, and compiles the application programs on either an Apple II or II Plus or on the vendor's Application Development System using a Cromenco microcomputer.

The corrected and compiled program is downloaded into the handheld terminal. This can be done directly from the development micro or by burning the program into an EPROM chip, which is encased in a plug-in programmable load module for remote on-site loading of the terminal.

The BLS application development package includes a simulator and compiler, a 300-page user reference manual with detailed descriptions of all procedures, and a concise pocket reference guide for the more experienced programmer. The simulator software develops, modifies, and tests the application program, simulating the operation of the handheld terminal. (The terminals use an RCA 1802 chip as a cpu.) The initial license fee for the BASIC package is $1,500, with discounts for quantity volumes. MSI DATA CORP., Costa Mesa, Calif.

FOR DATA CIRCLE 335 ON READER CARD

COBOL FOR JAPAN

This vendor's portable microcomputer COBOL compiler supports the Japanese Industry Standard set of kanji characters. Since more than 90% of all business applications in Japan are written in COBOL, the Level II COBOL will make office automation more friendly to users and will increase the productivity of Japanese-speaking COBOL programmers, the vendor says.

The compiler processes alphabetical, numeric, and kanji symbols as it reads the source code. The product also supports katakana characters, the Japanese ideograms for Western concepts not represented by other existing Japanese symbols. The compiler allows users to enter kanji at the keyboard and work in their native character set rather than in alphabetical notation.

The vendor says that Level II COBOL is the first microcomputer COBOL that is compatible with all ANSI 74 standard applications, so that the compiler can be configured for most computers. The compiler costs $1,600 to end users. MICRO FOCUS, Palo Alto, Calif.

FOR DATA CIRCLE 338 ON READER CARD

TELECONFERENCING

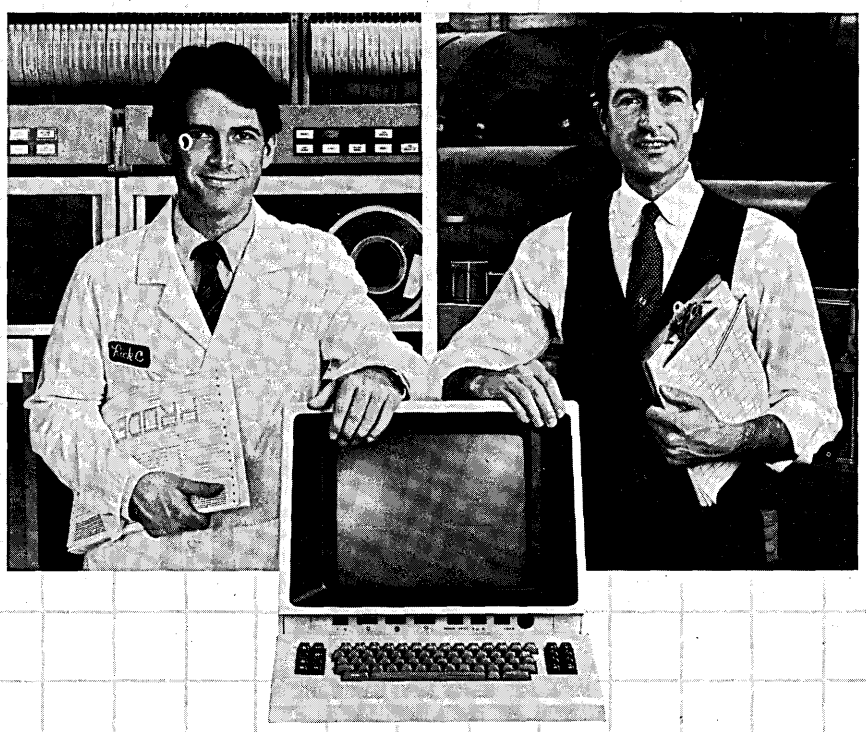
Trans-Call is an international telephone meeting service that costs $2 per user per minute worldwide and 75¢ per user per minute in the U.S., including the cost of the phone call.

The service is simple to use. A conference reservation is made with the vendor's Midwest headquarters. At the designated meeting time, the vendor calls the participants who are abroad. At the same time, the participants in the U.S. call in to the service, using a specially assigned number from the vendor's 800 service (except in Connecticut). This arrangement is designed to ensure quick conferencing and the best phone lines for the meeting.

There is a 15-minute minimum charge for the service, but all costs are included in the $2 (or 75¢) connect time charge. DAROME TELECONFERENCING DIVISION, Harvard, Ill.

FOR DATA CIRCLE 342 ON READER CARD

MRPS



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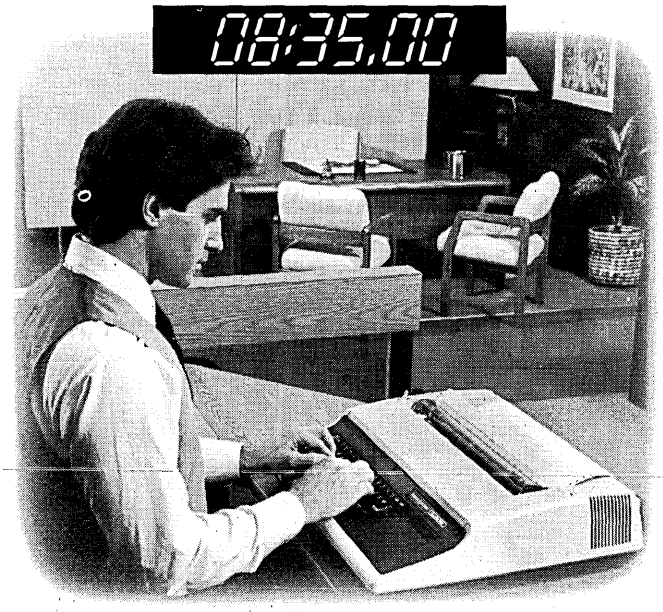

