SPECIAL REPORT

DATAMATION 81®

AUGUST 25/U.S.A.

SOFTWARE & SERVICES

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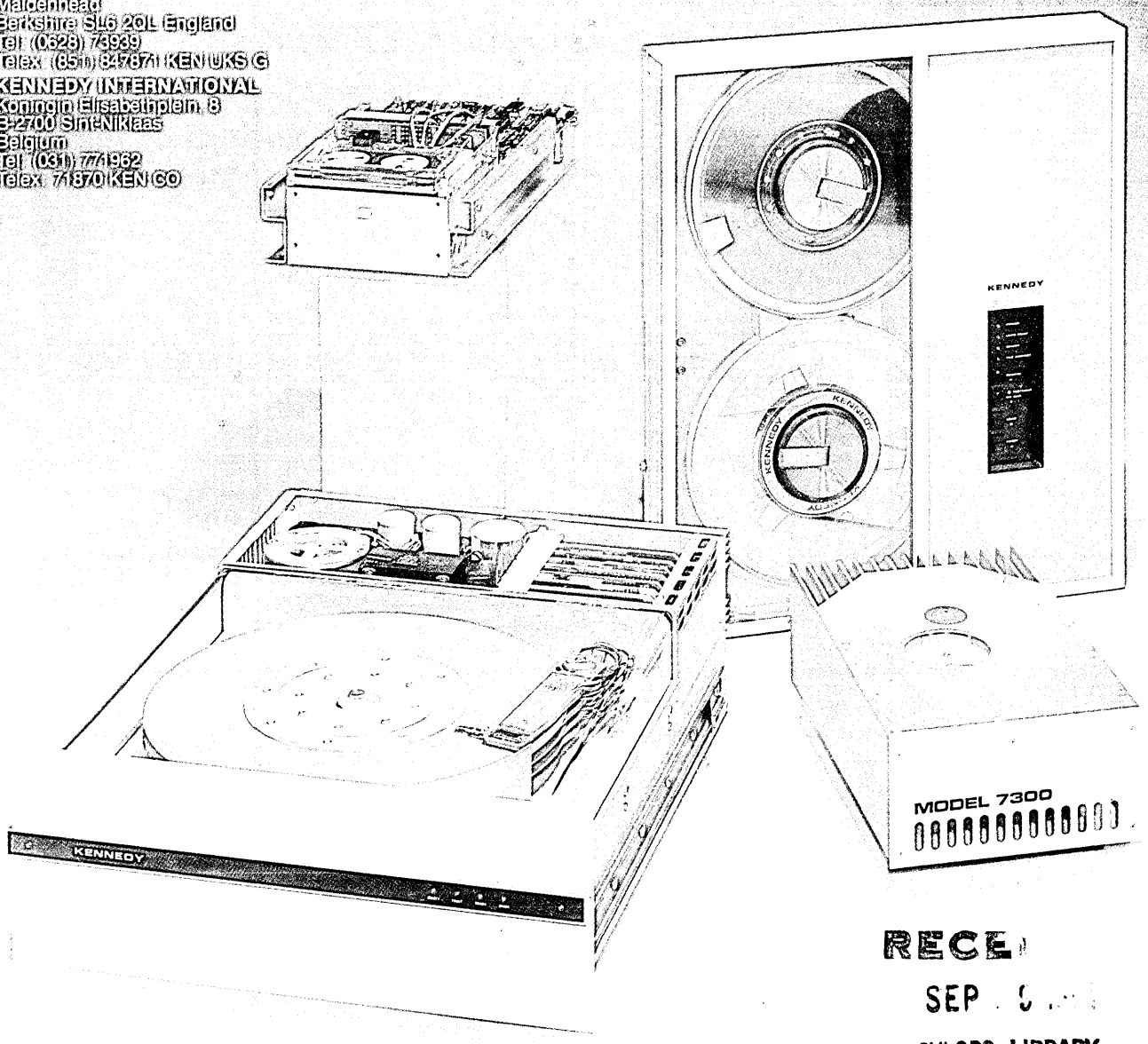

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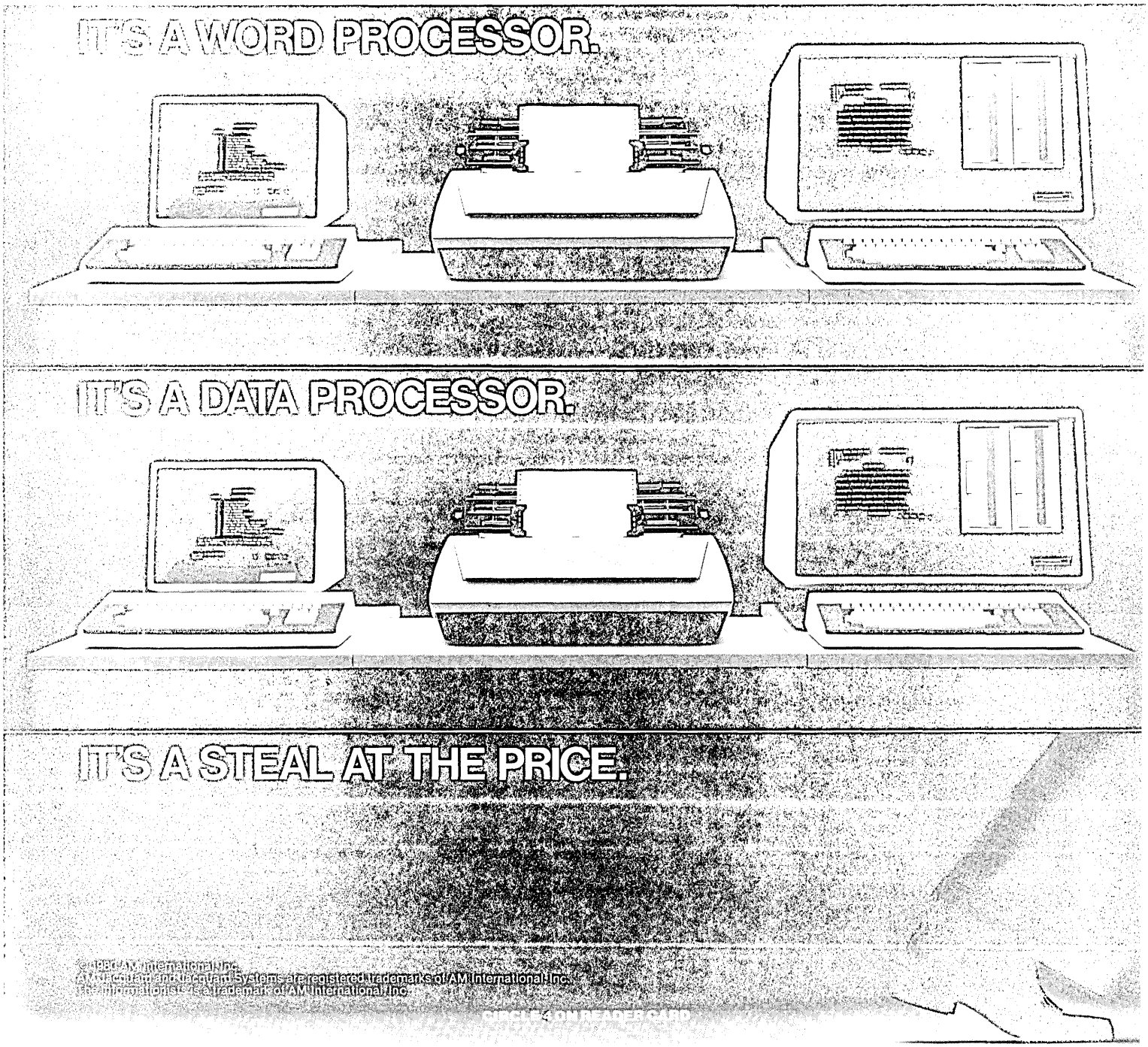

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DATAMATION 81

AUGUST 25, 1981/$4.00 U.S.A.
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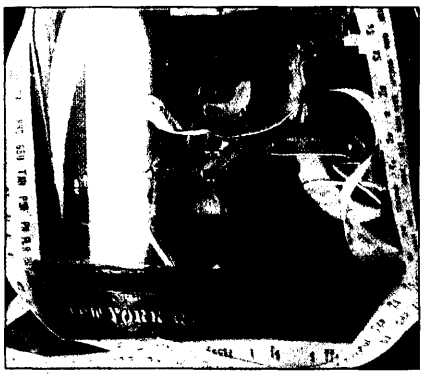

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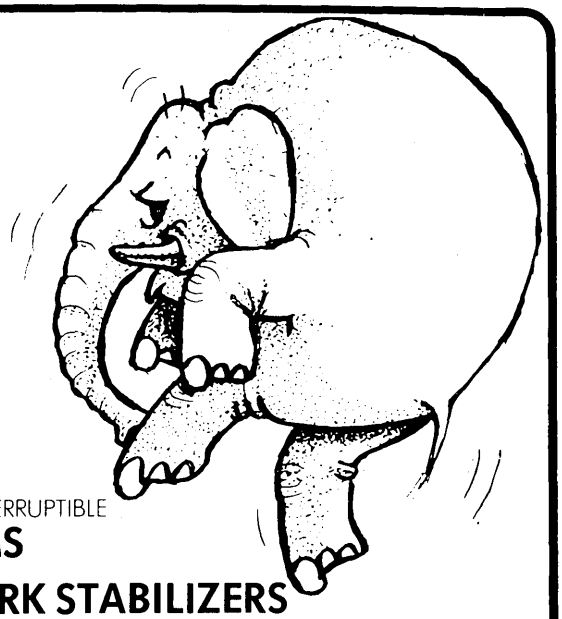

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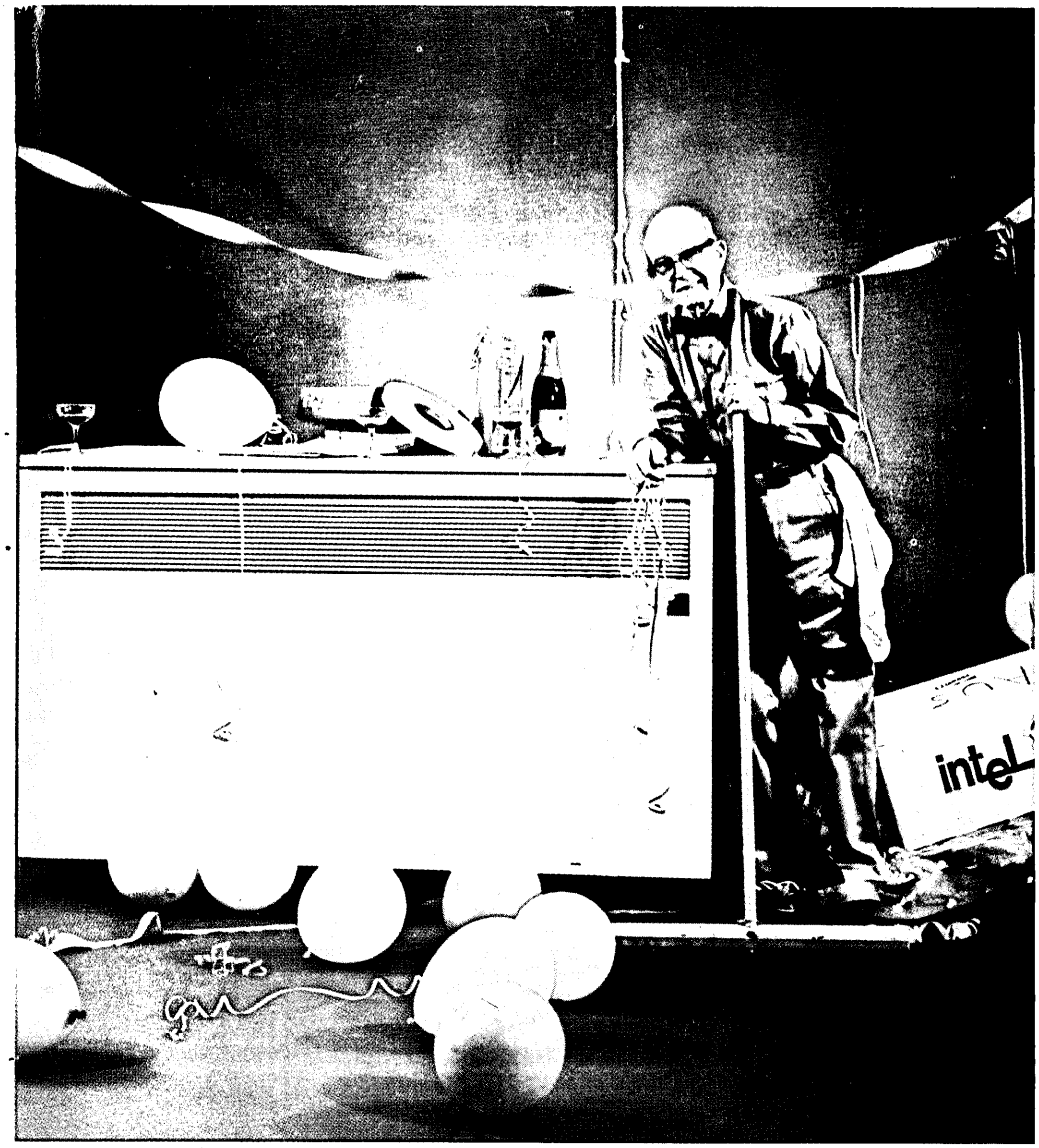

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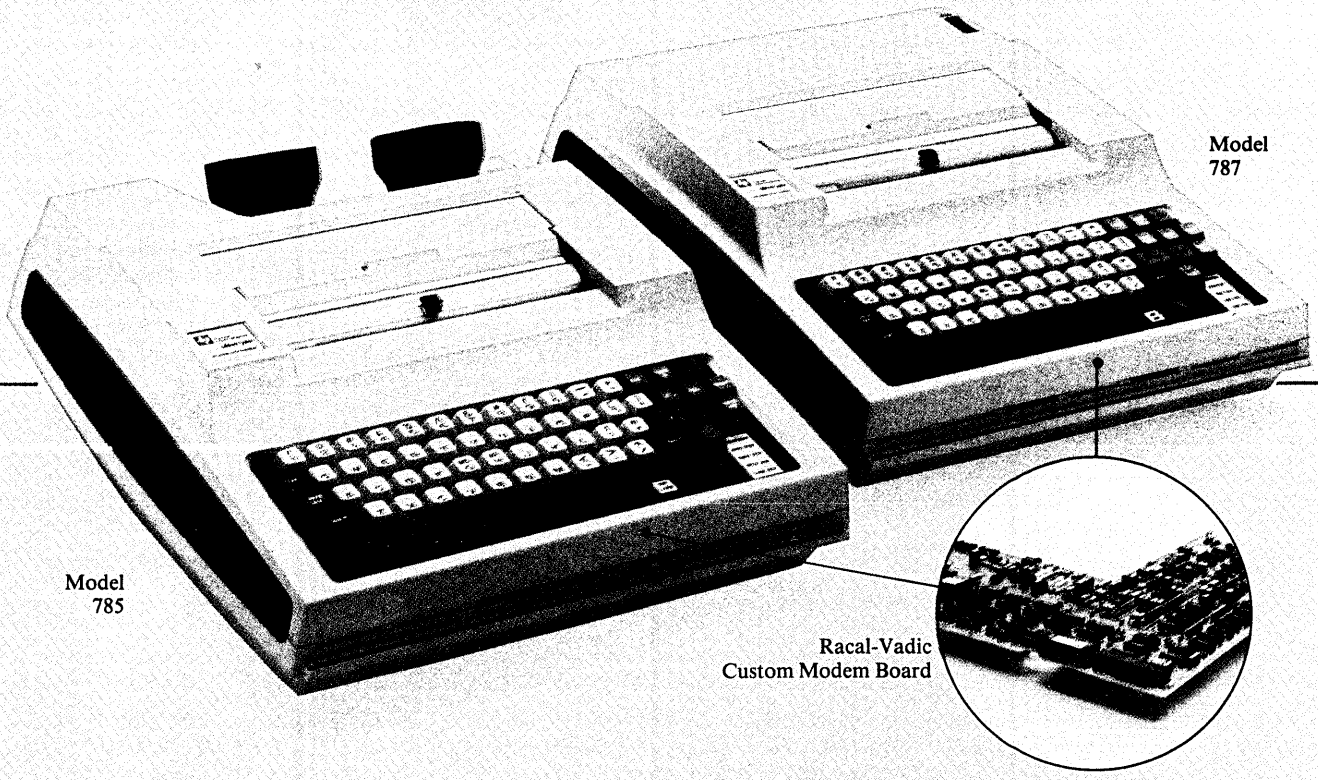

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CIRCLE 9 ON READER CARD

MAGIC MOMENTS IN SOFTWARE

From Lovelace to VisiCalc, here are some of software's brightest stars and their magic moments.

by Deborah Sojka and Philip H. Dorn

In the beginning there was only one programmer, Augusta Ada Byron, later Countess of Lovelace. Born in 1815, a frail, slim beauty with a mathematical mind quite unlike that of her father, the great English poet, Lord Byron, she left us an inheritance that only now is beginning to be appreciated.

In a brief lifespan (she was dead of cancer at 36), Lady Lovelace managed to document the remarkable invention of Charles Babbage—the differential engine. In passing, she wrote a program for computing Bernoulli numbers that had to wait over 100 years for final debugging. This is somewhat longer than the time required by most of today's programmers.

Over 90 years later, a young mathematician was assigned by the U.S. Navy to work for Howard Aiken at Harvard. When Lt. (J.G.) Grace M. Hopper began her work in computing, the modern history of software began.

In less than 40 years, the industry has moved from employing a single programmer to employing hundreds of thousands, the number of lines of code in existence has reached well into the multiple billions, and the investment in software has become nearly incalculable.

During the same period, there have been hundreds of languages invented, scores of operating systems created, programs built to do everything from running a microwave oven to calculating the orbit for the space shuttle, and more than a few personal fortunes made.

Through it all, however, a few events stand out like beacons on a dark night, events that were so important they changed the course of the industry. Curiously enough, many of the happenings were known to be important at the time or within a few short months. Unlike other technologies, programming is a world where major changes receive nearly immediate acceptance by the community at large.

For a business that is so new, it is curious to note how many exact dates have already been forgotten. People know that something happened in 1956, but with rare exceptions nobody knows the precise date. Perhaps the reason for this can be found in an old programming truth: "It is 90% checked out." There really is no exact date, just the week or month when the program began to run reasonably well, the number of fixes installed overtook the number of errors detected, and the users stopped grumbling about the lack of reliability.

Captain Grace M. Hopper

The events listed were chosen solely by the authors and consequently reflect their biases. It would be completely possible for other authors to establish sharply different lists. For convenience, the dates are separated by decades, although in reality events simply flow across time, and the division into groups is done to make the reading easier rather than to suggest a sharp demarcation.

THE '40S AND '50S: THE DAWN

1946—Konrad Zuse, unable to build hardware, thinks about the programming problem and creates Plankalkul, a language that embeds some unusual constructs including the idea of variables representing very large and very small numbers. It may have been the first algorithmic language.

1949—Francis (Betty) Holberton comes up with the idea that a program can generate another program, which she uses to generate sort/merge routines.

1949—F. Fortesque Fingerhut, while trying to debug his first program on the ACE computer at the National Physical Laboratory, cannot find the problem. He cracks under the strain, disappears, and is not seen until 1981 when he reemerges as the net court judge at Wimbledon.

ILLUSTRATIONS BY SCOTT REYNOLDS

PERSPECTIVE

1951—Dr. Alec Glennie gets his Autocode compiler for the Ferranti Mark I to operate, one of the first compilers to receive any sort of general usage.

Dr. Grace Hopper finds the original "bug," a moth, and carefully pastes it into the Univac I logbook. The term sticks and another Grace Hopper invention goes into the record books.

1951—Wilkes, Wheeler, and Gill come up with the idea of subroutines at about the same time that Grace Hopper independently makes the same discovery. That same year, Wilkes comes up with the idea of using what today would be called microcomputer controls or microprocessing to build a machine. The idea sits idle for many years until IBM, in developing the System/360, needs a way to make machines built in different parts of the world by different designers look the same to the user programmer.

1952—Grace Hopper's A-0 compiler goes live.

On election night, November 4, 1952, the Univac I goes out on a limb at 8:30 p.m. With only 7% of the votes counted, it predicts an Eisenhower landslide. Horrified, CBS and Univac officials turn chicken, and reduce the computer's estimate from odds of 100:1 to 8:7. A triumph for sound statistical analysis and good programming is taken away from the developers.

1954—John Backus has an idea that an algorithmic language might be useful on the IBM 704. His boss, Cuthburt Hurd, agrees.

John Backus

1955—On August 9, the late Fletcher Jones, later a founder of CSC, writes a letter describing a meeting of potential Los Angeles area 704 users, suggesting that since IBM does not appear to know much about the software, perhaps the buyers should get together and help each other. SHARE is born later that month at a meeting in the basement of the RAND Corp. With the organization comes the idea of standard operating systems, compilers, assemblers, plug boards, and utility subroutines.

1956—IBM having accepted the idea of SHARE, sets out to create GUIDE, a similar organization for commercial users, and thereby forces a split that exists even today.

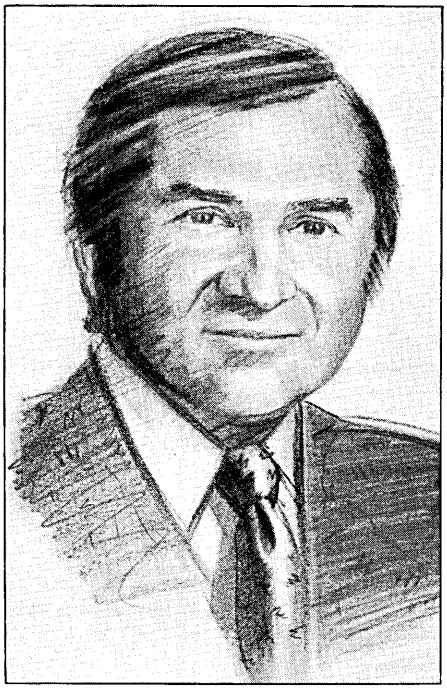
1957—On April 20, a Friday afternoon, the first live, user-written, meaningful FORTRAN program is run at Westinghouse-Bettis Laboratory. Herb Bright, Ollie Swift, and Lew Ondis watch carefully as the compiler, on the first try, kills the run for a missing right parenthesis. This raised a question still unanswered: "If the compiler knew what was wrong, why didn't it fix the problem?" Late in the afternoon, the program runs, and the FORTRAN era begins.

1958—SAGE, an air defense system, goes operational at its first live sites. The software includes such goodies as interactive graphic display support, programmatic recovery from dropped or picked bits, data communications, and an environment simulator. Environment simulation permits a programmer to test only a single module within the context of a large system. (Early SAGE programmers are still waiting for this special concept to reappear in the commercial world.) SDC is short of programmers to maintain the system and begins to train its own, a process that eventually will produce 20 new programmers every two weeks for over seven years.

A group of academics, dissatisfied with some of the arbitrary, machine-oriented restrictions in FORTRAN, decide that a new language is necessary. In a series of meetings, they create the International Algebraic Language, later known as ALGOL, which is tightly designed, block structured, powerful for mathematical manipulation, and omits input/output.

1959—The Department of Defense decides that FORTRAN will not be acceptable for its commercial work and that IBM's Commercial Translator cannot be implemented on multiple machines because it will give IBM too much of an edge. A set of committees go to work to create another language, with Grace Hopper carefully guiding the effort from backstage.

On February 25 at MIT, APT, an acronym for Automatically Programmed Tools, is first demonstrated. The APT language will become the recognized international standard for progamming numerically controlled machine tools. Doug Ross carefully sets up the demonstration to do something useful; he mills ashtrays for the assembled onlookers.



Howard Bromberg

THE '60S: SOFTWARE EXPLODES

1960—In a Paris meeting in January, ALGOL is firmly defined, and a terse, tightly integrated report is issued that to this day serves as a model for a language definition document. But aside from use by European academics, ALGOL remains little used.

In February, MAD, the Michigan Algorithmic Decoder, goes live. Based on ALGOL 58, it is the product of a three-man team—Bruce Arden, Bob Graham, and Bernie Galler. MAD includes a special construct permitting the programmer to define new source statements with a minimum of fuss.

Later the same year, JOVIAL, Jules' (Schwartz) Own Version of the International Algebraic Language, goes live at SDC. For the hundreds of programmers working on military command and control applications, it is the first intimation that assembly languages will eventually disappear even from their world.

On December 6 and 7, the same COBOL program runs on a Univac II and an RCA 501 producing the same results from a single program. Charlie Phillips, Howard Bromberg, and Grace Hopper are delighted. All the hardware manufacturers promptly set out to extend in unilateral ways their versions of

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D101

Kenneth E. Iverson

COBOL so that this demonstration can never again take place. Software lock-in begins.

A small team at Burroughs (nee Electrodata Corp.), led by Bob Barton, begins to see daylight with their ALGOL-based hardware, which will eventually become the B-5500. Barton has been promoting the strange idea that one ought to design a machine to fit the software. They will structure the stack-oriented instruction set to simplify the compilation and execution tasks. Few believed him at that time, and, with some notable exceptions, few believe him now.

1961—Maurice Halstead, working at the University of California in Berkeley, releases Neliac, another ALGOL-based compiler. Neliac has the interesting property of being written in Neliac. It is generally regarded as the first production compiler written in its own language.

1962—John McCarthy releases LISP, the result of six years of effort, as a language for dealing with artificial intelligence and symbol manipulation problems. Among other important breakthroughs is the concept of garbage collection, a process of regaining unused storage. Today, with the advances in giant-sized systems, garbage collection is probably no longer necessary.

1963—On November 18, General Motors Research Laboratories sees a culmination of six years of effort with the production of the first automobile part designed at an on-line terminal. The system, DAC-I, includes home-grown database management, user languages, coordination of multiple processors, pointer-based virtual storage for data, and the ability to produce hardcopy from the graphic terminal in a few seconds. Since GM is more interested in making money than in receiving academic credit, nobody is told of the work. And the buyers of 1965 Cadillacs never know the history of their trunk lids.

General Electric release IDS, Integrated Data Store, the first commercially available database management system, for users of the GE 225. Since their numbers are small, it takes a long time before the world hears about IDS. Many new IDS versions are released before people realize what Charlie Bachman has done. A direct forerunner of the present DBMS systems, IDS was originally developed for only a single customer. Hardly anybody realized the widespread applicability.

1964—At Dartmouth College, John Kemeny and Tom Kurtz release BASIC, a language destined to spread far beyond the green hills of Hanover. All they wanted to do was to make it easy for users who were not computer science majors to have access to the computer. Few at the time are impressed. Almost nobody believes that BASIC really has an ALGOL underpinning. In its earliest versions, the entire language definition and user manual could be printed on a 3″ × 5″ card.

In April IBM announces System/360, which turns out to be a full employment act for programmers. Later, T.J. Watson will admit that IBM spent over $50 million per year and 5,000 man-years of effort getting OS/360 to run.

In December, IBM releases a document describing NPL. As there is considerable noise from the National Physical Laboratory, its name is changed to PL/1. This language was one of the last major design efforts in which the users had the upper hand. IBM took control of the language and shoved the SHARE-sponsored 3 × 3 development committee into the background. Bruce Rosenblatt, of SOCAL, Hans Burg of Lockheed, and Jim Cox of Union Carbide had spent a year of their lives on the project. They are less than overwhelmed by IBM's so-called "improvements."

1965—Larry Breed and Adin Falkoff begin to implement Ken Iverson's APL. Developed originally with Fred Brooks as far back as 1956, APL was created as a tool for describing and defining various machine functions. The implementation will take four years, but the end product—a sparse, powerful, rigidly defined language with more power for less effort than any other language to date—will be worth the effort.

Dutch professor Edsger W. Dijkstra begins to attack the deadlock process in which two programs competing for the same resource will both stop dead. The work leads to a number of later solutions, tasking and semaphore systems being the more commonplace solutions, but the understanding of the problem doesn't really exist until Dijkstra publishes his papers. He will later produce T.H.E., an operating system that deals excellently with the competition for resources.

1966—Some 2,000 attendees at a SHARE meeting walk around sporting mysterious buttons reading "Q10." IBM's president Watson asks its meaning and his own people won't tell him. The users cheerfully admit that it refers to the 10th question in an IBM Western Region sales promotion piece: "Why OS/360?" Within four hours, all the cards in the promotion kit disappear except for one set, which today resides in the SHARE archives.

1968—The first of two NATO-sponsored software conferences is held on October 7-11 in Garmisch, Germany. Attended by most of the world's software heavyweights including Dijkstra, Perlis, Galler, Paul, Naur, Barton, Gill, Gries, Graham, Kinslow, Bemer, Kolence, McClure, McIlroy, Opler, and Ross, the conference probes software from every direction, including such nonacademic subjects as pricing. Unfortunately, the proceedings are not made available in hardback form until 1976. The text, however, is still excellent reading and a fair reflection of the best of current thinking.

Professor Edsger Dijkstra writes a let-

Edsger W. Dijkstra

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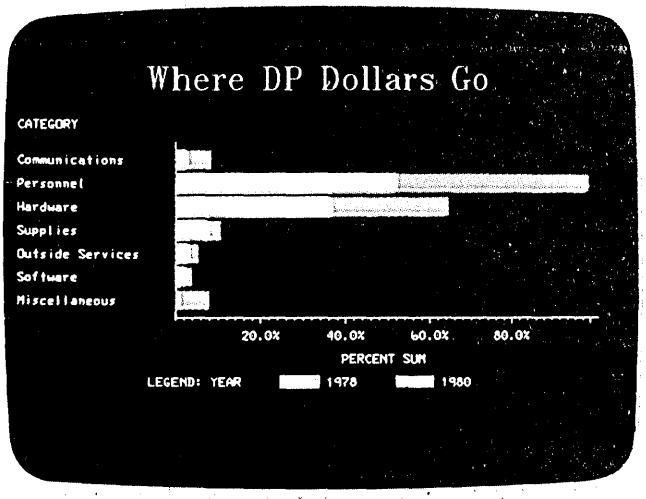

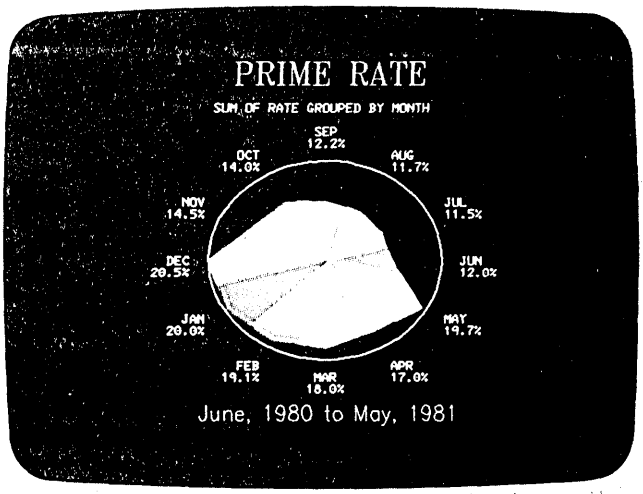

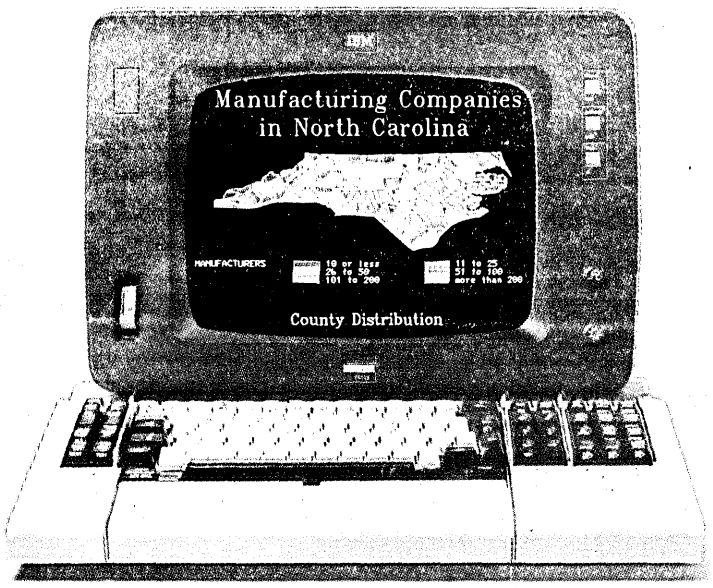

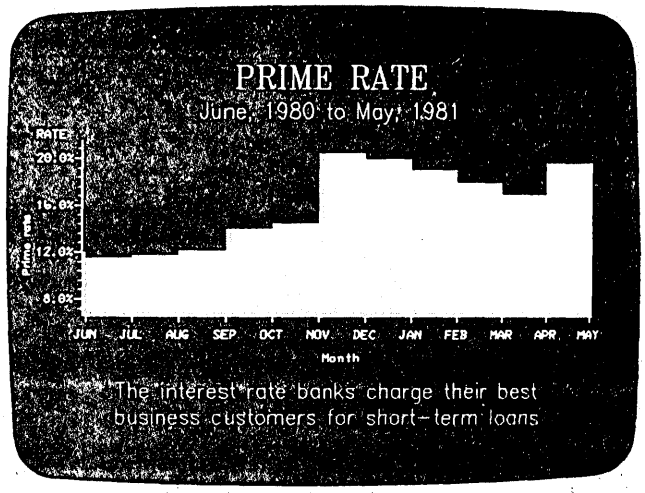

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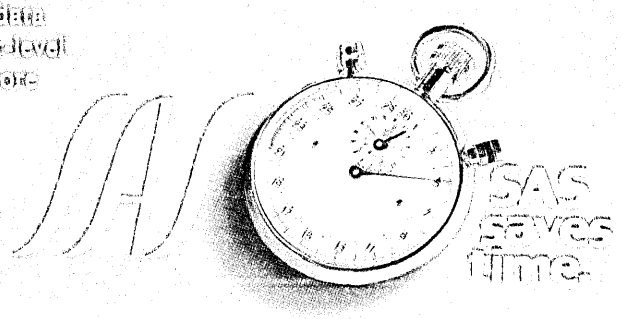

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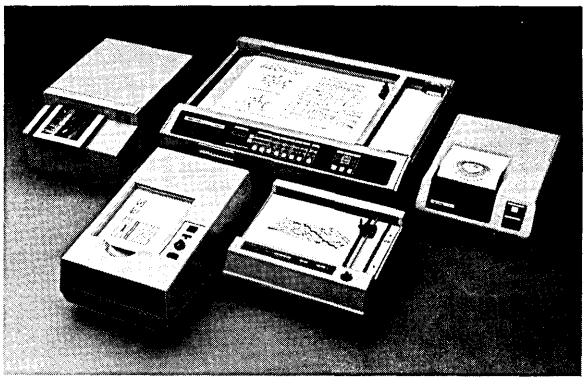

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ter to *Communications of the ACM* in which he casually observes that "the quality of programmers is a decreasing function of the density of GOTO statements in the programs they produce. More recently I discovered why the use of the GOTO statement has such disastrous effects, and I became convinced that the GOTO statement should be abolished from all 'higher-level' programming languages (i.e., everything except, perhaps, plain machine code)." In one stroke, Dijkstra starts the entire movement to structured programming.

1969—On June 23, IBM announces that henceforth, software will be unbundled and you will have to pay for it. While the policy has little immediate impact on user budgets, a decade later software rental costs begin to appear as significant line items. A $3 billion business is born on this date. Unfortunately for the many independents who rush in, IBM still remains the largest software house.

Later the same year, MULTICS, the MIT-developed timesharing system built on General Electric hardware, goes operational. Replacing its limited predecessor, the Compatible Time Sharing System (CTSS) on the IBM 7094, MULTICS trains a generation of MIT students. What makes the system unique are the unilevel file structure and the language in which it is written, PL/1.

SHARE and GUIDE vote not to merge, thereby continuing their almost meaningless separation. The COBOL and FORTRAN adherents toss rocks at each other across the slightly moldy Atlantic City territory, where the meeting is held in October.

