THE ABCs OF PRINTING

On May 3, 1983, IBM introduced its 2,000 lpm model 4245 line printer. The product suffered from some engineering problems — problems that came as a surprise since IBM's line printers have almost always been the best in the industry. For two years, IBM tried to mollify unhappy users who complained about the device's print quality and stability, but the reputation of the $54,500 box was tarnished beyond repair.

Finally, on May 1, 1985, IBM unveiled a new 4245 that offered the old performance specifications at a new low price of $35,000. A slower version selling for $28,000 was also announced. The new 4245, which came with a one-year warranty, carried maintenance charges of $400 a month — more favorable terms than its predecessor, which had a three-month warranty and monthly maintenance fees of $650. Even though the sales pitch for the revitalized 4245 touted the unit's improved price/performance, the main advantage of the new machine over the old one was its superior quality. Redesigned and repriced, the 4245 won over users in droves (see p. 59).
What could possibly make the Kennedy ½” tape hybrid streamer even better? How about...

50 MSEC

Model 9600/9650
Tri-density with 3200 BPI at 100/50 ips
- Low cost storage up to 110 Mb
- High speed streaming
- 50 ips true start/stop
- 800/1600/3200 BPI
- Interfaces: industry standard: SCSI
- Standard 8.75” height
- Front load
- Power up self diagnostics
- Service diagnostics
- Resident tester and exerciser
- Rack mount or cabinet
- 50 MS reposition time in same direction at 100 ips
- 200 MS reposition time in opposite direction at 100 ips
- 12 MS ramp time at 100 ips

Kennedy has long been in the forefront of computer tape peripherals, providing the highest quality ½” and ¼” start/stop and streaming tape drives. That's one reason we can proudly state Kennedy — twenty-four years of leadership.

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KENNEDY • QUALITY • COUNT ON IT

CIRCLE 1 ON READER CARD
Our New\nPageWriter 8\nAims\nA Lot Higher

Emulate an IBM 5219 with a printer that blows the petals off any daisy.

If you pick daisies for your System 3X, you know all about the IBM 5219. So do we. That's why we built the PageWriter 8. It's absolutely plug-compatible with the 5219, and better at just about everything.

Starting with speed. The PageWriter 8 doesn't poke along at a few petal-pushing characters per second. It pumps out a full 8 pages per minute. That's faster than any printer on wheels.

The PageWriter 8 is quieter, too. While the 5219 sounds like a machine gun, the PageWriter 8 prints in near-silence.

Everything about the PageWriter 8 is designed to make things easy around your office. Take the automatic sheet-feeder. With a 500-page capacity, it can run unattended for half an hour or more. And consider what it takes to change typefaces. The PageWriter 8's LED Array technology prints a variety of laser-quality fonts under push-button control. You'll never change print wheels again!

Sure, there are other page printers that emulate the 5219. But the PageWriter 8 blows them away too. Its 5000 page monthly duty cycle is 40% better than the competition. And it achieves its compatibility without an outboard protocol converter.

Perhaps best of all, the PageWriter 8 actually costs less than a 5219. Which is why the 5219 should soon start pushing up daisies.

So aim higher. Set your sights on a PageWriter 8, and call Datasouth today at 1-800-222-4528.
If You Just Look At The Screen, You’re Missing The Picture.

AST-3G Plus™ and AST-3G I/O™

Lots of companies bundle EGA, CGA, MDA, and Hercules™ graphics card capabilities on one board. AST gives you this and a lot more. Starting with a choice.

**AST-3G Plus or AST-3G I/O.**

Choose the AST-3G Plus and get high-resolution 640 x 350 graphics, brilliant 16 color displays created from a full-spectrum palette of 64 colors and high-quality text. Giving you across-the-board IBM® PC/XT/AT™ applications software compatibility.

So, you'll have all the power you need for business and presentation graphics, CAD/CAM, graphic arts and desktop publishing.

You can even expand the AST-3G Plus with an optional parallel port.

Or, pick the AST-3G I/O (formerly known as AST-3G Pak) and get the parallel port and all the graphics capability of the AST-3G Plus, as well as a serial port and clock/calendar with battery back-up.

You can also order an optional game port. Both the AST-3G Plus and AST-3G I/O give you 256Kb of on-board video memory.

So whether you need more powerful graphics, or powerful graphics and more, AST has an EGA solution.

**More, An AST Tradition.** AST pioneered compatible multifunction expansion boards. For more power.

Now we're doing the same with graphic display adapters.

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Yes, Please send me more information about AST-3G Plus and AST-3G I/O. 12/1/86

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Company_______________________

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Phone__________________________

Send to: AST Research, Inc., 2121 Alton Ave., Irvine, CA 92714-4992. OIC068A01FM
BEHIND THE NEWS

Laptop vendors offer a broader array of features and greater expandability than ever before. Yet, Robert J. Crutchfield writes, prospective buyers aren't "Getting Carried Away" with the little machines.

THE ABCS OF PRINTING

Hesh Wiener

The will of the market in the printer sector seems to be operating in favor of the processor vendors. That and other observations within.

TAMING THE DASD MONSTER

John W. Verity

The problem of how to manage those myriad threatening datasets as they migrate between disk, tape, and future mass storage devices is quickly becoming one of epic proportions.

A NEW CLIMATE FOR LEASING

David Stamps

The loss of the Investment Tax Credit benefit is just one of several changes that the new tax code brings to the computer leasing marketplace.

DESKTOP PUBLISHING

Connie Winkler

Despite the big differences in capabilities between low-end and high-end systems, electronic publishing is one of today's liveliest applications, especially at the desktop level.

OPERATING SYSTEMS

Unix customers pressure AT&T.

ADAPSO

Battle lines are being drawn.

MINICOMPUTERS

Pyramid hits the skids.

VERTICAL MARKETS

Brokerages discover pcs.

ECONOMY

European forecast: mediocre.

SOFTWARE

IBM pricing irks users.

BENCHMARKS

DEPARTMENTS

INTERNATIONAL 56-1

SPECIAL REPORT 56-A

MANUFACTURING TECHNOLOGY/86
Track the buying activity of the micro market:
Results of Datamation’s 1986 Microcomputer Purchasing Study now available!

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It's easy with the SAS System. You can write front-ends for all your applications. And with a few keystrokes, you can change them as your information needs change. A convenient screen manager lets you edit, display, and control your work without ever leaving your desk. And if you need to move between several operating systems, you'll find the language, syntax, and commands the same for the mainframe, minicomputer, and PC SAS System.

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ON AT&T'S "HIGHWAY 3B"
THERE ARE NO LIMITS ON WHERE YOU CAN GO WITH COMPUTERS.

Like it or not, the multi-system environment is here to stay. Mainframes will be mainframes. PCs will continue to proliferate like mosquitoes. And user needs will change every day.

It is high time somebody created a family of computers for an evolving mixed-system environment. The time is now. The "somebody" is AT&T.

Our 3B computer family is among the first to blend the technologies of data processing and communications. Result: a unique ability to distribute processing power across system lines, from user to user, desktop to department, and department to mainframe.

AT&T’s 3Bs are easily linked up to IBM® mainframes and down to any combination of terminals, peripherals, and MS-DOS® PCs. The idea is to open communication between

<table>
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<th>COMPUTER Specs</th>
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<td>3B3/310 Supports up to 14 users, 18 RS232C ports. Speed: 1.1 MIPS, 32 bits at a time. All 3Bs are 32-bit machines. Storage: 80MB internal hard disk; up to 546MB with Expansion Modules.</td>
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<td>3B2 XM Expansion Module adds 23MB cartridge tape storage and/or 30 to 72MB hard disk storage.</td>
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<tr>
<td>3B15 Serves 16 to 60 users, 128 RS232C ports. Speed: 1.6 MIPS. Supports 8 drives, with maximum storage of 2.7 gigabytes.</td>
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Not shown: Other members of AT&T's 3B computer family serve up to 100 users, across a wide range of business needs and environmental conditions.
systems—without forcing users to give up the applications they know and trust.

In most offices, the effect on productivity is electric.

"THESE GUYS THINK OF EVERYTHING."

The 3B's role in a distributed data processing environment can grow and change as your business evolves. For starters, UNIX™ System V permits the same software to run on a variety of machines, protecting your investment in applications and user training.

On the hardware side, the whole 3B family is like a big set of building blocks. Everything is modular. A system of feature cards and interfaces makes it easy to add functions or peripherals. Or add users. Or boost performance. Or all of the above—in any order, at your own pace.

Example: A 3B "starter" system that is cost-efficient for 6 users can easily grow to serve 60 users—and more—with the same efficiency. By networking 3B to 3B you can support thousands of users—like adding beads to a string.

Whether those "beads" are down the hall or an ocean away, AT&T's networking tools can swiftly unite them all into a single, flexible, responsive system.

WHERE ARE YOU GOING?

AT&T's 3B family was created as a family to enhance the systems you have today, without imposing limits on where you can go tomorrow.

You can start with the pieces you need to solve today's problem: linking mainframe and desktop, say; or pulling together a department. As your needs and ambitions change, so can your system. AT&T makes the pieces fit.

To learn how much we can do for your company today, and how far we can take you tomorrow, please contact your AT&T Account Executive, authorized supplier, or telephone 1 800 247-1212.

*IBM is a registered trademark of International Business Machines Corp.
**MS-DOS is a trademark of Microsoft Corporation.

AT&T The right choice.
If you can’t put a Hayes modem on every PC in your IBM network, here’s the next best thing.

It’s new communications software from Hayes called Smartcom II® for the PC Network.

It lets you share modems. So even PC’s without their own modems can communicate outside the network.

Before now, if you needed to communicate outside the network, you had to physically go to wherever the modem was. That, in turn, meant bumping the operator off his modem-equipped PC, so that you could handle your communications.

Hayes Smartcom II for the PC Network puts an end to all the delay and inconvenience. Now, when a PC needs the modem, the user is automatically connected from his own desk. So communications capabilities are immediately available to everyone on your network, whether their PC has a modem or not.

You only buy one software package per modem. The workstation part of the software can then be duplicated for each PC on the network, at no extra cost. It’s better than having a site license!

Each PC can have its own password, define its own log-on procedures, set its own macros, and use all the other outstanding operating features of our standard Smartcom II while connecting with any of the shared modems on the network.

You get all this for only $599*! And it’s backed by Hayes, the PC communications leader.

So if you currently utilize, or are contemplating adding, IBM PC networks, you should also add Smartcom II for the PC Network. For efficient communications. Without delay.

See your authorized Hayes dealer for details. Or contact Hayes at 404/441-1617.

Hayes Microcomputer Products, Inc., P.O. Box 105203, Atlanta, Georgia 30348.

Say yes to the future
<table>
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<tr>
<th>SIEMENS FLIP-FLOP ON FUJITSU DEAL?</th>
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<td>It looks as if Siemens may be reevaluating its plan to stop reselling Fujitsu's mainframe hardware in Europe. Following Fujitsu's recent introduction of a new operating system, which the company called 90% IBM-compatible, Siemens is expected to sign an agreement to sell up to 50 of Fujitsu's M780 mainframes over the next three years, sources say. Siemens' flip-flop may signal that a settlement of the current IBM-Fujitsu arbitration is near. It's unclear if Siemens has dropped its alternate plan to form a joint pc locals venture with BASF, which sells the Hitachi mainframe in Europe.</td>
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<th>FUJITSU TO SETTLE WITH IBM?</th>
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<td>Meanwhile, is there evidence in Fujitsu's dismal profit picture that the company is close to settling with IBM? Tokyo analysts speculate that a mysterious 81.8% drop in Fujitsu's half-year (April 1 through Sept. 29) net profits announced Oct. 29 is an indication that the company is close to settling with IBM over alleged illegal copying of the latter's operating system for mainframes. Since average industry profits are down a mere 40% to 50%, the consensus is that Fujitsu is probably setting aside reserves to cover payments required under a pending settlement. Many feel, however, that Fujitsu would like to delay any such agreement as long as possible. &quot;[Delaying settlement] encourages customers to think that all is well, and keeps the order flow coming,&quot; says Philip Townsend of Morgan Stanley. According to another analyst, the company has been taking advantage of arbitration procedures to send group after group of employees to the U.S. for discussions, most recently in Oakland, Calif. The possible settlement amount remains, as always, a matter of pure conjecture, with guesses ranging from a few hundred million to &quot;between $1 billion and $2 billion.&quot; The amount will most likely never be known, however. Japan's loose reporting requirements mean that it's possible to &quot;bury [the payments] in the books,&quot; as one analyst puts it.</td>
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<th>CHALK UP ONE FOR WANG OA...</th>
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<td>Wang appears to be winning some lucrative contracts at IBM's expense within the W.R. Grace chemicals conglomerate. The New York-based company is planning to replace a number of IBM systems--mostly minis and a few mainframes--as it sets about the creation of a worldwide OA network based on Wang Office software. In a multiyear, multimillion dollar strategy, Wang's distributed VS minis will be used to complement existing IBM systems and in some cases to replace them. Sources say that a number of IBM System/34 minis are being replaced by Wang VS minis, but it is not known whether this is the first step in the planned obsolescence of...</td>
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### LOOK AHEAD

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<tr>
<th>WHILE SOFTWARE TOOLS FAIL TO EXCITE</th>
<th>all of W.R. Grace's 3X Group machines (IBM's Systems/34, 36, and 38). W.R. Grace's MIS director was unavailable for comment at press time.</th>
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<td></td>
<td>Wang's efforts to sell advanced programmer workbenches and software development technology to customers of IBM have met with a lukewarm reception. Wang and its partner, the Hartford Insurance Co. spin-off Hitech, are jointly marketing the technology, which was developed within the insurance group's data processing operation at Hartford, Conn. &quot;Though we have four beta sites, the market doesn't seem to be ready for us yet,&quot; admits Hitech president Jack Crawford. Many corporations are waiting for IBM to bless an existing programming methodology or to offer a lead with a new one of its own. A number of conflicting tools and theories are now being offered, including the new Information Engineering Facility from Texas Instruments, which fleshes out the methodology of database guru James Martin.</td>
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<td>IBM ON ISDN</td>
<td>Watch for IBM to get heavily involved in the ISDN technology. In a statement recently issued exclusively to DATAMATION, IBM revealed, &quot;ISDN is one of the basic tenants of IBM's telecom direction. IBM's development and manufacturing divisions have accepted ISDN as a given and will provide hardware and software interfaces for digital access on our future products.&quot; IBM's implementation of ISDN will focus on SNA, the Rolm PBX II, and new lines of terminals.</td>
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<td>DON'T CALL US ...</td>
<td>Another tidbit of information has surfaced regarding Martin Marietta's sale of the former Mathematica and Oxford software products to On-Line Software International Inc., Fort Lee, N.J. (see &quot;Clash of Cultures,&quot; Nov. 1, p. 22). Sources tell us that none other than Information Builders, the New York-based developer of Focus, had been interested in acquiring Ramis, Mathematica's chief software product, but that Martin Marietta didn't return phone calls placed by Information Builders. Information Builders is, of course, where the developer of Ramis, Gerald Cohen, is president.</td>
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<td>MANY SUITORS FOR AION</td>
<td>Boole &amp; Babbage, Sunnyvale, Calif., this week became the first in a series of third-party software companies to integrate the AI run-time system from Palo Alto-based Aion Corp. into its product line. B&amp;B will announce an IBM mainframe performance management product using the Aion technology to provide MIS users with interactive system performance information. The initial product, which focuses on disk and I/O performance, will be delivered beginning in January. Other companies developing products using the Aion technology include MSA and Arthur Andersen.</td>
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Today, managers are asking corporate computer systems to answer the questions they need answered before they make important decisions. And only 4th generation languages and relational data base management systems (DBMS) can give them those answers.

But according to IBM, if you want this new software, you'll probably need to upgrade to their biggest operating system and buy more hardware. Because DB2 won't run on every IBM system and will only run efficiently on their biggest systems.

That's why many companies are buying ADR software instead.

You see, ADR/IDEAL, our 4th generation application development system, and ADR/ DATACOM/DB, our high performance relational DBMS, will probably run on the IBM system you already have.

So although ADR software costs more, it ends up costing a company a lot less.

And managers won't have to wait for critical applications. They're written and running in a matter of days instead of months. On average, 10 to 15 times faster than COBOL. Because IDEAL automates the programming process.

And they get the information they need when they need it. They have immediate access to the same current information all the departments use. Because DATACOM/DB is flexible enough for end-users to use and still delivers high volume production performance.

So ADR can probably give you all the benefits of the new relational software on the IBM hardware you're using now. Even though IBM can't.

And the reason for that shouldn't surprise you. After all, ADR isn't in the hardware business.

For more information about ADR software, call 1-800-ADR-WARE. Or mail us the coupon.

---

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DISK AND TAPE PRODUCTS FOR THE VAX UNIBUS...

SC41/MS—This high performance, low cost MSCP controller lets you run large capacity SMD disk drives on any VAX UNIBUS. Supports drives with 2.5 MByte/sec transfer rates and high capacities.

TC13—Tape controller supports industry-standard “Pertec” formatted ½” tape transports, including conventional NRZI, PE, and GCR start/stop units. Features a 3.5 KByte buffer and 800 KByte/sec transfer rates.

VAX-11/750...

SC7002—Powerful Massbus controller, ties directly to the CMI bus and supports up to four industry-standard removable or Winchester SMD drives in mixed configurations of 825 MBytes or more. High transfer rate of 2.5 MBytes/sec makes the SC7002 an ideal choice for such drives as Fujitsu 2361A or 2333.

SC7003—Our newest high-speed controller supports 80 to 850 MByte drives with transfer rates to 3.0 MBytes/sec, including CMC 9772.

SC758—Massbus controller accommodates up to eight disk drives. Supports capacities from 80 to 675 MBytes and transfer rates up to 1.8 MBytes/sec.

VAX-11/780/785...

V-Master—Houses one or two disk controllers, or a tape controller, or a combination of a disk and tape controller. Each disk controller supports up to four disk drives—up to eight with the SC788 controller.

SC7002—Change a few switches and this “750” controller becomes compatible with the VAX-11/780/785; also supports 2.5 MByte/sec transfer rates and capacities to 825 MBytes.

SC7003—Switch selectable to run 11/780/785, operates transparently with UNIX BSD 4.2, ULTRIX-32, and VMS; also features a large 16K buffer.

VAX 8600/8650...

Side Car—Field proven V-Master controller configured in a cabinet that attaches directly to VAX 8600 or 8650.

SC7002—Handles up to four drives entirely transparent to the drive address.

SC7003—Features up to eight drive ports, each transparent to the drive address, which can be set up on any port and changed without controller reconfiguration.

SC788—Supports a transfer rate of 1.8 MBytes/sec and up to eight disk drives.

TC7000—With switch changes, this tape controller is compatible with 11/750 or 11/780/785; mounted in a Side Car runs with 8600 or 8650. Supports up to eight formatted drives. Emulates DEC’s TM03/TU77. Works with “old” or “new” GCR 6250 drives and features transfer rates to 1.5 MBytes/sec.

COMMUNICATIONS PRODUCTS FOR THE VAX-11/730 THROUGH THE VAX 8650...

CS21—Single hex board emulates DEC’s DHU11 and DZII communications multiplexers, and asynchronous portion of DMF-32 multi-function controller; also interfaces with three alternative 16-line distribution panels.

CS23—Still need more lines? On a single hex board the CS23 will give you up to 32 communications lines. Emulating DEC’s DHU11, it is transparent to VAX software and diagnostics.

CS32—Add high performance data transfers to all your VAX IIs. It’s transparent to DEC’s new DMF-32 and supports up to 128 lines per board.

CS41—This new T1 compatible UNIBUS communications multiplexer lets you connect up to 144 asynchronous terminals to your VAX. With a single controller, up to six 24-line remote distribution panels can be connected to a host computer 5000 ft. away. Ring networks exceeding 5000 ft. can also be created with minimal restrictions. CS41, an inexpensive way to connect the most terminals to your VAX for the least money.

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Retire Your PC Coax Connection

The PC-to-host coax connection. She was a good piece of equipment working with coax cable and cluster controllers, but time just passed her by. End users started needing more than simple host access. They also needed their PCs to share resources around the office. That's when local area networks came along to fill the need.

LANs are dramatically increasing office productivity through efficient information management. And Gateways are exploiting LAN versatility by providing cost-effective host communication for PCs and other network devices. Now for thousands of dollars less, LANs and Gateways provide PC-to-PC and PC-to-host communications all without a cluster controller.

INS Gateway PC Adapters are engineered around proven INS SNA 3274 cluster controller emulation. A single INS Gateway PC Adapter in an IBM NETBIOS compatible LAN, including Token Ring, will support up to 32 logical unit sessions. The LAN allows each PC on the network to share disks, printers and other resources while the Gateway allows performance of any host-supported function and maintains host access.

INS planned on PCs becoming a major component in the development of information systems. We designed our Gateways to be the logical choice in providing the vital link between LANs and mainframes. We also planned on much more—flexibility, simplicity and reliability. We provide free, responsive user assistance and guarantee every INS Gateway PC Adapter (hardware and software) for five years.

Now the vast resources of mainframes and local area networks are available at your fingertips with INS Gateway PC Adapters.

Call now for more information about putting new life in your MIS/DP efforts with INS Gateway PC Adapters. Our toll free number is (800) SNA-3270, in Alabama (205) 633-3270. Or write Integrated Network Systems, P.O. Box 91395, Mobile, AL 36691. Telex: 701238.
TWINS, BUT NOT IDENTICAL  
In the June 15 Look Ahead, DATAMATION had it right. It was also right in the July 15 News in Perspective. Now, you've incorrectly placed ETA Systems in Minneapolis (Look Ahead, Oct. 1, p. 10). No, DATAMATION, ETA Systems is still in St. Paul.

PAUL PERRAULT  
St. Paul, Minnesota

A LITTLE HONESTY  
It was a very small item headlined “Instant Honesty” (On the Job, Sept. 15, p. 150). It discussed how employers are using preemployment opinion surveys to screen prospective employees for honesty.

From the tone of the article, it seems that these surveys are included with other preemployment paperwork without explanation to the applicant. Apparently, the surveys work better if the prospective employees do not know what the surveys are and how they will be used.

How about a little honesty from the employer? How about being candid about these surveys?

DAVID E. ROSS  
Agoura, California

CAREER PATH  
“MIS for MBAs, or Vice Versa?” by Michael A. Tyler (Sept. 1, p. 46) is interesting, and the main points are well made. One point of disagreement is the comment, “The Minnesota faculty recognizes that its graduates will likely cap their careers at the top of a functional area and not compete with Harvard or Stanford graduates for positions in the very highest tier of corporate management.”

We feel just the opposite. Minnesota graduates are ready to compete with MBAs from any school for the top tier of corporate management. The only difference may be that the Minnesota program puts an emphasis on a career path that starts with a functional area.

There is no reason why MBAs who have an interest in MIS should not be able to be chief executive officers. They should be able to do it by first becoming the chief information officers managing the MIS function.

GORDON B. DAVIS  
Honeywell Professor of Management Information Systems  
School of Management  
University of Minnesota  
(On sabbatical leave, 1986-87, as Shaw Professor of Information Systems and Computer Science, National University of Singapore)

BETTER IDEAS  
If there are people like Lawrence Seabury (Letters, Oct. 15, p. 19) out there who feel that sending work offshore is less than the best way to handle the data entry problem, perhaps there is a better solution.

We are interested in getting industry to help support a program in which disabled American veterans and other handicapped people work with computers in a sheltered workshop environment. Data entry will be the first area addressed, as it requires less training and equipment than other areas.

We hope that industry will recognize the tremendous resource that the handicapped represent and will actively assist in the creation of curricula that will satisfy the needs of the job market.

JUDITH PHILLIPS  
EDWARD JUDGE  
Multi-Service Health Inc.  
Northampton, Massachusetts

CONSULTANTS BETTER?  
“Is Anyone Really Using Computer Consultants?” by David Stamps (Oct. 15, p. 99) clearly identified many of the pros and cons of going outside the company for technical expertise. However, there are some factors working to a contractor’s advantage that were not addressed.

My experience at Chrysler, General Motors, and a dozen much smaller firms is that contract jobs are usually well defined. Contractors work to meet real performance and cost criteria. In-house development can mean long coffee breaks, useless meetings, vague goals, and unworkable schedules.

There is a difference in world view between a consultant and a traditional employee. People who contract their services tend to be entrepreneurial, self-motivated, and creative. Employees are generally security oriented, team motivated, and inititative.

The net effect is this: consultants create new systems; employees run them.

MICHAEL E. MAROTTA  
Lansing, Michigan

IN OTHER WORDS…  
While basically agreeing with the sentiments expressed by Lori Russon in “Understanding Messages” (Readers’ Forum, Sept. 1, p. 108), I could not help wondering at the author’s examples, some of which undermine her thesis.

“Fine for littering,” conveys the opposite of its intent to most readers. “Littering fined” is shorter and more to the point.

In general, words which may serve as more than one part of speech should be avoided. I even prefer to avoid words with similar spellings: “now” and “not” may not be distinguishable on a poorly operating printer.

I strongly disagree with Ms. Russon about words with negative connotations. There are occasions, especially within operating system routines, when the designer has evidence that the user is about to do major harm, and should know better. A weakly worded message might be ignored.

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CIRCLE 9 ON READER CARD
AT&T's Unix customers are mad as hell and won't take it anymore.

by Ralph Emmett Carlyle

Efforts to police the use of its new Unix System V.3 technology through stringent licensing provisions have backfired on AT&T. The company is bowing to pressure from major customers for a new licensing agreement—perhaps by Christmas. It is also prepared to hand over control of the System V Interface Definition (or SVID) verification process, which has so angered its customers, to a neutral public body if required, the company revealed in an interview with DATAMATION.

At least eight of the 10 members of X/Open, the international vendor group intent on creating a standards environment for applications portability, are refusing to sign the System V.3 license agreement because, as Geoff Morris, chairman of the group's strategy committee, says, "It's tantamount to letting AT&T set your Unix strategy and product goals for you." The eight members are DEC, Hewlett-Packard, ICL, Siemens, Olivetti, Bull, Philips, and Ericsson.

Under the terms of the System V.3 licensing agreement, available since July, users may be subject to testing at any time by AT&T to see whether their products conform to the SVID. Should they not, in AT&T's view, the company can pull the license within a 60-day period. But another way, AT&T can force a potential competitor to disclose vital product information well in advance of its marketing phase, and if AT&T is not satisfied, it can stall or severely disrupt that customer's product development. AT&T also reserves the right to change its System V.3 pricing with little notice and no limit.

"Clearly, you can't expect large Unix vendors to commit to wide-ranging System V.3-based product developments under these conditions," says Morris. "AT&T seems to be more interested in policing the market with its license than in enabling it to grow."

AT&T, acknowledging the anger and frustration its System V.3 licensing provisions have engendered in some quarters of its user base, warns that these grievances—"though legitimate"—must not be allowed to distort the whole picture. "We're shipping System V.3 at three times the rate of our previous release [V.2]," claims Bill Klinger, division manager, Unix Product Management. "Around 60% of the worldwide Unix systems community has taken the software since we began shipping in July. So clearly lots of our customers like the new technology."