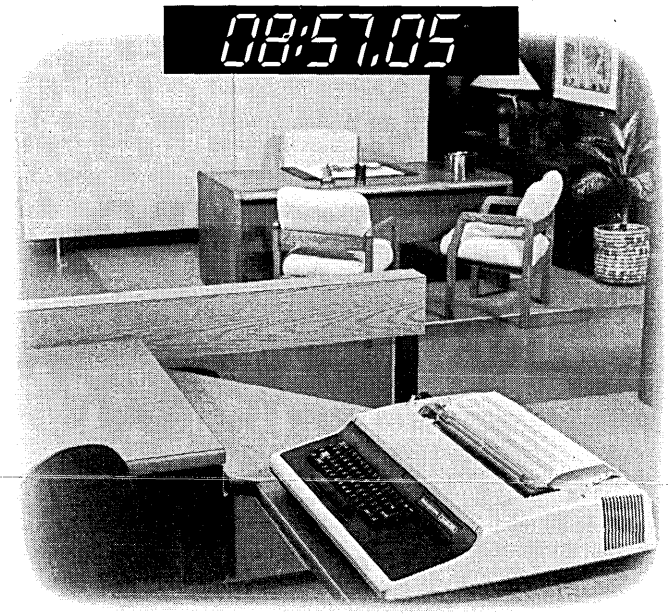

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In time-sharing, every minute your printer spends on-line costs you money. That's why a lot of people are taking the time now to look at the GE 2120 printer.

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Stylish, compact, lightweight, quiet, and easy-to-use, the energy-efficient GE 2120 printer comes with an outstanding list of standard features. Plus you get choices in paper handling: friction, pinfeed platens, or adjustable tractors. And if you need more, we have more than enough options to choose from.

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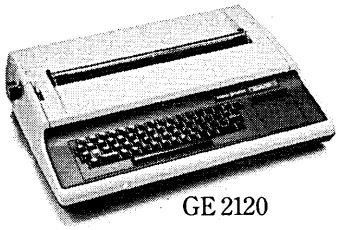

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GENERAL ELECTRIC

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The Marketplace... SOFTWARE SERVICES

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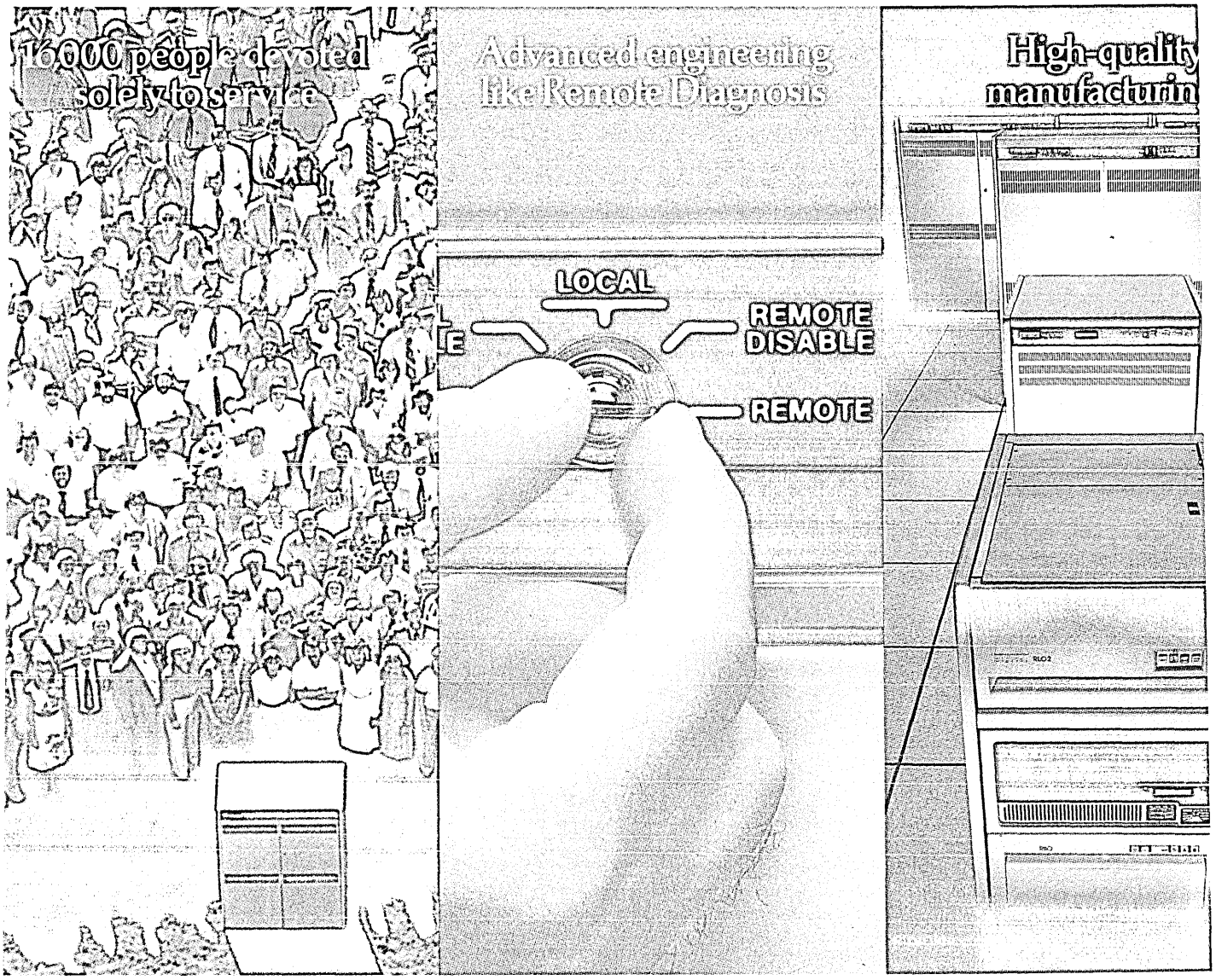

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digital

SOURCE DATA

LITERARY ROUNDUP

It's the start of a new year and time to rid DATAMATION's bookshelves of the many review copies that accumulated over the past year. Mostly because of lack of space in the magazine, many of these books don't receive a full review treatment. So, in an effort to at least note the wide spectrum of topics the computer press is currently addressing, we've put together a quick rundown of what looks to be the Best of the Rest.

