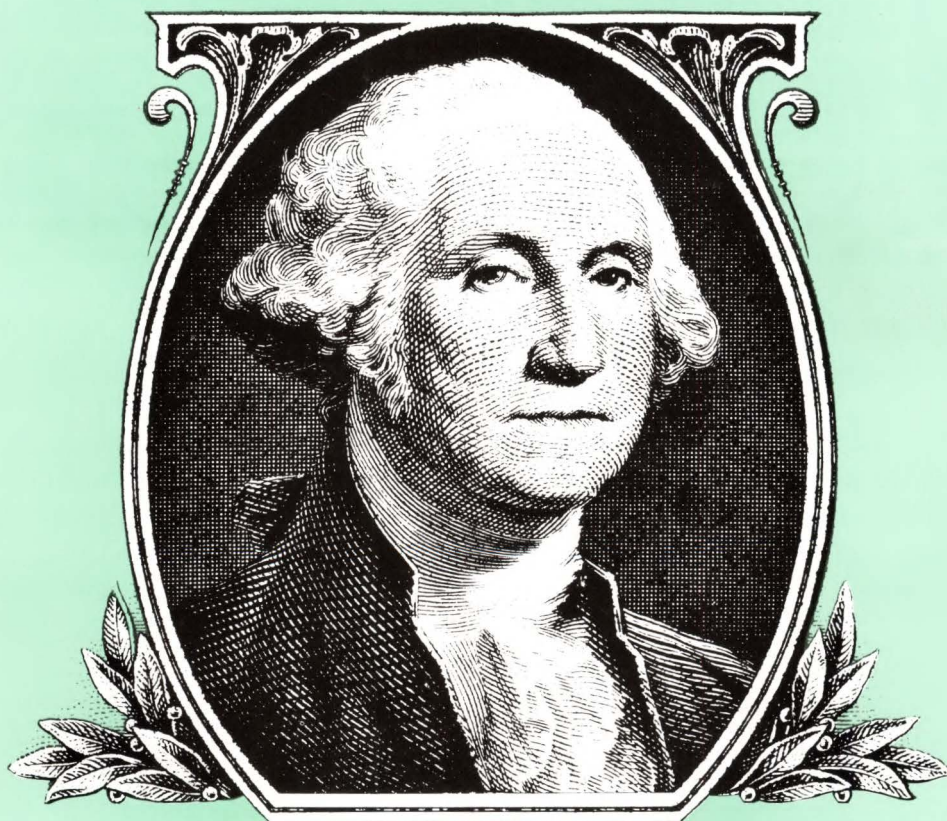


SPECIAL PRESIDENTS' ISSUE

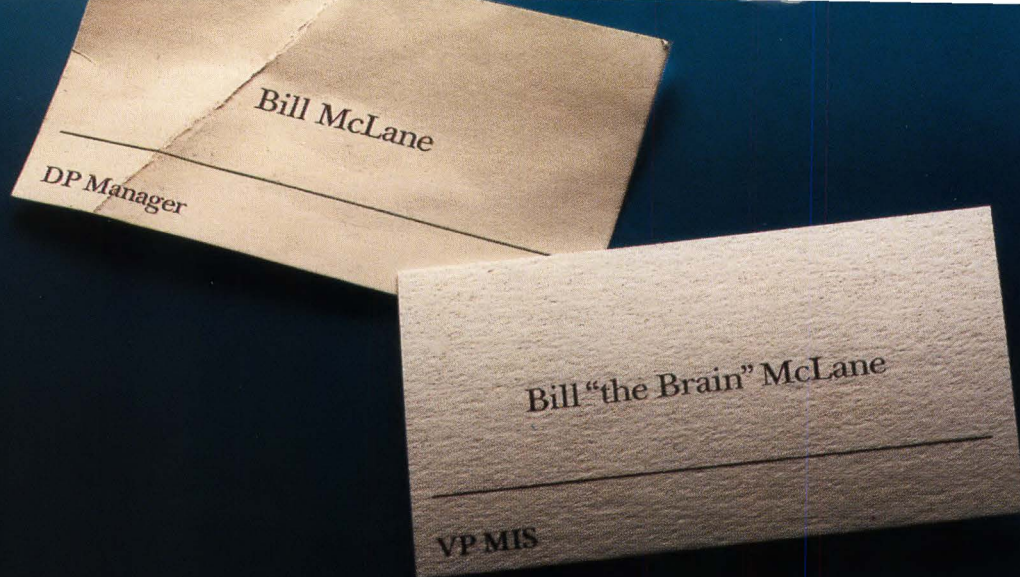
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SEPTEMBER 15, 1984

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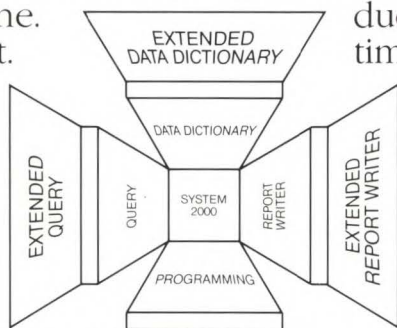
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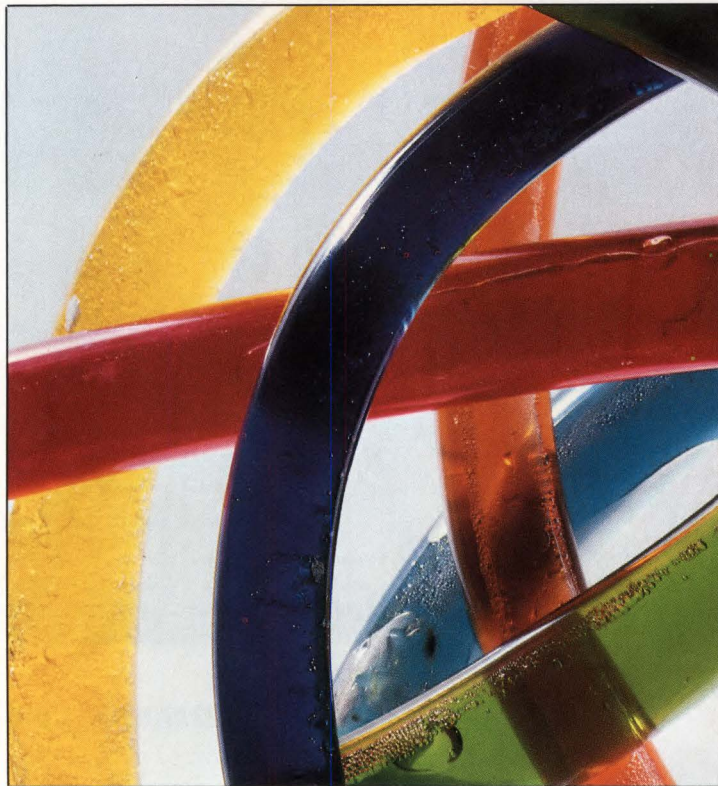
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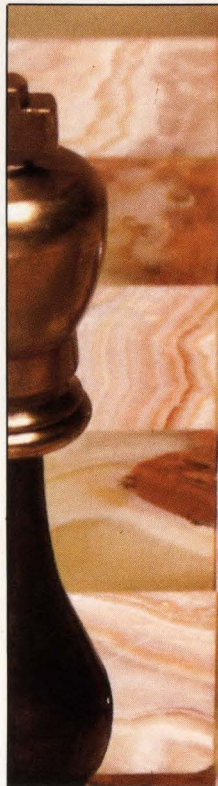
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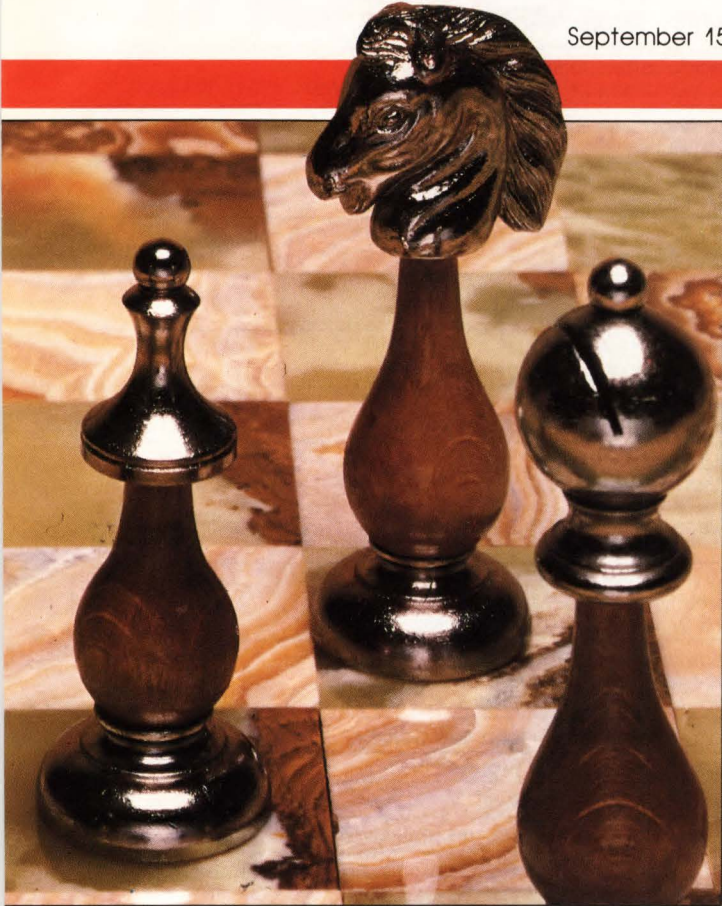
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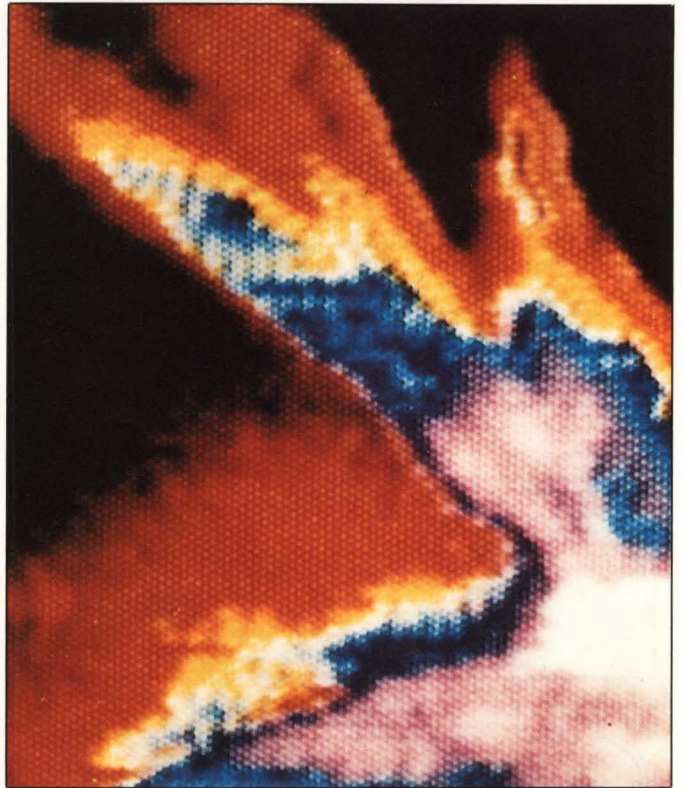
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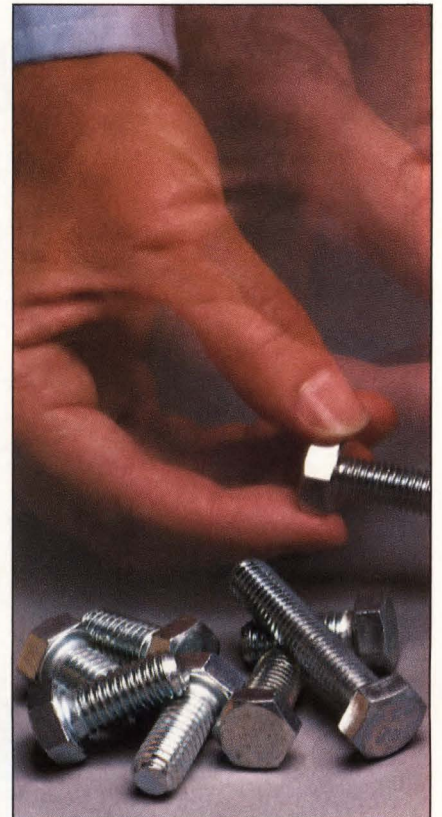
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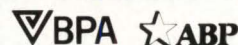
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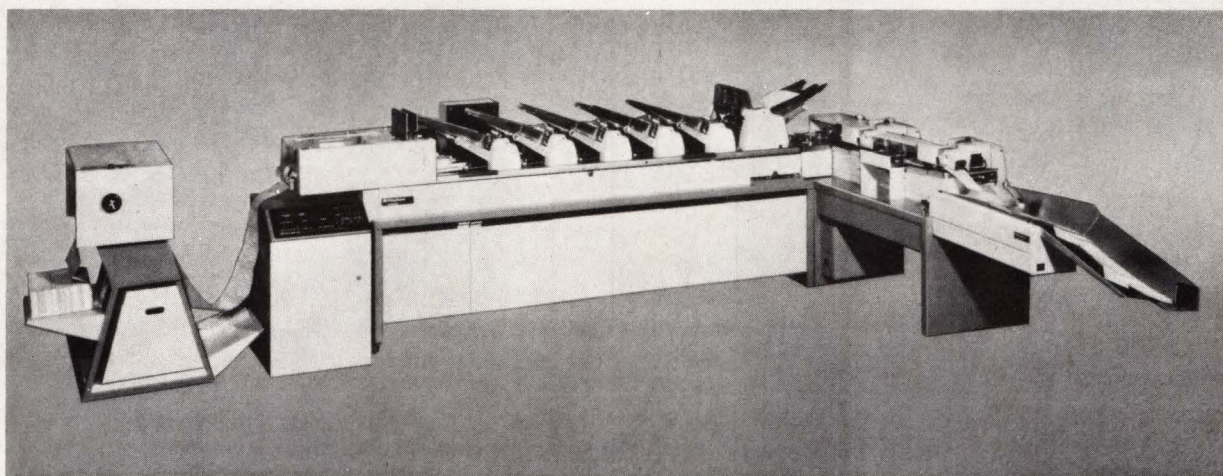
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EDITOR'S MESSAGE

INFORMATION POWER BOOSTS PROFITS

Once top management develops a strategic plan, information and the systems for handling it can be key factors in the success or failure of it.

The powerful effects strategic use of information resources can have on a corporation's ability to compete was the subject of the first Presidents' Issue, published one year ago. In this follow-up special issue, we chronicle some of the ways in which the power of information is being translated into profits.

It would be presumptuous to claim that effective organization of information resources is the crucial element in profitability. Obviously, top management first must give its line managers direction. But once top management develops a strategic plan, information and the systems for handling it can be key factors in the success or failure of it.

Foremost among these goals is earning profits. There's no point in sweating out very sophisticated information-handling systems if they don't enhance a business' ability to survive and grow. The executives quoted in this issue reiterate again and again that information-handling systems are repaying their costs, sometimes several times over, by contributing to a corporation's ability to do battle in the marketplace.

Each industry and each organization within each industry has a different, specific route to achieve higher profitability and greater resilience to the vagaries of the marketplace. In broad strokes, we have attempted in this issue to show how various major industries can specifically apply information technology. We start with a general look at the ways executives and managers use decision-support computer systems to make better

decisions ("Computers help you win the game," page 14). We then proceed, in separate articles, to look at the profitable application of automation in the office ("The source: office systems," page 32); the factory ("Computers accelerate manufacturing," page 44); the warehouse ("Directing the flow of goods," page 62); and the retail outlet ("Ringing in the new retail technology," page 76).

Many of the organizations profiled in these articles applied sophisticated computer technology long ago and are now making refinements or installing a "new generation" of systems. In other corporations, computers are the new kids on the block. Whatever their level of sophistication, most of these corporations have installed computers for one application, only to find others that are just as valuable. More often than not, the catalyst for innovation is the computer.

The articles on automation in offices, factories, warehouses, and stores may not directly reflect your organization's problems or needs. Nevertheless, they're valuable for two reasons. First, the trials of managers contain widely applicable advice—even for managers working in seemingly unrelated businesses. Second, you never know when you may find yourself working in an unfamiliar industry—out of choice or because your organization shifts direction. An organization that diversifies needs managers with knowledge of other businesses and operations.

The issue concludes with articles of general interest to all managers. First, we look at the growing number of ap-

plications of project-management software ("Getting more from your key resources," page 88). Nearly all managers at one time or another are faced with implementing a major project. It could involve a move to a new location, construction of a new data center, or installation of a new information-handling network. Software that tracks a project's progress is now available on personal computers, giving managers many more options than existed before. Managers involved in data-center operations will find the next article, on software that helps you get more dp for less money, very useful. "Fitness programs for your data center," page 98, suggests that many organizations have more dp muscle than they suspect. Finally, we examine the growing importance of treasury-management software ("Computers put corporate cash to work," page 108), which helps corporations get more from their "float."

Despite all the ballyhoo about computers, corporate America is still in the early stages of computerization. However, as corporations come to grasp the ways computers can help them compete more profitably, computerization is proceeding apace. Indeed, some of today's computerized systems appear to be only the beginning. They've provided a hint of what will be possible with systems utilizing advanced techniques, like artificial intelligence. But that's all somewhere in the not-too-distant future. For the moment, it's full speed ahead with systems that help make corporations more profitable. After all, profit is the name of this game. —Mel Mandell



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"LET THERE BE LIGHT!"

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“As a systematic and readily understood control system for tracking the performance, load, and user activity of the TSO facility, TSO/MON fills a distinct need for those installations that are operating, or are planning to operate, TSO.”

—Auerbach Computer Technology Reports

environment as easy as reading a one-page summary.

You see, TSO/MON maintains a file of historical TSO usage and performance data that can be reported against system and user service objectives. Then, it provides a one-page management summary as one of its standard reports.

At an East Coast utility, the Manager of the Operations Technical Support Division asserts: "As a manager responsible for providing quick, accurate computer service to... TSO users, it is important to me to maintain good communication with other managers. Throughout our use of TSO/MON, I've been able to do this and keep those users happy."

A Project Systems Analyst at a major airlines says of the director of his department: "He sees the backup TSO/MON gives him in terms of dealing with both his management and his users—there's no way to argue with someone who has hard data in hand."

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"HEAD'EM OFF AT THE PASS!"

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Another user, the Manager of Technical Support at a Southern gas utility, agrees: "**With TSO/MON, we can watch things develop and manage pro-actively rather than reactively.**"

"GIVE ME THE BOTTOM LINE."

Datapro Research Corporation reports that users who responded to its independent survey "**unanimously agreed that TSO/MON saves human resources.**" Story after user story substantiates this fact. Many of them tell of dollar savings as well.

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DECISION-SUPPORT SYSTEMS



COMPUTERS HELP YOU WIN THE GAME

A growing number of corporations are using decision-support systems to plot their next moves.

by Ellis Booker

Decisions. The right ones can build a corporation's fortune, the wrong ones can topple it. Increasingly, decision-makers are arming themselves with sophisticated arsenals—systems that let them create their own business models, pose ad hoc questions, and test their business hypotheses on corporate data. These decision-support systems often incorporate electronic mail; tickler files, which automatically remind users of important dates and appointments; and even electronic "ticker tapes," which scroll across the bottom of the screen to keep managers up to date with financial news.

Why the rush to these exotic and expensive systems? "Business is being looked at in a different way," says Gary Gulden, vice president of Index Systems, a management consultancy based in Cambridge, MA. "From the smokestack industries to the high-technology manufacturers, corporations are redefining their roles in the marketplace." As they strive to redesign major chunks of their manufacturing, sales, and financial procedures, says Gulden, "managers have an intense need for information and insight."

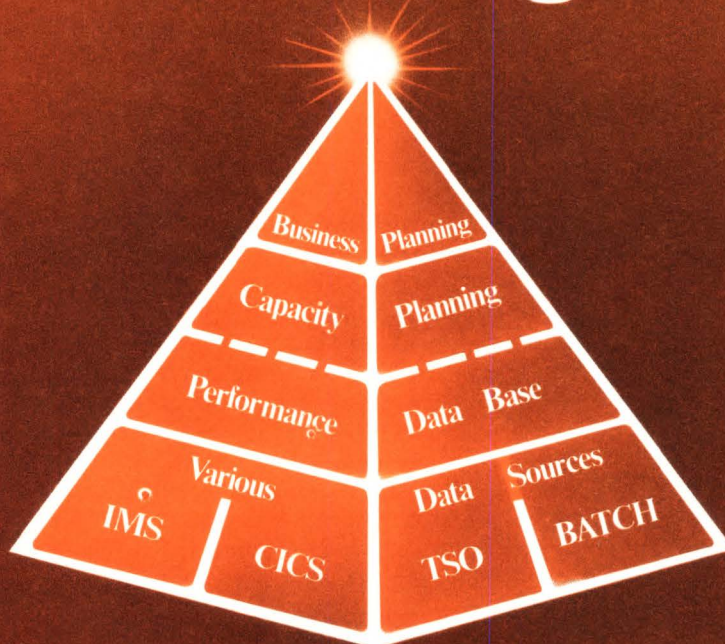
Broadly defined, the term "decision-support systems" encompasses a wide variety of information technologies. Lynne Markus, a consultant with the San Francisco office of Arthur D. Little Inc. (Cambridge, MA), prefers this loose definition. She argues that the concept has already been defined too narrowly, coming to mean only interactive computer systems

able to create financial or strategic models. "People believe decisions are made in isolation," says Markus. "They overlook the reality: Many managers participate in most decisions, and decision-support systems are not useful until they support communication between all managers involved in the process." She suggests that a basic communications system—one with indexing, database, and electronic-mail features—affords the most useful kind of decision support, because it improves the exchange of information among employees.

Still, despite its changing role, decision support is still defined as programs that stress interaction between decision-maker and software. Many see decision support as an evolutionary step forward from management's traditional dependence on the data-processing department. With decision-support systems, managers can scan for themselves data from personnel, accounting, or inventory files, and access market information from external sources. This information, available at their fingertips, is not only timely, but is in an appropriate format.

A relatively new decision-support user, Zale Corp., Irving, TX, is the world's largest retail jeweler, with more than 800 stores across the country. Zale posted sales of over \$1.3 billion last year. The in-house installation of the System W decision-support package from Comshare (Ann Arbor, MI) began last fall, after Zale had been using the product on a time-

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CIRCLE 11

DECISION-SUPPORT SYSTEMS

sharing basis for several months.

"We're using System W for our long-range planning," says Gene Morphis, vice president. "We maintain long-range forecasts for each of our business units [Zale's business units cover the low, middle, and high ends of the jewelry market]. They also do classic 'what-if' analyses," he says. "We have also created an economic model to forecast jewelry demand for almost every market in the United States. We use it to develop sales plans market by market, and then, using a database, sort by markets or by organizational chart—district manager, regional manager, and so on." Morphis hopes eventually to sort the database by product line as well.

When did Zale's interest in decision support begin? "Some technicians in the planning and marketing-research departments began to show us what these programs could do," says Morphis. "Then some line managers said, 'That stuff is great, let me have more of it.'" Morphis thinks the move toward decision support is self-sustaining. "Once you get used to good analyses, you want more," he says.

Although the number of System W users at Zale's corporate headquarters is comparatively small—about 20—Zale has some 300 computer terminals, including what Morphis calls a "liberal number" of IBM 3270 and 3279 terminals, and IBM Personal Computers. "Employees in all ranks

of the organization use the equipment," reports Morphis.

Most of the corporate planning is done on the 3279s, which use Comshare's Micro W, the micro version of System W. The various divisions create their models independently. But Morphis hopes to "reach into each division's databases, grab its final numbers, and consolidate the bits and pieces into one model on the mainframe."

Another decision support user is Bowater Inc., a major manufacturer of newsprint, with 1983 sales in excess of \$772 million. It has used IFPS from Execucom Systems Corp., Austin, TX, since 1980. "Originally, I was using Plan Master," explains Doug Parker, director of business planning and analysis. Parker, who still uses Plan Master for some applications, explains that long-range strategic planning and budgeting models are the core of decision support at Bowater.

A divestiture in May split Bowater from its British parent, Bowater Corp. PLC of London. North American Bowater, based in Old Greenwich, CT, now manages a substantial paper and wood-pulp business, including processing plants in South Carolina and Tennessee, 1.1 million acres of timberland in the continental United States, and another 750,000 acres in Nova Scotia. Sales of newsprint account for 69 percent of the corporation's revenues.

Parker explains that Bowater first used Plan Master from Comshare, but switched to an in-house system and an IBM PC version of IFPS when Comshare's rates proved too high. "We don't do a lot of sensitivity analyses," reports Parker. "Rather, we try to quantify long-range projections. For example, we look at our timberland investments as far ahead as 30 years to project yields and future products." In addition to creating timberland models, Bowater projects manufacturing and production rates,

and the cost of capital projects.

Bowater has recently become a user of IFPS/Personal, the personal-computer version of IFPS. IFPS/Personal has color graphics and multi-screen windows, which Execucom officials say make the product far easier to use. Priced at \$1,500, IFPS/Personal runs on the IBM PC and IBM PC XT, the Texas Instruments Professional Computer, the Victor 9000, and compatible personal computers. Minimum system requirements are 512,000 bytes of random-access memory, dual disk drives (a hard disk is recommended), and, to take advantage of graphics, the MS-DOS 2.1 operating system, a color graphics adapter, and a color monitor.

At Atlantic City Electric, Pleasantville, NJ, forecasting is an equally important function. Express, from Management Decision Systems, Waltham, MA, provides the forecasts for the public utility. Alphonso Gandica, corporate-planning-systems coordinator, reports that the program is being used in a detailed operational model that tracks plant finances, rate scales, and customers. "We made a deliberate decision to design the operation model first, before creating a strategic one," he says.

Gandica emphasizes that the decision-support tool is operated and maintained by employees in the forecasting, rate, and tax departments. "There isn't anybody more qualified than the tax expert to understand the logic of a tax problem, and therefore the logic of the model," he says. Gandica reports that the dp department at Atlantic City Electric is consulted only when there's a hardware problem or a need to expand.

The Electrical Power Research Institute (EPRI), a Palo Alto, CA, trade association for more than 700 utilities around the nation, has watched the growth of decision support with interest. Lew Rubin, a project manager at EPRI, says decision support has al-

We look at our timberland investments over 30 years to determine future yields and products."

—Parker, Bowater

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ways been an important part of utility computer systems, because utilities face unique planning problems. "It is impossible to store an inventory of energy," he explains. "Our planning systems must match up a predicted consumer demand to the plant's optimum capacity." Moreover, government regulations demand power suppliers use modeling systems that are more sophisticated than ones used by many corporations. In fact, the lengthy reports on predicted energy demand, profits, and so on, that electric utilities must routinely submit to regional and state public utility commissions to justify proposed rate increases are actually forecasts from various decision-support models.

Not all corporations are lured by the promise of decision-support packages. "I've come around 180 degrees over the last few years," says Donald Buchanan, senior vice president of data processing at Giant Food Inc., Washington. "For a package to be useful, it must be attractive to a large user community." Buchanan believes that creating a package from scratch, while more expensive, will prove more economical and efficient over the long run because the package will be geared to a corporation's unique needs.

Giant Food's in-house system tracks inventory at the chains' 132 supermarkets in and around Baltimore and Washington. Claiming to be first to install electronic point-of-sale bar-code readers in all its stores, Giant Food records all items sold over every day. A small staff then tabulates these results, watches for trends, and tailors each store's merchandising to its particular region. "Instead of running 132 cloned stores, we run a chain of 132 mom-and-pop stores," says Buchanan.

Mead Corp. uses an extensive in-house decision-support system. Clay Sundermeyer, manager of decision support at the paper producer's Dayton, OH, head-

quarters, oversees the program, which boasts an impressive amount of top-management use. "What distinguishes our plan is our executive-information system (EIS)," says Sundermeyer. "From the president, chairman, and senior vice presidents on down to most staff department directors, we have hands-on users."