Klinger believes that all AT&T customers want to be SVID compatible. "But we recognize that some of our customers—notably those like DEC whose products are based not on System V but on Berkeley 4.2—will have a harder time getting there than others." The AT&T executive revealed that the company is currently drafting a new System V.3 licensing agreement. "One of the changes will allow our customers more time to conform to the SVID," he says, but declines to confirm source reports that the new license would be available by Christmas.

"The message we want to get over is that there shouldn't be any more stumbling blocks. Our licensing people are discussing the problems with customers right now, and whether through licensing changes, side letters, or new schedules—whatever it takes—we'll get over all the hurdles," says Klinger.

The biggest stumbling block, according to X/Open's Morris, is AT&T's testing and verification procedure. "We all recognize that the SVID is the nearest thing to a public domain standard in rela-

"It's tantamount to letting AT&T set your Unix strategy and product goals for you."

tion to Unix," he says. "Shouldn't verification of the standard also be in the public domain, in the hands of a neutral or independent body? This is what we'd like to see."

Adds Robert R. Ackerman Jr., president and CEO of Unisoft Corp., Berkeley, Calif., a market leader in Unix systems software, "It's time to put some distance between the market's Unix standard and any hardware vendor. This is what my customers tell me."

AT&T seems amenable to the idea of relinquishing control of the SVID verification process if a neutral body can be agreed on. "We'll talk any solutions at this time," says Klinger.

One major reason for AT&T's compliance is the rapid emergence of the IEEE trial use standard, Posix (portable operating system for computer environments), as a public domain alternative to AT&T's SVID. Though the two are similar, there are some strategic differences. The Posix interfaces allow users more flexibility than the SVID because of a "host environ-
ment" feature. This allows Posix to be used with non-Unix operating systems. Should AT&T persist in stringent policing of its System V.3 technology, angry customers could be driven to Posix, or to the creation of Unix look-alike operating systems working with Posix, and thus could evade the issue of AT&T royalties and control altogether.

Well-placed observers say the System V.3 license was a major blunder—albeit a well-intentioned one. "There was no malicious intent on AT&T's part," says Unisoft's Ackerman. "The company was responding to the call for more leadership [see "Unix Family Feuds," Sept. 15, p. 30] and attempting to speed up the standards-making process. Unfortunately, its new licensing provisions aren't consistent with the needs of today's marketplace."

Ackerman says that two years ago, customers wouldn't have batted an eye at the licensing conditions. "Now that many companies are battling along with AT&T for control of the Unix marketplace, contractual terms are more important. Their lawyers tend to scrutinize these issues and get very nervous." Thomas F. Cull, president and founder of the Westville Group consultancy in Westlake Village, Calif., adds that AT&T's customers need to be free to make their own product development decisions. "They're concerned about entering licensing agreements without this flexibility," he says.

Meanwhile, AT&T is feeling the pressure of the Posix bandwagon, which is well on its way into user camps. The federal government and General Motors, two of the biggest Unix customers, have already thrown their weight behind Posix and are eagerly awaiting its emergence as a full-use standard in around one year.

"The problem with the SVID," says Roger Martin, manager of the Software Engineering Group at the National Bureau of Standards (NBS), "is that it is in the private sector, and hence can't be tested in the public domain like Posix."

Martin says that if AT&T can bring its SVID and Posix closer together, or ideally, make them one and the same, it would be possible for the NBS to test them both with the verification suite it is currently developing for Posix. "We don't think that NBS is an appropriate vehicle for verifying SVID conformance as things

DECEMBER 1, 1986
THE DOMINO THEORY

Charges fly over alleged IBM software bundling and the Hogan deal, but what will ADAPSO do?

by David R. Brousell

The votes confirming his election as the next chairman of ADAPSO had barely been counted when Jay Goldberg found himself in the middle of a political firestorm.

IBM was red hot. The ADAPSO leadership was recoiling. The board was huddling. And the usually soft-spoken Bernard Goldstein, the man who raised the age-old practice of matchmaking to a lofty art form in the software and services world, had a bemused smile on his face.

Had Goldstein, the well-respected ADAPSO pioneer, former executive of Tymshare and National css, the man who had married more than 150 companies in the industry, gone mad? If so, there was method to his madness. What was billed as a celebratory 25th anniversary meeting for ADAPSO turned out to be a hotbed of debate over IBM's alleged software bundling and whether the giant manufacturer had somehow erred in striking an exclusive marketing deal with banking software developer Hogan Systems Inc., Dallas.

In a speech immediately following a keynote address by IBM chairman John Akers, Goldstein unexpectedly attacked the Hogan deal. "The press releases have referred to this deal as a distribution agreement; I don't think so," Goldstein said in his speech. "We know that an exclusive license can be a form of acquisition when we see one. . . . Nor is this an isolated incident of IBM filling a small niche. I believe IBM is implementing a strategy and a program to dominate multiple horizontal and vertical software lines. I would like to suggest that this is not good for our industry, and it is equally not good for IBM." Goldstein called for IBM to voluntarily terminate the Hogan deal, and he asked ADAPSO for its support.

That started a large ball rolling. In a subsequent seminar, charges that IBM was again practicing bundling with its new SolutionPacs software and services offerings, of which the Hogan software is one, were thrown at Robert F. Berland, IBM vice president, strategy, Requirements and Quality Assurance, IBM Information Services, Milford, Conn. Berland forcefully defended IBM's actions.

Chairman-elect Goldberg, who has advocated a more statesmanlike role for ADAPSO (see "Coming of Age," Oct. 15, p. 66), was facing his first test. The ADAPSO board, meeting in closed session, sought to put some distance between itself and Goldstein. Concern over Goldstein's press release, in which a headline referred to him as "ADAPSO Leader," prompted the board to send a letter to Akers saying that Goldstein, a partner in merger and acquisition consultancy Broadview Associates, Fort Lee, N.J., was expressing only a personal viewpoint, and that ADAPSO had taken no position on the Hogan deal. Meanwhile, they formed a committee to look into the issues raised at the conference.

The IBM representatives to the meeting, however, were still fuming. "These guys think they own the industry," says one IBMer who declined to be identified. "Well, I've got news for them; they don't." There was also consternation among ADAPSO leaders. "There was no need to undermine Akers," says Arthur Kramer, former ADAPSO chairman and chairman of Mobix Partners, Cherry Hill, N.J. "I think he [Goldstein] overreacted."

Goldstein, calmly acknowledging that he created a stir, was philosophical. "Well, we only meet twice a year." Goldberg, meanwhile, looked for a middle course, of sorts. "What IBM did from a legal standpoint is not bundling," he says. "But it is approaching bundling. It's a major issue we want to deal with, as is IBM's new strategy. But the Hogan deal is a completely separate issue."

Well, maybe yes; maybe no. The product in the Hogan deal is a set of banking programs IBM calls Integrated Banking Applications. The software is grouped into a category of offerings called SolutionPacs, which IBM introduced along with its new 9370 mid-range computer. The eight SolutionPacs are described by IBM as a series of "predefined packaged offerings that include software and services," with pricing customized or fixed.

Some feel the combination of software and services under one packaged price amounts to bundling, a phrase traditionally used to describe IBM's combination of hardware and operating systems under one price prior to 1969, the year Big Blue unbundled and began pricing them separately. Others, however, aren't convinced.

Ernest "Lee" Keet, a senior partner in Vanguard Atlantic Ltd., Wilton, Conn., told IBM in Phoenix, "You have rebundled solutions in specific areas to the exclusion of other players." Keet says there's nothing unfair or illegal about the IBM offerings, but it does "raise the ante" for companies that have to compete against IBM's marketing muscle.

Martin A. Goetz, chief technology officer at Applied Data Research Inc., Princeton, N.J., and a well-known maverick who has fought in the past over alleged bundling of the Sxx operating system on the Series/1, is not as worried. "It's not unfair, and there is no proof they are dominating these areas," he says.

So what's all the fuss about? Part of it is a domino theory Goldstein and others are advancing that has as its underpinnings the powerful market position of IBM. The theory holds that IBM will make deals like the one with Hogan in a variety of vertical markets, put the marketing squeeze on the remaining, weaker competition with packaging moves such as the SolutionPacs, and end up frustrating the development of software, hurting users by limiting choices, and constraining options for IBM.

IBM, while acknowledging at least publicly that it needs the independent software producers, says the Hogan deal and the SolutionPacs are good for the industry.

"I understand all this makes some people nervous," Berland told the seminar, "but there are [application] areas that need to be addressed. Some are not growing as fast as we want. When we pick an area, we feel we need to. I think it's healthy to stimulate competition."

He defends the SolutionPacs and denies they are examples of bundling. "It's not bundling. All can be bought separately," he says. "I don't consider it bundling at all. You should look at the
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definition of bundling,” Berland also notes the exclusivity of the Hogan deal is only a one-way street; IBM can market any other banking company’s products if it strikes a deal to do so. But he hints that isn’t likely. “I think there is an obligation when you set up a deal to be as equitable as possible,” he says.

Another part of the fuss, particularly on the part of ADAPSO and its members, has to do with communication. Sources say that at the most recent quarterly meeting between IBM and ADAPSO, a procedure put in place a couple of years ago enabling the trade organization and the

“What IBM did from a legal standpoint is not bundling. But it is approaching bundling.”

IBM to discuss areas of interest and concern, the SolutionPac concept was reportedly discussed, but IBM executives at the meeting apparently never mentioned two occurrences that, when ADAPSO members subsequently found out about them, caused concern.

One had to do with the Expert System Assistance SolutionPac, which carries a one-time charge of $67,500. The total price of all components in this SolutionPac was found to be 10% less than the sum of individually priced components. IBM announced this pricing for the expert system product in its Oct. 7 Programming Announcement document. The second occurrence was for a series of four System/36 Total System Packages, which include cpu, operating system, and utilities, but not applications. Each of these carried a 5.5% reduction when bought as one package. This information was also announced on Oct. 7.

Berland acknowledges that the information was not provided at the meeting, but he defends the two instances of packaged price reductions as specific occurrences. “I presume the two [IBM] executives present [at the meeting with ADAPSO] didn’t realize that,” he says. “But we make these decisions area by area, on a case-by-case basis. Personally, I think there has been a tremendous overreaction.”

The Hogan deal, meanwhile, has not been lost on users or competitors.

Bill Synnot, director of information systems and services at First National Bank in Boston, says the IBM imprimatur is significant. “It certainly makes a difference,” he says. “The resources of IBM give the feeling that it [a company like Hogan] won’t collapse.”

John J. Cullinan, chairman of Cullinet Software, Westwood, Mass., also believes the Hogan deal “is a legitimate concern. Marketing is something IBM is good at. Some will consider IBM/Hogan

where they would not have before. But Hogan has had its problems, and they’re well documented [see “Banking On Big Blue,” July 15, p. 34].”

Cullinan notes that IBM made many marketing agreements for software when the PC was introduced, and that a lesson was learned thereafter. “IBM came out with their own software and stifled all those guys,” he recalls.

Whether IBM’s approach with Hogan and the SolutionPac will eventually succeed or whether the issues will fade as did the brouhaha over the ssx operating system, remains to be seen. “The antitrust issue was never resolved,” says Thomas J. Lawton, editor of Computer Systems Report, Belmont, Mass. “If, as a trade association, they feel it’s [the SolutionPac] a predatory practice, they have to be prepared to pursue it after Reagan leaves office.”

That pursuit, if it ever occurs, would be a long way off, but the wariness will continue. Says Keet, “ADAPSO should be at the forefront in educating its members to walk down the red carpet, as long as it's not a dragon’s tongue. But I think it's a dragon's tongue.”

MINICOMPUTERS

CURRENTS GONE AWRY

A RISC machine maker struggles to win back users’ confidence in the shadow of mighty DEC.

by Jeff Moad

Five years ago, Pyramid Technology Corp. had all the answers. The Mountain View, Calif., startup was in the process of raising $31 million to build a 32-bit computer based on a then little-known reduced instruction set architecture called RISC. Pyramid would package its system with the Unix operating system and offer users of Digital Equipment Corp.'s VAX a less expensive, higher-performance alternative able to run nonproprietary software. The so-called VAX Killer was born.

Lately, things have not gone exactly according to plan for Pyramid. After jumping off to a fast start, growing to $34 million in 1985 sales and going public earlier this year, the erstwhile VAX Killer is struggling to avoid becoming the VAX Victim. In the second half of 1986, Pyramid has reported consecutive quarterly losses totaling nearly $4 million. Pyramid is now hoping that an upgraded version of its RISC system and a new solutions-oriented marketing approach can restore its lost luster.

The problem Pyramid has struggled with is one that will face a large group of young companies that followed it in targeting the DEC VAX customer base: how to build new, compatible generations of an initial product and maintain a price-performance edge over DEC.

Pyramid's RISC computer design was supposed to make that task easier. Because the RISC architecture is simpler than conventional designs such as VAX, its proponents argued, it should be easier to implement a RISC cpu in high-speed VLSI logic and take advantage of new, advanced semiconductor technology. Then, package several such RISC chips packaged together, and you’ve got power to burn in a small, low-cost package. At least that was the plan.

To date, the company has not succeeded in developing a VLSI version of its architecture, nor has Pyramid been able to bring to market a version of its system using more than two RISC processors. There have been delays in incremental upgrades to Pyramid's original 3MIPS 90X processor. Pyramid's most significant upgrade to date, the 5MIPS 98X dual-processor system, fell a year behind the company's internal schedule, sources say. A new I/O processor to go along with the 98X was almost two years late, and still doesn't support some of the promised integrated tape drive and Ethernet functions.

Pyramid users interviewed by Datamation did not wish to be quoted, but some expressed impatience with Pyramid's product upgrade delays. Their mood was not improved in recent months as they watched DEC make major performance upgrades to its VAX line with the 4.5MIPS 8600, the 6.5MIPS 8650, and the 12MIPS 8800. Suddenly Pyramid found itself being outgunned in its own performance game by DEC. According to analyst Omri Serlin of Los Altos, Calif.-based

"Pyramid can't afford to fall any further behind DEC."
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CIRCLE THE READER CARD
Pyramid may introduce the four-processor RISC product as early as February, with initial shipment around midyear.

Pyramid is still working on that full next-generation leap. The company is currently pumping lots of cash into the development of both a four-processor RISC system and a VLSI version using fast CMOS technology that will cut power consumption requirements. In fact, Pyramid may introduce the four-processor product as early as February, with initial shipment around midyear. Pyramid is shooting for 20MIPS performance from the four-way system, which will be priced in the $300,000 range. Pyramid has a working prototype of the system.

The CMOS project, which Pyramid hopes will allow it to package a larger number of processors into one system, represents a change in direction for the company. Until earlier this year, the company was financing development of a VLSI version of the RISC system that used ECL technology. That project, called 300X, has been folded into the CMOS development and is now seen as a performance accelerator add-on to the main product.

Pyramid's tardiness in coming up with a more active packaging strategy has frustrated many inside the company who say Pyramid management, until recently, put more time and money into product sales than product development. Several key engineers, including vice president for computer architecture Robert A. Ragan-Kelley, have left Pyramid in the last year.

Pyramid's first volley came recently with the introduction of its 7MIPS 9810 single-processor system and its 9820 12MIPS dual-processor system. Selling at $200,000 and $300,000 for packaged systems including disk and tape storage, the new systems are designed to allow Pyramid to at least catch up with DEC's current performance levels when it starts shipping in the first quarter of 1987.

Most observers agree the 9810 and 9820 alone do not solve Pyramid's need for a new product generation. The new 9000 products get their improved performance through the addition of floating point accelerator hardware and an extra stage of pipelining that cuts in half the average number of cycles it takes the Pyramid system to execute an instruction, from 3.2 to 1.6. Although the I/O technology on the 9000 systems now integrates the Ethernet and tape support originally promised on the 98X, the hardware is still implemented in the original TTI technology and cannot support more than two processors.

Pyramid is still working on that...
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VERTICAL MARKETS

PLACE YOUR BETS

Old and new players in the computerized brokerage services game are putting their money on microcomputers.

by Susan Kerr

High stakes and big bucks are common on Wall Street, but lately one of the biggest financial games has been taking place in an unlikely spot: the computer rooms of brokerage firms.

For years, a few companies, most notably Quotron Systems Inc., Los Angeles, and Bunker Ramo Information Systems, Trumbull, Conn., have comfortably handled the business of offering real-time news and quotation services, direct order entry, and other support services to brokers and traders. Unfortunately for them, their niche has begun to attract a lot of attention.

An impressive group of multi-billion-dollar computer and finance companies are now entering the brokerage service ranks. IBM teamed up with Merrill Lynch & Co. to form an on-line service called International MarketNet Inc. (or IMN). Wang Laboratories recently acquired W. artists Greenwood Information Systems Inc., New York, and now markets the firm’s micro-based line of Sho quotation systems. Another big name, AT&T, made an abortive attempt in the market this year, but says it’s still interested in what the future may hold.

Quotron and Bunker Ramo hardly have been sitting still, with each recently gaining a new backer. Earlier this year, Automatic Data Processing Inc. acquired Bunker Ramo from Allied Corp. for an estimated $70 million and Citicorp paid a whopping $680 million for Quotron, which was then publicly held. Beyond these two are a myriad of competitors, including Reuters Holdings PLC, a big force overseas but not yet in the U.S., as well as Telerate Inc., New York.

The brokerage service industry is one of those niche markets that is lucrative for the few companies that dominate it, but is not particularly fast growing. Analysts estimate that the market, worth between $500 million and $1 billion, is growing by 10% annually. Also, the market is saturated—most of the several hundred thousand brokers and account executives in the U.S. already use one or more computer terminals for up-to-the-minute access to market data services.

So why do IBM and the others want to enter such a market? Simply put, the PC revolution is finally hitting Wall Street. The traditional setup of a computerized brokerage service was a dumb terminal connected to a minicomputer. Now, all the vendors are experimenting with some form of distributed processing, most typically replacing dumb terminals with IBM PCs or compatibles.

Microcomputers would reduce the clutter of terminals on brokers’ desks as well as integrate standard office automation tasks into the trading cycle. Furthermore, vendors say, there’s the potential for the introduction of expert systems technology, which could allow brokers to act upon the incredible amount of data on hand in more timely and creative ways. And since many brokerage houses typically lease quotation systems under multi-year contracts, replacing terminals with microcomputers makes viable possibility.

Firms not only are trading more, but they are doing so in a greater number of ways. “At the brokers’ desks right now there’s a margin crunch on,” says Wang financial industry group vice president Samuel Gagliano. “A lot of workstation intelligence means applications can be developed to give brokers more choices.”

Although the promise of PCs is hardly new, Wall Street firms are just beginning to show their interest in the most persuasive manner: contracts. In October, E.F. Hutton & Co. awarded a $20 million contract to NCR for IBM AT-compatible workstations, which will replace Bunker Ramo dumb terminals. Merrill Lynch, under the auspices of Imnet, has begun installing 22,000 IBM PC-based workstations in 400 regional locations.

This trend has not escaped Quotron and ADP, although both question the speed with which micros will overtake Wall Street. ADP recently began offering systems based on the IBM PC to augment its line built around San Jose-based Convergent Technologies Inc.’s Ngen computer. Although ADP vice president John Gaven says that many brokerage houses so far have been slow to see the need for PCs, he concedes that intelligent workstations offer great promise. One reason is that “brokers want additional office automation.” However, says Gaven, “Although the hardware is there, all the applications haven’t been written.” So, he adds, “there’s still a lot of life left” in the older Bunker Ramo terminals.

Broage leader Shearson Lehman Brothers Inc. is definitely interested in the possibilities of distributed processing, but recently found itself in the midst of an uncomfortable situation. The firm was to have been the first major site for a new product developed and marketed by Quotron and AT&T, incorporating Quotron’s 68020- and Unix-based Q1000 minicomputer and AT&T’s Unix PC workstations. According to published reports, Shearson had agreed to purchase roughly $150 million worth of products and services during the next five years, but canceled the deal in the wake of the Citicorp acquisition. Citicorp, Shearson felt, is too close a competitor to be a major supplier. As a result, AT&T has apparently disbanded its short-lived efforts to enter the brokerage services market. Why is not clear. AT&T is hard put to talk about the situation. Barry Campbell, an AT&T spokesman, tersely comments, “When it became apparent that Citicorp would acquire Quotron, we realized we probably would not be able to go through with it. It triggered whether we could continue.”

But Campbell says AT&T is “still interested in” the financial marketplace.

George Levine, Quotron marketing vp, says something may still come of the aborted relationship. “We have their Unix PC connected to the Q1000 and we’re able to upload and download data into the Unix PC,” he says. “We’ve gotten very far. We could sell it now.”

Levine adds that Quotron currently is renegotiating a 39-month contract with Shearson and doesn’t dismiss the possibility that the contract may still come off. Shearson did not comment on that situation by press time, but word is that the firm is considering continuing the relationship. Although the Citicorp merger “wasn’t our choice,” Levine contends that “Citicorp has averred it will keep us as a separate company. We can serve anybody.”

But a sampling of Wall Street firms contacted by DATAMATION reveals that buying from a competitor, while not preferable, is not out of the question. That may be good news for Merrill Lynch and Imnet.

Merrill Lynch operates the nation’s largest securities firm. Imnet was formed in March 1984 and today employs 250 people. Merrill Lynch and IBM each own 50% of the New York-based company, and reportedly have invested more than $100 million in the venture. Obviously, Imnet was not founded just to serve Merrill Lynch.

According to Imnet president and Merrill Lynch veteran Josep Castellano, when Merrill Lynch started Imnet, “we were the first ones to say, ‘Go with a pc on your desk.’” Merrill Lynch was dissatisfied with their vendor. They wanted to
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Perhaps the best fit of all is the way
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get the kinds of automation they need. ‘‘Imnet began offering its first product, the System 100, in August 1985. Another product, the System 500, is just now entering beta sites at Merrill Lynch, Drexel Burnham Lambert Inc., and a third undisclosed firm.

The vendor Imnet will replace inside Merrill Lynch is Quotron. Merrill Lynch currently accounts for 25% of Quotron’s business. ‘‘I know they’re working very hard, [but I’ve] not yet seen a proven product,’’ says Quotron’s Levine. ‘‘Our contract with Merrill Lynch goes through next year with an option for an additional year. We understand what we can do for them and we think we can do it better than they can do themselves.’’

IBM isn’t the only hardware company interested in the brokerage market.

A lot of workstation intelligence means applications can be developed to give brokers more choices.

Wang Laboratories hopes to make a splash with its newly acquired Shark quotation service. Wang’s Gagliano says there are today 1,700 installed Sharks.

Wang can sympathize with Quotron because it’s been there, remarks Gagliano. ‘‘When Wang started with word processing in 1972, why did Wang grow as big as it did?’’ he asks. ‘‘Because it had a good product and was the only show in town. Isn’t that the same with Quotron? But single-function machines don’t make it anymore. History is repeating itself. Pretty soon, brokers will realize that they need databases there [residing in their desktop systems]. With the focus in the financial industry on deregulation, a broker needs the services of a decision support system.’’

Nevertheless, with all the vendors leaning in a similar direction, the question of differentiation arises. They already for the most part offer the same quotation services, such as broadcasts of the New York Stock Exchange and access to the Dow Jones News Service. And if microcomputers are commodity items, where’s the attraction for this crop of suppliers?

Vendors are trying to outshine each other by concentrating on specific features. Imnet, through the help of IBM, has devoted a great deal of time to networking, says Merrill Lynch’s Castellano. In addition to a coprocessor card for the PC, it’s developed a card that allows the PC to hook up to the Series/1.

‘‘We’re using a very special LAN engineered for us by IBM,’’ Castellano says. ‘‘It’s neither PC Net nor token ring. It’s basically a radial LAN providing 1.5 million bits per second to each workstation. We’re experimenting with several..."
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Relational DBMSs have always dealt with logical sets of data. But they manipulated only one physical record at a time. V5 eliminates overhead by physically delivering arrays of hundreds, even thousands, of records at a time.

**Reason #3: Parallel-Processing Optimizes Computer Resource Usage.**

V5 is 100% re-entrant shared code, and ORACLE's parallel-processing architecture fully exploits modern dyadic and quadratic processors from IBM, and other multi-processing computers such as those from DEC and Stratus. So ORACLE uses all the MIPS in parallel-processor configurations.

**Reason #4: Multitable Clustering Optimizes Joins.**

ORACLE stores data from different tables on the same physical disk page. This technique-called multitable clustering—permits you to access data from multiple tables in one disk read operation. Clustering improves ORACLE performance on all multi-table operations, such as join queries, update transactions, etc.

**Reason #5: High-Speed Relational Sort Facility Optimizes Data Aggregation.**

Ad hoc relational queries frequently request that data be grouped, ordered or otherwise sorted. V5's internal sort facility performs aggregation and elimination early, faster than previously thought possible.

**Reason #6: Efficient Row-Level Locking Optimizes Transaction Thruput.**

Row-level locking and a read-consistency model optimizes ORACLE V5 transaction concurrency. For the first time, high transaction thruput is achieved by a fully relational DBMS.

THE ULTIMATE REASON

Oracle introduced the first relational DBMS and the first implementation of SQL back in 1979. Today ORACLE is installed on thousands of minis and mainframes, and over ten thousand PCs. ORACLE is the only SQL-compatible relational DBMS that's portable across IBM mainframes, DEC, DG, HP and most other vendors' minis and micros, including the IBM PCs. And ORACLE applications and databases are connectable across different hardware and operating systems, providing you with a true distributed solution to your information needs.

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types of cable and are trying to figure out how to use it with existing wiring in branches. That's a real challenge.

For ADP, the challenge will be capitalizing on its established presence in the back office, where since 1961 it has serviced Wall Street firms' record-keeping activities. "We think back and front offices will be more and more integrated," says ADP chairman Josh Weston. "Management needs workstations that don't just provide stock quotes but are integrated with customer records."

Likewise, Quotron is hoping to build upon its strength in the next generation of systems. Its installed base and well-known name are not easily dismissed. Levine claims Quotron's revenue rate this year will grow 20% over last year's despite the fact that there is "no lack of people who want to be in this business."©

News editor David R. Brousell assisted in the reporting of this story.

ECONOMY

EUROPE SLOWS DOWN

But its slump is less dramatic than in the U.S.

by Sarah Underwood

Europe's $50 billion annual dp market will continue to grow next year, say vendors and industry analysts. Opinions vary on the scale of that growth, but one thing almost everyone agrees on is that growth rates will slow. Alberto De Macchi, head of Olivetti's market research and competitive analysis unit in Ivrea, in northern Italy, estimates that the European market grew 16% in 1985. He predicts that "the market will grow at 10% to 12% this year, varying from country to country."

The dramatic slide in U.S. growth rates that has forced U.S. suppliers to look overseas for new opportunities is unlikely to be so steep in Europe. The rapid technological pace set by the U.S. dp industry over the last decade has left a trail of falling earnings as customers pause to assess their needs. In Europe, however, an inherently more conservative attitude is likely to ease the transition from a market hungry for processing power to one seeking systems solutions.

No one in the U.S. is more aware of the need for strong overseas sales to counter a poor domestic performance than IBM chairman John Akers. Last year, the European division showed a 12% gain in profits to $2.1 billion, while IBM's U.S. earnings plunged 13% to $3.5 billion. This year the European contribution could be even more important. Akers already has been forced to acknowledge a slowdown in international business. In his nine-month report in October, he conceded, "Growth in our World Trade operations has begun to moderate, and we have yet to see a turn in the weak North American business environment we have experienced over the last year and a half."