Last year's best-selling computer book was Tracy Kidder's *Soul of a New Machine. Engineering a Compiler* by Patricia Anklam et al. could have been subtitled *Soul of New Compiler,* but it probably wouldn't win a Pulitzer. Nevertheless, the book provides a close, highly technical look at the development of the PL/1 compiler written for Digital Equipment's 32-bit VAX machines. A step-by-step chronicle of the programming team's progress is provided, complete with diagrams, coding examples, and even a few photos of notes the team kept. Technical jargon is kept to a minimum in this book which displays no lack of a sense of humor: one section is entitled "Domesticating the Beast." Published by DEC itself in Bedford, Mass., at $24, the volume should appeal to anyone—computer scientist, software engineer, or student—attempting a similar project on other equipment.

An area of increasing interest in the so-called information industry is that of teletext and videotex, the transmission of textual and graphical data by electronic means directly to a customer's premises. The field has only begun to emerge as a commercially viable one and only a few experimental and limited production systems are in use, but it is clear that some very large corporations (IBM and AT&T, to name the most obvious) see electronic publishing as a high growth market for the future. Two recently published volumes study the market and its implications for public policy-making.

McGraw-Hill has come out with *Teletext and Videotex in the United States* by John Tydeman and four other researchers at the Institute for the Future in Menlo Park, Calif. Claiming that teletext and videotex have the potential "to change how people use information and indirectly how they think," the authors provide a wide overview of market potentials, technology, and public policy issues.

While this book does not claim to break much new ground in terms of analyzing the social or technological impact of the new systems, it appears to provide a comprehensive overview of the various elememts involved. As up to date as any book can be in such a fast-changing field, this $34.95 volume offers a wealth of information on the potential benefits and threats electronic publishing presents to the world.

Narrowing in on the legal issues raised by teletext/videotex technology is *The Birth of Electronic Publishing* by Richard M. Neustadt. Expanding on an oftencited December 1981 article that Neustadt and two coauthors published in the *Federal Communications Law Journal*, the book delves into the intricacies of law pertaining to the new systems. The author comes to the conclusion that current statutes will be quickly outmoded by the electronic delivery of information and suggests a number of proposals for their revision. At the basis of his thinking is a belief in minimal government intervention in the content of electronic publishing. Neustadt says the government should give the medium "as much freedom as possible so that all its possible applications will have a chance to be tested." Published by Knowledge Industry Publications, Inc., White Plains, N.Y., the $32.95 book tries to give electronic publishing a place in the law where none currently exists.

Popular interest in the computer is on the rise, and with it has come a wealth of books exploring the origins of the fabled beast. Scribner's has come out with *Breakthrough to the Computer Age* ($12.95) by former Univac man Harry Wulforst. Concerntrating on events of the '40s and early '50s, Wulforst has written a concise story showing the dogged attempts by computing pioneers to develop logic and memory circuits, programming languages, and input-output devices. While explaining many of the technological issues, Wuforst provides an engaging account of the people involved: John Mauchly and Presper Eckert, George Stibitz and John von Neumann, to name a few. Much to his credit, the story is not laden with made-up dialog as so many historical accounts are these days.

Artificial intelligence (AI) has been receiving a great deal of attention lately from the industry, venture capitalists, and the press. In an attempt to draw together in one source an in-depth overview of AI concepts and research, William Kaufmann, Inc., Los Altos, Calif., has published *The Handbook of Artificial Intelligence*. The handsomely produced three-volume set surveys AI in detail, arranging a series of overview articles in a hierarchical manner so that even the initiate can quickly find what he's looking for. The total set is $95 and is scheduled to be revised regularly as new research is accomplished, according to the publisher.

A broader overview of the computer industry, and a few guesses at its future, are to be found in Ulric Weil's *Information Systems in the 80's, Products, Markets* and *Vendors*. Unfortunately this Prentice-Hall book of 383 pages is rather heavy going, burdened as it is with the jargon typical of most Wall Street research departments. That, of course, is where Weil comes from, Morgan Stanley & Co. to be exact, but it seems a shame that his writing is not up to the level of his insight into the industry and its players. Nevertheless, this leading analyst's book is a mother lode of information, much of it relating to markets, projected growth rates, and strategies of IBM and its rivals. At $24.95, Weil's volume will surely be more of a reference book than one to curl up with on a cold winter's night.

As always, books on programming are plentiful. They seem to come in waves, according to the shifting popularity of different languages and programming methods. A few years ago it was structured

methods, this year it seems to be Pascal and Ada. Two birds of a feather, perhaps.

One company that seems intent upon tapping the Pascal market is Reston Publishing, an imprint of Prentice-Hall in New Jersey. The company has no less than five Pascal textbooks, most of which have been written by Canadians. Do our northern neighbors have a monopoly on this language or are we merely seeing them play catch-up to a previous series of U.S. books? Or do Canadian authors demand lower royalties than their U.S. cousins?

The largest Reston text by far is the 625-page *Computing, An Introduction to Structured Problem Solving Using Pascal* by V.A. Dyck et al. Developed at the University of Waterloo, the book attempts to enforce structured design thinking and provide beginning programming students with a complete understanding of Pascal and algorithmic program solving in general.

In a similar vein, *UCSD Pascal, A Beginner's Guide to Programming Microcomputers* was written by two University of Toronto computer scientists. Authors J.N.P. Hume and R.C. Holt introduce the language in a series of subsets.

Pascal, Text and Reference with Waterloo Pascal and Pascal VS by John B. Moore is a paperback apparently set on a computer's line printer, making it look quite unprofessional next to some of the others. It does, however, appear to provide a comprehensive introduction to the popular language along with problems for students to solve.

Reston's next title is *Pascal Programming, Problems and Applications* by David T. Barbard and Robert G. Crawford, both of Queen's University in Ontario. Like Moore's, this book is a paperback, but its layout is much more attractive. Its aim is similar, that of teaching beginning students the basics of Pascal (no pun intended).

Finally, for those interested in Pascal on Motorola's 6809 and 68000 microprocessors, Reston has published George W. Cherry's *Pascal Programming Structures for Motorola Microprocessors*. The self-study text can be used in classrooms. It delves extensively into the semiconductor firm's own compilers.

As if Reston's lineup weren't enough, Van Nostrand Reinhold offers for $13.95 Dr. Martin D. Beer's *Programming Microcomputers with Pascal*. It is aimed at scientific and engineering users and to that end offers a series of typical problems—data measurement, process control, and the like—for the reader to program.