THE '70S: SOFTWARE RULES

1970—American National Standard COBOL is released to the user community, which really doesn't care. Each installation continues to use its vendor's versions. Few can see any advantage in a national standard that isn't completely and carefully observed. The same flap will occur again in 1981 when a new ANS draft of a standard is released.

1971—The first edition of Gerry Weinberg's *The Psychology of Computer Programming* appears. Weinberg opts for structured programming, higher level languages, and programmer teams, all of which the average programmer dislikes immensely. Nevertheless, the book is so good at explaining programming problems that it is read for the next 10 years as *the* handbook for computer programming.

IBM announces it has invented virtual storage, which is going to free programmers from the burden of optimizing their use of memory and using overlays. To get this feature, most installations discover that they will be required to buy more memory. Later on, they find out that the idea was implemented in

Robert S. Barton

England on the ATLAS in 1958 and by Burroughs on the B-5500 in 1961.

1975—Fred Brooks, long ago a co-developer of APL and the manager of OS/360, issues *The Mythical Man-Month*. The book dissects the traditional programming philosophies based upon what J. L. Ogdin called the Mongolian hordes. Brooks points out that the more people you put on a lagging project, the further behind you fall, and that a small team can beat an army any time. It becomes the second book of compulsory reading for all programmers.

The Department of Defense starts to think about programming for its thousands of computers embedded within various weapons systems. DOD will go through numerous cutely named gyrations—Strawman, Ironman, Steelman, etc.—before it finally issues a contract for the design of a new language. The competition is won by Honeywell-Bull, based on a design produced by Jean Ichbiah. Since one person is in complete charge, the eventual result, ADA, is a coherent and integrated language rather than merely a set of interesting features having little relationship to each other.

1978—The Sigplan group within ACM sponsors a major conference on the history of programming languages held in Los Angeles, June 1-3. A set of apparently definitive papers on how various languages were created, what ideas were included, and what objectives were being sought were presented. By their own admission, some of the contributors had forgotten all the details. Ross, when talking about APT, noted that he had over 70 feet of shelf documentation to plow through.

1979—VisiCalc reaches popular consciousness and the microcomputer world explodes. Conceptually a simple enough idea, VisiCalc permits the businessman to set up budgets and do projections in a comparatively easy way without having to learn programming. As such, it helps sell machines in a way that no program ever has before. Originally designed to run on the Apple, VisiCalc has now spread to all sorts of other microcomputers. VisiCalc may well be the most important program to have appeared since FORTRAN because it sells otherwise unapproachable computers to people without any technical training.

THE '80S: PROMISES TO KEEP

1980—IBM releases System/38, the first computer system that includes a built-in relational database management system. The idea goes back to the work of Ted Codd over a decade earlier, but the first implementation in a full-scale system is being watched carefully. What most programmers can't figure is how to convert their multibillion record IMS files to a relational system.

1981—Intel announces the 432 microprocessor, a 32-bit system programmed in ADA.

Software AG announces that it will now deliver its DBMS in an independently manufactured hardware box that you can attach to your existing system.

In one short, frenzied spring period, several major software houses, including MSA, Pansophic, and Software AG, all go public.

*

Software is a business. Money is being made, and lost, producing and marketing programs. The variety of programs available for sale is staggering: operating systems; compilers; applications, both industry-specific and cross-industry; and utilities. Some are sold directly by salespeople using all the standard paraphernalia of hardware selling. Others are sold in retail stores, like razor blades, or over the telephone.

What was once a business for a single individual or a small team has become a planned project with all the overhead that corporate structure can attach. Interestingly, the two greatest success stories, FORTRAN and VisiCalc, reverse the trend. The 1954 to 1957 FORTRAN effort was done by a 13-person team, while VisiCalc was a two-person job. Perhaps this indicates that the really good software of the '80s will come from miniature companies with microcomputer target markets.

Where are the pioneers of yesterday, the names that dot the history of programming? Some are dead. Stanley Gill, Fletcher

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Jones, Howard Aiken, Maurice Halstead, John Mauchly, and Asher Opler have passed away. Many others, however, are right where they always have been—working and creating. Grace Hopper, well past a normal retirement age, is busy educating yet another generation of programmers. John Backus is still with IBM. Doug Ross is still trying to automate design efforts. Iverson, Falkoff, and Breed are still working with APL. Herb Bright is working on cryptographic software. John Kemeny has just retired as president of Dartmouth. Rosenblatt is still at SOCAL, Galler at the University of Michigan. Most of the others are still active too.

There is every reason to expect more software landmarks in the forthcoming decade. Now that software is a business with money to be made, it's likely that the developers will obtain a larger share of the profits. That's what software houses are all about.

The authors gratefully acknowledge the assistance of Howard Bromberg, Mort Bernstein, Phil Cramer, John Backus, Marty Goetz, Ken Iverson, Herb Bright, Larry Welke, John Imlay, and Bruce Rosenblatt in the preparation of this article.

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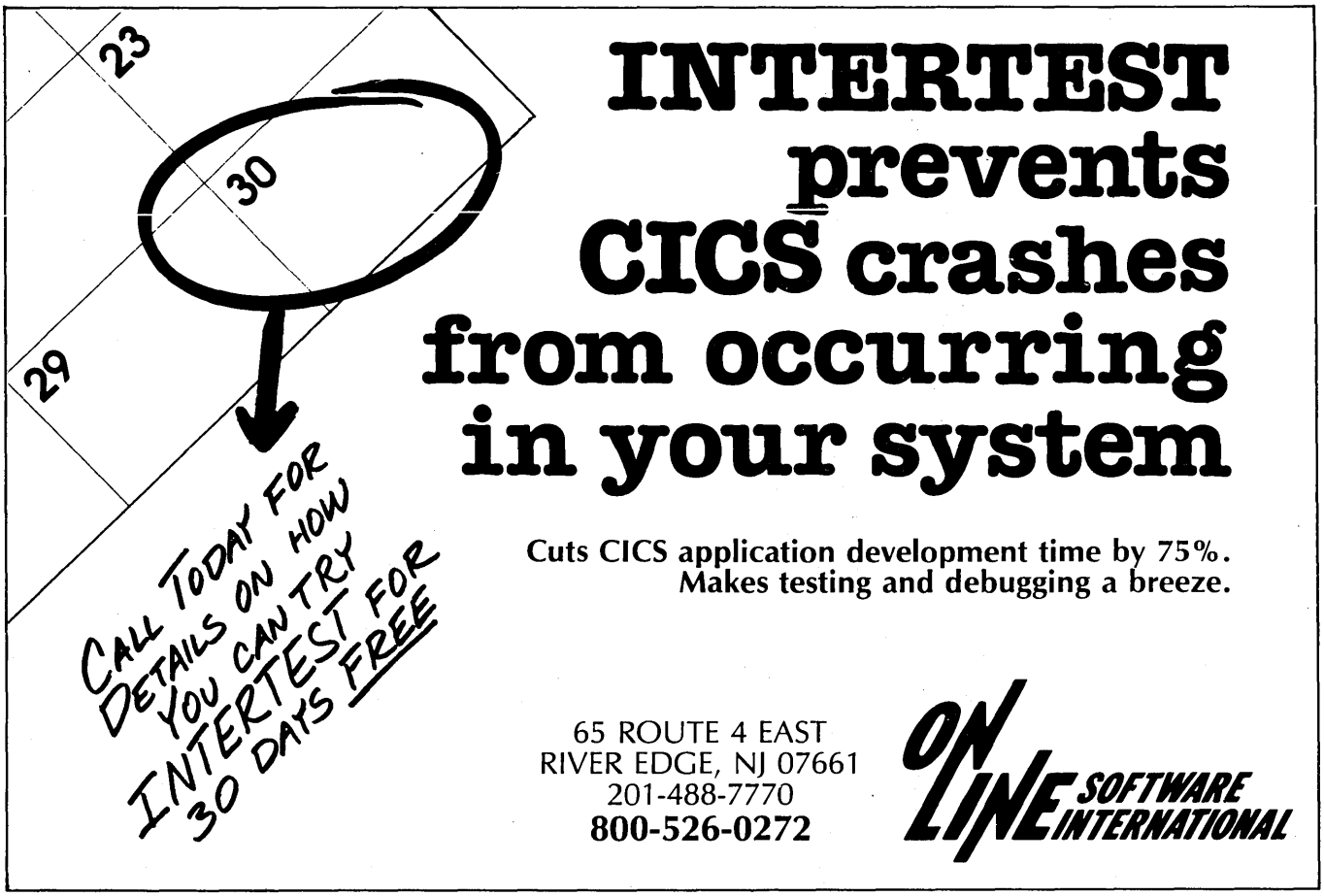
Bernard A. Galler, editor in chief, *The Annals of the History of Computing*, AFIPS Press, Washington, D.C. This quarterly publication, begun in July 1979, is dedicated to dp history. Highly recommended for anybody at all interested in how we got this way.

Erik Bruhn, editor and publisher, *DATA Magazine*, Copenhagen, Denmark. This magazine has recently begun a series of articles on important dp personalities of the early years. Included are stories about Grace Hopper (authored by Angie Pantages) and Konrad Zuse (authored by Andrew Lloyd.)

John L. Kirkley, editor, *DATAMATION*, New York, which regularly publishes articles dealing with the history of various phases of and developments in the computing activity. The authors include Nancy Stern and Molly Gleiser, and others from time to time.



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COMMENTARY

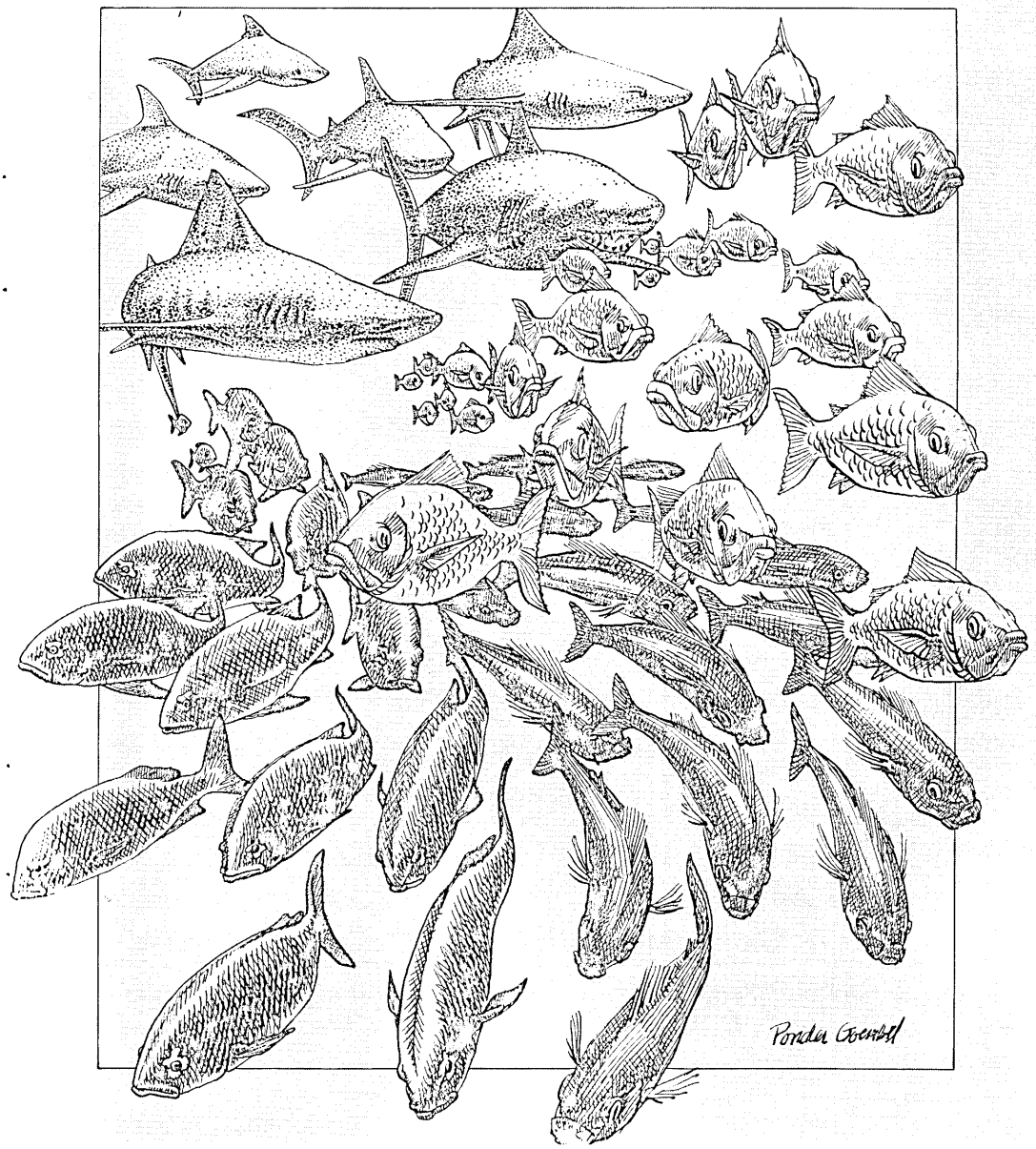
BOOM TIMES FOR SOFTWARE AND SERVICES

by John L. Kirkley

"Like sharks at a feeding frenzy" was the not so flattering image one observer used to describe the security analysts milling about at ADAPSO's annual meeting in New York.

"Times have changed," said another, as he watched the over 200 analysts converge on the various software and services company brass who were also at the meeting. "Used to be we could hold this shindig in a hotel suite."

It's obvious that Wall Street, just like the general press, has discovered that the software industry has entered its boom phase. As Al Berkeley comments in the lead article in this special issue, "The investment community has taken an extraordinary interest in computer services for several reasons. The industry is growing at about 20% per year and Input (a west coast research firm) estimates that some parts of



Users who are saddled with a system that fails to meet their expectations, and perhaps does damage to their business, are very likely to sue.

the industry are growing faster than 30%, while individual niches and some companies are showing growth faster than 50% per year. Fast growth is coupled with the potential of enormous size. The industry, earning just over $14 billion today, is clearly going to be one of the largest industries in the country by the end of the decade."

Berkeley, who also chaired the ADAPSO analysts' meeting, told the attendees that the industry is moving from the entrepreneurial to the professional management stage and is now reaching the international marketplace. U.S. software and services companies will do about $200 million in export business by the end of this year, a growth rate of 85% in foreign sales.

As the articles in this issue indicate, the opportunities are many and extraordinarily diverse. Of course, with opportunities come problems. For example, microcomputer technology has made inexpensive raw computing power available to myriads of first-time users and opened up a large market for microcomputer software. But unless the software and hardware vendors are willing to do a great deal of handholding, or the software is so "friendly" that the first-time user has no trouble understanding it, these initiates to the world of computing could get into a lot of trouble. And these days, users saddled with a system that fails to meet their expectations, and perhaps does damage to their business, are very likely to sue. But caveats aside, it's obvious that the industry is moving into high gear. Our candidates for the five hottest areas of software development are:

1. Computer-aided design and computer-aided manufacturing (including computer graphics).

2. Standard software products for mainframes. This segment of the industry is growing at 35% a year; its vigor is indicated by the number of firms going public: among them Pansophic, Management Science America, and Software AG.

3. Turnkey or industry specific systems. Companies like Triad, Reynolds, and HBO are making hay in specialized, vertical marketplaces.

4. Microcomputer software for business applications. Personal Software, Peachtree (recently acquired by MSA), and MicroSoft are examples here.

5. Microsoftware publishing. An interesting and as yet ill-defined opportunity where the programmer submits his program (or manuscript) to a publisher who provides the same kind of financial, editorial, and marketing services that a book publisher might. Instead of winding up in the front windows of B. Dalton or Barnes & Noble, the lucky author may find his offering housed in a blister pack and hanging from a rack in every department store and retail outlet that peddles computers.

Obviously there are other candidates for this list, but at this point in the computer software and services industry's existence, it doesn't make much difference. Almost every area is one of rapid growth. From all indications it looks like the next several years should be quite fascinating as this portion of the computer industry takes off like a rocket. No wonder a meeting like the ADAPSO session draws a crowd of financial analysts, jaws agape, salivating expectantly. ❋

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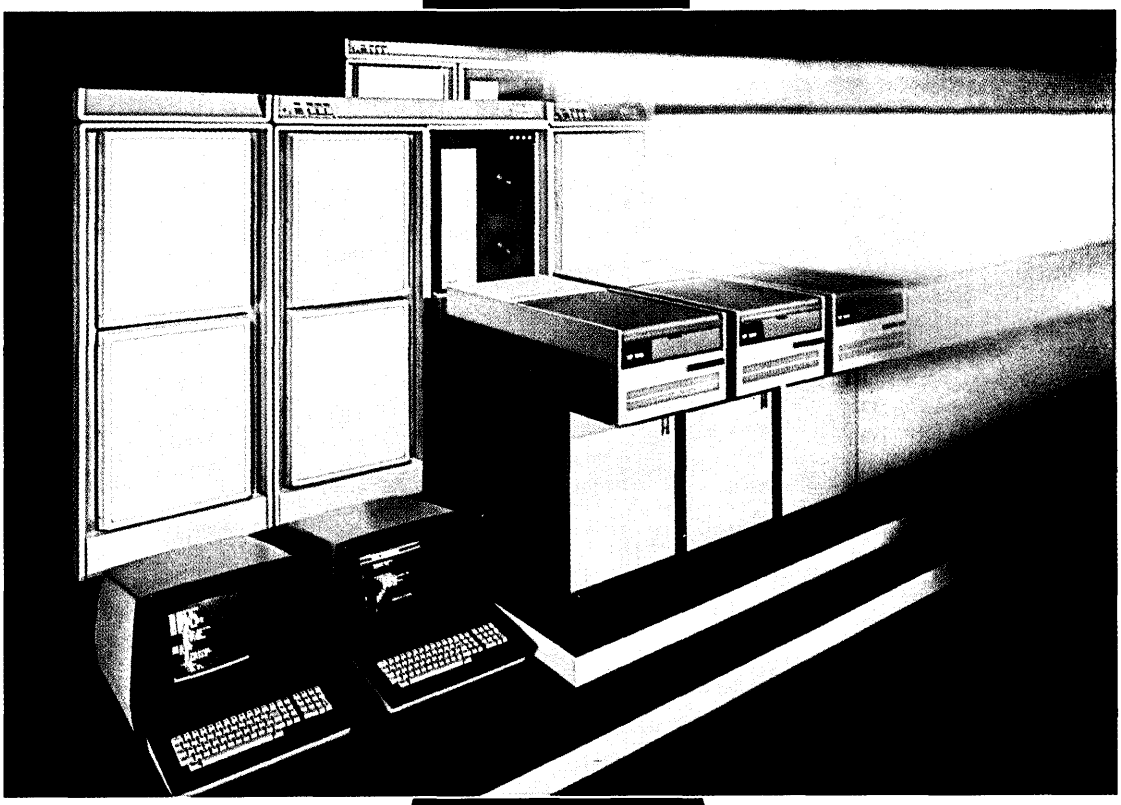


CIRCLE 15 ON READER CARD

MILLIONAIRE MACHINE ?

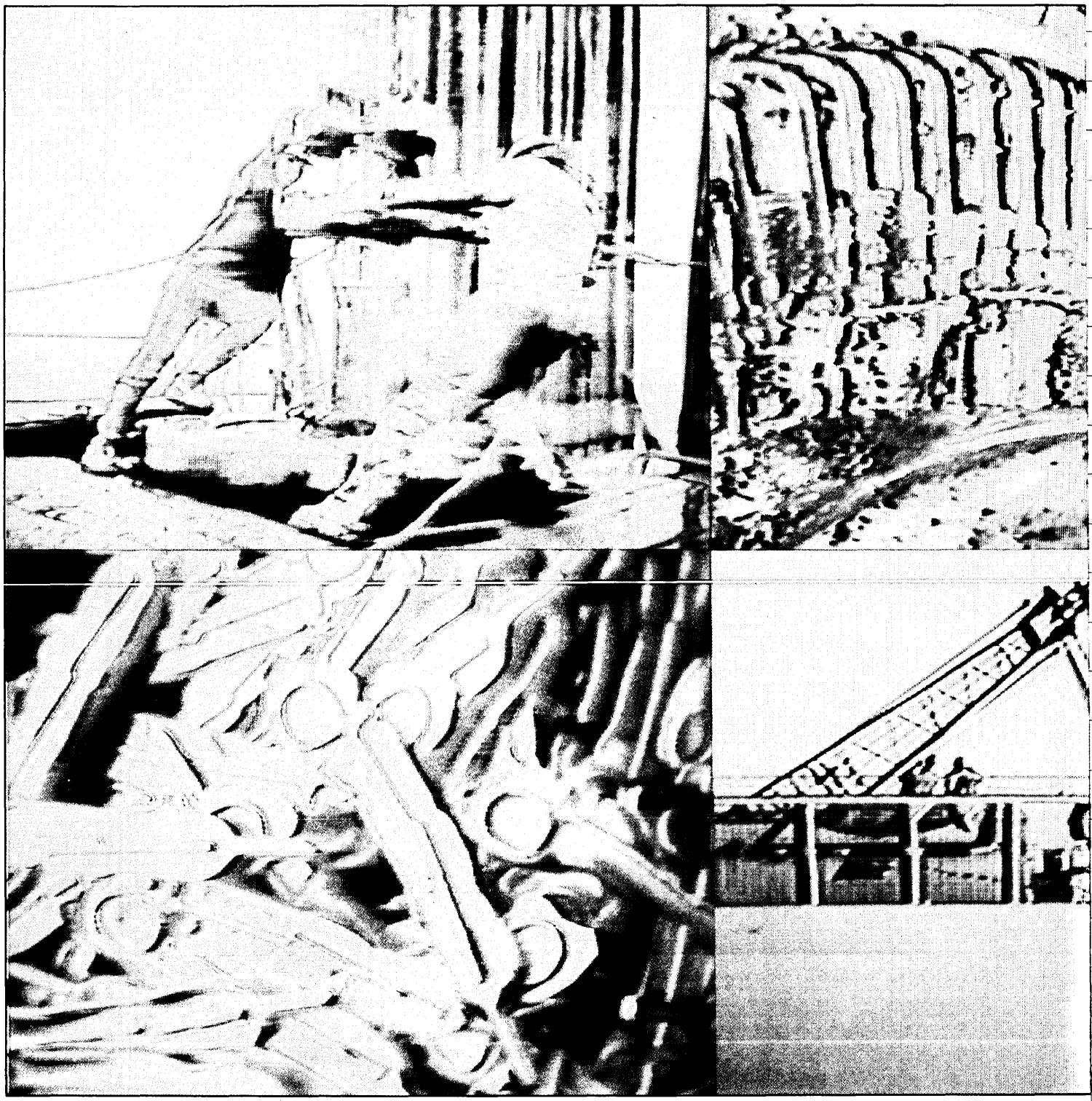
Like the industrial revolution, the information revolution is spawning new industries and creating fortunes.

by Alfred R. Berkeley

The computer services industry, once the crying stepchild of the matured hardware industry, is attracting attention and money. Big money.

Stock prices are up, the pace of mergers and acquisitions quickens, startup ventures abound, new products find quick success, prominent companies go public. Growth—of markets, revenues, and profits—is the word on everyone's lips.

Dp professionals, company managers, and investors are all enjoying the growth and change. And yet, some observers, par-



ticularly those with a financial stake, are not too sure about the industry's future.

They ask: can the astounding growth of software and services, which currently outpaces that of the overall computer industry, continue for long? Or will the business, and stock prices, crash the way they did so spectacularly in the early '70s?

To answer such questions and to make sense of what some seem to think are contradicting signals, a method of analyzing the services market's current state and future potential is needed. In lieu of a crystal ball, the traditional life cycle concept may be applied effectively. Just as humans and other living organisms go through specific periods of birth, growth, maturity, and decline, industries may show similar tendencies.

The industrial revolution created enormous fortunes as capital and labor moved from agriculture to manufacturing. The movement's by-product was a significantly improved standard of living. Similarly, the shift of capital and labor now occurring, from established industries into information industries, is again creating significant fortunes and benefiting the standard of living.

Like the industrial revolution, the information revolution is spawning a whole list of small industries, each composed of many companies. Computer services, a term Wall Street uses to embrace a wide variety of companies whose principal value lies in their computer software, is just one of many busi-

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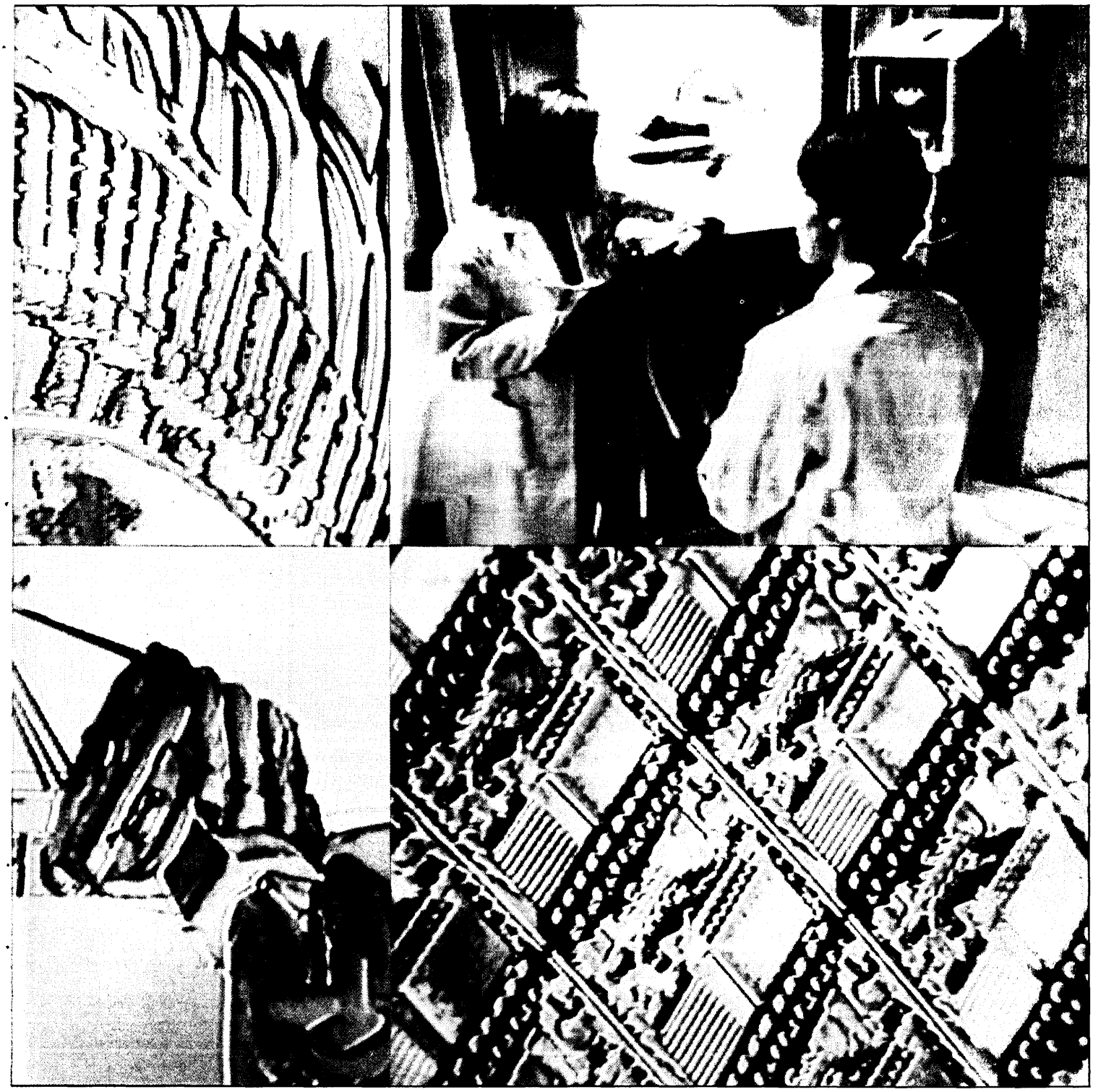


nesses in the information industry. Others include computers, telecommunications, peripherals, and semiconductors. The computer services industry itself may be segmented into timesharing, facilities management, turnkey systems, packaged software products, and contract programming.

Capital flowing into these growth areas is fleeing from older industries which offer little growth and a return on equity lower than the inflation rate. By contrast, computer services companies offer growth rates considerably higher than the inflation rate and many times the growth of the economy as a whole. Peter Cunningham, of Input, Inc., estimates industry growth at about 20%, broken down as follows:

	1980 (in $bil.)	1985 (in $bil.)
Processing services	$8.8	$18.8
Software products	2.4	8.7
Professional services	3.4	7.5

The average annual growth rate for each of the three categories is: Processing Services, 17%; Software Products, 29%; and Professional Services, 17%.

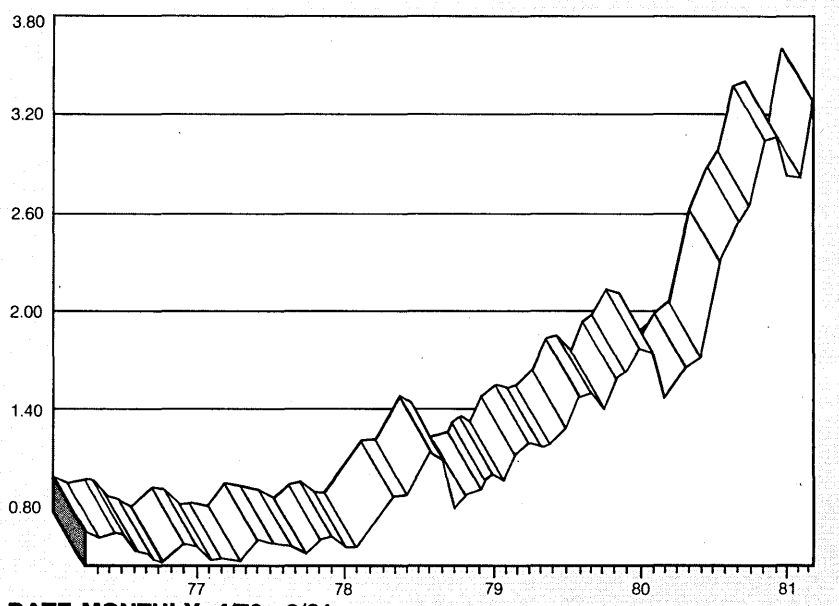
Recognizing this substantial growth, Wall Street has poured money into the industry. In 1980, the computer services stocks followed by Alex. Brown & Sons more than doubled on average—performing significantly better than the market as a whole, as shown in Exhibit 1.

In the early growth stage of the life cycle, computer services companies are enjoying a fast track because of three sources of available growth. First, the market for computer services is rapidly expanding as decreasing costs bring computing within reach of more and more buyers. Second, not all among those who can afford and want computing use it. Hence, growth is available through additional market penetration. Third, growth is available to any company grabbing market share from competitors.

In mature markets, it is not unusual to find the dominant competitor commanding a 50%, 60%, or 70% share of the market. (General Motors provides a classic example.) No such dominant competitors, however, have yet emerged in computer services. In fact, the very largest competitors command less than 5% of the market.

The unusual growth opportunities have attracted much investment attention because in older industries growth is slow or declining, markets are fully penetrated, and the sole source of growth is someone else's market share. Further, computer services growth is leveraged and enhanced by other industries' investments. Importantly, plummeting semiconductor prices bring real benefits to computer users by creating price-elastic markets. Hence the explosive demand for cost-efficient computing.

EXHIBIT 1
COMPUTER SERVICES INDEX



DATE MONTHLY: 4/76—3/81

SOURCE: ALEX. BROWN & SONS.

To investors, the ability to benefit directly from others' advances has important implications (i.e., the closer a producer is to the end user in the manufacturing and distribution chain, the more stable the demand is for its service). Conversely, the more removed a producer becomes from the end user, the more susceptible it is to the accordian effect of inventory and capital spending curtailments up and down the chain of producers. Schematically, raw material is converted to

> Hardware/software cost relationship reversal has led to significant shifts in relations between hardware and software vendors.

parts, parts to components, components to products, products to systems, and now in this business, systems to networks. To the extent that different providers up and down that chain curtail their inventories, the lower-level producers find the demand for their products violently fluctuating. The earnings of such companies are even more erratic because these companies are often both financially and operationally leveraged. Additionally, as a general rule, the closer the business is to raw materials, the more capital intensive it is, as in the case of computer services:

Raw Material + Capital + Labor

Part 1 + Part 2 + . . . + Part N

Component 1 + Component 2 + . . . + Component N

Product 1 + Product 2 + . . . + Product N

System 1 + System 2 + . . . + System N

Network 1 + Network 2 + . . . + Network N

User

Software enters the chain as a product, and computer services such as timesharing and turnkey systems enter at the systems level—relatively close to the end user. Computer services companies add value to "iron" produced by others. One of the reasons that computer services companies are now acquisition targets is that they represent a way for hardware vendors to integrate forward, add additional value, and create complete solutions to users' problems. By entering the chain at a higher level, computer services companies benefit from other participants and investments. This means lower capital intensity, lower labor intensity, and higher operating leverage.

Frank Lautenberg of Automatic Data Processing, Inc., stresses the difference between computers and computing: computers are tools; computing provides solutions. Computing turns data into information and information into insights. Insights provide raw material for knowledge, which is power. The computer services industry turns computers into computing, and provides solutions to significant information problems.