Mead's EIS is divided into several modules, namely Five-period Forecast, Flash-earnings Report, Corporate Planning, and—as yet not fully operational—Human-resources Database. Exception reporting is one of the most popular uses of the system, according to Sundermeyer.

Sundermeyer calls "strategically important" the IBM Profs system,

which has been used for some time and is growing in popularity. "We have 500 Profs users now," says Sundermeyer. Mead's information system includes electronic mail, word processing, electronic ticker tapes, and electronic Rolodexes. Still, Sundermeyer doesn't have any illusions about who benefits most from the system. "Use of technology is still limited to those with computer knowledge," he says. "The leading-edge executive who is a closet computer hobbyist at home is most likely to use the system."

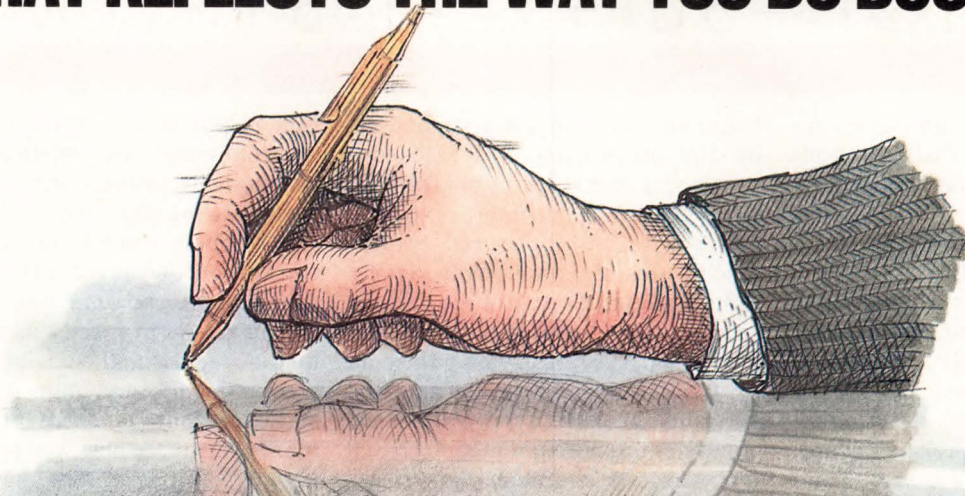
Some corporations are expanding the scope of decision support by connecting to remote databases. ADP Network Services Inc., Ann Arbor, MI, recently announced a system that lets organizations take this step. Last April, ADP Network Services began offering Execucom's IFPS and IFPS/Personal packages in conjunction with its own financial and investment databases. ADP clients will be able to access financial, econometric, and investment databases, and integrate the data into IFPS models.

Carey Schoening, IFPS product manager at ADP, thinks models that can take advantage of ADP's broad databases will enhance the analyst's job of performing "what-if" scenarios. Data from ADP's databases can be used in one of two ways. The user can either download into an IFPS model or answer a series of online prompts to discover the most relevant data for his or her model. Connect charges for the new service range from \$15 per hour for 300-baud connections to \$40 per hour for 2,400-baud connections. The computer-utilization rate is 2.7 cents per minute.

Another vendor offering online databases with decision support is Alpha Software Corp., Burlington, MA. Alpha is marketing a \$795 microcomputer version of ESP, an econometric and statistical package that was introduced in the late 1960s



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DECISION-SUPPORT SYSTEMS

for mainframes. A significant enhancement in the new ESP is its ability to retrieve data from Chase Econometrics' databases. ESP requires 256,000 bytes of memory and runs on the IBM PC or PC XT.

Chase Econometrics is planning to introduce an integrated package that includes Alpha's ESP. The Wal-tham, MA, firm hopes its offering will be the best of both timesharing and microcomputer worlds. PC Planr, as it's called, will sell for \$5,000 and will run on the IBM PC XT.

Another development that may someday facilitate decision making is the expert system, the next step in concept-processing software. According to George P. Huber, professor of management at the University of Texas at Austin, decision-support systems provide a limited kind of analysis. They are used to plot a path to an objective—say increased profits—by achieving the best solution within stated constraints. "The systems say, in effect, 'This is the best I can do, given what you asked.' None of the products take the next step by saying 'If you were willing to relax constraint X, we could increase profits,'" says Huber. Expert systems will take that important step.

Managers may not have long to wait for expert systems, given the speed of software developments and the plummeting costs of hardware. When they do arrive, expert systems will not only perform the traditional "what-if" analyses as instructed, but will also be able to prompt the user with such questions as "what if I tried?"

Despite the growing popularity of decision-support systems and their important role in corporate decision-making, one question remains unanswered: Is it, in fact, the decision-makers who are using the software? In other words, what is the demarcation between MIS and decision support?

At Conrail, for instance, the in-

house decision-support system used by the marketing and sales departments uses a combination of batch processing and interactive computing. For Conrail, the need for more precise, flexible, and timely reports came as a direct result of the deregulation of the railroad industry. In October 1980, the railroad embarked on a \$4.2 million program that doubled its computer resources. "One reason our system is more oriented for batch processing its enormous data files," says Bob Mortensen, assistant vice president of forecasting and planning control. "A wide range of data is attached to each train carload—there are 1,000 new loads per day, and each load is online five days a week. We record date of destination and arrival, weight, shipper, category of train, number of available locomotives, average elapsed time between scheduled departure and arrival, and so on."

Conrail's decision-support system is Probe, a database and decision-support system that has been in use since about 1970, just after Conrail was created from the wreckage of the bankrupt Penn Central railroad. By 1974, data-processing files had been consolidated and were available for global analysis. Typically, sales representatives request information about a specific shipper or geographic region, the request is submitted for batch processing, and within two days the representative receives the printed results.

However, in Conrail's Philadelphia headquarters the sales and marketing departments have access to other interactive systems. According to Harry Kaplin, assistant director of informa-

tion resources and systems for the marketing and sales departments, 29 interactive terminals are now at the corporate headquarters. One decision-support model, for example, tracks the efficiency of car usage. "It's a menu-driven screen system allowing car managers to specify in detail the kind of reports and calculations they want to include and omit. It provides statistics that let them and upper management see how well the system is running." Kaplin says the data are chosen interactively, but the production of the reports is done in batch, with the reports printed within a few hours.

During the 1970s, the idea of bringing interactive computing to all managers—from senior executives down to staff analysts—was "the dominant evangelical aim" of decision-support theoreticians, says Peter Keen, assistant professor of organizational psychology at the Massachusetts Institute of Technology's Sloan School of Management (Cambridge). But experience in the business world has proven this view to be, at best, overly simplistic. Not all companies can embrace such a total commitment to computerization. In fact, evidence from many quarters indicates either that managers aren't using decision-support systems or that the hands-on use of the technology is more frequently done by staff analysts. Gerald Wagner, Execucom Systems president, believes that managers want to be involved in model building, but that "once a model has credibility, they turn the mechanics of using it over to an assis-

(Continued on page 24)

"From the chairman, president, and senior vice presidents on down, we have hands-on users."

—Sundermeyer, Mead

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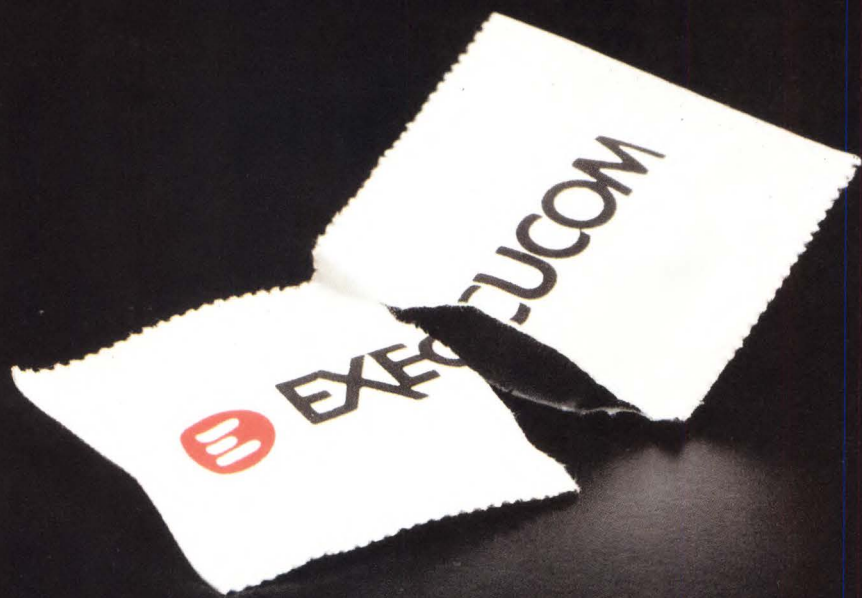
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CIRCLE 13



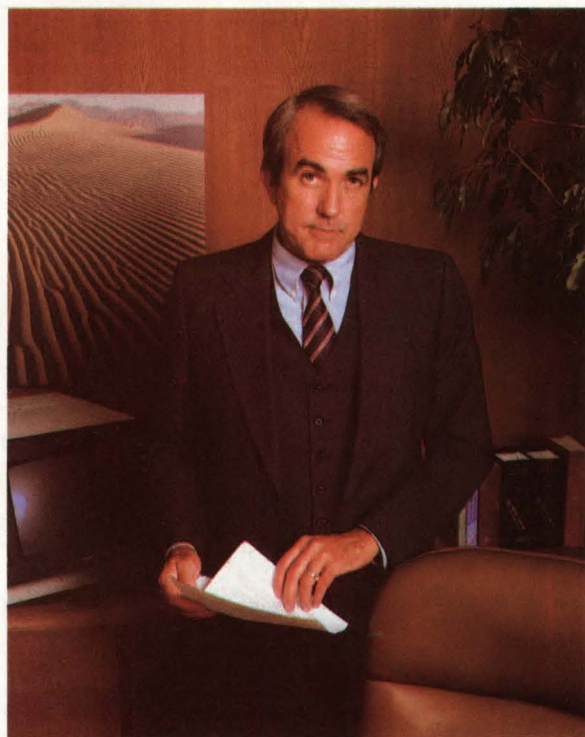
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DECISION-SUPPORT SYSTEMS

(Continued from page 20)

tant." And recently some refreshingly pragmatic decision-support theoreticians have expressed doubts about whether every manager should be encouraged to go online.

In an article entitled, "Why is man-computer interaction important for

decision-support systems" (collected in *Decision-support Systems*, William C. House, ed., Petrocelli Books, 1983), Steven Alter challenges the very foundation of decision support—its alleged interactivity. Alter, a professor at the University of Southern California at Los Angeles, exam-

ined the use of 56 decision-support systems. The key issue, he reported, was not whether a manager could get answers needed to make decisions from a computer, but rather, whether "a combination of people, data, models, and technical tools could provide these answers in a convenient, timely, and cost-effective manner."

Alter's conclusion runs counter to the prevailing "terminal on every manager's desk" mentality. As he's written: "... The goal of developing better man-machine interfaces to entice direct usage by busy managers may be entirely inappropriate. ... The research [in better man-machine interfaces] should not worry about cosmetic features of language (e.g., error tolerance, English-like appearance, acceptance of ambiguous questions), but rather, about the precision, terseness, scope, power, and flexibility of the language in its application to the problem domain by experts (who might well be staff intermediaries working very closely with managers)."

Of course, these disagreements over terminology may be what they seem—merely academic. Asked how managers are using decision support, one writer offers the following riddle: "Tell me who uses the limousine? Is it the chauffeur or the passenger—and does it really matter?"

Gil Mott, senior consultant at Real Decision Corp., notices winds of change blowing into mainframe decision support. Pointing to an increasing number of mainframe-system vendors bringing out reincarnations of their products, he says there's a cross-pollination between the mainframe and micro packages. "In graphics especially, packages for microcomputer decision support are ahead technologically of the mainframe packages." Mott cites both Execucom's IFPS/Personal and Prism from Deltacom Inc. (Feasterville, PA) as micro versions that have better graphics than their mainframe predecessors.

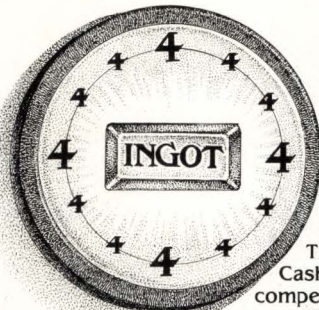
Another trend noted by Mott is an increasing emphasis in mainframe decision support on "insulated user-friendly front ends." Once again, the

(Continued on page 28)

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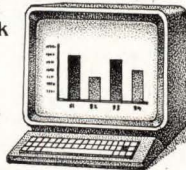
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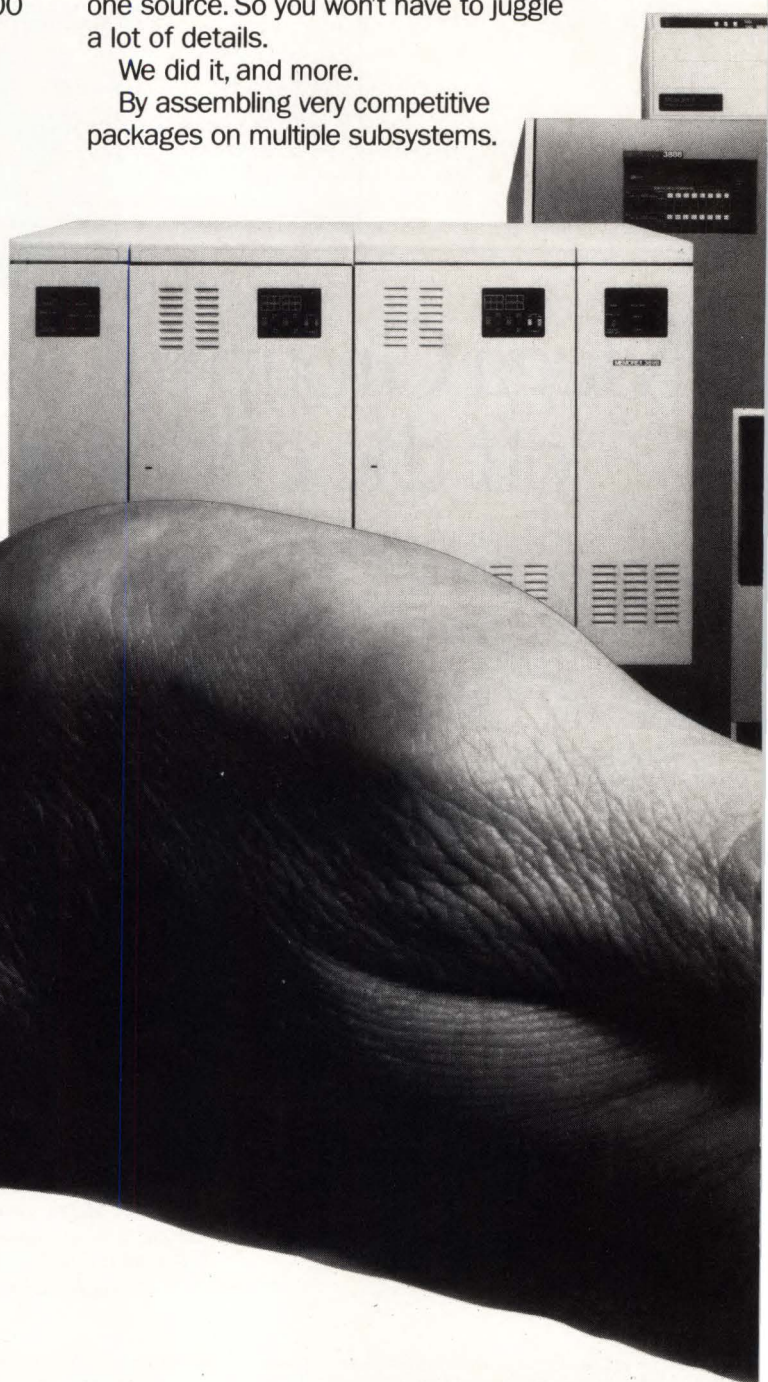
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DECISION-SUPPORT SYSTEMS



(Continued from page 24)

number of mainframe programs that employ menus, prompts, English-language commands, and graphics is growing, no doubt a result of the popularity of microcomputer software offering these techniques.

To keep current with program updates and micro-based systems, Real Decisions Corp. publishes "Financial Modeling Decisions," a yearly guide to some 30 decision-support packages. The consultancy has an interesting standard for evaluating the packages: It prints excerpts of the code used to solve a set of five business-modeling problems. The problems are supposed to test a program's ability to perform sensitivity analyses, backward iteration, simultaneous equations, consolidations, and various reports and graphics. Accompanying each excerpt are Real Decisions' own annotations. "This benchmark shows the style of the language and how complicated it is to design a model," says Mott.

A few observers doubt that mainframe decision support is still useful at all. "It's all a screaming, flaming failure," says W. R. Purcell, author of

Understanding a Company's Finances: A Graphic Approach, (Houghton Mifflin, 1981), and publisher of a monthly newsletter on business graphics. Over the past several years, Purcell has delivered some 200 seminars on computers and computer graphics in financial planning as part of a nationwide lecture series sponsored by the American Institute of Certified Public Accountants. He has seen, he says, what managers are seeking in decision support—and what they haven't found.

"Overwhelmingly, there is a gap between what is being provided and what managers need," says Purcell. "The universal complaint is that managers are getting a truckload of numbers that they can't fully use. Managers don't need great gobs of numbers. Rather, they need an ounce of gold—a few key numbers that best reflect what will happen in the future."

For Purcell, the solution lies in the use of graphics in the decision-support design. Where do graphics come into the picture? "It's clear graphics are the only way to stop giving decision makers overwhelming lists of figures they don't want," he says. But when

Purcell says "graphics," he doesn't mean bar and pie charts. The real potential of decision-support graphics will be realized, he says, only by *analytical* graphics, which compile numerical data and multiple analyses into simple representations. Purcell envisions such graphs presenting answers to series of "what if" questions in the form of shifting slopes, plotted against, for instance, profits. Remarking that this type of graph could be designed using current decision-support languages, Purcell argues that such systems haven't been developed because of what he calls the "principle of unnecessary complexity that afflicts mainframe software."

Even with the current emphasis on microcomputer decision-support applications, most experts agree that mainframe-based decision support will remain important to corporations well into the future. The relationship is likely to change, with the mainframe packages doing more data consolidations and the micros retrieving selected sets of information for study or injection into models. But, as Mott puts it: "Data will tie managers to the mainframe. As long as people need access to corporate data—to one set that's accurate—the mainframe will be with us."

Given this, it may be healthier to look at decision support as a relay race—one involving the data-processing department as well as users. "The greatest strength of decision support," believes Ramsay Smith, senior project manager at Timex Corp., Middlebury, CT, "is going to be its ability to bridge the orientation gap between traditional MIS departments and users. Both groups use the software and both can benefit. The users will learn to appreciate the dp mind for problem-solving, and the dp staff will become more aware of the company's business." □

Ellis Booker is a free-lance writer and editor based in New York.



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INCREASED PRODUCTIVITY



THE SOURCE: OFFICE SYSTEMS

Whether they're counting dollars or watching the clock, managers are breathing easier these days, thanks to computerized office systems.

by Leslie M. Berke

Saving money improves the bottom line for any organization. And cost savings combined with increased productivity lead to happy management—not to mention satisfied shareholders. Many corporations and financial institutions are using minicomputers for office automation to realize both monetary gains and greater work output.

Such is the case at Delaware Trust (Wilmington), one of the nation's top 300 commercial banks. Bank officials estimate that due to intensive studies into the most cost-efficient and beneficial item-processing methods, last year the institution saved \$500,000.

Delaware Trust had been planning to use a service bureau to handle its item processing. But when the bureau said the bank would first need to purchase new teller equipment costing half a million dollars, bank officials knew there had to be a better way. Delaware Trust had purchased two Hewlett-Packard 3000 minicomputers four years earlier, and discovered that the 3000s could be adapted for use with its IBM 3031 mainframe and its audio-response system from Cognitronics (Stamford, CT), which gives tellers such information as account balances.

"We developed the software in a matter of weeks and saved a great deal of money," says Rolf Eriksen, senior vice president and chief economist for

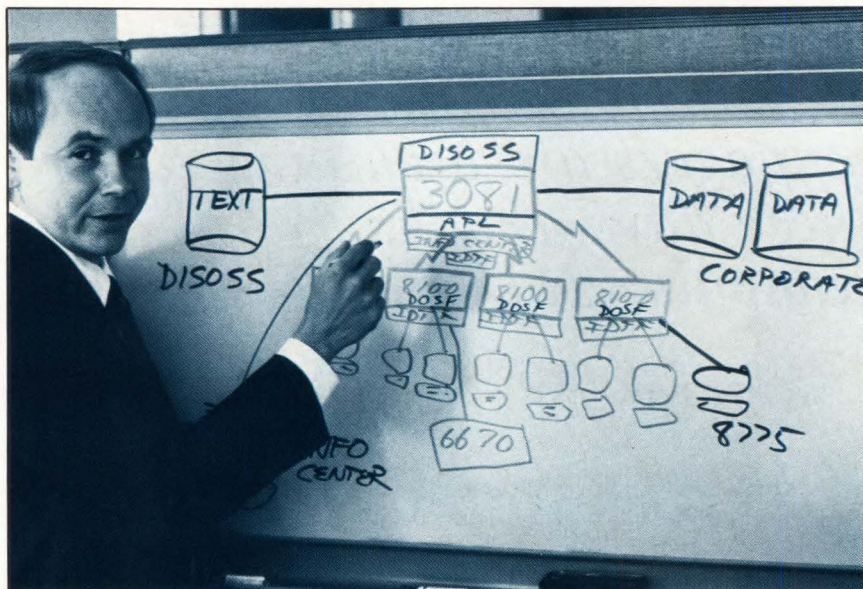
Delaware Trust. "By adapting our existing system instead of using the service bureau, we not only avoided purchasing new teller equipment, but saved on operating, communications, and maintenance costs. Over five years that would have run about \$1 million."

But that's not where Delaware Trust's savings stop. A unique feature of the bank's corporate charter lets it become involved in businesses other than banking. For example, Delaware Trust is writing software for its class-action-litigation processing business. The bank maintains lists of claimants, examines and processes claim forms, calculates losses, and divides the money between plaintiffs. Because each case is different, unique programs must be written each time. The bank also supports a multiple-listing service bureau for three of Delaware's real-estate boards.

Eriksen says, "Delaware Trust has the ability to become involved in these business ventures and use the software that's developed for them to make some extra money. From the real-estate and class-action services, the bank is making an extra \$425,000 a year. And we're actively marketing and selling this software to real-estate boards around the country."

Delaware Trust recently purchased an HP Model 3000 Series 48 minicomputer for word processing, elec-

INCREASED PRODUCTIVITY



Jeffrey Newburg, First Wisconsin assistant vice president, diagrams the 8100/DOSF system that supports the bank's office-automation program.

tronic mail, and file management. "We anticipate that over five years, we'll save twice the cost of the equipment, which was about \$160,000. These savings will come from reassigning people to more productive jobs. It's just that simple," he adds.

Delaware Trust is not the only company to benefit from applying minicomputers to office functions. At the First Wisconsin National Bank of Milwaukee, a distributed office system is boosting efficiency and productivity.

The IBM 8100 computer, with its ability to handle both text and data processing, is a key element of the distributed system. Four 8100s serve various divisions of the Milwaukee bank and more than 100 departmental and individual users. A number of 8775 terminals, also able to handle both text and data processing, are on-

line to the 8100.

"With Distributed Office Support Facility software, the 8100s can handle the full range of text processing in a variety of ways," says Jo Ellen Lauritzen, a data-processing officer in charge of office systems. "Text and documents for local processing can be stored and retrieved via the 8100's own local text database."

The legal department is an especially strong proponent of the new system. It saves a great deal of time using the 8100 text processor to revise, update, and reproduce standard and specialized legal forms and loan agreements.

Another major text-processing time-saver is the system's preparation of reports showing the precise time spent by lawyers for other departments. "The 8100 tracks the daily activities of every lawyer by quarter-

hour segments. It then pulls together the data needed for the departmental user reports and for departmental management reports summarizing attorney activity," says Jean Kohlweiss, administrative assistant to the head of the department. "The system cuts the time required for this in half."

Gary M. Sopchik, assistant vice president in the credit division, is equally enthusiastic about the new system's contributions. His division is responsible for very critical "credit analysis" reports. "We prepare a great many credit analyses, and each is lengthy and detailed and must be highly accurate," Sopchik says. "The initial portion of the report can run as long as 12 pages of tightly packed text; the 8100's text-processing speed saved a tremendous amount of time in preparing the original report and its revisions."

Sopchik notes that more time is saved in preparing the second part of the report, which is a spreadsheet reflecting the loan applicant's sales, costs, preferences, assets, and profit status. "Here, we use a powerful information-center tool, called A Departmental Reporting System, to create spreadsheets with an in-house program," he says. "We use IBM 3279 color display terminals that enter and maintain the data, print the spreadsheets, and combine them with the 8100-created text to form the complete credit report."

At the Life Insurance Co. of Virginia (Richmond), a wholly-owned subsidiary of Stamford, CT-based Continental Group Inc., strategic planning is paying off both monetarily and in increased productivity. "We've projected that a fully implemented computer system will save the company a quarter of a million dollars a year," says Richard C. Moschler Jr., vice president of information systems.

After an exhaustive two-year search for the most appropriate

(Continued on page 38)

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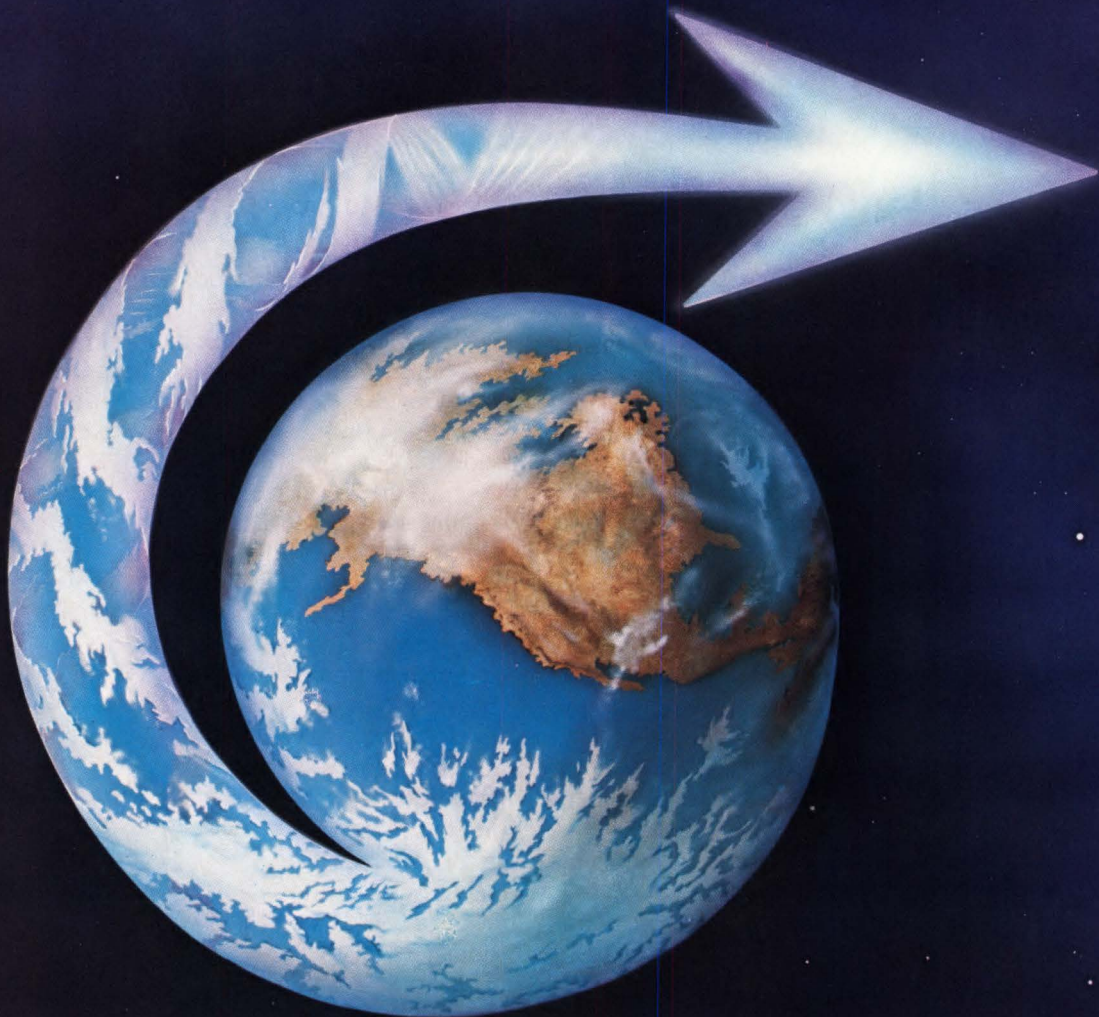
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office-automation equipment, Moschler and his associates finally chose Data General's Comprehensive Electronic Office (CEO) system. Besides saving the insurance carrier money, CEO has also helped increase the life insurance carrier's productivity. "There has been an increase in productivity," Moschler says. "Some people have been reassigned to other divisions, and since automating, we haven't had to hire more staff to maintain our head count."