Ada is, of course, the Defense Department's baby, a language to end all languages. It is an easy guess that the industry will need some texts to help educate itself in the new language itself as the demand for it spreads. (Don't throw away your COBOL books yet, though!) M.J. Stratford-Collins's *ADA, A Programmer's Conversion Course* comes from Halsted Press, a John Wiley imprint, located in New York, for a hefty $48.95. Billing itself as "providing the professional programmer with an easy means to learn the basics of ADA," the book assumes the reader already understands another language fairly well. As such, however, the book does not intend to be a full-blown manual on Ada but rather a concise (170-page) teaching and reference tool to provide the professional with a working knowledge of Ada's most often used features.

Apparently written for the novice is Brian Mayoh's *Problem Solving with ADA* (John Wiley, $23.95.) The book offers a wealth of intriguing diagrams and emphasizes the basic Ada concept of approaching big problems as a series of concentric subproblems. An index of useful Ada packages is provided and the book supplies many problems for the reader to solve.

Moving away from specific languages, we come to two general programming books that approach problems of software efficiency and portability. *Writing Efficient Programs* by Jon Louis Bentley (Prentice-Hall, $22.95) attempts to instruct the software engineer and computer hobbyist alike in the benefits and methods of writing efficient code. The trade-offs between memory space and processor time are explored in the 170-page volume that provides a wealth of examples in Pascal. A comprehensive list of efficiency rules is provided, and a good list of references.

If ever there was a cliché that should be replaced it's the one about portable software: "We were trying not to reinvent the wheel." Peter J.L. Wallis's *Portable Programming* (John Wiley, $18.95) is a primer in designing and marketing software that can be moved from machine to machine. Wallis covers the issue from all angles, discussing legal considerations, high-level languages, specific and general applications, and even industry attitudes towards the subject. The concise text and ample bibliography appear to make the book anything but a reinvention of someone else's wheel.

—John W. Verity

REPORTS & REFERENCES

DEC REFERRAL

Digital Equipment Corp. wanted to make life easier for its computer graphics users, so it published the Graphics Referral Catalog (GRC). Now in its second edition, the catalog lists products that are compatible with the Digital VAX, PDP-11, DECsystem-10, or DECsystem-20. DEC does not review the products it lists; the book is designed simply to show users what is available. The vendor's name, its product's name, and a product description are given for each entry. Categories include software, hardware, display devices, and input devices. The GRC is free to DEC customers (one copy only); others can obtain it for $5. Contact DEC at Two Iron Way, Box 1003, Marlboro, MA 01752, (617) 467-5111. Ask for the Engineering Systems Group.

TECHNO-TALK

Talk is getting cheaper, so don't be surprised if, in the not too distant future, your new car says, "Hey buddy, you forgot to fasten your seat belt." A recent Datapro Research Corp. report, "All About Speech Technology," tells where this technology began, where it is, and where it's headed. Voice recognition, voice synthesis, voice response, and voice store-and-forwarding are examined in the $19 report. Comparison charts of 71 voice products and 40 manufacturers of voice equipment are included. In addition, Datapro tells what applications these technologies are used for, and how to begin planning to add them to your organization's operations. For copies of the report, contact Datapro at 1805 Underwood Blvd., Delran, NJ 08075, (800) 257-9406.

MAP IT UP

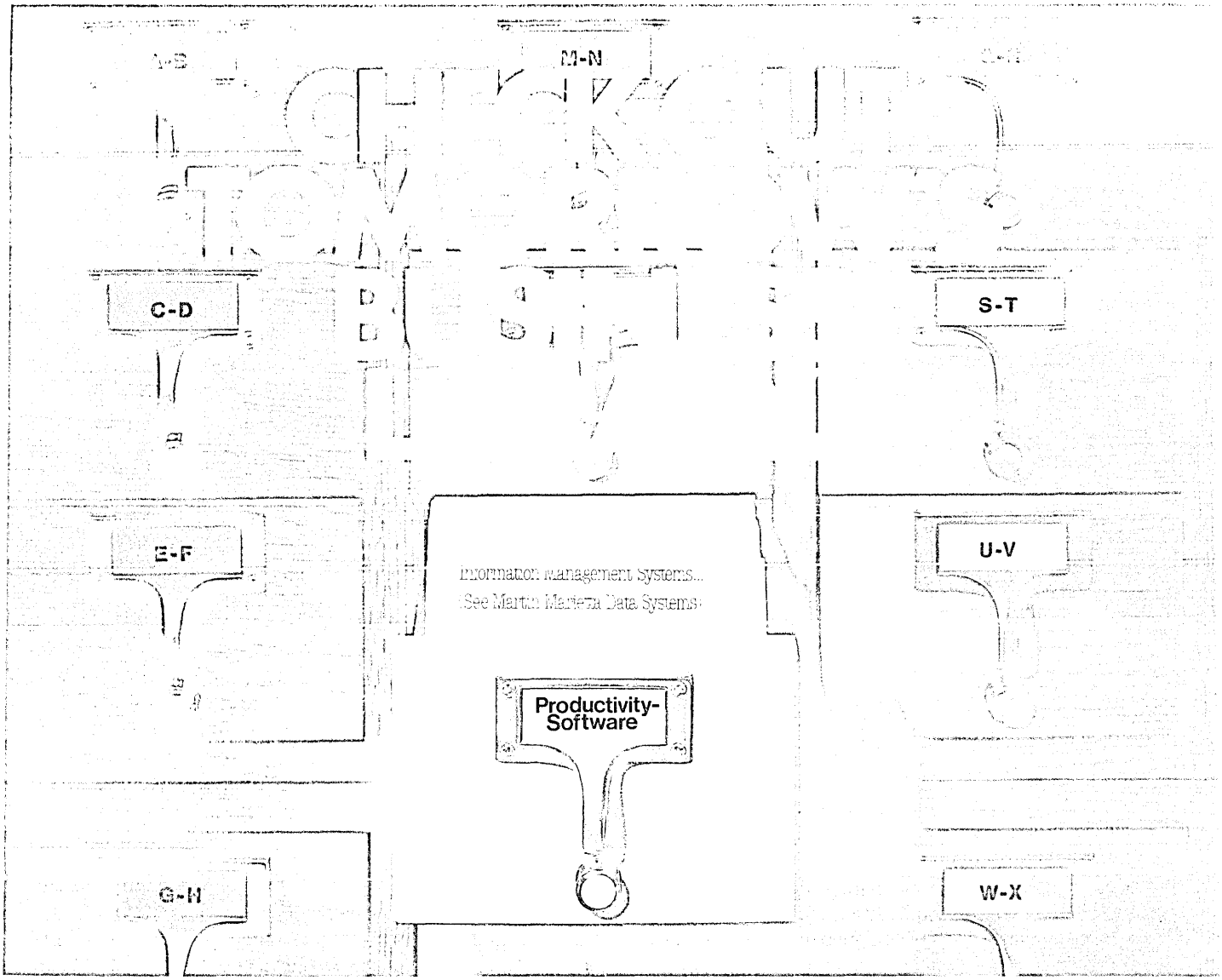
Don't get lost in the valley; get *Rich's Guide to Santa Clara County's Silicon Valley*. This guide can be used as a directory, plant site locator, product/service source, address book, restaurant guide, and hotel/motel guide. Only $45 buys over 190 pages of more than 150 maps with 1,100 locations. Send for yours today, and don't get lost again! Area wall maps also available. Contact Rich's Enterprises, 1000 Elwell Court, Suite 215, Palo Alto, CA 94303, (415) 961-9557.