As the demand for computing soars,

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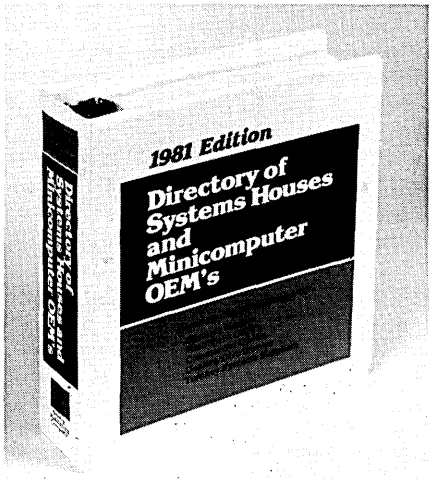

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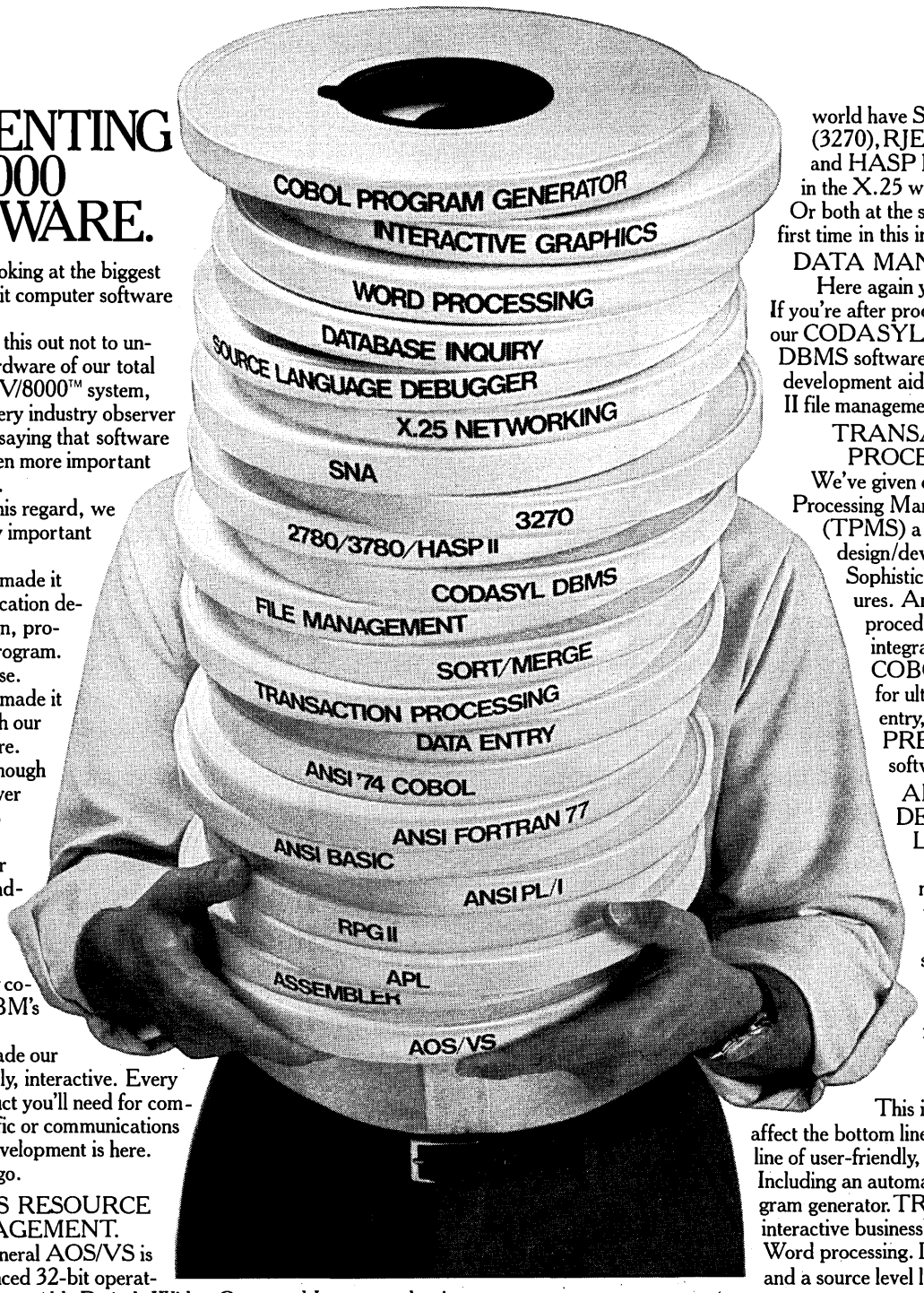

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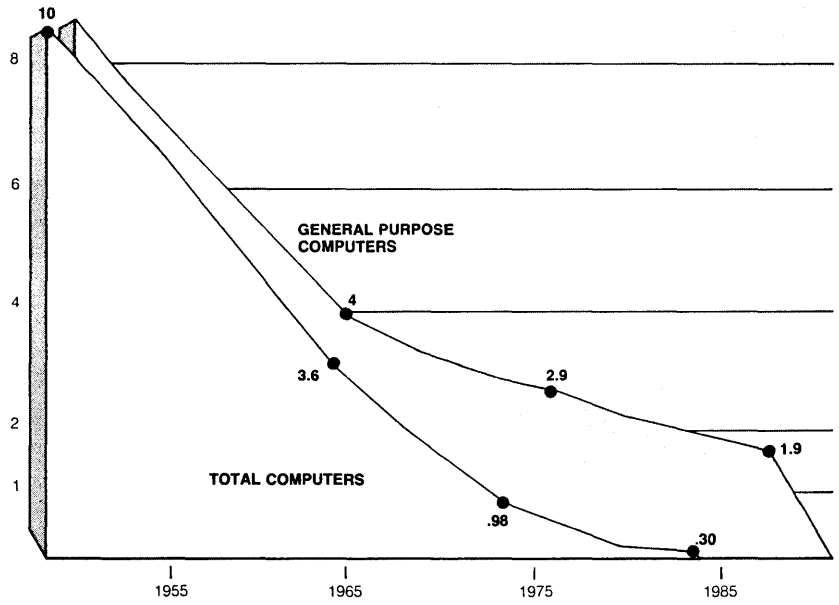
CIRCLE 17 ON READER CARD

CIRCLE 18 ON READER CARD

EXHIBIT 2

PROGRAMMERS PER COMPUTER



COMPUTER POPULATION (THOUSANDS)

	1955	1965	1975	1985
GENERAL PURPOSE	1	20.0	150	925
DEDICATED	0	2.5	220	330
TOTAL	1	22.5	370	1,255

Source: Share, Inc. and G.T. Orwick, MSA, Inc.

computer services companies fill the gap between supply and demand. The computer population is increasing faster than the supply of trained programmers, with every new general-purpose computer sold needing 150 to 400 separate programs in a typical business installation—from utilities and programming aids to database management systems and applications. Wall Street is particularly intrigued with this "software multiplier" concept. The marketplace expresses such supply/demand imbalance in its pricing mechanisms: trained computer programmers earn significantly more than the average American worker; even entry-level programmers receive more than the minimum wage. Exhibit 2 shows educated estimates of programmer and computer populations by G. T. Orwick of Management Science America.

But while a shortage of computer programmers contributes to the growth of computer services, the industry also profits from significant economies of scale. Assembling and distributing specialized computer solutions for a vast customer base is ultimately cheaper than having users acquire requisite skills and facilities on an individual basis. All buyers together, however, pay more than the costs of providing the solution. Thus the industry offers access on terms economical to both buyer and seller. The seller's risk lies in attracting enough customers, while customers are faced with a classic "make or buy" decision. Relevant costs are fully allocated life cycle costs, and economies of scale provided by computer services are large because solutions to significant problems involve complex software. (All the easy programs have been written!)

A buyer can license a database management system for about $100,000; building a similar system might cost $1,000,000, might take several years to implement, and might never work. The decision switches from "whether" to "which?" Since computers require a specialized body of knowledge, since the intricacies of major applications require their own body of knowledge, and since the costs of developing significant solutions can be shared by many users, the economies of scale in computer services are real and permanent. The compelling economics of computer services have given the whole industry a new legitimacy and acceptance.

Computer services companies benefit from selling old products to new customers and new products to old customers. For example, virtually every major hospital in the country uses computers to manage information. Nonetheless, major independent computer services vendors have consistently added new products over the last decade. One of the largest, Shared Medical Systems, now offers 28 different modules. The company's average revenues per hospital bed per day have risen to $2.07 from $1.16 over the last six years. This trend has spread to other industries as computerization brings efficiency, discipline, and control to more and more corporate functions.

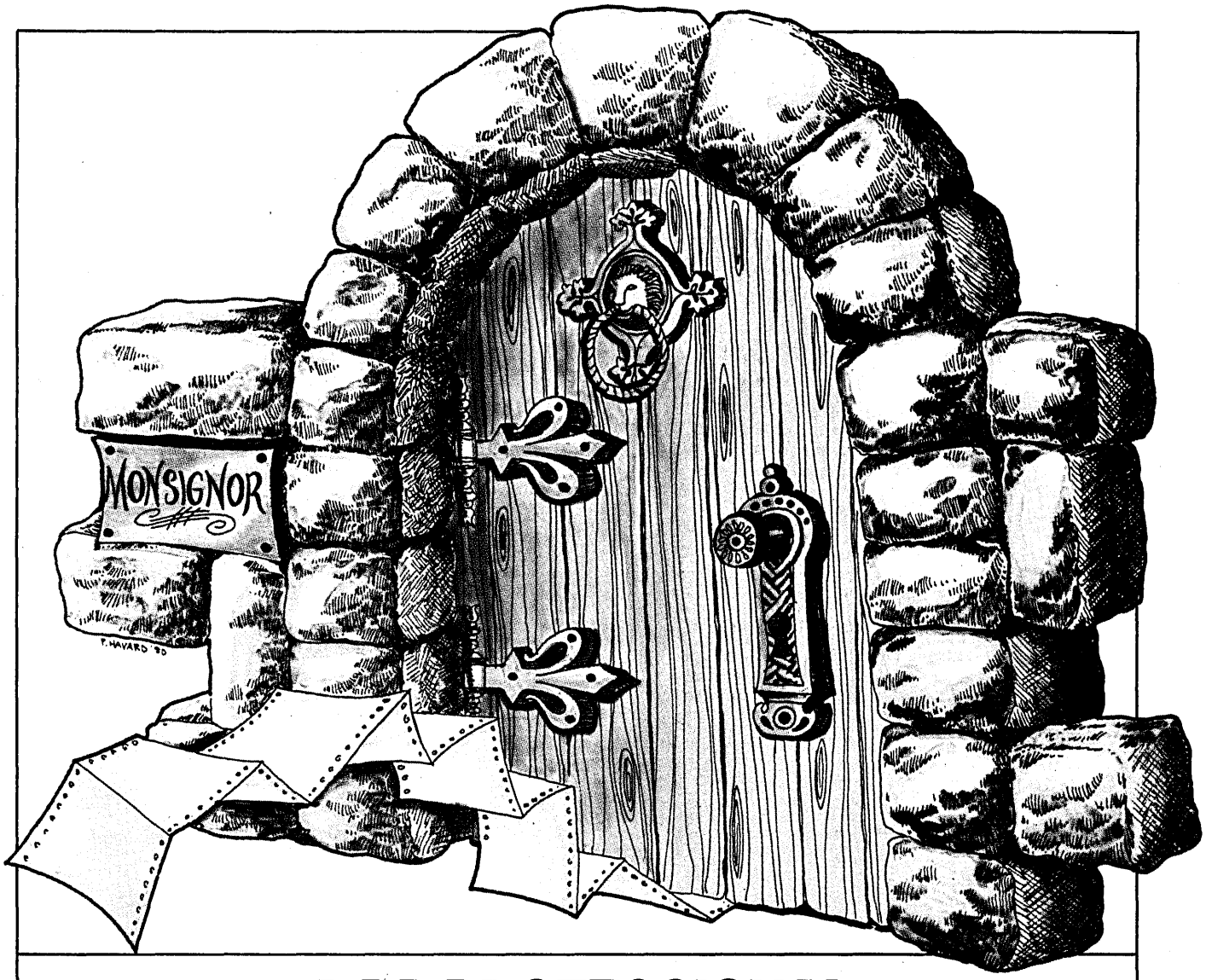
Life cycle analogies also show that market share changes swiftly. Vendors delivering excellent service at attractive prices before competition arises can usurp and dominate thousands of small individual markets for computer services. Triad Systems, Inc., serving the automotive parts retailer, is a fine example. But winning market share in head-to-head battles with entrenched competitors can be terribly expensive. Acquisition represents a far more fruitful strategy, as Automatic Data Processing, Anacomp, and Tymshare have clearly demonstrated. Dominant competitors in other industries have emerged in the same way. The cumulative investment in product features and marketing have prompted new entrants to tackle potential competitors directly by buying existing participants.

Economic shifts caused by technological advances represent yet another reason for industry growth, perhaps illustrated most dramatically by the shift between hardware and software costs. Plummeting hardware costs contrast sharply with inflating programmer costs. Consider the apocryphal tale of the manufacturer who paid about $5 for the microprocessor and over $100,000 to develop software for it. Conventional wisdom in the industry claims that in the late 1960s hardware costs consumed 80% of the dollar, programming costs consumed 20%. Now the ratio may be reversed. This highlights the compelling economics of buying computer

> Plummeting semiconductor prices bring real benefits to computer users by creating price-elastic markets.

services to a point where the rate of growth for services is faster than the rate of growth for hardware. Additionally, computer services spread high ongoing maintenance costs among many users while developing cost-efficient, universal applications for entire industries.

Trust accounting, for example, is the toughest computer application facing modern banking. Maintaining a trust department typically consumes between 8% and 10% of the bank's data processing assets, although on the average the service produces only between 1% and 2% of the bank's revenues, and often less of the profits. But the trust industry is experiencing wave after wave of significant



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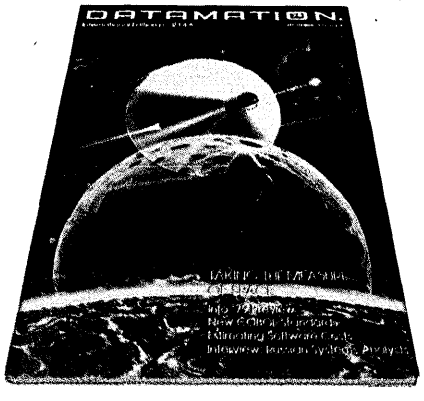

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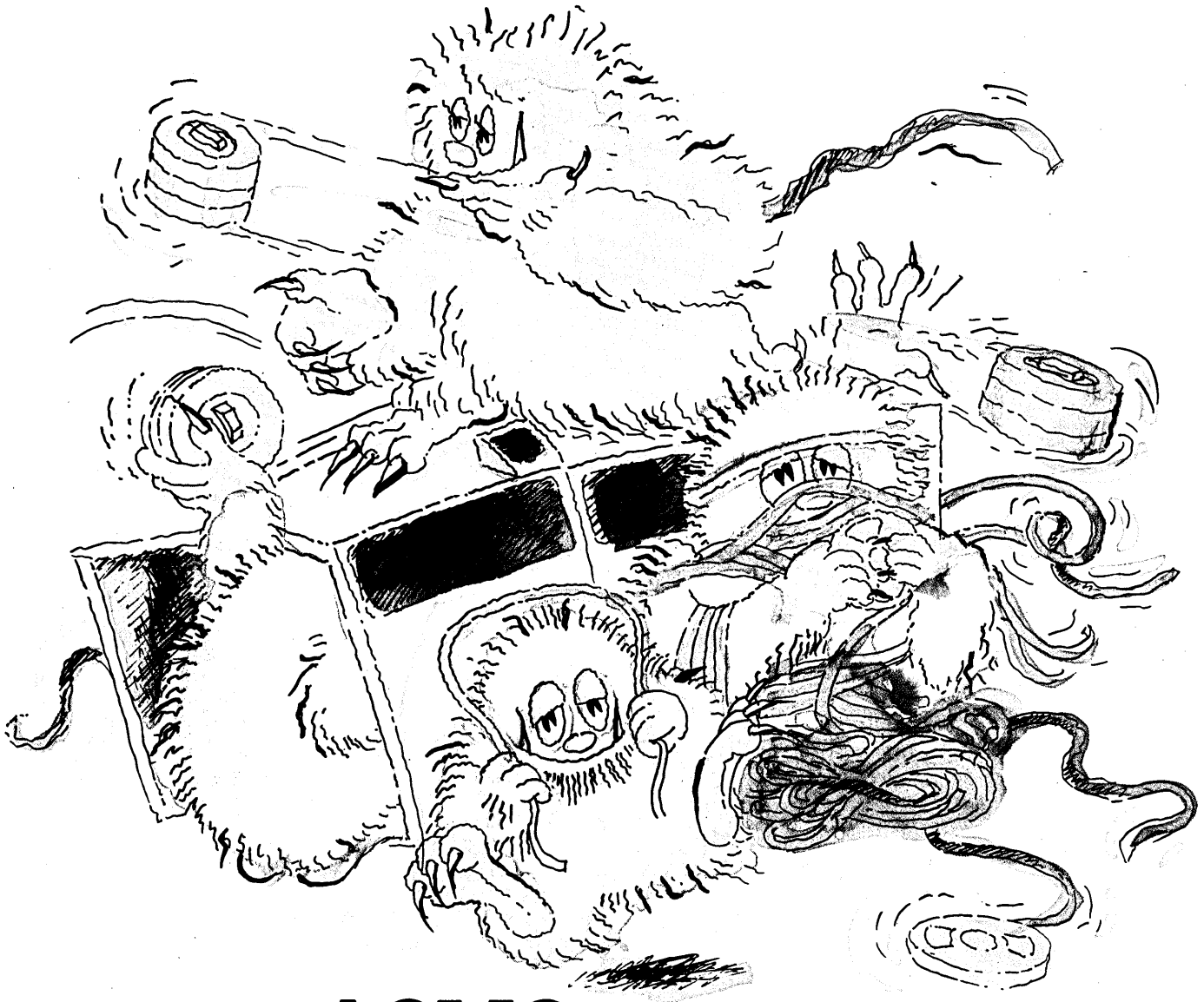

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change. New investment vehicles are entering the market. Traditional holdings, stocks, and bonds are being joined by options, Ginnie Mae pass-throughs, commodities, oil drilling partnerships, financial futures, and even stamps and diamonds. Add to all this increasingly burdensome government reporting requirements for ERISA, IRA and Keogh accounts, and the Comptroller of the Currency.

When the trust department requests software modification or development, however, it's usually queued behind electronic funds transfer, automatic teller machines, and interest bearing checking. The department can hardly afford to wait its turn; here, it may find purchased computer services the better

> Computer services companies benefit from selling old products to new customers and new products to old customers . . . for example, nearly every major hospital in the country uses computers to manage information.

alternative, where companies like SEI will spend almost $2 million this year alone to enhance and maintain its trust accounting software. These costs exceed the revenues of many trust departments and the profits of all but the larger ones, but when life cycle costs are understood, the economics become clear.

In the early stages of any business life cycle, management emphasis is on producing a product that works, on product features, and on performance. But as the business matures, and as competition matches product features and marketing capabilities, capital and marketing strategy become paramount. For computer services, marketing is now key, but capital has not yet become a critical determinant of success. The relative importance of each factor shifts as markets mature. For example, technology changes throughout the life cycle greatly influence service companies' product development, marketing strategy, and financial controls. Products must keep pace with new advancements, so R&D costs remain high.

Similarly, marketing investments remain substantial because of rapid market growth. All participants assume heavy reinvestment spurred by fast growth and fast technological change: professionals must invest time in education and reeducation; managers must forego a percentage of profits for new product development; and shareholders must exchange dividends for corporate reinvestment. Also, some companies use Wall Street's reborn interest in the industry to raise low-cost capital to weather hard times and to make incremental investments and acquisitions. Competitors must follow suit or risk losing market share.

The services industry has moved from selling computer tools to creating customer solutions. To capture new users who might never have considered service contracts, the maturing industry has resorted to product enhancements such as user-friendly access and multiple program and services packaging to make leasing time as economical as possible. A parallel shift from single product, single market strategies to multiple product, multiple market strategies often occurs as growth proceeds.

The shift toward multiple channels of distribution for computer services deserves mention. Increased competition and sophistication in product performance has forced many participants to change the definition of their business. As products evolve from tools to solutions, business formats evolve into distribution modes. A company that entered the business viewing itself as a timesharing firm may grow to view timesharing as just one way to deliver computing solutions to customers.

The shift toward multiple distribution modes is no easy task. While it is an absolute bonanza for the customer to be able to move easily up and down the scale, using as much or as little of an offering as needed at an ever decreasing cost per transaction, the vendor has a vastly different view. There are often heavy initial costs associated with marketing a new product, and the revenues that were repetitive in a timesharing offering may become one-time revenues in a turnkey system or software environment.

Other complications arising from multiple distribution channels involve the sales cycle and the degree of knowledge and expertise required by the vendor's sales force. For example, buying a solution via timesharing is a variable expense, easily canceled on short notice, and any line manager in the buying organization probably has authority to make the purchase decision. A solution in the form of a turnkey minicomputer, however, is probably a capital budgeting item for the buyer, requires advanced planning and rather high-level approval, and cannot be canceled. Furthermore, if a customer's level of usage is high enough to justify a turnkey system, the solution offered is probably rather important to business continuity.

The vendor's sales force requires sophisticated knowledge of the solution and ability to sell at a rather high organizational level. Selling the same solution in the form of a software product for use on the customer's large in-house computers is quite another task. Here, the vendor's sales force must interact with professionals as well as with high-level line managers. At this level of use, the solution probably addresses problems that are core to company survival. It is unlikely that the salesperson who sells the solution via timesharing is the same person who can sell the solution as a software product. The industry is plainly wrestling with these problems now. Nonetheless, the trend is clear: more and more services will be offered via multiple distribution channels.

For new entrants, penetrating established markets has become increasingly difficult and expensive. The trend can clearly be seen in virtually all niches of the market. In the early days of timesharing, it was competitively sufficient to offer raw time on a computer. Once several vendors offered raw time, competition turned to selling specialized software. When several vendors offered the same specialized software, aggressive competitors invested in interactive capabilities and remote processing.

The cycle continues today with companies vending databases and specialized access programs. Existing competitors have financed these capabilities from earnings over time; a new entrant would have to commit significant capital to play the game.

Emphasis is also shifting from individual products and services to integrated systems. This is part and parcel of the shift to provide complete solutions to users' needs. The trend in financial software products, for instance, is clearly toward offering communicating programs. It used to be sufficient to offer good standalone accounts payable or fixed assets, general ledger, payroll, etc.—each able to interact where appropriate. Competition demands that the vendor satisfy two of his customers' dilemmas—writing and maintaining a solution, and weaving that solution into the overall flow of the enterprise. The customer benefits from this competitive quest for superiority in the market.

Another shift is toward world competition. Decreased telecommunications costs have propelled the timesharing firms into

> Because growth is valuable and acquisition carries much lower risks than starting from scratch, acquiring firms are willing to pay high prices.

more and more markets. Software product vendors are going international too, drawn by large, untapped markets and compelling economics. American companies are not alone in the move to worldwide competition. The French government, for example, nurtures and protects domestic industry while its companies, like Cap-Gemini, acquire U.S. computer services firms.

Overall, competition has encouraged

entrepreneurial management styles and structures to move toward more formalized, more professional arrangements. Owners and managers who have traditionally focused on product performance and personal selling now find themselves in the business of managing people, bankers, and vendors.

Hardware/software cost relationship reversal has led to significant shifts in relations between hardware and software vendors. The hardware industry has tried for years to ignore the computer services industry. Now computer services firms are among their largest customers and among their toughest competitors in selling computing solutions and software. At International Computer Programs Inc.'s annual software awards meeting in San Antonio this year, almost a dozen hardware manufacturers sat at the same podium and virtually begged the assembled software houses to do business with them, through them, and for them. The bait was all sorts of free or low cost hardware, technical support, and promotion.

The hardware vendors, of course, hoped to tap the enormous capital investment and accumulated experience of the software houses. Economically, the ICP meeting may have been a milestone event for the computer services industry. The seesaw is tipping: in the past, vendors sold hardware and gave away software; now, vendors sell hardware and software. In the future, vendors may sell software and give away hardware. Passionate courting of software houses by hardware firms is further prompted by the zero cost hardware concept. Since hardware alone doesn't provide solutions, its pricing moves from value to cost. The only way the hardware vendor can continue to price its products to value is to create value by adding software.

> With American tax laws and free market policies encouraging sustained foreign competition in virtually all the older industries . . . computer services companies seem uniquely protected by software's intimate association with American business.

Further evidence of the dramatic shift in value between hardware and software lies in the astounding lineup of bidders for the U.S. Army's so-called "viable" contract. The army is requesting proposals from vendors to automate administrative support at its bases. Traditionally, such proposals would have been submitted by hardware vendors. In this case, the major contractors are Electronic Data Systems and Computer Sciences Corp., each using hardware vendors as *subcontractors*! One cannot overemphasize the significance of this arrangement as evidence of the shift in power toward software.

As noted, the quest for growth has led the industry through a number of rather obvious shifts: toward solutions rather than tools, toward integrated systems, and toward multiple markets and multiple distribution channels. In sum, the trend is toward "vertical markets." Vertical marketing means the computer services vendor satisfies all computing requirements for a single market. Shared Medical Systems is probably the best known vendor using this approach, meeting virtually any health industry computing need. The vertical approach incorporates complete solutions, hardware, software, integrated interactive programs, and complete backup support. Vertical marketing offers buyers substantially simplified purchase decisions while giving substantial operating leverage and clear competitive advantages to vendors.

Certainly, marriage and divorce are no strangers to the computer services industry, each producing significant impact. The merger and acquisition movement has in fact effectively placed a "safety net" under industry investors in that successful companies are extremely valuable properties. Eyes were opened industrywide and particularly on Wall Street by prices paid for access to the business by well-heeled outsiders. Broadview Associates provides summary figures.

Acquiring firms pay high prices because growth is valuable and acquisition carries much lower risk than starting from scratch. If a company does not perform well, it can probably be sold at a handsome price. Acquisitions accomplish different tasks for different competitors. McGraw-Hill and Dun & Bradstreet entered the business to gain electronic publishing capability for large, valuable databases and another distribution channel or delivery method for ongoing publishing efforts. Automatic Data Processing, Anacomp, and Tymshare are clearly executing growth through acquisitions strategy. Life cycle analysis shows us that the giants of many industries have grown large via acquisitions. It happened in railroads (Pennsylvania Railroad), in tobacco (remember the tobacco trusts), in public utilities, and in textiles (Burlington Industries). Computer hardware manufacturers like Burroughs and CDC acquire software houses to add value to hardware offerings and to move from providing tools to providing solutions.

The aggressive approach to acquisitions reflects participants' sure knowledge that growth does not go on forever and that deals should be struck "before the music stops." Virtually every company in the industry actively seeks acquisitions, much like the larger fish drooling over a smaller prey. Also contributing to the stepped-up pace of mergers and acquisitions is the fact that there are willing sellers as well as willing buyers. Many computer services companies go on the block because entrepreneurs can cash in, finance product growth, and bring in additional marketing and development resources. There are literally thousands of small computer services companies without resources—management, financial, or otherwise—to sustain the battle. Cashing in at today's prices looks awfully good to many of them. Secondly, fast-paced activity is assured as new companies attracted by plummeting computer costs open up still unspoken-for markets.

> Information processing systems have become so critical to the operation of an organization that chaos would result if these firms tried to operate for even a few days without the information provided by data systems.

Larger computer services companies are probably affordable only to very large companies outside the computing industry. Many corporations, Exxon for example, need fast growing businesses to sustain their own growth. Further, antitrust considerations and high prices may restrain the takeover of large computer services companies such as Automatic Data Processing, Electronic Data Systems, and Computer Sciences Corp. , among others. Below these large companies are other companies probably too large to be acquired by computer services companies but that could be acquired by large outsiders. Companies like Shared Medical Systems, National Data Corporation, Comshare, and Quotron Systems fit into this category. Below these are companies representing fair game for insiders and outsiders alike. While outsiders grow by acquiring computer services companies, and industry insiders buy other industry insiders, it seems unlikely that industry insiders will seek industry outsiders. Clearly, the best use of time and money is in this business.

The computer services industry has developed all the trappings of permanence. Professions such as accounting and legal services have honed field specialists, and a whole body of law has emerged for patenting and copyrighting software. The Association of Data Processing Services Organizations has created industry support and represents the industry before government. The press has recognized the industry with specific publications, and academia has responded with more course and degree offerings related to software and services. Finally, Wall Street

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has focused on computer services as an industry in its own right, no longer an awkward appendage of other companies.

The investment community has taken an extraordinary interest in computer services for several reasons. The services industry as a whole is growing at about 20% per year. Input, Inc., of Palo Alto, Calif., estimates that some parts of the industry are growing faster than 30%, while individual niches and some companies are growing faster than 50% per year. Fast growth is coupled with the potential of enormous size. The industry, earning just over $14 billion in revenues today, is clearly going to be one of the largest industries in the country by the end of the decade. Fast growth and large scale become even more appealing because of the industry's unique financial characteristics. Computer services have been called the "millionaire machine" because it is still possible for a smart fellow to develop a useful program and make himself rich. At the industry level, computer services are relatively less capital intensive, have relatively higher operating leverage, and relatively higher output per employee than most industries. Some older, more mature industries may offer better operating leverage, or lower capital intensity, or lower labor intensity, but they do not offer growth or returns on equity greater than the rate of inflation.

Professionals and managers have significant sunk costs—in training and experience, if not in cash—in their industry. Investors have no such constraints. The capital markets are highly liquid, and continued high inflation has put an extraordinarily high premium on companies capable of growing more rapidly than the rate of inflation. Money is pouring out of yesterday's industries into tomorrow's industries, and computer services are major beneficiaries of this shift. Capital is no longer a constraint for promising vendors. With a growing number of computer services companies tapping the public market for funds, more investment vehicles are available, thus enabling investors to spread their risks in this increasingly attractive industry. Computer services accounting practices are particularly attractive to investors. For the most part, revenues reported approximate cash received and expenses reported approximate cash disbursed. Development costs are generally expensed. Most parts of the industry are able to generate a stream of repeat income from their customer base. Timesharing is built around repeat revenue, and turnkey systems and software products usually generate a stream of maintenance revenue. Extensive cash flow finances ongoing product development and enhancement.

> Standard approaches in the accounting or payroll functions should not restrict a company's competitive alternatives, but adopting standard product selection, design, and distribution systems could severely restrict a firm's competitive options.

Perhaps the most appealing characteristic to investors is the industry's unique technological niche. Many investors feel that computer services represent the most defendable high growth, high technology investment available. With American tax laws and free market policies encouraging sustained foreign competition in virtually all the older

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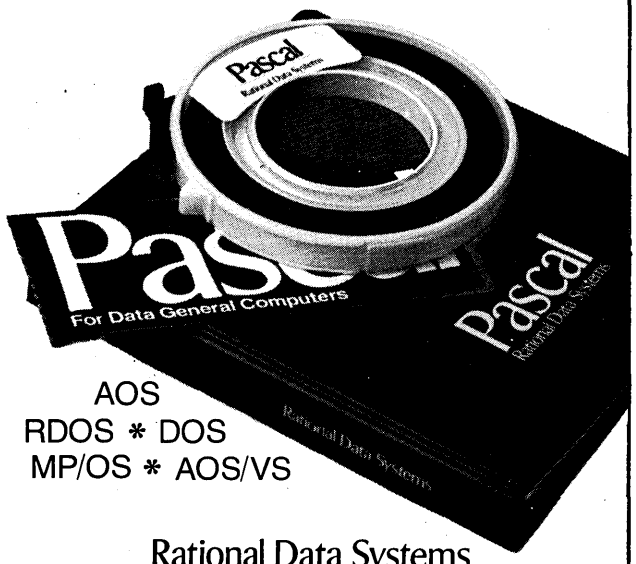

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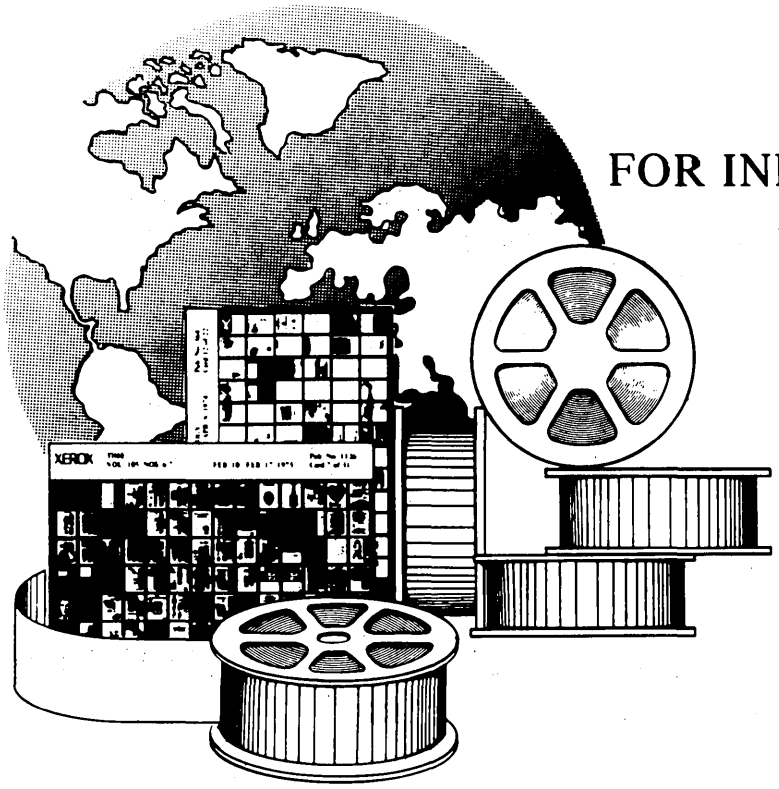

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industries (steel, textiles, automobiles, etc.) and increasingly in high technology businesses (semiconductors and computers), computer services companies seem uniquely protected by software's intimate association with the workings of American business. Even generalized software programs incorporate features that require an intimate understanding of our business culture.

Software is not a commodity item. It is still priced to value, and this should continue as its value is continuously enhanced by ongoing development.

As the essence of value in any computer services offering, software occupies a uniquely protected position between the rapidly changing technology of computer hardware and the slowly evolving needs of the end user.

Computer users expect to change hardware as new generations permit more performance at lower prices: they do not expect to change their way of doing business. Hence, while computers come and go in an organization, the software stays on. In economic terms, hardware's life cycle is substantially shorter than software's life cycle as reflected by new generations of hardware remaining software-compatible with older generations. Consider that there are some $95 billion worth of computers installed vs. between $200 billion and $400 billion worth of software installed.

When the old-timer observes the computer services industry of today, he cannot help but remember the same industry of a decade ago. Then, as now, it was a darling of Wall Street. Will it crash into disrepute again? Are there important differences between the industry then and now? In those days, hardware was relatively expensive and software relatively cheap. Back then, computers were used by very large enterprises and by government. Today business computing comes in all shapes and sizes.

> Computer services has been called the "millionaire machine" because it is still possible for a smart fellow to develop a useful program and make himself rich.

In the past, computer services companies capitalized software development costs and reported profits that rarely approximated cash flow. In those days, the whole concept of buying software was new; IBM gave away "bundled" software until 1969. The independent software products industry was truly an infant.

Today the industry has won respectability through proven performance and compelling economics. Large user groups exist and support specific products and services. So strong is this movement that most software and services sales are done by reference base selling.

Times have changed, and so has the industry, but clearly, computer services has earned a vital—and permanent—place in the information revolution. ❋

With Alex. Brown & Sons, Baltimore, Maryland, since 1972, Mr. Berkeley follows a number of companies, primarily those in the computer services industry. He graduated from the University of Virginia, received his MBA from the Wharton School of Finance in 1968, and then joined the Air Force from 1968 to 1972.

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MYTH #1

The 3-year development backlog found at most installations can only be reduced by a massive infusion of new resources.

FACT

A recent survey shows that RAMIS II systems are implemented in less than 1/5 the time it takes using COBOL, FORTRAN, or PL/1 —and the RAMIS II systems typically use no more resources than the average COBOL program to do the same work.

MYTH #2

80% of programming resources are taken up by maintenance work and there's no way to reduce this figure.

FACT

Because RAMIS II commands are precise, concise and clear, users report that maintainance is 50% less with RAMIS II than without—even though RAMIS II systems are modified more frequently because they are easier to update.

MYTH #3

It takes anywhere from 6 months to 3 years to integrate a new software product into an organization.

FACT

RAMIS II provides automatic transparent access to IMS, DL/1, ADABAS, TOTAL, ISAM and VSAM files, as well as to RAMIS II databases. This means that the full range of RAMIS II reporting capabilities —including graphics and financial modeling—is available for all your files beginning on Day One.

Quick implementation, reduced maintenance, unrestricted access to files—these former myths are now realities for RAMIS II users, and they are just three reasons why RAMIS II users report an average payback period of less than 12 months.

Mandatory backlogs, excessive maintenance, slow start-up—these former realities are now myths at over 450 in-house installations and for another 1,000 clients worldwide who use RAMIS II through 14 service bureaus.