Digital, unlike most of its competitors, reported a 153% increase in worldwide earnings in its first quarter ended Sept. 27, with Europe singled out as a particularly strong market for its networking systems.

Wang, on the other hand, suffered a $30 million loss in its comparable quarter, but again pointed to growth in its European operations. Wang's director of marketing for the European, African, and...
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Middle Eastern division, Ken Olisa, ventures, "The U.S. market is constipated. It has more than enough MIPS to go around, but they are badly distributed. Things are very different in conservative Europe, where users have been far more cautious and slower to accept new technologies. They want to cost-justify investments over longer periods."

The head of Ericsson's Stockholm-based Facit office automation unit, Ulf Bergenudd, is of a similar mind. "People are getting hysterical," he says. "The expansion is slowing but things are not as bad as people suggest." It's a sentiment echoed at Siemens. The West German company is currently experiencing 15% to 20% annual sales growth by meeting the fast-moving networking and end-user computing markets. "Europe had a slow start in the early 1980s compared to the U.S.," maintains a company spokesman. "Our customers are not so excited about new technology and new products. They are fine-tuning their systems, setting up local and wide area networks which, in turn, require more MIPS to support them."

Siemens, with both dp and telecommunications expertise, is hoping to take advantage of the need for integrated systems. So too is the U.K.'s ICL. "We have very consciously shifted our offerings to provide more departmental systems," explains director of external affairs at ICL, Dr. Aodh O'Dochartaigh. "The distributed dp market has been growing at a rate of near 30%, compared to about 12% for mainframes. That's slowing down now, but there will still be new opportunities."

Europe's user community echoes the need for a more flexible approach from equipment and services suppliers, admitting its reluctance to spend money solely for the sake of the latest technology. Geoff Johnson, director of one of two IBM- and ICL-equipped dp shops at U.K. services company Data Networks, West Midlands, comments, "Suppliers are much more realistic than they were and far more flexible. We won't make our next big hardware investment until the next big job comes along."

Statistics in a recent user survey by Price Waterhouse in the U.K. bear out Johnson's attitude. The survey indicates that customers today are not going to spend as much as they thought they would a year ago. Some 61% of users surveyed expect their hardware budgets to rise over the next year, while 13% say they will spend less. By comparison, 64% of users surveyed in January expected to spend more on hardware this year, while 10% expected to spend less. Software spending is also forecast to rise, but slowly. Uncertainty in the business climate is reflected by an increase in customers choosing to lease or rent equipment and a decline in those purchasing outright.

Changing national economies clearly affect customer spending patterns. Dave Stone, vice president of international engineering and strategic resources at Digital's European headquarters in Geneva, Switzerland, believes that any sharp movement in the economy in any direction is beneficial. Customers spend freely in the good times, he claims, but also invest a lot in the hard times to increase productivity. "The only time sales are not so strong is when the economy is flat—and that only lasts about a week at a time."

West German management consultancy Diebold Deutschland forecasts a healthy 10% growth in the local dp market next year as a result of a buoyant
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economy. "There are no indications of an imminent disaster," says company spokesman Hans-Joachim Gröbe. "IBM is losing a little ground as local suppliers become stronger, but IBM always has something up its sleeve. Management changes [at IBM Germany] are in the air."

Wang's Olisa contends that the relative health of the European market is a matter of luck rather than judgment. Besides customers' guarded approach to dp, the existence of a PTT in each European country and their restrictions on buying equipment has slowed development—although this could change if the European Commission (EC) uses its legislative powers to end restrictive trade practices.

One solution for U.S. multinationals seeking to raise international sales would be to reduce prices, but this is unlikely to do more than reduce their profit margins. Dave Stone concludes that prices will remain stable in Europe as governments will continue to support indigenious dp suppliers. "If government contracts don't provide local manufacturers with a sufficient profit, the governments will need to put funds into propping them up anyway," he contends.

"Users have been far more cautious and slower to accept new technologies."

"U.S. companies can therefore keep their margins up in Europe by coming in under that protective umbrella."

The European subsidiaries of U.S. corporations could find themselves under as much pricing pressure as their parents if they fail to respond to the Japanese threat, maintains Maurice English, an economist specializing in information technology at the European Commission in Brussels, Belgium. "The Americans need to be very wary," cautions English. "They could wake up one day and find they have lost their European market share to the Japanese. The European market may not be large, but it's where profit margins are high."

English proposes a policy of both wider cooperation and matching Japanese investment to ensure European suppliers a place in their own market. "Unless European companies start investing the same amount as their Japanese counterparts, they won't get anywhere," he says. "It's a disturbing fact that the European Council spends four times as much subsidizing the cultivation of tobacco every year as it does on technology."

For Europe's dp suppliers that could mean the difference between a $250 million R&D budget and the $1 billion budgets of their U.S. and Japanese competitors.
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Large IBM users are irked by Big Blue’s new software pricing policies.

by Susan Kerr

Someone always has to pay. In this case, it’s the big guys.

In the wake of IBM’s announcement of new pricing structures for selected VM and VSE operating system products—which Big Blue touts as a boon to small-systems users—come warnings that did not exist previously for the remaining high-end System/370 computer users. Previously, IBM charged one across-the-board price for software.

Under the plan, IBM has divided its S/370 computers into four groups determined by processor size and performance. One-time charges of approximately 120 software products are now “graduated,” so that users of the low-end 4321, for example, pay less for software than users of the high-end System/370 computers.

The move is at the expense of users of high-end System/370 computers. The move is at the expense of users of these computers. The move is at the expense of users of these computers.

This erases the penalty for buying software for smaller cpus,” points out Clare Fleig, systems research director, International Technology Group, Los Altos, Calif. “They want to encourage people to buy [at the low end].”

Those other products are primarily manufactured by archival Digital Equipment Corp. DEC already scales software prices according to processor size and configuration, company officials say.

In the IBM way, the company acknowledges that it’s following the lead others have set. “It’s in keeping with the trends in the industry” is how IBM spokesman Les Szabo explains the pricing move. It’s primarily “to respond to customer requirements for more flexible software terms,” he says.

Not all customers appreciate the new “flexible” terms. J.M. Graziani, vice president of San Francisco-based Southern Pacific Transportation Co., thinks the new arrangement is unfair. “Why should I have to pay more for the same software products?” asks Graziani, who uses IBM large mainframes but has not yet made the move to departmental systems.

The answer is simple, according to some. While IBM wants and needs to increase hardware sales at the midrange, it’s not as pushed at the high end. Indeed, as part of the new pricing scheme, IBM raised the price of 11 software offerings for those systems now placed in Groups 30 and 40.

Conversely, prices of 46 offerings have been dropped for Group 10 and/or Group 20 systems; in almost all these cases, prices were left virtually untouched for the larger systems. One-time charges did not exist previously for the remaining 58 offerings now listed in the graduated pricing list.

Bob Djurdjevic, president of Annex Research, Phoenix, says, “There’s no question that this will be a boost to IBM’s revenue,” says Djurdjevic. He points out that in addition to some of the higher prices. “The general trend is that many of the people who had monthly fees on smaller systems will go for the price break [i.e., elect the lower one-time charge]. . . . It’s indicative of how badly IBM is trying to build up its revenues this year. . . . IBM is taking away from its future income and bringing it forward.”

While IBM lately has been in a financial slump, it has depended on software for an increasing percentage of its revenues. In 1983, software sales accounted for 66% of its revenues. In 1985, 48%, or roughly $4.2 billion, of IBM’s $50.6 billion in revenues came from software.

There’s every indication that IBM will elect to move to a graduated pricing structure with other product lines.

“This erases the penalty for buying software for smaller cpus.”

“We’re certainly looking at other software programs” as potential candidates, agrees IBM’s Szabo.

Although the changes in the S/370 pricing structure mark the first time IBM has elected a graduated approach to a mainstream product line, there is precedent for the move. In February 1985, IBM priced its 308X software according to the number of users on the system.

The graduated pricing structure applies to one-time charges as well as distributed site licensing option prices. Monthly license charges have not been altered, but customers can switch to the one-time charge from their current payment programs, notes Szabo.
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CA SEEKS ISSCO: Computer Associates International Inc., Garden City, N.Y., moved to extend its reach into the packaged software market through an agreement to take over Integrated Software Systems Corp. (ISSCO) of San Diego. The proposed deal called for Computer Associates to make a tender offer of $12.37 a share for ISSCO's 5.6 million shares of common stock. ISSCO specializes in graphics software for use on minicomputers and mainframes.

CENTRONICS BOWS OUT: Centronics Data Computer Corp., Hudson, N.H., agreed to sell its printer operations to Genicom Corp., Waynesboro, Va., for $75 million in cash. Genicom, which was formed several years ago through a leveraged management buy-out of General Electric's computer printer business, also agreed to acquire Momentum Technologies Inc., Parsippany, N.J., in a stock deal worth $45 million. Momentum was a remnant of Mohawk Data Sciences Corp. offering data processing services and selling certain hardware equipment; its projected sales for this year were said to be $165 million. Together, the two acquisitions would give Genicom annual revenues of almost $500 million a year, making it a leading domestic printer manufacturer. Centronics, which pioneered matrix printers more than a decade ago when it was set up by Las Vegas interests, but which recently lost great market share to Japanese and other suppliers, would exist only as a shell corporation once the Genicom deal went through. Centronics, which expects to show revenues of about $180 million this year (down from $217 million last year), is being pressed by the Internal Revenue Service to pay as much as $13 million in back taxes that it allegedly owes for the fiscal years 1977 through 1982.

MORE DUMPING CHARGES: Just two months after Washington and Tokyo signed agreements designed to stop below-cost selling of Japanese semiconductors in the U.S., the U.S.-based Semiconductor Industry Association charged four Japanese suppliers with dumping certain parts. The SIA declared that Fujitsu, Hitachi, NEC, and Toshiba continued to sell electrically erasable read-only memories, so-called EPROMs, at the same prices as those charged before the recent trade agreement. Those prices are said to be below the fair market value agreed upon in lengthy and politically touchy negotiations held early this year. According to ailing U.S. manufacturers, Japanese chip makers have consistently gained market share in the U.S. and abroad by selling their wares at unprofitable prices; the Japanese companies are said to subsidize their low prices with profits made on other equipment, namely, computer systems with much added value. Except for IBM, which is the largest chip maker of all but which keeps all its capacity for captive use, U.S. chip makers are narrow-line suppliers with few sources of profits other than chips. They are consequently extremely sensitive to price discrimination by competitors. The Japanese firms charged with dumping had not responded to the U.S. charges by press time.

AT&T-OLIVETTI LINK: Still struggling to make a name for itself in computers, AT&T has given its Italian partner, Ing. C. Olivetti, a more important role in that market. Olivetti is to develop and build all future personal computer products for the two firms and is to take on more marketing responsibilities for AT&T products sold in Europe. Olivetti is also to take on manufacturing of the AT&T System 75 private branch exchange (PBX) in Europe. Meanwhile, AT&T hired Vittorio Cassoni from Olivetti to be senior vice president in charge of a newly formed Data Systems Division, and shifted senior vice president James E. Edwards from his post as head of the Computer Systems Division, now part of Data Systems, to a staff post. AT&T, estimated to have lost as much as $1 billion on its computer efforts so far, is understood to be concentrating on networking applications that can take advantage of its communications expertise. At least half of its computer sales of about $2 billion last year were said to come from Bell operating companies. AT&T has a 23.5% stake in Olivetti.

PARALLEL CPU CONTRACT: AT&T's Bell Laboratories, using technology developed at Columbia University, won a $7.7 million contract to supply the Defense Research Projects Agency (DARPA) with a parallel processing computer designed for speech and image recognition. AT&T has been working closely with New York-based Fifth Generation Computer Corp., which has commercial rights to a computer architecture dubbed DADO, developed at Columbia. DARPA's machine will include 311 node processors running in parallel, which is expected to make it useful in pattern-matching applications. The machine is said to connect to a small host computer, either a personal computer or a minicomputer.

MSA TO EXPAND: Management Science America Inc. (MSA), Atlanta, has agreed to acquire Minneapolis-based Comserv Corp., a developer of manufacturing software for IBM mainframes and Hewlett-Packard minicomputers. The proposed acquisition, which follows MSA's recent purchase of RTS Limited, a Dublin, Ireland-based supplier of manufacturing software for IBM System/36 and 38 computers, calls for MSA to pay $2.21 per share, or $7.1 million, for the common stock of Comserv and assume $19 million in debt. In addition, MSA has entered into an option to buy Control Data Corp.'s 20% interest in Comserv for $3.5 million. Comserv has 500 IBM mainframe customers for its manufacturing software and 100 HP customers; MSA has 175 mainframe and 400 S/36 and 38 customers. The proposed acquisition is subject to certain conditions, including settlement of a class action suit brought by Comserv shareholders and bondholders and the disposition of Comserv's lease on its corporate headquarters. MSA says a settlement of the suit has been agreed to by attorneys for both sides and is awaiting judicial approval. MSA says it will combine Comserv's operations with its own manufacturing software activities in an entity as yet unnamed. Named to head what MSA describes as the "new enterprise" is Dennis V. Vohr, former president of MSA, who will have the title of president and retain his MSA corporate name. Tania Amochaev, president and chief executive of Comserv, will become executive vice president. MSA expects the transaction to be completed by the end of the year.

U.S. AIDS ICOT: The Institute for New Generation Computer Technology (ICOT), Japan's fifth generation computer project, is preparing to receive researchers selected by the National Science Foundation (NSF) starting next April. ICOT hopes to have up to three computer scientists or engineers each year from U.S. universities or nonprofit research institutions spend six months to a year working at its Tokyo headquarters. NSF will pay for the travel and living expenses of selected candidates, whose research results are to be published in scientific journals. At present, ICOT receives six to eight foreign researchers per year, but most are able to stay only three weeks to a month because of busy work schedules.

DEC GOES MAP: DEC jumped on the MAP bus just as it was about to leave the station. The company introduced its first product using the manufacturing communications protocol at the recent Autofact show. The VAX DEC/MAP, available Dec. 1, is an interface and software set that will enable the full VAX family to communicate to MAP networks. The DEC implementation of MAP Version 2.1 can coexist on a VAX host system with DECnet, which means both IEEE 802.3 and 802.4 protocols will be available on the same broadband cable.
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CIRCLE 23 ON READER CARD

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Laptops are used on space shuttle missions, by scientists in Antarctica, soldiers, and spies... but what about Harry in accounting?

by Robert J. Crutchfield

Data General introduced its first laptop computer at a lavish gathering in New York City's Avery Fisher Hall. Less than two years later, and without as much fanfare, DG announced its second generation laptop at a restaurant. While changing venues from Lincoln Center to a Manhattan eatery doesn't mean the end to laptops, it does reflect the market, which is sluggish at best.

The laptop market has been an elusive one for vendors; the Holy Grail is always seemingly over the next ridge or past another barrier. First, there was the issue of IBM compatibility. Next, it was better screen graphics and longer battery life. Then, it was a question of incorporating floppy diskettes and hard disks into the machine. Finally, the issues of price and IBM's expected entry into the market became chief concerns.

Today, there have been advances in memory size, battery life, and screen resolution. IBM, along with other vendors, has entered the market this year and even more companies are expected to offer laptops in 1987. The laptop vendors are offering a broader array of features and greater expandability in their products. Nevertheless, "the year of the laptop" has evaded these companies since 1984.

After a slow start, the numbers are improving. According to Future Computing Inc., a research firm headquartered in Dallas, unit sales for battery-powered microcomputers increased only slightly between 1984 and 1985, to 190,000 from 140,000; overall expenditures were $290 million, up from $160 million. Sales rose to 350,000 units between 1985 and 1986, while expenditures increased to $670 million. Future Computing forecasts unit sales will increase to half a million in 1987 and spending will hit $1.1 billion. By comparison, 8.3 million personal computers were sold in 1986.

Future Computing forecasts that by 1990, unit sales will exceed 13 million, with expenditures of $2.9 billion. The expansion of the laptop and the downsizing of the luggable microcomputer will account for much of the growth as those two markets begin to merge.

According to Jocelyn Young, a Future Computing analyst, multimillion-dollar contracts, such as the one Zenith Data Systems, Glenview, Ill., was awarded by the Internal Revenue Service, accounted for the increased unit sales and dollar volume.

According to a number of industry observers, price, perceived need, and specialized software are three criteria that are holding back the market. Despite the problems, there are several serious players. Grid Systems, Data General, Zenith, and IBM have all made headway in securing volume orders from corporations.

The largest laptop order to date has been Zenith's $27 million order from the Internal Revenue Service for 15,000 to 18,000 Z-171 laptop computers. Grid sold 150 laptops to the Cigna Insurance Co. and is expected to sell more than 14,500 total units this year, according to Dataquest, a research firm in San Jose. Dataquest has also forecast that IBM will sell 105,000 PC Convertibles by the end of this year.

Other vendors include Hewlett-Packard, Tandy, Toshiba, Kaypro, Panasonic, Sharp, and Quadram. Wang Laboratories recently announced its entry into this crowded market and Apple is rumored to be readying a laptop offering.

Noticeably absent from the market is Compaq Corp., which made its mark with luggable computers.

Plasma displays are becoming a more common and less expensive option. These displays are more practical for AC-powered systems than for battery-powered systems due to the amount of current required. According to Future Computing, AC-powered laptops that feature plasma displays include Panasonic and Toshiba. Quadram, Sharp, Data General, and Zenith are offering back-lit LCDS as part of the basic configuration of their portables. Backlit LCDS provide the user with better visibility than a regular LCD monitor and cost less than a plasma monitor.

Noticeably absent from the market is Compaq Computer Corp., Houston, which made its mark with luggable computers. Michael Swavely, who is vice president of marketing for Compaq, contends that it is not possible to bring the full functionality of a desktop personal computer to a laptop. Swavely says that no laptop on the market today has the power of Compaq's luggables and that Compaq will introduce a laptop only...
when it “can add significant value.”

Young of Future Computing says that by the 1990s, the luggables will be smaller and lighter, and will resemble the laptops. “The lines between the different product categories within the personal computer arena are blurring. Both categories are beginning to resemble desktops in functionality and price,” she adds.

IBM is beginning to bridge the gap between the desktop pc and the laptop with its PC Convertible. Big Blue sells its laptop with a full-size monitor. Vendors say, however, that the company’s most noticeable contribution to the laptop market is its support of the 3½-inch disk drive.

IBM’s entry into the laptop market hasn’t hurt us,” says Martha Nolan, a product manager at Data General. DG claims it has achieved a double-digit portion of the laptop market with its Data General/One machine. Robert C. Miller, senior vice president of Data General’s business group, says, “While market volume fell short of industry expectation due in part to a weak computer demand, the Data General/One has achieved approximately an 18% share of the laptop market.”

Indeed, vendors who bet the farm on the 3½-inch technology can breath a collective sigh of relief.

Clearly, price is a major issue. A full-blown laptop with a built-in modem, hard disk, and 512KB of memory can be priced upwards of $3,500. The same desktop pc sells for around $2,100. Laptops are still too price sensitive, despite the fact that vendors have positioned the product as a second-wave purchase where functionality and productivity would far outweigh cost.

Price in the laptop market, however, is a double-edged sword. Most MIS professionals queried don’t see $3,000 worth of value in a laptop when they have to supply one to every member of a 5,000-person sales force. On the other hand, vendors can’t afford to shave their margins too closely.

Price in the laptop market, however, is a double-edged sword. Most MIS professionals queried don’t see $3,000 worth of value in a laptop when they have to supply one to every member of a 5,000-person sales force. On the other hand, vendors can’t afford to shave their margins too closely.

An examination of the Zenith-IRS deal illustrates this dilemma. The contract is worth $27 million for a maximum of 18,000 Z-171 laptops equipped with expanded memory and a modem. Retail, this version of the Z-171 would sell for around $3,000. If the government buys 16,500 machines, it will only pay $1,636.36 for each machine—a discount of almost 50% off the list price.

In the retail arena, Tandy has slashed the price tag of its top-of-the-line laptop to $1,000 from $1,600. The company has also cut prices on its other laptops. “People originally bought the laptop to use like a portable typewriter,” says Ed Juge, director of market planning for Tandy.

Large volume discounts and price slashing at retail show how price sensitive these machines are. Consider Grid Systems, Mountain View, Calif, a company whose sole product has been laptops since its inception. According to Dataquest, while Grid’s sales and growth have been modest by personal computer industry standards, the company’s revenues have almost doubled since 1985. Grid, a privately held company, reported revenues of $33 million in 1985 and was not profitable. In 1986, Grid’s revenues rose 69% to a modest $56.6 million and the company is said to have reached the break-even point.

“Many industry observers felt that the high-end true portable market would take off rapidly once these machines equaled desktop computer capabilities,” says a Dataquest report. “Hindsight now indicates why this did not happen as expected. Grid, however, was not caught up by these overblown expectations.”

Indeed, the market has unfolded more slowly. Despite some benefits, MIS directors say they can’t justify the current
BEHIND THE NEWS

price. “Our salespeople and auditors don’t need a laptop to do a more effective job,” says Homer Lovorn, executive vice president of MTech, a Dallas-based computer service company for the banking industry. “We don’t want to be on the leading edge of a new tool.”

Yet, other dp managers see the need, and can’t understand why more companies don’t use laptops. “IBM, HP, Avon, and Mary Kay Cosmetics don’t use laptops, but their sales forces could probably use them to fill out forms and in other situations where they can’t use a real personal computer,” observes Charles Feld, vice president of management services at Frito-Lay Inc., Dallas.

Vendors go out of their way to position the laptop in esoteric applications. A Grid computer has been used on space shuttle flights. Called SPOC (Shuttle Portable On-board Computer), the modified laptop (a fan had to be added) was used to conduct navigational experiments and display the craft’s position in orbit. Another ruggedized Grid laptop is used by the U.S. Army for communications and missile guidance under combat conditions. There are Tandy laptops in Antarctica and Data General/Ones in Africa.

Ironically, while a ruggedized laptop can survive in the hostile environment of outer space, it can’t survive the rigors of Frito-Lay’s route-sales force. Feld says the laptops are too expensive and not rugged enough for the route-sales drivers, whose trucks are exposed to 100°F heat in the Southwest and subzero temperatures in the Midwest. Instead, Frito-Lay uses handheld computers designed by Fujitsu Corp. in Japan.

“Our people in the field don’t require laptops that are MS/DOS compatible,” says David L. Lee, manager of the information center for M. W. Kellogg, a construction and engineering firm in Houston. Kellogg’s engineers use portable dumb terminals like the TI 700. In fact, many companies have chosen a portable dumb terminal when all that is required is a micro-to-mainframe link.

Custom terminals, such as handheld and application-specific devices, and dumb terminals have cut into markets that the laptop vendors are pursuing vigorously. These markets include the federal government, sales, and industrial applications.

As vendors bring applications back down to earth, sales seems to be one of the most viable markets for the laptops. “There are currently 4.5 million people engaged in the field of sales and client management,” says Cliff Bream, vice president of Data General’s distribution division, adding, “Of that number, only 5% are automated.”

Today, 32% of the battery-powered micros are used by large businesses, 14% by medium-sized businesses, 20% by small businesses, 13% by the government, and 5% by schools.

The government is one area in particular that laptop vendors have targeted. Typical applications in the federal government include financial analysis and auditing. It is also targeted for use by federal investigative agencies. Secure versions that meet the Tempest specification versions are available to the military and intelligence agencies.

According to Future Computing’s Young, Zenith has the right idea on how to market to the government, landing large, volume orders instead of focusing on highly specialized and very expensive laptops for secure communications or missile guidance. After all, there are a lot more auditors than there are astronauts or communications officers.

In industrial applications, petrochemical and chemical refiners can use the laptop for drill-site data acquisition and analysis, or as a remote terminal. Laptops could be used on the factory floor to program industrial equipment like robotics controllers, machine tools, and programmable logic controllers.

Personal productivity is another area the laptop vendors are pushing. Certainly you’ve seen the laptop advertisements that emphasize the use of the laptop in an airplane. Realistically, how many people do you see using laptops on airplanes, trains, in airline VIP clubs, or other graphically desirable locations where market research says they should be? Not many, according to industry watchers, because personal productivity has been a weak area for laptop sales.

“Our salespeople and auditors don’t need a laptop to do a more effective job,” says Homer Lovorn, executive vice president of MTech.

“Unless you are sitting in first class, it is virtually impossible to use a laptop on an airplane,” says Juge of Tandy. “I’ve yet to see anybody using a laptop on an airplane.”

“Why spend $3,000 for a portable to work at home,” asks Young, “when for around $995 you can buy a clone for home use? All you are transporting is a diskette, and which is more portable, a diskette or a laptop?”

“Very few people do work in transit; most work is done at the office or home,” says Juge. “For the price of a laptop, I can sell them two personal computers.”

A major problem, according to Young, is a lack of industry-specific software for the laptops. “Spreadsheets and word processing are not good enough,” she says.

“Value-added resellers should work with vendors to develop applications for the laptop,” Young adds. She says that because most laptops are sold through the direct sales channel, there is not much opportunity to develop software. Laptops have been virtually untouched by vendors. Analysts say that laptops could take off with software geared for company-specific applications.

Another drawback is training. “You have salespeople that won’t use a desktop computer, let alone a spreadsheet,” agrees a data center manager for an office supply company.

While some dp managers don’t see the value in laptops and end users don’t want to use them, many who work with laptops are very positive about them.

Peter Giampietro, MIS manager for NYNEX Business Information Systems in White Plains, N.Y., says laptops are used for electronic mail. “I’ve been in need of a machine that would allow me to access my office wherever I am,” he says.

In a sales environment, Mead Data Central Inc., Dayton, Ohio, uses more than 200 laptop computers to demonize its legal, news, and medical online database services (LEXIS, NEXIS, and MEDIS). “The Grid laptops will give [our] sales force great flexibility to demonstrate our on-line services,” says G.M. McGill, vice president of national sales for Mead.

Citicorp’s Global Trade Services Division is processing and closing complex financial deals that involve multinational clients and worldwide offices. Laptops played a role in Chevron Corp.’s acquisition of Gulf Oil. Making an offer to buy Gulf meant finding more than $13 billion in financing. As loan offers came in, iterations were done on the laptops until the amount was reached by the syndicate banks.

Clearly, laptop vendors are starting to find markets for their products. It is slow going, however. While portables are used in unusual situations, the real payoff for these companies is when corporations start using them in broader applications.

“It’s not the portability, but the footprint,” says Frito-Lay’s Feld. Maybe as the portables become more powerful and less expensive, there will be a place for them on a desktop as well as in a suitcase. For now, vendors in this crowded market continue to look for customers who are interested in the laptop and can justify its expense.
Use It or Lose It

Four experts discuss using automation to ensure quality.

Everybody wants good value for his money. If manufacturers are unable to produce quality goods at the right price, customers go elsewhere. In some industries, American manufacturers have already lost key battles; in others, domestic producers are under siege. So it is little wonder that companies across the land are renewing their commitment to quality. And the key to higher quality is automation—in engineering departments, testing labs, and on the factory floor in particular.

When automated machines produce or assemble parts, consistency and accuracy generally improve—as long as the equipment is in proper order. Machines must be watched more carefully than people; they don’t know when they’re functioning incorrectly. An automated system producing off-spec parts will do so with the same consistency it produces correct output, only, as one panelist puts it, “Not only do you get more scrap, but you get it faster.” As a result, automated manufacturing increases the need for automated quality control.