PERSONAL WORLD

Keeping up with the personal computer industry is difficult at best. Future Computing, Inc., is offering a monthly newsletter, *Views*, that "provides time-sensitive information on the shipping volumes, product announcements, and policy and marketing changes" of the companies involved in this booming industry. The publication also evaluates new products, discusses the Japanese position in the personal market, and gives data on market shares held by the various competitors. Annual subscription rate for 16 issues of *Views* is $325. Future Computing, Inc., 900 Canyon Creek Center, Richardson, TX 75080, (214) 783-9375.

LEND AN ARM

Industrial robots are the focus of this 368-page book, *Robotics Today '82 Annual Edition*, by Robotics International/Society of Manufacturing Engineers. This volume is a compilation of feature articles that ran from 1979 to 1981 in SME's publication, *Robotics Today*. It begins with a chapter entitled "Basics," which covers such topics as "Can I Use a Robot," and "Planning the Successful Robot Installation." Next, the book reviews the man-machine relation-



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ship, and continues on to discuss the many applications for robots. SME members can purchase the book for $30; $42 nonmembers. Contact RI/SME, One SME Dr., P.O. Box 930, Dearborn, MI 48128.

SEMINARS

DBMS

The 1983 National Data Base Management Symposium, offered by Digital Consulting Associates, will be presented in three cities: Los Angeles, March 1-4; Washington, April 19-21; and Chicago, May 16-19. The '83 symposia will focus on new and enhanced database and data management products that run on mainframes, minis, and micros. There will be guest lecturers and one-hour presentations by 30 vendors on their specific products. Four-day conference registration is $650, or $350 for the first day (seminars) only. Contact Digital Consulting Assoc., 5 Kimberly Terrace, Lynnfield, MA 01940, (617) 334-5755.

SOMETHING TO GAIN

The 11th annual Employment Register will once again take place at the Computer Science Conference, cosponsored by ACM and the computer science departments of numerous universities. Both new graduates and experienced individuals already in the work force may sign up with the register. Employers from business, industry, government, and academia will also be present. The conference takes place on Feb. 14-17, in Orlando, Fla. Contact Orrin Taulbee, ACM Computer Science Employment Register, Department of Computer Science, University of Pittsburgh, Pittsburgh, PA 15260.

GOING EAST

The Technology Transfer Institute (TTI) and Arthur D. Little Co. are cosponsoring a technical mission to Japan March 5-20. Group members will observe how such companies as Hitachi Seiki Co., Fuji Heavy Industries, Mitsubishi Electric Corp., and Toyota Motor Co., Ltd., are using computer integrated manufacturing (CIM). Dr. Joseph Harrington, a consulting engineer affiliated with A.D. Little, will lead the group through the present state of CIM in Japan, the benefits and problems of CIM application, future CIM developments, and more. For mission brochures, contact Nancy Dyer, project manager, TTI, One Penn Plaza, Suite 1411, 250 West 34 St., New York 10119, (212) 947-2648.

VENDOR LITERATURE

ATTENTION UNIX USERS

An eight-page catalog listing short courses on Unix use and C programming is now available. Courses for programmers and end users at three levels—novice, intermediate, and advanced—are described. UNIOPS, Walnut Creek, Calif.

FOR DATA CIRCLE 350 ON READER CARD

DIAGNOSTIC HELP

The Datalyzer, a network diagnostic and performance monitoring system, is described in the vendor's 12-page color brochure. It explains what this product can do, and what options and features are availble. PARADYNE, Largo, Fla.

FOR DATA CIRCLE 351 ON READER CARD

TEST THOSE SEMIS

This 48-page design manual tells how Impact II, a "discrete semiconductor test system," operates, and includes information on configurations, programming, software and hardware options, I/Os, specifications, and more. EATON CORP., Cleveland, Ohio.

FOR DATA CIRCLE 352 ON READER CARD

PROTECTION

To protect your investment in a personal microcomputer, whether or not you ever use it for business purposes, an insurance policy is now available that will cover all hardware, software, and media after a $50 deductible. ARMCO INSURANCE GROUP, INC., Middletown, Ohio.

FOR DATA CIRCLE 353 ON READER CARD

How do you create a microcomputer to match the power of the UNIX™ operating system?

magine. You are perfecting a revolu-
onary operating system. In about two
ears, it will be the system of choice
or 16-bit microcomputers.

It will be called the UNIX operating
stem.

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perating system are going to make
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The microcomputer developed speci-
cally for the UNIX operating system
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ONYX will live up to every demand
nd expectation.