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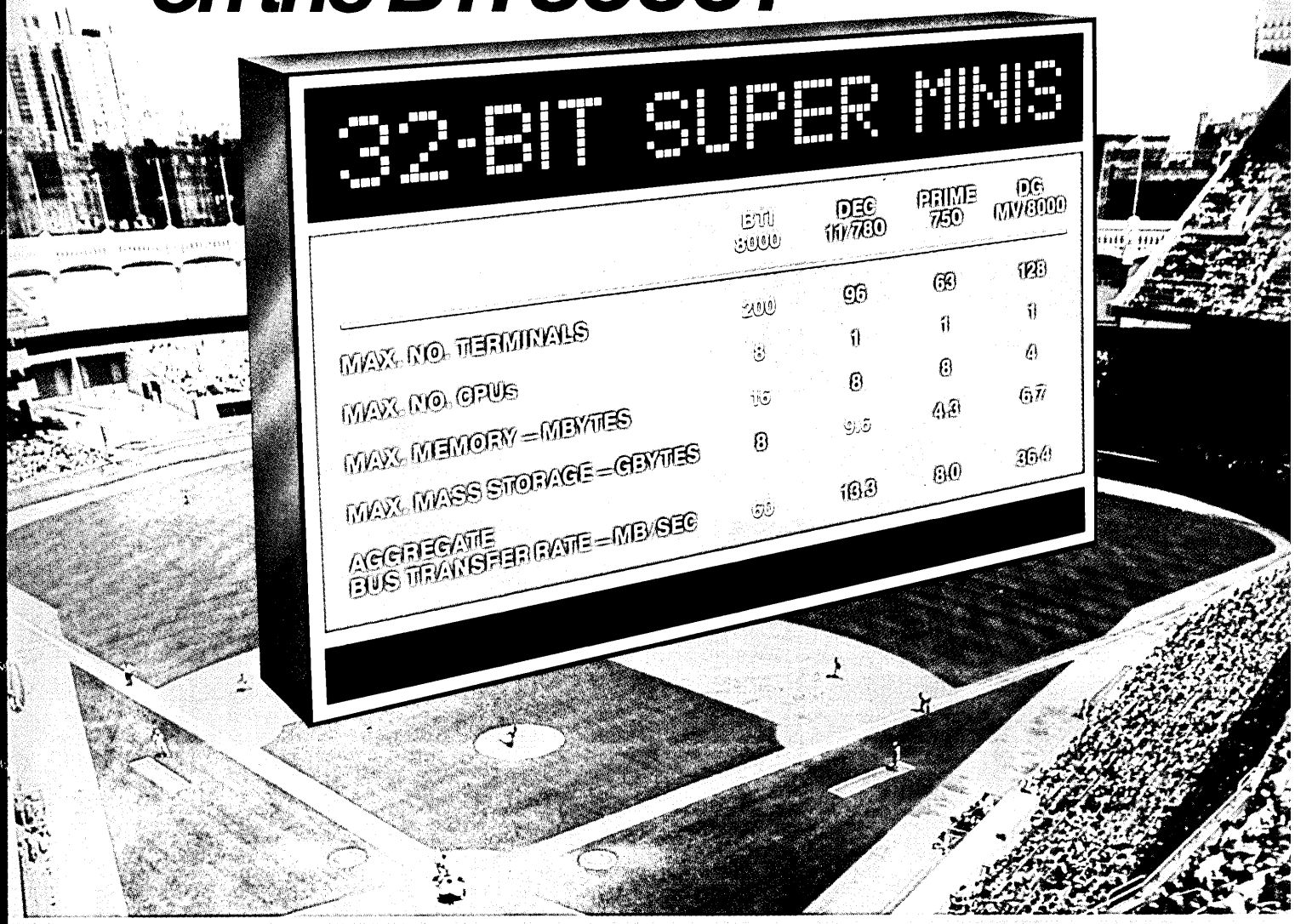

In this game, it's clearly no contest. The BTI 8000 32-bit multiprocessor system gives you the lead in the first inning, and keeps you there all the way. And, you can sign it up for 30 percent less than competitive systems.

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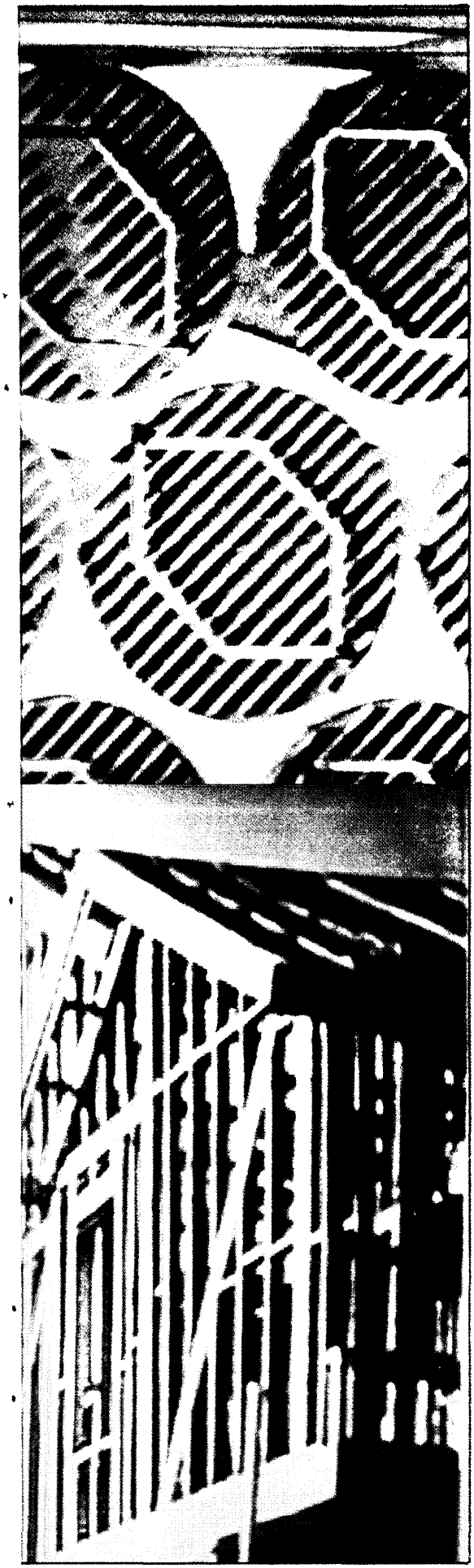

SOFTWARE TRENDS IN EUROPE

Software products sales in Europe are less than one-half of U.S. sales, but are growing at a much more rapid rate.

by Murray Disman

Software product sales have been growing more rapidly than hardware markets or the overall computer services industry, in both the U.S. and Western Europe. Performance pressures on management, staffing difficulties, and long and lengthening backlogs of work have made software packages an attractive and cost-effective alternative to in-house development. The key advantages to a data processing organization are:

- *Less Risk:* it can be proven, through either trial runs or by verifying the experiences of other data processing departments, that the package does work.
- *Speedier Implementation:* the packages can be installed much more rapidly than the application could be developed internally, even allowing for customization and familiarization processes.
- *Lower Cost:* package prices are typically less than 10% of what an internal development activity would cost. This assumes that comparable levels of expertise and specialized knowledge are available in-house.

The delay in the development of the Western European software product market, compared to the U.S., results from a more generally conservative attitude toward new approaches and from differences in language and business practices between countries. These differences require a great deal of vendor effort to make a given package broadly acceptable. U.S.-based package vendors concentrated, at least initially, on the development of domestic markets.

Exhibit 1 provides data comparing the U.S. and Western European software markets. Current sales of software products in Europe are less than one-half of U.S. sales, and represent a smaller percentage of the total computer services market, but are growing at a significantly more rapid rate. Market growth rates from 1979 to 1980 were 39% for Western Europe, contrasted with 28% for the U.S. Input has forecast that these respective growth trends will continue at least through 1984. The forecast contains price increase estimates which add to the lead in growth rates for the European software industry. Despite price change considerations, the European market for software products will still grow twice as rapidly as the total European computer services market. The growth of the U.S. software products market will be somewhat less than twice the growth rate of the total U.S. computer services industry. By 1984 the European software product market will be $4.0 billion, compared to a U.S. market of $6.6 billion.

Software packages have become increasingly attractive because of several evolutionary changes—both internal and external—affecting the department. The trend toward outside software purchases first occurred in the U.S. It is now moving very rapidly in Western Europe because of severe personnel shortages and sky-rocketing costs of in-house program development.

Dp use has evolved from an off-line reporting and/or scientific calculation mode to an on-line control mechanism. This trend first matured in the U.S. and then spread to Europe through the needs of multinational companies. These firms, either U.S.- or European-based, compete internationally and need the most effective and updated systems available. The popularity of database management systems indicates the importance of information and its use in continuous decision-making processes. Interactive applications and real-time operation concepts are evident at many companies where the dp system must interface with the customer. Typical applications are reservations, ticketing, credit verification, and bank teller functions.

A new bit of jargon, Information Resource Management (IRM), is becoming popular in European industry to describe a high-level position with the responsibility for seeing that an organization makes optimum use of its available information and data. Establishment of an IRM indicates management's concern with handling large amounts of data in a timely and accurate manner. Information processing systems have become, in many instances, so critical to the operation of an organization that chaos would result if these firms tried to operate for even a few days without the information provided by data systems. This evolution is changing the major

FROM LEFT TO RIGHT CLOCKWISE, PHOTOGRAPHS BY D. DURRANCE II. D. JONES, J. BLAUSTEIN, S. SEITZ/WOODFIN CAMP & ASSOCIATES. ELECTRONIC COLORIZATION BY PETER ANGELO SIMON.

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thrust of the dp department's role from one of development to one of maintenance and enhancement. Exhibit 2 shows the percent of time spent by programmers and computer equipment on different functions. The data, derived from Input's panel of dp users in the U.S., shows less than 20% of total machine time utilized toward programming effort is devoted to new application development. Programming personnel spent 51% of their time on new applications in 1978, 49% in 1979, and only 45% in 1980. This 45% was an average for all industry sectors and ranged from a low of 31% for Federal Government respondents to a high of 53% for retail. In both Western Europe and the U.S., maintenance growth, in conjunction with a major effort to develop on-line applications has placed an inordinate load on already scarce programmer resources. A recent Input survey of Western European users confirms this concern with the scarcity of dp analysts and programmers.

Another significant factor leading to the increasing acceptance of packaged software products is the growth in sophistication and confidence of European dp management. In general, managers are now capable of defining requirements for a specific application and implementing it with the most cost-effective approach. This capability varies from country to country in Europe and depends on the size of the firm and actual experience of the dp manager.

In addition to the changes just described, a number of external factors have increased the attractiveness of packaged software in Europe:

- Unbundling, started by IBM some eleven years ago, has succeeded in ending the era of "free" IBM software. As a result, managers have become used to paying separately for software; software vendors now have a clear target in terms of price and program features. IBM's programs must satisfy an extremely wide user base. An independent software vendor can introduce features that make his product far superior for a more narrowly selected group of users.
- Lower hardware costs have had the dual effect of optimizing the use of the dp manager's personnel resource (which is increasing in cost) and easing concerns about achieving high levels of machine efficiency. The latter makes software package solutions, that may not be optimum in terms of equipment utilization, more readily acceptable.
- Package improvements in terms of the range of products available, sophistication, features, flexibility, and ease of use have resulted from the experience gained and the inventiveness of the vendors. Significant improvements in these areas will continue for at least the next five years.
- Increasing respectability of the software product provider as a result of growth in size and longevity has given managers the confidence to do business with these firms and to know that they will be around to provide

EXHIBIT 1

WESTERN EUROPEAN AND U.S. SOFTWARE PRODUCT MARKETS 1980-1984 (in $ BILLIONS)

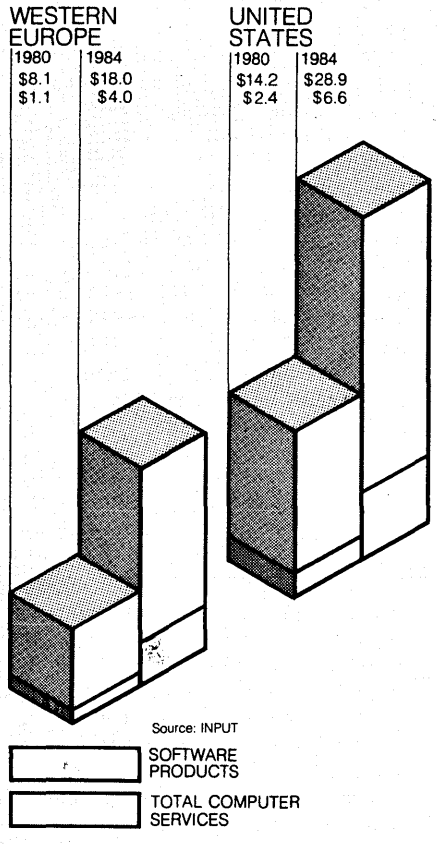


EXHIBIT 2

DATA PROCESSING RESOURCE USE

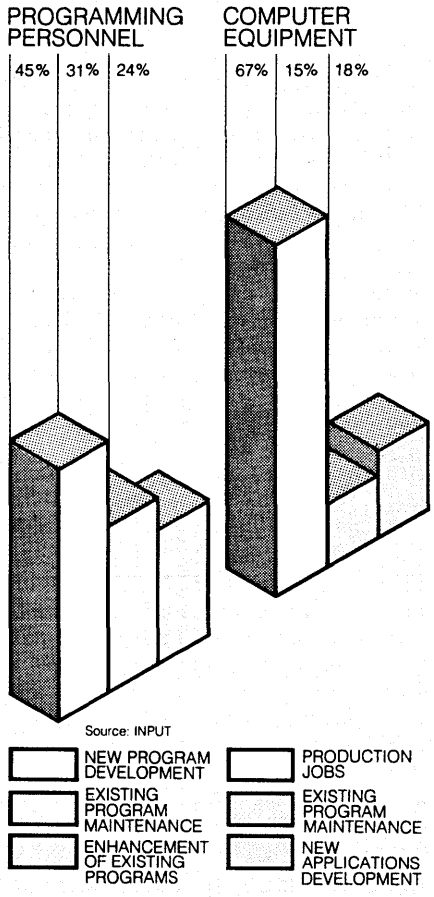
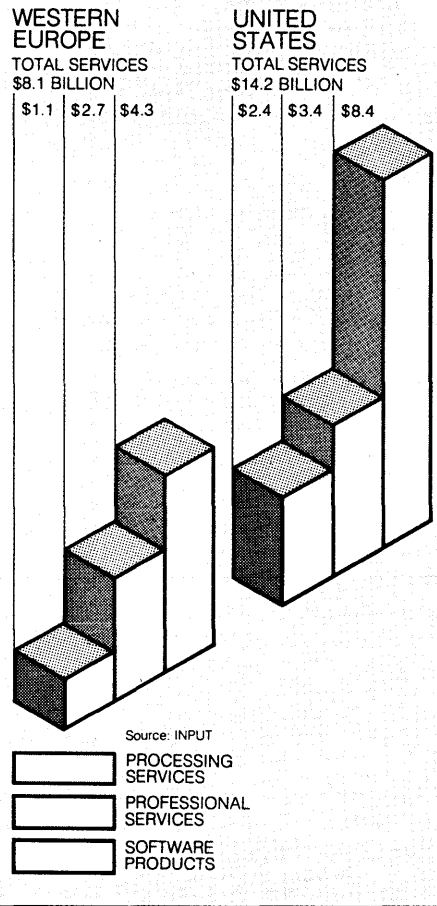


EXHIBIT 3

THE 1980 COMPUTER SERVICES INDUSTRY (in $ BILLIONS)



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Baley, Feldman
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Wenker
Distributed Systems: Concepts and Management Overview
Baley, Feldman
Distributed Systems Technology and Design
Liebowitz
Data Base Management for Geographic Information Systems
Hamlin
Data Dictionary/Directory Systems (DD/DS)
Plagman
Management of Software Engineering
Manzo, Levenson
DP Security, Audit, & Control
Rector
Improving DP Center Performance & Productivity
Plasket
Structured Programming, Analysis, Design, and Testing
Berard
Systems Analysis
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Cariss
Project Management
Contos, Collard
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future support and upgrades.

- Satisfaction of other users is the key to this market's growth. Ask your neighbor if you want proof that the package works, that it can be installed quickly, and that it costs significantly less than an in-house or custom development effort.

Computer users have solicited help in developing information processing systems, especially at the applications level, since the beginning of the dp industry. Some of this aid came from hardware manufacturers and some from independent vendors established to specifically provide services to organizations.

The computer services industry grew out of these activities and now has the size and structure shown in Exhibit 3. Processing services include batch and remote computing services; software includes both systems and applications products; professional services include education and training, consulting, and custom software development activities. Custom software development expenditures in Western Europe are about 50% of the total professional services segment. European users currently spend more for custom programming than they do for software packages. Expenditures for custom software in Europe will grow at a 23% annual rate as compared to a 38% rate for software packages through 1984, demonstrating a desire on the part of dp management to achieve more cost effective and timely solutions to software assignments. The shift to procurement of software packages, however, represents a potentially serious problem for corporate management. The problem is one of restriction on competitive differentiation between organizations arising from the use of standard hardware and software.

> Companies compete with each other on the basis of different styles and approaches to satisfy their customers' needs and demands.

Companies compete with each other on the basis of different styles and approaches to satisfy their customers' needs. This competition, which derives from the creative abilities of the individuals within the organization, has been the basic driving force in improving the quality and lowering the costs of goods and services produced throughout the western world. Standard approaches in the accounting or payroll functions should not restrict a company's competitive alternatives, but adopting standard product selection, design, and distribution systems could severely restrict a firm's competitive options.

This problem is at the heart of the controversy between custom or internally developed and package approaches to software. It is much more evident at the applications than at the systems software level. As one moves away from the commonality inherent in dp and communications hardware, it is the applications software which adapts a fixed hardware system to the operating style and approach desired by the user management. There are two approaches to this difficulty: the first is the design of a completely custom system, while the second approach is the procurement of a software package with sufficient flexibility to be adapted to "almost" satisfy user management.

The relation of these two choices is evident when one considers that many packages being marketed today evolved from custom programs developed by the software vendor. The improvement in package flexibility and adaptability has come from the experience and sophistication gained by the vendor as the software package was marketed and installed at different organizations. Exhibit 4 lists the leading suppliers of software products and custom software services in France. The number of French companies performing custom programming and also offering software packages demonstrates the close relationship between these two areas in Europe.

European users have had both good and bad experiences with the purchase and

EXHIBIT 4

A COMPARISON OF LEADING SOFTWARE SUPPLIERS IN FRANCE

LEADING CUSTOM SOFTWARE DEVELOPERS	LEADING VENDORS OF APPLICATION PRODUCTS
CAP/GEMINI/SOGETTI	IBM
SESA	CII-HB
TSIL	HEWLETT-PACKARD
CERCI	PHILLIPS
SEMA	SG2
SG2	SESA
SLIGOS	GFI
STERIA	CISI
SOPRA	UNIVAC
ORDINA	CAP/GEMINI/SOGETTI
CISI	GSI
GFI	TSIL
GSI	SEMA
	SOPRA

Source: INPUT

EXHIBIT 5

WESTERN EUROPEAN USER SATISFACTION WITH COMPUTER SERVICES

OVERALL RATING*

SERVICE TYPE	UNITED KINGDOM	FRANCE	WEST GERMANY	ITALY	BENELUX
HARDWARE MAINTENANCE	2.2	2.0	2.0	1.8	2.2
PROCESSING SERVICES	1.9	1.5	1.7	1.3	1.5
SYSTEM SOFTWARE PRODUCTS	1.8	1.8	1.4	1.7	1.9
APPLICATION SOFTWARE PRODUCTS	1.5	1.6	1.0	1.3	1.6
CUSTOM SOFTWARE	1.6	0.9	0.9	1.2	1.9

Source: INPUT * HIGH = 3 MEDIUM= 2 LOW = 1

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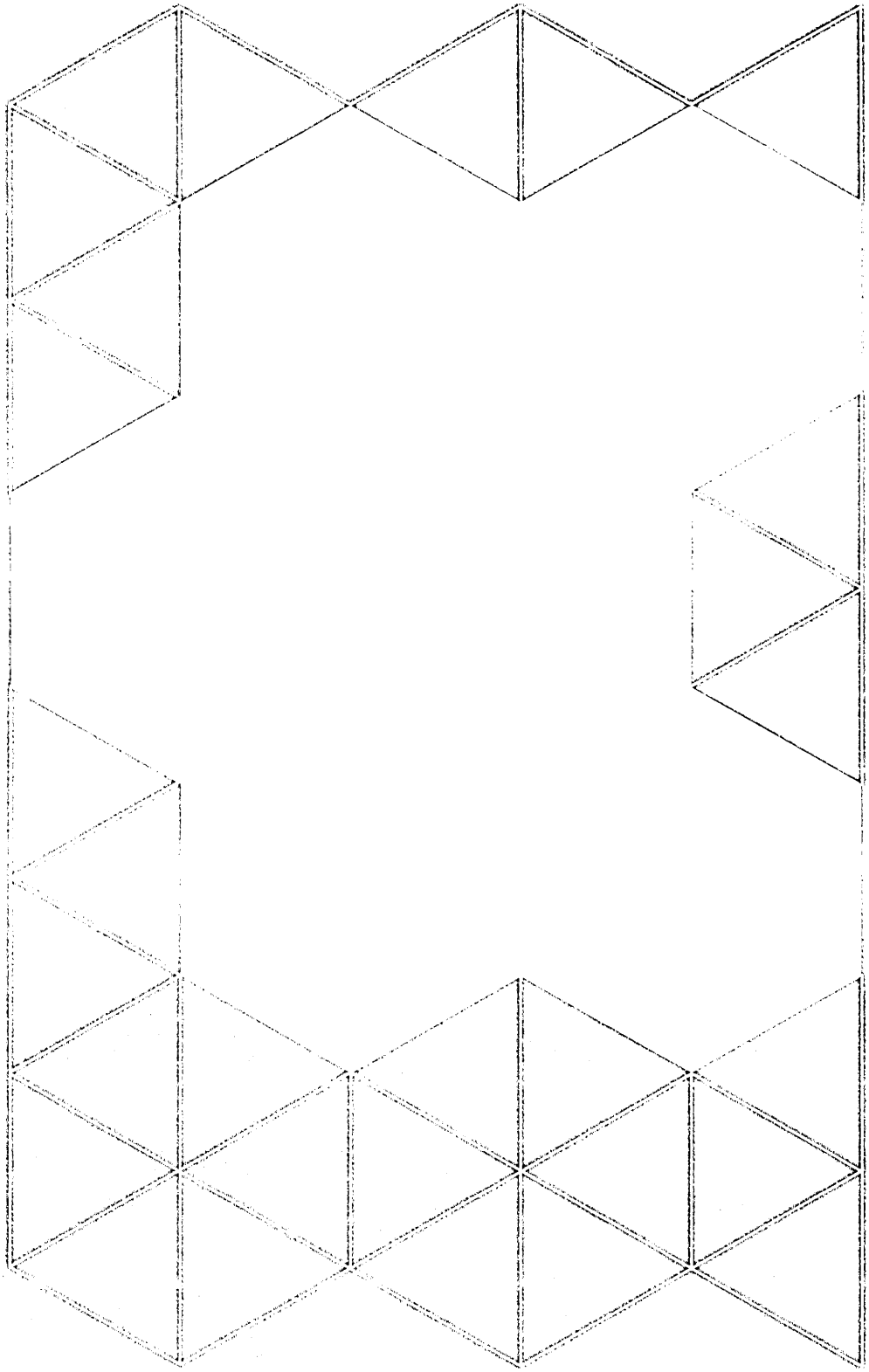

As managers become more adept at applying the computer to business forecasting, operations analysis, financial consolidation, cash management and other applications, it often happens that the people doing the planning become more sophisticated than the planning tool they are using.

FCS-EPS: More than a modeling system.

FCS-EPS is designed to bring the full power of the computer into the hands of financial management. It's an easy-to-apply system, yet it's extremely hardware efficient for tightly scheduled minicomputers and mainframes. Over 150 functions built around a "Business English" are pre-programmed for rapid initial use of FCS-EPS, should you wish to extend any model or system function, the FCS-EPS language can easily be applied to do so.

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installation of software products. The result achieved depends on type of product selected, vendor used, expectations of the buyer, and most importantly, preparation and selection procedures used by the dp manager. A rating of user satisfaction with a number of different services for each of the major European countries is shown in Exhibit 5. Two key points are discernible from the data. The more standard and closer the service is to the hardware, the higher the degree of user satisfaction. Systems software products ranked higher, in every case, than applications products, and applications products generally ranked higher than custom software. Countries with a "we prefer to do it ourselves" user attitude—primarily West Germany and Italy—were less satisfied with software products than the other countries.

The European software products market varies from country to country in almost all characteristics. In all countries but the U.K., more than 93% of the software packages bought by a company are purchased by the dp manager. In the U.K., 15% of the packages are bought directly by the end user, showing a much more decentralized dp environment.

Exhibit 6 contrasts the U.K. and Italy indicating the portion of applications packages purchased compared to the total new applications being developed. The U.K. is a more mature market and buys three times as many of its requirements from outside vendors as does Italy.

In two areas which are not so completely dominated by dp management—Industrial/Manufacturing Control and Engineering/Design—Italian companies purchase a greater percentage of their requirements from outside vendors than do English companies. However, these two areas represent a very small part of the applications software market. Together, they account for only 5% of the total U.K. market. In contrast, the Order Entry/Billing, Production and Inventory Control, and Personnel and Payroll areas each represent 20% to 30% of the total market.

The Western European market for software products and services between 1980 and 1984 is shown for applications software products, system software products, and custom software in Exhibit 7. An increase of 2.8 times occurs during that period, as the market grows from $2.6 to $7.2 billion. The market for applications products will grow most rapidly (48% per year) as a result of the pressures on dp management to look outside of its own organization to meet cost and time constraints. Systems software markets will grow more slowly (32% per year) representing the effects of unbundling policies set in motion by the hardware manufacturers. The relative importance of the hardware manufacturer in the software product market varies by country, ranging from the U.K. with 76% of the market to France's market share which drops to 55%. The variation is highly dependent on the strength of the local software vendors and the attitudes of the users.

EXHIBIT 6

OUTSIDE PURCHASE OF NEW APPLICATION SOFTWARE PROGRAMS AS A PERCENT OF TOTAL PROGRAMS DEVELOPED

APPLICATION AREA	PORTION OF TOTAL NEW SOFTWARE PROGRAMS	
	ITALY	UNITED KINGDOM
INDUSTRIAL/MANUFACTURING CONTROL	22%	14%
ENGINEERING/DESIGN	22	20
ORDER ENTRY/BILLING/PURCHASING	9	30
PRODUCTION/INVENTORY CONTROL	10	36
DISTRIBUTION/TRANSPORTATION	3	33
MARKETING/SALES	5	13
PERSONNEL/PAYROLL	15	59
ACCOUNTING/FINANCE	14	37
OTHER	19	29
OVERALL AVERAGE OF APPLICATIONS PACKAGES PURCHASED		35%

Source: INPUT

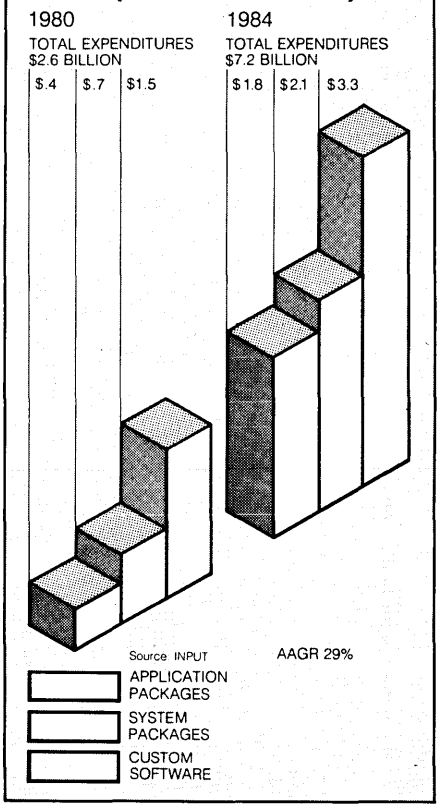
The top 10 suppliers of software products in Europe are all hardware manufacturers. These 10 account for 53% of the total packaged systems software market but only 41% of the applications market. In order of market leadership, they are IBM, ICL, Burroughs, Honeywell, Siemens, DEC, NCR, Univac, Hewlett-Packard, and Nixdorf.

U.S. firms—Cincom, Computer Associates, and ADR—lead that portion of the Western European software products market held by the independents. Six of the top 10 positions are held by U.S. companies. European-based firms among the top 10 independents include ADV/Orga and Software AG from Germany, SG2 from France, and Altergo from the U.K. Most of the other European-based independent software product vendors concentrate on their home markets. ❋

Dr. Disman is managing director with Input, Ltd., London, where he is responsible for managing and developing Input's European activities. Prior to joining Input in 1980, he was president of Mackintosh Consultants, Inc., the U.S. branch of a large European electronics consulting firm, for five years. Dr. Disman received his BEE from New York University, and an MSc and a PhD from Stanford University.

EXHIBIT 7

WESTERN EUROPEAN MARKET FOR SOFTWARE PRODUCTS AND SERVICES 1980-1984 (IN $ BILLIONS)



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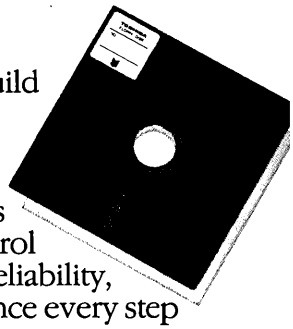

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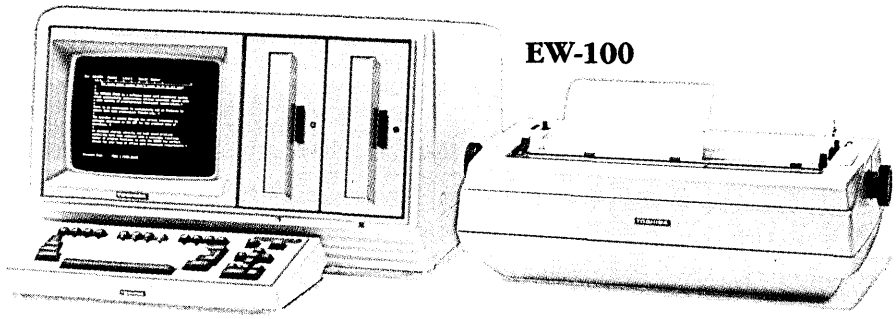
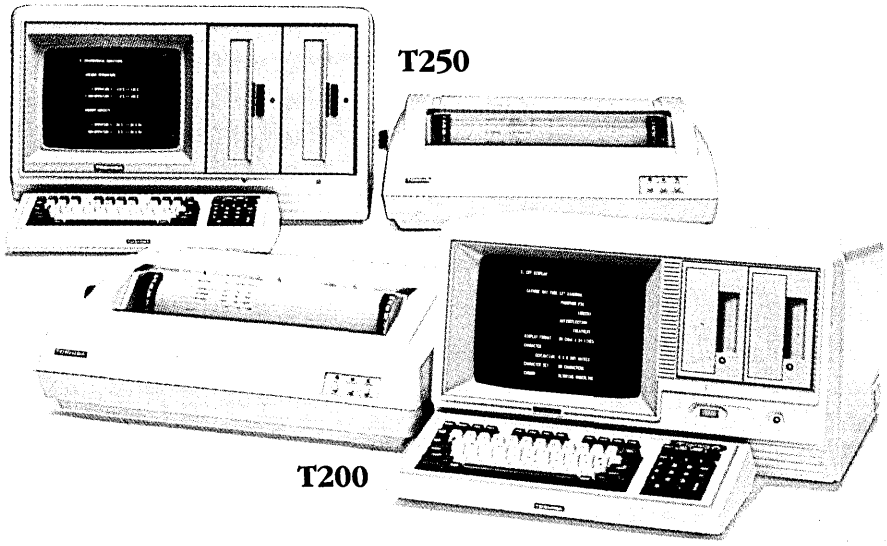
Word Processor



EW-100

display capacity: 80 characters × 24 lines
floppy disk: 8″
storage capacity: 300KB × 2,
1MB × 2
type of printer: daisy-wheel printer
printing speed: 45 characters/sec.
print pitch: 10/12/proportional spacing

VSBC (very small business computer)



T200/T250

Hardware

memory: 64KB
display capacity: 80 characters × 24 lines
floppy disk: T200: 5¼″
T250: 8″
storage capacity: T200: 280KB × 2
T250: 1MB × 2
printing speed: 125 characters/sec.
characters per line: 136 characters

Software

CP/M®, Microsoft BASIC-80, CBASIC™

* CP/M® is a registered trademark of Digital Research, Inc. CBASIC is a trademark of Compiler Systems, Inc.

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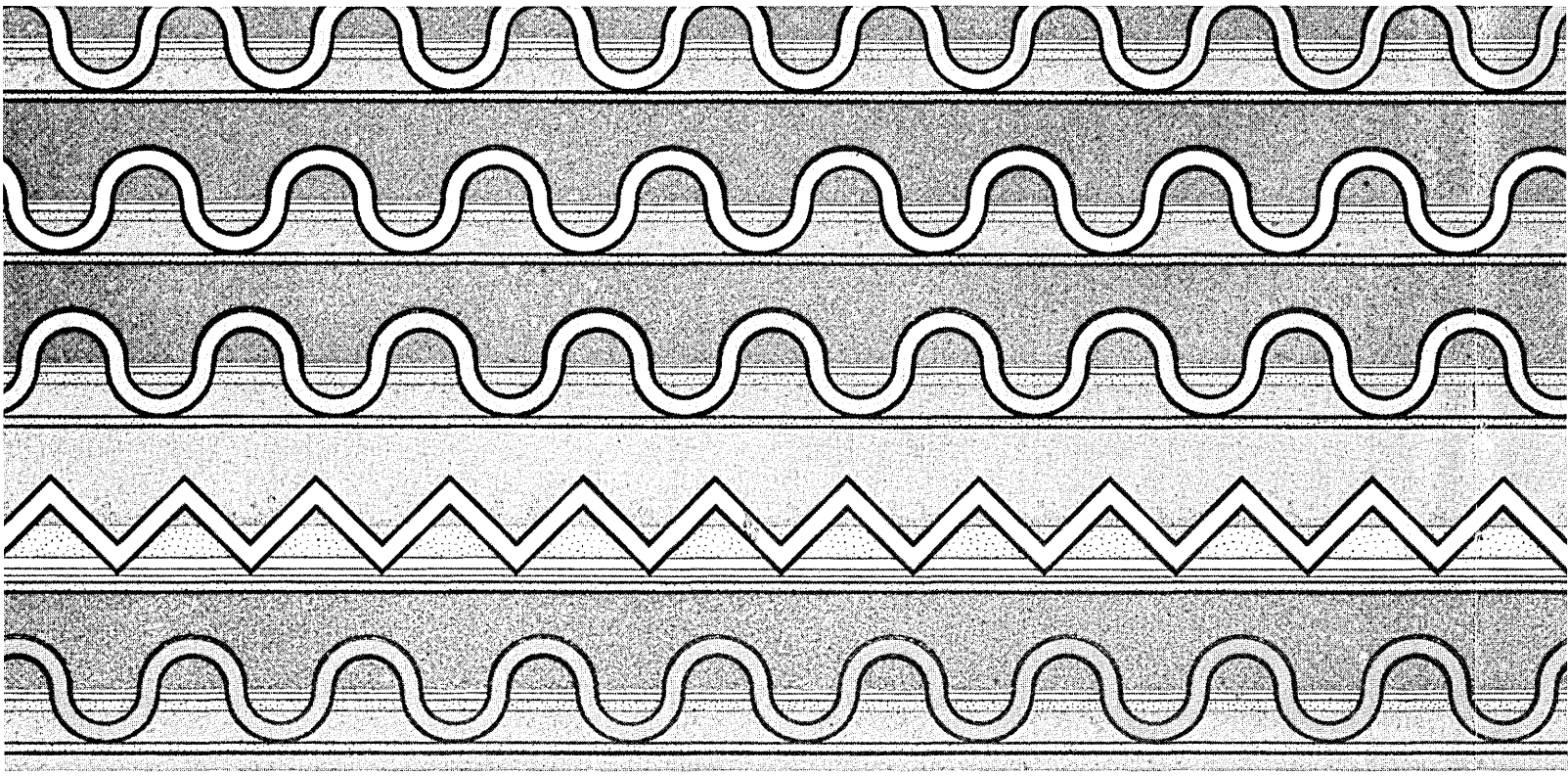
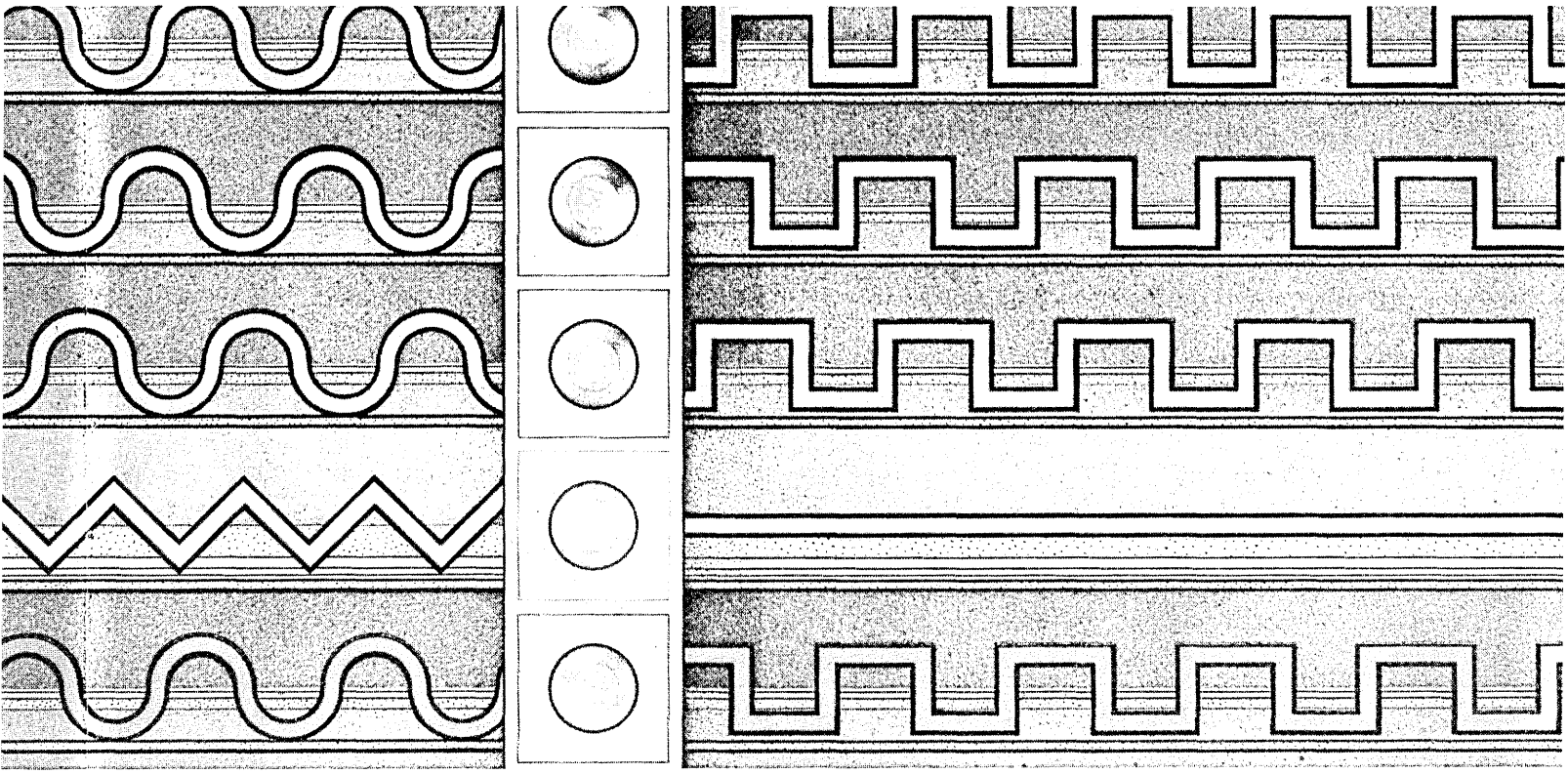


Give every kilobit intensive care.