There are many ways for a manufacturer to systematize data collection and analysis of factory floor data. By installing the right kind of computer power at the plant level, companies can not only spot quality problems sooner, they can often cope with them on the spot. When a manufacturer can locate and fix a production problem quickly, defective goods will be trapped on the factory floor, before they are shipped to customers.

Q: What can be done, in general, to improve quality control on the factory floor?

Walleigh: The idea is to do things only one way, and that way is the right way, and to do it that way every time. To do this, a manufacturer needs a good understanding of the production process; he must accurately characterize each process and then control it. The overall goal is to reduce the variability in process, and as you reduce that, you assure that you are going to produce things the same way every time.

Linden: We look at quality as conformance to requirements. And that is really conformance to customer requirements. We have seen situations in our company where we had excellent control of quality on the shop floor, but that did not translate into good quality for the customer, because we didn’t begin by adequately identifying the customer’s needs. If we fail in the product requirements, we’re probably going to carry that flaw into the process requirements.

Helmstetter: As management, we have to communicate to all of our employees what we mean by a commitment to quality. We not only have to communicate the how, but also the why of what we are asking them to do. We have found that if instead of dictating, we put problems in front of groups of workers, and ask them to assist us with a solution, the product and process work much better.

Productivity and quality go
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Roundtable Participants

Ward W. "Bill" Are is manager of the Technical and Quality Labs division of the Lockheed-Georgia Co., Marietta, Ga., and is responsible for developing and implementing quality control programs. He has served as manager of the Quality Engineering and Technical Support Department at Lockheed, and has also held positions as manager of production flight inspection in the C-130 and C-141 programs, quality engineer, quality engineering group supervisor, and quality engineering manager.

Frank Helmstetter is an engineering group manager of the process development center for the Buick-Oldsmobile-Cadillac Group of General Motors, Warren, Mich. He is responsible for development and implementation of strategic process automation for that division, which entails overseeing assessment, evaluation, feasibility testing, prototyping, and plant implementation of automated processes and systems. Since joining GM in 1957 he has served in manufacturing engineering, production, and maintenance.

Larry Linden is director of the Manufacturing Data Center and Quality Department for Baxter-Travenol Labs Inc., a manufacturer of medical testing equipment in Deerfield, Ill. He is responsible for all the data processing that relates to Travenol's quality program, and was instrumental in developing and maintaining that program.

Richard Walleigh is a principal in the Management Consulting Group at Arthur Young & Co., San Jose, where he aids clients in developing manufacturing strategies, and implementing total quality control and Just-in-time manufacturing programs. Prior to joining the firm, he spent 10 years with Hewlett-Packard as manufacturing engineering manager, production manager of the Computer Systems Division, and engineering manager.

hand in hand, no matter what industry you are talking about. If you think in terms of productivity, instead of just production, if you do not think about how many things you make, but how many quality parts go out the door, then you will realize what an important part quality plays in that equation.

Linden: The language you use to communicate what you mean by quality is also very important. We make medical products. It is an industry that is highly regulated. We produce something in the order of 10 million products a day that are either life supporting or life sustaining. So we must have a high regard for quality. But it is not so long ago that we were measuring a lot of defects in percent defective. Well, 99.9% good sounds all right, but if we are producing at a high volume, that means 1,000 items that contain some kind of defect even though it might be of a minor type. So we wanted to shift away from the acceptable percentage good, or the acceptable quality level, to defects per million, and ideally, we'll go beyond that to measuring the time between defects, a far more sensitive measure.

Q: Does automated equipment, in general, aid or hinder improvements in quality?

Walleigh: Automation has tremendous potential in being able to reduce variability, which is a major cause of defects. But unless you get very, very sophisticated equipment, it will not be able to deal with variability. If you implement automation, that does not necessarily improve quality. If you have a human being doing a process, he will often compensate for problems or variability coming from the previous activity. If you install an automated piece of equipment that can't make those adjustments, then not only are you going to produce more scrap, you'll produce it faster. On the other hand, if you do understand what is going on in the production facility, and you implement automation in order to reduce that variability from the very beginning, then automation can have a tremendous impact.

Helmstetter: Whether automation will help improve quality depends on how you define a 'good' part. If you design a part to be constructed by humans, and the amount of variability that human labor inevitably puts into a part is acceptable, then it is perfectly possible to have humans make things with zero defects. Automation gives you the ability to define your parts with a much greater precision, since you have eliminated, to the greatest extent possible, human error.

ARE: So we are back to definitions again. Defect-free does not mean that something has to be perfect. Perfect is an arbitrary term.

Walleigh: A lot of us are moving towards installing more automated equipment, and see a lot of benefits, but we realize that there are a lot of things that we have been doing that won't work in an automated facility. The guys in the past who were the heroes got things done despite bad documentation and bad product design. Inaccurate specs, defective materials—automation won't take that. Machines are very unforgiving; they force us to do a lot of things right.

Q: If management is going to approve any investment, it has to be able to rationalize it. How do you quantify improvements in quality in order to do cost-justification? Must you invest in more expensive data acquisition equipment to do so?

Walleigh: It has been my experience that improvements in quality are very easy to cost-justify. If you can produce a higher-quality product, and you are successful in projecting that quality to the outside market, you increase your market share. This is the quickest way I know of to improve profits. Still, that is often difficult to put a hard number on up front. There is no way of predicting the rise in market share that will result from improved quality.

On the other hand, you can look inside the factory, where quantifying those things is a little easier. We have had clients who have found the cost of...
poor quality has been 25% of the manufacturing cost. And that just takes into account the inspectors and labor involved in rework that is caused by bad parts. It doesn't even include the cost of the people who make the defective part in the first place.

**Helmstetter:** All quality really means is eliminating or reducing nonconformity to requirements. If you look at it that way, and you find a way of improving your conformance to standards, 25% is a conservative estimate as far as what you can gain.

**Are:** In order to defray startup costs, we have found that it is often useful to implement quality control programs on a pilot basis at first. Like so many other projects, the pilot will give us an opportunity to prove to the doubting Thomases that a new idea will work. Then management will begin to see the financial benefits in improved quality. That goes a long way toward getting momentum going and provides the enthusiasm you'll need in order to implement a project on a companywide basis.

**Q:** What role do computers play in improving quality on the factory floor? **Helmstetter:** What the computer is doing for you in this situation is giving you the capability to analyze huge amounts of data in real time. That is what we are using them for. Instead of waiting until tomorrow to find out what we did today, we have immediate feedback that we can use to do something about it today. These systems are measuring tools, and the most important thing is that they be consistent. The danger, of course, is that this will just become another process that we have clouding up production, diverting our attention away from the real goal of improving quality and productivity.

**Are:** One of the most important uses we have found for computers in quality control is in our testing equipment. We were talking about the need for a common way of gauging the conformance to standards. With computerized testing equipment we know precisely how deep that hole ought to be, and can make sure it is that way every time.

**Q:** Much of the current literature that discusses total quality control (TQC) pairs it with another three-letter acronym, namely JIT, Just-in-time inventory control. What is the relationship between the two? **Walleigh:** You can have TQC without JIT, but you can't have JIT without TQC—it just won't work. One of the things JIT will do is to expose a lot of the problems within a manufacturing facility. If you strip away the security blanket of excess inventory, quality becomes critical, because if you have bad quality, you are going to shut your line down. And you need a methodology to get good quality. So I never talk to a company about JIT without telling them that they also have to make a firm commitment to quality control.

**Linden:** I would never attempt to implement the two simultaneously. The change in mentality that comes with a commitment to quality has to come first, and it will provide the environment in which a company can work toward JIT. Once you are on your way, JIT is a natural progression, but JIT is an awful way to implement quality control.

**Walleigh:** Implementing TQC and JIT together simply forces the issue of a commitment to quality. You may think it's a drastic way to make people up to the need to a commitment for quality; but then, there are a lot of people in a lot of companies who could use a knock on the side of the head to wake them up to the realities of global competition. JIT is flashier than TQC, people have read more about it, and so that is the thing that they want to go with first. They quickly realize the necessity of TQC with JIT.

**Q:** Who should have responsibility within a corporate structure for the implementation of a quality program?

**Walleigh:** It has to be part of everyone's job to improve the processes, and to improve quality. It can't just be the quality department or the process engineers if it is going to work. Somebody at the very top of the company has to make quality a strategic goal. The CEO won't implement the detailed programs on the factory floor, but he has to make a commitment. If that doesn't happen, then inertia will filter down. The people on the factory floor will have no motivation to keep going, and the financial resources won't be committed either. Top management has to define the global performance measures, and then department heads have to define performance measures that support those global performance measures.

**Helmstetter:** One of the things that is a problem is that top management sometimes sets those performance measures in a vacuum, and doesn't truly appreciate what it takes to get things done.

**Are:** That can be a problem.

**Helmstetter:** You've got to have group development of performance measures. You have to involve the people who are actually trying to meet those measurements. We have to eliminate standards that are there because they were there before. The people...
who know they ought to be changed must be in a position to do something about it.

Are: We are right now embarking on a total quality assurance project. It will be interesting to see under whose control it falls. Because if it comes under the control of the quality assurance division, then it will be just another quality control program and it will not be something that everyone has responsibility for. The way it should work is that every department has the responsibility for quality control in its own functional area. If the project is going to work, management will have to go to engineering and say, 'Okay, you are in charge of quality in your area,' then go do the same thing in maintenance, and everywhere else.

Q: So that commitment to quality has to go beyond just the factory floor?

Linden: Without question. We have had a number of independent studies done on customer perception of the quality of our products. What we found was that the customer's perception of the product was influenced to the extent of almost 50% by all of the service-associated aspects. So you can have a perfect product, but if the salesman couldn’t provide an answer, if the invoice was not correct, if the delivery was late, the customer doesn’t separate that from the product.

Walleigh: The problem is that there are a lot of people working in a production facility who may directly influence production on the factory floor, but they don’t think of their jobs in that way. A lot of people go on doing their job and don’t think about the fact that it is part of a process.

In manufacturing we have started to get used to the idea of production as a smooth process flow, and of the importance of maintaining that flow. But the overhead departments of that same company probably don’t think that way—and they should. Accounts payable is a process, accounts receivable is a process, and many of the quality control tools used on the factory floor can also be implemented in every one of those ‘nonproduction’ activities.

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Innovate or Renovate

Companies automating must balance the costs of building vs. rebuilding.

So you're going to get into automation in a big way. How are you going to do it? Are you going to start from scratch and build a whole new plant from the ground up, dazzling your directors with a showcase and giving your competitors the willies? Or will you gut old Plant No. 9, which has been in mothballs for years anyway?

The answers can be elusive, for there are no simple rules. Manufacturers faced with a surfeit of options have tried everything at least once. Some take giant steps like creating entirely new divisions, as General Motors did for its Saturn manu-

facturing facility project. Others go into automation one tiny step at a time, replacing machine lines with work cells, adding new wiring, and adjusting production plans only when absolutely necessary.

Setting up a new facility—or installing new automated lines in an existing plant—means juggling dozens of variables and making a lot of choices that boil down to, well, gut decisions. Yet somebody's got to call the shots, whether it's an individual or a committee. And, in big business, that means checking out every angle.

To begin with, a company must calculate whether it costs more to build or rebuild. But even if all the contractors' quotations can be pumped into a spreadsheet, the answer may not present itself. Numerous intangibles have to be figured into the equation as well. Costs will also continue after a plant is built. Savings achieved in haste at the start of construction could lead to big penalties over the years. Further, companies that try to avoid big bills by renovating piecemeal will often pay more over the long run than those that revamp factories in one organized push.

Not all the hard numbers will be found in bricks and mortar. The real cost of a facility is after tax, not pretax. The changing federal tax rules and revised accountants' opinions have made construction a whole new ball game. Nevertheless, the Commerce Department estimates that private industry players have spent $16 billion building factories during 1985, and will invest more this year.

The IRS is only one of several tax authorities a manufacturer will have to appease. State and local governments may also significantly affect the cost of setting up and running an automated plant. Some communities will give a manufacturer a tax holiday for building plants on their turf. Others, afraid of losing their tax base altogether if old factories shut down and move away, provide comparable incentives for renovation. "Not only does every state follow different rules, but the tax rules change with greater frequency and are more flexible at the state level," says Mark Johnson, a tax manager at Coopers & Lybrand's Richmond, Va., office. "There are so many factors that determine how to get the greatest tax break, it really pays to have some outside help on it."

Recent revisions in the federal Tax Code have put many builders at
The useful life, for tax purposes at least, has been extended for both real estate and machinery. Machines that were written off over five years now "survive" between five and 10 years, although programmable equipment is generally considered to have a useful life of no more than five years. Real estate that was depreciated over 19 years now must be written off over 31 1/2 years.

In part to compensate for the loss of the Investment Tax Credit, depreciation schedules for machinery have been made more favorable. Depreciation schedules for real estate remain straight-line; users will deduct equal amounts each year. Machinery, however, will follow an accelerated schedule that allows users to deduct 200% of the declining balance each year. According to the experts, this means companies will try harder to blur the distinction between real estate and machinery to get the more favorable depreciation schedule.

"When you start trying to decide for tax purposes what is part of the building and what is machinery, it gets very sticky," says Johnson. "For example, if I want to install a local area network within a plant, that is counted as an equipment purchase. If I want to build a clean room within a factory, that also can be counted as separate tangible personal property—equipment, in other words. But if I have to make changes to the building itself, if I have to add extra ventilation or raise the roof of the factory, then I am entering a gray area in the code, and everything has to be considered on a case-by-case basis."

Erecting a new plant can cost a fortune; so can shutting down an old factory that the new one will replace. For industries that want to move into a new geographic area, or for those building up in a locale that offers no suitable existing structures, there's really no choice but to build. And even an otherwise acceptable facility may not be able to accommodate necessary new installations.

Even with several options available, the construction of a new plant provides a company with an opportunity to institute changes in fundamental aspects of production. A new facility may enable a manufacturer to substantially improve the handling of freight, or to better segregate hazardous materials, or produce products with greatly increased size, weight, or delicacy.

But setting up a new plant is a costly choice if a manufacturer already owns some real estate, and has an adequate shell building containing electrical fixtures, heat, and water. The company should not have to make those investments again, assuming the existing shell can support new technology. There is a need for caution here, however, since many companies don't know what may be lurking inside an old plant.

"A manufacturer will go into a renovation, having done as much financial planning as possible, and when he begins work, he runs into all sorts of surprises," says Tom Frey, a consultant with the Austin Company, a Chicago-based management consultancy. "It isn't until he rips up the floor that he discovers there are a lot of things down there that he didn't expect to find. And at that point he has committed himself to that plan, and he's stuck with it."

The decision of whether to build or to renovate may well hinge on the physical characteristics required of the plant. Building from the ground up will allow the company to do things right in the first place; renovation may well involve compromises that create problems later. The builder can take advantage of the latest energy efficient designs and materials. The new plant can have adequate loading docks, enclose clear floors to accelerate the flow of goods through the facility, include a computer networking scheme that will allow greater flexibility in the future, provide good ventilation, and include features that add to that very important intangible, company pride.

A manufacturer that cannot afford all this luxury may still get the results it needs—if it can meet the challenges associated with a renovation. "There are a number of things that can present problems for a renovator," says Glen Allmendinger, president of Harbor Research Inc., a Cambridge, Mass., consulting firm. "Most older buildings have only 12-foot ceilings. They are not adequate for a lot of machinery. They are also not high enough for proper ventilation for either a paint application or a clean room application. Many older buildings have columns spaced every few yards for support; they are a nightmare for materials handling systems and assembly lines."

Even if the physical layout of an old building is adequate, its physical stability may not be. "When engineers designed buildings 40 years ago, it was fine for the floor to shake a little," says consultant Frey. "But today, you are going to be in trouble if you try to make a highly sensitive positioning robot or a delicate vision system work on a bouncing floor."

Another problem common among facilities that date from the World War II era is electric wiring that was installed to what are outdated specifications. "When a manufacturer goes to get a construction permit," Frey says, "he may find that fire codes and electrical codes have all been changed, and he is going to have to pay a lot more to get his building brought up to snuff."

The difficulties of carrying off a renovation are compounded if the company wants to maintain production while work is going on. When contractors must come in on weekends and during odd shifts, costs go up. And these days, safety regulations are not limited to the building and its contents. A plant has to pass muster with environmental authorities, too, whether it is a new facility or a significant renovation of an existing one. While this is a necessary step to control pollution, it may adversely affect a company's profits and a community's prosperity. Carmine DiLullo, a consultant with Lockwood Greene Inc., a Spartanburg, S.C., facility plan-
Digitalizing Springfield

In 1777, General George Washington authorized Springfield, Mass., the first federal arsenal, which functioned as an arms facility manufacturing muskets and gunpowder throughout the Revolutionary War. The Springfield Armory, as it was called, was productive for nearly two centuries, expanding and modernizing in both appearance and product. In 1968, the federal commission was withdrawn and the Armory was closed.

But this sprawling complex of red brick buildings had not witnessed its last metamorphosis. By 1987, Digital Equipment Corp. will have completed a $25 million renovation project that will have transformed the hoary abandoned munitions plant into a high-tech facility, manufacturing some of the company's most sophisticated equipment. Where there were forges there are now robots, the firing range is now office space, and where the Springfield rifle was developed and assembled is now a class 1000 clean room.

DEC could have moved and built a spanking new facility, but according to Harry Drab, manufacturing programs manager at the plant, employees were a large determinant in the decision not to move. Management believed that moving out of the center of town would disrupt otherwise good employee relations.

There were also solid financial reasons for staying put. Beyond the federal investment tax credit, DEC also received, through the jurisdiction of the Massachusetts Historical Society, a tax subsidy equal to 25% of funds spent to update the building—a mixed blessing according to DEC engineers. Locating the factory in a designated historical area placed certain restrictions on what could be built in the space and what those buildings could look like, even though it reduced the ultimate price tag.

According to facilities manager Charles Crocini, almost nothing from the old plant was salvageable. "If you had seen the place when we started, you would not believe it now," he says. "We left the shell of the buildings and cleaned everything else out. Besides the pounds of brass shell casings we took out of the rifle range and sold for scrap, we removed about a ton and a half of lead out of the bunker it was fired into." Where that bunker was now a small courtyard with a gazebo and outdoor tables.

But what remained—solid brick walls, and wood and concrete floors—had already proven strong enough to withstand the test of time. "The basic structure was sound," says Crocini. "They really don't make buildings like this anymore. It is surprisingly energy efficient. Once we got the new windows put in, the buildings were pretty snug."

Unlike a plant dropped down in the middle of a rural area, which has room to expand, the facility is in the center of downtown Springfield, and bounded on all sides. The Massachusetts Historical Society restrictions exacerbated the limitations. Digital was not allowed to add new buildings, and the number and location of entrances were also restricted. Clearly, the company needed to make very efficient use of what it had.

When DEC first moved in, the space wasn't being used well. There was little warehouse space, and, since the company had no good inventory management plan, inventory was left on the production floor. "We knew from the start that our biggest problem was going to be getting materials through the plant—from inventory, through production, and back out again," says Crocini. "So the plan we devised was to automate inventory, and work with suppliers toward a Just-in-time zero inventory system. We knew that if we could reduce inventory we would free up the space we needed on the floor to add more production lines and increase capacity."

According to Walt Tucker, distribution systems manager, WACS was a group project developed by the inventory and MIS departments over a two-and-a-half-year period. He says that when the planning team first got together, it quickly became clear that even the most brilliant scheduling program in the world would leave them with problems. "The facility was planned from the start to support high-volume production. We figured out that without an automated inventory retrieval and distribution system, we would have people literally waiting in line to get goods."

The inventory distribution system the planners needed had to be able to store large amounts of goods and retrieve them rapidly—and take up as little room as possible. The solution that engineers devised was a pair of 150- by 14- by 8-foot rotary racks that house totes of goods. Both racks have four bidirectional levels, which move independently of one another; each set of racks is controlled by a dedicated Falcon computer (an early version of DEC's PDP-11).

The complex inventory/distribution system is orchestrated by WACS in tandem with DOLPHIN—Delivery Organizer Linking Parts Handling and Internal Navigation, essentially the execution part of WACS. WACS runs on a VAX 11/780 with 32MB of main memory and 200MB cartridge memory; it is linked via Ethernet to a VAX 11/780 with 16MB of main memory running DOLPHIN, which controls the four Intel ART-automated guided vehicles currently in use at the plant (the system will eventually support 14), as well as the plantwide conveyor system.

The conveyors are complemented by a series of Allen-Bradley PLC-controlled lifts to transport materials from level to level in the plant. Even though there are only four floors in the facility, material must be moved automatically between nine levels, as all five buildings were constructed at different levels. To compensate, engineers installed multilevel lifts.
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ing firm, recalls such an event. He did a study for a Pabst Blue Ribbon brewery located in the heart of Newark, N.J. The company wanted to double production capacity, that meant that effluent discharges into the Newark River and the atmosphere would also be doubled. There was no practical way to handle that much waste. So DiLullo advised Pabst to close the plant, which it did.

Some of the most important issues cannot be easily quantified, even if they can be translated into dollars and cents. Community relations, labor contracts, logistics of moving goods, and a company’s competitive situation must all be reckoned with.

Every locality wants to hold onto existing industries, and to attract more. There’s hardly a town anywhere that wants its corporate ranks to move away or even diminish.

“Community feeling about a company is more powerful than you might think,” says Tom Frey. “In particular, if a company only has a single plant, or it has been in a particular place for a long time, then it is a big deal to the community for it to move. There are very few companies that want to get the reputation for destroying the economy of a small town.”

On the other hand, there are a lot of state and local bureaus that are hungry for new industrial residents. Cities and states will do all they can to woo new employers, including, of course, tax incentives, but also promises of transportation links, low-interest loans, and funding of joint training programs with local universities.

Another major consideration is labor relations, not only because automation changes the relationship of the worker to the production process, but, for multiplant companies, employee problems that start at one facility can easily spread to the others. If a company has good labor relations, it may not want to rock the boat by moving production or shutting down a plant for renovation. Yet management may well be tempted to move production to a region with a large and enthusiastic labor pool, even at the cost of angering its present employees.

Different problems surround a company’s plans for management. Reorganization may mean the elimination of many middle management positions. “Very often, when a company wants to streamline a production facility, it will involve eliminating a lot of middle management positions,” says Allmen-}

—Larger industries,” says Harbor Research’s Allmendinger, “were basing their cost-justifications of investments in production gear on a false assumption: that they would build a line, and it would take 10 years to write it off. That’s okay—if they knew that they were going to machine
the same size engine block for that amount of time, as they did in the '50s. “Those manufacturers,” he continues, “are just catching on to the fact that true flexible plants follow assumptions like, 'I don’t know what I am going to be building here in a few years except for its approximate size and the general class of metalworking that it will entail. Beyond that, it could be anything.' Then they set up for processes that make that feasible.”

Allmendinger adds that there is no real incentive within manufacturers' financial departments to alter the way they look at investments. The old way of thinking will most likely remain until the engineering groups educate management.

Done correctly, a gradual retrofit can be a way of diffusing some of the costs, but it, too, has pitfalls. If the incremental changes are not part of an overall plan, then a manufacturer may encounter the much talked about problem of islands of automation. “A user may decide he can boost productivity by implementing CAD systems, so he buys a few, and speeds up the design process,” Allmendinger explains. “This improves productivity in a way that makes the accountants happy. But it only improves one of the steps of the process. What those systems ultimately produce is paper, and unless the manufacturer can eliminate that paper, and fully integrate the design system, then it has just foisted the productivity problem off onto another department.”

The same problems crop up when a plant is modernized in a piecemeal fashion. It is much more difficult and expensive to expand a cooling system than to build it properly in the first place. The same is true of a conveyor system, or an automated guided vehicle setup, although these components of a plant can be built up to some extent.

“When I design the structure of a facility,” says DiLullo, “I have to think, ‘Do I ever want this facility to have a mezzanine? Will I ever have to add extra pipe loads? Will I ever want to add something that will require supports that the building doesn’t have?’ These things have to be planned for now, because they will be very expensive to do in the future.

“The big companies have learned this the hard way,” he continues. “They now realize that the most important thing is to not lose manufacturing time. If the choice is between spending an extra million dollars up front on a $20 million project, or to hurt production, they are going to spend the 5% to make it flexible.”

The maturity of the product and the technology employed to make it are also important considerations. Manufacturers don’t want to invest millions building a facility for a product that won’t be around in a few years. “It’s pretty straightforward: don’t spend more on a production facility than you expect to get back over a certain amount of time,” says Allmendinger. “You would be crazy to invest millions in producing a product that is going away in a year, or in a technology that will shortly be obsolete.”

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CIRCLE 267 ON READER CARD
Managers of discrete manufacturing plants used to be happy with 24-hour turnaround on finished goods inventory. Today, they get uptight if it takes 24 minutes. On the factory floor, where people can't dodge spilling cups of coffee, users want computers that jump in microseconds. Every desk, from the CEO's to the maintenance engineer's, seems to have a terminal on it. And every person at every terminal demands an instantaneous response. Entire plants are going real time.

Manufacturers, accustomed to measuring plant output by the week, the month, or the quarter, may find moving to on-line information is a big and difficult step. But there are substantial rewards for those who take it.

When the information from the factory floor is made available to departments outside manufacturing—purchasing, for instance, or sales—it can be put to productive use. Constant awareness of inventory levels is an absolute necessity if a plant wants to move toward Just-in-time. Similarly, good control over output is important for companies that want to build to order, or minimize warehousing of finished goods.

Before these benefits can be realized, changes must occur throughout the factory. Electronic systems in the plant must be enhanced in order to yield the three Rs of real-time systems: response, resiliency, and reliability. Controllers and minicomputers in the factory must be tied together and then linked to computers in data processing departments. The closer the ties, the faster the movement of information, and the more efficient the factory can become.

As they solve their technical problems, manufacturers going on-line will also encounter some new managerial headaches. For instance, going to a real-time system will change the relationship of floor engineers to the DP department.

"It isn't that common today to have the middle-level plant computers linked to the bigger, corporate computers," says Omri Serlin, president of ITOM International, a Los Altos, Calif., consulting house. "The barrier is primarily organizational. In the past, plant people bought their computers, and the larger ones were taken care of by the data processing guys. And these departments rarely spoke. Now that companies are beginning to realize that there is some value in top management being able to get immediate information on the status of the plant, you see these people beginning to talk to one another more."

While there is no easy way to iron out all the potential disputes, let alone the technical problems that accompany them, most companies will improve their chances of getting on-line if they try to meet key technical goals first. By defining the performance characteristics of the system they want, personnel from the corporate level on down will foster a set of common interests. Having set the goals, management should then let the
personnel closest to the actual problems develop specific solutions. A good way to begin is by defining an on-line system in terms of response time. At every level in a plant hierarchy, having a responsive system means installing hardware, software, and communications links with real-time capabilities. At each level within a factory, the real-time needs of the system will be different.

At the controller level, real time means a control device that thinks faster than any of the machines it watches. In some manufacturing systems, response times of 500msec are considered real time, but a fast robot running a cutting tool will need much better reflexes. Similarly, a minicomputer that checks controllers every second may be good enough for slow-moving lines, but it won’t support a group of fast cutting tools or robots.