To achieve the ultimate flexibility,
mplicity, efficiency and productivity,
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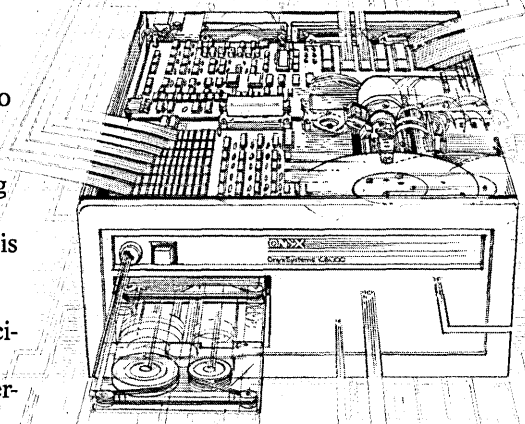
ets and sub-sets of directories, arranged
a tree-like hierarchical structure.

And flexible directory and file pro-
ection modes, allowing all combina-
ons of *"read," "write,"* and *"execute"*
ccess, independently for each file or
irectory, or for a group of users.

But these advantages will require
ntensive disk access, and superior
emory management. In simple lan-
uage, disk access must be as fast as
ossible, and the disk must have an
nusual capacity to maintain complex
ile systems on-line at all times.

Floppy disks with their low capacities
nd high access times won't do.

Winchester disk drives that utilize
low-moving stepper motor head posi-
ioning devices won't do.

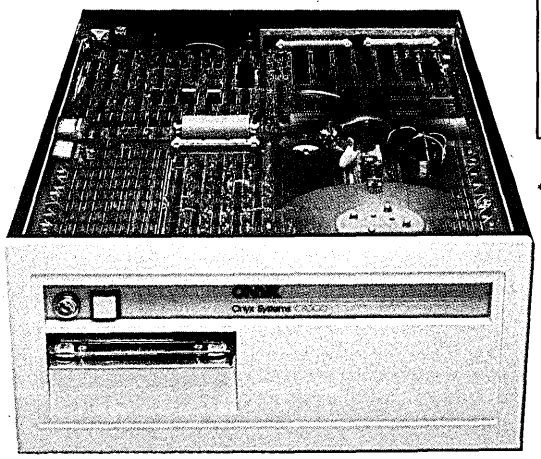


ONYX's IMI Winchester disk storage system, with its servo-driven voice coil head positioning, is more than twice as fast!

So, obviously the ONYX C8002 *will* do.

And, as developed, the ONYX C8002 features expandable memory up to 1 Mbyte, and disk storage up to 160 Mbytes on-line. Its cartridge tape back-up offers cyclical redundancy checking on every backup. Both the Winchester disk storage system and the cartridge tape backup are *internal.*

In the UNIX operating system environment, the disk becomes an extension of main memory. *"Swapping"* programs between the disk and main memory



increases the number of operations tha
can run concurrently. ONYX's memory management system utilizes *"scatter"* instead of *"contiguous"* allocation, and the more efficient swapping minimizes demand on the disk channel. That's why ONYX assures a highly efficient environment for the UNIX operating system

Now it's 1982. The UNIX system's pre eminence among 16-bit operating systems is established. And ONYX is the only company that has significant production experience with UNIX systems

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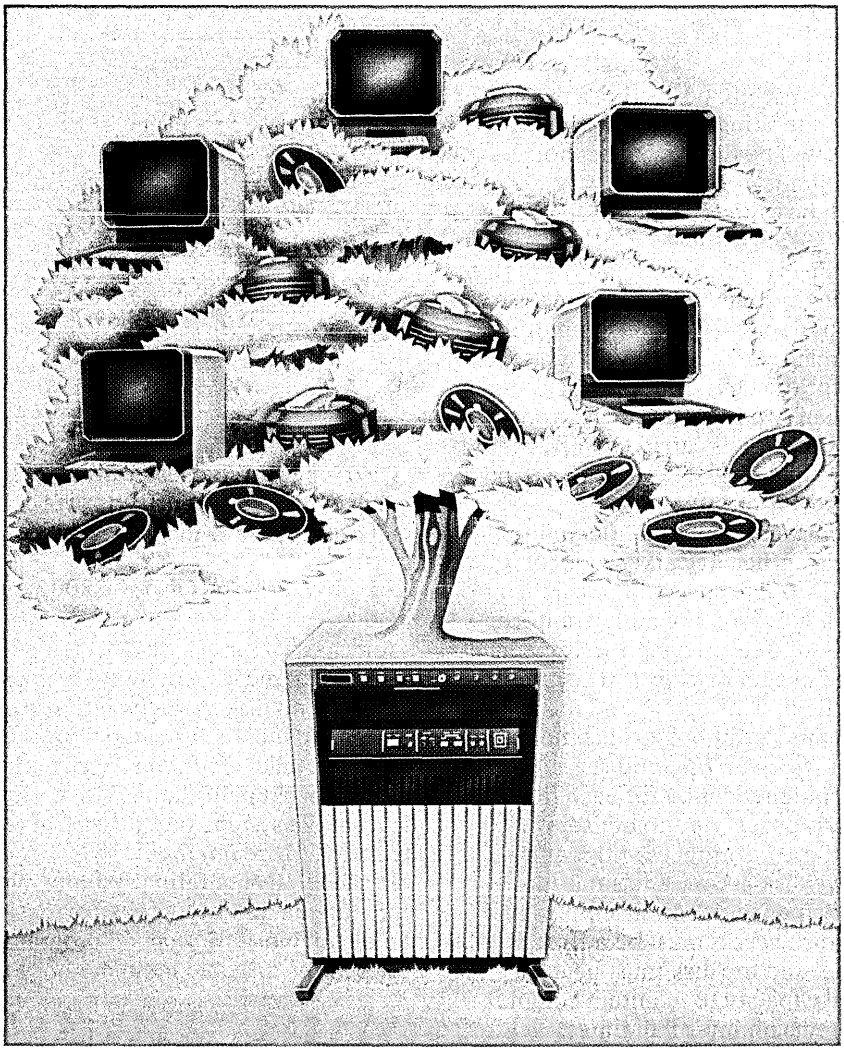

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READERS' FORUM

HOW TO BUY SMALL

The last several years have brought an incredible proliferation in both the numbers and kinds of computers available in the marketplace. Computers now come in sizes ranging from minuscule to megamonster. Peripherals have gone from poor old, dumb terminals to communicating copiers, talking consoles, facsimile devices, plotters, video private eyes, and even more exotic stuff. Throw in the complexities of the networks that tie all the new gadgetry together, and determining the configuration that best suits an organization's needs becomes extremely difficult. Several factors complicate things further:

1. Processing power has become extremely cheap, but increased demand has kept most hardware budgets on the rise.

2. The advent of satellite communications, "data only" cable channels, digital telephone networks, and other cheap means of communication has put the sophistication of very large computers and small computer combinations within everyone's reach.