An ailing data stream can't tell you where it hurts, and that can mean hours of trial-and-error testing, some of it done far away and hard to supervise.



The Bell System's Dataphone® II modular data transmission subsystem gives you central monitoring, diagnosis and control of your whole data communications system, and automatically identifies system faults.

Regardless of your system's host or line protocol, Dataphone II is fully compatible, at transmission rates of 2400, 4800, or 9600 bps. Three levels of service are available, covering every level of system complexity. And because the service is fully modular, it can grow with your needs by simple addition of components.

Dataphone II service is state-of-the-art in sophistication, yet extremely simple in operation, and communicates in plain English.

With its full-time assurance of operational readiness, Dataphone II service is the ideal link to integrate your system. It is a product of the world's most advanced information management system—the nationwide Bell System voice and data network.

◇ Applying our knowledge to your information management needs is a process that begins with one call to your Bell Account Executive. ⬭

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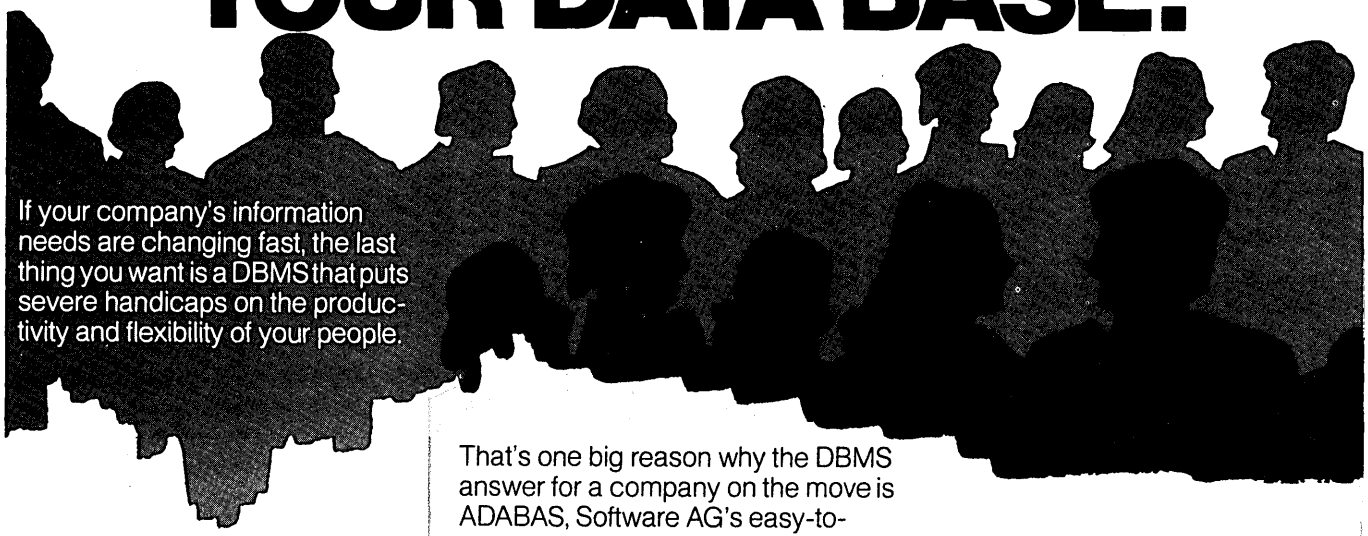

If your company's information needs are changing fast, the last thing you want is a DBMS that puts severe handicaps on the productivity and flexibility of your people.

But, practically speaking, that's just what chain-pointer DBMS systems do. All their logical relationships are hard-wired into the physical data. So, when it comes to meeting the dynamic data access and update requirements of a growing company, these systems simply get too tied up in their own structural limitations to deliver effective, flexible data management.

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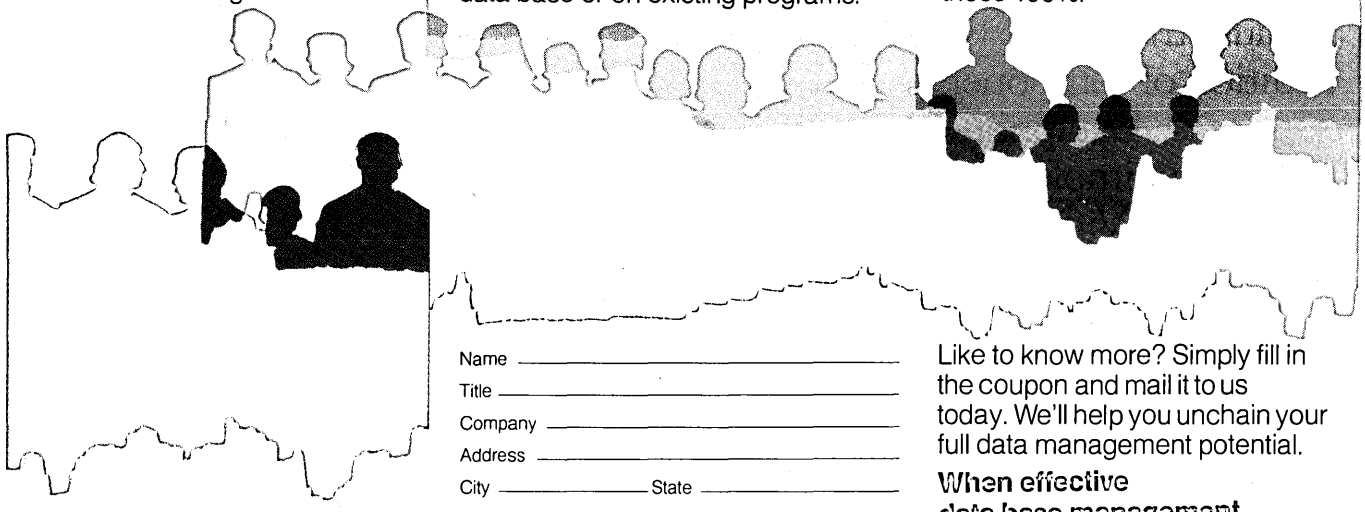

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CIRCLE 41 ON READER CARD

WALL STREET WED TO SOFTWARE

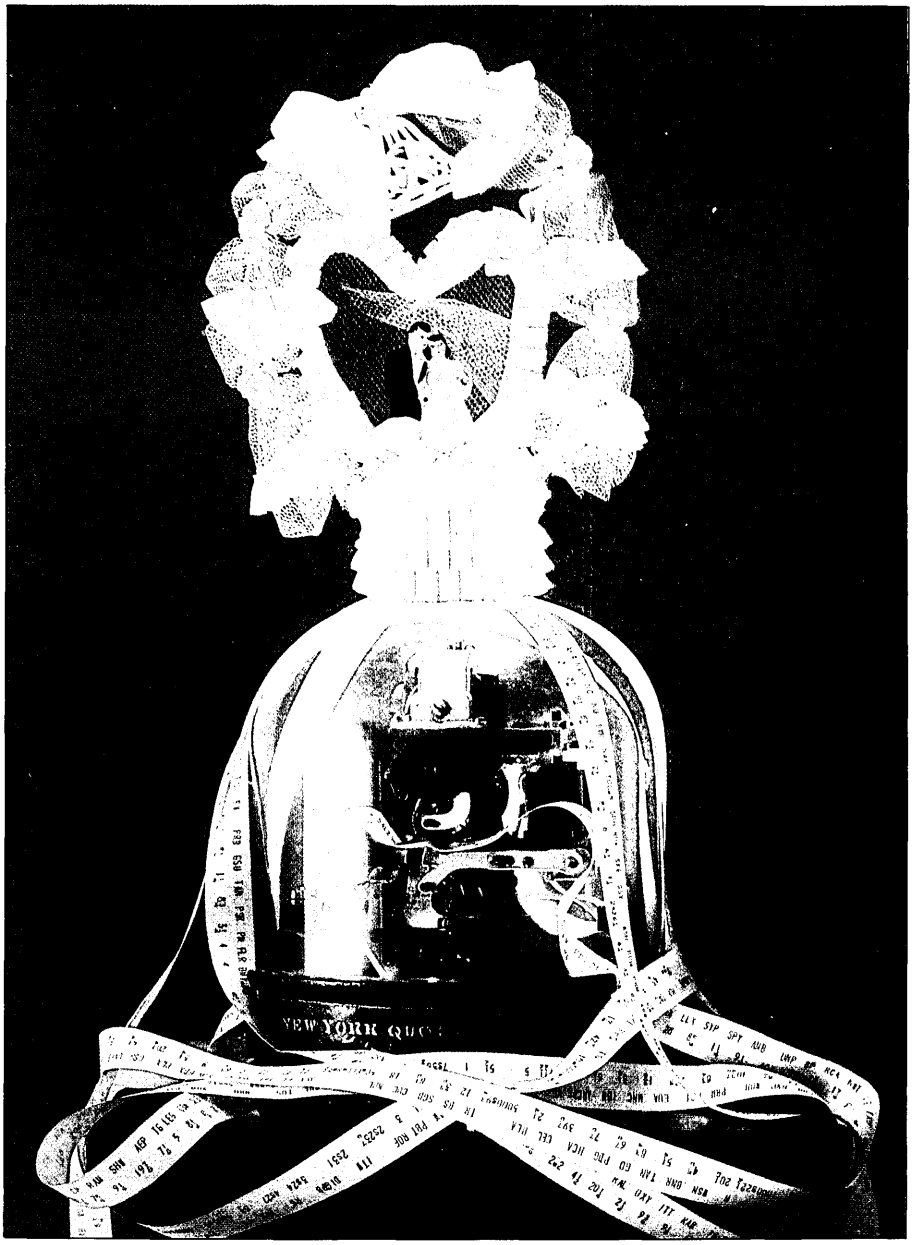
Software companies are being courted and wooed like never before.

by John W. Verity

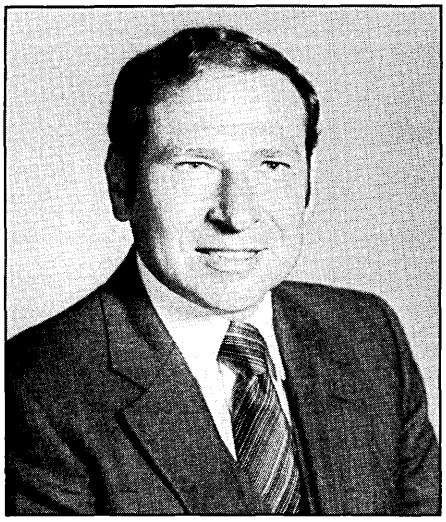
It wasn't the baseball strike that made Wall Street find the software and services business one of the best games in town. As the fastest growing segment of the overall computer industry, software and services offered what seemed to be great investment potential and the chance for some real action, the kind not seen since the go-go years of the late '60s when just about every computer-related issue was automatically hot. Unfortunately, there weren't many opportunities for investors since most of the business, especially packaged software, was in private hands.

All that has changed, however, with the recent rash of public offerings, increasing emphasis on software by traditional hardware vendors, and the imminent explosion (any minute now, they keep saying) of personal computing and on-line information services. Investment houses are not exactly rushing en masse to cash in on the software boom, but they are devoting more resources to finding out what makes this market segment tick.

The most obvious sign of the Street's awakening to the software market is the ap-



PHOTOGRAPH BY JAMES JOBRN



SY KAUFMAN: "Cullinane set the benchmark."

ROBERT K. O'CONNOR: "Finally people realize the industry is viable."

ESTHER DYSON: "It's a very exciting time. There's a lot of money flowing."

pointment by several large investment houses of research analysts specializing in software and services. While several analysts had been following established services vendors such as Electronic Data Systems (EDS) and Computer Sciences Corp. (CSC) for years, it was primarily as an adjunct to following IBM and its mainframe rivals.

Now, firms such as Oppenheimer & Co., Hambrecht & Quist, and Merrill Lynch have analysts devoted to following software. Of particular interest to them is the packaged software market, which has seen several of its leading contenders go public in recent months.

"It's a very exciting time," says Esther Dyson, analyst at Oppenheimer, a New York house known for its strong research activities. "There's a lot of money flowing, there are many companies starting out, and there's a lot of ferment right now."

Dyson, who in mid-June was recommending EDS, Automatic Data Processing (ADP), Tymshare, Informatics, Cullinane Database Systems, and Triad, notes that "practically anybody (in the software business) can go public right now and do very well since the basic demand for services and stocks is quite high."

Robert O'Connor, who says he's been following the services industry for some 13 years, tracks 23 such companies for Tucker Anthony & R. L. Day, also in New York. "Finally people realize the industry is viable," he comments. "Most people couldn't see ADP selling any more payroll accounts, but they did and they will." Acquisitions by big corporations of services firms in recent years (among them, Dun & Bradstreet bought National CSS, McGraw-Hill went for Data Resources, and Schlumberger picked up Manufacturing Data Systems) has also helped draw attention to the services segment, O'Connor says. The general business press also has taken a few good looks at the market, prompting interest among investors.

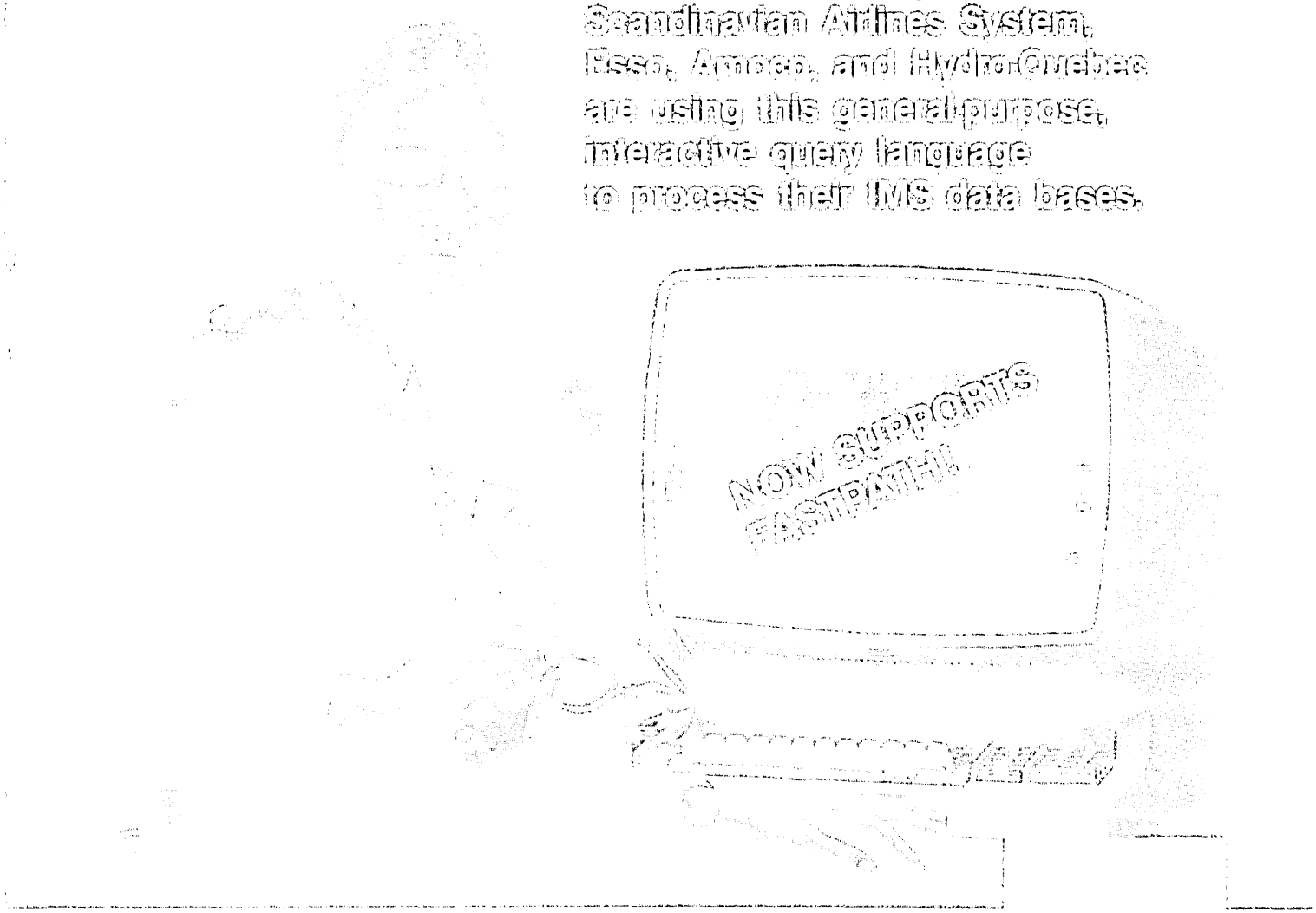
"Instead of the lone operator like me with a limited clientele," O'Connor says,

SELECTED KEY ACQUISITIONS DURING CALENDAR 1980

FIRM ACQUIRED	BY WHOM	SHARE PRICE PRIOR TO TRANSACTION COMMITMENT* ($ PER SHARE)	ACQUISITION PRICE PER SHARE ($ PER SHARE)	TOTAL CONSIDERATION PAID ($ MILLIONS)
Manufacturing Data Systems, Inc.	Schlumberger, Ltd.	$43	$63	$ 187.0
Calma Co.	General Electric Co.	—	—	100.0
System Development Corp.	Burroughs Corp.	—	—	98.0
First Data Resources	American Express Co.	—	—	57.0
Lambda Technology	General Electric Information Services Co. (GEISCO)	—	—	22.0
Digital Systems of Florida	Wyly Corp.	—	—	17.8
Itel's Audatex Div.	Automatic Data Processing	—	—	15.0
Source Telecomputing	Reader's Digest Assoc.	—	—	12.0
DASD	Cap Gemini Sogeti	—	—	11.0
Synergraphics	Anacomp	—	—	9.7

SOURCE: BROADVIEW ASSOCIATES *APPROX.; 30-60 DAYS ADVANCED.

ASI/INQUIRY: Companies like Hughes Aircraft, Scandinavian Airlines System, Esso, Amoco, and Hydro-Quebec are using this general-purpose, interactive query language to process their IMS data bases.



[illegible] reasons why.

1. ASI/INQUIRY is Easy To Learn and Easy To Use.

Because inquiries are stated in simple English, nonprogrammers can learn to use ASI/INQUIRY quickly. DL/1 structures are completely transparent to the user. You need not understand the complexities of multipathing or multiple data base access. Comprehensive diagnostic messages simplify error correction. ASI/INQUIRY automatically displays data in the appropriate format—horizontal, vertical, or overflow. Or you can specify any desired screen format. Repetitively executed queries can be saved in an on-line catalog. New release 5 features include the ability to defer query execution to batch and a powerful user exit facility.

2. ASI/INQUIRY Assures Faster Access and Response Time.

ASI/INQUIRY lets you access your DL/1 data bases through IMS or TSO faster and more efficiently. That's because it eliminates need to write and debug those highly procedural programs usually required to access data bases. ASI/INQUIRY operates as an IMS message processing program executed from any IMS DB/DC-supported terminal. Execution priority is dynamically controlled through automatic program message switching. High initial priority assignment assures fast response. Priority is then automatically adjusted to the rate that to-be-displayed data is encountered, which optimizes *load leveling* of IMS DB/DC resources.

3. ASI/INQUIRY Provides Complete Security.

Built-in safeguards protect data at the system, terminal, and data base levels. Data base administrators define the data bases users can access, their passwords, and the terminals from which individual data bases can be accessed.

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"you now have major wire houses like Merrill Lynch watching the market, so everyone listens."

O'Connor credits Alex. Brown & Sons, the Baltimore investment banking outfit, with boosting the software industry within Wall Street circles. "They're clearly the leader," he says, pointing to a monthly computer services bulletin put out by Alfred R. Berkeley and Joan E. Rodgers which investigates various submarkets, specific companies, and stock performance. Alex. Brown last year held a two-day conference on the software and services business which drew attendance from a wide variety of vendors and investment analysts.

> Some of the strongest areas in venture capital activity are database management, CAD/CAM, and business graphics.

Sy Kaufman, general partner at San Francisco-based Hambrecht & Quist, suggests that Cullinane's public offering of 1978 did much to fuel interest in the software industry among Wall Street circles. "It was the first software company to go public in a long, long time," he recalls. "It offered the investor an unblemished record of earnings and growth."

Since that time, several competing packaged software firms have gone public, several large services firms have merged, and the idea of software being a key component to success in the hardware arena has come to the forefront of the investor's mind, Kaufman says. And, he adds, it's only just begun. "I think 1981 will be seen as the year of the new issue. More software companies will go public this year than at any time previously. Hambrecht & Quist alone plans to bring four or five firms public this year, and there will probably be an equal number underwritten by others."

"By the end of 1981 then," he says, "there will be about 10 new ideas on the market."

Kaufman notes that in the past investors were unable to put their money into a "cross-section of investment-grade" stocks within the software arena since there were only a handful of public companies. "Obviously, the situation will now change," he says, noting that as more firms go public, analysts such as himself will be able to construct better statistical models of software stock performance relating to such variables as the overall economy, the performance of hardware vendors, and competition.

He points out that many software companies have extremely variable quarterly performance (some even make all their profits in a single quarter) and that investors, attracted to predictable results, are willing to pay premium multiples for such stocks. Therefore, he says, it is more important to look at these companies on a year-to-year pattern, something which hasn't been possible before due to the lack of public information.

Cullinane, a leading database management system vendor which is branching out into applications software, has become "the benchmark that other software firms will have to be measured against," Kaufman says. "It has done a superb job of managing its business and giving a sequential pattern of growth."

Hambrecht & Quist, in addition to underwriting new issues, also has its hand in another growing area of involvement in software by the investment community: venture capital. While Mr. Kaufman is reluctant to discuss details on his firm's specific vc activities, he characterizes the vc area as "frenetic." Software firms are "being courted and wooed like never before."

Some of the strongest areas in venture capital activity are database management, CAD/CAM, and business graphics, he says, noting that Hambrecht & Quist has made capital investments in some five software firms so far. "They're not startups; they're established companies with sound product portfolios, measurable p&l (profit and loss), and relatively good profitability. But they need the capital to build up sales and marketing," he explains.

Oppenheimer's Dyson agrees, noting that marketing, support, and service will be at least as important as technological leadership in the intensifying software game. Even if a company doesn't make it on its own, she says, "if it has a reasonably good product it should be a good investment because it will probably get bought up by a larger firm."*

WANTED: SOFTWARE FOR MICROS

The success or failure of microcomputer companies in this decade will be determined by software.

by Edith Myers

"If you put a sign on the Pacific Coast Highway saying you have user-proven applications software (for microcomputers), you'd have helicopters from the likes of Atari and Radio Shack on your doorstep in no time."

Dr. John Brackett, president of SofTech Microsystems, San Diego, Calif., was summing up what he sees as the most critical factor holding back the burgeoning microcomputer industry. The way things are going, he said, "in another couple of years there will only be one programmer for every five to 10 machines."

Creative Strategies International, the San Jose, Calif., market research firm, has said the number one factor in deciding the success or failure of microcomputer companies in this decade will be software. Sales of software in 1980 exceeded $100 million.

Brackett believes the day is coming when "people will buy functional capability and then ask what kind of computer it will run on. If you had an applications program for all machines, even today, you could sell a million copies."

SofTech Microsystems is a systems software firm that emphasizes software portability. A subsidiary of SofTech, Inc., Waltham, Mass., the company was formed in 1979 when it was granted the exclusive rights to license the Univ. of California, San Diego's (UCSD's) portable Pascal system, as well as to improve it. Today it has exclusive rights to license what has become the UCSD p-System in Pascal, Fortran, and BASIC. And Cobol will be added soon. Brackett called the p-System "the fastest-growing microprocessor software development system in use today, with more than 30,000 end users and dozens of microcomputer manufacturers and applications developers as customers."

> Applications programs written using the UCSD p-System can usually be moved from one machine to another without modification.

There are several approaches to software portability, said Julie E. Erwin, a vp at SofTech Microsystems. "One is to concentrate on the program, carefully designing it to reduce the amount that will have to be rewritten each time the program is moved to a new machine.

Another approach is to emphasize the language used to write the program, assuming that each machine can then be made to translate these programs into the appropriate, unique machine codes. Unfortunately, she explained, any sizable applications program will use resources of the operating system, particularly input and output, in ways that may be unique to the hardware for which it was written. Thus portions of the program may need to be rewritten if it is to be moved to a different system.

The approach used in developing the UCSD p-System was to provide a portable software environment. When the p-System is established on a computer system, it duplicates

"I (for once) was speechless."

-- Dave Mallery, March, 1981 issue of
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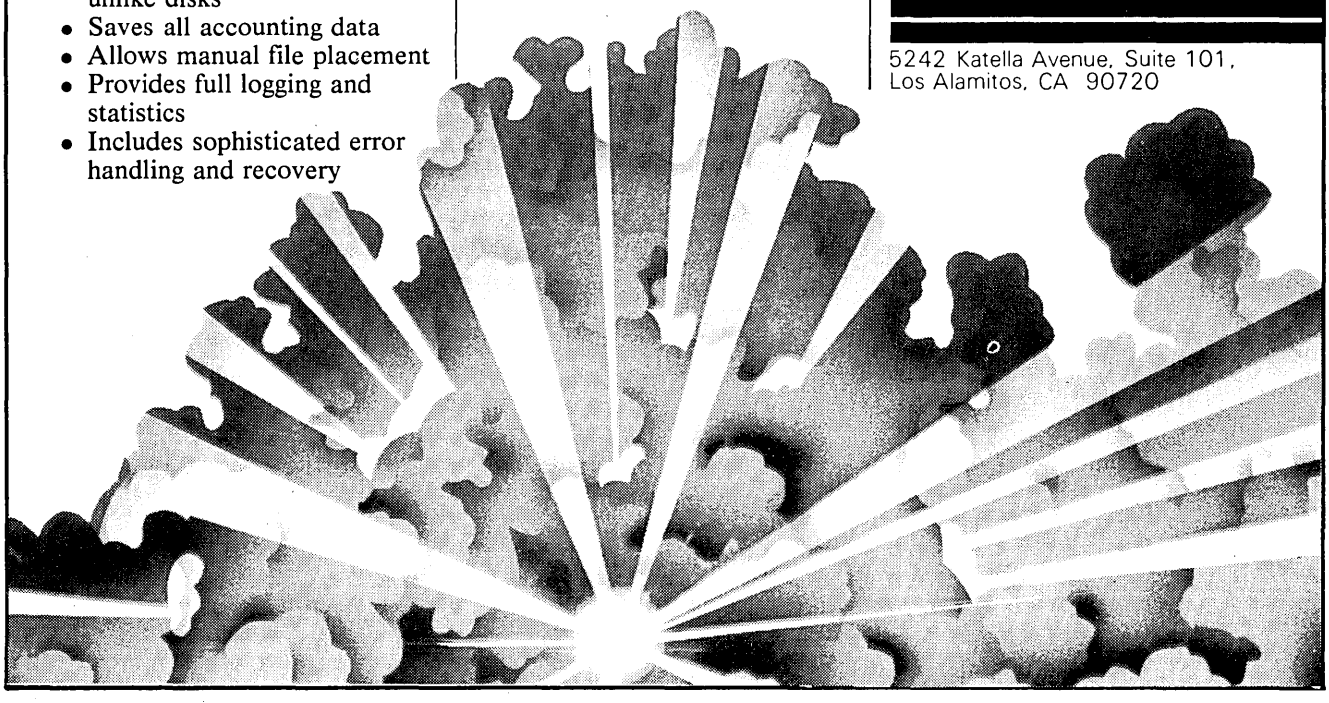


CIRCLE 39 ON READER CARD

all of the conventions of the UCSD p-System on any other computer system. Therefore, applications programs written using the UCSD p-System can usually be moved from one machine to another without modification.

Erwin said the UCSD p-System uses a hypothetical computer concept commonly called a pseudomachine, or p-machine. This p-machine is an idealized computer which executes a machine-independent pseudocode, or p-code. When an application program is written using any UCSD p-System language, the system compiles the program into p-code, appropriate for the p-machine, rather than into the machine code for the real computer being used. A p-machine emulator, a program in the native code of a machine, is provided for each real computer on which the p-System runs. When the application program is run, the p-machine emulator executes the p-code.

Another company selling portable language system technology is Language Resources, Boulder, Colo., a three-year-old firm formed by five people from Intel and the Univ. of Colorado. The company calls its major offering Language Resources Pascal, which it describes as a machine independent, retargetable, software development system for general use. Its hosts can be conventional computers or advanced microcomputers, and its targets can be conventional computers or microprocessors, say its developers.

The system has been made portable in much the same way, they say, as a Pascal applications software system can be made portable: it is completely modular; all basic system modules are written in the standard Pascal language; all functions dependent on the host computer design are in separate modules, and all functions needed for retargeting also are in separate modules. The system includes a Pascal compiler, a macro assembler, program library, other software development facilities, and an optional interpreter. The compiler translates standard Pascal into intermediate code for execution on microcomputers containing the interpreter, as well as into the native code of target microprocessors.

Because the system is completely modular, said Bruce Ravenel, president of the firm, retargeting for a new microprocessor takes only a few months. Rehosting takes only a few weeks. So, Pascal programs can be moved to new microprocessors almost immediately, using whatever host equipment is available in the future.

> By 1990, microprocessor software costs could constitute 90% of total system design costs.

Ravenel believes that "general purpose portable language systems should have been developed earlier. Had they been commercially developed when microprocessors began to be used in advanced applications around 1975, many of the problems of the 1980s could have been prevented." And he believes these problems are serious. "At the rate microprocessor software costs are soaring, they can increase from more than 50% to more than 90% of total system design costs by 1990."

And, said Gordon E. Eubanks, Jr., president of Compiler Systems, Inc., Sierra Madre, Calif., "applications people are the bread and butter." Like Language Resources, Compiler Systems is a firm spawned by the need for microcomputer software.

Eubanks' CBASIC also supports Digital Research's MP/M (a version which extends the facilities of CP/M to more than one user simultaneously and also gives access to very large disk files) and CP/NET (a Digital Resources operating system which allows many users to share expensive resources), and CPM/86 which supports the 16-bit 8086s. CBASIC also supports the Bell Labs Version (as well as others) of Unix and TRS/DOS for TRS-80s. Soon it will support Oasis, an operating system developed by Phase One Systems, Oakland, Calif.

Compiler Systems recently announced CB 80, a compiler it has been developing for more than a year, and one which Eubanks said "bypasses the usual pseudo compiler and generates direct machine code.

THE PROBLEM OF PROGRAM PIRATES

"I figure for every two licenses we issue for CBASIC, one copy is pirated," says Gordon Eubanks, Jr., president of Compiler Systems, Inc., Sierra Madre, Calif.

Eubanks, whose company is based on the licensing of CBASIC, a microcomputer language for business applications, was expressing a concern shared by many in the microcomputer software business today—a concern about program pirates.

One estimate has it that unauthorized copying has risen from economic insignificance to a problem that is costing the $200 million a year microcomputer software industry from $12 million to $36 million annually.

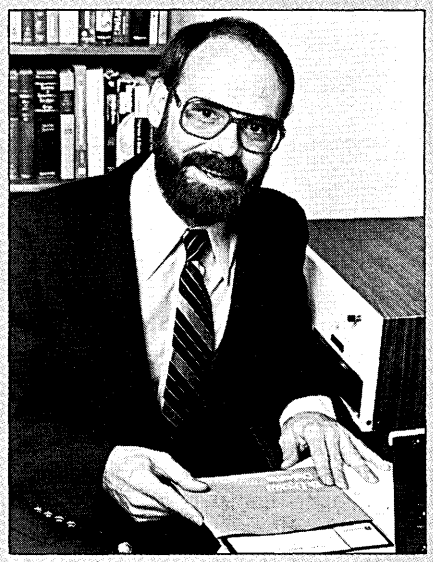
"They're (the pirates) stealing our R&D dollars," Eubanks says. "They're discouraging software development."

There are even programs on the market to make copying easy. "It's a problem of ethics," Eubanks complains. "A lot who do it (pirate programs) don't really think they're doing anything wrong. Some of them just share with their friends, but others sell."

He tells of a salesman for a reputable hardware manufacturer using a pirated software copy, seemingly unaware that there was anything wrong in what he was doing. Eubanks feels there is a big need to educate, "to make people realize that unauthorized copying of software is wrong and that it is damaging to the industry."

There are protections. There are hardware "locks" such as identification ROMs sold with the software. And there are the legal protections of copyright, trade secret, and patents. The last of these is difficult, at best, to obtain and the other two are hard to enforce.

The copyright area is particularly unclear and not well settled. In a case now before the U.S. International Trade Commission, Richard H. Stern and Jeffrey L. Squires, Washington, D.C. attorneys, argue that unloading of object code from ROMs is not a copyright infringement but is unfair competitive practice.



GORDON EUBANKS: "Applications people are the bread and butter."

The case involves an electronic game controlled by object code loaded onto a ROM. Its creator is alleging that a foreign competitor duplicated its ROM and put it into a competitive game that the company is exporting to the U.S.