“What real time means depends on the needs of the system,” says Mel Olson, product manager at Anatec, a Dublin, Ohio-based subsidiary of Anaconda Controls. Anatec makes control equipment for both process and discrete manufacturers. “For example, suppose you have a canning operation, and you just want to scan each piece as it comes down a line. If the cans are moving at 100 per second, you have to be able to count that fast. Something like a shut-down mechanism on an operation is very different. Not only do you have to get the information that something is wrong to the proper place. You then have to get instructions back out to the system fast enough so it shuts down before a mishap can occur.”

At the plant level, real time means something else. It is defined by the rate of flow of goods through the plant, not by the speed of individual operations on the factory floor. “Real time above the control level is just a different degree,” says Serlin. “Materials flow into a plant, and you process and assemble them into finished goods. If your computer operations cannot keep up with that rate of flow, then you have an inadequate system.”

So, at the plant level, a system’s response requirement is determined by the rate at which the information can be used—not by the speed of a computer or a smart tool. If a company can react quickly to changes in a process, whether they are variations in throughputs, quality or consistency, it will get its money’s worth from a faster, more powerful computer. By the same token, a company that spends days adjusting to changing conditions probably does not need reports updated every few minutes; it can use a less powerful computer at the plant or enterprise level and still satisfy its managers’ requirements.

Because real-time needs are different at every level of a plant, users have developed different ways of addressing those needs. When it comes to performance, for example, control systems differ from computing systems. The speed of a computer depends on the rate at which the central processor can execute instructions, and the amount of work each instruction performs. Sometimes a computer is characterized in terms of the millions of instructions per second, or MIPS, that it can execute.

With most equipment controllers, this is not the case. The ability of a control system to monitor a machine depends only to a small extent on the calculating power of the chips in its small processor. For the most part, there just isn’t that much information to process at the machine level, as long as its function is limited to basic control. The information is often simpler data, like the state of a switch on a sensor, expressible as one number.

“At the factory floor controller level in the computer hierarchy, it is the I/O structure that is most important,” says Serlin. “Above all, you would like to have a machine that has sufficient input and output channels to allow you to handle as many external devices as you want.

“The second thing that you want,” he continues, “is for the machine to quickly respond to a situation where a particular external device calls for attention. You want the computer to be able to very quickly identify the fact that such an event has occurred, and then act upon it. Here, it is more important to have a rich enough I/O structure with an adequate interrupt response time than to worry about MIPS.”

Consequently, a programmable controller may have much more circuitry dedicated to the handling of signals from switches and sensors than to the interpretation of the data on its input lines. It will also have more electronics, compared with a general purpose microcomputer, that are needed to get the electronic signals it emits back to the machines that must be regulated. It is still too expensive to pack everything into one box, so users have traded off computation in favor of fast, accurate process control.

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will shift greater computational work loads to the factory floor. This trend is already apparent in the growing popularity of vision systems, which require a great deal of processing power. Similarly, calculations that regulate processes will be moved closer to the machines that do the work.

"Today, I can get a 2MIPS machine right down on the basic control level," Olson says. "This will let me do many vital operations on the plant floor that are so compute-intensive they used to be off-loaded to the corporate mainframe. I can do them more frequently, in my own domain. I can do things like production optimizations every couple of hours and have up-to-the-minute information about how production is running. It's like being able to fine-tune your Ferrari every day, instead of taking it to a mechanic once a month."

With increasingly complex factory automation comes greater vulnerability. A production process can be optimized with the aid of technology, but if the automation isn't dependable, the net result may be a loss instead of a gain. It is theoretically possible to install automation that is as reliable as you please, but the cost of that technology may not be practical. Good maintenance is vital, particularly preventive maintenance. But some failures are inevitable. When they occur, good systems design can minimize the consequences.

At the basic control level, a user must be able to count on his equipment all of the time. Most experts advise building redundancy into controllers wherever possible. Fortunately, the technology closest to the production line is the least expensive. "The costs of a control system going down just begin with the costs of the material," says Olson. "If you have an interdependent process, like aluminum casting, you can't afford to have that process shut itself down because one of the sensors dropped out. If the process just stops in the middle, you are going to have to go in and trash all of the work you have done up to that point. That can get very expensive."

Above the controller level in an on-line system, the high cost of the equipment forces users to perform careful cost analysis. "You have to make some decisions pretty early on in designing an on-line system," says Mike Galane, a manager of research and development at Hewlett-Packard's Manufacturing Productivity Division in San Jose. "You have to know how you are going to back it up, and how much downtime you are going to be able to afford. Your choices will have broad implications for how you design the total system."

There are computers specifically built to be fault tolerant. They feature redundant processors, automatic recovery capabilities, and other such specially designed components. These computers can cost substantially more than non-fault tolerant machines that can do all the work, but may also crash. The simplest fault tolerant system is a duplex unit; there are some systems on the market, however, that include several interconnected processors.

A much more frequently used scheme to insure resiliency of the equipment is the distribution of process control intelligence over a number of processors. The single processor works on the whole job at any time. In a highly automated environment, resilient equipment is not the only requirement of real-time systems. The reliability of the data must be maintained as carefully as that of the equipment. The definition of data integrity, and the standards to which it must be held, vary from situation to situation.

Most sensors and actuators at the control level are optimized for speed. The amount of information they provide and its complexity are kept to a minimum, which lessens the possibility of getting bad information. "Because it is gathering a small enough amount of information, a sensor that is 1% in error is tolerable," says Anatec's Olson. "If the device is off spec, but still within the parameters set by the quality department, then you shouldn't be too concerned. All you need to worry about is that it is consistent, and resistant to failure. Of course, at some point there is no difference between a lack of correct data and an equipment failure. If a sensor is consistently 50% off, it is useless and you'd better replace it."

Reliability of data very quickly becomes important in an on-line system. Errors at one point in a process will produce errors throughout the system. Users need to be able to trust the veracity of the information they are receiving. They must have a comprehensive scheme of preventive maintenance in order to preserve the integrity of the manufacturing process. In addition, measuring devices should be placed at key points to permit production systems to catch errors that occur despite the best efforts of maintenance personnel.

The need for data integrity may bring manufacturers into the world of artificial intelligence. Common methods of checking on the reliability of data involve mathematical checks to see that the numeric values being interchanged follow a certain pattern. The process is a bit like casting out nines in arithmetic, although the math used to test blocks of data is quite a bit more sophisticated. This kind of data checking is based on an assumption that the sending unit—a controller, sensor, minicomputer, or other electronic device—is operating correctly. But if the raw data themselves are wrong, the sending unit may still send the error accurately. The error will not be detected.

Artificial intelligence techniques and other advanced computer-based checks can isolate faults that result from bad data. Computers can flag a sudden change in information from a process so that personnel can react. The cause for alarm may not be an event that signals a potential safety hazard. With sophisticated programming, a minicomputer can detect machines drifting out of spec, batches of parts that differ from the usual run, or an unexpected change in reaction time at the controller level.
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Product Spotlight

Enhanced versions of the Domain 3000 personal workstation are now available from Apollo Computer.

- **ADAC Corp.**, Woburn, Mass., is now offering a standalone or intelligent satellite data acquisition and control system for harsh industrial environments. The PX11/BASYS provides 16-bit LSI-11/23- or 11/73-based distributed control while interfacing to the IBM PC, XT, AT, Digital Equipment Corp. VAX and other DEC mini hosts. It will support more than 1,000 analog, 2,000 discrete, and up to eight serial I/O points. It comes with up to 4MB of nonvolatile battery packed CMOS RAM. All types of I/O are supported including high-voltage AC/DC, pulse trains, and sensing applications. The PX11/BASYS shares ADAC's proprietary PROM resident I/O/BASIC programming language, and it will support FORTRAN and Pascal. Prices begin at $5,500. RS #270

- **Apollo Computer Inc.**, Chelmsford, Mass., has expanded its Domain Series 3000 personal workstations with additional memory, better graphics, and enhanced network capabilities. Besides boosting resident memory from 4MB to 8MB, Apollo now offers 155MB and 384MB 5¼-inch Winchester disk drives and an enhanced 19-inch 60Hz noninterlaced 1,024 by 800 bit-mapped display with 16 simultaneous colors out of a possible palette of 4,096. The company also announced a serial/parallel expansion board and EtherController-AT, which allows users to link workstations to Ethernet LANs. The Domain Series 3000 personal workstation with the new display, 8MB of memory, 345MB Winchester, and a 60MB quarter-inch tape drive costs $38,200. It is available 60 days after receipt of order. RS #271

- **Cad Design Systems Inc.**, Chicago, is offering a computer aided design system for personal computers for under $6,000. Cadengine includes an IBM XT compatible computer with a graphics card, 640KB of RAM, 20MB hard disk, 360MB diskette drive, 8087 math coprocessor, two RS232 serial ports, one parallel port, a digitizer, plotter, RS/DOS 2.1, and Version 2.5 of AutoCAD enhanced by CDSI’s AeahPLUS tablet menu; the package costs $5,995. Training and a help hot line are included and AT turnkey systems are also available. RS #272

- **Hewlett-Packard**, Palo Alto, has announced an addition to its HP 9000 line of graphics workstations. The Model 320SRX uses custom VLSI and a new architecture to provide three-dimensional solids modeling at high speeds. It gives users doing solids modeling a response time similar to that of 3-D wire-frame applications, and also allows designers to work interactively. It will be primarily marketed for molecular modeling, mapping, and high-end architectural and engineering construction markets. The Model 320SRX bundle costs $45,000 and includes a 60Hz noninterlaced monitor, with 1,024 by 1,024 pixel resolution, I/O expander, 4MB RAM, HP-UX operating system, eight planes of frame buffer memory, and four overlay planes. An upgrade from the Model 320 costs $12,440. RS #273

- **IBM's** Information Systems Group has announced a new real-time coprocessor for the industrial environment. Called A Realtime Interface Co-Processor (ARTIC), it can be used as a dedicated high-performance subsystem for IBM industrial computers and Personal Computers to increase realtime capabilities. When used along with new software, it will also provide support for programmable controllers. Based on the Intel 80186 16-bit microprocessor, it comes with two independent serial ports that can be programmed for asynchronous, bit synchronous, and character synchronous protocols that either access memory directly or use interrupt mode. It has both 8-bit mode and 16-bit mode data bus support, with eight selectable interrupt levels. ARTIC comes in two configurations, one with 128KB of memory, which costs $1,295, and one with 512KB of standard memory, which costs $1,695. Prices include either a 5¼-inch or 3½-inch microcode diskette. RS #274

A ruggedized IBM PC/XT/AT-compatible computer is now available from Comark Corp., Medfield, Mass. The Expert is being marketed for use in process control, factory automation applications, and distributed numeric control. It comes with eight expansion slots, 640KB RAM, a 19-inch NEMA 12 R08 monitor with 16 colors, low- or medium-resolution display, and a full keyboard with 10 function keys. Expert-XT costs $4,995; the Expert-AT costs $5,995. RS #275

- **WinSystems Inc.**, Arlington, Texas, is now shipping an all-CMOS STD bus single-board computer based on the 80C88 cpu. The LPM-SEC8 combines the cpu, two 28-pin memory sockets, an 8087 coprocessor socket, three 16-bit counter/timers, serial RS232/422 1/0, an interrupt controller, precision power fail detect circuit, and watchdog timer on a single card. It operates at either 5MHz or 8MHz, and is available from stock for $495. RS #276

**Control Data Corp.**, Minneapolis, has expanded its line of pro-
cessors for integrated computer aided manufacturing and engineering. The ICAM 780G processor is a low-end, entry-level system for design, drafting, and analysis. The 32-bit machine includes an integral floating point accelerator, 2MB on-board memory, and 320MB of disk storage. It runs at approximately one million instructions per second. Additional cards will provide a either a two-channel or a 12-channel asynchronous controller, an Ethernet controller, or memory expansion. The 780G runs under IWS, a proprietary operating system, and supports terminals from CDC and Tektronix Corp. Prices range from $22,985 to $47,950. R5 # 277

The Test Instruments Division of Honeywell has published a brochure describing its HTMS 3000/22 Test Management System for die casting. It explains how the Die Casting Test Management System can generate Statistical Process Control quality reports and how it can also be used for a variety of monitoring applications. To receive a copy, write to Honeywell TID Inquiry Services, 5105 East 41st Ave., Denver, CO 80261. R5 # 278

A new software tool for evaluating and justifying investments in robotics is available from the Society of Manufacturing Engineers. RobotCalc II is a computerized database for IBM PC, AT, and XT. It includes names, addresses, and corresponding data sheets on products from over 100 major robot manufacturers and associated suppliers. The system can be used interactively to allow users to do financial justification of potential purchases. List price for the package is $895 ($850 for SME members). To get more information, or a copy of the program, write to Marketing Services of SME, One SME Dr., P.O. Box 930, Dearborn, MI 48121, or call (303) 271-1500. R5 # 279

Two new collections of articles, one on the Just-in-time method of inventory control and the other on robotics, are now available through the Institute of Industrial Engineers. Robotics and Industrial Engineering: Selected Readings, edited by Edward Fisher and Oded Maimon, is a collection of IIE papers and proceedings covering major topics in the field of robotics, including selection and justification of equipment, robotic cell design, and implementation issues. Applying Just In Time: The American/Japanese Experience is a collection of articles edited by Yasuhiro Monden, himself the author of various works on the subject. It includes articles on the kanban system, synchro MRP, total productive maintenance, and FMS at Toyota. Each book costs $39.95 ($26.95 for IIE members). They are available through IIE Publication Sales, 25 Technology Park, Norcross, GA 30092. R5 # 280

A new brochure on Artificial Intelligence is now available free from Digital Equipment Corp. "Artificial Intelligence: Training and Consulting" describes in detail the company’s software services and education services offerings in the AI environment. It discusses how the technologies work, and summarizes how DEC evaluates individual customers needs, as well as how the company aids users in developing AI applications and integrating them into their businesses. Those interested in obtaining a copy of the brochure may write to George Starr, 129 Parker St., Maynard, MA 01754, or call (617) 493-4596. R5 # 281

A 96-tape library of videotapes outlining the implementation of Manufacturing Resource Planning (MRP II) programs is now available from Oliver Wight Video Productions Inc. The library comes in three versions. The complete library is intended for companies just beginning with MRP II, or those hoping to improve an existing system. Users planning to integrate distribution with manufacturing can purchase the Distribution Resource Planning Library, and those companies looking for a general discussion of the fundamentals of MRP II can buy the Overview Library. Prices for the library, and the educational services that come with them, range from $20,000 to $50,000, depending on the size and needs of the company. All three versions are available now on VHS from Oliver Wight Video Productions, 5 Oliver Wight Dr., Essex Junction, VT 05452, or call (800) 343-0625 or (802) 878-8161. R5 # 282

A new brochure containing the product specifications of the Bailey Loop Controller is now available from Bailey Controls Co., a division of Babcock & Wilcox. The brochure contains tables and photos describing the standard product and available options, basic and advanced functions, and specifications including inputs, outputs, dimensions, and communication loop capabilities. To receive a complimentary copy, write to Bailey Controls Co., Marketing and Communications ST# 283

In September’s MRP II vendor survey, the manufacturer of MACPAC software products was inadvertently omitted. It is Arthur Andersen & Co., 33 West Monroe St. Chicago, IL 60603, (312) 580-0033.

This special report, which appears in Datamation, Dun’s Business Month, Control Engineering, and Plant Engineering, was prepared by Sharon Brady of Technology News of America Co., Inc., a New York City-based research and publishing company.
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Choosing the right output machine is often a matter of character.

THE ABCS OF PRINTING

by Hesh Wiener

On May 3, 1983, IBM introduced its 2,000 1pm model 4245 line printer. The product suffered from some engineering problems — problems that came as a surprise since IBM's line printers have almost always been the best in the industry. For two years, IBM tried to mollify unhappy users who complained about the device's print quality and stability, but the reputation of the $54,500 box was tarnished beyond repair.

Finally, on May 1, 1985, IBM unveiled a new 4245 that offered the old performance specifications at a new low price of $35,000. A slower version selling for $28,000 was also announced. The new 4245, which came with a one-year warranty, carried maintenance charges of $400 a month — more favorable terms than its predecessor, which had a three-month warranty and monthly maintenance fees of $650. Even though the sales pitch for the revitalized 4245 touted the unit's improved price/performance, the main advantage of the new machine over the old one was its superior quality. Redesigned and repriced, the 4245 won over users in droves. Before a year
was out, it had become one of IBM's most successful line printers.

This success, however, did not spell relief for disgruntled owners of the original 4245s. In fact, it exacerbated their woes. Customers who purchased the first version of the printer are married to the machine. The printer simply cannot be resold. Nobody will buy it at any price. Even leasing companies that invested in the machines have philosophically, if not financially, written them off. Investors in lease-based tax shelters are in the same position as lessors, but because they buy into large and diverse pools of equipment, they are unlikely to feel the pinch.

IBM never offered buyers of the older 4245s a chance to trade in their machines for newer and better units. The company's position seems to be that the original machines, even with their faults, performed as promised and, with IBM maintenance, will continue to work for years to come. Indeed, many buyers of the old 4245 appear to be happy.

So are third-party firms that sell used IBM gear as an alternative to the manufacturer's new products. IBM's flub produced a windfall for its third-party competitors. From the time the first 4245 was introduced until the revised version was shipped in volume, the third parties that had portfolios of used IBM printers cleaned up. Such stalwarts as the 1,200 lpm 3203-5 and the 2,000 lpm 3211/3811 printers gained value as buyers bid up the prices. Even the venerable 1403-N1, which dealers had pretty much consigned to the scrap heap, garnered a few orders.

IBM also did well with another new printer, the model 4248 that runs at up to 3,600 lpm. This heavy-duty machine became more attractive to midrange users who might not have been willing to plunk down $99,000 for a line printer under less pressing circumstances. (When the revised 4245 was introduced, the price of the 4248 was cut to $75,000 to maintain sales momentum.) In addition, non-IBM printers from various makers became a bit easier to sell to formerly true blue shops.

A HIGHLY UNUSUAL IBM CASE

The case of the 4245 was highly unusual for IBM and for the computer industry as a whole. Processor vendors normally enjoy extraordinary success in selling their printers to users, and so, indirectly, do several independent manufacturers that provide printers on an OEM basis to the full-line computer vendors. But the story of the original 4245 and what happened when users realized it was not up to snuff demonstrates that even IBM, the strongest vendor of them all, must yield to the will of the market.

The will of the market in the printer sector seems to be operating in favor of the processor vendors. Surveys of the U.S. installed base conducted by Computer Intelligence Corp. of La Jolla, Calif., show that mainframe and minicomputer companies provide the overwhelming majority of the printers installed by their customers. IBM printers are attached to IBM mainframes, Digital Equipment Corp. printers to DEC machines, and so on (see Figs. 1 and 2). The notable exceptions are mini makers Prime Computer and Data General, which have simply not pushed their own printer products the way other computer makers have.

Roughly 10% to 20% of the market veers away from the processor path and goes its own way. That more random route
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represents a substantial opportunity for independent printer makers. It's good for maverick users, too. They don't have to feel they're the only ones out there shopping for their own output devices.

In the personal computer world, things are a little different. Machines built to the IBM standard can drive dozens and dozens of printers. All the successful software packages for the IBM PC family and its vast horde of imitators are designed to drive a variety of output devices. The diversity in this market stems from IBM's decision to go with a standard plug on the back of its original PC, leaving the rest of the interface job up to printer makers and software houses.

Also, IBM did not offer its own printers to PC users at first. Instead, it put its logo on dot matrix machines made by Epson and let users know it. As a result, corporate America grew to trust Epson's printers, and, by inference, those of other Japanese companies. So even though IBM now has two strong contenders of its own in the Proprinter and Proprinter XL, there is little evidence that users can easily be wooed back into the IBM fold in the short run. In the long term, of course, the printer game may go to a persistent IBM.

In the other personal computer ballpark, where Apple goes to bat, the Macintosh requires a printer that can replicate bit-mapped screen images. This has greatly limited most of the company's users to Apple-supplied printers. The Mac, however, does use an independently developed page description language that permits intrepid users to attach various laser printers and typesetters to the machine.

A mainframe's age seems to be a factor in the user's choice of printer. This is evident in Computer Intelligence's extensive studies of the IBM base. While nearly 82% of the printers on 3090s come from IBM, only 78% of the printers on 3080s are supplied by the computer giant. And, while more than 88% of the printers on 4381s are from IBM, only 79% of the printers on 4341s bear Big Blue's logo. The 3090, of course, is the successor to the 3080, just as the 4381 is the follow-on to the 4341. Figs. 3 and 4 show how Big Blue's printer pie is divvied up on the 3090 and the 4381.

Many of the older mainframes are no longer in their original homes. When a user organization decides to install a second-hand computer—and buck the pressure to buy new gear directly from the manufacturer—it apparently is also more open-minded when it comes to buying printers. Used computers almost invariably pass through the hands of dealers. These dealers generally prefer to install all-IBM systems, so the statistics showing that non-IBM printers are more abundant on older machines reflect user preferences, not characteristics of the used equipment market.

Another factor that influenced the preferences of users of old IBM systems was the presence of a strong pcm supplier, Storage Technology Corp. While STC was growing into a billion-dollar business by supplying plug-compatible tape and disk systems, its printer subsidiary, Documation, was achieving substantial penetration into the IBM market. Things have changed dramatically since then, however.

Users, worried over STC's Chapter 11 bankruptcy filing, have been justifiably skittish, though the company's service and support received a great deal of attention from CEO Ryal Poppa. Should a new Storage Technology emerge from court protection with vigor—and the right products—the base of non-IBM printers on new IBM systems will almost certainly increase in size.

Outside the IBM arena, conditions are similar. The other mainframe makers have done roughly as well as IBM, selling most printers to their own user base. Ironically, Honeywell, the only mainframe that's succeeded in selling very high speed, nonimpact printers to IBM mainframe shops, seems to do worse than others in peddling printers of all types to its own customers. But the Honeywell survey data may be influenced by the company's minicomputer base. In the minicomputer business, users tend to be more independent of processor vendors than in the mainframe realm.

Users of DEC VAX machines are a good example of this independent streak among mini customers. Even though DEC printers enjoy good reputations, VAX users still buy a third of their machines from other suppliers. This can be partly attributed to the important role value-added resellers (vars) play in the DEC VAX market. Vars that provide independently made printers can often give users more value for their money. The vars, meanwhile, increase their profit margins through such sales.

The VAX market is also a much better target for independent printer makers than any other. Digital's VAX base includes more machines than that of the comparably powered IBM 4300 series. That base is also growing more rapidly than the 4300 base. Add to all this the availability of printer interface cards at modest prices, and you get a marketplace that simply boils with competition.

While all this may put the heat on marketing executives charged with selling DEC printers, the peripherals race helps the company sell processors and other system

![IBM Printers on 3090 Systems](image-url)
Printronix L-Series bar code printers are not afraid of work. Or overtime. They produce spec-quality AIAG, LOGMARS, UPC and EAN labels hour after hour. Day after day. Week after week. With no special treatment. Because these workhorses were made for the factory floor.

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### L-SERIES FAMILY

<table>
<thead>
<tr>
<th>Model</th>
<th>L150</th>
<th>L300</th>
<th>L600</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIAG Shipping Labels per hour</td>
<td>250</td>
<td>600</td>
<td>1,200</td>
</tr>
</tbody>
</table>

No wonder Printronix has put more bar code printers to work than anybody else. With the most service and support facilities nationwide.

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components to budget-conscious users. These days, that means just about everyone, as DEC’s financial results so clearly show. Also, there are indications that the mini manufacturer’s increasingly competitive home-brewed printers are winning market share among users who are putting in VAX machines. The statistics on the MicroVAX base, which includes a larger proportion of recent installations, show that Digital has done a better job of selling printers during the last year or two.

Other minicomputer makers have had mixed success in the printer business. One firm that comes out on the successful side is Hewlett-Packard. The California company, which has put tremendous emphasis on its peripheral wares, has earned strong user loyalty. HP has been providing excellent nonimpact printers for years, and its reputation for good service on all peripherals makes it a force in the field to be reckoned with. The result is apparent in the statistics and in the way the company has succeeded in selling printers to users of rival minicomputers.

It is not only the desktop laser printer market that Hewlett-Packard has taken by storm. The company’s minicomputer laser printers are also in demand. These printers are the basis of the hardcopy output on MCI Mail’s VAX network and they show up in many shops that have processors made by HP and its competitors.

Hewlett-Packard isn’t the only player in the nonimpact printer business. At the high end, IBM’s 3800s are the most widely used machines. Xerox also has a strong entry in the nonimpact niche, as does Honeywell. Kodak too is about to make the plunge into the minidater market, which has become a battleground for makers of high-end machines seeking to expand their business and producers of low-end printers that are looking for growth opportunities. The technologies used by various vendors include laser, LED array, and electrostatic transfer. It looks as if several techniques for inking paper will remain around for some time. So, of course, will paper, a persistent printer problem.

A nonimpact printer suffers from the same trouble copiers do. Paper is a dusty and generally annoying material to move through a complex machine. It also can be stubborn when it comes to taking toner. End users who want a choice in the type of paper they use for billing, management reports, and other kinds of computer-generated hardcopy are unsympathetic to the engineer’s dilemma. Every improvement in image quality that an engineer makes is met by a paper mill’s development of some new, cheap, attractive, and inhosspitable batch of squashed wood pulp.

Nonimpact printers reduce the cost of preprinted forms. As color capability is added to the machines—something likely to happen in the midrange before it does at the high end—even more forms will disappear. Nor has the large dp shop overlooked the way laser printers and their kin have changed desktop computing. By permitting users to control typography, graphics, and other aspects of document production, laser printers have greatly increased the effectiveness of computer printed materials.

Midrange laser printers, which have benefited from progress in page description languages, provide good graphics quality. For users of nonimpact printers, the job of moving images from a workstation screen to paper has been greatly simplified.

What’s coming in that era may not be coming from number one. Oddly enough, IBM has thus far been a laggard in the nonimpact printer domain. Most nonimpact printers generate images at 300 dots per inch, but IBM’s entries have a significantly lower resolution, 240 dots per inch. While several vendors have been able to link workstations to hosts and printers in a way that permits images to remain intact as they travel down the cables, IBM, with its diverse installed base and incomplete networking strategy, is unable to deliver end-to-end compatibility. While it’s true that IBM’s problem is far larger than that of other vendors, so is IBM’s capacity for coming up with solutions.

During the past couple of years, IBM has outlined much of its document interchange scheme, but so far the company has not committed itself to a page description language that can serve as a way to connect its diverse terminals, systems, and printers. To be sure, IBM has not entirely ignored these issues. Some of its products do support page composition software developed by outsiders and other IBM products can capture, move, and reproduce detailed images. But Big Blue’s products still don’t all work together in harmony. This same problem afflicts users of other vendors’ systems.

**Users Ahead of Vendors**

Hundreds of users are already well ahead of the vendors, pushing output systems to their limits. Banks, for example, have greatly improved the ease with which their statements can be read, as have credit card companies. Direct mail solicitations, group travel itineraries, stock analysts’ reports, and countless other computer-generated documents attest to the capabilities of nonimpact printers. By contrast, documents with the same content produced on impact printers are starting to look old-fashioned.

Yet image quality is only one appeal of nonimpact printer technology. In high-volume applications, laser printers are the
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Model 855: The 855 is the perfect printer for LQ word processing. Its removable font modules are available in over 30 type styles and special character sets.