3. Computers are beginning to permeate society at so many levels that even the layman has some perception of how the computer can improve his or her life.

4. Intense advertising campaigns have led many people to believe that all their problems will be solved if only they can obtain a computer.

The basic problem is that most larger organizations have already invested huge sums of money in mainframes to provide the necessary computing power. The realization that there are many alternatives beyond the typical mainframe setup has led to the call for a "minicomputer policy" or "procurement directives for distributed data processing." These policies are often created as a means of coping with, and perhaps shutting off, user demand for new technology. Unfortunately, all too many policies are based solely on the cost of computing power and storage capacity of small computers versus large. Several other factors must be considered before the overall picture can be seen.

A common error in preparing cost estimates occurs when only hardware is looked at as a capitalized expense. In reality, the cost of the software systems must also be considered. In the same sense that one expects a piece of manufacturing machinery to last for a certain amount of time and produce a certain number of products (hence the ability to estimate a fixed cost for each item produced), software is really a piece of invisible machinery that can be thought of as having a finite useful life and a certain rate of production. Just like any other piece of machinery, software needs regular maintenance. In addition, as hardware costs continue to decline relative to power, the cost of creating and maintaining software becomes the single most important item in a justification study.

Selection of equipment then, becomes a discipline similar to a game of chess. Each move can be evaluated in the light of four basic system considerations.

Economics. Simply stated, what is the cheapest way to create a computer system? On the surface, it might seem that small, cheap hardware would tend to keep costs low. But creating the first systems for a new hardware configuration will necessarily take longer and cost more because of the learning dp personnel must undergo concerning the procedures and limitations of the smaller machines. If more than one type of small machine is acquired, the learning must be repeated to varying degrees for each new model.

Operating costs manifest themselves in four ways: the cost of processing necessary to recoup the hardware and supplies investment, the cost of operations personnel to run the machines, the additional costs of servicing machines and software not located in the immediate vicinity of the computer room, and the costs associated with obtaining adequate vendor support. New small equipment may need additional operators, and software and equipment service charges may be higher because of additional mileage and distance charges. Small equipment vendors often do not have the same level of support as the large mainframe manufacturers, and the costs for support services can be high. Also to be weighed are the costs incurred if a small vendor (and many small machines are marketed by small vendors) faces bankruptcy or liquidation.

To support the hardware and control systems of small equipment networks, staff costs become significantly larger than if a mainframe environment alone is supported. In addition to supporting new kinds of operating systems, support groups must now grapple with networking problems. Part of the increase is due to the fact that large mainframes could not even be marketed until all the necessary protocols for handling many users over many different kinds of devices were worked out. Thus, the support person's primary role was, and is, to maintain software, solve problems, set parameters, and put on new releases. But hooking together many different pieces of hardware is an area where no single vendor can yet supply any comprehensive support programs. Consequently, it falls upon the support personnel to improvise and create the necessary software to make the hardware function effectively—a very costly task.

Technology. In the mad rush to prove how advanced their products are, many vendors tend to gloss over pertinent information, particularly when the small equipment is to be used in a large computing environment. One factor of prime importance is the ability of small computers to communicate with one another and the host. Although almost all vendors claim that their computers can communicate, the art of hooking small and large computers together is still in its infancy. No firm interface standards yet exist on an industrywide basis, and they may never exist. It is similar to Ma Bell telling you that you can talk to Japan for $3. Sounds cheap, but

READERS' FORUM

what's the use if you don't speak Japanese?

The data management or database systems on small computer setups are usually not as sophisticated as those found on larger mainframes. These database limitations may prove a hindrance in the development of sophisticated systems, particularly as the user asks for more enhancements. As with communications considerations, methods must be worked out to interface different database access methods, and new concepts must be devised to handle shared data, or to use the new buzzword, "distributed database."