In a 37-page brief, Stern and Squires make the case against this act being copyright infringement, but they conclude by urging the Commission "to protect American business from unjustified conduct, despite the technical shortcomings of the copyright laws."

It's a new industry with a new set of good guys and bad guys. There seems to be a problem in getting the roles straight.

—E.M.

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It really will be a multi-user product." CB 80 will run under CP/M initially but is expected to be available soon for use under Oasis, Unix, CP/M 86, and other operating systems.

Eubanks is a strong believer in encouraging applications programmers. "They're the people who can sell for us." His company publishes a directory of software vendors that market products written in CBASIC. Its latest version listed some 50 vendors with some 200 packages.

The firm also encourages applications developers to use its computer equipment for development purposes. "We make our equipment and our expertise available to them," said Eubanks. He said he believes that Digital Research is the only other microprocessor software firm offering applications programmers this kind of assistance.

> "The software crisis is the data processing industry's catch-all term for a complex of software obsolescence problems."

Eubanks sees programming veterans as a potential source for applications packages for the microcomputer market. "A cottage industry can be developed." He was referring to employed programmers who could moonlight to their advantage and that of the microcomputer industry.

"Something has to be done to promote software development," said Eubanks. He's got some ideas of what can be done within his own company. The firm has two facilities, one in Hawaii and one in Sierra Madre. The Hawaii facility is a house Eubanks owns and is used for development, "without distractions." He is thinking of leasing a larger facility in Hawaii to be used as a development laboratory to which he could attract people on a "year or two project basis." He sees Compiler Systems using it to get into applications tools "in a year or so."

The company listed by Creative Strategies as dominant in the microcomputer language market, Microsoft of Bellevue, Wash., has its own ideas about remedies for end user problems.

"New customers are not very concerned about the inner workings of the machinery but they are becoming very sophisticated about what they plan to do with it," says this company.

This, the firm believes, creates new demands in the marketplace, including a demand for end user systems software and one for operating systems software that can support as many levels of computer user sophistication as desired. The company defines end user systems software as "a layer of software between the user and the system that serves as a general purpose tool for one category of operations." An example would be operating software for word processing.

Microsoft has created a special branch of its new product division, headed by Dr. Charles Simonyi who moved to the firm from Xerox Office Products Div. where he was manager of advanced systems. Simonyi supervised the text editor project for Xerox's Alto office system.

The stated goal of his group is to provide end user system software products such as a spread sheet simulator, that are functional, easily-manipulated tools for new generations of computer users. Says Simonyi, "The user, of course, is concerned with an application, with problem solving. We want to provide the substrate."

Besides the lack of good microcomputer software applications packages, another problem is software obsolescence. Language Resources' Ravenel said, "the software crisis is the data processing industry's catch-all term for a complex of software obsolescence problems. It was caused by a slow advance in software techology during the 1970s, while semiconductor technology advanced rapidly. Software design, development, maintenance, and upgrading remained very time-consuming, while microprocessors and other new hardware devices drove down the costs of equipment and created a proliferation of applications."

Brackett of SofTech Microsystems doesn't believe the hardware revolution is going to slow down. "Hardware standardization is not very likely. We need solutions to keep software from becoming obsolete." ❋

PAIN AND PLEASURE IN GOING PUBLIC

The hot topic in the computer services community is: which company will go public next?

by Ralph Emmett

Leading software companies are beginning to cash in on Wall Street's recent "discovery" of the computer services business.

Suddenly, the main talk in the services community is: "Which company will go public next?"

Atlanta-based Management Science America (MSA) has just completed its first public offering. Software AG, based in Reston, Va., and Pansophic Systems, Oak Brook, Ill., are currently in the process of going public. And other software concerns, such as McCormack & Dodge, Needham Heights, Mass., are expected to follow suit this year or next.

While all of these companies have been viable entities for years, it's only now that they have found the ideal investment climate, say experts. Following the boom of the 1960s, the market over the last decade has offered little opportunity for computer services companies to seek public funds. But by the time Massachusetts-based Cullinane Database Systems Inc. ended the years of famine by going public in '78, a window to public investors had begun to open once again.

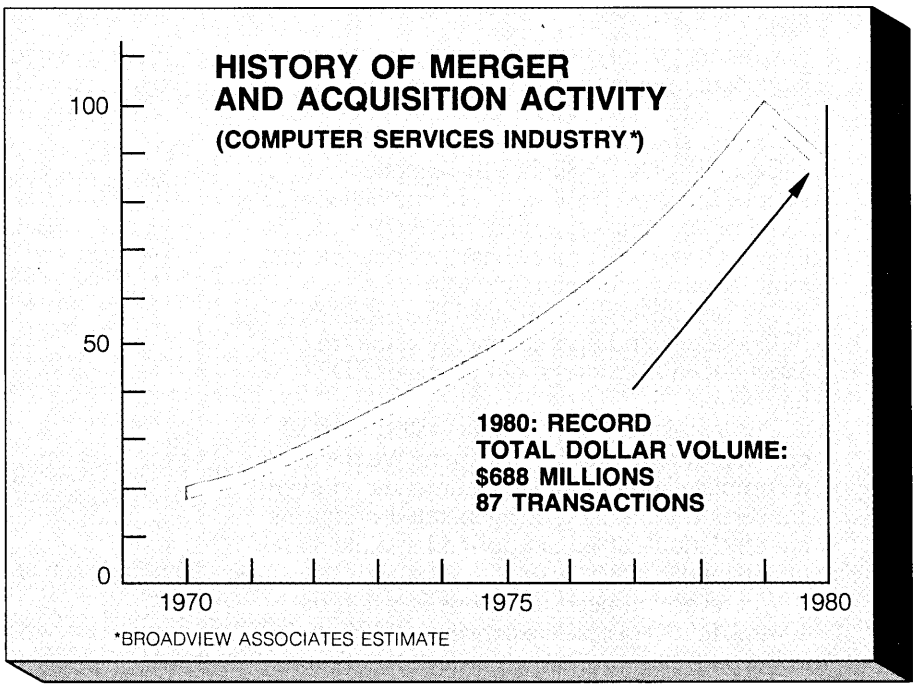

CHART BY BARBARA KRAUS

ILLUSTRATION BY ANDREA BARUFFI

Last year's big profile boost for the industry, not only among analysts but also across the general media, has put the seal of approval on this trend. Experts now tell us that the "time is ripe" for public offerings. Last year, according to the Association of Data Processing Services Organizations (ADAPSO), the index of computer services stocks advanced 106%. This group of 40 stocks easily outperformed the 25.8% overall gain shown by the various industry stocks on Standard & Poor's 500 performance rankings.

In addition, the average price/earnings multiple of these 40 services companies expanded significantly from 14 times earnings to nearly 25 times earnings over 1980, ADAPSO reports.

Software and services companies are lured into public offerings for a number of reasons. For those pioneers who put all their net worth into raising seed money to start their companies, it offers instant fluidity—real money for paper value. And for those company founders who want it, going public also offers the chance for a profitable exit from the business altogether.

"Most of us are in this business for the long term—not just to make a killing," says Frank Dodge, co-founder of McCormack & Dodge. "Though some are just looking to cash in—and it's nice to have that option—most software companies are really looking to the public for additional capital to meet growth requirements."

Dodge says there's hardly a software company of any significant size that isn't squeezed for cash right now. "The software industry is just growing so fast." He points out that an added bonus from public funding is one he's noticed in earlier offerings, like Cullinane and Shared Medical—the "added visibility" those companies earned from the experience.

That point is also made by George Grodahl of Broadview Associates, merger and acquisition specialists based in Fort Lee, N.J. "Going public has great PR value," Grodahl says. "In addition, it is a great endorsement for the company's marketing force. The whole experience is an exciting event that can stimulate the entire company."

> For those pioneers who put their net worth into raising seed money to start their companies, going public offers instant fluidity—real money for paper value.

Another key reason for going public is a little more subtle. "The company can use stock options as a lever for both keeping and recruiting key personnel," Grodahl says.

If, for example, the company plans to sell its stock to the public at 20 times book value, it can offer a block of the shares to its employees at book value prior to the public offering.

In theory, any services company could seek out an underwriter and try to reap the benefits of going public. But in practice, it's quite a different process. For one thing, underwriters have certain basic requirements these "hopefuls" must meet.

"We're looking for companies with the management, market niche, and size to reach $100 million in sales," says Richard Franyo at Alex. Brown & Sons, the oldest investment banking firm in the U.S. Alex. Brown & Sons is the underwriter for the MSA and Software AG offerings, and earlier handled such companies as Shared Medical and SEI when they went public.

But there is an even bigger stumbling block for the fledgling public corporation than this, Franyo points out. "The company should have a minimum $15 million to $25 million share base for a typical initial public offering of some $6 million."

And how does one reach this $15 million to $25 million critical mass? According to researchers, the average price/earnings multiple is 14 times to nearly 25 times earnings. That means that today's "prospect" should have achieved earnings of $1 million or more this year.

In the computer services business, pretax earnings are currently averaging out at around 10% ($950 million earned from a market currently estimated at around $10 billion

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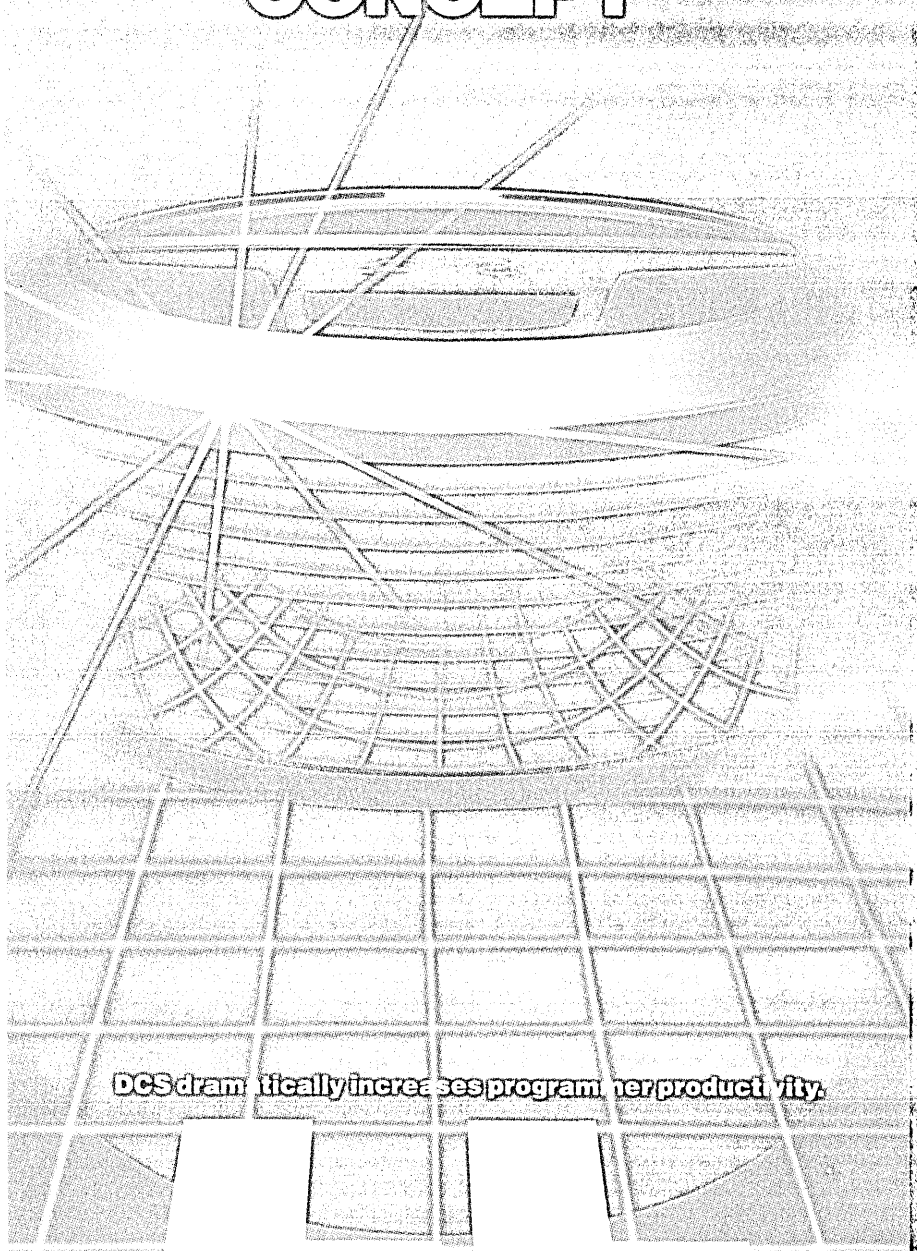

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in sales). So, to be earning $1 million, our hopeful would have to be turning over $10 million or more in sales this year to qualify.

As Franyo points out, only 150 companies in the whole computer services industry are presently registering such sales.

Experts note, however, that those companies which haven't yet grown to the top tier needn't despair. With the industry projected to grow from $10 billion to $35 billion by 1985, as ADAPSO estimates, there is plenty of venture capital around.

"Banks are showing themselves willing to lend at favorable rates to those services companies with lower p/e multiples, say 10 to 15 times earnings," says one observer.

According to Franyo, this option is a good one because of the speed with which a company can get money. "When it all comes down to the bottom line, running your own private company is still the best tax shelter."

Another advantage to going it alone, claims Steve Elias who heads up acquisitions strategies for Itel Corp.'s commercial operations, is the "total independence it gives you."

"You might think that after you go public by selling 10% to 30% of your stock that you still remain in control," Elias says. "But are you really in control?"

He points out that the public company immediately runs into a welter of SEC (Securities and Exchange Commission) regulations. "You've got 8K monthly reports to fill out if something significant happens. There's your annual 10K report disclosing your most inner secrets to the entire world. Then, of course, you'll have to contend with the quarterly 10Q, a little mini report of private things. And finally, that old bugbear, the annual report—salaries, insurance benefits, perks, etc., etc., out for public scrutiny."

> "The company should have a minimum $15 million to $25 million share base for a typical initial public offering of some $6 million."

Elias adds that there are other regulations relating to the buying and selling of stock which crimp management's control even further. Then too, he says, there's the matter of management being niggled by seemingly silly and unexpected things. "Like the calls that one executive kept getting from a new shareholder with 10 shares who complained that the company's exhibit stand at a recent show had been untidy."

"The public often makes a poorer parent than a multinational or big corporation," Elias claims.

He contends that a parent corporation can be capricious, arbitrary, and demanding. "But in each case, the public is more so. A parent can be talked to and a capricious decision changed. But the public is harder to address and takes a lot longer."

Elias adds that though both "parents" require specific performance on a continuing basis, the public is less forgiving when things go wrong. "They are less prone to accept 'R&D quarters'," he jokes.

But assuming that a company opts for control by the public, there are still more concerns beyond the p/e multiple and share base. Experts point out that the firm must have its house in order—and that, for some companies, could mean putting in place their first real management structure.

"Software companies are usually built around one or two entrepreneurs," says

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one software executive, "and simply aren't organized to go public." An example, he says, is the company built up by John Cullinane, which he originally planned to take public in 1974. "But Mr. Cullinane wisely held off until he'd built an organization around him."

Software AG even put in place a whole new board of directors before its recent public offering, observers point out.

Other housekeeping chores a company may need to do could include cleaning up its arrangements with other companies and even smoothing out earnings. "Remember that everything will go in the prospectus, so you have to be a tight ship to float well," comments one consultant.

McCormack & Dodge has been widely expected to be the next link in the string of public offerings. "But this won't happen," says Frank Dodge. "We've looked into it, and we've decided to wait." He concedes that now is certainly the time for "hot issues," but says his company's not quite ready. Maybe next year.

While Dodge wouldn't elaborate on what he meant by not being "ready," sources say that he and co-founder Jim McCormack may want to let out the reins a little on the company and perhaps put in a new management team.

If these arguments against going public aren't convincing and you're still gripped by the lure of an offering, the folks at Alex. Brown & Sons offer one final piece of advice: "If you are contemplating an offering next spring," says Franyo, "get to work early."

"You'll need to start talking to an underwriter in the fall, and put your own team together in December," he says. "Then by next February, you would need to be doing your 'numbers'."

"You definitely will need a good national accounting firm to audit the numbers," Franyo adds. "There is a tremendous variance between computer services companies in such things as bookings, sales, purchasing products, and writing off R&D. In many cases, completely new accounting procedures will have to be imposed *before* the company can go public."

Franyo also advises picking an experienced banker for what he can do for you after the deal. "And you definitely will need an SEC-oriented legal counsel to clean up your minutes and your charter," he warns.

When the whole package is ready, and one month before the date of the offering, the budding public corporation must file with the SEC.

If you're still eager, remember one more thing—with or without an offering, the whole process will cost you a bundle. Legal, accounting, and printing fees could run anywhere from $150,000 to $250,000.

Happy offering! ✻

AN EXCEPTION TO THE NORM

While the services industry as a whole strives to eke out a mere 10% pretax profit on sales, Cullinane continues to more than double that margin.

by Ralph Emmett

On balance, there aren't too many negative things you can say about Cullinane Database Systems Inc.

The Massachusetts-based company is so successful that, in the words of one observer, "It's almost boring."

Once again this year the company will have exceeded its (admittedly) conservative target of 20% to 22% pretax profit on sales. (This is more than twice the average pretax percentage for the industry.) The bottom line is that Cullinane will register a $6 million profit on some $28 million in sales.

What's more, at a time when the average revenue per employee sits at $40,000 a year, Cullinane is managing in excess of $80,000.

Other facts are even more incredible. This relatively small 350-man company went public in 1978—the first software company to do so in 10 years—and now has a book value of $200 million!

Since putting together its initial seed money of $500,000 in the late 1960s, the company has had no debt. And now, according to senior vp and number two man, Robert Goldman, the company has $22 million in the bank—close to 1980's total turnover!

So how did Cullinane get to be one of the most financially successful software companies in the nation?

"There's no big secret," says Goldman. "You just have to know yourself and know your market."

Knowing yourself has long been the domain of the company's founder and guiding light, John Cullinane. Though clearly a leader in his own right, he prefers the "family" approach, say colleagues. An example of this came just before the company's public offering when Cullinane offered all his employees 20% of his holding at book value to increase employee incentive and company identity.

To maintain balance, and perhaps because the company carries his name, Cullinane tends to take a back seat, associates say. "He prefers to let his staff express what Cullinane (the company) stands for by the way it performs," says Goldman. "He's always been very liberal and very fair."

Goldman himself is known within the company as "The Brain," and he seems to

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ROBERT GOLDMAN: "We were the first company that formed to sell software products exclusively."

have a reputation for clear and incisive thinking.

"It really all comes down to common sense and careful positioning," Goldman says.

He notes it is not by chance that the company sits squarely in the middle of the fastest growing sector of the software business—packages. "We were the first company that formed to sell software products exclusively."

Nor is it by accident that the company has positioned itself in the commercial marketplace where profits are highest, rather than in the government, quasi-government or regulated market sectors where profits are lowest.

Two of the industry's "giants" provide a good example of this. According to 1981 estimates from Wall Street analysts at Salomon Brothers, Computer Sciences Corp. will only manage a 9% pretax margin from $600 million in sales. ADP (Automatic Data Processing), in stark contrast, is expected to post a 16% pretax margin on comparable sales of $560 million. Unlike ADP, which mostly sells standardized products to the commercial sector, Computer Sciences has three-quarters of its customers in the lower margin government area.

"This accounts for the difference in profitability," says Cullinane's Goldman.

Another point to note is that there is less competition in the commercial sector. "You get more chances to choose your customers and define your market," Goldman explains.

According to Cullinane, you can even do this when the market for your product begins to reach the saturation point. And this is what happened with the company's bread and butter software package, IDMS.

This product was launched in 1973 as the first Codasyl database management system (dbms) for IBM computers. By the late 1970s a number of other competitors had joined in, selling head to head against IBM. The market was getting crowded.

"We took a good hard look at the nature of database software and we decided our marketing approach was wrong," admits Goldman.

"It's important to realize that customers only buy a dbms so they can develop applications more easily," he said.

Though a customer might buy IMS, System 2000, IDMS, or any other dbms package, what he is really looking for is something that will integrate the dbms into his setup and which will drive new applications in an on-line environment.

Cullinane had already developed such a tool in its Integrated Data Dictionary (IDD), as well as other software aids for easy access and security, says Goldman. "But rather than basing our marketing thrust around this, we were still pushing our dbms against someone else's dbms.

"So two years ago we began asking IBM's users whether they had a dictionary for control, or if they had report generators, or a query system, etc." The answer was a resounding no. "What they did have," Goldman says, "had all been written by other users, not by IBM. And it didn't work well with IMS."

The net result of all of this is that Cullinane has managed to redefine both its product and its market so that at this time the company is largely competing with itself.

This push into being an applications-driven company also shows great foresight for another reason, say observers. IBM and other computer manufacturers have begun to integrate dbms functions into their general purpose mainframes. Examples of this are IBM's System/38, Hitachi's VOS/3, and Fujitsu's OS IV/F4 system.

> It is not by chance that Cullinane sits squarely in the middle of the fastest growing sector of the software business—packages.

According to one study by Strategic Inc., San Jose, by the middle of the 1980s, the dbms will be just an operating system function sold with the machine. By that time, those software companies that have planned ahead will be positioned to sell applications packages to these machines.

The trend is there at Cullinane. Recently the company spent some $1.1 million of its cash hoard to buy a manufacturing applications package from the Rath & Strong consulting firm in Boston.

The purchase of databank companies to add even greater applications width can also be expected from Cullinane over the next couple of years, Goldman confides.

Another area where the company will spend heavily is on new data centers to build up its on-line service and support operation for all the applications software in the field.

The next result of the company's "conservatism" and anticipatory actions is that it can now do all the things that other "smaller" software companies cannot do—usually the things needed to survive. A program of significant acquisitions, broader marketing, economies of scale, and increased financing are now all comfortably within the company's span, say observers.

Another bonus for the company in the years ahead is that its management should be spared the frustrations of takeovers it doesn't court. "After all," says one observer, "a $200 million splash would be a strain on anybody's pocketbook." ✲

FEDS FIND SOFTWARE THE PROBLEM

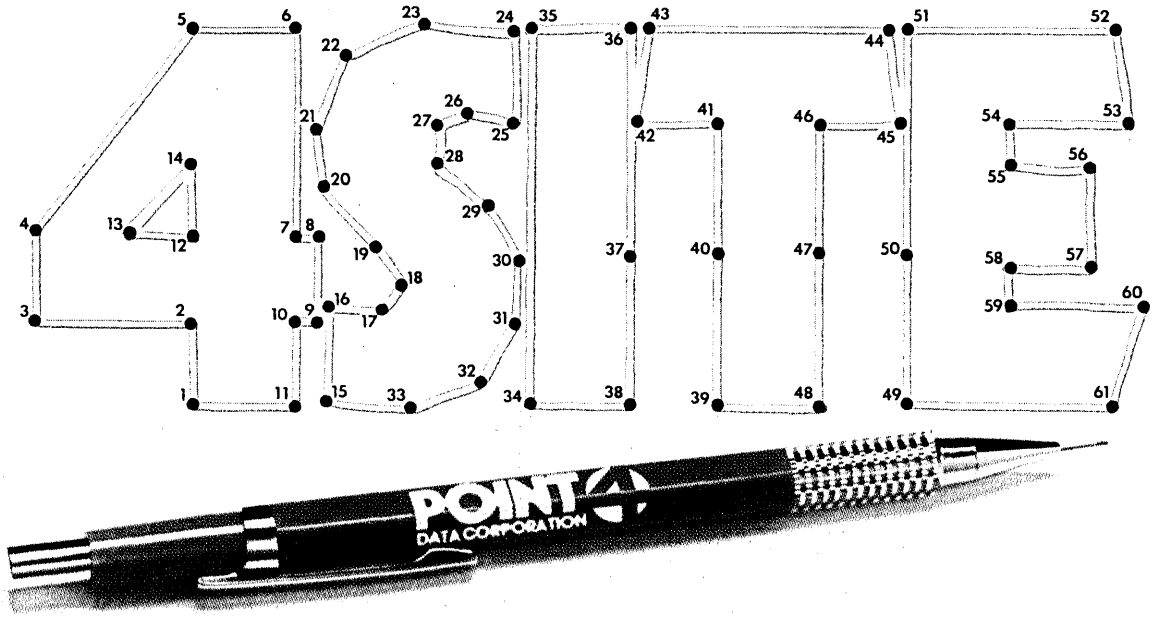
Two-thirds of all federal edp spending is for software and related services—but seldom is it money well spent.

by Willie Schatz

It was a typical series of government software development contracts. Nine, to be exact, the benefits of which were to be scattered among several agencies. Projected cost: $3.7 million. Projected development time: 10.8 years.

That was before buyer and seller began. They did double time to the finish. Combined cost: $6.7 million. Combined development time: 20.5 years. Usable software: 50 percent. Usable as delivered: $119,000 worth.

"That happens all the time," acknowledges Frank Carr, commissioner of the General Services Administration's Automated Data and Telecommunications Service (ADTS). The figures, released in a recent General Accounting Office report entitled "Government-Wide Guidelines and Management Assistance Center Needed to Improve ADP Systems Development," were confirmed by Carr at the last meeting of the Computer Law Association.



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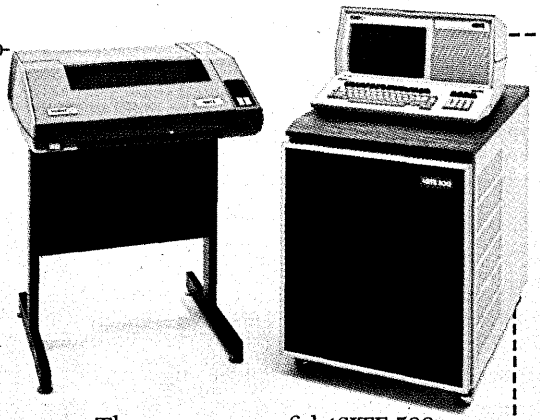

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Budget cuts may have gutted some parts of the government, but software investment is hardly hurting for cash. Two-thirds of all federal ADP spending is for software and related services—an estimated $25 billion a year. But only one-third of those funds is spent developing new software; the remainder is used for maintenance and conversion. "We are frequently offered the opportunity to perpetuate the errors of yesterday with the technology of tomorrow," Carr admits.

It was not always thus. A long, long time ago—perhaps a decade, give or take a few years—the public sector's ADP inventory and acquisition methods were standards for private industry to emulate. Not in these times, although some observers maintain that the private sector has no reason to pat itself on the back either.

"In the federal government the tendency is to think the problem is the acquisition process," Carr says. "If you speed it up—which means sole source contracting to the incumbent—then everyone thinks their troubles will be over. They don't realize that their difficulties will have just begun."

In more than 60 reports in the past 10 years, GAO has identified management weaknesses in the design and development of large, complex federal dp systems, which it says have led to the waste of more than $300 million. And that's just for 10 systems. For those taxpayers wondering where their dollars went, GAO has three answers: no fully defined or standard structured framework for managing systems development within the government; lack of sufficient and effective top management involvement and direction and a strong central office to facilitate agency-wide planning, coordination and control of ADP resources; and top managers who lack the required knowledge and expertise to effectively control systems development.

> The situation has improved slightly with the establishment of the Office of Software Development.

The situation has improved slightly with the establishment of GSA's Office of Software Development and the institution of information resources management (IRM) as a mandatory government concept (June 1981, p. 71). In addition to the IRM requirement from the Paperwork Reduction Act, that piece of legislation also established an Office of Information and Regulatory Affairs within the Office of Management and Budget and commanded each agency head to appoint a "senior official" responsible for all information activities within the agency. That official will report directly to the agency director, thereby purportedly giving some direction to the agency's information—and software development—policy.

The first dollar has yet to be authorized, however, for a chartered, federal ADP service center which GAO recommended be developed in a 1979 report to Rep. Jack Brooks (D-Texas), chairman of the House Government Operations Committee. "What we see as most desirable is to create a new federal ADP service center reporting to the Director of OMB and financed by the ADP fund," GAO wrote in its management assistance center report. The center would assist agencies in planning, designing, and acquiring ADP systems, independently review and evaluate agency ADP plans, and assist OMB and GSA by providing independent assessments, suggesting alternatives, and validating requirements and economic analyses for major information system budget and acquisition proposals.

"That's a bad idea," says Carr, whose Office of Software Development, begun in April 1980, is responsible for the software exchange program and for assisting agencies through language compiler validation and conversion of computer systems and software.

"It's unnecessary right now," Carr insists. "And why did they suggest putting it in OMB? That's a weird place for it."

Perhaps the man knows whereof he speaks. There has been no rush in the legislative and executive branches to break ground for the center. GAO's suggestion probably will meet the same fate as many of its others—death by being ignored. Shortly after lobbying for the center, the agency, bloody but unbowed, issued another report which demonstrated that the failures in systems development and acquisitions always come home again.

At least $1.3 billion per year is being spent on maintenance of the government's software inventory, according to GAO's calculator. The agency described that maintenance as "largely undefined, unquantified, and undermanaged." To prove its point, GAO visited 15 federal dp installations and surveyed more than 400 others. It determined that COBOL applications programs last an average of 5.4 years, FORTRAN programs an average of 4.8 years, and the life of the oldest application programs at responding sites an average of 9.4 years. GAO found inconsistent definitions of maintenance within one agency, lack of sufficient information given to management, an absence of cost records, goals and standards, and failure of management to obtain a comprehensive picture of its installation's total software maintenance.

"Without such a picture, it is impossible to measure performance," GAO concluded. "If performance cannot be measured, poor utilization of resources can go undetected for long periods, resulting in failure to meet objectives." It recommended that GSA and the National Bureau of Standards develop government-wide standards for defining and measuring software maintenance, particularly in terms of cost.

Even GSA has joined the fray. In an attempt to stem the all-too-familiar cost overruns and delays on software development contracts, and possibly allow agencies to sometimes get what they need as well as want, GSA two months ago promulgated new regulations implementing specific requirements for contracting and telling agencies to

> The first dollar has yet to be authorized for a federal edp service center, which GAO recommended.

ensure that "the major portion" of their overall systems engineering budgets are awarded on the basis of fixed-price contracts for specified fixed products. "Only in unusual situations" should more than half of an agency's budget be contracted for on a cost-reimbursement basis.

"That means the government is going to have to be more precise in what it wants, more diligent in stating its requirements, and more disciplined in monitoring," explains Joe Petrillo, a government contracts attorney for several leading computer clients. "They're really saying to the vendor, 'we haven't been able to do this ourselves, so you do it for us.' They're trying to thrust more risk on the vendors, which may not be a bad idea in the long run if they do it slowly so vendors can adjust. If they do it quickly it will only be good for the lawyers."

"The regulations are pretty well done, but they reflect a naivete that software can be done on a fixed price basis," says Terry Miller, a leading procurement specialist. "Fixed price can only be done if the government knows exactly what it wants. It's good for five percent of the contracts, but for the rest it's absurd. If you force a vendor into a fixed price, he has to cut corners. If you don't have tight specifications, he'll give less than you asked for because he won't be around tomorrow if he doesn't.

"Everything GAO says is true, but it's no better when it buys for itself. Neither side understands the procurement system. The government has unrealistic expectations, and the vendors don't understand which risks to take and which not to take. It's like two blind gladiators slugging it out. The problem is that the procurement system is difficult to begin with and software doesn't really fit into it. But there's nothing in it now that can't work. It just takes superstars."

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CIRCLE 55 ON READER CARD

ply. With college computer science graduates starting at $20,000 when they take off cap and gown, who wants to waste away in mid-level ADP jobs in a monolithic agency? Most government software shops are terminally in arrears; their personnel is overworked, underinformed, and unable to take time off to attend conferences or shows that might update their mental, if not physical, states. Even with exceptionally skilled technicians, conversion comes slowly when one is trying to interpret a program written seven years before. It's hard to think five years ahead when you're constantly five years behind.

"All the proposals are vendor-driven," says Dan Brooks, secretary-treasurer of the Computer Law Association. "The unsophisticated folk in the government get caught up in state-of-the-art rather than what they really need. So they buy Cadillacs when Fords would be fine."

"There are periods when an agency gets it together for a year or two, then the guy responsible for it leaves," Miller says. "Still, it's better than it was five years ago. I don't see private industry doing that good a job. The worst ones there are worse than any government agency. On the average, the government compares favorably."

No way, insists GAO, which recently wrote that "in far too many cases, sound management principles were not followed and systems were not successful. Inadequate management controls and planning were primary causes of failure in these ADP system development efforts and these failures wasted hundreds of millions of dollars."

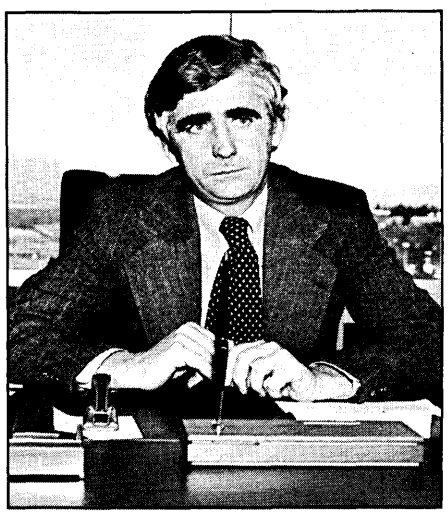
"You've got to address the long-range software problem," Carr says. "Then you can address the immediate problems. Too many managers get diverted from long-range planning, and then it's someone else's problem in three years. Finally there's a recognition that software is where the problem is. We're getting people turned around and looking at it." ✻

BODY SHOPPING IS BIG BIZ

Troubled by a shortage of programmers, users are turning more and more to professional services companies.

by Edward K. Yasaki

When a company outgrows its facilities, it does not employ its own personnel to construct an office building or a new factory. Instead it relies on architects and construction companies to provide that service.



PAUL CONNOLLY: "Most of the professional services companies are now coming to the realization that they have to start training people."

It's a more economically viable way to do project-oriented work, says Paul J. Connolly, vice president and general manager of the Professional Services Operation West at Informatics Inc. Professional services is the name applied to the supplying of programmers and analysts to work at users' sites. And Connolly likens his business to construction work, saying they're both project-oriented.

Users are being troubled by a shortage of programmers, the high salaries they command, and the high rate of turnover among them. What's needed are people who will stay on a project until it is completed. And here the professional services company offers more stability.

Thus, while the construction business has been slow in recent years, the professional services business has been booming. According to researchers at Input, the Menlo Park, Calif., research organization, spending for outside software services grew by 27% in 1980 over the previous year, reaching almost $3.5 billion. And the number of companies engaged in professional services grew to almost 1,000.

One of them, Computer Task Group Inc. of Buffalo, N.Y., finds this business growing at upwards of 40% a year. The company's Jack Courtney says it is forecasting total revenues this year of some $35 million, of which $30 million will come from professional services. The company, which has some 650 people engaged in this activity, focuses its marketing activity on the largest corporations in manufacturing, banking, and other industries. And it finds that at a typical client company, from 10% to 20% of the programmers are from the outside. But Courtney adds that this figure varies all over the ballpark. There are not many places where the figure is higher than 25% or 30%, but many companies have no outside personnel.

Informatics' Paul Connolly does not disagree with this observation, but he sees the figure moving to a 50-50 ratio by the end of this decade, saying that basic economics will force the move. "There are a fair number of organizations that I think are getting close to the 25% figure in the use of outside services right now," he says. This is only in the large corporations, such as banking firms. Some use a single outside services company, others use multiple sources.