Moschler says the ability to send information electronically from workstation to workstation has been a tremendous benefit to the carrier. "In the pension sales department, the actuaries use CEO to calculate and analyze data relating to prospective clients. Once finalized, those data are

"A 15 percent increase in productivity is attainable."

—Talbot, TRW

passed electronically to the proposal department where the staff translates them into a written proposal. That plan is then sent to the prospective client," Moschler explains.

Some companies are more concerned about achieving benefits than cost savings. An office-systems strategic-planning survey conducted in May 1982 by Cresap, McCormick, and Paget Inc., a Chicago-based consultancy, found

that when companies are asked to rate three by-products of automation (increased productivity, improved service, and reduced costs), most considered saving money least important. The study concludes that this may be one of the reasons why companies are installing sophisticated office technology when its benefits often can't be cost-justified.

Alexia Martin, an office- and information-systems consultant in Los Gatos, CA, believes "very few companies track their savings after the fact. Once their systems are installed, they perceive some improved production or improved operation and they're satisfied with that."

David Thursland, author of *Administrative Support: Economic Justification for Office Automation*,

"We had been plagued for months by intermittent disc failures, random CPU shutdowns, and other virtually untraceable, hardware errors..."

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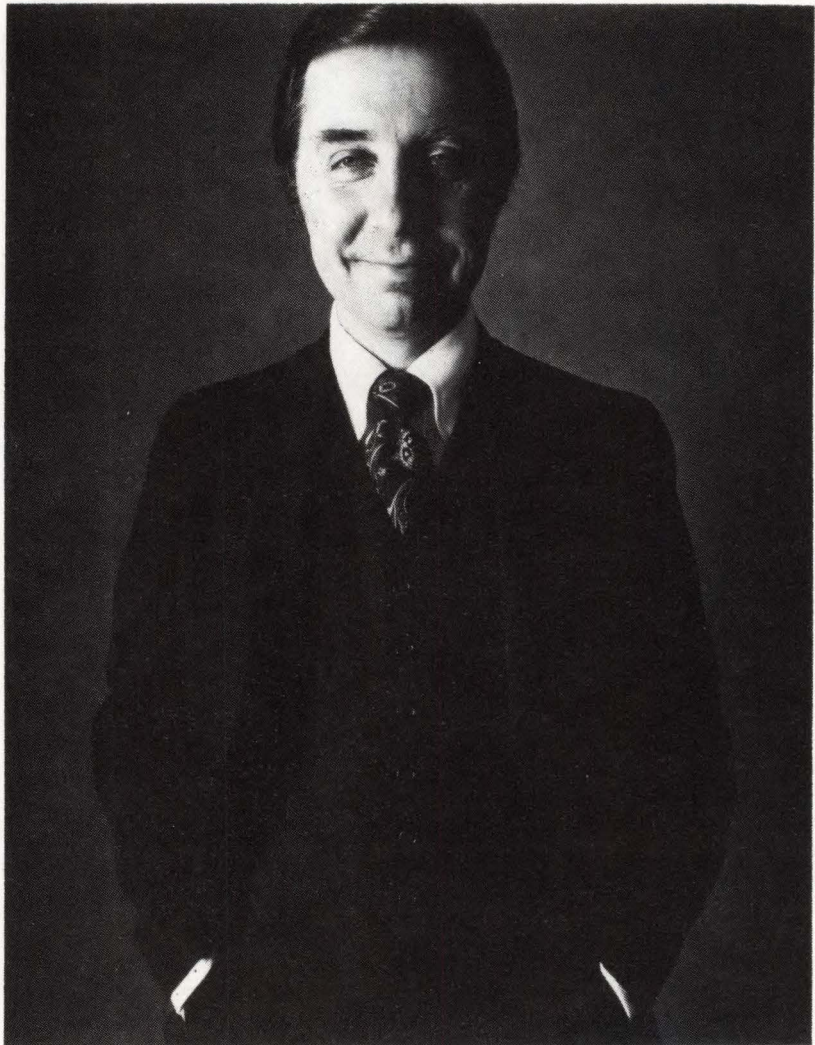
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CIRCLE 23

INCREASED PRODUCTIVITY

(Association of Information Systems Professionals, 1983) agrees: "At least 50 percent of companies that automate aren't figuring out whether or not they're saving money. Many of them are paying more for the system after it's installed than they were before automation."

Two years ago, the defense-systems group at TRW (Redondo Beach, CA) completed research into the effectiveness of electronic mail, word processing, and computerized scheduling. "We wanted to see if these functions would help TRW," says E. Guy Talbott, senior engineer for the group.

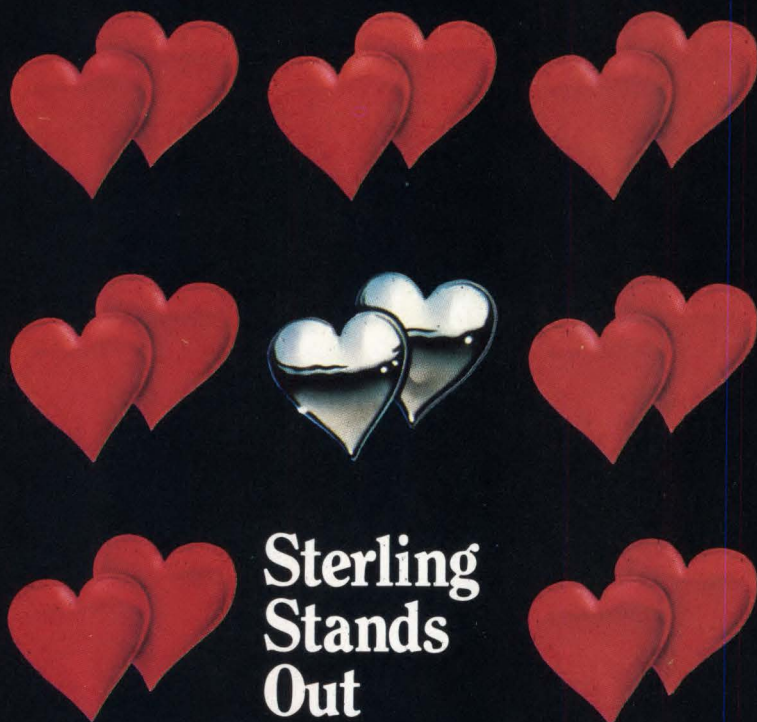
Today, TRW is using Zenith 110 microcomputers with various central processors, such as Digital Equipment Corp.'s VAX 11/750. The company is using the GTE-Telemail nationwide electronic-mail system. "A 15 percent increase in productivity is attainable," Talbott believes. "The research study shows we're already getting a 5 percent increase."

Chemplex Co., an 18-year-old joint venture of American Can Co. (Greenwich, CT) and New York-based Texaco Inc., manufactures polyethylene resins. Its year-old computer system, which is made up of HP 3000 Model 68 superminis and HP 125 and 150 personal computers, replaced its outmoded computer facilities. The new systems are being used for communications within and between the Rolling Meadows, IL, headquarters and the Clinton, IA, plant 130 miles away.

Chemplex officials hope the company will save money through computerization, but, they say, that wasn't their main purpose for automating. "Saving money is not always the bottom line," says Gilbert Johnson, director of management-information systems. "There are many things companies do solely because they make sense. For example, Chemplex needed to modernize its computer facilities to remain competitive. The old system had no terminals, online processing, or data-retrieval capabilities. That put us at a disadvantage. If we provide our workers with modern tools, efficiencies and cost savings will follow."

Johnson says once the major software installation is completed and adequate databases are built, middle and upper management will begin using desk-top micros to retrieve information from the main system. "Having the computers available for middle and upper management will allow them to do immediate analysis and decision-making from the electronic information they have at their desks," Johnson adds. "And that will be of immense value." □

Leslie M. Berke is the copy editor for Medicine & Computer, White Plains, NY.



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BUILDING IN EFFICIENCY



COMPUTERS ACCELERATE MANUFACTURING

Computerized production techniques help manufacturers put out high-quality products faster and cheaper.

by Gary Stix, Associate Editor

The in-process inventories for American industry in the past few months fell to their lowest levels since World War II. Despite the economic recovery, manufacturers steadfastly refused to follow the old practice of stockpiling large reserves of new materials. This trend is a somewhat belated recognition that profits rise inversely to inventory levels.

A large measure of credit for the push toward zero inventories goes to computer-integrated manufacturing (CIM), which includes manufacturing-resources planning (MRP), group technology, computer-aided process planning, quality control, and computer-aided simulation. These production methodologies emerged from university engineering departments and the military only during the past five to 10 years, and have revamped the manufacturing workplace. Reductions in lot sizes, machine setup times, and inventories resulting from CIM correspond directly to a rise in worker productivity and profitability.

But, even though CIM may restore a measure of efficiency to American industry, it can also add complexity. Often, packaged software is too inflexible for the exacting needs of manufacturers. Chris Gray, vice president of Oliver Wight Inc., Essex Junction, VT, a consultant and planner of educational seminars on MRP, cautions manufacturers considering MRP to

moderate performance expectations. "We have never seen a package that's functionally complete by our standards," he says. "But management often expects a package to be like a washing machine, which you hook up, turn on the water, and run."

As always, time and money are the overriding considerations. The necessity of obtaining detailed documentation of parts and processes means that a one-year conversion may take three times as long as planned, wrecking implementation budgets and confirming suspicions of an already skeptical upper management.

Software and implementation costs range from a few thousand to several million dollars. And because many of these packages are less than five years old, the purchaser, in effect, becomes a beta tester. Gray advises against buying premium-price packages, which often contain "bells and whistles" that work only in the vendor's product literature. "There's no way I'd buy a manufacturing package for \$500,000," Gray says. "There is very good, workable software in the \$100,000 range."

CIM also presents a dilemma for the data-processing department. "In a lot of cases, the dp people have been out front spearheading computerized-manufacturing efforts," says James Davis, a senior manufacturing consultant at

BUILDING IN EFFICIENCY

Arthur D. Little Inc., a Cambridge, MA, consultancy. "One of the pitfalls is that the project may be recognized as dp's effort and not that of the users (engineering, marketing, etc.). Then the whole effort goes to hell."

In fact, the dp department should never take chief responsibility for CIM implementation, says Gray of Oliver Wight. "Systems and dp play an important role, but not a leadership role," Gray says. "Dp should be responsible for interfacing equipment, training users on the software, and making sure all necessary functions are included."

The best known and most prolific intervention of computers in manufacturing planning is manufacturing-resources planning; some 165 software packages occupy the MRP marketplace. MRP was first conceived in the late 1950s as an inventory-control system called materials-requirements planning. The last few years have seen the introduction of packages, sometimes called MRP II, which go beyond inventory forecasting and production scheduling to encompass business planning for the entire manufacturing cycle.

In many cases, manufacturers claim significant productivity gains. In last December's issue of *Computer Decisions*, William N. Harris, MIS director for the Kendall Co., said: "In 1979 . . . we shipped about \$29 million in products, and had about 485 employees on our manufacturing staff. This year we'll ship about \$50 million and with only 340 employees. Moreover, our quality has established us as a leader in our industry. Our program lets the plant manager attend to busi-

ness, rather than run around looking for nuts and bolts."

Cost of the packages, however, is also significant, totaling as much as \$1 million in some cases. Some companies have responded by applying the concepts of MRP II to low-cost microcomputer systems. Bell & Howell Co.'s Visual Communications Group, Chicago, developed its own scaled-down in-house system with Visicalc and Apple II computers. Numerous MRP packages designed for microcomputers have become available, priced between \$10,000 to \$20,000.

With the increasing popularity of just-in-time methods, MRP has fallen into disfavor in some circles. (Just-in-time is a production method extensively implemented in Japan in which parts deliveries are only large enough to replace inventory just used.) MRP's long-term planning projections are considered antithetical to just-in-time concepts, says Thomas M. Hout, a vice president of the Boston Consulting Group.

The manufacturing software that has attracted perhaps the most attention during the past few years is a product that its marketers claim is not software at all. Optimized Production Technology (OPT) is touted as a production concept that enables its users to achieve greater production efficiencies and more realistic models of the production flow than do other computerized planning techniques.

The nucleus of OPT is four software modules and a software-protection device—"a black box" that prevents unlicensed use of the product. What the software does is to

create a model of a plant's operations, identifying production bottlenecks, and rescheduling processes to run more efficiently.

The software is the brainchild of an Israeli physicist, Moshe Eliyahu Goldratt, and is marketed in this country by Creative Output Inc. In the early 1970s, Goldratt devised the software's algorithms for a friend who needed a better production schedule for building chicken coops. Today, the software is being used by the likes of General Electric, RCA, Ford, and Westinghouse.

After initial success, Goldratt concluded that further productivity gains would only be achieved if manufacturers would change assumptions about plant operations embedded in conventional cost-accounting methods. His so-called philosophy has led some plant managers to drastically revamp the way they deploy machines and labor on the factory floor.

The management at GE's Wilmington, NC, aircraft-engine-parts plant has been devoted to both the philosophy and software of OPT since 1980. This \$100 million, 600-employee "factory of the future," which manufactures rotating hardware for GE jet engines, has seen inventory drop from 120 days' stock-on-hand in 1981 to 90 days' in 1983, saving \$3.4 million says John Schwenker, the plant's manager for production planning. This year, alone, the plant expects to achieve an additional \$1.7 million saving by getting inventory down to 75 days' stock on hand.

OPT is just one factor in such productivity increases as on-time delivery rates of between 92 percent and 94 percent at the Wilmington facility. The plant has automated at every level. It uses computer-aided design and manufacture (CAD/CAM) technology from Calma, a GE subsidiary; automated production lines operated by digital controllers; and automated parts-delivery systems.

(Continued on page 48)

A large measure of credit for the push toward zero inventories by U.S. manufacturers goes to computer-integrated manufacturing.



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Schwenker calls himself a convert to the philosophy promulgated by Goldratt and his representatives at Creative Output. Schwenker says he often must put plant workers through a "reeducation process." The ability of one segment of the plant's operation to run at full capacity is a pointless and costly pursuit unless the rest of the operation can maintain the same levels of production, Schwenker says. If one section of the plant is riddled with bottlenecks that impede the output of finished goods, another part might find itself working on production of inventory that might not be required for two years.

Another aspect of OPT's scheduling convinced factory personnel at Howmet Turbine's component-manufacturing facility in La Porte, IN, to drop plans for implementing an MRP system. "With OPT you can't generate a schedule that runs resources (workers and machines) at over 100 percent capacity," says Mark Tilling, a production-control analyst. "With MRP, though, you can overload resources."

At Howmet, OPT creates schedules for the plant's most labor-

intensive operation—wax injection, which produces parts such as air foils for engine assemblies. Using OPT on an IBM 3083 mainframe, lead times have been reduced by several weeks.

Tilling inputs part routings—orders and descriptions of resources—to generate 30 schedules every two weeks. "It tells you that this person should take this tool to this job, and that this machine needs this auxiliary to do this other job," he says. Howmet, one of the early users of the system, installed OPT in January 1981 in a timesharing arrangement on Creative Output's computer. The software, Tilling says, contained numerous bugs, which were eventually eliminated with the help of Creative Output.

Software and implementation costs range from a few thousand to several million dollars.

Part of the start-up phase was spent tinkering with the schedule formats. "We tried to get a schedule Howmet would be comfortable with," Tilling says.

One deterrent to buying OPT is its price. Marty Jacknis, Creative Output's vice president of corporate development, says the cost of the package—software, education, consulting, and "philosophy"—begins at \$400,000 "for smaller companies." For the biggest industrials, the cost can range from \$1 million to \$4 million. Jacknis defends the price, claiming that a big manufacturing operation can expect paybacks in the range of \$100 million per year.

The extravagant claims made by Creative Output have been greeted with detachment by some manufacturers. William Rankin, manager of manufacturing-engineering systems at Deere & Co. (Moline, IL) says a software package similar to OPT was developed in-house.

And the secrecy surrounding Goldratt's algorithms has irked some production-planning experts. "There's a healthy skepticism," says George Johnson of the American Production and Inventory Control Society, Falls Church, VA. "Nobody knows what's in the box."

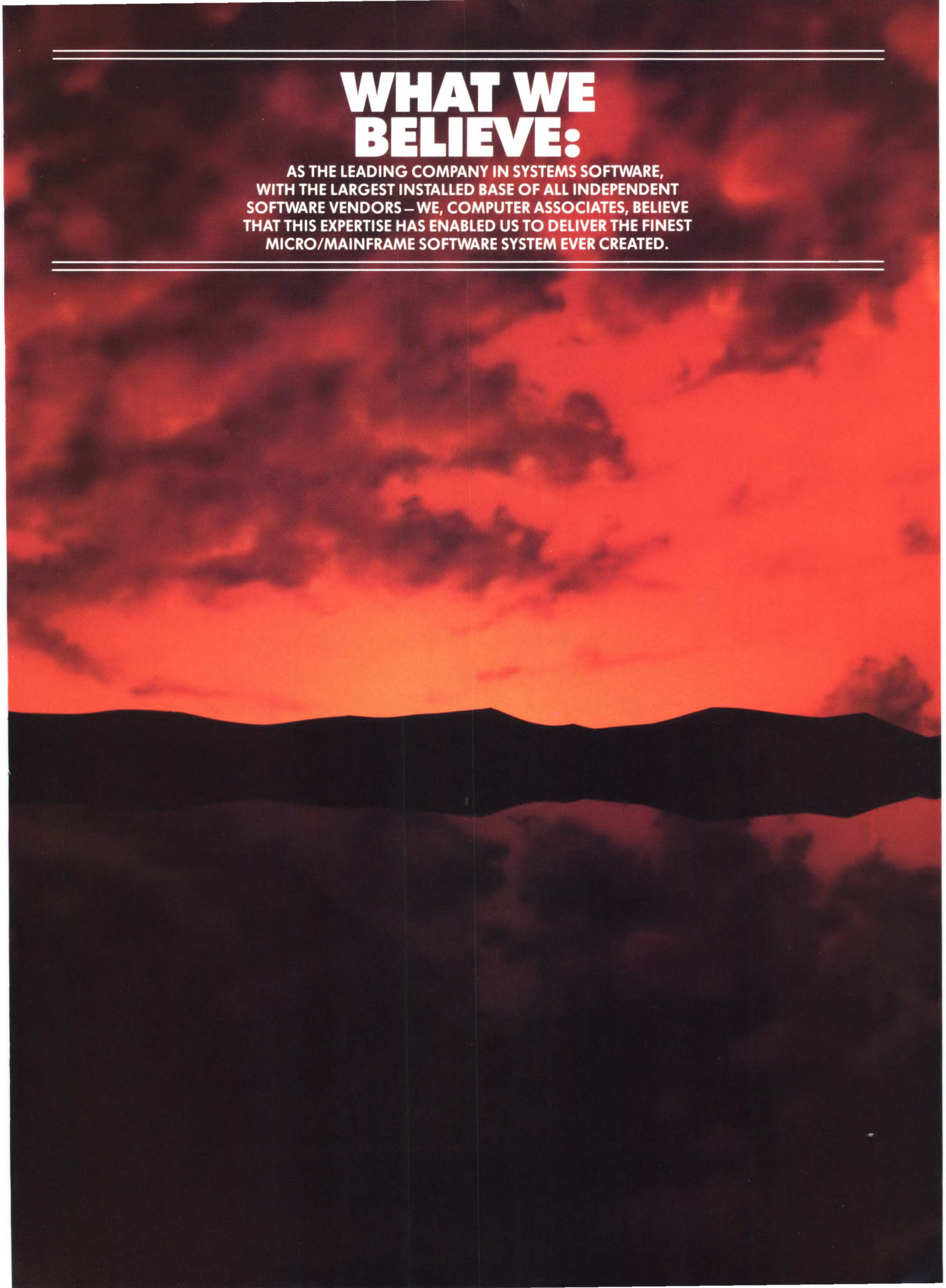
James Davis of Arthur D. Little says he knows a number of manufacturers that never achieved the success and benefits claimed for the package. "It doesn't have the richness of MRP, in terms of purchasing and inventory control," he says. Also, it's often difficult to tie in OPT's scheduling techniques with the purchasing and inventory modules in MRP packages, says Davis. GE's Wilmington plant plans to use it in tandem with Honeywell's HMS MRP system, however.

Finally, George Plossl, president of G.W. Plossl & Co., an Atlanta manufacturing consultancy and a strong advocate of MRP, believes it's im-

(Continued on page 53)

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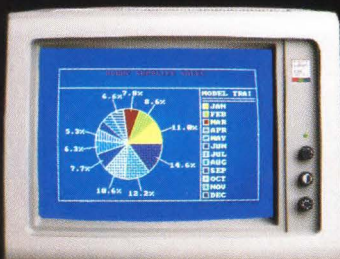
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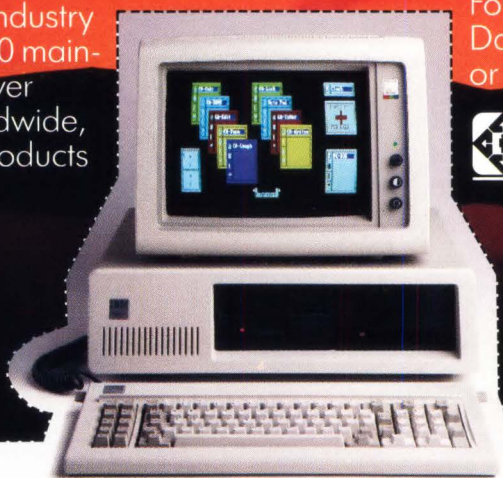
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practical to expect shop-floor personnel to have access to the key information that makes OPT an effective planning tool. "Creative Output's selling a \$2 million program that presumes people in the shop know exactly what orders will be arriving more than a day in the future."

While OPT's algorithms are hidden in a black box, the concept of group technology is simple: Bring together related components and processes, use design similarities to consolidate manufacturing processes, and avoid design redundancies.

Cost savings and production efficiencies can be significant. Having established a parts database, specific machines can be dedicated to the manufacture of like parts. Families of parts — those similar in design characteristics — can be processed in batch, using the same machines. According to the Organization for Industrial Research (OIR), a leading vendor of group-technology systems: "Instead of 1,000 different parts, there may be only 10 large groups of parts, requiring one standard manufacturing method for each

group." OIR claims that purchases of durable tooling and machine tools can be reduced, and machine-setup times can be lowered by up to 50 percent.

Group technology may be more alluring as a theory than as a practical organizational principle, however. Before the system can be used, thousands of parts must be coded by shape, dimension, tolerance, surface finish, chemistry, production requirements, and other criteria. The task of taming decades of manufacturing history in a cohesive database often proves daunting.

The U.S. Apparatus Division of Eastman Kodak Co. (Rochester, NY), which employs some 15,000 workers, manufactures conventional and disk cameras, slide projectors, copiers, microfilmers, blood analyzers, and other products. It's a perfect site for the implementation of a group-technology project.

Richard Wambach, the division's technical coordinator for group technology, says it took two years to establish a fully coded parts database, which went online last January. "There was a substantial upfront investment (more than \$1 million),"

says Wambach. "But the avoidance of redundant design pays for itself five times over each year for the one-time initial investment."

Group technology lets Kodak implement flexible manufacturing techniques. "With this system, we can set up to manufacture 20 different parts at one time, taking advantage of machining similarities," says Wambach.

Kodak employed the firm of Lovelace, Lawrence & Co., a group-technology consultant, to help with the coding and classification of 125,000 parts. The work was coordinated by a Kodak team of eight, including design and manufacturing engineers, software and hardware systems specialists, and clerks. The database, custom-designed using IBM's DL/1 software, is now running on an IBM 3033 mainframe.

A key element in such a large undertaking is the support of upper management. "It's always difficult to obtain millions of dollars," Wambach remarks. "You need to find a sponsor in top management, someone who's willing to stick his or her neck out."

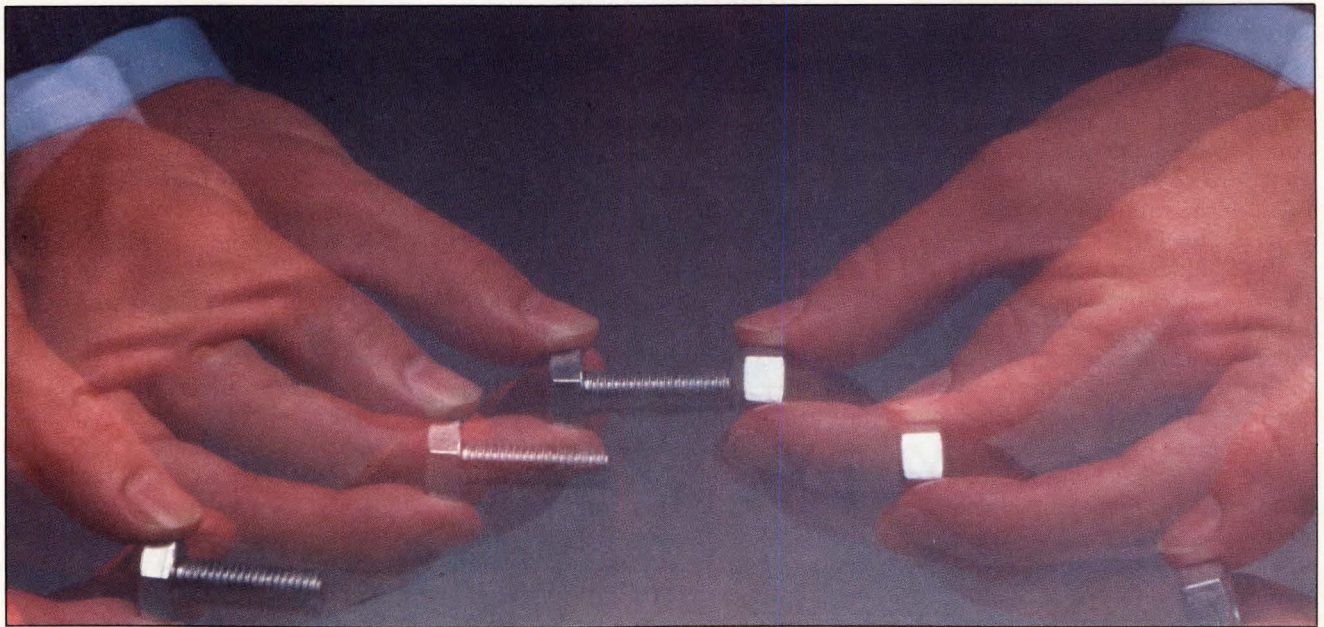
"It's the kind of project that doesn't pay off in three years. You don't see results until the system's online."

Such a substantial commitment often means that the manufacturer must continue implementing group technology, even during a downturn in the business cycle. At Black & Decker, a group-technology project using software from Organization for Industrial Research (OIR), was set aside when layoffs and retirements depleted available staff, says Ed Jarrell, senior project engineer at the manufacturer's professional-tool factory in Hampstead, MD. In recent years, competitive pressure from low-cost Japanese manufacturers caused Black & Decker to trim its workforce by half. But the manufacturer is fighting back with a big investment in CIM, which will once again include plans for group technology, as well as



Lockheed Georgia developed Genplan, a computer-aided-process-planning package, to give planners maximum computer support without big support staffs, says Joe Tulkoff, director of manufacturing technology.