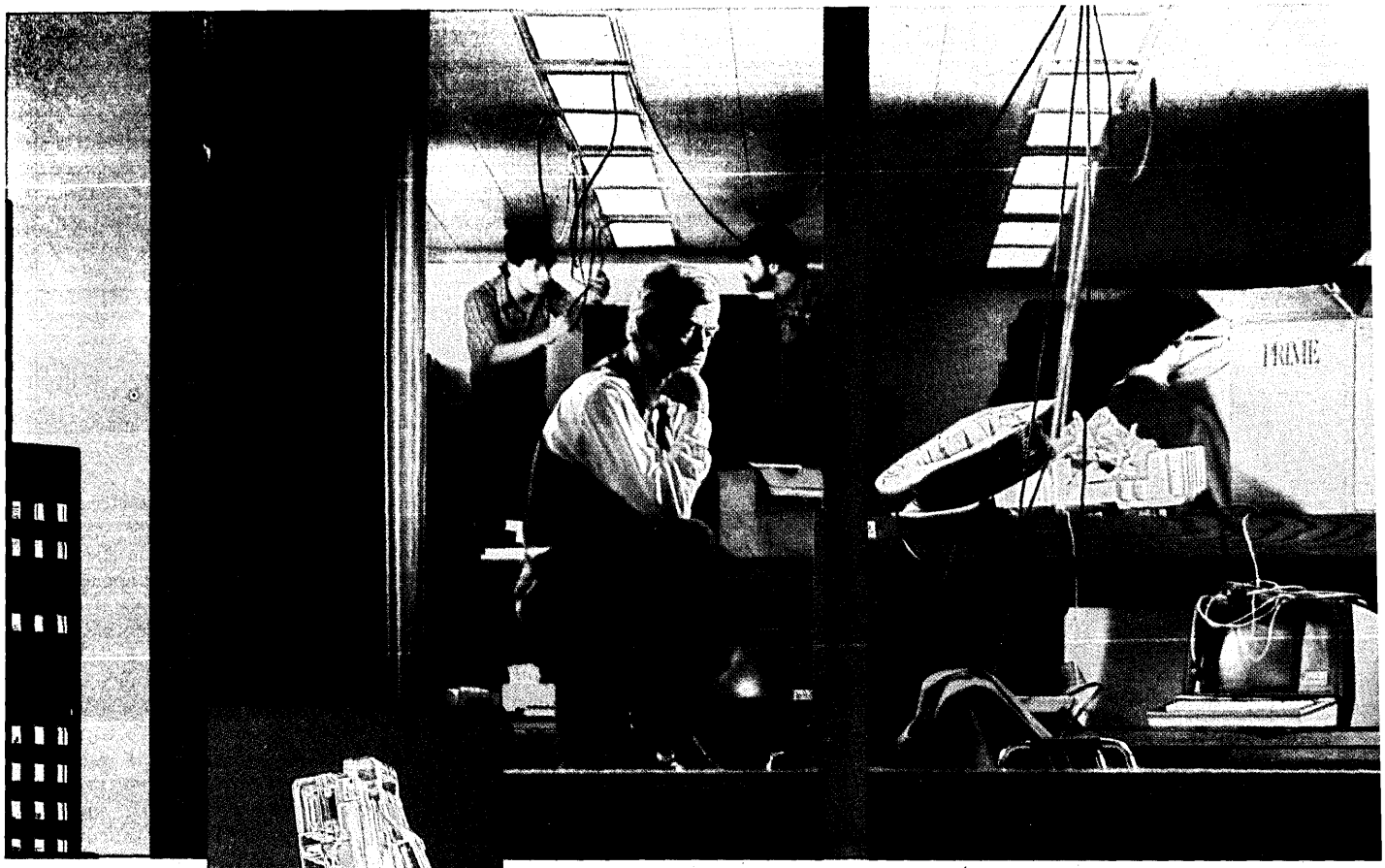
Another difference between large and small systems is the degree of generality built into them. Large computers tend to be called general purpose because of the very wide range of computing, storage, and access arrangements that can be programmed or where parameters can be set. On the other hand, small computers tend to have specialized functions and rigid protocols, two of the reasons for their lower cost.

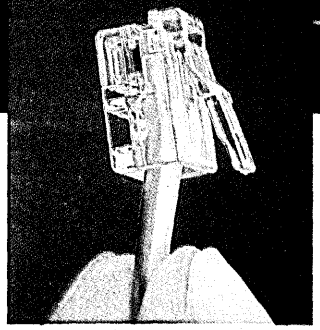
Organization. Although it is desirable to have users directly involved in their system, some measure of planning and control must be exercised if systems are to be upwardly compatible. While in some circumstances it is desirable to place a large measure of control in the hands of the user, particularly when that user has a mature understanding of the computer and the organization's requirements, in other circumstances the mere introduction of an independent or decentralized computer can wreak havoc where close cooperation between user departments is required. Thus, decisions must be made concerning the physical placement of small machines and who will exercise ultimate control over the software running on those machines.

Politics. Though somewhat divorced from other considerations, politics still plays a role in the selection of computer equipment. For example, in an organization where plant managers or division vice presidents operate with virtual autonomy, small inde-

"Way to hustle!"

CARTOON BY FRANK COTHAM





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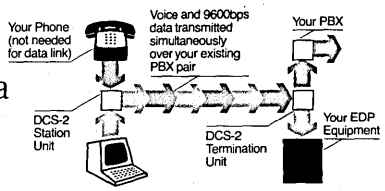

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pendent computer systems may be the only realistic alternative. Dp personnel must also face preconceived notions from upper management with respect to what computers can and should do. And of course, warring factions within an organization almost guarantee failure of a system unless the problems can be resolved.

Obviously, the first step in developing a rational procurement policy is to conduct a detailed needs assessment not only for each department requesting services or equipment, but at a corporate level as well. Regardless of what level the assessment is conducted at, four pieces of information must be obtained: what will be done with the system(s), how much volume and power is required, what is the anticipated growth of this and other systems, and what other systems will need to be interfaced.

This needs assessment, coupled with one-on-one interviews, corporate policy statements, and other information, provides the raw data for the following decision process:

1. Is the hardware required for the application cheaper if procured as a mainframe computer add-on or as a small computer? If it cannot be demonstrated that the small computer hardware would cost less, and unless there are extreme technological, organizational, or political factors that force the use of small computers, then mainframe development should be chosen as the practical alternative.

2. If it can be demonstrated that the hardware is cheaper, then a comparison of the savings in hardware must be made against the additional software and support costs. Naturally, for those specialized applications where a certain technology is required, extra costs must be considered separately. Other costs, including the costs of operation, staffing, physical plant remodeling, supplies, and other parts, must also be factored into the economic equation.

3. If justified from an economic viewpoint, or required by organizational or political considerations, then it must be determined if the dp shop has sufficient technology to support the proposed system. If not, then economic justification must be made to support the additional technology required or the applications should again be considered for the mainframe.

4. Once a small computer system is proved to be competitive when weighed against a mainframe, the applications' future growth rates must be determined. Small systems are much more sensitive to growth, primarily because any one application is normally a larger percentage of the total power available from the computer. Additional costs of the initial small computer, with reserves built in for future growth, must be weighed against costs for upgrades to the mainframe as well as the time cycle over which these upgrades will occur.

5. The small computer system must then be looked at from the organizational perspective to ensure that no undue influence or pressure can be exerted upon project participants. An inability to equalize roles among system users suggests that stronger central control may be required. Unless adequate management controls are in place, mainframe development may again be the only realistic alternative.

6. Lastly, the support, interest, and participation of top-level management must be gauged to calculate the possibilities of funding stops, stonewalling, or perhaps even outright sabotage of the new system.

If all the factors look favorable for small computer implementation, the recommendation to proceed should be made, with suggestions concerning the nature of equipment required to most effectively meet system specifications and integrate with the large mainframe computer.

—Wayne V. Herbert
Houston, Texas

If you'd like to share your opinions, gripes, or experiences with other readers, send them to the Forum Editor, DATAMATION, 875 Third Ave., New York, NY 10022. We welcome essays, poems, humorous pieces, or short stories.

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