OmniLaser: Available in three models, the 2015 and 2115 for shared-resource applications and the 2108 for workstations. The OmniLaser is designed to print more, print longer, and for less.

Model 860: The Model 860XL offers draft and correspondence printing and is ideal for spreadsheets and forms up to 16 inches wide.
Instruments. your needs are demanding.

Premium performance and industrial quality. That's what TI printers are known for. Their reliability has always been standard-setting. Their throughput, consistently high. And their quality surpasses the needs of their applications. Which means few, if any, failures and a minimum of downtime. In fact, about all the service a TI printer needs is a paper or ribbon change.

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The Model 810. The workhorse.

For almost a decade, the Model 810 heavy-duty 150 cps system printer has been printing forms and data reports in virtually unattended operation. Its performance has been so reliable that it's the choice of most of the world's major airlines for ticket counter service for one reason. If they aren't printing tickets, they aren't making money. We even took the 810's field-proven architecture and put it to work in our Model 880 system printers. You can't argue with success.

The Model 880 Series. The 300 cps heavy-duty system printers.

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The power and flexibility of the laser printer necessitate clever software.

most economical and fastest means to generate documents. Large utilities, financial institutions, and government offices have all installed high-end print engines in order to meet production goals. While a fast electromechanical line printer may run at 3,600 lpm, nonimpact printers can spew out upwards of 20,000 lpm in small type.

In terms of document output, several nonimpact printers exceed 100 pages per minute, and the fastest popular unit, IBM's 3800, runs at more than 200 pages per minute. Nevertheless, no laser printer can do the things an impact printer does.

Many jobs require the production of multiple copies, the handling of multipart forms, or the imprinting of self-stick labels. Other jobs are best run on wide paper, card stock, or other materials that accept oil-based inks better than toners. Whether or not laser printers can handle midrange tasks, impact printers are often the least expensive source of hardcopy output.

A mechanical printer capable of running, say, 1,000 lpm and surviving a high-duty cycle may cost $15,000; a nonimpact printer with output of 20 pages per minute can cost twice that much. As speed requirements fall to 300 lpm, prices of heavy-duty impact printers are dropping to the $3,500 range. While desktop laser printers can equal this throughput for a comparable price, they're not made to take the beating a line printer is built to handle.

At the micro level, where dot matrix printers still reign supreme, the laser printer is often a luxury. Nonimpact technology is replacing other means of printing with full-formed characters, but the machines are still too expensive, too large, and too sophisticated for small business applications. Accounting packages and spread sheets don't demand anything more complicated than a dot matrix printer, and getting these popular software applications to drive a nonimpact printer can be a chore.

The power and flexibility of the laser printer necessitates clever software; such ingenuity is rarely included in business programs. When pretty output is part of the job, the contest between printer technologies is a closer one. Dot matrix printers can draw graphs and charts, but the resulting printout falls short of what can be produced by a laser printer.

On the other hand, the most popular laser printer, Hewlett-Packard's LaserJet, even in its enhanced version, can't do full-page, high-resolution graphics—it will run out of memory before the program driving it runs out of points to draw. The lowly dot matrix printer, which has to remember only one band of dots at a time, can actually produce a more detailed though less crisp printout.

A user who must have graphs as well as character output can also buy an inexpensive plotter, a dot matrix printer, and a PC clone for less than the price of a LaserJet. But for the user who is more concerned with textual output, choosing the right printer for the right job is often a matter of character.

A selection of vendors and the types of printers each makes begins on p. 70.

Hesh Wiener is the president of Technology News of America Co., Inc., a New York-based research and publishing company. He is a contributing editor of Datamation.
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A SELECTION OF PRINTER VENDORS

The following list has been coded to show the types of printers each vendor makes. The codes are:

1) Dot matrix (black)
2) Dot matrix (color)
3) Fully formed characters (daisy wheel, minidrum, etc.)
4) Electromatic line (band, train, chain, dot bar)
5) Ink-jet (black)
6) Ink-jet (color)
7) Low-speed page printers (under 20 pages per minute)
8) Midrange page printers (20 to 75 pages per minute)
9) Production page printers (more than 75 pages per minute)

Advanced Color Technology
21 Alphas Rd.
Chelmsford, MA 01824
6 (CIRCLE NO. 100)

Advanced Matrix Technology Inc.
1157 Tourmaline Dr.
Newbury Park, CA 91320
2 (CIRCLE NO. 101)

Alphacom Inc.
2323 South Bascom Ave.
Campbell, CA 95008
1,3 (CIRCLE NO. 102)

Amdek Corp.
2201 Lively Blvd.
Elk Grove, IL 60007
3 (CIRCLE NO. 103)

American Computer Hardware Corp.
2205 South Wright St.
Santa Ana, CA 92705
1,8,9 (CIRCLE NO. 104)

Anadex Inc.
1001 Flynn Rd.
Camarillo, CA 93010
1,2 (CIRCLE NO. 105)

Andersson Jacobson
521 Chardot Ave.
San Jose, CA 95131
1,3 (CIRCLE NO. 106)

Anser Technology
5535 Airport Freeway
Fort Worth, TX 76117
9 (CIRCLE NO. 107)

Apple Computer Inc.
20555 Manans Ave.
Cupertino, CA 95014
1,3,7 (CIRCLE NO. 108)

AT&T
5555 Touhy Ave.
Skokie, IL 60077
1,2 (CIRCLE NO. 109)

BDS Computer Corp.
800 Maude Ave.
Mountain View, CA 94043
1,4 (CIRCLE NO. 110)

Brother International Corp.
9 Corporate Dr.
Piscataway, NJ 08854
1,3 (CIRCLE NO. 111)

Buff Peripherals
766 San Alsew Ave.
Sunolwale, CA 94586
9 (CIRCLE NO. 112)

Burroughs Corp.
Burroughs Pl.
Detroit, MI 48232
1,4,8,9 (CIRCLE NO. 113)

CAL-ABSCO
6041 Baril Ave.
Woodland Hills, CA 91367
1 (CIRCLE NO. 114)

Canon USA Inc.
One Canon Plaza
Lake Success, NY 11042
1,5,7 (CIRCLE NO. 115)

Cenronics Data Computer Corp.
1 Wall St.
Hudson, NY 12005
1,2,4 (CIRCLE NO. 116)

CIE Terminals Inc.
16842 Von Karman
Irvine, CA 92614
1,4 (CIRCLE NO. 117)

Citizen America Corp.
2425 Colorado Ave., Ste. 300
Santa Monica, CA 90404
1,3 (CIRCLE NO. 118)

Complete Electronics
23501 Ridge Route Dr., Building E
Laguna Hills, CA 92653
3 (CIRCLE NO. 119)

Computer Transceiver Systems Inc.
East 66 Midland Ave.
Paramus, NJ 07652
1 (CIRCLE NO. 120)

Comrex International Inc.
3415 Kashiwa
Torrance, CA 90605
1,3 (CIRCLE NO. 121)

Concept Technologies Inc.
P.O. Box 5277
Portland, OR 97208
7 (CIRCLE NO. 122)

Conftronix Inc.
3848 Marquis Dr.
Garland, TX 75042
1 (CIRCLE NO. 123)

Cordata Inc.
275 East Hillcrest Dr.
Thousand Oaks, CA 91360
7 (CIRCLE NO. 124)

CPT Corp.
8100 Mitchell Rd.
P.O. Box 295
Minneapolis, MN 55440
1,3,7,8 (CIRCLE NO. 125)

Cradek Peripherals Corp.
204 Cooper Center
North Park Dr.
Penneuken, NJ 08109
1 (CIRCLE NO. 126)

Daisy Systems Holland BV
3731 Northcrest Rd., Ste. 28
Atlanta, GA 30349
3 (CIRCLE NO. 127)

Data Card Corp.
Troy Div.
2331 South Pullman St.
Santa Ana, CA 92705
4 (CIRCLE NO. 128)

Data Engineering Inc.
2515 North State Rd. 7, Ste. 207
Margate, FL 33063
4 (CIRCLE NO. 129)

Data General Corp.
4400 Computer Dr.
Westboro, MA 01580
7 (CIRCLE NO. 130)

Datagraphix
P.O. Box 82449
San Diego, CA 92138
9 (CIRCLE NO. 131)

Datapoint Corp.
9725 Datapoint Dr., MS H13
San Antonio, TX 78284
1,3,7 (CIRCLE NO. 132)

Data Printer Corp.
99 Middlesex St.
Malden, MA 02148
4 (CIRCLE NO. 133)

Dataproducts Corp.
6200 Canoga Ave., MS 2032
Woodland Hills, CA 91365
1,2,3,4,7,8 (CIRCLE NO. 134)

Datashow Computer Corp.
4216 Stuart Andrew Blvd.
Charlotte, NC 28210
1,2 (CIRCLE NO. 135)

Data Terminals and Communications
590 Division St.
Campbell, CA 95008
3,4 (CIRCLE NO. 136)

Decision Data Computer Corp.
400 Horsham Rd.
Horsham, PA 19044
1,3 (CIRCLE NO. 137)

Delphax Systems
315 University Ave.
Westwood, MA 02090
8 (CIRCLE NO. 138)

Di/An Controls Inc.
944 Dorchester Ave.
Boston, MA 02125
3 (CIRCLE NO. 139)

Digital Associates Corp.
260 West Ave.
Stamford, CT 06902
1,3,4 (CIRCLE NO. 140)

Digital Equipment Corp.
146 Main St.
Maynard, MA 01754
1,3,4,7 (CIRCLE NO. 141)

Digital Matrix Corp.
105 Filley St.
Bloomfield, CT 06002
1 (CIRCLE NO. 142)

Docutech/Offiwest Inc.
106 Decker Court, Ste. 300
Irving, TX 75062
5 (CIRCLE NO. 143)

Dynax Inc.
6070 Rickenbacker Rd.
Boca Raton, FL 33428
1,2,3 (CIRCLE NO. 144)

Epson America Inc.
Computer Products Div.
2780 Iomita Blvd.
Torrance, CA 90505
1,2 (CIRCLE NO. 145)

Ergo Systems Inc.
303-5 Convention Way
Redwood City, CA 94063
1,2,3 (CIRCLE NO. 146)

Facit Inc.
9 Executive Park Dr.
Memphis, TN 38024
1,2,3 (CIRCLE NO. 147)

Florida Data Corp.
600 D John Rodes Blvd.
Melbourne, FL 32935
1 (CIRCLE NO. 148)

Fujitsu America Inc.
3055 Orchard Dr.
San Jose, CA 95134
2,3,4 (CIRCLE NO. 149)

General Business Technology Inc.
1891 McGaw Ave.
Irvine, CA 92714
1,3,4,8 (CIRCLE NO. 150)

General Optronics Corp.
Two Gleen Ave.
Edison, NJ 08820
6 (CIRCLE NO. 151)

Genicom Corp.
1 General Electric Dr.
Waynesboro, VA 22980
1,2,4,7 (CIRCLE NO. 152)

GTC Technologies Inc.
216 West Florence Ave.
Inglewood, CA 90301
7 (CIRCLE NO. 153)

Hermes Products Inc.
Printer Div.
1900 Lower Rd.
Linden, NJ 07036
1,2 (CIRCLE NO. 154)

Hevla Computer and Communications Industries Inc.
P.O. Box 970
Melbourne, FL 32901
4 (CIRCLE NO. 155)

Heewitt-Clark Co.
19447 Pomeridge Ave.
Cupertino, CA 94014
1,4,5,7,8 (CIRCLE NO. 156)

Honeywell Information Systems Inc.
65 Walnut St.
Westellesby Hills, MA 02181
1,4,9 (CIRCLE NO. 157)

Image Corp.
2650 San Tomas Exwy.
Santa Clara, CA 95056
7,8 (CIRCLE NO. 158)

Imtec Inc.
15 Columbia Dr., Unit 7
Amherst, NH 03031
1 (CIRCLE NO. 159)
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<table>
<thead>
<tr>
<th>Company Name</th>
<th>Address/Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Juki Office Machines Corp.</td>
<td>Torrance, CA 90502</td>
</tr>
<tr>
<td>Inteolor Corp.</td>
<td>Reston, VA 20160</td>
</tr>
<tr>
<td>Interface Systems Inc.</td>
<td>Ann Arbor, MI 48103</td>
</tr>
<tr>
<td>IBM Corp.</td>
<td>Old Orchard Road, Amronk, NY 10504</td>
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<tr>
<td>JDL Inc.</td>
<td>Torrance, CA 90501</td>
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<tr>
<td>Juki Office Machines Corp.</td>
<td>Torrance, CA 90501</td>
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<tr>
<td>Kentek Information Systems Inc.</td>
<td>Anaheim, CA 92803</td>
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<tr>
<td>ITT Qume Corp.</td>
<td>San Jose, CA 95131</td>
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<tr>
<td>JDL Inc.</td>
<td>Westlake Village, CA 91361</td>
</tr>
<tr>
<td>Leading Edge Products Inc.</td>
<td>Torrance, CA 90501</td>
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<tr>
<td>LEAR Siegel Inc.</td>
<td>Allendale, NJ 07401</td>
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<tr>
<td>LaserMaster, Ltd.</td>
<td>P.O. Box 1439, Minnetonka, MN 55345</td>
</tr>
<tr>
<td>LEAD Edge Products Inc.</td>
<td>20437 South Western Ave., Torrance, CA 90501</td>
</tr>
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<td>LEAD Edge Products Inc.</td>
<td>1,2 (CIRCLE NO. 167)</td>
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<td>Kentek Information Systems Inc.</td>
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<tr>
<td>Lear Siegel Inc.</td>
<td>Data Products Div.</td>
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<tr>
<td>LEAD Edge Products Inc.</td>
<td>714 North Brook-Hurst St., Anaheim, CA 92803</td>
</tr>
<tr>
<td>LEAD Edge Products Inc.</td>
<td>1,2 (CIRCLE NO. 171)</td>
</tr>
<tr>
<td>LEAD Edge Products Inc.</td>
<td>105 Filley St., Bloomfield, CT 06002</td>
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<tr>
<td>LEAD Edge Products Inc.</td>
<td>1 (CIRCLE NO. 172)</td>
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<tr>
<td>LEAD Edge Products Inc.</td>
<td>8301 South 180th St., Kent, WA 98032</td>
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<td>LEAD Edge Products Inc.</td>
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<td>Magnetics Corp.</td>
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<td>Memodyne Corp.</td>
<td>220 Reservoir St., Needham Heights, MA 02194</td>
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<td>Micro Peripherals Inc.</td>
<td>1 (CIRCLE NO. 175)</td>
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<tr>
<td>VERSATEC INC.</td>
<td>2710 Walsh Ave., Santa Clara, CA 95051</td>
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<td>VERSATEC INC.</td>
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<td>VERSATEC INC.</td>
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CIRCLE 2 ON READER CARD
In the search for storage, IBM and the independents are looking for ways of . . .

by John W. Verity

As hardware prices steadily drop and mainframe applications reach further and further into the corporation—automating functions in virtually every department and serving remote processors in networks of increasing complexity—the demand for on-line disk storage capacity continues to explode. That capacity is currently growing at close to 40% compounded annually.

The typical large 370 installation now comprises upwards of 30GB of direct access disk storage (DASD). By the mid-1990s, some observers say, on-line capacities of a terabyte (1,000GB) or so will not be uncommon in many large sites. Although database management systems will be there to handle much of those data, an unwieldy collection of hundreds, if not thousands, of discrete datasets for testing, production, and backup will remain. How to manage those datasets as they migrate between disk, tape, and future mass storage devices is fast becoming a problem of epic proportions.

"Historically, we've seen it take one person to manage each 10 to 15 gigabytes of on-line storage," says Victor Swan, marketing manager at Cambridge Systems in Santa Clara. "But with a terabyte on-line, there's no way people will be able to do it. They will most certainly need help from the system itself."

And that help is on the way. It's embodied in the evolving concept of automated storage management. IBM and independent software competitors are hard at work preparing products that in the future will transparently and automatically arrange data files in hierarchical schemes, putting the most active ones on disk for instant access and keeping less-used files close at hand on cheaper storage devices. In fact, much of this storage management function is already available today. IBM and rival vendors are vying for a market of approximately $60 million a year, a market that is expected to grow significantly as the demand for DASD capacity continues to rise.

While no one is committing himself to describing products that will be available in the next decade, some general technical trends are already visible. One of the most prominent is the push toward integrating presently discrete products. Also discernible is the increasing role played by the mainframe system itself in the movement of datasets.

IBM has already taken steps in the integration direction. The company has adopted the Data Facility moniker for a mutually compatible family of program products that "form the strategic base from which IBM is evolving to a system-managed storage environment." These include the Data Facility Product (DFP), the Hierarchical Storage Manager (DFHSM), a record sorting package called DFSort, and the Data Set Services (DFDSS) program.

The DF family can work closely with other IBM products: the Resource Access Control Facility (RACF), which is the company's primary data security offering; the TSO timesharing system; and the DB2 relational database management system. As IBM has stated, the DF family is a "foundation for response to the expanding storage management requirements in the MVS/ESA environment."

COMMON DF FAMILY INTERFACE

Early this year, IBM unveiled to users a "consistent, common interactive interface" for the DF family in the form of the Interactive Storage Management Facility (ISMF). Based on the facilities of IBM's Interactive System Productivity Facility (ISPF), the ISMF provides storage administrators and users with a series of interactive screens to choose from. They can also select datasets for certain operations. One of ISMF's prime advantages is that it eliminates the bother of creating and debugging JCL code—chores needed when operating "manually."

ISMF users can also browse through datasets, copy them, and delete them. IBM described the product as providing a simplified command syntax, input prompts, defaults, last-use priming, on-line help, and full use of CRT screens—all of which can improve dp shop productivity.

ISMF provides a "syntax umbrella" that controls the individual DF programs that actually manipulate datasets. Michael Braude, who tracks mainframe software developments for the Gartner Group in Stamford, Conn. It is meant, he says, to shield users from much of the complexity of those programs and to "exploit the synergy between them."

Braude notes that IBM seems to be incorporating nearly "half of MVS" under that umbrella, including data access methods and the operating system's entire I/O subsystem structure. Most of the work on such subsystems takes place in Santa Theresa, Calif., and in Poughkeepsie, N.Y., home to two large IBM development centers. Braude speculates that related work is also going on in Tucson, Ariz., where much of the company's mass storage hardware is designed and manufactured.

The Gartner Group analyst believes IBM's interactive umbrella has gone a long way toward answering users' calls for a common interface to what were once seen as a motley collection of "primitive mechanisms." Nevertheless, competitors can still stay in the game with products that replace individual components of the DF family—products they claim offer better functionality and performance than IBM's packages.
“IBM would like to go to a single-level storage scheme.”

In the sorting package market, the industry leader has been playing catch-up for a long time with the independent software houses. More recently, the independent software vendors have targeted IBM's hierarchical storage manager (HSM) with relatively good success. This is the package that keeps track of datasets as they move among disk, tape, and, once upon a time, IBM's ill-fated 3850 mass storage device.

The two most successful companies competing for HSM business are Cambridge Systems and Sterling Software, Rancho Cordova, Calif. Cambridge marketing manager Swan says his company introduced its ASM product in 1974 to help users manage a proliferation of datasets in the batch-only computing environment that was common in those days. "ASM was designed for archiving of seldom used datasets," Swan explains. "It moved stuff to tape when you weren't using it.

Then, as interactive computing came into fashion, ASM/2 evolved functionally to take advantage of new 370 computing facilities and the ongoing series of storage devices introduced by IBM and its competitors. The most dramatic of these was certainly the 3850, which stored data on broad pieces of videotape contained in cartridges that were stored in and plucked from a honeycomb-like rack. IBM, which sold less than a thousand 3850s, finally stopped marketing the device altogether.

In the meantime, HSM, which staged datasets on disk after they were called out of the 3850 by an application program, had caught on sufficiently to be used without the Rube Goldberg hardware.

A GRAND LEAP FORWARD

Cambridge's Swan says that ASM/2 also took a grand functional leap forward several years ago when it was enhanced with new facilities that enable it to better track the usage of individual datasets, storing them on the appropriate mechanical devices. With ASM/2, users can define classes of datasets that are to be treated in different ways; production data, for instance, are most likely to remain on disk, while test data, if not used for a few days, might be automatically transferred to tape. The goal is to free disk space for high-priority data and to improve overall system and worker productivity.

Swan feels that storage management has long been "person driven," because users themselves or dp staff had to intervene with the system to move data between storage devices. The latest version of ASM/2 is automatically invoked in a way that he claims is "totally transparent to the end user. He has no need to know where his data is—the software keeps track of where each dataset is and can move it as needed." Cambridge calls the new function IXR, for intelligent, transparent restore.

Swan stops short of calling the IXR capability artificial intelligence. "What does AI mean?" he asks, displaying more true intelligence than many a buzzword-happy marketing executive these days. But he adds that Cambridge "is going to build more 'intelligence' into the ASM/2 product and enable it to make better decisions. We're trying to remove the decision-making process from the end user." Swan reports that the installed base of ASM/2 is "in the neighborhood of 900 copies."

At Sterling's systems software marketing division, the answer to IBM's HSM goes by the name of DF/MVS. Introduced in 1976, it too has evolved over the years to handle automatically tasks that once required tedious attention from system users and administrators. "We try to deal with the total range of managing storage," says Kelpon Kinnick, the product's development manager. "This includes backups, archives, device conversions, compressions, DASD billing, and reporting.

"Most of the developments in hardware technology," declares Kinnick, "are complicating the storage management issue, because they've increased the recording density disks. All that does is give managers and budget people a way to put more data on-line. There are more bytes and more datasets. The problems of today and tomorrow are identical to those in the past, but the sheer magnitude has increased the level of severity of those problems. Storage management has been a labor-intensive task, but it's getting so you can't get your hands around it."

Both software companies claim their products outstrip IBM's HSM, primarily in the areas of functionality and performance. "We address a broader spectrum of needs," maintains Kinnick. "Our customers are used to the idea that we give them systems that can be tailored and can manage storage the way they want to do it."

Cambridge's Swan says that HSM is "very global in nature" and users archiving datasets cannot be as selective as they can be with ASM/2. He also contends that the Cambridge product has better reporting and flexibility than HSM.

Both Cambridge and Sterling vow they are not afraid of IBM locking them out of the evolving systems software arena, either through the intricate functional binding work done by PC vendors or through the changing of software interfaces. "We make a big attempt to sit on the outside [of IBM's operating system]," says Sterling's Kinnick. "We try to stay out of the internals. There are only three places where we go inside and there we try to use IBM-documented interfaces. One of those interfaces does not work as documented, but we've still figured out how to use it. We've made changes so we can coexist with IBM, even with HSM itself."

Cambridge's Swan reports that "IBM has stated to us and in marketing presentations to customers that its Data Facility products will evolve independently of MVS. Swan doesn't expect IBM to bundle the DF products into a single package with a single price tag, for two reasons. First of all, by marketing separate DF products, IBM can generate additional revenue. Second, and even more important, the company must keep the DF family composed of discrete "chunks" simply to make their development manageable.

"IBM could never evolve these products to the next generation all at the same pace," Swan points out. The only possible problem he sees is if IBM decides to integrate the RACF security package more tightly with DF components. "That would cause us a problem," Swan admits, "but it would hurt [IBM's] own customers as well."

How will future hardware developments affect storage management software? To forecast the future, you must take a look at what's going on now. Today, peripheral controllers seem to be getting more intelligent with each new operating system version, and new storage and memory technologies are adding more levels to the overall storage hierarchy.

SHOULD CONSIDER CACHE

The storage management function, predicts Swan, "could go into the controller, but that is over the horizon for now. But we must consider [disk] cache as something we might want to get involved with in the future... If we could identify datasets that are to be randomly and sequentially accessed, and store them in cache when appropriate, we could maximize system throughput."

The view from the Sterling camp is that IBM could use hardware "hooks." But as Kinnick notes, the company has "stated publicly [at GUIDE meetings] that they won't do that."

Kinnick also feels confident there won't be a block by Big Blue. "IBM has not done anything in recent times that makes us think they have any intentions of locking us out," he says. Well aware of the subtleties involved here, Kinnick is quick to point out that IBM's DF programs are delivered in object code form only, which makes them...
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Vendors expect IBM will eventually come out with a "jukebox" version of its 3480 tape drive.

relatively difficult to decipher.

Despite talk to the contrary, both vendors expect IBM will eventually come out with a "jukebox" version of its 3480 cartridge-based tape drive. The drive would be able to store hundreds or even thousands of cartridges for automatic loading under control of the operating system, or perhaps under the control of DF and competitive software. Storage Technology, the financially troubled maker of IBM-compatible peripherals, has already made it quite clear that even if IBM does not come out with such a device, STC will. In fact, the company, which has pinned its hopes for future revenue growth on the product, is believed to be gearing up for a formal introduction of the drive.

The STC announcement could come any day now. IBM's moves, on the other hand, remain a mystery. Deciphering IBM's intentions, which has never been easy, is particularly hard in the crucial area of mass storage, which has long been a big contributor to company coffers. "IBM would like to go to a single-level storage scheme in which the user perceives all his datasets as residing on the same device," speculates the Gartner Group's Braude. "The goal would be to manage storage at the logical, not physical, level."

Braude goes on to talk about a hush-hush IBM development program known as Project Jupiter, which supposedly involves as many as 300 people in Santa Theresa and Tucson. What those people are reportedly working on is applying Artificial Intelligence methods to storage management problems. "Every once in a while these guys come out of the lab and try out one of their prototypes," says Braude. "They have a lot of fancy design goals."

Meanwhile, the independents have some projects of their own. They say they are exploring advanced scheduling techniques that could monitor system activity and initiate storage management tasks as time and space permit. This would take some work off the shoulders of the administrators who are currently overloaded with such chores.

The independents and users are also keeping a watchful eye on Db2 developments. Of particular concern is the relationship between the database manager and IBM's DFS. The software houses claim their products work as well as IBM's with Db2. Nevertheless, it is conceivable that Db2, which already manages its own datasets, might become more tightly tied into DFS's various facilities.

Cambridge's Swan insists that he is not worried about this possible tie-in. "Not all data is in the database management system," he declares. "There will always be individual datasets for us to manage."

But how should your data be stored and managed? The question is posed by the Gartner Group's Braude. "That depends on what the data is used for," he answers. "I see lots of levels of physical storage in the future—multiple members of the 3380 disk, optical devices, tape drives. There will be more granularity in the storage hierarchy."

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by David Stamps

It was the third-party leasing company that called the dp manager's attention to the fine print in the contract he'd signed last March—a contract for a couple of IBM 3380 disk drives. The manager had entered into what's called an ITC-lessee deal, meaning that the 10% Investment Tax Credit allowed for new equipment such as computers was handed back to the leasing company.

The practice has been commonplace in computer leasing in recent years. Since the decision to lease equipment is usually made as a hedge against technological obsolescence—not for tax advantages—dp managers have normally handed ITCs back to the lessor in return for lower monthly rental rates on the equipment.

But 1986 was not normal. For much of the year, Congress was making noise about a new tax bill, one provision of which was the repeal of the ITC. In June, when the tax bill's chances of passage began to look good, the lessor directed the dp manager's attention to the fine print, and a thing called the ITC indemnification clause. It stated that if the ITC were repealed retroactively to Jan. 1, 1986, the lessee would have to "make the lessor whole," on the basis of after-tax yield.