BUILDING IN EFFICIENCY



for computer-aided process planning, says Jarrell.

Because of the idiosyncrasies of each manufacturing operation, packaged software for group technology is often inadequate for coding and classifying thousands of parts. Software developed for general use must be modified to fit a manufacturer's specific needs. James C. Harris, vice president of operations for the Landis Tool division of Litton Industries, Wayneboro, PA, says the division originally hoped to complete a group-technology project within eight months. "We've run over that by more than double. Don't let anybody tell you it's going to be fast and inexpensive," he says. Harris says the project was estimated to cost \$250,000; it's already beyond the \$750,000 mark.

Despite the delays, Harris is optimistic about the outcome: "If you don't have to reinvent the wheel each time, group technology saves you time in searching for the parts and mechanisms you need, and it increases the productivity of engineering." Even though the original package from OIR didn't conform neatly to the toolmaker's operation, Harris says the project would have

proved impossible if the division had to develop the software from scratch.

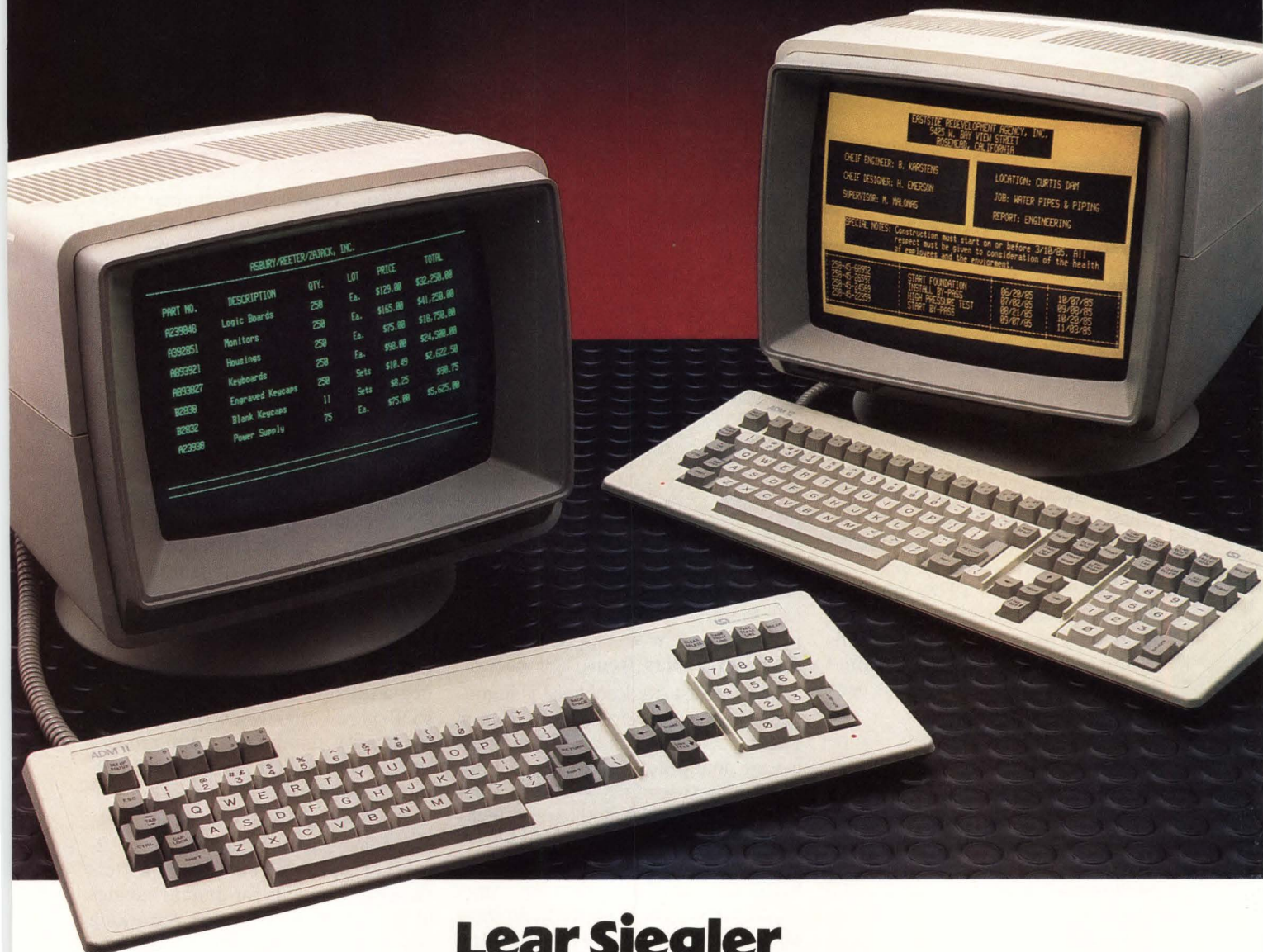
One manufacturer that did choose to go it alone in developing its own software was Deere & Co., the large farm-equipment manufacturer and a leader in computer applications in manufacturing. Having successfully implemented OIR's MIClass system in the mid-1970s, the manufacturer decided it needed a system tailored to its needs, according to William Rankin. The result was a system that Rankin claims is superior to the packaged software. "Our system creates more data about parts than do most other systems," Rankin says, commenting on the 35-digit coding scheme. Despite its complexity, it's also easy to use.

Using the huge parts database, Deere engineers can foresee the precise application for new technology before making costly outlays for new machine tools.

Despite the success stories, the very largest industrial manufacturers may find group technology ill-adapted to their needs. General Motors Corp., Detroit, researched the feasibility of group technology and computer-aided process planning five years ago,

says corporate spokesman Mark Crockett. Individual operating divisions may be using these techniques, but a corporate-wide effort for GM's 135 plants nationwide would break up the integrity of an automotive-assembly operation, consigning specific manufacturing processes to individual plants.

Computer-aided process planning (CAPP) extends the basic concepts of group technology, taking information about like parts from the group database and establishing the methods—machine routings, drilling specifications, and so on—by which a product is to be manufactured. The difficulties inherent in group technology are compounded in CAPP as more variables are added to the planning process, resulting in coding systems that sometimes require dozens of digits per item. If packaged software is difficult to adapt to group technology, it proves even more elusive when implementing CAPP. Lockheed Georgia (Marietta, GA), which manufactures military cargo planes, is the developer of Genplan, one of the most extensive CAPP operations anywhere. Lockheed's goal, says Joe Tulkoff, Lockheed



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Georgia's director of manufacturing technology, was to "get a planner with no clerks to interact with the computer, and to be able to come up with a plan with no other persons involved."

Lockheed's involvement with Genplan, beginning in 1975 on an IBM 360/165, has steadily deepened. Today the system runs on an IBM 3083 with 130 IBM 3278 terminals.

A team of five, including a Fortran programmer, an industrial engineer, and manufacturing planners, were recruited to develop Genplan. Implementation proceeded gradually; CAPP for machine parts began in 1977, sheet metal in 1978, tubing in 1979, sub-assemblies in 1980. The system now contains 250,000 plans for the manufacture of individual parts. Process-planning time has been reduced by some 60 percent.

Like Deere's system, Genplan is menu-driven and responds to English-like commands. "It acts on the technology database and brings back in a few seconds the optimum plan of parts, machinery, machine sequences, and kinds of tools needed," says Tulkoff.

Like many others, Tulkoff believes the engineering department should be first among equals in planning for CAPP. However, even with engineers in the forefront, it is often difficult to convince process planners to use the system. "You take a guy who's been pushing a pencil for 25 years and all of a sudden you put him in front of a tube, and the first thing he says is that he's not a typist," says Tulkoff.

Tulkoff's team developed a solution that may serve as a lesson to dp managers, manufacturing engineers, and others involved in CIM. Using a Lockheed MAC 16 minicomputer



manufactured by Lockheed Electronics, Plainfield, NJ, a programmed-learning system was developed that weaned planners from their pencils.

In contrast to Lockheed's home-grown approach to CAPP, Baker Packers, Orange, CA, a \$290-million-a-year manufacturer of oil-drilling equipment, uses OIR's Miplan software to implement both group technology and CAPP applications at two facilities. Ray McMullen, manager of manufacturing engineering, says 2,300 parts at the Houston plant have been coded into a database in the manufacturer's IBM 3033. The \$400,000 cost of bringing the system online was recovered within two years through 40 percent reductions in machine setup time and a 35 percent drop in overall production time. Two machines are now performing an operation that was once executed by "20 to 30 machines," McMullen says.

While production planning has been enhanced with new software tools, the latter stages of the production cycle have also benefited. Quality-assurance packages are being used for statistical

analysis, vendor-performance monitoring, tool-recalibration tracking, and other quality-related tasks.

At its Forest, OH, plant, United Aircraft Products, which produces components for military aircraft like the B-1 bomber and F-15, F-16, and F-18 fighter planes, has begun to use both packaged and custom software from John A. Keane & Associates Inc. "We get a complete parts-rejection history for each product line," says Bob Davidson, quality auditor for the \$30 million-a-year manufacturer. The statistical-analysis package, besides showing the cost and frequency of defects, also furnishes a cost-benefit analysis on whether to rework or scrap defective-machine output. The system, which was slated to begin full operation June 1 on a DEC PDP-11/24 mini, is scheduled to handle quality assurance for 400 product lines, ensuring that they meet the military's standards.

Davidson said simply changing a die configuration can chop a 12-percent parts-rejection rate to less than one percent, for annual savings of \$250,000 in scrap and reworking costs. With the software, the analysis can be performed in a matter of hours by Davidson and a data-entry clerk. Without the computer, it would take several weeks for two engineers and as many as five clerks to complete the task.

Before breaking in a calibration package from Hansford Data Systems, Schlumberger Well Services, Houston, used a manual-filing system to track recalibration schedules for more than 1,000 instruments, according to Charles Morina, senior manufacturing engineer.

Schlumberger uses other Hansford packages to conduct analyses of machine performance, according to Robert S. Livingston, quality-assurance development engineer. "It used to take us about 12 hours, now it takes us an hour," Livingston says. The package, which is

Because many of these packages are less than five years old, the purchaser becomes, in effect, a beta tester.

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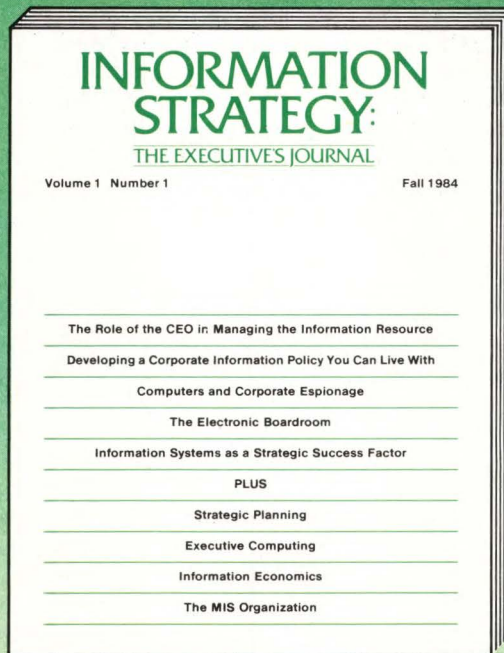
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running on a Hewlett-Packard 9836, has broad applications, and even measures employee performance in an in-service training program. However, Schlumberger quickly ran up against limitations—and alleged bugs—in the packaged software, and has been hindered by Hansford from adapting the software to its own specifications, Livingston says. "The software won't tell you if the disk has enough file room until after you input the information," Livingston says. "If it doesn't have enough room, it destroys all the information. We chose Hansford because we had dealt with the vendor before. In hindsight, though, it was a bad decision."

Among the confusing array of software that has become available for streamlining manufacturing operations, there are even packages to help plan which computers and machines to use on the factory floor.

United Technologies Research Center, East Hartford, CT, has used Map/1 from Pritsker & Associates

since August of last year for projects ranging from the modeling of a factory floor to the simulation of equipment to be incorporated in the Space Shuttle. According to Stuart Lehman, a manufacturing-systems engineer, the flexibility of the package, which requires no programming knowledge, results in a partial trade-off in precision. "It doesn't give all the answers, but it gives you a little bit better than a gut feeling that this is the way to go," Lehman says.

The system was used to model an industrial air conditioner-manufacturing line at United Technology's Carrier Corp. subsidiary.

A problem that Carrier faced was having to stop the production line when repairs were required on one of the big 10-foot-by-40-foot air conditioners. To solve the problem, management wanted to install new test stations that would enable the production line to continue while a faulty machine was being repaired. Using Map/1 modeling techniques, United

Technologies was able to determine exactly how many of the \$100,000 test stations were needed.

Computer-integrated manufacturing has resulted in better production planning, shorter lead times, and better control over manufacturing operations. As with any other systems operation, however, CIM effort relies on the manufacturer's ability to categorize massive quantities of raw data: The efficiency of the operation is equivalent only to the integrity of the data.

Even more important than valid data is the continuing support of upper management for a project that may break more than one deadline before coming online. "You have to have the commitment of the organization to put the system in," says Arthur D. Little's James Davis. "You can't go in half-heartedly. If you do, you can lose control of operations, missing delivery dates, increasing your inventories, and, perhaps, forcing your company into bankruptcy." □

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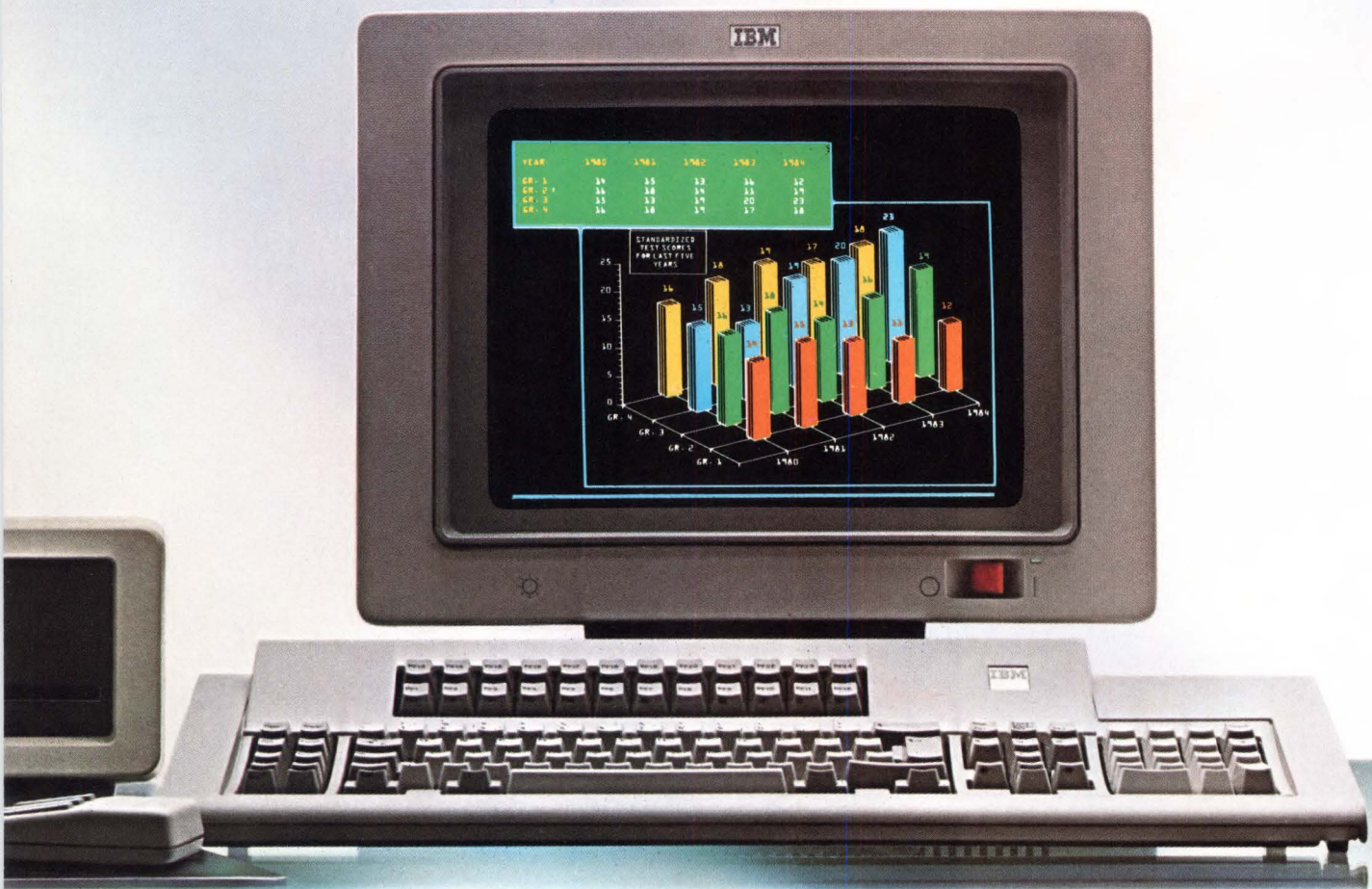
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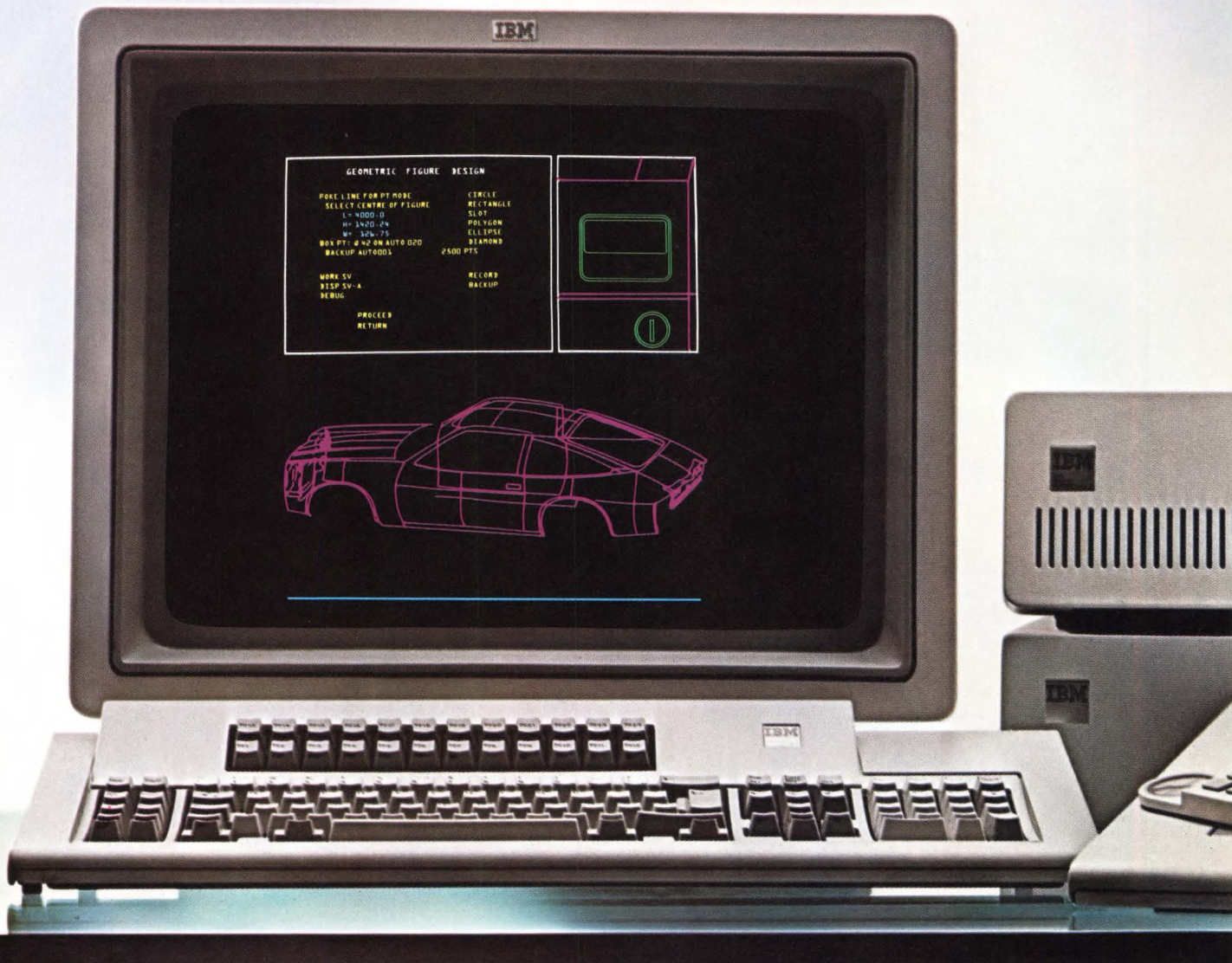
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COMPUTERIZED DISTRIBUTION



DIRECTING THE FLOW OF GOODS

In computerized distribution, corporations are finding that the only limitation to added efficiency is their own ingenuity.

by Lamont Wood

After manufacturing, but before sales, comes distribution. Keeping track of products as they're gathered in warehouses and shipped to stores or other warehouses is an expensive process, one involving many decisions. Where should the warehouses be located? What exactly should be shipped, when, and where? Computers are increasingly being used to find answers to these questions—questions whose correct solutions can save corporations a lot of money.

At 3M Corp., for example, distribution is a huge job. And managing distribution for the \$7 billion-a-year diversified manufacturer is a complex task. Allen Messerli, manager of distribution planning and systems at 3M's domestic-distribution department, uses a distributed data-processing system to tackle the job.

Most of 3M's 40-plus operating divisions use an integrated corporate-warehouse system, says Messerli. A few divisions sell directly to customers and don't use the system, but most sell mainly to distributors or major end users. Messerli adds that 3M's distribution channels are as diversified as its product line, which includes cleaning chemicals, scouring pads, office copiers, printing supplies, electrical components, and adhesives.

The operating divisions are all headquartered in St. Paul, MN, where corporate headquarters and

Messerli's department are also located. Six IBM 3080 mainframes at the distribution department communicate with 35 Hewlett-Packard 3000 minicomputers at major corporate sales offices and warehouses. Smaller remote sites have terminals connected to one of the HP 3000s.

Inventory and customer-account records are kept both at the remote sites and at headquarters. Updates from the remote sites are transmitted to headquarters in batch at least daily. The system keeps track of about 200,000 stock-keeping units. Messerli says he couldn't even guess at the extent of the software—only that it must have millions of lines of code. All software has been written in-house.

According to Messerli, 3M's system started out with IBM 6400 magnetic ledger-card machines and built up, first, to an IBM System/3 and, about five years ago, to HP 3000s for online inventory and order entry. The major problem in developing the system, says Messerli, was in projecting the capacities required for hardware and in justifying costs.

Initially, capacity requirements were underestimated, and 3M has often had to upgrade its system's disk capacity, memory, terminals, and even central processors, as increasingly sophisticated online order-entry software was installed. All the HP 3000s have since become what Messerli calls major minicomputers or

COMPUTERIZED DISTRIBUTION

small mainframes." But upgrading was a gradual process, he adds, so it never posed a major problem.

Once the system did achieve prime capacity, however, 3M began to benefit. "Overall, we have seen constant improvement in order-entry and warehouse productivity, both in units per hour and in cost as a percentage of sales," Messerli says.

Yet, despite such improvements, 3M has even more ambitious plans for reducing distribution costs. As a result of a study involving computerized logistical modeling, 3M is reconfiguring warehouse operations, Messerli notes. What was once a separate warehouse operation for its business-products division is being consolidated with its main warehouse system. Also, the company has reduced its regional warehouses to 12 from 15. (The regional warehouses are serviced by a central distribution center in Forest City, IA. It's located there because most of 3M's production facilities are in the midwest.)

Messerli says 3M also plans to reduce data entry drastically. Soon it will begin to use barcodes for product identification, and will install computerized conveyor belts. The warehouse workers will unload an item onto the conveyor. As the item moves along the belt, it will automatically be scanned, identified, and routed to the correct spur of the conveyor, where it will be loaded for shipment. Data on the item's movement will also be fed into the system. Thus, notes Messerli, the computer system will be able to "sense" what's going on inside the warehouse, and update the files.

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Ciba-Geigy's agricultural division also uses a distributed system—but it doesn't own a single warehouse. Dan Acker, manager of logistics, analysis, and systems development at the division's Greensboro, NC, headquarters, explains that computers coordinate the use of public warehouses and common carriers. "Due to the seasonal nature of our business, if we owned our own warehouses, they would be idle six months out of the year," Acker explains. "We use the computer to monitor the flow of products through the public warehouses, track the warehouse charges, and alert us to potential inventory shortages."

Ciba-Geigy's agricultural division makes and sells pesticides, herbicides, and fungicides, and grossed about \$600 million last year. The corporation is headquartered in Ardsley, NY, and its parent is Ciba-Geigy Ltd. of Basel, Switzerland. Agricultural chemicals are shipped from the corporation's production facilities in Louisiana and Alabama to any of 35 public warehouses. From there, they are either picked up by customers, most of which are wholesalers, or shipped to their destination.

Acker says Ciba-Geigy employees

do not work at the warehouses. Instead, the manufacturer depends on the warehouse workers to report arrivals and departures accurately. "We depend on a fine spirit of cooperation. It works well," he adds. Warehouses report via telex or telephone, although Ciba-Geigy is considering installing terminals.

Ciba-Geigy relies on several modeling packages to manage its flow of products. As Acker puts it: "At one point we used a package called Locate/Allocate from Analysis Research and Computation to analyze our warehouse locations. We found we had too many locations in traditional regions, but not enough in the expanding regions."

Terry Ross of Analysis Research and Computation says Locate/Allocate helps with warehouse location and customer-sourcing. The shipping software comes as two packages for solving distribution problems—Genasys and Arcnet. First, Genasys generates equations based on data input by the user, mostly on costs of operations, anticipated demand, and warehouse status. Then, Arcnet solves the equations. (The name "Arcnet" is made up of the firm's initials and the word "net," and should not be confused with Datapoint Corp.'s networking protocol.)

Ciba-Geigy also uses a software package from Rand-McNally-TDM Inc. to figure freight charges. According to Rand-McNally-TDM spokesman, the package, Ratemaker, uses a computerized version of the user's "tariff library" (the rates of the freight carriers it deals with) to determine the lowest legal charge for a particular shipment.