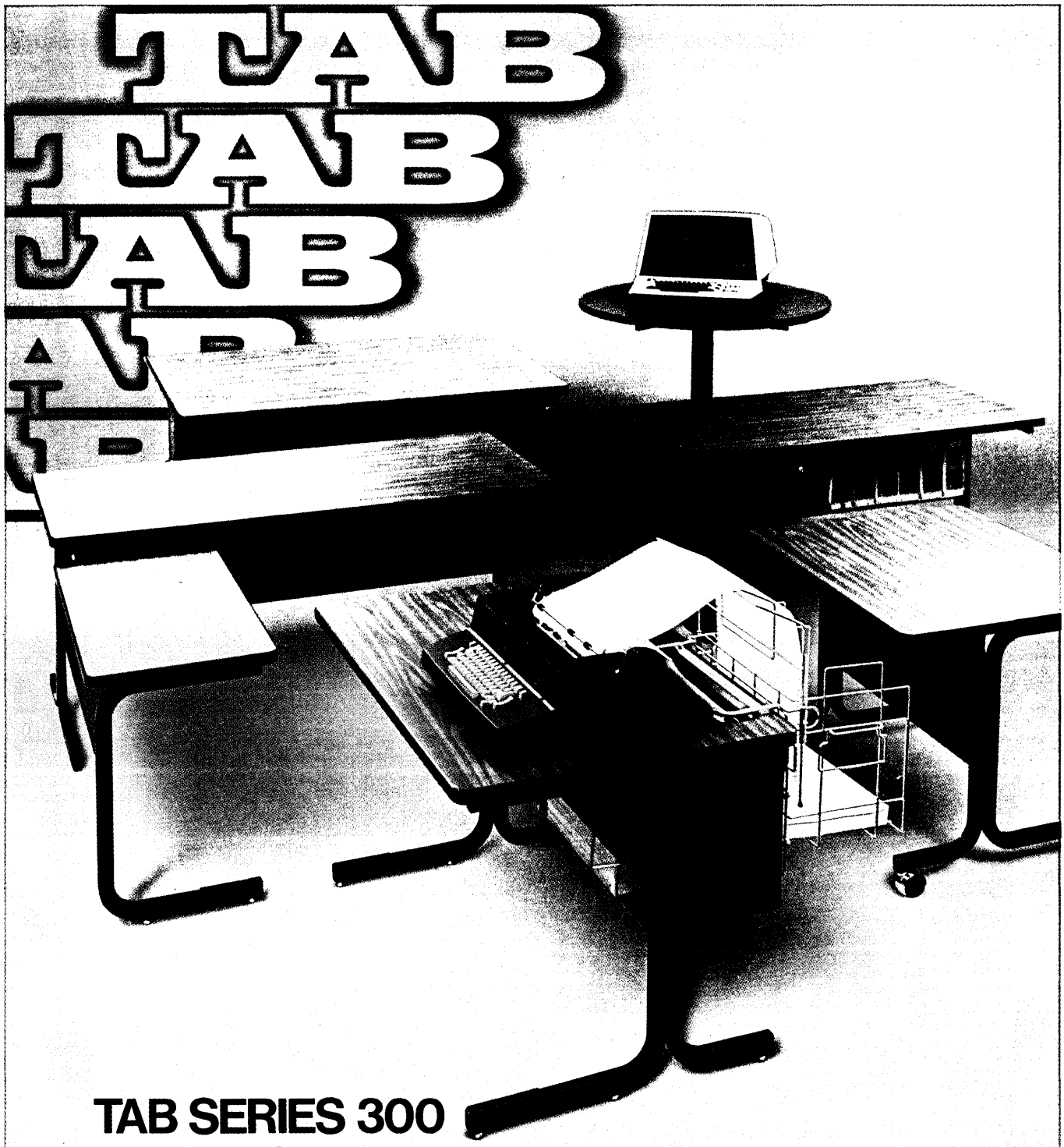
Connolly thinks it makes sense to rely on multiple vendors, adding that the availability of numerous sources is "absolutely necessary if this growth is going to take place." If there's a good, strong services industry providing the choice to user organizations, he believes, then the shift to outside services will take place faster.

While people such as Connolly and Courtney talk only about large companies and governmental units, the use of professional services is not restricted to the nation's largest firms. It just turns out to be more economical for them to target such users, rather than going after a contract to provide one programmer or analyst for one month to work on a small computer. And while Computer Task Group does no government business, Informatics has been heavily involved with the government, having recently ended a major 13-year contract with NASA. But Connolly says state and local governments also see the appeal of using outside personnel and cites the case of a northern California county that recently stopped hiring inside programmers, choosing instead to rely on contractors. Universities, too, are said to be among client companies, both state campuses and private institutions like Stanford.

> Input says spending for outside software services grew by 27% in 1980 over the previous year, reaching almost $3.5 billion.

Some of the professional services companies have begun to specialize in applications for a specific industry, like banking, according to Vince Hamill of Input. Paul Connolly confirms that some groups specialize in IMS or in CICS for IBM users and that a few specialize in accounting applications, for example. But he says in this respect the analogy of the construction company is not a perfect fit; you don't find companies with their particular niches. "Not yet," he adds. "Maybe by the end of this decade."

Until now, the client companies have insisted on retaining management responsi-



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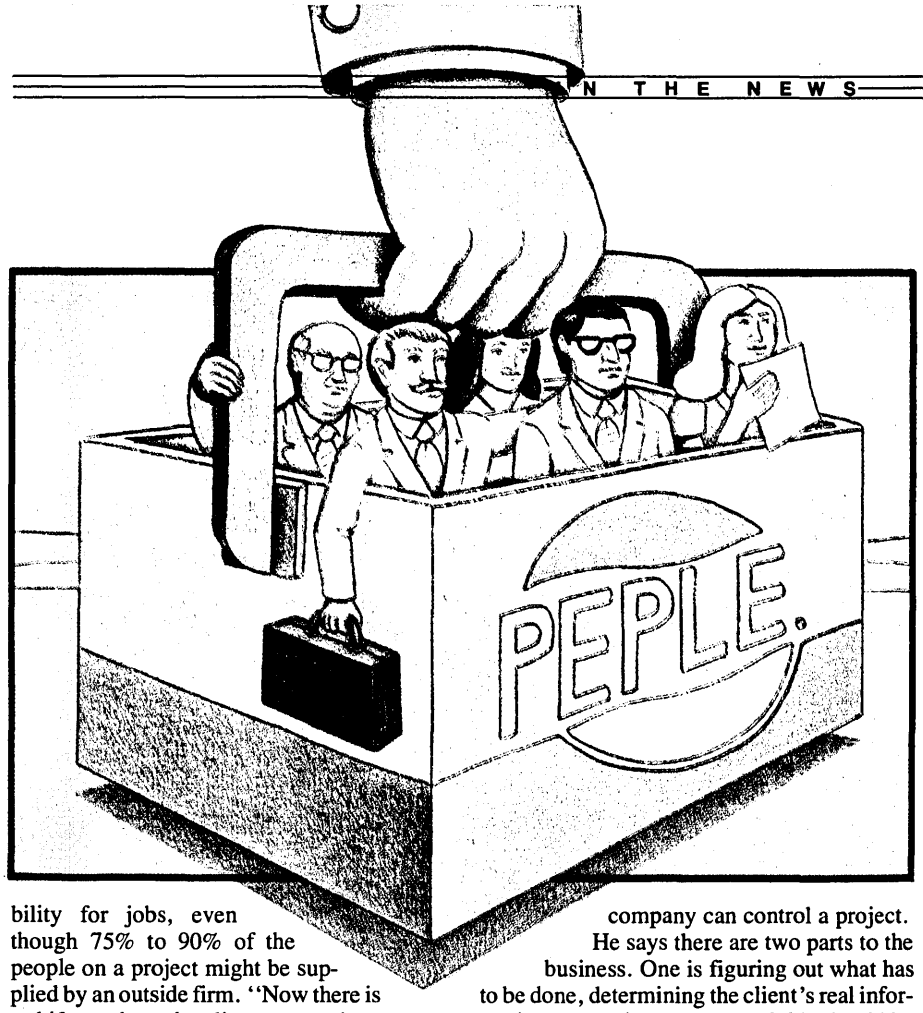

CARTOON BY FRED JACKSON III

bility for jobs, even though 75% to 90% of the people on a project might be supplied by an outside firm. "Now there is a shift to where the client companies want to give project responsibility to the software company," observes Connolly. This suits him fine, says the Informatics exec, for he needs an upward career path for his employees who want to grow into management positions. Besides, professional service companies are beginning to develop a stronger opinion on how a project should be run. A company might train its people to do things a certain way and if the client is managing things and has the software company's people doing things differently, friction can develop.

Computer Task Group's Courtney agrees. "We feel it's an additional service we can bring to the client," he says of the management responsibility. "Secondly, it allows us to have more of an influence on the mix of people assigned to the project."

> What is holding back the growth of the professional services business is the same problem facing the user community—the shortage of skilled, qualified programmers.

Connolly notes, too, that the industry has matured to the point where users are not insisting on a fixed-price contract. He says a client is willing to settle for a time-and-materials contract if the client can be shown a way of reporting costs, budgets, how the money is being spent, how much progress is being made on a project, and how well the software company can control a project.

He says there are two parts to the business. One is figuring out what has to be done, determining the client's real information processing needs—and this should be done by the client. But taking a preliminary spec and turning it into a detailed spec, implementing that system, getting it tested—he thinks the professional services industry is stronger at that.

Over at Computer Task Group they recently surveyed their client companies and found that about 60% of the work being done was maintenance programming, not only in finding and removing bugs but more in enhancing existing systems. Thus it would behoove the industry to learn how to build systems with better maintenance capabilities in them, systems that require less maintenance. And Informatics' Connolly believes this is a task cut out for the professional services industry. "The guy who learns how to do it best in our business is going to have a billion-dollar business by the end of the decade," he says.

All ideals aside, however, the fact remains that what is holding back the growth of the professional services business is the same problem facing the user community. And that is a lack of skilled, qualified programmers. "Most of the professional services companies are now coming to the realization that they have to start training people," says Connolly. And this is what the large vendors are doing. Computer Task Group is said to be spending about $2 million a year on the training of its personnel, both in the enhancement of existing skills and in the training of newcomers to the field.

But it is thought that by the end of this decade there could be a big export business in professional services, in which professionals would be sent to developing countries. Already Informatics has undertaken a job in San Francisco for software that is to be installed in Brazil. While the Japanese have begun using programming teams in Taiwan and in Korea for jobs assigned from Japan, Connolly doubts whether the market is quite ready for that. "Right now the psychology of the buyer is that he wants it done at his site." The reason, he adds, is that few people know how to write the specifications in adequate detail and organize the work properly to allow its implementation at some distant location.

It brings Connolly back to the construction work analogy. He talks of that industry's development of standards, materials, and tools by which to get the work done, and says the information processing industry must do the same.

"Instead of laying down code one line at a time, I think we're going to learn how to build reusable modules, very small functions that are the equivalent of a 4 × 8 foot piece of plywood, and be able to put systems together much more quickly and at lower cost in the future. And we have to develop better materials and better tools for putting systems together." He thinks some of this work is being done by the professional services industry, observing that Informatics has proposed to a large user the development of a reusable code library. Hopefully, it could reduce significantly the amount of programming effort now being expended. ✱

UNIONIZATION OF DP DEPARTMENTS

Like it or not, a number of dp departments are being forced to become dues-paying union members.

by Jan Johnson

Coerced but not controlled. That is how the programmers and analysts at Western Air Lines Inc. have emerged from their precedent-setting bout with forced unionization.

"We've got a contract, but it's basically a skeletal agreement with nothing in it," said Jim Carolan, director of data processing planning and passenger/flight control information systems and a 13-year veteran of Western's dp department.

The contract is actually part of the overall agreement negotiated between the company and the newly-installed independent employees union, ATE (Air Transport Employees). It was negotiated separately with management by the labor relations department specifically for dp.

"The agreement gives us all the flexibility we need to do our jobs," said Carolan. "There are no fine lines that say an analyst can't pick up a coding sheet. There are no fine lines that say a senior programmer must be given an assignment before a junior programmer. There are no things that say you are promoted to the next level based on seniority. There is no time clock, no provisions for overtime, and the firing policy has not been changed.

"The situation from the department's point of view is unchanged. We are allowed to continue to function as we have always functioned," Carolan concluded.

But for other dp departments in the airline industry, the situation has most certainly changed, say some labor experts. A precedent has been set by the supreme ruling body of the labor world, the National Mediation Board, which proclaims that programmers and analysts at Western do indeed belong to the clerical office craft and class. And they didn't just now become eligible; they always should have been there says the NMB. This decree came as a shock to many at Western and the ATE union, both of which testified against including dp professionals in a clerical union.

After Western's dp department learned of the decision, 12 to 15 people out of 110 left the department within a three-month period, recalled dp director Carolan. If that rate had continued over a 12-month period, he figured, "we would have had a 40% turnover rate for the year." However, not all of those departures can be attributed to the unionization issue, said Carolan. "The same day we got the news about the board's decision, the head of dp lost his job, for completely unrelated reasons," explained Carolan, who became acting head for the interim.

Now, almost a year later, the department's turnover has settled down to about a 10% level, which is a more normal rate when compared with the estimated industry average of about 15% per year.

Several dp managers in the airline and railroad industry believe there would be massive turnover in their departments if a union came in.

"I feel pretty certain all the people in my department think of themselves as professionals and identify with management because of the type of work they do. Many people have said they would quit if they had to pay union dues," said one dp manager with a midwestern railroad. "Whether they really would quit remains to be seen," he added.

Another dp manager with a midwestern railroad believes it would be difficult to hire people into a union shop. "I can't call it resistance, but I would say there seems to be some reluctance to get involved with a union shop."

Asked if unionizaion might change the way people move up into management, he replied: "I'm sure it would change, but I'm

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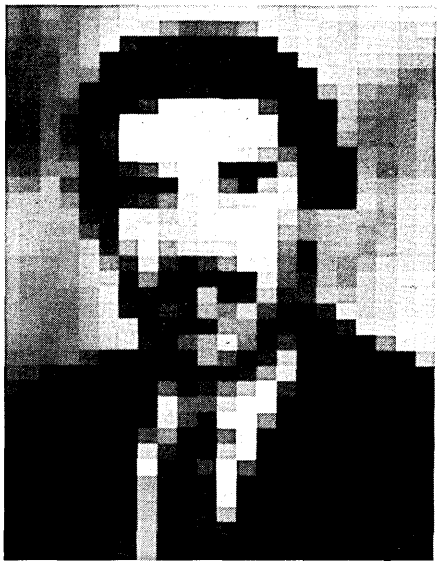

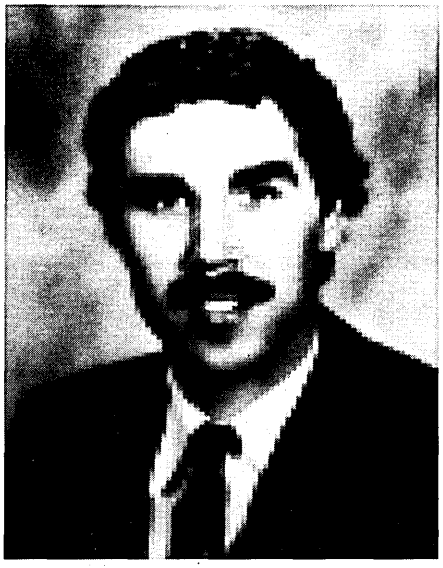

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not sure how. It would depend on whether programmers and analysts would be part of BRAC (Brotherhood of Railroad and Airline Clerks) or some other union. I guess it might depend on the type of organization they were part of."

"No one has any idea why they (the NMB) included the dp department as part of a clerical union," admitted Fran Norris, president of ATE local #3, the local which represents the dp department. "They were not a part of the craft and class covered by the previous union, BRAC. They simply were not union employees; they were not contract people."

Never mind what was or what should have been, once the mediation board has spoken there appears to be no route for appeal. "They cannot vote themselves out, it's not allowed. They had no choice, no place to appeal. Now there is no way out," is how Norris explains dp's plight.

The reason the question landed in the lap of the NMB had more to do with a power play between two warring unions than with the issue of who belonged where. The right of the Brotherhood of Railroad and Airline Clerks to represent Western employees was being challenged by upstart ATE, a group of seven former BRAC union officials who formed their own independent union. In a last ditch effort to stall for time and sidetrack ATE's takeover attempt, BRAC challenged that other groups, such as the dp department, were entitled to union representation. Thus, ATE needed dp's vote of support to win the war.

> The National Mediation Board ruled that programmers and analysts at Western Air Lines belong to the clerical office craft and class.

While BRAC won the question of who was to be included, it lost the war to ATE. Forced by the mediation board to join the union, the dp department voted to support ATE.

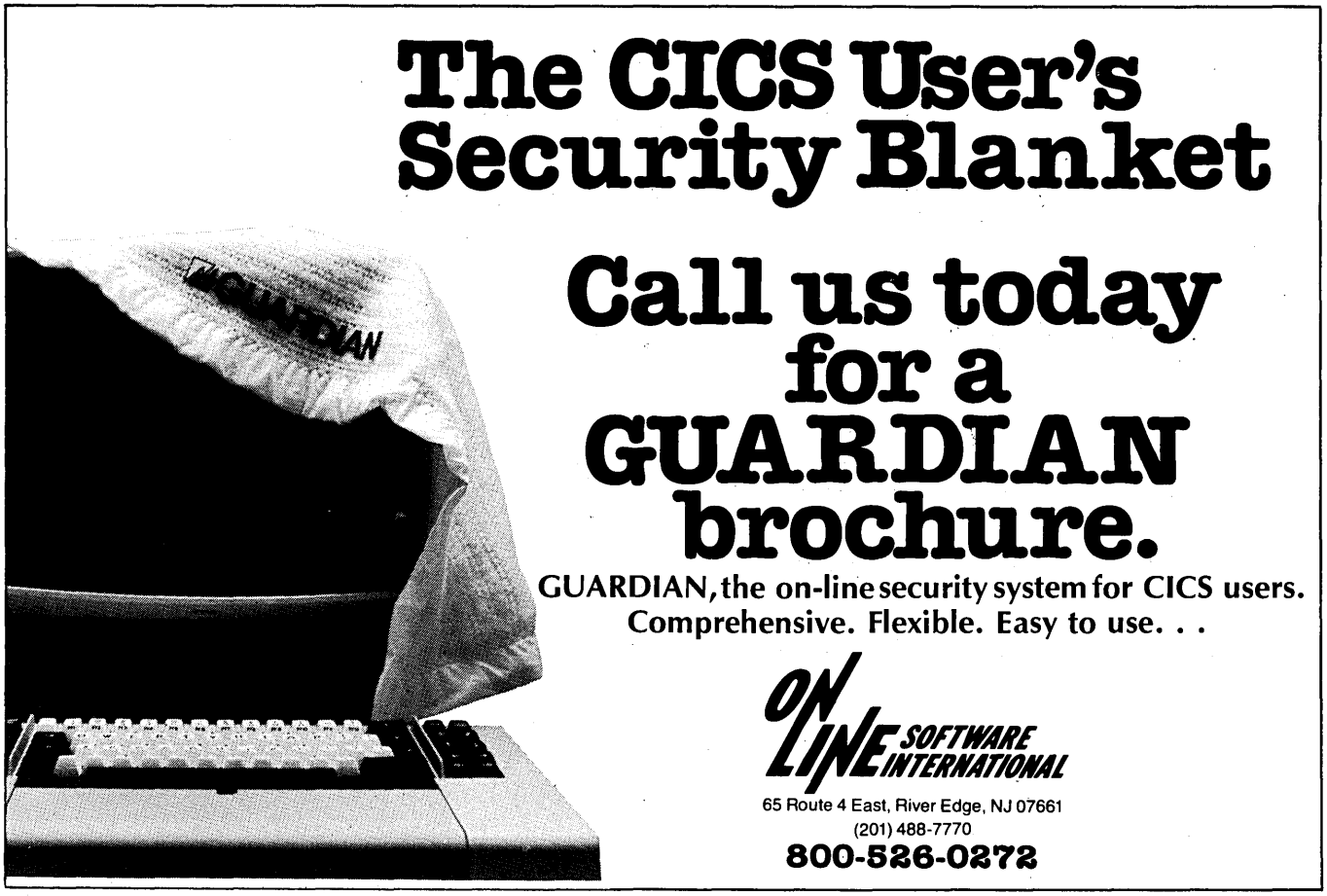
"Case closed" says the mediation board. So now it's up to the dp departments and the unions to wrestle with the problems of folding a technical group into a clerical union.

Does this mean, then, that dp departments should brace themselves for an onslaught of organization activity? "Well, it was a precedent-setting case," say sidestepping labor lawyers. The case could be used to support an organization effort, most lawyers concede that much. Of the two industries, airlines and railroads, it appears that railroads and their dp departments will be hardest hit since they present the weakest target.

That bit of intelligence came out during a conversation with the mediation board about another case of uninvited unionization in the dp department, this one involving the staff at the Union Pacific Railroad, Omaha, Neb.

Unlike Western, this was not a case of the company claiming that the dp staff was part of management. The company had already conceded that point in earlier talks. Management was on record saying that the dp staff was not part of management. The only reason the dp department had not been unionized prior to the 1980 talks was that management had secured for them an exempt status, which means the union promised it would not make dp professionals a dues paying part of the union.

But BRAC changed its mind and in the most recent round of talks announced it want-



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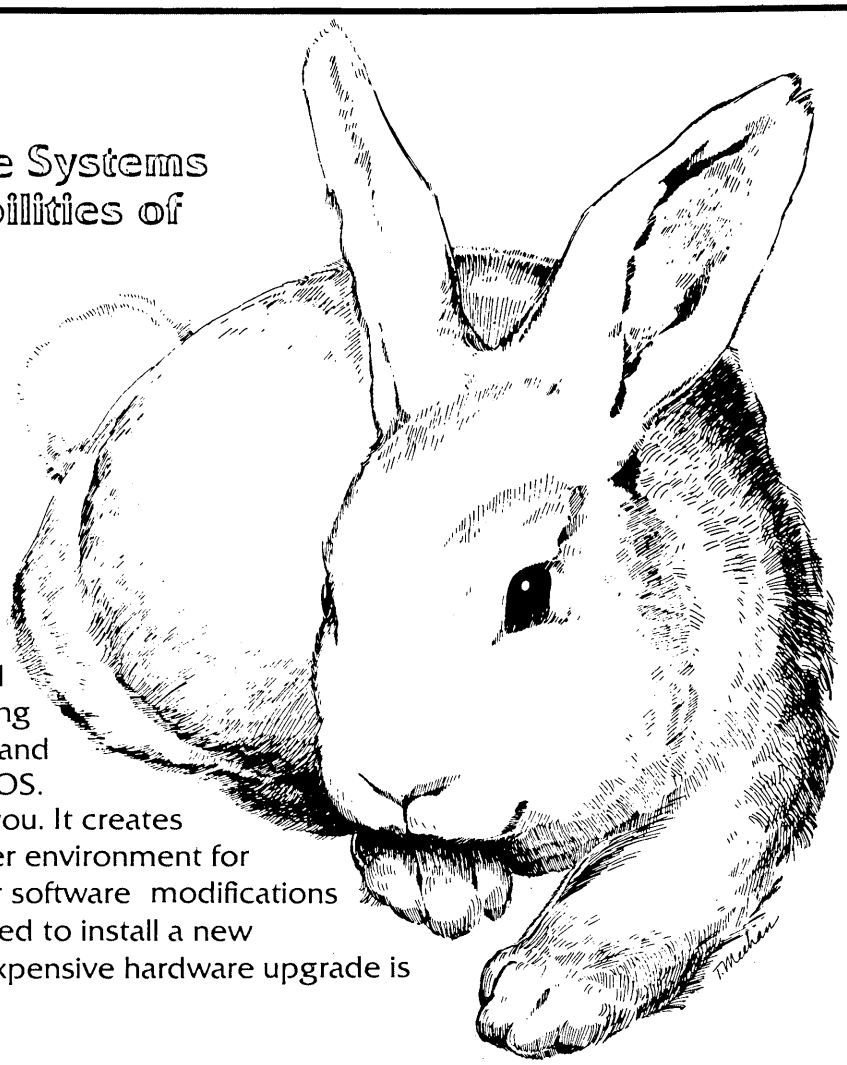

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ed to include these people in its union as dues paying members. The issue became a negotiating point—a point the company lost. So, the dp people had to join BRAC.

Angry and upset with this turn of events, the employees brought their case to the mediation board. But it was a lost cause from the start.

"Since the company had already agreed that these (dp) people were not management officials, the employees could hardly argue that they were," explained hearing officer David Cohen. They didn't have a defense.

"We did not rely on the Western decision for the Union Pacific case," Cohen added, "because the railroad industry, to a much greater extent than the airline industry, replaced manual work with computers and dp people." He agreed this circumstance meant railroads have a weaker case when fighting unionization of their dp departments.

This fact didn't slip by BRAC either. Taking the route of least resistance, BRAC, for the better part of the past 10 years, has been concentrating its efforts on railroads and unionizing their programmers, analysts, and anyone else they could lay claim to. They were out to expand their union ranks and the number of dues paying members. It didn't matter that the people they were including did not want to be represented by BRAC or, in most cases, any other union.

No wonder dp staffers are shaking their heads in disbelief when they learn they are the victims of an arbitrary negotiating system that reflects little or nothing about the desires of the people it "represents." The

> Several dp managers believe there would be massive turnover in their departments if a union came in.

concept of unionization certainly takes on a different meaning when the deal that is struck requires the "union member" to pay dues, but does not require the member to give up any of his or her non-union status, noted a railroad dp manager whose domain was under serious attack from just such a BRAC threat. It makes one wonder why such unions function and for whose benefit. It also makes one question the labor laws and just who or what they are supposed to protect, he added.

"BRAC has been working for quite some time to bring more and more people under its agreements. Most are covered by exceptions right now," observed NMB official Cohen.

BRAC is in the process of eliminating those exceptions and has made some progress among the very large railroads, such as Burlington Northern and Union Pacific, Cohen added.

What does BRAC have to say about this? "Programmers and analysts are part of the craft and class. As such, we have an obligation to represent them and they have an obligation to join and pay dues," said Jack Fletcher, executive director of disputes and procedures for BRAC. "However, railroads have been successful in the past in persuading our people to permit certain classes to be excepted from contract or the union."

No more, Fletcher indicated. "We are actively pushing to eliminate such exceptions."

John Cook, a dp manager with Burlington, is well aware of the fate that hangs over his group and the circumstances leading them into such a position. "I guess in the heat

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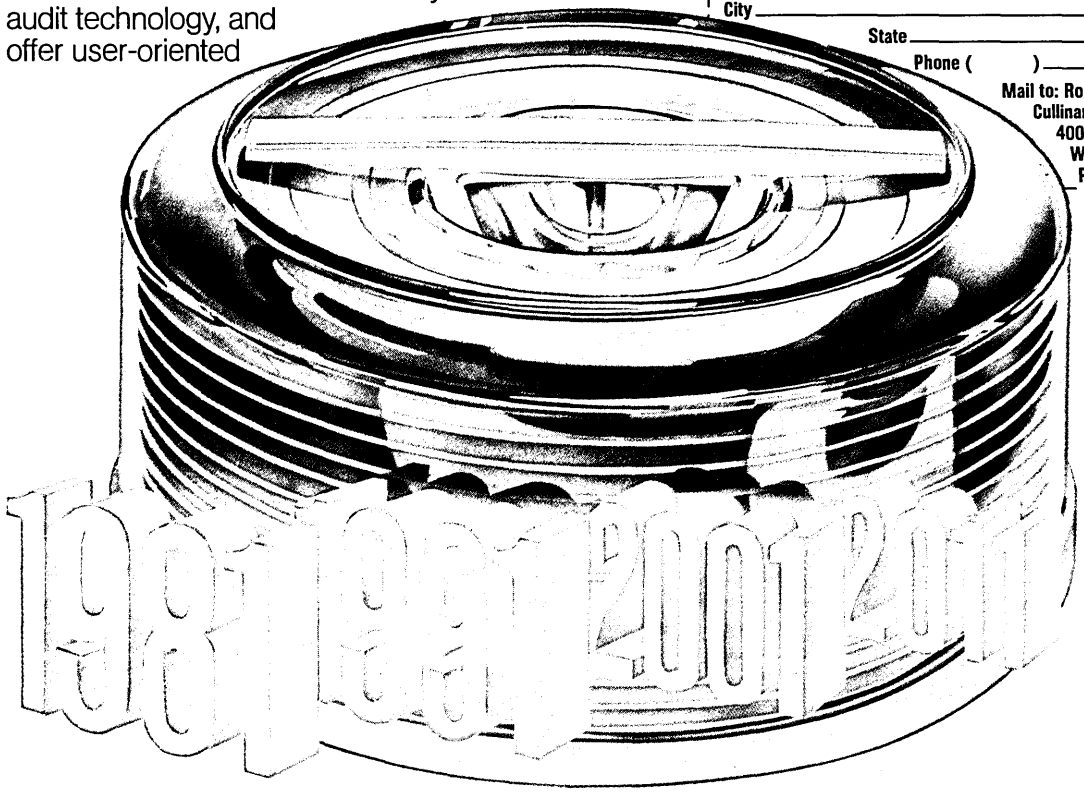

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of battle when negotiating union contracts, sometimes concessions are made. The general supposition among railroads, and certainly the theme song here, is that you always know you are going to lose. It's only a question of how much."

Cook figures that BRAC will soon chip at the edges of his department, starting at the secretarial level. "The people (who get pulled into the union in this manner) would be protected with all management benefits. They'd still be treated as management individuals. Anyone drawn into the union would be forced to pay union dues, but he would not lose any of his non-union status at all."

According to Cook, Burlington's dp staff is not in the dark about this possibility. "We don't talk too much about it around here, but I have brought all my people in in separate groups and told them what is happening and let them fire away."

Meanwhile, airline unions, like ATE also wonder who the laws are protecting these days. They disagreed with the mediation board's ruling and, as a result, did a little precedent setting of their own.

The ruling states, according to mediation official Cohen, that in terms of "the general working conditions, the office environment in the dp department is similar to that of people like accountants, who have historically been included in the clerical group.

"If the data processing field had developed to the point where there were clear, unambiguous differences that made them totally unlike office clerical people, then the board might have taken a different view and split them off from other office employees," he added.

> There's one indisputable defense in blocking a unionization effort—prove that the people in question have "managerial authority."

The ATE, taking things into their own hands, split dp off from the rest of the bargaining unit and negotiated a separate contract for that department. This action, in effect, was a de facto decree that all parties concerned believed the board had grossly missed the mark.

The action may serve as evidence for future cases that a "clear and unambiguous difference" already exists between dp professionals and clerical and accounting people. "ATE decided that dp should not be a part of the rest of the bargaining unit because they are a technical division, using different procedures to train, evaluate, and make salary raises than the rest of the unit," agreed local president Norris.

Of course, there is always that one indisputable defense in blocking a unionization effort—prove that the people in question have "managerial authority."

Briefly, the NMB defines such authority as the power to fire and hire and to initiate policy.

At Western, Cohen recalled, "it basically boiled down to the fact that they weren't managerial employees in respect to the authority they had in the company's operations. Although their jobs are important, they are not managerial jobs. Also, their role is a service role. They accept assignments to do programs and to develop computer systems that will handle the functions, rather than having the power to implement policy on their own."

Data processing managers disagree that their people have little authority or decision-making power. While most admit that not everyone in the dp department is bestowed the power to fire and hire, many younger staff members do enjoy some of the fruits of being a supervisor. As project leaders, they are rotated through temporary jobs for part of their training and informal evaluation. These programs are similar to what a first-line supervisor or management trainee might expect as part of his training and evaluation.

One dp manager with a national airline explains how his program works. "After a new hire has been here awhile, that person is asked to run a project; he is in charge. It's up to the project leader to do the planning, scheduling, meet deadlines, coordinate people, all those things. They encourage this. We like it; they like it, and it gives them a chance to get some management type experience.

"It gives us a chance to evaluate for management talents and see how that person reacts under pressure. If we lost this method of measuring an individual's ability because of unionization, chances are promotions into supervisory levels would come much slower and not always from the inside, the source of most upper level positions at present."

According to other dp managers, the dp professional is not always the passive receiver of assignments. In some cases, particularly in those departments that have been organized to mesh with other sections and divisions of the company, the dp person works with a particular section for an extended period of time and comes to understand some of its problems and operations. Suggestions for improvement or how to solve certain problems then begin to flow in the other direction.

The question of "making policy" then becomes a little fuzzy, say some dp managers. Where does a technical decision end and a policy decision begin? The answer may become even more difficult if the trend towards integrating the dp person more tightly into the decision-making loop continues. ✲

SOFTWARE FOR THE VERTICALS

Microdata sees applications software as a means of zeroing in on specific markets.

by Edith Myers

Microdata Corp. is getting into applications software in a big way.

At the National Computer Conference, the Newport Beach, Calif., mini maker introduced AD PAK, a software system designed for advertising agencies. And that's just a first step, said Carl Jeremias, group vice president, marketing/sales.

"Applications software is the key to the '80s," he said. Microdata wants to get a grip on that key.

"Few people realize that we have our own software development operation," said Jeremias. Diversified Computer Technology, Union, N.J., was acquired by Microdata in 1975. DCT has 24 people who Jeremias describes as "high quality applications programmers. And we plan to expand on that."

AD PAK was the result of a joint effort by DCT and Basso & Associates, Microdata's advertising agency. "They (Basso) put a computer in last January," said Jeremias, "and we have been refining AD PAK since that time."

He said the company has identified 2,576 advertising agencies "and 765 of them can use dp equipment." He said the new Microdata package "totally integrates the functions of the accounting, creative, account services, public relations, traffic, media, and other agency departments, allowing better account control and resulting in better service to clients."

CARL JEREMIAS: "Applications software is the key to the '80s."

SOFTWARE BRIEFS

Volume 2 No.1

CA-DYNAM/DMF — A New Disk Space Management Facility for OS/VS1 and MVS Users

Jericho, New York — A new software solution to the chronic problem of disk space management has been announced by Computer Associates for use in OS/VS1 and MVS data centers.

Called CA-DYNAM/DMF (dataset management facility), this new package allows OS/VS1 and MVS installations to optimize usage of the available disk space through a dynamic dataset migration technique and a complete dataset archival management system.

CA-DYNAM/DMF can be executed to provide 'extra' DASD storage in an orderly and efficient way. The result is a 'working set' of datasets that remain on disk while those infrequently referenced are on tape.

When migrated data is required again, it is restored to disk. CA-DYNAM/DMF allows this movement to take place in a pre-requested mode where it is known that a particular dataset will be used soon.

Requests to be restored come from TSO or batch commands. Alternatively, in the event a dataset is not on disk when required, restoration can take place automatically and the job continues normally.

According to the vendor, CA-DYNAM/DMF is easy to use, provides security, control and flexibility; is simple to install and easy to maintain. CA-DYNAM/DMF also provides standard, easily used control statements.

CA-DYNAM/DMF Includes These Desirable Features:

- Automatic and/or user-requested migration/restoration of datasets based on date of last reference, dataset name, dataset group, volume serial number or a combination of these.
- Incremental backup of datasets based on whether a dataset has been updated subsequent to the last backup operation.
- Full online support through TSO, including online interrogation of the CA-DYNAM/DMF database.
- Efficient DASD access, employing full track read/write where appropriate.
- Efficient use of the offline storage media.
- Complete reporting of space used, space available for use, space utilization within datasets and volume utilization. The user can also select the format and sort sequences.
- Integration of multi-system DASD information in a single database.
- Dynamic allocation of files under MVS.
- Special handling of generation data groups.
- Consolidation of dataset extents.
- Movement of all data in a volume.
- Interfaces to standard security and tape management systems.

A major performance advantage with CA-DYNAM/DMF is multi-threading. The CA-DYNAM/DMF system is totally re-entrant and will make use of as many tape drives as are supplied to perform concurrent migration and restoration of data.

In addition, CA-DYNAM/DMF provides a set of reports which enables the user to track all DASD datasets, both online and offline. Report controls also allow contents to be formatted to specific installation requirements.

CA-DYNAM/DMF is available on a three-year lease license, with a variety of other lease plans available. For more information contact: Computer Associates, 125 Jericho Turnpike, Jericho, New York 11753 or call our toll free number (800) 645-3003. In New York call: (516) 333-6700

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The package is made up of nine major modules: accounts payable, accounts receivable, payroll, general ledger, production expenses/materials, labor/time keeping, traffic, and mail list management.

Jeremias said the software was designed "to give staff level agency management immediate access to information necessary to control and manage virtually every agency operation. It permits agencies to get down to business. For the first time, a software package has been designed specifically to help agencies—large or small—to improve account control and client service."