What does that mean? The answer is not always clear and may in some cases be a matter for company lawyers. But at the very minimum, the lessee must fork over 10% of the equipment costs to the lessor.

The loss of the ITC benefit is just one of several changes that the new tax code brings to the computer leasing marketplace. Among the longer-term effects is the strong probability that lease rates will increase (see "What Price Leasing?"). There's an equally strong likelihood that the number of leasing companies will decrease and that lease/purchase decisions will have to be analyzed much differently from the way they have been in the past. Already, some users have found themselves studying the fine print on their current lease contracts.

"Fortunately, we didn't acquire that much equipment this year," says the dp
WHAT PRICE LEASING?

A question soon to tax the minds of dp managers everywhere is how high will lease rates rise, once the full effects of tax reform are felt. The obvious answer is 10%, the amount of the Investment Tax Credit (ITC) that will be immediately lost to new equipment deals—at least until such time as the economy goes into a tailspin and Congress feels political pressure to reinstate the ITC. (The latest repeal of the ITC is the third in the past 20 years. Since previous repeals have been followed by immediate slowdowns in nondefense capital spending, many observers believe the ITC will be reinstated, possibly before the 1988 elections.)

But the new tax law changes more than the ITC, of course, and some of these changes will affect lease rates. For example, the tax bill contains provisions for a change in the corporate tax rate to 34% from 46%, sets a new alternative minimum tax of 20%, and allows quicker depreciation of computer equipment under the accelerated cost recovery system.

Other indirect changes resulting from tax reform could influence lease rates as well. Many smaller leasing firms could lose their primary sources of capital, i.e., investors who in the past sought tax shelters. That drying up of capital could increase the rates they quote. Many believe the small leasing companies will be shaken out of the market entirely. Assuming they have been a factor in keeping lease rates down, their disappearance could be a factor in driving rates up.

Whether or not the predicted disappearance of small lessors will drive up rates is a subject of debate. James Benton, president of the Computer Dealers and Lessors Association (CDLA) in Washington, D.C., believes the leasing business will remain competitive. "With 300 members in the CDLA and another 800 members in the American Association of Equipment Lessors [Arlington, Va.], it hardly makes sense to say the computer leasing business isn’t going to be competitive." He adds, "You only need two firms to get competitive bids."

Customers don’t necessarily see it that way. "It’s true that the big leasing companies like Comdisco [Rosemont, Ill.] and CMI [Brookfield Hills, Mich.] bid against each other," notes one dp manager who claims to be an experienced lessee. "But if you don’t have those little guys making bubbles in the leasing business, you’ll see prices start to slide up."

While most lessors say they expect lease rates to rise, few are willing to cite a specific figure. One person willing to do so is Tom Martin, president of Computer Financial Inc. in Hackensack, N.J. Martin, who did computer runs in September to find out how the tax bill would affect his business, claims that lease rates will increase about 20%. Citing four provisions of the tax bill, Martin offers this breakdown: loss of the ITC will cause rates to rise to 12% from 8%; the change in the corporate tax rate will increase lease rates by 8%; and the alternative minimum tax provision will increase rates anywhere from 1% to 4%.

The accelerated cost recovery system will have the effect of lowering rates by about 2%, estimates Martin. But that 2% will be more than offset by the disappearance of private investors from the leasing market, which he estimates will boost rates anywhere from 1% to 5%.

"The deep shelter syndicators will be removed from the leasing market and that will have a big impact on rates," says Bruce Smith, vp at BancNewEngland Leasing Group, a subsidiary of the Boston-based Bank of New England that operates as a diversified equipment lessor. "A number of leases relied on those investors, and computer leases have been especially popular for tax-oriented leasing deals," he explains. "High-tech gear, particularly mainframes, tends to command higher rental rates; that has allowed computer deals to raise more tax leverage."

The assumption that lease rates will go up is not universal. Bob Djurjdevic, a Phoenix forecaster of computer equipment residual values, believes that increased competition in the leasing industry could hold rates at their present levels. "Most lessors would have us believe that rates will go up. That’s assuming that as the cost of production goes up, prices go up. That’s not true," he argues.

"Competition is what dictates prices and I foresee a sharpening of competition," Djurjdevic continues. "With tax considerations going away, lessors will have to risk more of their own money. Changes in the tax law are going to bring this industry closer to reality."

Closer to reality means more closely tied to equipment residual values, not tax benefits. Others in the industry acknowledge that such a change could indeed mean more competition among lessors. Still, says BancNewEngland’s Smith, "it would take a lot more competition than you’re going to see to compensate for the loss of the ITC."

He adds firmly, "Lease rates will go up."

Many in the industry are also predicting that the alternative minimum tax provision of the new tax law could have a dramatic effect on the leasing business. For lessors, the impact will be largely beneficial. One strategy companies may use to avoid paying the 20% alternative minimum tax will be to lease equipment rather than purchase it; for some capital-intensive companies, the cost of leasing may be lower than the 20% tax triggered if the equipment is purchased and then depreciated. Some observers expect the minimum tax will boost the demand for leasing in general.

For computer users, the effects will be less advantageous: they could be picking up the buck passed on by leasing firms. Leasing companies haven’t been taking the ITC off the hands of their customers for years just to be nice guys; they have used tax benefits to cut their own tax liabilities to near zero. As a result, virtually every leasing company in the business will be hit with the 20% minimum tax, and they will try to pass that cost on to their customers.

"What doesn’t bode well for the industry, at least in the near term, is that there is going to be a lot of upheaval," says Bob Gulko, president of Unicorn Leasing Corp in Sausalito, Calif. What with the income funds entering into the business, and attempts to take advantage of tax benefits before the new tax law takes effect, Gulko says he has seen in the past 12 months some of the lowest rates in years. He believes that the reverberations from the tax bill will be felt for a while. Until things settle down, Gulko predicts, "rates are going to be all over the place."—D.S.
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Small, tax-oriented lessors could be driven out of the business.

"The bookkeeping on this alone is a world-class pain," declares Rick Forsythe, a partner in Forsythe & McArthur, a Skokie, Ill., leasing firm. "It has the potential to be a real national problem. Looking at IBM equipment alone, and assuming that $5 billion worth of IBM equipment transactions were done as ITC lessor deals, that is half a billion dollars that lessors are going to have to recover. They're going to have to do it by going back to lessees and asking them to ante up."

That's assuming that lessees who inked ITC-lessor pacts will be asked to cough up just 10% of the equipment cost. Some lessees will be shown computer printouts purporting to prove that they owe the lessor anywhere from 15% to 20% of the equipment cost. The reason for the higher figure has to do with the indemnification clauses that state that if the ITC is repealed, the lessor must be made whole on the basis of after-tax yield. Covering the accumulated total of lost tax benefits to the lessor, or the lessor's investors, could actually mean paying more than a straight 10% of equipment costs.

REAL GOUGING POTENTIAL

"Our leasing vendor tells us that he will not push for more than 10% of the cost of equipment," reports Dick Reidy, vp of information management at Union Labor Life Insurance in Washington, D.C. "It appears to me that unless you've dealt with a reputable vendor, there is a real potential for some gouging on this one."

James Benton, president of the Computer Dealers and Lessors Association (CDLA) in Washington, D.C., is reluctant to predict how much gouging will be going on. "I don't think it's going to be real widespread, but the whole issue is going to be fraught with confusion. It's not the sort of thing that's going to foster harmonious relations between lessors and lessees."

Just how big a problem retroactive ITC payments become will be known only when lessors begin billing customers. Even then, the true scope may never be widely known.

"There are lots of firms—banks and other leasing organizations—in the business of originating leases at the lowest rates," explains Bob Gulko, president of Unicom Leasing Corp. in Sausalito, Calif. "A lot of customers only look at the lowest rates, and I'm sure there are some who will have been caught, but I doubt if you'll find many people willing to stand up and admit it." Gulko is also treasurer-elect of the CDLA.

Not all dp managers were caught out in the rain over the ITC revision. Some were attuned to the tax climate enough to shun ITC-lessor transactions.

"Normally, we give the ITC back to the lessor, but this year, given the tax climate, we just ignored it and paid a higher monthly lease rate," reports Mark Stonecipher, facilities manager for Arthur Andersen's Advanced Systems Center in Chicago. "I'm sure there are people in the industry who didn't put two and two together, though. It may not be as many as one in 10—maybe only one in 25—but some of those people are going to find themselves in hook up to their noses."

Some leasing companies claim they tried to prepare customers as far in advance as possible. Frank Chartier, executive vp for financial services with CMI Corp., Brookfield Hills, Mich., says his firm "tried to make sure lessees went into a deal aware of the financial hits. Wherever possible, leases quoted specific rates, and we have tried to keep customers notified as developments with the tax bill transpired."

Nevertheless, indemnification clauses with an imprecise "make the lessor whole" statement are fertile grounds for disputes. "It's possible some lessors could end up suing lessees in order to get their money," Chartier admits.

"Frankly, I don't know what the response will be when we start to contact customers," declares Marc Keepman, senior vp of financial services for Dataserv, a computer leasing firm in Minneapolis. "For the most part, lessees are pretty savvy about indemnifications, especially for a big-ticket item like a mainframe. Some will say, 'I was waiting for your call.' Others may not have been thinking about it at all. I'm a little anxious."

SAVvy ENOUGH TO HOLD OUT

Many dp managers were apparently savvy enough about indemnification to hold out for lessors willing to write leases without an ITC clause. A number of leasing companies claim their volume for 1986 is down because they had to walk away from dp managers who insisted on such deals. Few lessors would admit to writing ITC-lessor contracts without an indemnification, though many say they knew of competitors who had done so.

"We did a few deals where the equipment cost was only $150,000 or so," reports one lessor. "On a small deal, we can make up the ITC; it's hardly worth the paper work. But to write a deal on a large processor with no indemnification—after June you'd have had to be crazy to do that."

Such deals were reportedly done, however—evidence, perhaps, that the third-party leasing business retains a wheeler-dealer aspect that savvy dp managers can profit by. Dataserv's Keepman estimates that his company lost out on half a dozen contracts because competitors were willing to write nonindemnified leases.

Nonetheless, according to many lessors, the effect of the new tax code will be to drive small, tax-oriented firms who traditionally offer cut-rate leases out of the business. The leasing business will be consolidated, in this view, among a smaller number of well-financed companies—so-called larger lessors—that provide services in addition to low-cost leasing.

Some observers predict that leasing companies will try to differentiate themselves from one another with extra services, and that the leasing market will become highly segmented. As the task of setting rates based on forecasted residual values—the anticipated value of the leased equipment at the end of the lease—requires ever sharper pencils, the smaller leasing companies will have to focus on niches in order to play the game.

Centron DPL, a Minneapolis leasing firm, has already taken the niche market approach, specializing in communications front-end processors. Moreover, it offers installation and equipment refurbishing through a separate division. This year, it's adding a new division to provide network services.

One must excuse dp managers, however, if they seem mostly unaware of niches and diversification in the leasing business at large. Ask any dp'er why he turns to third-party lessors for his equipment, and the answer is not likely to be network service, disaster recovery, or maintenance.

"I'm looking for the lowest rate," says David Johnson, corporate vice president for MIS at National Car Rental Systems in Minneapolis. "Smaller companies may need those services. A big company can usually get IBM to provide service if it pushes them."

"Low rates" are also what Chemical Bank vp Louis Riehl seeks. "Price is absolutely the main concern," he insists.

Echoing these bottom-line sentiments is Arthur Andersen's Mark Stonecipher. "I don't need technical support services, I don't need physical planning, and I don't need a monthly rehash of the Gartner newsletter," he says. "I'm only interested in leasing because it offers lower rates. But now, thanks to the new tax law, those rates will not be as low as before."

David Stamps is a Minneapolis-based freelance writer.
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CIRCLE 41 ON READER CARD
Electronics can help companies build their own publishing empires.

by Connie Winkler

What you see is what you get—
in the competitive cry of those vendors on
the desktop edge of electronic publishing
technology. In the WYSIWYG world, what
appears on the CRT screen is exactly what’s
reproduced on paper, with no embedded
codes. WYSIWYG, however, is an ironic
sales-phrase, because what users are actually
getting is a mixed bag of hardware and
software options accompanied by a rush
debate about the benefits of electronic
publishing.

Electronic publishing is the automated integration of text and graphics for
paper output — operations that are usually done by the traditional commercial typesetting and printing trade. Electronic publishing using a microcomputer and laser printer to attractively display text on a printed page is referred to as desktop publishing. In the overall field of electronic publishing, some of the most satisfied users are those who have large mainframe-based systems that combine huge databases with electronic composition systems and character printers. Two leading-edge users in this market are Sun Microsystems Corp., Oak Brook, Ill., and Apple Computer Inc., Cupertino, Calif.

Despite the big differences in capabilities between low-end systems and high-end systems, electronic publishing is one of today's liveliest applications, especially at the desktop level. Printing centers that provide fast turnaround are beginning to appear in storefronts, much the same as copy shops — and in many cases the two operations are actually one and the same.

Desktop publishing proponents envision a $4.5 billion market by 1990. That multimillion-dollar business does not even include revenues that could flow from increasing corporate publishing. Only 3% of the 700,000 corporate printing operations are now users of electronic systems, according to John Kopeck, director of electronic publishing market analysis at Dataquest, the San Jose, Calif.-based market research firm.

The new battle for the desktop is once again between Apple and dataquest products that by late next year, with estimated $800 million in revenues from desktop systems, will pull ahead of Apple, which is expected to make $705 million from its desktop wares.

Apple's graphics-oriented Macintosh and LaserWriter printer introduced in January 1985 helped the company establish an early lead in the desktop document imaging market and competitive products have that feature, and most other desktops, so that many more have been added in just six years since
processing packages to Hewlett-Packard LaserJet printers to produce newsletters or proposals. Those publishing options should increase within the next few months as companies such as Software Publishing Co., Mountain View, Calif., Aldus Corp., Seattle, and Xerox's recently acquired Ventura Software fulfill their promises to deliver desktop packages for the IBM PC.

DESKTOP SYSTEM SATISFIES

One user unaffected by such PC market moves is WGBH Education Foundation, which is happy with its Mac-based desktop publishing system. "One of the surprises," comments WGBH senior designer Paul Souza, "has been how many other things we could do with the system."

The Macintoshes were originally brought into WGBH to design routine internal documents such as proposals, letterheads, and newsletters, which had formerly been done with typewriters. "We wanted to improve the quality of low-end projects," explains Souza. Now the design group is doing 300-page new project proposals with the help of the Mac system.

The award-winning public television producer has three Macintosh desktop systems running such art and composition software as MacDraw and MacPaint from Apple and PageMaker from Aldus. PageMaker enables WGBH staffers to preview multiformatted text and images transmissions in multi-vendor environments. That's possible because of the LaserWriter system, which has already been shipped to WGBH. This process, says Jacqueline Kahle, marketing manager for departmental systems at WGBH, is also available on the RT computer...

WGBH, together with other "publishing island" systems is not without glitches, however. "While it's one thing to publish your own newsletter, the true productivity is in being able to share information in a workgroup..." points out Jacqueline Kahle, marketing manager for departmental systems at WGBH.

In the past, operators had to dial up a minicomputer-based typesetting system at the company's Duluth, Minn., operations site or use composition software, which sells in the $30,000 range, is also available on the RT and from Digital Equipment Corp.

A good example of these mini-replacement systems is the $7,000 SuperPage page composition system from Bestinfo, Springfield, Pa. The second attack on the midrange front has been launched by manufacturers and software developers in the 32-bit workstation market. Such sophisticated typesetting and composition software, which sells in the $30,000 range, is also available on the RT and from Digital Equipment Corp.

The growth of such desktop or other "publishing island" systems is not without glitches, however. "While it's one thing to publish your own newsletter, the true productivity is in being able to share information in a workgroup..." points out Jacqueline Kahle, marketing manager for departmental systems at WGBH.

Although the dividing lines are blurry, electronic publishing systems generally fall into three categories. First, there are desktop publishing systems based on a personal computer and a laser printer. Moving up a notch, you'll find midrange systems that traditionally have been based on minicomputers. More recently, however, those midrange systems are being supported by IBM ATs. Finally, at the high end, there are mainframe-based systems that are in sore need of standards.

Desktop publishing was born when Apple Computer introduced its $10,000 Macintosh personal computer and LaserWriter duo back in January 1985. The micro maker quickly followed up with page makeup and composition software that lets users design page layouts for simple printing jobs like employee newsletters and brochures.

IBM PC developers followed suit with their PC and Hewlett-Packard LaserJet combination. These systems, which save users a trip to the typesetter, can also save them time and money. Typically, the output to a $2,000 to $5,000 laser printer is three unjustified columns on an 8½ by 11 inch piece of paper, which can then be duplicated on a copying machine. These page makeup systems, like PageMaker from Aldus Corp., Seattle, and Ready-SetGo from Manhattan Graphics, New York, sell for between $250 and $700.

Hoping to build on the popularity of these systems is a new group of vendors that has come out with more powerful personal computer packages. On that vendor list are Xerox's new acquisition, Ventura Software, Morgan Hill, Calif., which has the Ventura Publisher package, and Software Publishing Co., Mountain View, Calif., which has yet to deliver its Harvard Professional Publisher.

Computers have long been connected to typesetters. Until the advent of desktop publishing, those computers have mostly been minis that were used primarily in high-quality commercial typesetting and composition systems. Those systems are provided by such traditional manufacturers as Compugraphic Corp., Wilmington, Mass., and Linotype Co., Hauppauge, N.Y. To keep pace with developments in the desktop publishing market, these manufacturers are also offering Mac or PC-based systems that for the most part connect to their larger machines. These companies, however, should get a run for their money from vendors that sell professional-quality software composition and typesetting software solely for the PC.

In the past, operators had to dial up a minicomputer-based typesetting system at the company's Duluth, Minn., operations site or use composition software, which sells in the $30,000 range, is also available on the RT and from Digital Equipment Corp.

At Paul Revere Life Insurance Group, publications manager Alfred J. Lemire, is also interested in a personal computer composition system, has decided to wait for the next round of products. In the meantime, he keeps in touch with the dp department at the Worcester, Mass., insurance company to make sure that the systems compatibility issue is covered.

Lemire is concerned about potential life insurance customers being put off by promotion pieces generated by personal computers. "With a slogan such as 'Our policy is quality,' it's difficult to imagine us drifting downward from typesetter resolution for many document applications." Likewise, staffers want more capability from page composition systems. "If one has..."
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The ultimate desktop system connects the various publishing islands. According to consultant Michael Szczygiel, president of Inforizon in Princeton, N.J. Next come office publishing systems. This is where networked users, perhaps an editorial department, have desktop systems and share a small database. At the third level, where documents are tightly controlled, are database publishing systems based on large mainframes. Many organizations already have such databases.

**CONNECTED ISLANDS SYSTEM**

The ultimate desktop system connects the various publishing islands in the organization—office automation, publishing systems, database systems, and records management or document storage systems. Many standards need to be hammered out, however, before these computer-integrated publishing systems become a reality. Nevertheless, Dataquest's Kapoor believes that the market for these connected-island electronic publishing systems “will really, really explode.”

The total publishing industry today is worth about $106 billion. "Electronic publishing is by no means at that stage. There's a real way to go," Kapoor points out. Inforizon's Szczygiel believes the development distance could shorten if designers and dpers would talk to each other.

"The printing people are not particularly oriented toward issues of information management and the information people are not oriented toward considerations such as formatting, but they're starting to come together," says Szczygiel.

Things have really come together from a publishing point of view at Ace Hardware outside Chicago. In 1981 there was real doubt whether Ace would be able to continue producing its 45,000-item, 4,000-page catalog for its 13 regional warehouses. “Producing this book was becoming almost cost prohibitive. Despite the word processing systems, it was very laborious,” remembers Chris DeBoo, the company's office systems manager. “Until the new system, there were days when I wondered if we were a publishing company or a hardware company.”

The catalogs that Ace sends out to its 48,000 dealers must be tailored to specific regions because some products are only suitable for certain areas—snowblowers in New England, for example. Thirteen word processing operators and thirteen graphic artists manually prepared each region's catalogs. Also working feverishly to pull the books together were seven paste-up people, line illustrators, and two clerks who assisted the WP operators. The $1 billion hardware company updates the important catalog checklists, rotating the various departments such as housewares or hand tools throughout the year.

"Each time we added a warehouse," says DeBoo, "we had to add five people. At the time, we were adding a warehouse a year, so the preparation was very cumbersome, the books were enormous," recalls DeBoo, who supervised much of the conversion work.

Ace started looking for automated alternatives and found the Xerox XPS 700 publishing system, a mainframe-based setup built around the Xerox 9700 high-speed laser printer. Now all the catalog checklist information is stored on the corporate IBM 3081 mainframe that runs Xerox's XICS software. Pages are composed on the XPS 700 system, with output to the 9700.

During the demanding two-and-a-half-year conversion period, Ace's dp shop wrote 50 to 60 custom programs. It was also necessary to keep producing the catalog by the old manual methods, so temporary staffing was high. The new system has cut down on those personnel costs. "One operator in half a day of keyboarding does what dozens of operators and clerks used to do full time," explains DeBoo. "We've saved $600,000 and every year that grows by leaps and bounds."

The publishing system has helped Ace do more than produce its mammoth catalogs. It has created several new marketing tools the company has used to good advantage, such as a catalog without prices that local dealers can give to their commercial and industrial accounts.

**A WAY TO MASS PRODUCE**

Another company making marketing use of electronic publishing is May & Speh, a service bureau in the Chicago suburb of Oakbrook Terrace that caters to large direct mailers. “We were looking for some way to mass produce time-sensitive documents, such as price lists and technical publications,” explains Gene Kent, director of R&D at May & Speh. “Before, we had to go to the typesetter.”

To accomplish their automation, the service bureau added seven Xerox printers (attached to an NAS AS/XL-80) and the XPS 700 composition system. All the necessary custom programming was provided by May & Speh. The new publishing scheme “makes it a lot easier to meld old and new data,” says M&S's Kent. It also makes it a lot easier on customers, who can sit at the screen and design their mailing pieces. This capability, Kent adds, has “brought in a few new customers.”

May & Speh's document production requirements were nothing compared to the publishing problems faced by the U.S. Postal Service. “Things were so bad we had to do something,” admits Marguerite Boudreau, general manager of the document control division at the USPS in Washington, D.C. The USPS is the first of what will probably be a long list of agencies to digitally distribute employee and customer publications. The Department of Defense, for example, recently asked, through the Government Printing Office, for proposals to develop an automated publishing system for the army. The subsequent award to Electronic Data Systems Corp., Dallas, is being challenged by other competitors.

USPS employee and customer publications such as postal bulletins, policy manuals, management instructions, and handbooks—totaling about 53,000 pages—are now electronically produced under a project called Spectrum. The documents, references, and chapters from all the sundry publications are stored on IBM mainframes in Raleigh, N.C., so that they can be accessed and then printed locally on laser printers. The problem of finding the most recent version or the exact citation in the USPS literature is then eliminated.

USPS editors and document preparers working on Wang word processors are part of this “connected islands” publishing system. This setup eliminates much rekeying by ensuring that everyone works on the same version of the documents. The need for expensive outside typesetting is also dramatically reduced.

The Spectrum system in service at USPS uses a combination of database management software (IDMS from Cullinet, Westwood, Mass.) and publishing software (XICS from Xerox). Considerable custom programming is also required. Consultant Szczygiel predicts that such custom techniques will move into the mainstream as the separate worlds of printing and information management come closer together.

The next critical task—that of linking documents entered into the database with the right format and document structure coding for output—is no easy matter. It's exactly in this crucial area of electronic publishing that much more work needs to be done on setting industry standards.

Connie Winkler, the former executive editor of PC Magazine, is a freelance technology writer based in New York.
Re: Palm Fruit Research

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CIRCLE 44 ON READER CARD
Cellular telephones may take a back seat to a proposed satellite system when it comes to making long-distance calls. The mobile satellite network, consisting of two Hughes Aircraft Company HS 393 spacecraft, would relay two-way voice and data communications services directly from airplanes, cars, trains, or remote locations. While cellular telephone systems are limited to areas equipped with fixed antenna networks, mobile satellites would cover the continental U.S. and Canada, and possibly Mexico. Users would have their own mobile ground terminals. Hughes Communications Mobile Satellite Services, Inc. is seeking authorization from the Federal Communications Commission to operate the system.

Computers will be troubleshooting hybrid microcircuits used in new sophisticated missiles at Hughes. Computer-aided troubleshooting (CATS) will cut troubleshooting time, improve effectiveness by automatically locating faults, eliminate mistakes and wasted time, and simplify the technician’s decision-making. CATS also will be able to use past repair records as a key to speed up troubleshooting. A typical case: An automatic bar code reader identifies a failed part, and data about the failed test is retrieved from a main computer. A probe then automatically takes measurements at key internal circuit nodes so the fault can be isolated. Next, the computer displays a schematic of the failed circuit area and compares the actual and ideal signal values. The technician then determines which component has most likely failed and selects rework instructions accordingly.

Infrared sensor transplants would enhance Air National Guard F-4 Phantoms for approximately one-tenth the cost of developing a new infrared system. Hughes has developed a concept to transfer Infrared Search and Track (IRST) systems to F-4 aircraft from deactivated U.S. Air Force interceptors. IRST detects targets passively and supplements radar detection. It would allow a pilot to establish and maintain target tracks when the F-4 radar couldn’t pick out targets because of clutter, countermeasures, or malfunctions. Hughes built IRST in the 1960s to provide low-altitude detection and countermeasure capabilities for the F-101, F-102, and F-106. The systems have been upgraded, most recently in 1980 with a new detector that improved performance and cut operating costs.

Enhancements to NATO’s air command and control system will include provisions for interoperability among all member nations, as well as a variety of systems that will prevent gaps in the network. These enhancements to NATO’s C²I (Command, Control, Communications, and Intelligence) system will also include the expanded use and reliance on advanced high-speed digital computers to sort vital information from sensors and immediately relay it to commanders in the most useful form. Hughes is part of an international team that is studying NATO’s needs and defining just how the command and control network should be upgraded.

Hughes needs college graduates with degrees in EE, ME, physics, computer science, and electronics technology. To find out how to become involved in any one of the 1,500 high-technology projects, ranging from submicron microelectronics to advanced large-scale electronics systems, contact Corporate College Relations Office, Hughes Aircraft Company, Dept. S3, C1/C128, P.O. Box 45066, Los Angeles, CA 90045-0066. Equal opportunity employer. U.S. citizenship required.
KING OF THE JUNGLE

When he walks into the room, six feet four inches tall, impeccably dressed, with a commanding baritone voice and silver-gray hair, you know one thing for sure: Gordon Smith is a marketing guy.

In fact, with 46 years of experience under his belt, Smith might be considered the dean of computer industry marketing executives. For a time, in the 1950s, he was mentioned among those in line to become president of IBM. He has worked for Sperry-Univac, Control Data, and Honeywell. He has been called upon to sell computers in the Soviet Union and to polish the tarnished images of companies such as Information Sciences Corp. and Memorex. Along the way he has built up a network of personal, governmental, and business contacts that often startsle and Memorex. Along the way he has built and Up a network of personal, governmental, and business contacts with 46 years of experience and Memorex. Along the way he has built and

GORDON SMITH: "There are a lot of ways to get people to work for you."

ing, Mr. Watson asked if he could address the group after lunch. When we came back, Mr. Watson told us he had been listening all morning to us worry about what our competition was doing. But they should be worried about you," he said. Then he showed us a large print of a group of horses in the snow being attacked by coyotes. The horses had formed a circle with their heads in the center and were kicking the coyotes to keep them back. "That's what you can do if you act as a team," Mr. Watson said. He was very straightforward.