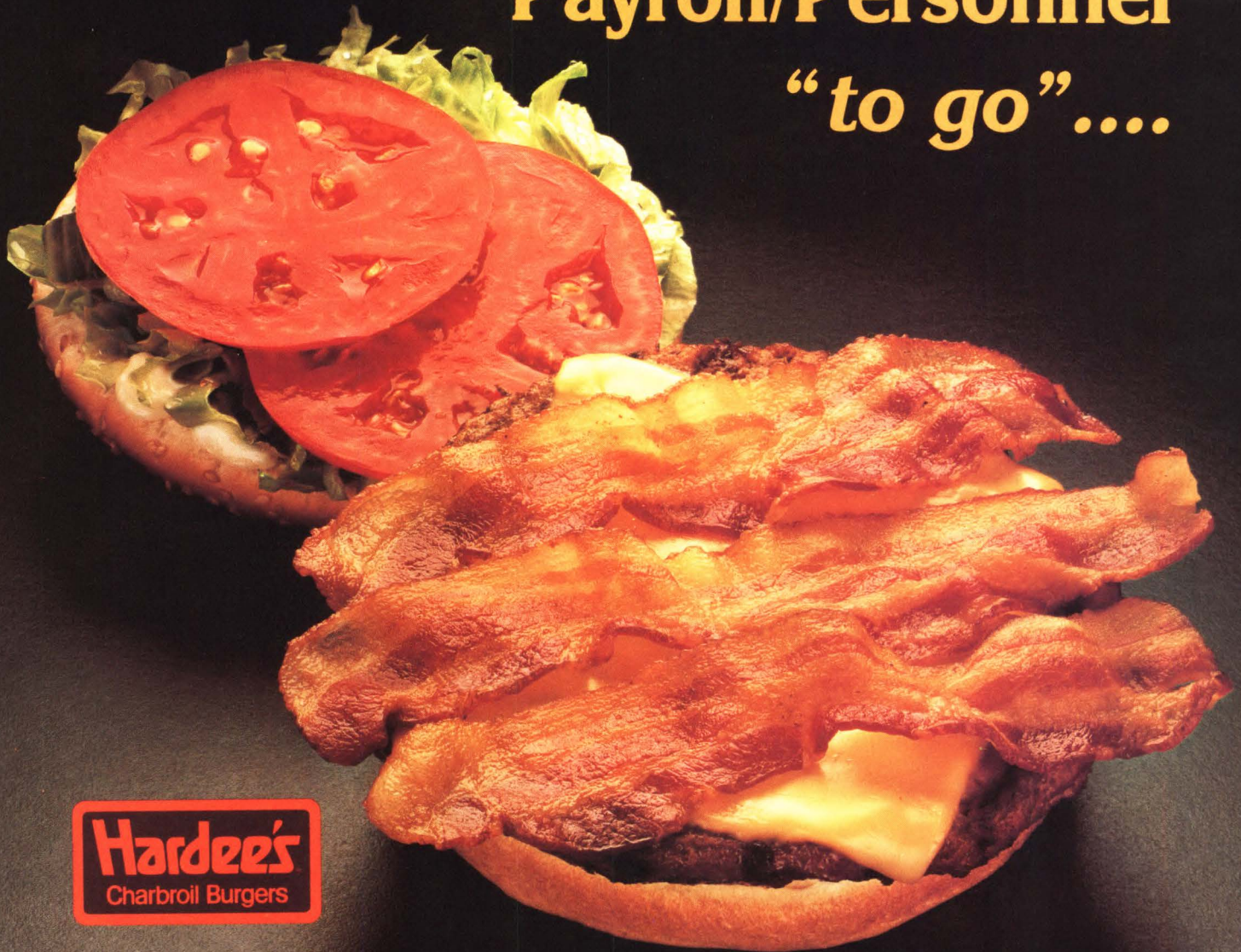
Acker's division runs an IBM 4341 mainframe with about 25 3278-style terminals in Greensboro. It also makes remote use of an IBM 3081 and 3033 at corporate headquarters. "Computerization has forced our users to structure their thinking, and

(Continued on page 68)

*"I've never come across a company
that's as dependent on computers as
Federal Express."*

—Freeman, Federal Express

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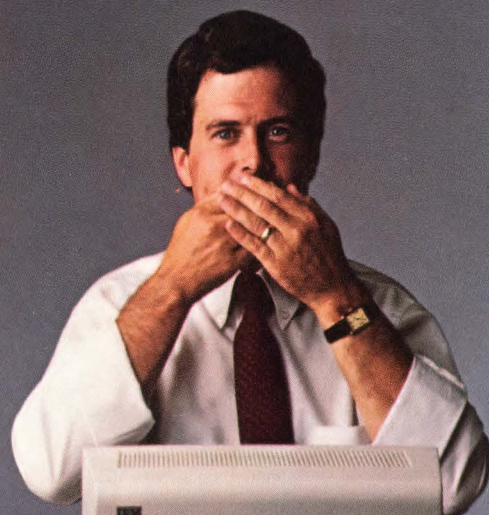
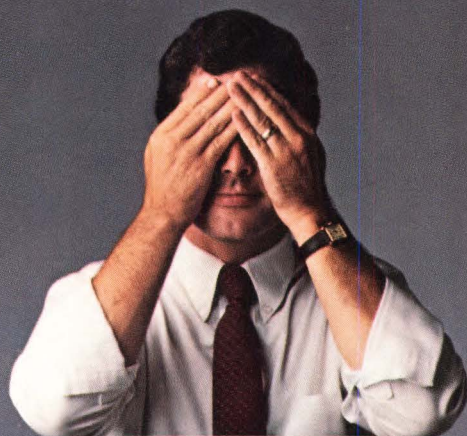
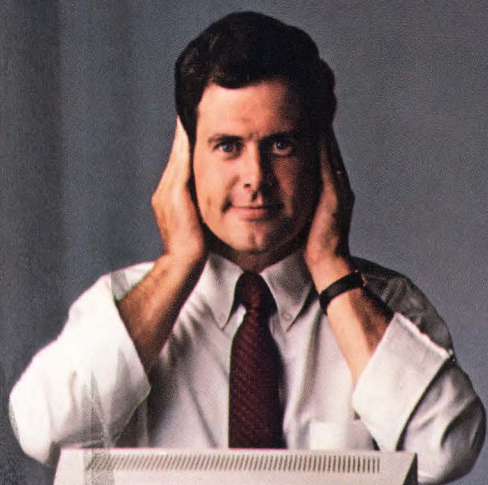
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COMPUTERIZED DISTRIBUTION



as a result, we understand our own operation better," Acker believes.

At Kinney Shoe Corp. distribution is driven by data captured daily by point-of-sale (POS) terminals in each of the retailer's more than 2,400 stores.

Dick McMichael, vice president and director of management-information systems, explains that the corporation owns more than the well known Kinney Shoe stores. The \$1 billion retailer, a subsidiary of the F.W. Woolworth Co. of New York, actually operates eight separate divisions through three distribution centers. Each division operates its own chain of shoe stores under a different name, each with a specialized product line. Distribution for the corporation's Kinney Shoes and Susie's Casuals divisions is handled from Camp Hill, PA, where the MIS center is also located. Distribution for its Footlocker, Lady Footlocker, and Final Cut stores (which carry sportswear lines) are handled from Phoenix, AZ. Distribution for Stylco (which operates shoe departments under lease in department stores), Fredelle, and Frugal Frank's Factory Outlet stores is handled from Mechanicsburg, PA.

Kinney Shoe Corp. has no regional or local warehouses—every store is serviced directly from one of its distribution centers. However, all data processing is handled at Camp Hill, PA. How does Kinney keep these lines tied together, without entangling them? "It's not as complicated as it sounds because all operations are linked to the point of sale," says McMichael. "We're a 100 percent point-of-sale operation." Each shoe store has an IBM 3680 POS terminal—a computerized cash register with 72,000 bytes of random-access memory, disk drives, an auto-answer modem, and of course, a cash drawer. When an item is sold, a clerk inputs its receipt and its stock-keeping unit (SKU) code.

Overnight, all of the Kinney POS

"We've automated just about every function you can imagine."—McCoy, Graham Supply

terminals are called via the public phone lines, or "polled," by the Camp Hill computer system, which includes three IBM 4341 mainframes in a "triplex" configuration that lets them share certain peripherals, and an IBM 3705 teleprocessing controller. Forty-eight telephone lines used simultaneously take about four hours to poll all the terminals, using ADCS (Advanced Data Communications for Stores), an IBM telecommunications-polling package.

The financial data from the stores go into an accounting system, and the SKU data go into the distribution system, and automatically generate replenishment and pick orders. Sportswear orders are transmitted to Phoenix.

Kinney computerized during the late 1960s, but its POS project, which was started in 1979 and completed in 1982, added significant benefits. Previously, the stores sent weekly sales tickets into headquarters. The information on the tickets was entered into the system either by optical scanner or by terminal operators. The sales tickets were handwritten, so the rejection rate was fairly high, McMichael recalls. "The conversion to POS terminals was quite an experience—the logistics were tremendous. All store telephones had to be changed to rotary phones, with an RJ11 jack for the POS terminal. We had to modify the counters to hold the terminals, and we had to get isolated power supplies. But once we got going, we were converting as many as 100 stores a week," he says.

"Capturing the SKU data has enabled us to replenish the stores faster," he continues. "But another benefit is that the system frees the store manager's time. We keep the books for managers. They have more time to spend on the sales floor, where they should be."

McMichael plans to add receiving and purchase-order software to the

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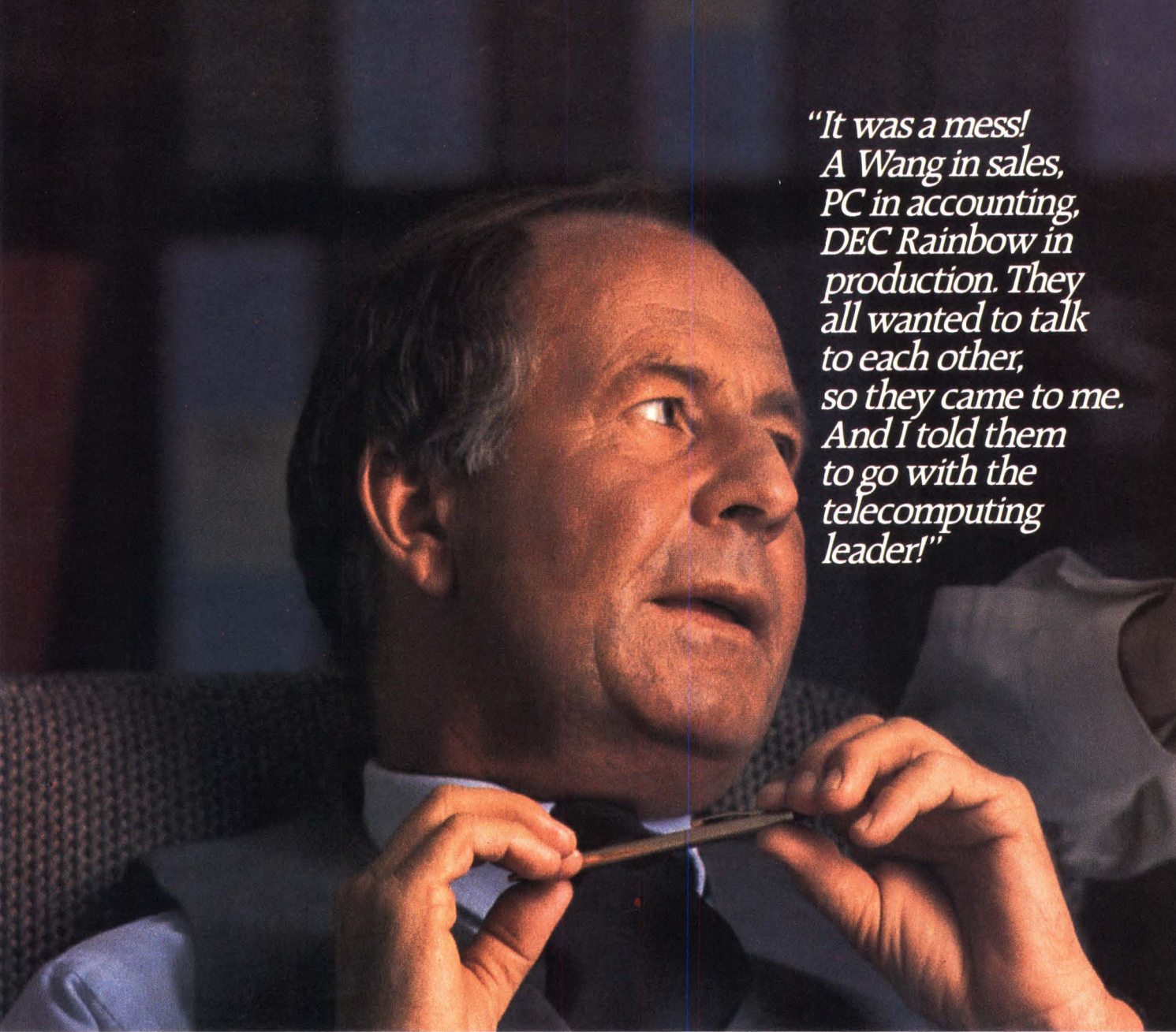


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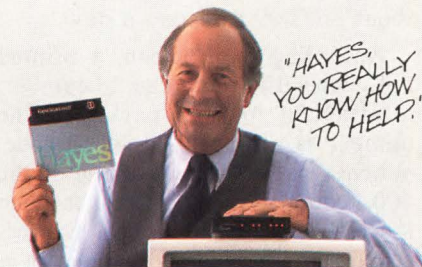
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COMPUTERIZED DISTRIBUTION

system. Sales data will generate purchase orders for Kinney's suppliers, which include nine Kinney factories and a number of foreign firms. The purchase-order information will then tell the receiving system to expect the arrival of merchandise.

Except for the ADCS package, all the software in the distribution system was written in-house, says McMichael. The MIS department includes 63 programmers, and a total staff of about 260.

Eddie Freeman, project manager for data-processing at Federal Express Corp., is an expert in using computers for trouble-free distribution. For distribution is the business of Federal Express. The carrier, which grossed more than \$1 billion last year, offers overnight package air-freight service between most points in the United States. Packages are brought by customers or couriers to local Federal Express offices, and flown overnight in company jets to Memphis, TN, the corporation's headquarters. There, the packages are sorted and then flown to their destination cities, where they are delivered by couriers the next morning.

"I have never come across a company as dependent on computers as is Federal Express," declares Freeman. He explains that the Memphis headquarters has computers that track every package as it moves through the system—and Federal Express delivers about 300,000 packages a day.

According to Freeman, a printed bill, each with a unique serial number, is attached to each package. The number is also printed in barcode. When a package reaches one of the 400 Federal Express offices, or when it's picked up by a Federal Express courier, the barcode is scanned by a hand-held terminal from Norand Corp.

A Norand spokesman says Federal Express is using the Norand Alpha-1 unit with a 29-button alphanumeric keypad and a single-line, 16-char-

acter display. The unit is about the size of a large hand-held calculator, and has an attached optical-scanning wand. It's powered by rechargeable batteries. At intervals, the scanners are placed in battery-recharging cabinets that also contain modem circuitry that downloads the contents of the unit's memory to headquarters at a baud rate of 9,600.

Each package is scanned a second time when it reaches its destination city. A package's arrival at the wrong city is immediately detected by the computer, and rerouting has usually begun before the customer complains, says Bob Higgins, senior technical advisor at the Federal Express research-and-development unit in Colorado Springs, CO.

Directing this complex traffic is an in-house software package called Cosmos, which occupies more than half a million lines of code in Cobol, says Higgins. Cosmos handles both courier-dispatching and package-tracing. Customer calls are routed to one of three regional centers—in Memphis, Sacramento, CA, and Somerville, NJ—where agents with IBM 3270 terminals connected to Cosmos quote prices and collect orders. The system then sends a notice to the appropriate local Federal Express office to dispatch a courier.

Cosmos began as a dispatching system on a Burroughs machine in about 1976, recalls Higgins, and was rewritten from scratch in 1979 to run on IBM's special Airline Control Program (ACP) operating system, which achieves short response times despite heavy transaction loads. However, Federal Express could not add financial programs to the ACP system, so it converted to IMS, IBM's database management system. The conversion took about two years, says Freeman.

To run Cosmos, Federal Express uses an IBM 3084, three 3081s, and a 3033, Freeman adds. Other mainframes are at the research facility in

Colorado Springs. Why such a plethora of processing power? As Freeman notes, Federal Express is almost entirely run by computers. "This company is generated by data," agrees Pat Mulvey, manager of corporate expansion at Federal Express. "All our planning is done with computers. In fact, I can't think of a single facet of the company that's not touched by computers."

We are working toward the goal of serving 95 percent of the nation's population," says Mulvey. "We served 71 percent three years ago, and we reach about 88 percent now. We hope to reach 95 or 96 percent by next June." Using population figures, business indices, and known operational-cost data, Federal Express runs three-year simulations to see what it would take to serve a new market profitably.

All the software was written in-house except Geo-Map from Geographical Systems Inc. It charts locations by zip codes. "Graphics is great for selling your ideas," asserts Mulvey. "Columns of data on printouts are very cumbersome. One picture is worth a thousand pieces of paper."

Plans at Federal Express call for a new scanner with an internal clock as



well as a display and a keyboard, says Higgins. Each package will be scanned every time it changes hands—about six times. The display will show when the scanning took place. The courier who picks up a package will key in its destination zip code, and when he or she delivers it, the courier will key in the name of the person who signed for delivery. The data will be transmitted directly from the couriers' trucks in the field, or from phones at the end of a delivery cycle.

The new system, which may be in place by the beginning of next year, should give Cosmos almost up-to-the-minute tracking information. Because most customer inquiries concern what Federal Express calls "proof of performance"—customers just want to make sure their packages got through—the new system should allow agents to answer customer questions immediately, Higgins says.

Graham Electronic Supply Inc. probably matches the average person's notion of a "distributor." The Indianapolis-based wholesaler of manufactured products serves the central United States from Michigan to Florida. It sells electronic parts and hardware, such as integrated circuits, diodes, power supplies, cabinets, and microprocessors,

says Steve McCoy, secretary and controller. The company grosses about \$50 million a year.

Graham Supply, a subsidiary of Bell Industries Inc., a \$280 million corporation headquartered in Los Angeles, represents about 1,500 manufacturers, 80 of which comprise most of its business. The distributor's inventory is divided into 167,000 part numbers, stored in three large and six small warehouses. "We've automated just about every function you can imagine," claims McCoy. "We couldn't operate without the computer."

Graham Supply's application software was written in-house. Its system includes about 1,500 programs. "Actually, we are still writing it—that never ends," says McCoy. Reports are generated to highlight product movements, inventory turnover, and customer volumes. No graphics are used.

The software systems are tied together to feed into one another, he says. For example, outgoing orders generate purchase orders for replacements. Printers (mostly Sperry dot-matrix machines) provide warehouse workers with prioritized pick lists, as clerks enter data about shipments and arrivals. Barcodes aren't used, because many of the inventory items are smaller than a pinhead. Ninety-seven percent of the inventory data is accurate, McCoy estimates.

Graham Supply has 137 terminals and 27 printers online. About half the equipment is at remote sites, including nine sales offices and six customer offices. The customers do inventory inquiry and order items from their terminals, without talking to anybody. (Conversely, McCoy notes, Graham Supply has on-site terminals connected to its own vendors' offices.)

Graham supply acquired its Sperry 1160 in 1980. McCoy says it had previously used an IBM System/3, Model D, but converted to Sperry because IBM didn't offer an upgrade path. "At the time, IBM offered us a

dead end," McCoy explains. "We didn't want to go to CICS [Customer Information Control System] on a mainframe, so we looked for a computer line that used the same operating system from top to bottom. Several vendors met our needs, but Sperry also had the Mapper programming language."

McCoy says Mapper, a "fourth-generation" programming language, has proven to be quite efficient. "We do in two to three hours what would normally take two to three weeks," he says. "Mapper is interpreted, not compiled, and has everything we need. It's also easy to use, and it requires little overhead—we have about \$1.5 million worth of hardware, and we run it with five people, whereas it would take eight to 10 people with conventional processing."

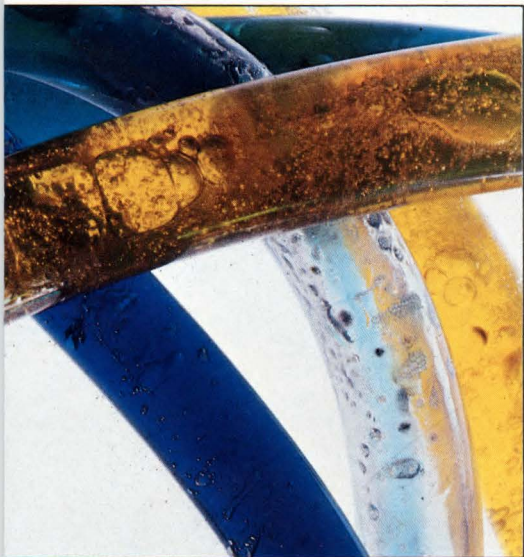
"The computer lets us have electronic sales offices—businesses without inventories," continues McCoy. "These offices can check inventory from a terminal and order directly from whichever warehouse has the item in stock. That couldn't work without the computer." The computer also generates about 29,000 invoices per month, a job that by itself would tie up 20 typists, McCoy adds.

Distribution lends itself well to computerization. Computers can track every inventory item as it makes its way from the factory to the customer. And the trail of data left by each item can be examined for clues on how to improve the entire operation.

The only limitation of computerized distribution is each user corporation's imagination and commitment to the technology. As this article is being printed, MIS workers in countless organizations are searching for new distribution functions to computerize, and new uses for their data.

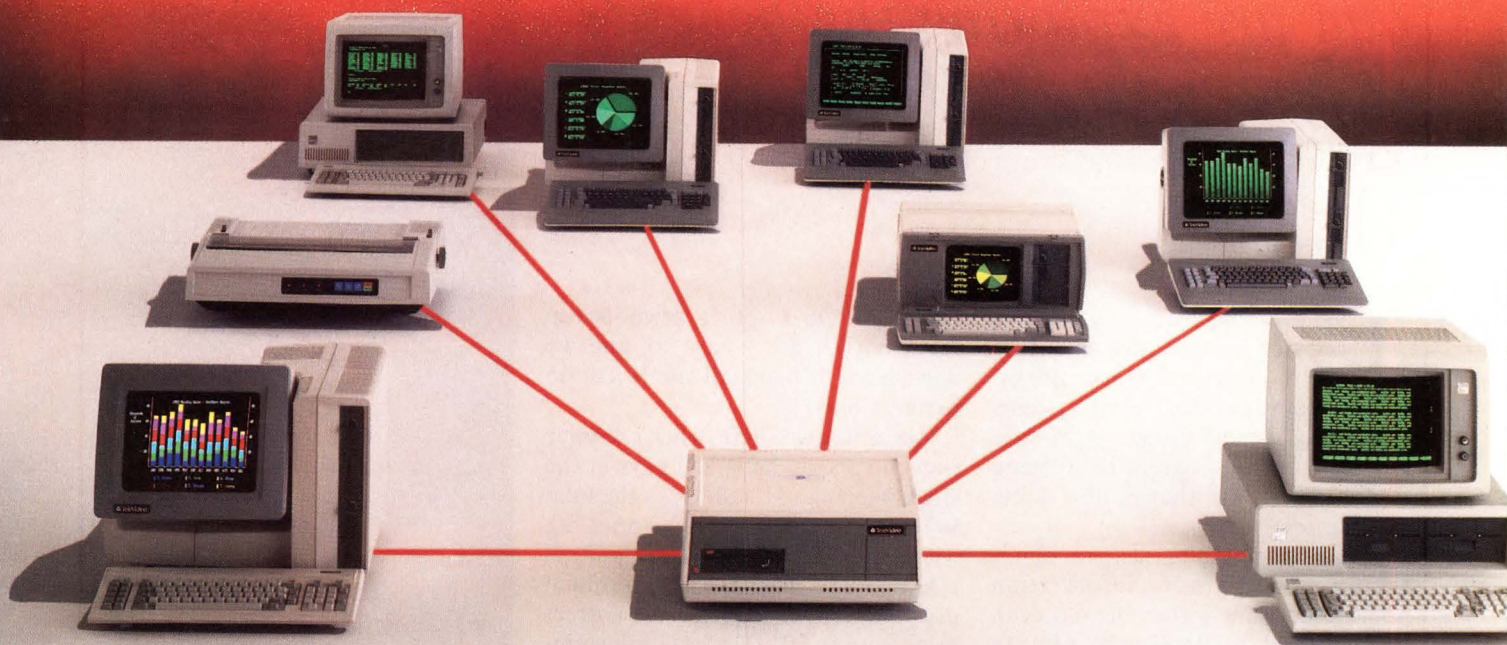
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RINGING IN THE NEW RETAIL TECHNOLOGY

Major retailers have abandoned the mechanical cash register, progressed beyond the electronic models, and are exploring the benefits of computerized retail systems.

by Lamont Wood

Just over 100 years ago, the cash register was invented to ensure the honesty of store clerks. Today, computerized retail systems—usually based on point-of-sale (POS) terminals—are still keeping clerks honest, but they're also doing much more.

These systems' biggest attraction is their ability to store information about every sale. Later, the data can be analyzed to determine exactly which items are moving and which aren't, gauge the effectiveness of advertising, and measure the efficiency of store management. Computers also look up prices and speed check-out.

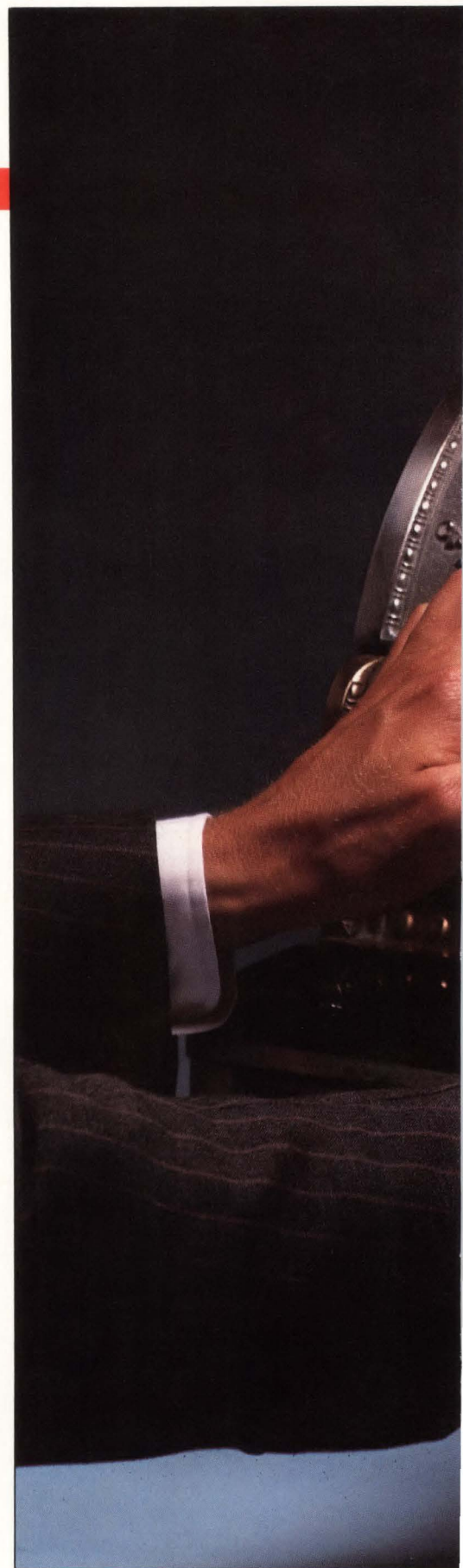
Sears, Roebuck & Co., for one, is equipping its stores with NCR 2152 POS terminals. The retailer, which grossed \$25 billion last year, hopes to have these microprocessor-based programmable cash registers in all its 813 stores by the end of the year. Sears spokeswoman Kathy Gucfa expects the terminals, which can operate as stand-alones or as part of a network, will make shopping at Sears faster and more convenient. "We use the central-cashier concept; banks of cash registers are clustered throughout the store, serving all departments," she explains. "The cashiers can't possibly learn all the prices. But

with the POS system's price-lookup feature, they don't have to, and we don't have to mark all the prices on items in bins."

According to Gucfa, when a cashier rings up a sale, he or she keys in the stock-keeping unit (SKU) of the item to be purchased, or scans its price tag with an optical-character-recognition (OCR) wand. Then the POS terminal uses the SKU to retrieve the correct price from an IBM Series/1 minicomputer in the back room. At night, the information stored in the terminals is tapped by mainframes at Sears' headquarters in Chicago, a process known as "polling."

The POS terminal is also used for Sears credit-card authorization. It transmits card numbers to one of Sears' six credit centers, which responds with an authorization or refusal. Then, says Gucfa, instead of printing a sales slip, the terminal prints out a credit slip, which the customer signs, eliminating printed sales slips.

The system is also used for what Sears calls "express package pickup." Gucfa explains that when a customer buys items that are too bulky to carry to the cashier's counter, a ticket is automatically printed out in the correct stock room, so the items will be



POINT OF SALE

Photo by Bob Ward



GET TO THE POINT OF SALE

ready when the customer drives around to pick them up.

What are the benefits of such a system? Gucfa says transaction time has been cut from an average of three minutes per customer to 90 seconds. And ringup errors have dropped 90 percent, she adds.

Such claims are easy to come by, but nevertheless, Safeway Stores Inc., Oakland, CA, was cautious about computerizing its 2,500 supermarkets. Safeway was wary about customer acceptance of the new technology and worried about justifying its cost.

Safeway spokeswoman Felicia Del Campo says that until three years ago, the various divisions of Safeway decided for themselves whether or not to computerize. (The company is divided into 17 geographical divisions in the United States and five in Canada, each having from 70 to 300 stores.) The stores that chose not to computerize bought electronic cash registers, largely because they could no longer get mechanical cash registers.

But three years ago, a change in management brought about plans to

"K-Mart's system cut hundreds of jobs at headquarters and two positions at each store."

computerize completely, Del Campo says. And, in Safeway's case, computerization means scanners—checkout counters equipped to read the Universal Product Code (UPC) printed on the packaging for most retail items. This barcode identifies the product, but does not encode its price—the system has to look it up. (Ironically, a Safeway item was the first product in the United States to bear a UPC—a 40-ounce package of White Magic dry bleach, which appeared in July 1973.) Del Campo notes that Safeway has installed scanners in 800 stores, and plans to have about 1,100 scanners by the end of the year.

The scanners used at Safeway are made by National Semiconductor Datachecker/DTS Corp., a subsidiary of National Semiconductor Corp. Grey Allen, spokesman for National Semiconductor Datachecker/DTS, says the Datachecker scanner uses a

laser recessed into the top of the checkout counter. The scanner and other devices at the counter—such as the cashier terminal and scales—are connected to a back-room controller, which houses most of the system's intelligence. The laser scanner senses the bar pattern of a UPC label and transmits it to the controller, which decodes it and looks up the product's price. The controller can transmit data overnight to headquarters. Allen says the scanners can increase checker productivity by 20 percent.

Productivity increases are always welcome. But for Safeway, the major benefit of the automation program has been the extensive sales data gathered by the scanners. According to Del Campo, those data are collected and analyzed at both the division and corporate levels. Prior to computerization, warehouse shipments were the only data that could be reliably monitored. Now, she says, stores with scanners have computerized records of the sale of every item.

These data are put to a number of uses. Take marketing experiments, for example. Del Campo describes how two groups of stores with similar sales volumes and demographics were chosen for an experiment in one district. Both groups ran a special promotion for rubbing alcohol. The test group set up a floor display marked by a large sign; the control group did no special merchandising. The sales data collected by the POS terminals showed that the test group sold 500 percent more alcohol than the control group.

Another study based on sales data gathered by the system showed that back-to-school items sell best just after school opens—contrary to the

(Continued on page 82)



Unlike Sears, Roebuck & Co., Montgomery Ward installed computerized point-of-sale terminals in each of its retail departments. The move eliminates the need for an automated price-checking capability.

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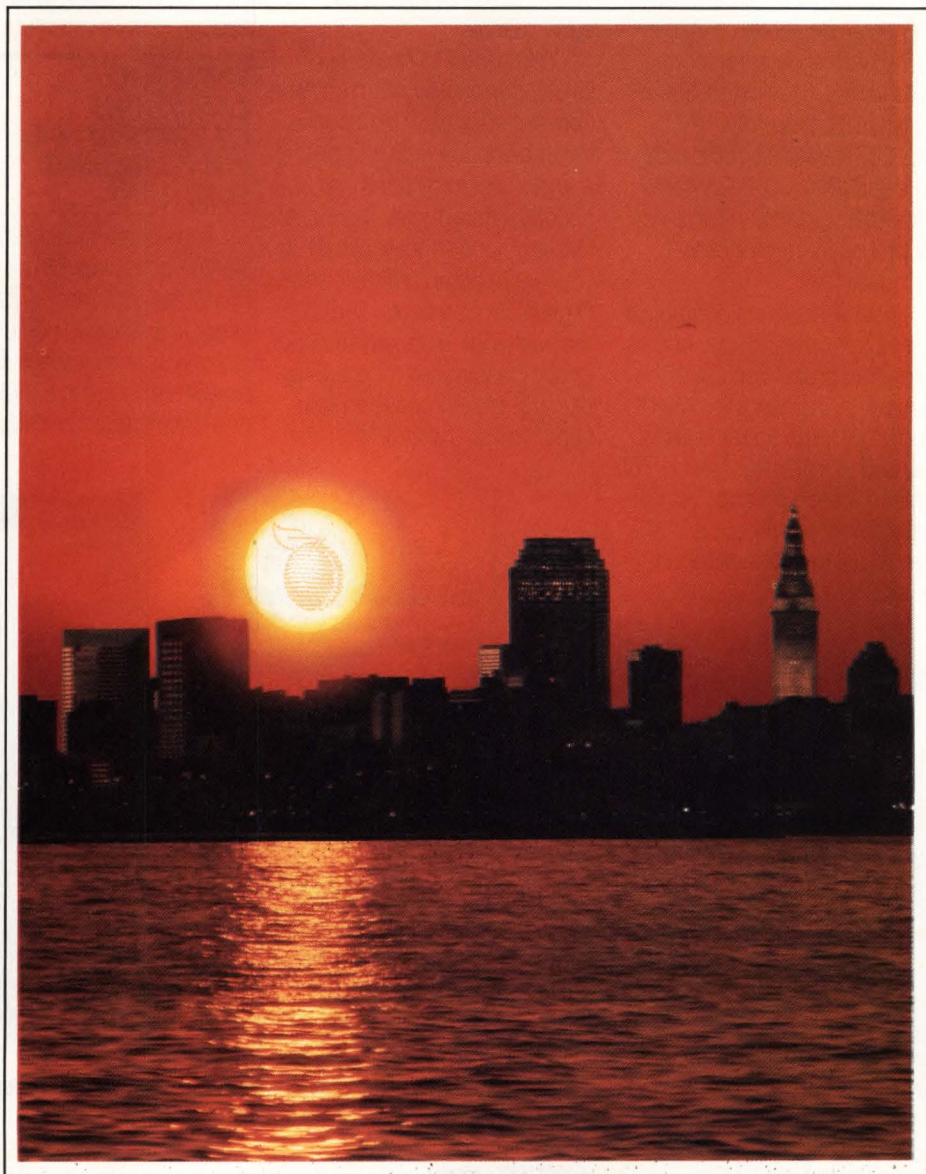
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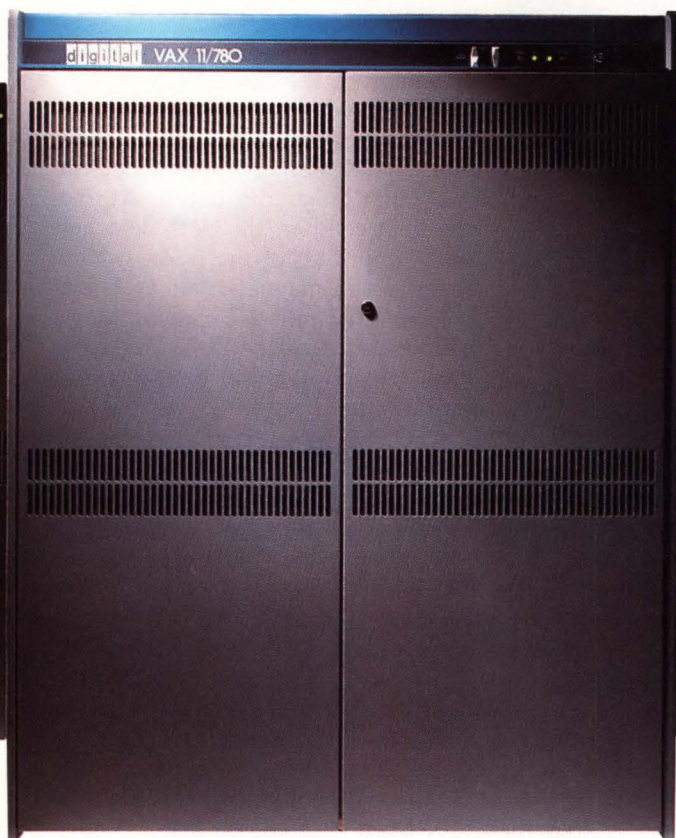
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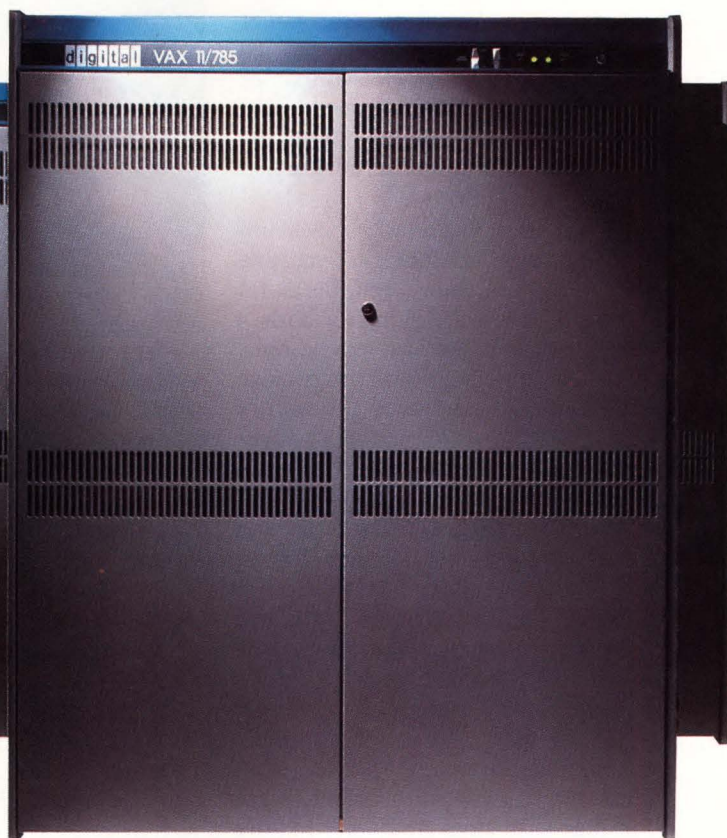
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can link multiple processors together and manage them as a single unit in a VAXcluster system. This capability, which is unique in the industry, enhances data integrity, increases system availability, and does it all with complete user transparency. Moreover, it permits the resources of a single facility to be shared throughout your organization, and lets you keep pace with expanding needs through incremental system growth. As many as 16 processors and storage servers can be combined in a single VAXcluster system,

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GET TO THE POINT OF SALE

(Continued from page 78)

long-held belief that the heaviest sales come just before school opens, Del Campo adds.

The data are also used to schedule the manning of checkout counters against trends in customer traffic. For example, when some stores noticed that small purchases accounted for most of the business between 11 a.m. and 1 p.m., the managers opened extra express checkout lanes during that period, Del Campo says.

While some retailers seek improved customer service, and others, more reliable sales data, still others are going for both—like Montgomery Ward, for example. "Our computerization efforts have been driven by the need to improve customer service and get more accurate data," says Dave Schlotterback, director of financial systems.

Ward's stores use NCR 2151 and 280 POS terminals as stand-alones, says Schlotterback. These capture whatever data the cashiers key in, and are polled overnight by a mainframe at the \$6 billion-a-year retailer's Chicago headquarters.

Unlike Sears, Ward places cashiers in each department—rather than clustering them—so the cashiers are familiar with stock and don't require terminals that look up prices. Terminals only verify SKU numbers.

Montgomery Ward has begun installing IBM Series/1 minicomputers in stores to add more uses to the POS terminals. Schlotterback hopes to have a central minicomputer in about 300 of Ward's 323 stores by the end of this year. "Inventory control was the major reason for installing the IBM computers," says Schlotterback.

Thus, the POS terminals, like the comparable terminals at Sears, are networked to the IBM computer, which serves as a central data-collection point. The price-lookup system so far includes only the prices of items that are "on sale," but Schlotterback hopes to have a full



price-lookup system by the end of the next year.

Schlotterback also notes that Ward's system handles authorization for Visa and Mastercard, using communications lines from the IBM Series/1 to credit-card clearing houses. "Authorization is handled automatically after the clerk keys in the card number," he says. "It only takes a matter of seconds—the customer doesn't even know we're doing it."

K-Mart has an untraditional computer system, says Walter Bzdok, senior director of corporate data-center services and store systems—it does not capture data in POS terminals. Bzdok explains that K-Mart uses a "minimax" system for every item it sells except apparel. On every rack or bin, a label names the item and the minimum number of items that should be displayed there. About every two weeks, the displays are surveyed by employees using Norand 101 hand-held battery-powered data terminals with optical scanners.

This procedure is not the same as inventory control. The items are not actually counted, Bzdok notes. If more than the minimum number of items are on display at a certain spot, the store's surveyor takes no action and moves on to the next spot. If less than the minimum are on display, he or she has the supply replenished.

The Norand terminal is down-

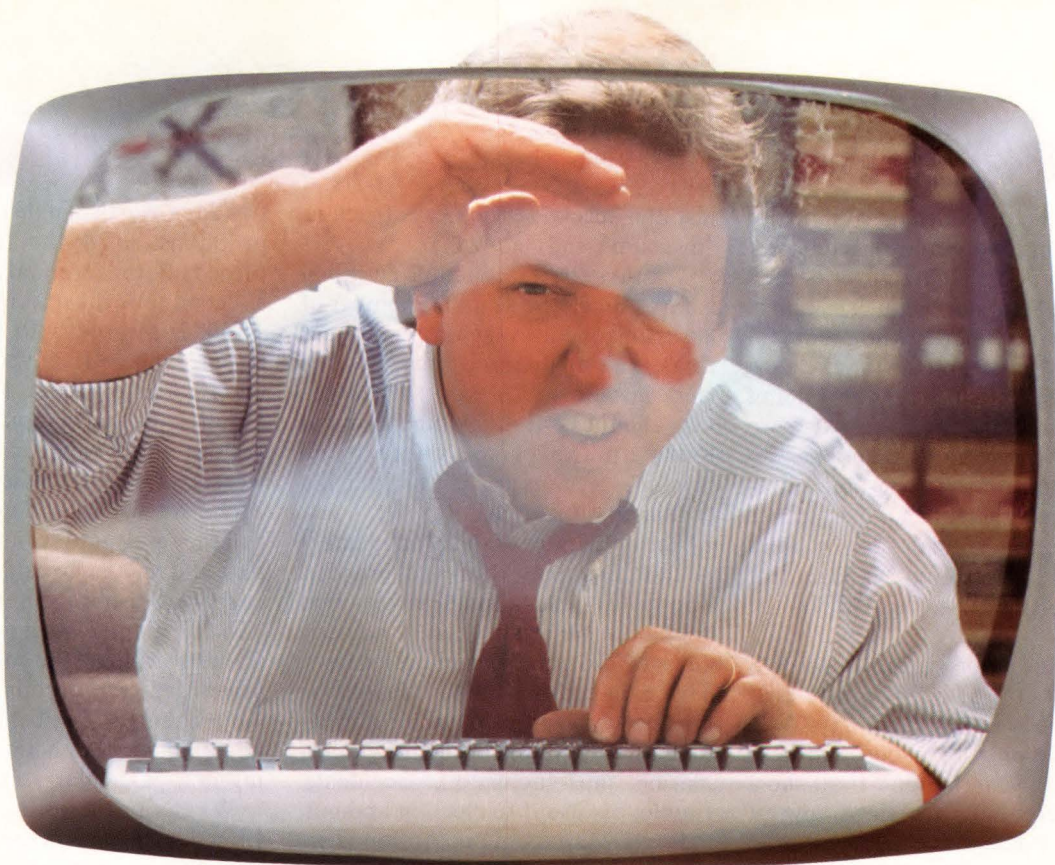
loaded through circuitry built into its recharging cradle into the store's minicomputer—usually an IBM Series/1, he says—and the data are used to generate purchase orders that are transmitted to corporate headquarters in Troy, MI.

Apparel is handled with a Meritag system from Dennison Manufacturing Co. Bzdok says each item has a tag with the usual price and size information printed in English and encoded in a circular magnetic patch. At the checkout counter, the clerk detaches the bottom half of the ticket, which contains the magnetic patch. These are later fed into a Dennison Magnetic Ticket Reader 400. The data are then transferred to the minicomputer via diskette.

K-Mart's system has saved managers a lot of work. "A K-Mart store manager is a merchant—what he or she gets paid is based on how much the store makes," explains Bzdok. "Therefore the store managers had a personal interest in the figures, and were doing a lot of bookkeeping, which was being duplicated at headquarters. With our system—which we finished installing in 1982—the computer does the bookkeeping and eliminates the duplication."

K-Mart's system has also cut hundreds of jobs at headquarters and a couple of positions at each store, saving the chain between \$90 million and \$105 million per year, Bzdok claims. The Norand scanners saved at least an additional \$40 million each year, he adds, noting that it previously took 12 hours to set up a typical hardware department; now it takes two.

Church's Fried Chicken Inc., a nationwide restaurant chain headquartered in San Antonio, TX, does a lot more than fry chicken: It has designed its own point-of-sale terminals. Stan Vik, MIS department head, noted that the chain, which grossed nearly \$550 million last year, began looking for a POS terminal in 1977. When it could not find



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GET TO THE POINT OF SALE

what it wanted, it formed a company called Transaction Control Industries to develop and manufacture its own terminals. "The store manager's job is to produce and market the product," Vik says. "We wanted to make sure the manager was spending time doing that—not keeping the books. Also, we wanted to speed up transactions."

The result was a twin-unit store-automation system. One or more Transaction Terminals at the sales counter are linked to a Management Action Terminal in the back of the store.

The Transaction Terminal is a POS that reflects the company's policies at the time it was designed, says Vik. There were only 14 menu item keys because it was thought that short menus were best. (A third row of seven keys has since been added.) These are augmented by "large," "small," and "choice," keys, a numeric keypad, and a huge "enter" key, which the clerk can hit without looking directly at it. There are also a few

test and special service keys (such as "discount" and "no tax").

Vik says the Transaction Terminal is fast (hence the minimal number of keys) and operates the way employees think. To ring up three large fries, the clerk pushes the "3" key, the "large" key, and the "fries" key: The terminal looks up the price. There is no printer—receipts are handwritten if a customer wants one.

The operations of the Management Action Terminal are much broader. The system has 28 function keys that double as alphabet keys, a numeric keypad, and some special-option keys. The manager uses the terminal to log hirings and firings, payroll information, inventory, and accounting information, plus factors like accidents. Employees use it to clock in and out.

Each Management Action Terminal is polled overnight from corporate headquarters. Vik says 98 percent of all Church's restaurants are polled, a rate he considers to be very satisfactory. The terminals can store

two days' worth of data. In case of line problems, or if the terminals are turned off, the terminals can be polled a second time the next night, he notes.

Vik is pleased with his machines' performance. "If anybody can show me a better machine, I'll buy it," he declares. Before computerization, every restaurant would call the previous week's total into area headquarters on Monday. Area headquarters would call the totals into regional headquarters, and regional would call them into corporate headquarters, Vik says. "Today, management gets any data it wants overnight," he continues. Executives can track promotions of individual items and call off expensive TV advertising if they notice it's not working in a particular area.

What's in the future for Church's Fried Chicken? Vik says he is looking ahead for a more flexible system. The software for Church's current system uses memory chips that must be replaced to implement changes. Vik would rather download new software. He would also like easier menu changes, two-way communications, and electronic mail, he adds. (Transaction Control Industries has since been sold to PAR Technology Corp., New Hartford, NY.)

What's the best approach to computerization? One that most closely reflects a company's approach to retailing. At Sears, this involves computerizing clustered cashiers. Montgomery Ward arrived at a similar system through a desire for computerized inventory management. Computers at Safeway Stores serve a corporate commitment to use data as a resource. At K-Mart, where many decisions must be made at the local level, the computer eases the bookkeeping workload. And at Church's Fried Chicken, the computer reflects the chain's desire for simplicity, speed, and central control.

Retailing is a tough business. Profit margins are low, employee turnover is high, and customers are fickle. But computerization is making business easier all around. □

Lamont Wood is a free-lance writer based in San Antonio, TX.

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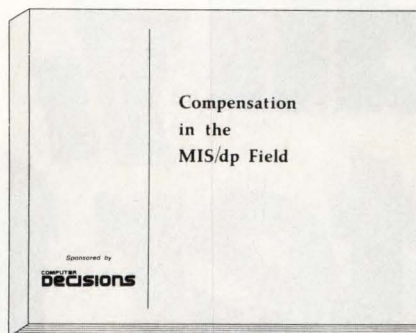
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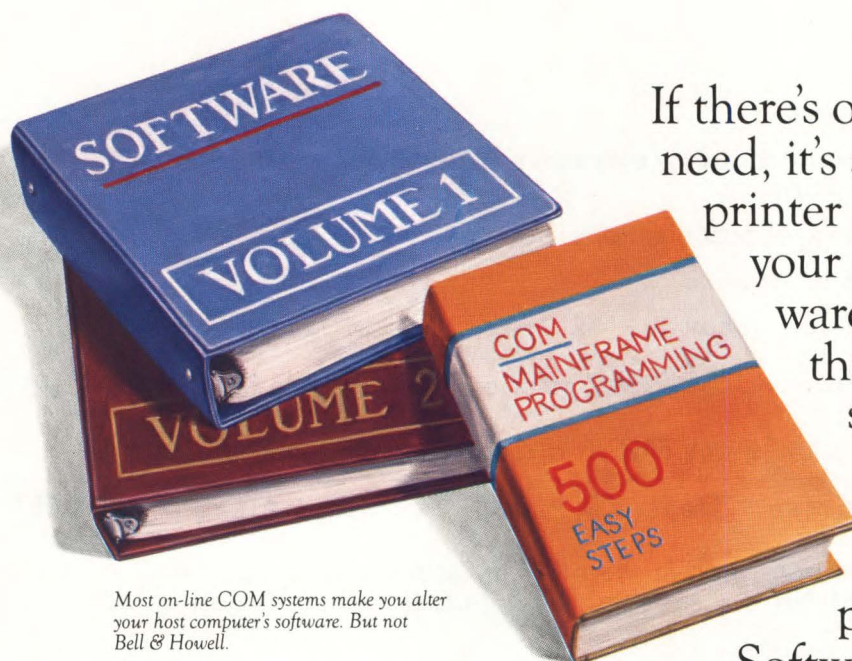
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CIRCLE 42

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PROJECT MANAGEMENT



GETTING MORE FROM YOUR KEY RESOURCES

Newer, more affordable project-management packages can mean substantial savings in time and money.

by Ara C. Trembly

The deserts of Saudi Arabia, endless miles of lifeless, remote, sun-baked terrain—hardly a friendly environment for a project-management team using computers to plan and implement a massive irrigation project.

This was the task faced by the CRS Group of Houston, TX, when it accepted an assignment to build and install an irrigation system in four far-flung regions of Saudi Arabia. Working against the elements, a tight schedule, and a considerable communications problem (the nearest telephone was 50 miles away from some sites), CRS nonetheless managed to complete the project on time, thanks in large part to project-management software. It was that technology, according to Bob Morse, vice president of the CRS Systems Division, that also enabled the contractor to deliver planning and scheduling services "at a fraction of what it would have cost previously."

Once the province of highly paid specialists using sophisticated systems on mainframes, project management today is a cost-effective option for virtually any executive. One reason for the change is the recent profusion of new project-management packages for personal computers, coupled with the ever-increasing power of micros. While packages for mainframes are still being created and used extensively, micros can do the job as well, or better, in many

cases. Depending on the duration and sophistication of a project, micros are often less expensive to operate, and may respond much faster than a terminal connected to a remote, overloaded mainframe.

Mainframe systems are best-suited to projects expected to last three years or more, or to those handling many thousands of activities. Yet, according to Leonard H. Aptman, a principal of Professional Executive Programs Inc. of Chappaqua, NY, most corporations prefer to deal with projects of no more than two years' duration. A project that drags beyond that time is subject to a number of confounding problems, including changing corporate requirements, personnel comings and goings, and rapidly advancing technology. Indeed, many project-management experts recommend that no project go beyond one year in length. Projects that might ordinarily take longer can be broken down into more bite-sized pieces, they note. This practice minimizes the potential stumbling blocks and enables the project to be managed on a more user-friendly micro, as opposed to an intimidating mainframe.

At a recent American Management Associations seminar on project planning, scheduling, and control using personal computers, Aptman—who regularly leads such sessions—surveyed the group of some 40 project planners from corporations and government agencies. Asked whether

PROJECT MANAGEMENT

their organizations were presently managing projects on mainframes, none of the participants responded affirmatively.

Breaking down a large project into smaller, more manageable pieces was the key for CRS, which specializes in project construction, development, and design. The four regions to be irrigated were dispersed over Saudi Arabia, and each site had its own unique demands and problems. CRS had been hired by Lindsay International—a Houston manufacturer of irrigation pivots—to build and install systems at the four locations within eight months. (A pivot is a large pipe that rotates, under electronic control, to spray water evenly over an area.) Each location became a separate sub-project, and CRS sent its project-management team to Riyadh, the Saudi capital, in June 1983 to coordinate the four sub-projects from a central location.

"The time available for shipment and installation of the equipment was critical," says Morse. "The way the Saudis write a contract, if you don't get the job done by a certain date, you don't get paid." According to Ken Malloch, vice president of operations for Lindsay, the Saudis insisted on a January completion date so they would be able to use the system to irrigate their all-important wheat crop.

Speed of response made Pertmaster, a project-management package from Westminster Software, ideal for this project. "We had developed some of our own mainframe-based scheduling systems in the 1960s, and we learned a lot about

project management," states Morse. "Pertmaster was the only micro package we found that worked like our own system. We started using it several years ago when Westminster Software was still based in England. Pertmaster is like a little brother to our big system; we can use the two in harmony, because they have the same basic logic. I have not found any package as fast as Pertmaster."

Pertmaster uses either Project Evaluation and Review Technique (PERT) or Critical Path Method (CPM) to manage complicated projects. The package handles up to 1,500 activities and analyzes and updates a full network in less than 10 seconds.

The CRS project-management team ran Pertmaster on four IBM Personal Computers (one for each sub-project) in Riyadh. Using the microcomputers offered several advantages. Morse notes that the cost of bringing in more powerful hardware or paying timesharing charges would have been exorbitant. In addition, the personal-computer systems could be up and running within a matter of weeks, saving precious time.

The project-management team devised a master schedule and a context schedule, which allowed it to compare the sub-projects. "The project manager could follow progress at each site within the context of the overall project," notes Morse. "If the project manager needed to know the impact of a late shipment, the information was available."

As each sub-project progressed, reports were also relayed to the contractor's Hewlett-Packard 3000 in

Houston, to keep Lindsay informed of developments. Morse adds that, with four sites to consider, Pertmaster's ability to respond to "what-if" questions made it particularly valuable. Morse was also happy with Pertmaster's user-friendliness, citing the package's "help" function and menu-style approach.

Cost savings on this project were achieved because CRS could avoid paying huge telecommunications charges from the sites to a mainframe or timesharing system in Houston, and because the microcomputers and the software could be easily transported. "We couldn't have completed this job on time with the older technology," states Morse. "If we had tied into Houston to get planning and scheduling information, the output would have been tremendous in volume and the cost would have been prohibitive. For the cost of Pertmaster and the IBM PCs, we were able to provide the same service at roughly 25 percent of what it used to cost."

Project-management software is not an instant ticket to project completion, but it can be invaluable in keeping track of a project's activities. In El Monte, CA, the South Coast Air Quality Management District is using Project Alert from CRI to implement an automated equipment-information system for use in its divisions.

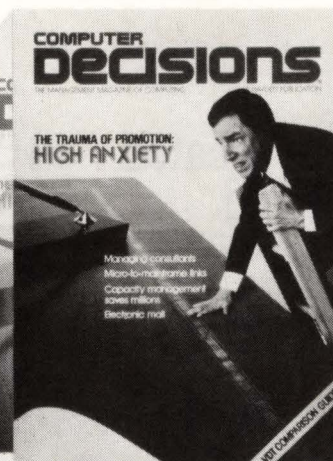
The District is a regulatory agency responsible for monitoring and controlling emissions (mainly industrial) in four counties—Los Angeles, Orange, San Bernardino, and Riverside. According to Ron Sweet, director of information systems for the district, the automated equipment-information system is needed to keep track of permits, applications, violations, and complaints concerning some 40,000 businesses and over 70,000 permit units in the four counties.