Smith carried a simple, straightforward approach to marketing with him when he left IBM for personal reasons in 1958. Today, as a marketing consultant to startup companies and large corporations, Smith still keeps it simple. He urges executives to keep defining the markets they think they are addressing, and he helps them hire and motivate the best sales and support employees.

"Today, a lot of companies just throw money at people," says Smith, "but there are a lot of other and better ways to get people to work for you."

Just because Smith's marketing philosophy is basic, it doesn't mean he's unacquainted with high-profile marketing bombast. In fact, if the computer industry ever emerges from its current economic doldrums, it should consider getting Smith to stage the press conference announcing the return. Smith was perfecting "events marketing" before Apple's John Sculley knew what an event was. Once, while corporate marketing vice president at Memorex, he had a Pullman positioned in the company's parking lot for a press briefing. He has held similar meetings in Swiss chalets and European palaces. Once, as the executive vice president of Sperry Rand International, Smith rented an Italian submarine within which he held a press event in the depths of Lake Geneva.

"Gordon, more than any other person I know, thinks big," says Dowd, who worked with Smith at Sperry and more recently was a partner with Smith on a European marketing venture. "Gordon literally thinks he can do anything he sets his mind to. It's not easy being seen as a poor second in any market, but Gordon has the persistence to take a sales team into a big account and say, 'This is going to be my account.'"

That's just what Smith and Dowd did in the early to mid-1960s, when Smith was running Sperry's Univac marketing and sales operation in Europe, Africa, Eastern Europe, and the Middle East. Sperry had already fallen far behind IBM and was losing about $2 million a year on $13 million in sales on its overseas operations. Smith moved in and targeted a few large accounts, including the big European airlines to which he aggressively marketed Sperry's new real-time computer. Smith's team captured many of those airline accounts, including Air France, Lufthansa, SAS, and Iberia. The effort helped establish Sperry as a key supplier to the airline industry, a position Sperry has managed to retain. By 1967, Smith built Sperry's overseas operation to $65 million in sales.

If Smith thinks big, he also expects big things from his associates. According
to Kenneth J. Rowe, who worked with Smith at Memorex and is now director of communications at Alrol Corp., "Gordon's staffers always found themselves getting stretched almost to the breaking point. You'd propose a modest project to Gordon, and before you knew it, it had grown into an impossible project." Dowd remembers his first week working in Europe for Smith. "I showed up and was told I had to put together a six-page advertising supplement to go into the Herald Tribune. It had to be in four different languages, and it had to be ready in time for the Hannover Fair. Somehow it got done."

Smith put such demands on his staff in part because he was often running a marketing operation on not much more than a shoestring, and with not a lot of corporate support. For example, when Smith moved to California and joined Memorex in 1979 as its corporate marketing vice president, reporting to then president Robert Wilson, he was the company's first high-level marketing official in two years. "Mr. Wilson thought of marketing as a necessary evil," Smith says.

Smith had to contend not only with Wilson's lack of enthusiasm for marketing but also with the mostly accurate perception of Memorex as a company in a struggle with IBM for its very survival. Smith used that challenge to motivate his associates. Remembers Rowe: "When I was considering going to work at Memorex, I also had an offer from AT&T. But when I talked to Gordon about it, he said, "You'll learn more here in three years than you would in a career at AT&T. We're at the edge of the tar pit, boy." Rowe chose Memorex.

Smith left Memorex in 1982 when the company was acquired by Burroughs. After a brief stint at Palo Alto-based Varian Associates, he founded World Trade in Computers, an international marketing operation designed to utilize Smith's vast network of contacts both inside and outside the computer industry. In the industry, associates say, Smith seems to know everyone. According to Rowe, Smith once invited an unsuspecting reporter to an informal lunch with some friends. It wasn't until halfway through the meal that the reporter realized he was dining with Presper Eckert, designer of the first computer, and Grace Hopper, its programmer. "Gordon does stuff like that all the time," says Rowe.

Through the 1970s, Smith's stops included Diebold Corp., where he was director of research; the Association for Computing Machinery, where he was executive director from 1970 through 1972; Singer Business Machines International, where he was vice president and general manager; and Information Sciences Corp., Montvale, N.J., where he was senior marketing vice president. Although World Trade in Computers failed due to poor timing and the stronger U.S. dollar in 1985, Smith, at 67, remains active as a marketing consultant, based in Menlo Park, Calif.

Many of the young companies Smith advises today have a lot to learn about marketing, he says. "Many of them are run by engineers who like to talk about the wonderful features of their products. They don't realize what they need to talk about is the benefit those products can bring to the user. Why should he buy it?"

As a marketing consultant in Silicon Valley, Smith is in demand, and his friends are pleased to report that he has lost little of his flamboyant marketing flourish. Recently, says Rowe, Smith brought a group of Danish officials over to Rolm for a tour of the company. They arrived in a Rolls-Royce, of course. On his way into the building, Rowe says, Smith whispered to him, "Well, times are tough. It's only a Bentley." —Jeff Moad
A California shipping agent, who used to worry about keeping in touch with a worldwide fleet of container ships by telex, called his operation “shipshape” today.

Bill Lowe, a manager for Los Angeles-based Merit Steamship Agency, Inc., added that ITT Worldcom experts had made it “much, much easier” to transmit cargo schedules.

Merit, a nationwide shipping agency, is one of the few agencies to represent a number of steamship companies in worldwide cargo transport, Mr. Lowe explained.

“We dispatch over 40,000 telex messages a month,” he said. “So we really needed a first-rate communications network to keep our customers on top of their imports and exports.”

ITT Worldcom solved all the sticky problems that Merit faced with its last international carrier, Mr. Lowe pointed out. “And they even cut some of our costs—by 50%!”

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OFF-LINE

In the low-end printer market, dot matrix is dominant. It's capable of handling the tasks of most businesses and is relatively inexpensive—under $1,000. Typical business-printer users, industry observers say, simply do not have a need for the "pretty" output that laser printers produce.

Some printer manufacturers are betting that this will change. The desktop publishing boom will create new users, and as users look for opportunities for these manufacturers, they are betting that this will change. The desktop publishing boom will create new users for these manufacturers as users look for near typeset quality output.

The advent and acceptance of near typeset quality output will change. The desktop publishing boom will create new users for these manufacturers as users look for near typeset quality output.

While dot matrix will continue to reign supreme until the end of the decade, says John Boldt, we'll see 15% to 20% price drops. By '87, he adds, even though there will be higher volume sales in dot matrix, expenditures on laser printers will outpace those of dot matrix. Software development will also grow, Boldt believes.

Three more printer companies recently entered this market. Okidata announced its Personal Laser Printer, with a base price of $2,195, which features a print speed of 6ppm; one-port HP LaserJet compatibility with options to expand to three-port LaserJet Plus compatibility; 272K of memory expandable to 656K; quarter-page 300 by 300dpi resolution expandable to half a page at 656K; and a second-generation Ricoh engine. The company also announced it will be including $150 worth of software with the printer through March '87. Okidata is shipping it now.

Citizen America's Over­ture 110 is a 10ppm laser printer priced at $2,395 that features a Mita engine; 512K of memory; parallel and serial interfaces; and Ep­son, Diablo, and IBM emula­tions. The product will be shipped in February '87.

The GQ-3500 from Epson boasts a second-generation Ricoh engine; 470K of memory expandable to 640K; half-page 300 by 300dpi expand­able to full page at 640K; Hewlett-Packard and Diablo emulation; and a price tag of $2,495. It will be shipped in January '87.

DOCUMENT SCANNER

The Stand-Alone Entry Station (SES), recently introduced by FileNet Corp., is de­signed for high-volume document scanning. It records digitized images of documents onto optical disks without inter­rupting processing or utilizing re­sources of FileNet's document-image processing system, the company claims.

The SES consists of a document entry file server, scanner, image display and quality control checking features, an optical disk drive for writing images, and a 300MB magnetic disk for storing operat­ing system software and for temporarily storing document images. It's claimed that the SES can scan from 10,000 to 15,000 pages per day. FileNet's document interchange architecture for writing images onto optical disk is utilized by the SES, allowing images recorded off-line on it to be used by a FileNet document-image processor.

The SES is priced at $175,000 for a basic configuration. It can be expanded to include up to three more scanners, six more workstations for indexing doc­ument images, and two more magnetic and optical disk drives. FileNet's document-image processing systems begin at $328,000.

PERSONAL COMPUTER

Wyse Technology recently unveiled its newest pc, the Wysep+. Standard features include a dual-processing speed off­ering a 9.54MHz mode and a standard 4.77MHz mode; a built-in monochrome/color graphics adapter compatible with IBM, Hercules, and other adapters, which provides 16 shades of gray; a 256KB cpu board expandable to 640KB of RAM; one parallel and two serial ports; a real-time clock with battery backup; and either IBM AT-compatible or enhanced keyboards.

The Wysep+ can be configured with a single floppy disk drive, a dual floppy disk drive, or a 20MB hard disk. Two slots remain free for further expansion. International keycaps are available, and the pc meets European regulatory standards.

Two slots remain free for further expansion. International keycaps are available, and the pc meets European regulatory standards.
HARDWARE

NEW TOWER
NCR has added a fourth member to its Tower supermicrocomputer family with the Tower 32/400. This is the second 32-bit entry into NCR’s Tower family to utilize the 16.7MHz Motorola MC68020 microprocessor. The first offering to use it, the Tower 32/600, formerly called the Tower 32, offers 48-user connectivity, while the 32/400 supports up to 16 users. Other features of the 32/400 are Unix System V operating system (which is used throughout the entire Tower family), 1MB to 8MB of memory, and 46MB to 140MB disk capacity.

Based on Aim Suite II benchmark testing (see “Updates,” Oct. 15, p. 151) for Unix-based systems, the 32/400, NCR claims, provides more than twice the performance of the 16-bit Tower XP and more than triple the performance of the MiniTower.

Built in NCR’s South Carolina plant using surface mount technology and integrated circuitry, the 32/400 uses the same skin as the MiniTower; the 32/600 uses the same skin as the Tower/XP. The price for the Tower 32/400 ranges from $14,995 to $54,810, depending on configuration. NCR CORP., Dayton, Ohio.

FOR DATA CIRCLE 300 ON READER CARD

MODEM AND PRINTER
LaserLine 6 is the first in a new family of laser printers from Okidata. The six-page-per-minute printer features three plug-in personality modules that enable up to three users to share a printer. Included are 15 resident, typeset-quality fonts and face-down and correct-order stacking of letter and legal paper. The input tray can handle up to 150 sheets. The basic personality module is a one-port HP LaserJet-compatible version, the advanced module is a one-port HP LaserJet Plus-compatible module, and the multi-user module is a three-port HP LaserJet-compatible module. Laserline 6 is compatible with such software packages as Microsoft Word, 1-2-3, Lotus 1-2-3, and the PreText emulation for graphics, DEC Tower 32, offers 48-user connectivity, and a bit-mapped display with text input, and a set of resident fonts. To accompany the RTL220, Talaris has written a page previewing program, PreText, for users of TEX, the TeX device-independent file into complete board, spaced resident fonts and can be configured to store up to 16.7MHZ Motorola microprocessor. The first offering to use it, the Tower XP, offers 48-user connectivity, while the Tower 32/400, formerly called the Tower 32, supports up to 16 users. Other features of the 32/400 are Unix System V operating system (which is used throughout the entire Tower family), 1MB to 8MB of memory, and 46MB to 140MB disk capacity.

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FOR DATA CIRCLE 310 ON READER CARD

TWO PRINTERS
Printronix recently introduced two printers. The P1013 Personal Line Printer is designed for the IBM PC, XT, AT, and compatibles, offering, the vendor claims, line printer technology in a desktop format. It features an “ultra-small” print tip that produces letter-quality text and graphics. Text printing can be done in draft mode at 134 lpm, and in letter-quality mode at 47 lpm. IBM Block Graphics can be printed in either mode. The IBM Proprinter, Epson 101500, or Diablo 630 can be emulated with the included plug-in cartridges. Price is $795. The second printer, the L1012 Personal Laser Printer, also targeted for desktop micro-based applications, offers 12-page-per-minute printing with 300-by-300dpi resolution. It features 250-sheet automatic paper feeder cassette and a second 50-sheet tray. The L1012 is compatible with the Diablo 630, the HP Laserjet and Laserjet Plus, and Epson with IBM Graphics. It is priced at $2,295.

PRINTRONIX, Irvine, Calif.

FOR DATA CIRCLE 311 ON READER CARD

GENERATES FORMS
Computer Language Research has introduced a series of products that enable companies to create and generate their own forms. The vendor says the ability to electronically reproduce forms virtually eliminates their oversupply and obsolescence. The Formwriter products consist of an IBM AT, laser printer, and software. The Formcoder workstation includes a graphics tablet to create business forms. The Formwriter workstations support laser printers that print from six ppm to 20 ppm. The workstations allow users to merge electronic forms with application data created by software packages including Lotus 1-2-3, and also allow for the alignment and placement of data anywhere on the form. The products store up to 5,000 electronic forms and 150 fonts. Prices range from $5,000 for the Formwriter 2 to $25,000 for the Formwriter 10XD. ELECTRONIC FORM SYSTEMS, a division of Computer Language Research Inc., Carrollton, Texas.

FOR DATA CIRCLE 313 ON READER CARD

—Theresa Barry

FOR DATA CIRCLE 314 ON READER CARD

HARDWARE SPOTLIGHT

TERMINAL AND SOFTWARE
Talaris Systems Inc. has introduced the Talaris 7800, a terminal combining alphanumeric, graphics, bit map capabilities, and a set of resident fonts. To accompany it, Talaris has written a page previewing program, PreText, for users of TEX, the computerized typesetting language.

The 7800 features Tektronix 4014 emulation for graphics, DEC VT220 keyboard, VT220 emulation for alphanumeric text input, and a bit-mapped display with a resolution of 1,024 by 780 pixels in a 14-inch monitor. It has 30 proportionally spaced resident fonts and can be configured to store up to 300KB of font bit maps downloaded from the host. The PreText page previewing software transforms a TEX device-independent file into complete page images for viewing on the 7800. The terminal also supports graphics applications throughout the Tektronix emulations.

The Talaris 7800 and the PreText screen previewer are available now for users of DEC VAX/VMS and many systems using the Unix operating system, and are priced at $2,890 and $750, respectively. Optional DEC REGIS compatibility and a mouse pointing device for graphics and directory manipulation are priced at $195 each. TALARIS SYSTEMS INC., San Diego.

FOR DATA CIRCLE 302 ON READER CARD

FOR DATA CIRCLE 310 ON READER CARD

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ARE HEATING UP IN THE EMERGING MEDIUM, THE SLOWER ACCESS TIME OF CD-ROMS VS. MAGNETIC MEDIA, AND THE REPERCUSSIONS OF PIRACY ARE NOW BEING DISCUSSED AMONG PLAYERS IN THE INDUSTRY.

The group laboring over the standard issue, dubbed the High Sierra Group, has reached a consensus on the key elements of its proposal, and ANSI validation is expected by this time next year, according to a report from Philips Subsystems and Peripherals Inc. Players in this group include software giants Microsoft, Apple, Digital Equipment Corp., Hitachi, and Philips. With such well-established companies betting on CD-ROM, industry watchers agree there is momentum and that the optical storage market (disks and players) will reach anywhere from $2 billion to $4 billion by 1990. It is now estimated to be $200 million.

Because of the storage capacity of CD-ROMs, which hold up to 600MB of digital information on one side, they are ideal for large databases. Most of the CD-ROM products announced so far have been database related.

Datext Inc., Woburn, Mass., is in the CD-ROM business. Founded in 1984, the company takes existing databases from other suppliers, adds value to them in the form of additional information, and sells the package on compact optical disks. Datext gears its products to the business and financial communities. Its newest products, recently announced, are CD/NewsLine and CD/CorpTech.

CD/NewsLine integrates current on-line news and information with historical business and financial data stored on a disk. It was developed in conjunction with Dow Jones & Co. and provides access to four Dow Jones News/Retrieval databases: Dow Jones News, the News/Retrieval World Report, Current Quotes, and Historical Quotes. This product is an add-on option to Datext's first product, CD/Corpo-rate, which provides seven years of historical information, updated monthly, on all public companies traded on national and regional stock exchanges collected from six database suppliers. CD/Newsline incorporates Datext's proprietary menu-driven software, which handles the necessary switching between the CD-ROM and the on-line service transparently. The software also handles log-on and search routines so that users do not have to know the commands and syntax associated with on-line research. Information either from the CD-ROM or received on-line can also be transferred to micro software packages, including Lotus 1-2-3 and Microsoft Word. Subscription prices range from $4,500 for 50 connect hours to $53,000 for 1,000 connect hours.

Datext's newest database, CD/CorpTech, provides information on 12,000 public and private domestic high-technology companies. CD/CorpTech is priced at $7,500 and is updated every three months.

HAL IS HERE

Lotus HAL is a companion to Lotus 1-2-3. HAL, Lotus says, enables both the novice and intermediate user to take advantage of the functionality of 1-2-3. Using English words and phrases, HAL has defaults for common tasks and can execute a series of 1-2-3 operations with one phrase. With HAL, users can hit the backspace key to undo the last command executed, link data in separate worksheets, and write macros with English language commands. HAL accepts thousands of phrases, Lotus claims, allowing users to, for example, specify locations on a worksheet using names such as "sales" or "January."

Lotus acquired the framework for HAL from GNP Development Corp. in January 1986. Lotus says it plans to make HAL work with other Lotus products in the future, Symphony being the first on the list. HAL is not copy protected, is available now, and works with all releases of 1-2-3. Requirements are personal computers from IBM, Compaq, or AT&T, and DOS 2.0 or higher. HAL resides in memory with 1-2-3 and operates with it; 512K is required. The price is $150. LOTUS DEVELOPMENT CORP., Cambridge, Mass.

FOR DATA CIRCLE 326 ON READER CARD

APPLE TO VAX

Helix VMX is a multi-user applications environment from Odesta Corp. that allows users to create customized applications on a Macintosh and to run them without modification on a VAX. Helix VMX, using the Mac as an intelligent workstation, creates applications without a programming language, and Mac users can tie into the centralized
SOFTWARE AND SERVICES

power of the VAX. Two levels of security, per user and per form, are provided.

Helix VMX runs on a Macintosh with 800KB of disk space and any VAX. A Macintosh Plus with hard disk is recommended for all individual application development. The product will be available in the first quarter of 1987. Two pricing structures will be offered: per user fees or per VAX license. The per user price is $450 for each Mac connected to any VAX; licensing ranges from $7,500 to $20,000, depending on the VAX configuration. ODESTA CORP., Northbrook, Ill.

FOR DATA CIRCLE 327 ON READER CARD

PROGRAMMING LANGUAGE

Trees-pl is, recently introduced by AVYX Inc., is a programming language for IBM PCs, XTs, ATs, and compatibles initially developed for NASA by Information Sciences Inc., now the R&D arm of AVYX. This is the first commercially available product from AVYX. It is billed as a resource management tool that can be applied to scheduling, resource allocation, project control, and information management. AVYX claims it can manipulate tree structures, making it useful in artificial intelligence applications. AVYX is planning mini and mainframe versions of Trees-pls for release in about a year, and is currently working with VAX and software systems housed to develop vertical packages. Trees-pls is available now for $995. AVYX INC., Englewood, Colo.

FOR DATA CIRCLE 326 ON READER CARD

PC TO TYPESETTER

Xchange is a program designed to convert word processing documents prepared on an IBM AT or equivalent to formats usable by standard telecommunicating typesetters. The files can contain text, tables, database files, and other types of code. Up to 512 different non-ASCII items can be identified for replacement to meet the typesetter's input requirements. With documentation, the price is $395. Several I/O options, including Compugraphic, MCs, Powerview, and CCI connections, are available for $75 each. Quadex systems without communications options are supported through an $800 add-on program.

FOR DATA CIRCLE 335 ON READER CARD

PERSONNEL TRACKING

HR-Applicant Track from Mainframe Micros Inc. is an IBM PC program that allows human resource professionals to create, store, manage, and manipulate a database of information on job applicants. HR-Applicant Track can operate as a standalone product or can be integrated with HR-l, the vendor's PC-based personnel information system. The package allows users to select, update, or globally change hundreds of records with one command, according to the company. Reports and specialized forms can be generated. Using a proprietary micro-to-mainframe interface, the Information Link, users can upload or download information to an IBM mainframe or to applications programs such as spreadsheets or word processing.

Both HR-Applicant Track and HR-l use Mainframe Micros's HR-Intelli-

SOFTWARE SPOTLIGHT

FOR IBM MAINFRAMES

Alert/XP is a new dataset security product for IBM mainframes using DOS/VSE Version 1 and VSE/SP Version 2. This is Goal Systems' first security product. Its main function, says Goal, is to secure the resources accessible to normal batch jobs (including VSAM datasets, non-VSAM datasets residing on direct access devices, and tape datasets) and the level of access permitted to those jobs. Rules are created using menu-driven screens through CICS. The product does not require modifications to the operating system since it uses the security interface provided by VSE. It also offers a monitor mode facility to aid in implementation or to provide an audit trail of security activity. Available now, Alert/XP is priced at $9,100.

QuikTask is Goal's new on-line interactive application development system, which uses a "streamlined" COBOL-like procedural language that allows batch programmers with minimal COBOL or CICS experience to develop application systems. Ten subsystems are integrated into the package. They are on-line help, on-line training, dictionary, screen painter, language, editor, translation, test and debug, execution, and utilities. QuikExec is the subsystem that executes all QuikTask applications. It's available as a separate option. QuikTask is designed to run on IBM mainframes under OS/MVS, DOS/VSE, and CICS 1.5 and above. Available this month, the price is $44,800 (MVS) and $35,000 (VSE). Separately, QuikExec is priced at $22,400 and $27,500. GOAL SYSTEMS, Columbus, Ohio.

FOR DATA CIRCLE 325 ON READER CARD

"PICTURE" PROGRAMMING

Cortex recently announced CorVision, an application development tool for automating the software life cycle for Digital's VAX/VMS environment using a technique called picture programming. The technique allows users to create a visual representation of an application by diagramming the design and automatically generating the production-ready application directly from the pictures. A developer sits at an IBM AT-compatible workstation and defines an application using icons. The workstation is tightly coupled to a central repository on a VAX, which stores application specifications, drives the format and content of the front-end workstation diagrams, and provides the input specifications to the back-end application generator on the VAX. In the design phase, a developer can diagram a complete view of the application and add custom logic to it using an action diagrammer and a very high level language. Once design is complete, CorVision generates the complete production-ready application for the VAX, which executes in optimized machine code. CorVision will be available in the first quarter of 1987 for $50,000 to $175,000, depending on VAX model. CORTEX, Waltham, Mass.

FOR DATA CIRCLE 337 ON READER CARD

—Theresa Barry
Many of the country’s largest organizations have eliminated the tedious, manual process of systems specification. Instead they automate their systems analysis and design with Excelerator—the best-selling computer-aided software engineering (CASE) tool.

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HOW NOT TO PROTECT U.S. HIGH TECH

Capitol Hill's current calls for protectionism against foreign competition are based largely on shortsighted views of the American economy. There is not enough recognition that our most competitive companies, including those in the computer industry, are already developing global procurement and marketing strategies that would be seriously disrupted by protectionist actions. Even more important, Congress needs to look at the direction in which those competitive industries are moving in order to create policies that support U.S. economic growth and jobs.

Today's computer industry returns a consistent trade surplus to U.S. coffers. As president of the Computer and Business Equipment Manufacturers Association (CBEMA), I'm familiar with the industry's balance sheet. Forty percent of its domestic manufactures are shipped overseas. It employs about 2 million Americans directly, and millions more work with computers in other industries. Over the past 15 years, the industry has enjoyed a 15% compound growth rate.

Growth is hampered by two important characteristics. First, high costs for product research and development must be amortized quickly because of the speed of technological change.

Second, extremely high price competitiveness among companies leads to a constant struggle to cut costs. Over the last two decades, for instance, we have witnessed a price decline of about 10% per year in the cost of computing power—a drop unmatched by any other industry.

To cope in this atmosphere, companies have developed global strategies. They tend to manufacture standard components in countries with lower labor costs, import those components into the United States for final assembly and integration, and then feed those products into both the domestic and international marketplaces.

Thus, protectionism for today's computer industry makes no sense at all. Tariffs or quotas on imported parts encourage companies to move final assembly out of the country, at least for all products intended for the international marketplace. A reduction in U.S. jobs would result. If companies attempted to keep those jobs in the U.S., the added costs of tariffs would price U.S. products out of the international market.

But protectionism makes even less sense for the computer industry of the future. By the end of the century, we expect our industry to have the following characteristics:

- Today's multinational computer company, with its set of worldwide subsidiaries, will evolve into a truly global concern.
- There will be less and less difference between the power, prestige, and decision-making authority of the subsidiaries and today's parent company. Instead, a working relationship will have evolved in which the subsidiaries exercise considerable power and control.
- The world market for the large, integrated computer systems used by major businesses will be dominated by no more than five strategic alliances, primarily among international partners. It is doubtful that there will be any single-country companies of any consequence in the industry.
- The U.S. and Japan together will lead the world technologically. Both will be making major technical contributions. Japan is likely to be the world's dominant trading nation in terms of volume, with particular command of developing markets. But the U.S. will maintain its strategic edge in certain high-tech markets, as in its current dominance in software.
- Final assembly of computers will more commonly be done as close to the market as possible. With increasing use of robotics and automation, the labor component of pricing will drop to an international norm, making transportation costs far more significant as a percentage of total product price than they are today. Pacific Basin countries will increasingly have become manufacturing centers. But the U.S. will remain competitive because of computer-integrated manufacturing.

This internationalization of the computer industry may not please those who would prefer that America keep technology under lock and key and use it as a club to keep the rest of the world in a subordinate position. But American companies cannot "go it alone" and expect to survive.

Fortunately, American business leaders are not as shortsighted as those English businessmen who, in the nineteenth century, attempted to prevent the rest of the world from setting up textile mills. We recognize that the transfer of technology is inevitable given the level of intelligence, education, and economic infrastructure that exists among our trading partners. American high-tech companies are instead looking to build a mutually rewarding future with our international allies through mutual support and the rapid dissemination of today's techniques that will lead to tomorrow's breakthroughs.

The U.S. Congress today perceives itself at a crossroads on trade. Despite the impulse to kick sand in the faces of our more successful trading partners, it should resist the temptation toward protectionism. Such resistance is the only way to keep America a vital player in the advance of international high technology.

Businesses react to business incentives and disincentives. Given the inevitable internationalization of the computer industry, protectionism is a clear disincentive. But even more important than avoiding the pitfalls of today is the need to look ahead clearly to tomorrow. For the sake of the nation in the next century, Congress should recognize that the future does not stop at national boundaries; it should vote with a long-sighted view.

—Vico E. Henriqueς
Washington, D.C.
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