Project Alert is an automated system for planning, scheduling, and

(Continued on page 94)

"We were able to provide project-management services at roughly 25 percent of what they used to cost."
—Morse, CRS

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CIRCLE 45

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**The \$10 charge for the disk is refundable with the purchase of any Smart Software.

PROJECT MANAGEMENT

(Continued from page 90)

monitoring projects. The system generates network diagrams, resource charts, and Gantt charts (time-line charts of project tasks), and operates according to the Critical Path Method.

At the District, the new administrative system—which will provide information to the agency's engineering, finance, enforcement, and legal divisions—is being implemented as a \$1.5 million project scheduled for completion in two years. Sweet notes that his agency chose Project Alert because it runs on the agency's HP 3000, and because it offers the necessary features at the right price.

Implementation of the project-management package was done by the District's systems and programming staff over a month's time. During that time, the activities for implementing the information system were laid out, and the staff was trained to use Project Alert. The District has only been using the package for several months, but Sweet is already enthusiastic about the results. "Over all, Project Alert will be a big help," he says. "I'm beginning to see more reports on the status of the implementation project, and on ongoing costs. That's making it a lot easier to report on the project to top management. I don't have to keep detailed records of how much was spent for a task or try to determine how the tasks will fit together; the package does that for me."

"All we're inputting is estimated time lines and tasks," Sweet explains. "This is a dynamic package. If we see we can't achieve some goal, we adjust the schedule's bottom line for resources and activities." He adds that Project Alert offers the convenience of being able to view any aspect of the project "without having to chase somebody down."

The cumulative effect of these advantages has been reduced costs. "The best way to describe the savings



we've gained by using Project Alert is in terms of cost avoidance," states Sweet. He notes that without the project information in a database, planning and scheduling of time and resources would have to be done manually. That would mean hiring, and paying, additional staff.

Questioned about any weaknesses of the Project Alert package, Sweet adds: "It's not much of a problem, but we would like to execute some online functions more quickly. We need to go directly to a function without dealing with several menus. CRI is correcting that fault, though. Its staff has been extremely responsive. This package is providing a lot of options I haven't had in the past."

For Jim Wilcox, executive vice president of Chris Berg Inc., a construction firm in Seattle, WA, the most important options offered by the new project-management packages are ease of implementation and user friendliness. Berg is using PMS-II, a project-management package from North America MICA Inc., to schedule construction at a radar station in Fort Yukon, AK. The \$7.5 million project has been contracted by Alaska District Corps of Engineers, part of the U.S. Army Corps of Engineers, and involves building two steel-frame structures to house personnel and equipment at the site. Construction is scheduled for completion late this fall.

Berg has its microcomputer on the

site of the Alaska project. Reports are relayed to the company's computers at its Seattle headquarters.

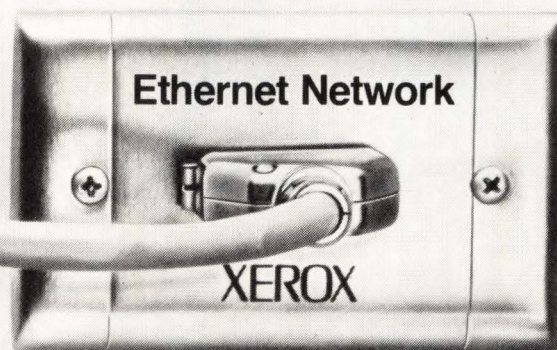
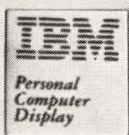
PMS-II is a Critical Path Method project-management system that handles up to 1,250 activities on micros with 64,000 bytes memory or 2,500 activities on those with 128,000 bytes. PMS-II prints activity reports and Gantt charts. "We started using PMS-II in August 1983, and within the first two months we saved the cost of the package," says Wilcox. "Previously, we went to consultants to get project-planning and -management services. This system lets us do it ourselves, and we don't have to waste time teaching a consultant about our business."

Perhaps the most important benefit of the new project-management package has been that it has helped Berg receive payments more quickly. "The government pays us periodically, based on the amount of work we've done," Wilcox explains. "With PMS-II, we always have a fix on the status of the project, and payment estimates can be done much faster. We're going to use the package on all of our jobs. It's so easy to use that once you set it up, it can be updated by a clerk. The bottom line," he concludes, "is that the quicker you get your reports to the government, the quicker you get paid."

Executives everywhere are taking advantage of project-management software to effectively schedule complicated projects. The software helps users focus on the critical portion of the project, and identify the part that will have less impact on the completion date. The number of applications is staggering—ranging from keeping track of a simple bookkeeping system to developing multimillion dollar space-exploration projects in which project goals, tasks, and deadlines are systematically organized and monitored. The result may be significant savings—in time, money, and resources. □

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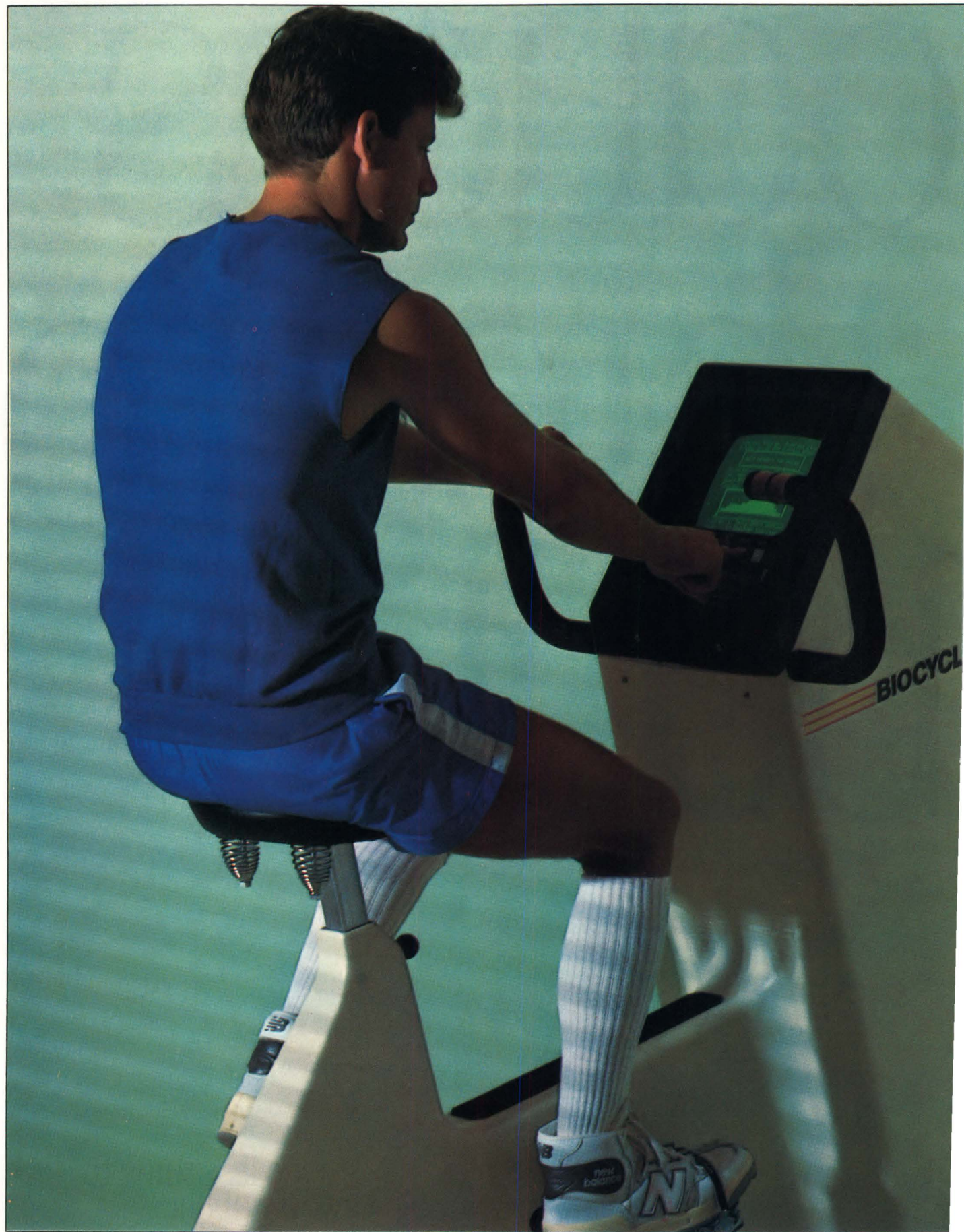
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MORE DP FOR LESS MONEY



FITNESS PROGRAMS FOR YOUR DATA CENTER

Whip your data center into trim productive shape with software that improves performance.

by Jennifer E. Beaver, Southwestern Editor

A sluggish heart can cost you your life, and a sluggish data center can cost you business. For, like the heart, to which it is often compared, a data center may run 24 hours a day, seven days a week, taking in raw data, purifying them, and pumping them out so the whole organization benefits.

Just as cardiovascular exercise improves bodily health, certain software maximizes a data center's fitness. Perhaps you've had the experience of attempting to call up last year's sales figures on your personal computer, only to find that the host computer you're accessing is down. Multiply your inconvenience by the number of users, and you'll begin to grasp the impact of downtime on your corporation.

Some packages make sure your corporation's heart doesn't miss a beat during such technical malfunctions. Others automate functions like repetitive job scheduling. By minimizing human intervention, and thereby error, they decrease the chance of late reports and missed opportunities.

Data-center-automation packages can also help you track system resources. Is a system underused? Is a project consuming more computer and staff horsepower than the resulting profit justifies? Maintaining such hard data is essential for long-range

planning.

No software package comes with a written guarantee of improved performance and the reduced overhead that results from reducing staff. Claims such as these should be met with the same skepticism reserved for statements like "The check is in the mail." To measure the success of automation software, your data-processing pros must analyze its effect on your data center. Such software is not a panacea for all of a data center's ills, but it can contribute to dp's general good health.

Like most progressive banks, Citizen's Bank of Providence RI, relies on automated-teller machines to provide customers with an easy way to extract and deposit funds 24 hours a day. For many customers, the machines are the bank's primary representatives. When they don't work due to a computer malfunction, the bank looks bad.

That's why it's important for the financial institution's Customer Information Control System (CICS), running on an IBM 3083, to be up as much as possible. Citizen's Bank relies on DADS (Dynamic Allocation/Deallocation Subsystem), a multi-user online monitor from Star Products, to prevent system aborts in the event of a missing file.

Before DADS was installed, a missing or damaged file could only be

MORE DP FOR LESS MONEY

corrected by a programmer. Often, programmers were routed from their beds in the wee hours to solve a problem. It took anywhere from 20 minutes to 90 minutes for them to reach the data center before they could begin fixing the error.

DADS allows users to bypass a missing or damaged file and continue processing. It also gives a status print-out on why the file was unavailable, according to Dan Kokoruda, Star's president.

Like most data-center-automation packages, DADS was developed by an independent software house to compensate for deficiencies in a computer vendor's software. IBM's CICS, for example, was introduced in 1969, long before demands on data centers reached their current peak. Subsequent CICS releases improved performance substantially, but even they benefit from enhancement packages like DADS and Compuware Corp.'s Abend-Aid/CICS, which analyzes the cause of CICS problems and provides programmers with immediate online diagnostics.

American Sterilizer Co., an Erie, PA, manufacturer of health-care products, has 250 online users who feel the impact of a system shutdown immediately. In a sort of ripple effect, the rest of the company's 3,250 employees realize there's been a problem four to six hours later, when they can't get the reports and answers they need to do their work.

V/Save and V/Snap from VM Systems Group help prevent unnecessary system crashes on American Sterilizer's IBM 3033. "Before installing this software, if one user got in trouble, everyone else paid," comments Anthony J. Longo, manager of technical services. "The products reorganize conditions so only the user who's having problems is sacrificed—the rest of the system keeps running."

A software package from Software Corp. of America helps the manufacturer's users recover automatically

Think of automation software as an overall fitness regimen for your data center.

from datachecks. Such occurrences, caused by events like tape scratches, make it impossible for the operating system to read data. Large dp departments have about one or two datachecks a week, according to the vendor, and recovery may take from an hour to a day. Software Corp. of America's Datacheck Recovery software promises restarts in three minutes 75 percent of the time, provided the problem was caused by a soft error.

Crashes aren't the only events that slow down business. A missed job run, common in highly active data centers, can also cause damage. Crown Zellerbach, a worldwide paper-products manufacturer, has a San Francisco data center that runs between 300 and 400 jobs a night on an IBM 3033. "There are so many jobs that sometimes we'd forget one," admits Faye Oliver, production coordinator. "The easiest to forget are those that only run once in a great while, such as the quarterly unemployment statements we file with the state government. If that job doesn't run, the state has to wait until the following quarter to receive a report on those earnings." Other missed jobs could throw the general ledger out of whack, and that would foul up profit reports, adds Oliver.

Crown Zellerbach installed an Automated Data Center System (ADC2) in January 1983, and hasn't had a serious scheduling error yet. "Of course the system doesn't eliminate human error—occasionally, someone will enter the wrong series

code—but it does minimize it," says Oliver. From Cambridge Systems Group, ADC2 speeds production by starting a second job as soon as the first is finished. It eliminates time-consuming manual collation and review procedures.

Another major attraction for Oliver was ADC2's easy-to-understand manual, which she has used to teach the 70 employees on the data center's three shifts about the product.

Managing the production workload in a data center that runs 500 to 600 jobs daily, as does Federal Mogul in Detroit, can be a time-consuming, frustrating task for a manager with other responsibilities. That's part of the reason production-control supervisor Robert Fahey assigned the task to UCC-7, one in a series of production aids from UCCEL.

A manufacturer of ball bearings and precision parts for the auto manufacturers, Federal Mogul has representatives on three continents. Each night, its data center processes physical-distribution and online-order entries in batch on an IBM 3083 and a 3033. With manual scheduling, the process always took about an hour longer than it should have, knocking the rest of the day's production off schedule. UCC-7 chopped two hours off batch processing, according to Fahey, effectively adding another much-needed 60 minutes to a formerly crowded day.

Previously, at the end of each week and each month, specially scheduled jobs required that operators spend extra time monitoring for correct sequences. Now that UCC-7 controls the scheduling, the operators engage in more productive, less house-keeping-oriented tasks. "UCC-7 helps us make better use of our time," says Fahey. "We concentrate on fine-tuning operations rather than putting out fires."

Fahey took advantage of Cam-

(Continued on page 104)

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MORE DP FOR LESS MONEY

(Continued from page 100)

bridge's 90-day free trial to make sure ADC2 and Federal Mogul meshed. He put 10 jobs under its control the first week, and when those succeeded, added more. He gradually added jobs over four months until reaching the current cache of 4,000 jobs.

Nordstrom's is a rapidly growing chain of west-coast department stores that prides itself on quality merchandise in its retail outlets and state-of-the-art technology in its data center. Over the next five years, Nordstrom's plans to add nine new stores, bringing the total to 50.

At the same time, the retailer's goal is to keep the number of employees in the data center level. UCC-7 helps Nordstrom's increase profit opportunities while minimizing overhead.

The credit-authorization system is

a case in point. Every third day, tapes from the retailer's NCR Criterion must be interfaced with those run on an IBM 3083 and a 3086. "It was very confusing for the operators," comments Vicki Hanson, production-services analyst. "They never knew when the tapes would arrive or what priority to place on them. With UCC-7, warnings and criteria to make informed decisions are built in."

By taking the repetition out of many tasks, UCC-7 makes the jobs of data-center personnel more rewarding, Hanson believes. "They can spend their time designing systems and programs, rather than monitoring schedules," he says.

At Public Service Electric & Gas (PSE&G), New Jersey's largest utility, ADC2 helps 4 million ratepayers get more bang from their bucks out

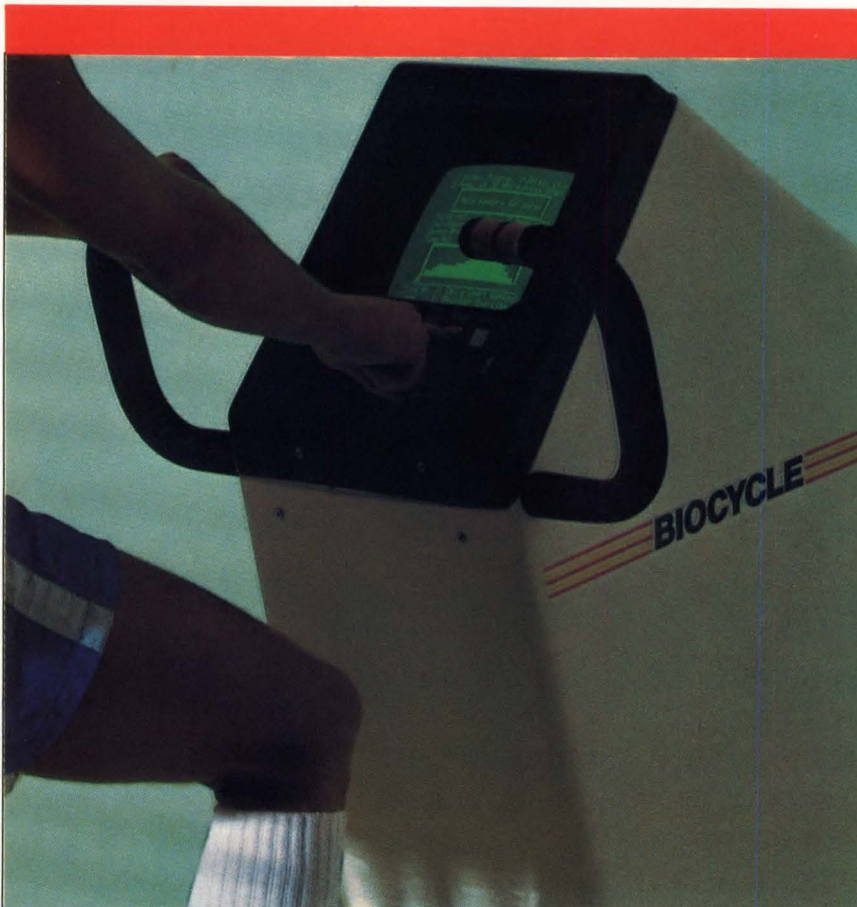
of the utility's five mainframes—two IBM 3083s, two 3033s, and one 3032. Though ADC2 is primarily a scheduling tool, it also tracks system resources. PSE&G's users do about 9,000 jobs, according to Kevin Duddy, senior operating-support analyst. ADC2 gives him an immediate history of resource use that helps in capacity planning. "If, for example, we discover we're underutilizing one of our mainframes at night, we can reallocate jobs to take advantage of those time slots," he explains.

Users can also check the status of jobs themselves without bothering the dp department. "ADC2 helps us address user complaints about turnaround time," says Duddy. "We now have a written record that proves turnaround time is getting shorter."

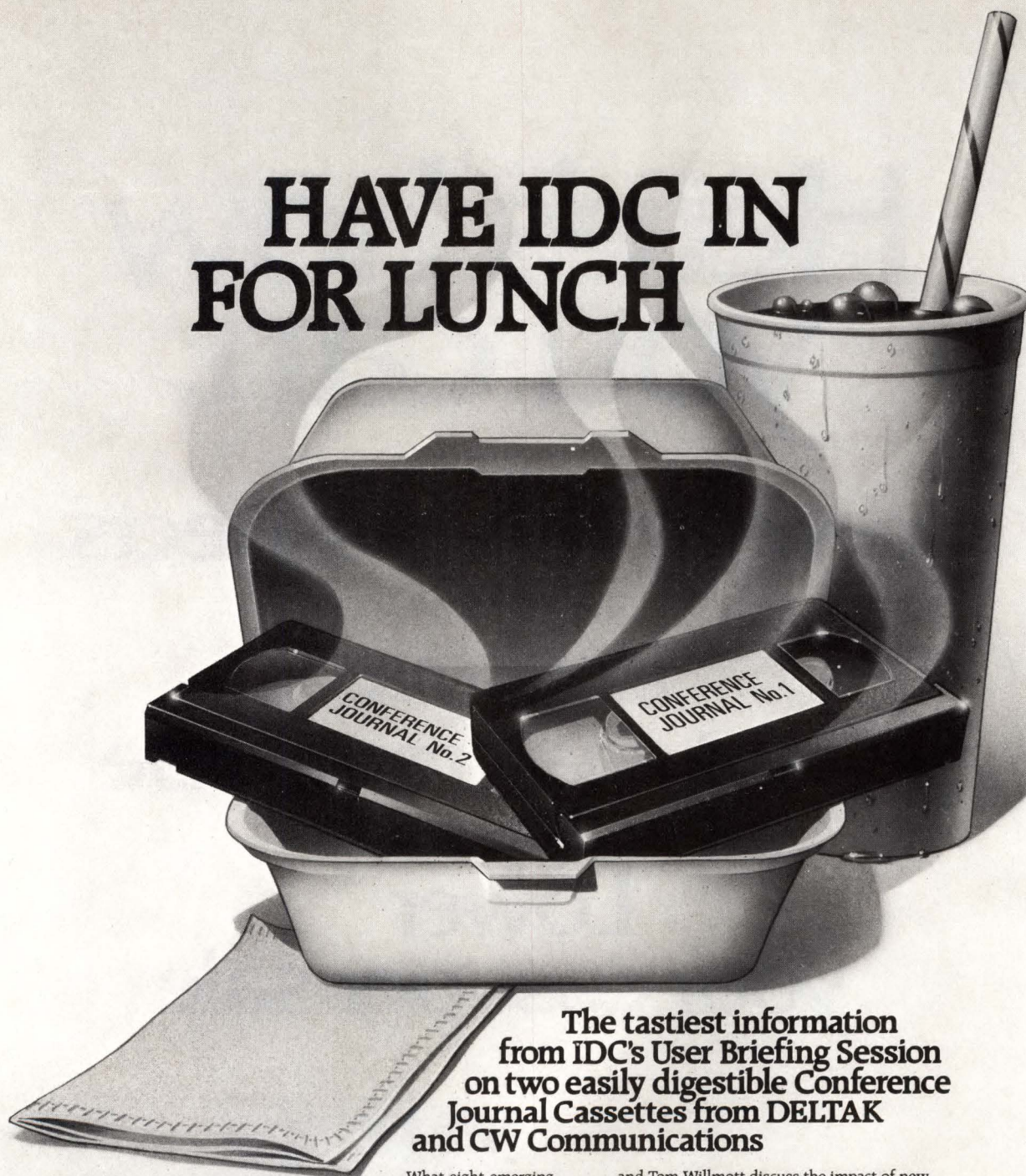
Ezlog, a project-based resource-accounting system from Signal Technology, also gives data centers better control over resource consumption. For DEC VAX minicomputers, the package provides three reporting levels for account name, user name, and project name.

You know a fitness regimen has been successful when, after jogging and dieting, your heart rate and weight decrease. Measuring the less tangible results of software productivity is trickier. One way, according to Dan Kokoruda, is to measure service objectives. "If you know that it normally takes your computer three minutes to recover from a certain type of error and your software cuts that to two minutes, you might say it was productive," he explains.

Automation software can save you both people and money, but some does it better than others. Kokoruda suggests defining your needs first, and then looking for a product that fulfills them; talking to other users; and taking advantage of the 30-, 60-, and 90-day free trial periods offered by many vendors to make sure you get the best product for your requirements. □



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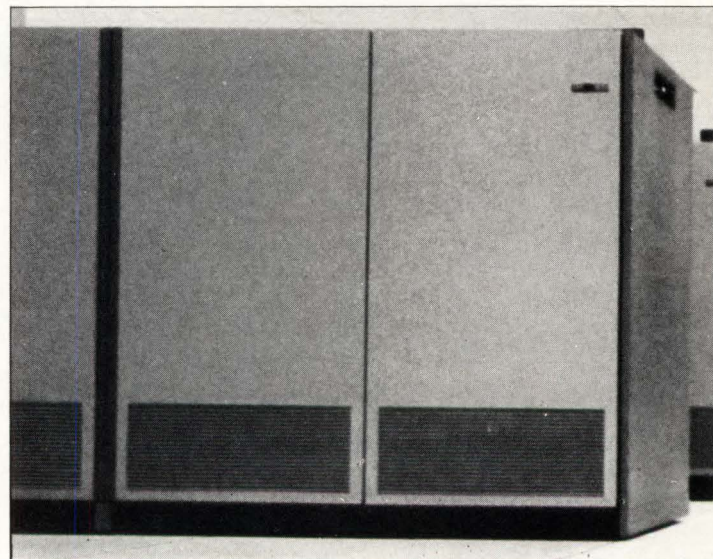
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COMPUTERS PUT CORPORATE CASH TO WORK

by *Miriam Lacob*

A federal-government handbook on how to improve cash management in government agencies recently gave employees three pieces of common-sense business advice: Don't pay bills until they are due, collect money owed to you as soon as possible, and invest any money you have on hand. "This good, simple cash management," says Susumu Uyeda, executive director of the Federal Joint Financial Management Improvement Program, "helped the government save millions of dollars annually."

Of course, cutting costs and maximizing profits involves more than those three steps. But speeding collections and making sure managers make on-time payments and quick investment decisions are important to any organization's financial well-being. And computers are putting those abilities at managers' fingertips. Automated accounts-receivable systems are collecting funds days, or even weeks, sooner than paper-based or mixed systems. Micro-computer links between corporate-treasury offices and bank mainframes are cutting hours of paperwork and calculations, enabling cash managers to make quick and profitable investments with spare cash. And electronic funds-transfer systems are enabling businesses to pay vendors on the exact due date.

These systems are speeding cash flow in corporations, while cutting the rapidly rising costs of paper processing. They are also providing decision-makers with a tool many experts say is more important than speed: good information.

This has been recognized by managers at Hewlett-Packard, whose own in-house financial-management systems have cut collection time from 73 to 54 days over the past five years. "Good information systems do not ensure effective management, but effective management is difficult without good information," says Paul Haefner, a manager of information-system-management support at the Palo Alto, CA-based computer and instruments manufacturer.

In the past five years, Hewlett-Packard has been forced to develop systems that kept up with its tripled sales turnover, continues Haefner. Using a modified version of its older commercially available financial systems, HP has cut collection time by almost three weeks, and has cut inventories from 23 percent to 16 percent and the error rate in order processing from 5 percent to 3.2 percent. As a result, Haefner estimates, the company has freed up about \$375 million—a substantial amount for this \$4.7 billion operation. "These numbers are very important because we

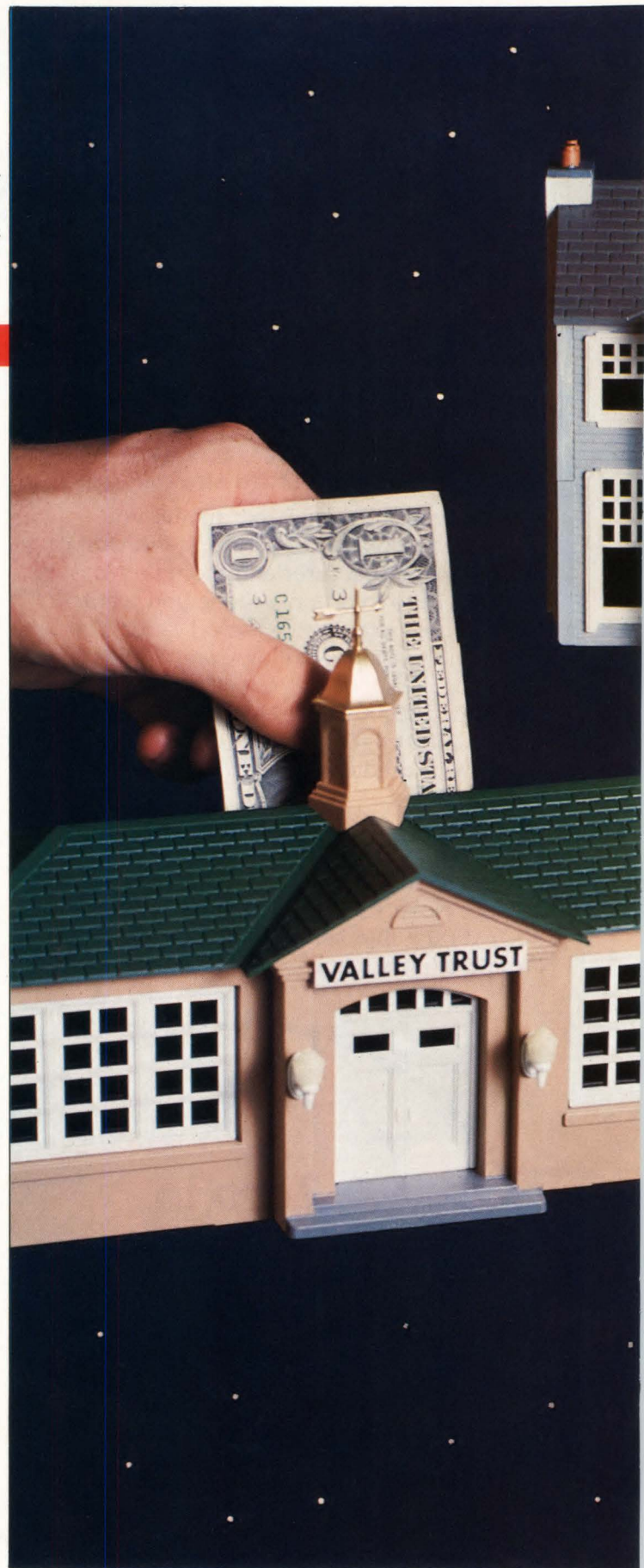


Photo by Bill Oliwa

The newest money-management systems help top executives squeeze every last cent out of their corporate float.

do self-funding for growth," he says.

Haefner attributes HP's successes in speeding up its collections and cutting inventory to two factors: one, being able to put systems in place, and two, providing personnel with the information to be able to manage them. The company accomplished this by decentralizing, using as a major tool its HP 3000 minicomputers, which are located in operations divisions and branch offices.

HP uses two Amdahl 470 V-8 central mainframes to process information, and to get management measurements, but it has placed the day-to-day business of the company at the operating divisions, where orders are taken, inquiries are answered, and money is collected. Customer orders are entered into the system by each branch office. Information is batched and transmitted to the central computers up to four times a day, is processed, and then sent back to the branch offices at night. When a shipping notice is sent out, the system generates an invoice and the pertinent branch office is notified.

Decentralization lets customers call their local office, where the status of everything they have on order can be called up on screen in five to 15 seconds. This has eliminated the need for phone calls back to the central location to check on information, made it possible for people in branch



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offices to answer questions by phone, and pared phone bills by 60 percent. "We put the responsibility in employee's hands and gave them the information to do the job," Haefner says. "By having better information, you can bill customers properly for what you send to them. You can't get customers too interested in paying if you don't do that."

Like Hewlett-Packard, the Chilton Corp., a Dallas-based collections agency with \$68.5 million in annual revenues, is decentralizing and making accessible its information system to collection agents out in the field, and as a result, is speeding up collections.

To do this, Chilton is using Mohawk Data Science's recently released Hero Super 21 communication processors, which link a cluster of intelligent and dumb terminals. These processors are key to upgrading Chilton's existing automated collections from a data-entry system to a local online interactive collection network that Chilton calls Ultra Tech.

Previously, Chilton's collectors manually recorded debtor information onto paper "work cards," and then keyed the information into MDS

distributed processing systems at remote sites. Data were then transmitted at night for batch processing at Chilton's data center in Dallas, and new work cards and a variety of reports were transmitted back to each location for printing the next day. The Ultra Tech system eliminates the work cards, and allows collectors to record, process, and store collection information locally in the Super 21s, using custom screen formats on MDS terminals. The system handles a high volume of transaction information, and provides heavy database-inquiry capabilities. According to David Harder, director of systems marketing and development, the new system, which is being test-run at three locations, has improved collectors' productivity by 60 percent. "Doing away with the work cards is saving 40 to 50 percent of the collectors' time."

Chilton handles accounts that have already eluded the dunning systems of its clients. Much of the work, Harder relates, involves "skip trace"—or tracking down debtors who have disappeared—and has to be done manually. The Super 21s assist, he says, by providing as much on-screen information as possible. Collectors

enter into the remote database new information, which is transmitted at night to Chilton's Amdahl mainframes and updated, with errors and acknowledgements reported back to the sites. In the future, the remote capabilities of this entirely unattended system will let Chilton place terminals in its clients' offices.

The need to ensure that collectors and credit managers are supplied with up-to-date comprehensive information has been recognized by several major software suppliers. General Electric's Software International recently enhanced its accounts-receivable system with a "credit-manager workstation," which lets collectors retrieve up to 33 categories of information while on the telephone with a customer.

Joe Powers, product manager for Software International's accounts-receivable systems, claims users pilot-testing the product have cut collection time from 58 to 39 days. One of the pilot users whose specifications were built into the system is Gerry Carver, head of the National Association of Credit Managers, Hospital Division, and credit manager for Professional Medical Products of Greenwood, SC. "The best collection instrument is the telephone," Carver asserts, "and I want the collection agent to have enough information on-screen while making the telephone call."

With the G.E. system, Carver's receivables turnover is two to three days better than average for the industry. The manufacturer previously used an outside service bureau, and Carver says the \$6,000 he spent on the Software International system paid for itself in less than four months.

Management Science America (MSA), which markets an accounts-receivable system with 10 other financial-system modules, is about to introduce Release 4, with online credit search and review. With this system, a credit manager can call up

(Continued on page 114)



Chilton Corp.'s automated collection system is based on Super 21 communication processors by Mohawk Data Sciences, which link a network of terminals.

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(Continued from page 110)

aged accounts by self-defined categories, says Jack Shaw, manager of the vendor's financial-systems development. MSA has added two more capabilities: one is to have the telephone number of the customer appear with the aged account's data; the other is a micro-mainframe interface that will download an aged account onto a micro and use word-processing software to generate a letter, which can include personalized notes from the collector. "People do not respond much to automatic dunning letters," Shaw says.

Earlier versions of MSA's AR systems already let users access comprehensive, online information, which, they report, helped speed up collections significantly. Tom Van Himbergen, vice president and controller of the Water Products Co., a division of A.O. Smith (Milwaukee), installed an MSA AR system in 1980. Previously, the \$160-million-a-year, Kankakee, IL, division had a manual system with 25,000 transaction cards, which provided almost no customer history and had limited cash-posting capabilities. The division averaged outstanding claims of up to \$900,000 because customers would claim discounts and withhold payments until

discrepancies were resolved.

Van Himbergen wanted current credit-inquiry capability, automatically generated audit trails, real-time cash-posting facilities, and price-remittance audits. With online screens, the company can access data on what was shipped and billed as recently as the most current posting. The new system also makes it possible, for the first time, to monitor customer claims for discounts and price reductions, and cut the average life of these claims in half, reducing the amount of outstanding claims from \$900,000 to less than \$200,000.

According to Van Himbergen, the \$200,000 AR system "paid for itself in less than two years, speeded up collections by 10 percent to 20 percent, and eliminated two staff positions."

Although businesses like Hewlett-Packard and Chilton are satisfied with online branch activity transmitted to a central-processing system in batch, many companies are seeking integrated, online financial systems that provide immediate information about their financial position. Thus, most large software vendors are beginning to fill in the missing pieces for integrated financial systems. The Xerox manufacturing system, for example, includes

accounts-payable, general ledger, sales management, receivables, and order management in an essentially turnkey system that can be run either as licensed software operating in-house or as a timesharing service through the Xerox nationwide communications network. Cullinet, best known as a supplier of database management systems, plans to release later this year an accounts-receivable component to what eventually will be a total financial package, with all modules working off the same database.

Cullinet officials claim that basing all elements of the modular system on the same database will speed up financial operations. "All the information will be in one place, available immediately. There are no extra programs to run, and the company knows what information it has at all times," says Ed Blumstein, director of software development.

Blumstein declines to estimate by how many days the system, presently in beta testing, would speed up collections. However, simply by avoiding the need for batch processing, he says, the system will save at least one day. "As soon as a sale is made, everything is known throughout the system, in every one of the modules," he claims. "Inventory is properly charged, accounts receivable is charged, and you know your exact customer status."

The fastest collection system is one that guarantees immediate payment, if not in cash, then by an electronic means whereby a purchaser's bank account is automatically debited while a vendor's account is immediately credited.

Although this is by no means the norm, several factors are making such systems increasingly feasible and important. One is the development of retail point-of-sale terminals that automatically debit a customer's bank account. Another is the increased involvement of banks eager to cut their paper-processing costs by marketing their own cash-management expertise.



A collector at Chilton Corp. reviews activity summaries generated by Ultra Tech, the collection agency's online, interactive collection network.



Thomas Van Himbergen says the \$200,000 receivables system at the Water Products Division of A.O. Smith "paid for itself in less than two years, speeded up collection by up to 20 percent, and eliminated two staff positions."

Diebold, which has been producing automated teller machines for several years, has recently developed a micro-computer, the Diebold 1000, and applications software that will support automated point-of-sale debit and credit authorization. The vendor is cooperating with Universal Money Centers, a Kansas City operation, to introduce a combined electronic couponing and check-authorization terminal for supermarkets and convenience stores. With an Atlanta-based firm, Buypass, the company is test-marketing point-of-sale terminals at gas stations.

The use of electronic funds transfer has significant implications for retailers, which are presently bedeviled by long lines, credit hassles, charge-backs, worthless checks, and wasted time, labor, and money. Montgomery Ward, a Chicago-based retailer, uses NCR 2151 cash registers modified for its own telecommunications network and that of the Bank of America. In-house software expands Montgomery Ward's electronic bank-card payment service, which instantly debits a cus-

tomers' bank account while crediting the retailer at its Bank of America account.

Glen Taylor, corporate-credit controller, will not reveal company estimates on savings on electronic over paper processing, or the volume of business done this way, but he says Montgomery Ward is well pleased with the results. "The system provides a great deal of convenience for the customer and the sales clerk," he says. "It's a very polished and discreet method of transacting business. The clerk does not have to go through warning-card lists and embarrassing credit-card checks; it eliminates a great deal of the time a check takes to clear, and it's more cost-effective than the more cumbersome paper method."

Electronic means of paying bills and receiving payments have also moved into the corporation. In January 1984, the National Automated Clearing House Association (NACHA) reported the results of a three-year pilot test of an electronic-payments system called "corporate trade payments" (CPT). The technology developed for the system is similar to that used for the automatic deposit of payroll, pension, and social-security payments for consumers, and makes use of the same communications network—the 32 Automated Clearing Houses (ACHs) in the United States.

Numerous banks, which have a direct interest in cutting paper-processing costs, participated in the pilot, as did 45 corporations, including Exxon, Westinghouse, and Sears. "CTP is more accurate and efficient than the paper check-based system," says Robert L. Caruso, director of cash admin-

istration for Westinghouse Electric Corp., Pittsburgh. "In the long run, we anticipate significant cost savings through use of this product."

One of the issues that had to be resolved in the development of CTP was that of "float." Maximizing float, says MSA's Jack Shaw, used to be a major function of a cash manager, with corporations and banks often mailing their payments from remote processing sites to earn extra interest on their funds. Float has become less of an issue, however, because its elimination was one of the objectives of the Monetary Control Act of 1980, and the Federal Reserve has instituted its own procedures to impose costs on float and thus reduce it. The Federal Reserve's efforts, says Shaw, have already cut down float from \$7 billion to about \$2 billion. In addition, corporations can negotiate payment terms with major trading partners to lessen the impact of float loss. These new terms might offer higher discounts or extended payment due dates in exchange for electronic payment in immediately usable funds.

Another stumbling block, says Peter Panos, a vice president at Pittsburgh's Mellon Bank, which is heavily involved in electronic funds-transfer systems, was the unwillingness of corporations to include orders and invoices in their automated billing and payment systems. "Their reluctance stemmed from the need to work out individual computer formats for each supplier," he explains. But, with advances in technology, the individual formatting is no longer necessary, and corporations can now transmit an order, the invoice, and remittance data directly from their own computers to the supplier. And, if a corporation uses corporate trade payments, the entire transaction can take place without using a single piece of paper.

So far, CTPs have a very small user base. During the pilot program, 300 transactions were processed through the automated clearinghouse system,

"Banks eager to cut paper-processing costs are marketing their own cash-management expertise."

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with each transaction covering an average of 10 invoices, replacing about 3,000 paper checks. Dollar volume of the individual payments ranged from \$400 to over \$1 million, with a total of more than \$14.5 million. But experts like Don Long believe that the scale will not remain small for long. A financial consultant for IBM, Long believes that by 1990, electronic transfer of funds will eliminate some 2.6 billion paper transactions.

Exxon joined the NACHA pilot at the outset. So far, according to treasury analyst Peter Somes and banking and cash-management coordinator Lars Larsen, the results are extremely gratifying, although a very small portion of the giant's payments—two a day—are being made this way. Most of Exxon's cash-flow systems are already highly automated; the company employs the automated clearinghouse to pay salaries and annuities, and already has a centralized payables system. (The company's in-house receivables system

calls up the entire file for a given customer when a payment comes in, and automatically updates the account.)

To reformat its payment information into CTP, the company purchased software for direct deposit of payroll from Stockholder Systems, Atlanta. Somes says the system required a minimal amount of programming to become functional, and even less to receive CTPs. (The company has not yet found anyone willing to make payments via CTPs.) Although Larsen says the results of the pilot have yet to crystallize, Exxon is certain that, besides speed, CTP's major advantage is the potential savings. Somes estimates that the cost of processing through electronic lockbox systems is at least one dollar an item, whereas the estimated cost of a CTP is less than 20 cents.

Although CTPs constitute a minute part of the financial systems of the large corporations participating in the project, they constituted most of the cash flow of one small company. Mid-America Bankers Service Company (MABSCO), the umbrella association of 12 state bankers' associations, rents audio-visual training material to member banks, which pay the company via electronic systems. Marva McCarty, a representative of the Iowa Bankers' Association and a MABSCO Video Board member, estimates that the small company is gaining at least six weeks in the time it takes to prepare an invoice, send it out, and receive and process a paper-check payment.

McCarty says MABSCO turned to CTPs because, with a small staff and monthly receivables of less than \$3,000, it needed a very tight payment system to break even.

To set up a CTP system, MABSCO contracted with the media-resources center at Iowa State University (Ames) to provide warehousing, dubbing, and computer services. The system takes orders and prints out mailing labels. Banks then pay

MABSCO at its Des Moines bank through the Automated Clearing House system. The bank reads the tapes, takes out the items due to MABSCO, gives Iowa State its cut, and credits the remainder to MABSCO's account. Banks that did not want the electronic system but required paper bills are charged an extra five dollars—a reflection of the amount of time it takes to send them a paper bill.

"If I bill a bank electronically and it pays me electronically, I have money in hand six weeks to two months sooner than I would if I used a paper billing system," McCarty says. Using CTP, the company is running 400 to 700 debits a month; McCarty estimates the amount of time it takes to create tapes and bills is less than one hour.

J. Robert Brubaker, president of NACHA, expects the U.S. Treasury to begin making some corporate trade payments by the end of this year, a development that is expected to stimulate acceptance of CTPs. Executives involved in the pilot predict that the rising cost of paper transactions, including increases in postage rates and the future cost of float, as well as the importance of good financial information, will almost certainly increase the volume and importance of CTPs. Thus, Peter Panos of Mellon Bank advises purchasers of payables and receivables packages to look to the long term, and to ensure that the software is open-ended and can include electronic payments and receipts.

Advanced banking technology is also turning into a business item in another respect—that of treasury management. Faced with deregulation and fierce competition, banks are increasingly turning their own electronic cash-management techniques into profitable services, offering their customers quick cash clearing and up-to-date information on financial standing.



"People do not respond much to automatic dunning letters," says Jack Shaw of MSA. MSA's system has a custom-letter generator.

A chief development is the advent of microcomputer-based systems that link the corporate treasurer's office with a bank's mainframe-based reporting systems to provide corporate treasurers with information on the company's cash position, as well as on available investment instruments. The main attraction of these systems is their speed. "Ten years ago, the emphasis in cash management was on creating float," says MSA's Jack Shaw. "Now the catchword is 'time value.' The time value to a treasury manager making daily investment decisions is about 20 basis points an hour."

Proponents of microprocessor-based treasury-management systems say they are turning what was once a labor-and-time-intensive operation that required platoons of clerks into a single-person task. In addition, their speed enables treasury managers to quickly develop a consolidated balance report, and then get into the market while the best investment instruments are still available. Most of the systems have an internal clock that can be programmed to automatically dial a bank's reporting system at times the bank is likely to make reports.

New York-based Citibank and Chemical Bank, Security Pacific National Bank of Los Angeles, and San Francisco-based Bank of America are selling microcomputer-based treasury-management systems. These are usually modular, and their complexity and versatility increase as modules are added on.

The Citibank system, Citi Integrator, released last November, automatically retrieves and consolidates balance information from a customer's reporting banks, calculates a target balance date, and provides access via an IBM Personal Computer to other services, like electronic funds transfers, debt-and investment-portfolio-management systems, and foreign-currency accounts. Bank of America's Microstar offers nine mod-



ular products that range in capability from basic communications to very sophisticated and highly customized treasury management. The bank recently contracted with IBM to market its Corporate Cash Manager, a fairly inexpensive package.

The use of computers in treasury management is already translating into time and cash savings. According to Dee Dorsey of Aerojet, a user of Bank of America's Microstar system: "By 8 a.m. we have the whole picture. It used to take until 9:30 a.m."

David Boyle, a Citibank vice president, says the pilot users of his bank's systems forecast annual increases of \$150,000 to \$200,000 in revenues, simply because the systems get treasury managers to the market 60 minutes earlier than before—in time for the most attractive rates.

David Grunbaum, an assistant treasurer with Teacher's Insurance and Annuities, has been using Citi Integrator since late last year. He finds the system easy to use, and is happy with its performance. "It starts dialing our banks' reporting systems while I'm still at home, and makes it possible for us to get into the market early, when suitable investments are still available," he says. The Citibank system only dials one bank at a time, however, and Grunbaum finds this a disadvantage. "We want a module

that will take all the information accessed and reconfigure it into the format we need."

As yet, according to MSA's Shaw, none of the systems on the market can integrate data from a mainframe on the cash position of a corporation. "User organizations that do have this kind of system have developed their own at a cost of hundreds of thousands of dollars," he says.

Grunbaum does not miss this function: "It is not a concern for us. We want to maintain the integrity between the corporation's database and our cash-management functions." However, Shaw of MSA considers the approach of Teacher's Insurance a serious limitation. "It is difficult to project your cash position based on your bank's routine reporting systems," he says. "You have to get information on your payables and receivables from the mainframe. You have to have systems that do these kinds of forecasts. A stand-alone micro-based system is a trivial application."

The integration of daily bank information accessed by microcomputers from a mainframe accounting system is a challenge for data-processing managers. MSA offers one such system in its Executive Peachpak, which lets micro users download information by category from a mainframe, and put it into a spreadsheet for forecasts. Another approach is to develop analytical software that will improve cash-flow forecasting, and thus increase profitable decisions.

"Corporations keep cash on hand because they don't know what is going to happen in their cash flow," says Arlington, MA-based financial-management consultant Gregg Diegquez. "Certainly, better operations can improve cash flow, but it's even better to know what is going on with your corporate finances." □

Miriam Lacob is a free-lance writer based in New York.

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	Pertmaster	IBM PC; micros under MS-DOS or CP/M	\$695 to \$895	
Alpha Software (617) 229-2924	The Executive Package	IBM PC, Compaq	\$145	471
American Computer Grp. (617) 437-1100	Quickplan	IBM PC and PC XT	\$7,727	472

SOURCES OF SUPPLY

MICRO-BASED PROJECT-MANAGEMENT PACKAGES

Vendor	Package	Equipment	Price	Circle
A+ Software (315) 685-6918	Gantt-it	IBM PC, PC XT, and compatibles running A+'s Under-control	\$195	473
Apple Computer (Contact local dealer)	Lisa Integrated Package	Apple Lisa	\$8,190/software & hardware \$1,195/software only	474
Arthur Andersen (312) 580-0069	Estimate/1	IBM PC	\$1,000	475
	Track/1	IBM PC	\$1,000	
Cara (312) 968-8100	Epsilon	IBM PC	\$3,500	476
Coade (713) 973-9060	Clip1	IBM PC and most MS-DOS-based micros	\$295	477
Collins & Assoc. (415) 571-6991	Cpert	HP Series 86 and 87	\$175	478
Computerline (617) 773-0001	Plan Trac	Micros under TRS-DOS, CP/M, or MS-DOS; IBM PC	\$3,000/1st- year license \$1,000/2nd- year license	479
Computer Software Assoc. (617) 965-9870	Practicalc 64	Commodore 64	\$50/ cassette \$55/disk	480
Convergent Technologies (408) 980-9222	Time/Project Mgt. Taskware	Convergent Technologies' Workslate	\$50/cassette	481
D&M Software Publishers (206) 537-8155	Questair	Radio Shack TRS-80 Models I, III, and 4	\$50	482
Datamension (312) 564-5060	Project Mgr.	IBM PC; Victor 9000	\$499	483
Earth Data (804) 231-0300	Micro Gantt XT	IBM PC	\$395	484
Lloyd Harvey (213) 881-7387	Pams	IBM PC	\$3,500/one license	485
Mgt. and Computer Svcs. (215) 648-0730	Projectmacs	IBM PC	\$15,000/5 copies	486
	Estimacs	IBM PC and PC XT	\$10,000	
Metier Mgt. Syst. (713) 988-9100	Artemis	IBM PC	\$300 to \$5,000	487
Microsoft (206) 828-8080	Microsoft Project Manager	IBM PC	\$250	488
Morgan Computing (214) 739-5895	Pathfinder	IBM PC	\$80	489
North America MICA (619) 481-6998	PMS-II	Many micros	\$1,295	490
Primavera Syst. (215) 667-8600	Primavera Project Planner	IBM PC XT and MS-DOS- based micros	\$2,500	491
Quala (805) 255-2922	Task Manager	IBM PC and compatibles	\$395	492

MICRO-BASED PROJECT-MANAGEMENT PACKAGES

Vendor	Package	Equipment	Price	Circle
Scitor (408) 730-0400	Project Scheduler	IBM PC, PC XT, and PC-DOS compatibles; TI PC; Grid Compass; DEC Rainbow; Wang PC; NCR Decisionmate; Toshiba T-300; and micros under MS-DOS	\$285	493
Sheppard Software (916) 222-1553	Micro Pert O	IBM PC, PC XT, Compaq	\$350	494
Simple Software (714) 857-9179	Project Master	IBM PC and compatibles; TI PC; DEC Rainbow; HP 150; Zenith Z-100; NCR Decisionmate; and MS-DOS-based micros	\$289	495
Softpoint (412) 279-4130	PMS I	IBM PC	\$295	496
Strobe (415) 969-5130	Enhanced Business Graphics	IBM PC; Victor 9000; Osborne I; micros by Kaypro, Xerox, and Apple	\$195	497
Trac Line Computer (516) 935-7500	Pert	IBM PC and micros by IBC, Compupro, Onyx, Altos, and Dynabyte under Oasis	\$1,100	498
Westminster Software (415) 854-1400	Pertmaster	Micros under MS-DOS, MP/M, or CP/M; IBM PC	\$695	499

MICRO-BASED TREASURY MANAGEMENT SYSTEMS

Vendor	Package	Equipment	Price	Circle
ADP Network Svcs. (313) 995-6400	Cashexpress Workstation	IBM PC and PC XT	\$2,500 to \$8,000	445
Bank of America (415) 622-3456	Microstar Corporate Cash Manager	IBM PC and PC XT Same systems	\$300 to \$10,000 \$4,000	446
Chemical Bank (212) 701-6935	Bank Link II CCMgr.	IBM PC and PC XT	\$4,000	447
	Bank Link II ICM	IBM PC XT	\$1,000 to \$8,000/module	
Chilton (214) 699-6111	Ultratech	Mohawk Data Sciences' Super 21	Custom price	448
Cincom Syst. (513) 662-2300	AR	IBM mainframes and PCMs	\$65,000	449
Citibank (212) 559-1000	Citi Integrator	IBM PC and PC XT	\$15,000	450
Cullinet Software (617) 329-7700	Cullinet Financial System	IBM 4300 and up	\$65,000 to \$100,000/module	451

SOURCES OF SUPPLY

MICRO-BASED TREASURY MANAGEMENT SYSTEMS

Vendor	Package	Equipment	Price	Circle
GE Software Int'l. (617) 285-1400	Financial and Personnel	IBM, Sperry, DEC, Hewlett-Packard, Data General, Wang systems	\$75,000 to \$200,000/ mainframe lease \$35,000 to \$45,000/ mini lease	452
Hewlett-Packard (415) 857-1501	HP Financial Accounting	HP 3000	\$4,000 to \$6,000/ module \$10,000 total	453
McCormack & Dodge (617) 651-1010	Millennium	IBM 4300 and 30XX	\$61,000 to \$105,000/module	455
MSA (404) 239-2000	14 systems	IBM under DOS or OS; Honeywell 66; Sperry 1100	\$50,000 to \$129,000/mainframe lease \$30,000 and up/mini lease	454
Payment Svcs. Grp. (203) 646-0731	Continuous Info. Exchange	IBM 4300, 370, and 3000	\$50,000/module \$90,000 total	507
Security Pacific Nat'l. Bank (213) 613-6211	Spacifacs Plus	IBM PC and PC XT	\$6,000 \$100/monthly maintenance	508
Stockholder Syst. (404) 441-3387	Paperless Entry Processing Corporate Automated Payments Syst.	IBM 4300 and up Same systems	\$20,000 to \$80,000 \$45,000	509
UCCEL (214) 353-7100	Paperless Item Processing System	IBM 370, 30XX, and 43XX	\$15,000 to \$42,000	510
Walker Interactive (415) 495-8811	Integrative Interactive Syst. Financial	IBM mainframes and PCMs	Custom prices	511
Xerox Computer Svcs. (213) 306-4000	Business Mgt. Syst.	IBM 4300, 370, and 3000; DEC VAX under VMS	\$250,000 to \$500,000 \$1,200 month/ timesharing	512

SELECTED DISTRIBUTION PRODUCTS

Vendor	Product	Price	Circle
Analysis Research & Computation (512) 459-1941	Locate/Allocate	\$8,700/one year \$21,000/25 years	437
Geographical Syst. (617) 470-3760	Geomap	\$40,000 to \$80,000	438
IBM (Contact local sales office)	3683 POS terminal Model 1 3684 POS-terminal controller ADCS software	\$6,000 to \$8,000 \$9,000 to \$12,000 \$266/month	439
Norand (319) 366-7611	Alpha-1 hand-held terminal Alpha-121 Alpha-101XL	\$1,460 \$2,400 \$1,200	440

SELECTED DISTRIBUTION PRODUCTS

Vendor	Product	Price	Circle
PBL Assoc. (415) 234-4338	Inventory Mgt. Sales/Order Mgt. Purchasing/Receiving Mgt.	\$25,000/Level 1 \$50,000/Level 2	441
Rand McNally-TDM (312) 673-9100	Ratemaker	\$50,000 to \$200,000/ purchase \$2,500/month	442
Superex Business Software (914) 964-5200	Superex Wholesaler	\$800	443
Verbex (617) 275-5160	Model 3000 voice/ data-entry terminal	\$24,000	444

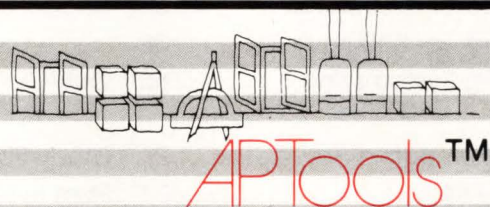
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Cambridge Syst. Grp. (408) 249-1086 Circle 500	Compuware (313) 540-0400 Circle 501	Signal Tech. (805) 683-3771 Circle 502	Software of America (703) 471-1545 Circle 503	UCCEL (214) 353-7100 Circle 505
			Star (203) 529-7128 Circle 504	VM Syst. Grp. (703) 243-5514 Circle 506

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