In general, Jeremias explained, DCT will develop applications software for Microdata, then it will be turned over to a group headed by Warren Blossom, vice president, domestic marketing, for "productization." In Blossom's words, this means making the software more user friendly and more attractive from a documentation standpoint.

When "productization" is complete, the application goes back to DCT for distribution and support.

Blossom sees applications software as a means for narrowing down markets "as fine as you can. Prospects decrease in quantity but your success rate increases. We plan to pursue markets on a sub-industry rather than on an industry standpoint."

He expects an even bigger market for AD PAK than Jeremias does. Blossom says there are more than 8,000 advertising agencies listed in the Red Book, an industry directory.

Microdata has 14 direct sales offices, and Blossom said the company would train two people from each branch in both AD PAK and the fine points of the advertising agency business. "As we come out with more vertical products, different people will be trained until everyone in every branch has a vertical responsibility."

And then there's Pro, a concept that came out of Data Technical Analysts (DTA) in Honolulu (April, p. 64) and for which Microdata is one of five licensees. The concept, which involves storing pre-coded common elements in a computer and then linking them via a special algorithm to perform an application based on specifications input by the user, has been given a variety of names by its licensees. But Microdata hasn't named its offering yet.

Blossom said recently that he thought someone in the company had come up with an ideal name, but he wasn't willing to disclose it "until we have unanimous agreement internally."

Jeremias is excited about what the concept can do to help get Microdata into a variety of vertical applications markets. "We've got a two-year jump on everybody else." ✱

IMPORTING SOFTWARE TALENT

International recruiting has become one way to solve the chronic shortage of qualified programmers and analysts in the U.S.

by John W. Verity

When Monchik-Weber, a New York computer consultancy specializing in financial and business applications, was looking for systems analysts earlier this year, it found what may be a partial solution to the chronic shortage of qualified, experienced software talent—international recruiting.

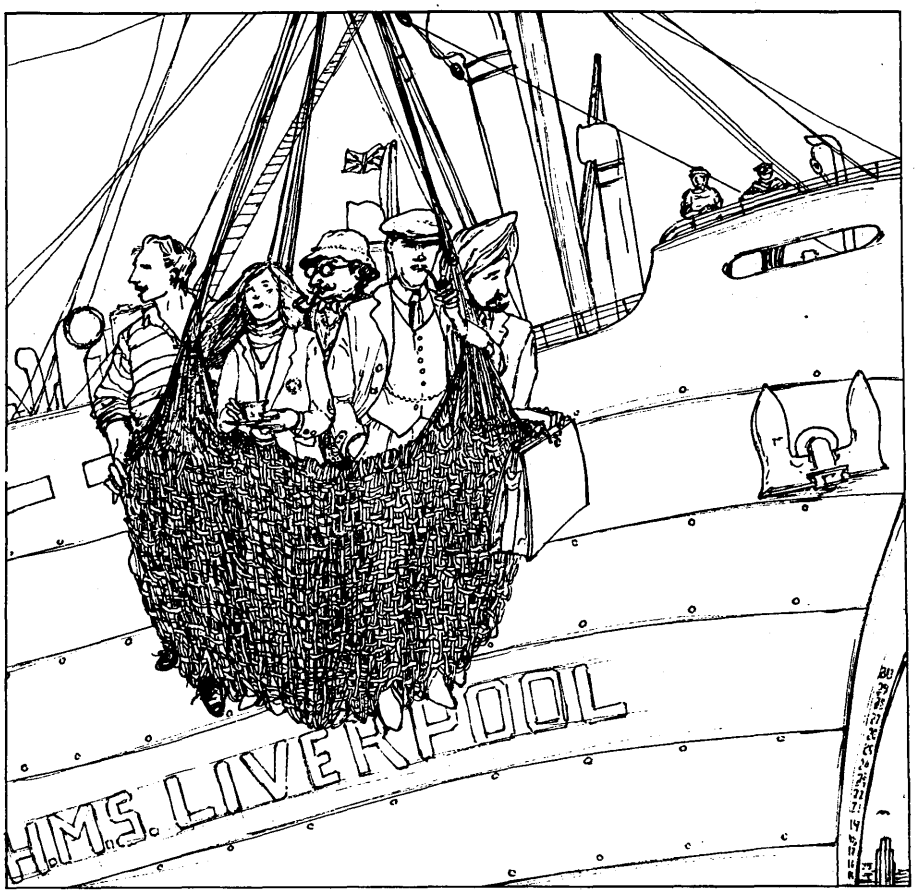
"With the high turnover rates and people jumping all around, it was obvious that a new pool of people was needed," recalls Lorraine Visovsky, director of personnel at the Wall St. area firm. "We already had several people from abroad, so it was natural for us to look overseas."

Monchik-Weber is clearly not alone in its search for good software talent. Nor is it alone in looking outside the country for programmers, systems analysts, and project leaders. The practice is widespread, although not something companies are likely to brag about. It's a "low-profile activity," as one recruiter puts it.

The demand for software personnel in the U.S. is at an all-time high, particularly in organizations requiring expertise in such complex areas as database systems, transaction processing, and operating system internals. The shortage of such people has prompted some of the country's largest users—banks, manufacturing companies, and even some large computer vendors themselves—to seek help from foreign shores where personnel can often be procured in greater abundance and at less cost than in the U.S. itself. But there are problems.

Countries with large bodies of English-speaking people, such as the U.K., South Africa, India, and even Hong Kong, are said to gain the most attention from U.S. firms seeking software people abroad. Israel, Australia, and Western European countries are next in ranking. The need for proficiency in English is obvious, but in some cases a strong background in a particular system like IBM's IMS database package can make a foreigner attractive enough for an American firm to go through the trouble of bringing him or her through the tangle of immigration.

And a tangle it is. According to Philip



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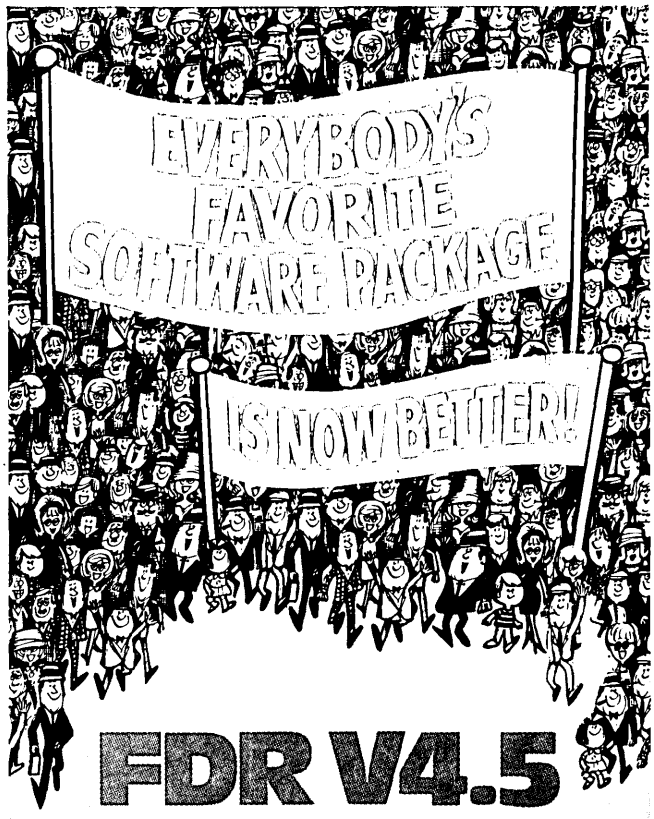

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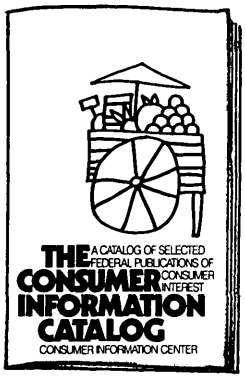

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J. Kleiner, an attorney specializing in computer personnel immigration at the New York law firm Barst & Mukamal, the paperwork and legal hassles are by any measure the biggest problem encountered by U.S. firms when importing software talent. Getting the proper visas, immigration papers, clearance by the Labor Department, and other bureaucratic details squared away can take the better part of a year unless the proper pressure is applied to the various government agencies involved, Mr. Kleiner claims. The reason for much of the delay, he thinks, is an understaffed Immigration and Naturalization Service which he says suffers from a lack of funding.

"It's often easier to get a foreign piece of hardware into the country than it is to get in the people required to support it," Kleiner remarks.

It seems, however, that the demand for software personnel is so strong that U.S. user organizations and the recruiting firms they use can benefit from "bending the rules," as one recruiter put it privately. Instead of waiting for work visas, foreigners are often brought in on tourist visas and given work quickly while the necessary paperwork is filed to have their visas changed to work status. This is done quietly, according to recruiters, who repeatedly decline to speak for attribution about their practices.

> Manufacturers Hanover has imported as many as 50 people from England through the consulting services of ACS International Systems in New York.

Another practice used to bring aliens in is to have so-called computer consultancies, operating out of sparsely furnished offices, go abroad on hiring trips with U.S. clients who interview potential hires for their specific needs. The hirees are "sponsored" for visa purposes by the consultancy, which also pays them, but they work on the client's premises. This method, those close to the situation point out, enables large U.S. firms, such as banks, to avoid criticism for hiring abroad during times of high U.S. unemployment.

Dave LaBelle, vice president in charge of human resources for the Operations Division of Manufacturers Hanover Trust in New York, said he has imported as many as 50 people from England through the services of ACS International Systems, Inc., a New York computer consultancy connected to a British firm of similar name. "We interview people over there (England) and we'll select the number we want and make offers. We tell the consulting company, which brings them over for Manufacturers Hanover assignment. We pay ACS a consulting fee."

Often, LaBelle explains, foreign software people brought here under such circumstances are offered full-time employment with the bank after a year or so of consulting-based work. So far about 15 have been hired by the bank under this arrangement, he says.

He notes that the bank is "investigating the possibility of changing its policy" of not sponsoring foreigners, but no definitive plans have been made.

Barry Shaxted, director of ACS International in New York, declined comment when asked about his firm's dealings with Manufacturers Hanover and said his firm "does not operate as a middleman." He said ACS imports some 75 people a year, primarily from England.

Industry sources claim ACS International is one of the most established consultancies hiring software people abroad, joined by Starlex Systems & Services, Inc., also of New York. Starlex's Mike Starr says his firm "always has the client sign the petition" for a visa, even though that means sometimes losing business "to Brand X," meaning another consulting company with less stringent requirements.

Starr adds that his firm brings "40 to 50 people" a year from the U.K., most of whom work on a temporary basis. He declines to identify his clients.

The field has drawn several other participants, including the Harvard Management Group, New York, which, according to director Steve Green, places only a handful of foreigners each year rather than moving bodies en masse. He recently helped Max Bichunsky of South Africa find work in Westchester County, N.Y., as a consultant with Automated Concepts, Inc. Bichunsky entered the U.S. as a tourist but immediately upon finding work sought to have his visa upgraded to H status, or a work visa. As long as his papers are in the works, says Bichunsky, he's legally able to be employed in the States.

How does work here compare with what he left at home? "I think I'm doing about equivalent to my last job in South Africa. If anything, I'm actually making a little less here because of the high cost of housing," he says. He adds that he may stay permanently in the U.S. depending on his experiences over the next year or so, but he is concerned that the new Administration will tighten up immigration laws.

Industry observers generally agree that money is no longer a major incentive for Britons in particular to come to the U.S. for software jobs because the salary gap between the two countries has narrowed considerably in recent years.

However, jobs here can often provide more satisfaction, observers claim. *

ITS NAME IS ITS BUSINESS

The young National Commission on Software Issues in the '80s already represents more associations than any other industry body.

by Willie Schatz

There can no longer be any doubt that software has arrived as a serious topic of discussion. The subject is being studied by a commission.

Unlike almost all similarly-titled bodies, the National Commission on Software Issues in the '80s is completely non-governmental. Founded last summer by the Association of Data Processing Service Organizations (ADAPSO), the Computer Law Association (CLA), the Association of Educational Data Systems, the EDP Auditors Foundation, and the Data Processing Management Association (DPMA), the commission's goal is to examine the entire range of issues affecting the industry. Its name is its business.

The commission's mission is "to present critical and objective reports airing the social, economic, technical, and legal issues arising from the development, distribution, and use of computer software during the coming decade." Its immediate tasks are to describe the history and trends of the industry, define software, and explore such delicate and important issues as privacy, productivity, protection, standards, and government competition.

Growth has been prolific enough to make the commission appear to be a govern-

> Status reports from task forces are expected at the commission's first symposium, scheduled for Oct. 5-6.

ment bureaucracy. The original five founders have signed up an additional 17 member organizations, including the Information Industry Association, the Computer Society of the Institute for Electrical & Electronics Engineers (IEEE), and the Independent Data Communications Manufacturers Association (IDCMA). The Association for Computing Machinery (ACM) has expressed an interest in joining and its decision was expected sometime this summer.

As with most groups, the real work of the Commission is performed by task forces. Those first four bodies are charged with investigating software protection, education and training of software professionals, soft-

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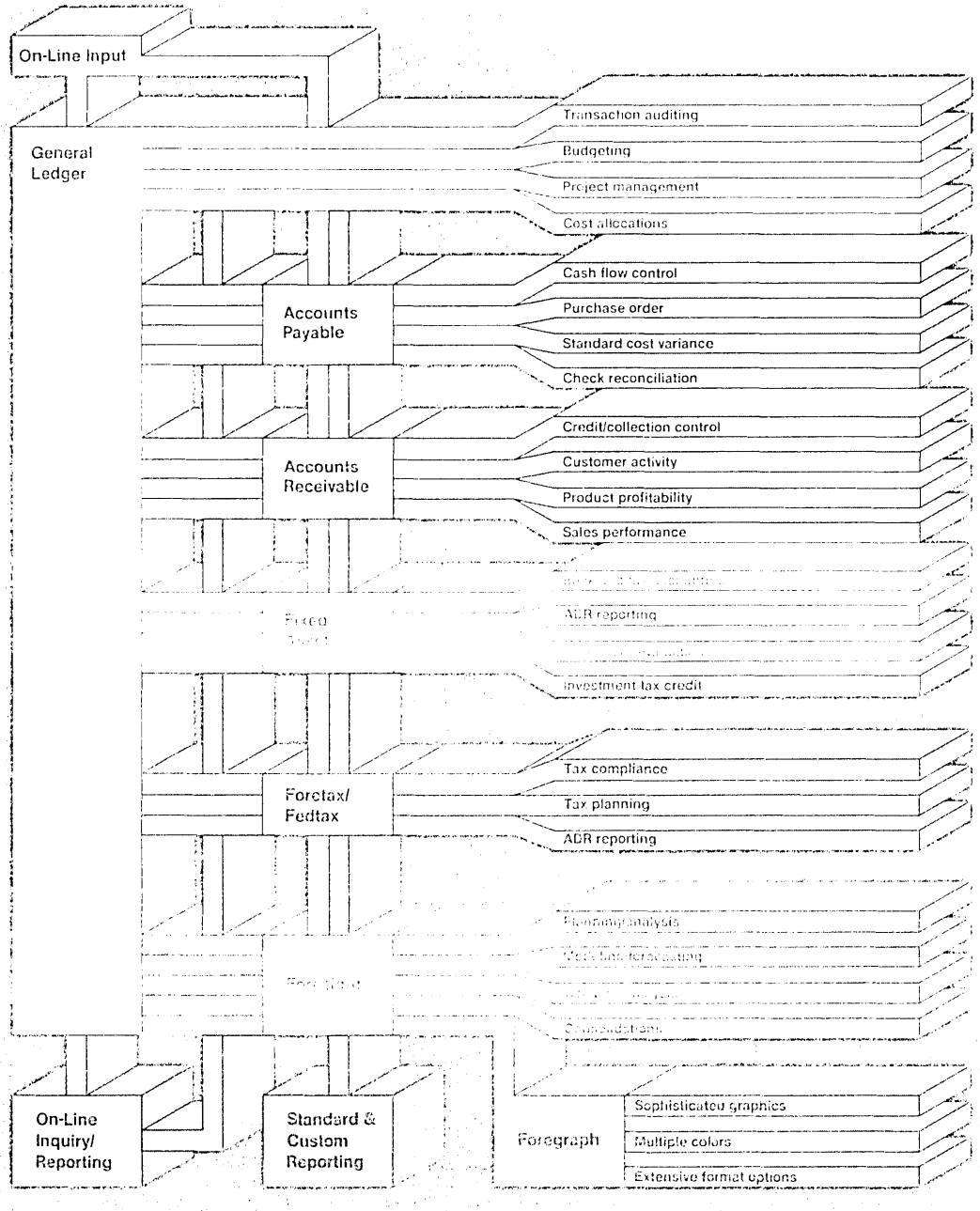

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ware taxation, and standards. "We chose those issues because they seem to be the most relevant and pressing," says commission chairman Daniel Brooks, a Washington attorney. "We have several other task forces planned, but we thought these were the subjects that needed and deserved the most immediate attention."

Each task force has a mission statement, which in addition to describing specific duties requires that public comment be sought on the assigned subject. Members of the software protection group will "seek public comment from interested parties in order to define and report on the issues and controversies affecting proprietary interests in software, including copyright, patent, trade secret, and other forms of protection of computer software." Panelists in education and training will define and report on issues involving development of model education curricula, validation of competency, development of continuing education and training programs, and developing ethics and recognition for members of the profession. The tax people will analyze issues arising from the application of local, state, and federal tax laws to computer software and transactions, including researching model tax provisions for any or all of the above. The standards members must define and report on issues related to developing standards applicable to software and its uses, including the advantages/disadvantages of setting such standards from the developer's, vendor's, and user's perspectives. Their area extends to ANSI (the American National Standards Institute) specifications, FIPS (Federal Information Processing Standards) and other governmental programs, and other specific industry concerns.

Status reports are expected from each task force at the commission's first symposium, scheduled for October 5-6 at the House of Representatives office building in Washington. That affair is the full commission's first venture into the outside world. It has been actively seeking public participation in its task force endeavors, and hopes for significant input during plenary sessions on the panels' reports. The task force on education and training will present a white paper on its subject, while the other groups, not quite so far along, will reveal whatever they have learned to that point.

Chairman Brooks hopes the education and training report is worth far more than the paper on which it is printed. The commission thus far has been operating on token donations of $250 from some members and kind but modest contributions from others. If the paper is successful, Brooks plans to walk into several organizations, paper in hand, and attempt to persuade them to lend a few dollars to the cause.

"The long-range plan is to show the paper to ACM, AFIPS, or some other organization like that," Brooks explains, "and ask them to fund us for $30,000 to $40,000. I want to show them that this is the kind of work we can do and the time we can do it in. Then we hope to hire someone from a leading business school, give him or her a tuition credit, and let that person be our legs for future findings.

"We've been very, very pleased with the overwhelming response of support for this unique project. It's only about a year since a handful of people got together in Washington to discuss how to prepare for the coming decade of technological innovations. I don't think any of us thought we would come this far this fast. Now we have a formal organization representing more associations and diverse interests than any other industry body."

NETWORKS NEED FINE TUNING

Rapid fire rate hikes have sent telecom managers scrambling for ways to cut back on network costs.

by Ronald A. Frank

This has been a difficult year for any business that regularly uses the telephone or a data terminal. Rate increases in FCC-approved interstate tariffs have been coming fast and furious, thus frustrating users. Most telecommunications managers have been hard pressed to absorb the rapid-fire rate hikes and many have been sent scrambling to find ways to avoid the higher operating costs.

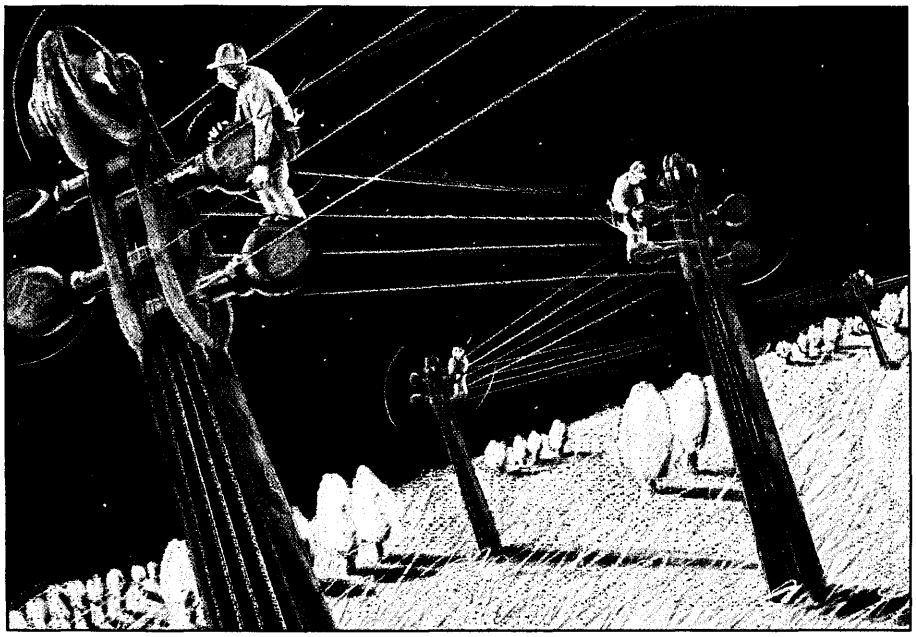
Fortunately, users have some sophisticated software defense mechanisms to help them lower monthly phone bills for both voice and data applications. Network optimization packages have been available for a number of years from firms specializing in telecommunications network design and consulting, and users are now afforded considerable choice.

Most of the optimization packages use some type of computer database which is updated or modified whenever the tariffs change. Even without major upheavals in interstate charges, the configuration of corporate networks is a special science, and optimization (or least monthly cost) often requires the help of outside experts.

Just this year users have faced a "composite 35% private line increase," according to David Rubin, director of network design services at Network Analysis Corp. (NAC), Great Neck, N.Y. This increase is important because the average private line net has between 60% and 80% of its costs tied up in line facilities. "That's the monthly telephone bill, so if you can cut even 1% of that cost and still maintain your performance, you can save a lot of money," he said.

In a data network, terminal response time is one of the most crucial parameters. A user may want two-second response time but it may cost an additional $100,000 per month compared to living with a three-second response time. And most operators don't really detect much difference in response time until it gets up above six seconds, Rubin explained.

The NAC software for data nets is called Modular Interactive Network Designer, or MIND. The company advertises that



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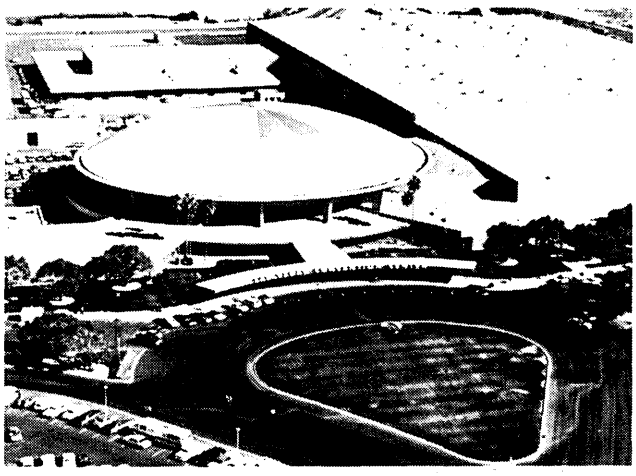

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MIND can save up to 30%, which in theory would make it possible for a user to overcome most of the line increases that have occurred this year.

Rubin does not make such claims. Instead, he talks about the changes that MIND might suggest for lowering costs.

"One obvious way is to use less lines. By taking advantage of multipoint techniques, which means putting more terminals on the same line, you are sharing the facilities," he explained. But more terminals operating on the same line can also lead to degraded performance based on traffic and other operating variables. That is the type of analysis that MIND will handle.

In a similar manner, the network might be reconfigured using concentration or higher speed lines. The software package can also evaluate more extreme changes such as a change in protocol. It is sometimes possible to achieve economies by switching from Binary Synchronous Communications (BSC) to High-level Data Link Control (HDLC), but that would involve major changes in network operations, he stated.

To fully apply MIND to a network could take up to four weeks and might cost from $5,000 to $15,000, which includes what Rubin calls "sensitivity sessions" with the user. The most important element in the analysis is building a database of network parameters. Once the database is in place, it is only a question of paying for cpu time to do a further optimization.

For voice nets, Rubin sees a different problem. With the latest rate hikes, tandem nets, CCSA, and similar offerings may no longer be cost effective. With Telpak discounts gone and Wats rates in many instances "getting very close to DDD charges," a voice net-

> Most network optimization packages use some type of database which is updated or modified whenever tariffs change.

work by itself may not be justified anymore. But in a few years, Rubin predicts, alternate voice/data use will be more popular on private lines, and then these nets will be more cost effective.

NAC has a voice optimization package called WATSAN-PLUS which has shown that there are some things that users can do to lower voice costs. Rubin calls Foreign Exchange (FX) lines, for example, a very hot number right now.

Also cost effective are private line clusters where a series of private lines might be used to hub on a particular node. Long distance traffic from that node might then be most cost-effective using some form of measured (dial-up) service, he explained.

Despite the growth of data, voice traffic is still as much as 80% of the average company's phone bill, and that is why there have been so many voice related tariff increases, Rubin feels.

One specialist who works to bring voice phone bills into manageable limits is Barbara Zingler, senior technical consultant with the DMW Group Inc., Ann Arbor, Mich. Zingler works exclusively with a DMW pack-

> The Aries Group has a program which optimizes only data nets based on an analysis of terminal response time.

age called the Teletraffic Optimizer Program (Top), which she describes as a "discrete event simulator."

With increased competition these days from companies such as MCI, Southern Pacific Communications, and other carriers, as well as a variety of options from the phone company, Zingler stresses that the user must determine network goals and performance levels before outside assistance can lead to meaningful results. But assuming that a corporate communications manager has such critical parameters well in hand, then optimization can lead to significant improvements.

The procedure described by Zingler is representative of the manner in which such software is applied; it also serves to explain the complex options that are involved. Before the Top database can be brought into the picture, the user must provide one month's operating data for analysis. Typically this data is included in phone company supplied Station Management Detail Recording (SMDR) data. This is a complete breakdown of calls according to destination, calling number, cost, and other vital data that provides important network traffic patterns. In addition to SMDR data, which is supplied in magnetic tape, many users have intelligent PBXs or other devices which collect similar information.

Once the quantitative data has been studied, Zingler sits down with the corporate telecommunications manager and determines the vital parameters that cannot be exceeded.

But even with such vital constraints, there are usually savings. In fact, DMW promises savings of 10% to 30% with a four month pay-back.

The company is so certain it can provide significant cost savings that its fees, which for Top can range from $12,500 to $34,500, are pegged to the actual monthly savings that result, a spokesman said.

While this may sound like marketing hype to those who don't live with networks, the numbers are large. As an example, membership in the International Communications Association is restricted to users who have a yearly phone bill of at least $1 million. And there are more than 400 members in the ICA, the largest U.S. telecommunications user organization.

Getting back to our optimization specialist, Zingler enters all relevant user information into the Top database and a series of reports and recommendations are then generated for the user to consider. Typically the user may be advised to change the current mix of Wats "bands" which are pegged to geographic calling areas. Or the software simulator may suggest that the user reduce Wats and rely instead on foreign exchange (FX) lines to certain high usage calling areas. Also intrastate Wats service might be considered or alternative services from other carriers such as MCI, etc.

The optimization process is often a give-and-take that can last several months for large, nationwide users that have complex nets, Zingler explained.

Sometimes a change in long haul intercity trunks or satellite links are involved, but there are usually options.

And even without tariff changes, many user networks have such fluid traffic patterns that optimizations have to take place on a regular basis. NAC and the DMW Group are only two of the firms that help users in this area. Another is Telco Research Corp., Nashville, Tenn. The consulting company has a software package called the Network Optymizer/2 that promises "3% to 25% immediate

> The DMW Group is so certain it can provide significant cost savings that its fees are pegged to the actual monthly savings that result.

savings on long distance expense, regardless of the equipment presently being used."

Pricing for network software can vary. The Aries Group, Rockville, Md., has a program which optimizes only data nets based on an analysis of terminal response time. It is available at a cost of "$10 to $20 per multipoint circuit," according to a spokesman.

The user looking for ways to improve his monthly phone bill has many options. He can select from an optimization service, install an in-house package, use voice-only or data-only programs, etc. And many software products are available.

The key to proper product selection requires the user to know where he wants his network to go and at what level he wants it to perform.

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THE FLOPPY IS HERE

If the floppy disk lives up to expectations, Media Systems Technology expects its business to boom.

by Edith Myers

Al Alcala, president of Media Systems Technology, Inc., Santa Ana, Calif., foresees a day when a developer of an applications program can walk into a computer store with his program on a floppy disk, say that he wants 50 copies, walk out and go about other business, and come back in less than an hour to pick them up.

MST is in the business of supplying automatic floppy disk duplication and initialization systems. And if Alcala's prediction proves true, it could mean big business for the firm.

"There were 50 million floppy disks sold last year. There will be 140 million sold this year, and 600 million by 1985," said the MST president. "The floppy is here."

MST was started in 1978 by Alcala, Eric Kadison, now vice president, and Dr. Peter Roots who has international marketing rights to the company's products through his Inverdata Buerotechnik, GmbH & Co. KG, West Germany. The company's aim was to design and develop automatic processing equipment for diskettes.

Its first product was the System 800 automatic diskette initializer system, introduced last year. It is capable of simultaneously processing floppies of different formats, densities, and media under multitasking software. Both 5¼ in. and 8 in. floppies can be loaded, initialized, and sorted at a maximum rate of 80 per hour.

The system can run unattended, said Alcala. "Manual initialization requires constant attention, and time is the most valuable thing we have in our business."

> Some 140 million floppy disks should be sold this year, and 600 million by 1985.

The company's first customers were 3M and Verbatim. "Since then we've expanded nationally to where we serve everybody (who produces floppies) but CDC." But he believes Control Data will eventually come into the fold, too.

In March of this year, MST announced an enhanced software option called the Format Manager for its Series 800 and a later version, the Series 820 diskette processor. Kadison said this allows users to create and/or modify their own diskette formats which then can be used to process new formats. "It permits modification of encoding mode, sector size, sector count, identification fields, and gap/sync fields and allows users to define their own formats without revealing the contents to others.

AL ALCALA: "The microprocessor has opened up a whole new world for us."

The Format Manager is menu-driven and supports both 5¼ in. and 8 in. diskettes, single or double sided, single or double density.

"Our customer base has traditionally been made up of very large companies," said Alcala. "But now we see a new business coming." He said they're now talking to new kinds of customers like Lifeboat Associates and other software publishers. "There's a lot of hardware out there and not enough software (in the microprocessor market). The microprocessor has opened up a whole new world to us."

And he sees as their key to this world the company's newest product, the model 824 automatic floppy disk copier system which handles both 5½ in. and 8 in. floppies. It uses MST's automatic media loader as a copy station and provides simultaneous copying and verification of copied formats and data. Throughput speed is as high as 163 copies per hour, per station for 5¼ in. single-sided diskettes and 116 copies per hour for single-sided 8 in. diskettes. Double-sided diskettes also can be copied.

A maximum of four automatic media loaders, featuring a stacking capacity of 50 diskettes each, can be configured within the system, each operating concurrently and independently under MST's initializer/controller. The system is built around a Computer Automation LSI 4/10 computer with a 1,920 character display terminal.

If required, all formats and data can be downloaded onto an 8 in. Winchester hard disk. In addition, the system provides for simultaneous verification of copied formats and data.

> MST's newest product is the model 824 automatic floppy disk copier system.

The way it works now, a user sits before a crt and puts the system first into master duplication mode. In this mode, an image of the floppy to be copied is transferred to a Winchester disk which also contains data on a wide variety of formats. It is from this image and this data that the copies are made. The system disk itself is a floppy, and Kadison hopes that one day they will be able to eliminate the Winchester and have the system floppy handle everything.

The company has installed two systems to date, one at its own site and one at an undisclosed customer site.

And it's a proven technology. MST has been doing floppy disk copying as a service for about a year. Burroughs Corp. is among the companies being provided the service,

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said Alcala.

"When we deal with a service customer," Alcala explained, "we first sign a non-disclosure agreement. Then they send us their specs and two diskettes. We copy them and send them 10 for inspection."

Non-disclosure agreements also will be incorporated into sales of the System 824 since each system delivered will have to be modified for customer formats and other special features of customer generated software.

Alcala, who is a worrier about software piracy, emphasizes that if the day ever comes when copiers are installed in computer stores, they will copy only disks which have formats that are in the public domain. He also looks for a day when formatted disks will be displayed on counters.

The MST president said he has been contacted by "pirates." They want to know if MST can copy this or that vendor, "thinking to make a lot of money for themselves. I tell them about our non-disclosure agreements and advise them to contact the vendors directly."

He said proprietary formats can present substantial obstacles to people contemplating unauthorized copying. He believes "there's no way to completely eliminate software piracy. We can cut it down but we can't stop it anymore than the recording industry can stop people from buying records and taping them for their friends."

> Proprietary formats can present substantial obstacles to people contemplating unauthorized copying.

But, he believes, a lot can be done such as incorporating unique address marks to identify the start of the fields that can be used to store data. And there are more sophisticated techniques such as using analog keys at the beginning of each track and using analog-to-digital converters in the controllers.

MST protects its own control software. Formats are handled by proprietary floppy disk drive controllers. MST diskettes run on another controller simply won't work. The controller developed by MST can handle from one to eight diskette loaders simultaneously.

MST's automatic diskette copier system, the Model 824, is priced from $35,000 to $70,000, depending on configuration and options. Delivery time is 90 days.

Alcala is excited about the new 3½ in. floppy disk introduced by Sony at the NCC but is waiting to see if he will modify his equipment to handle this smaller diskette. "We'll wait to see what acceptance there is in the marketplace before addressing development dollars that way." ❋

UNDOING THE PAST

Along with the proliferation of terminals has come a dramatic change in the way data processing departments operate.

by Jan Johnson

Dp managers that functioned like feudal lords are dying out.

So says John Stevenson, manager of data processing for Valspar Corp., one of the top 10 paint manufacturers in the U.S. "There has been a change in dp's attitude. People who were territorialists are leaving. They are being pushed down the ladder, moving off to a different sized department, or moving out and starting up one-man shops."

Their successors worry about teamwork, structured systems development, and building credibility among users. Programs are not meted out like favors to fiefs; they are group efforts, with special attention to "user input."

New forms of on-line, interactive terminals have put an end to old methods of dp-dom. Now that the computer has become a tool for the masses, "the control of information is no longer handled by a centrally located, high-level few," observes Sandy Rosen, president of Communication Sciences Inc., Minneapolis, and a computer industry consultant since 1972.

New wave dp bosses see themselves as professional managers, not technical experts. Their shops are beginning to resemble a manufacturing production facility, rather than a loosely run research lab where people push and shove their way inside the door and place their requests in the hands of the first programmer they see.

In short, they are out to undo what has been done for years. "Three years ago people would come down and run their own programs. Users and programmers didn't talk to each other much, and software development for computer products was done on the same system that supported manufacturing," recalls Trond Jakobsen, director of Management Information Systems for NCR Comten, Inc.

"As for documentation, there was none. It was only last year that we got a handle on that."

Comten's customer service area had been so badly mistreated that it was reluctant to let MIS do anything. It took Jakobsen, who became director in 1978, two years to convince them to move from a manual system to an in-house computer.

Michael Thorsen, director of systems for the Tennant Co., a Minneapolis-based maker of industrial and commercial floor maintenance equipment, recalls what he found when he took over in 1977: "There was very little user involvement in the system design process."

Manufacturing was the exception, he said, and users were "deeply involved" there. But in other areas of the company, it was just the opposite.

"Nothing was being done. The order processing system, for instance, went back to the late '60s and mirrored the manual method it replaced."

Few dp departments emerged from the '70s without tarnish on their service reputation and serious plans for reorganization. Some of that tarnish will linger for years.

The culprit: lack of documentation. Thorsen explains why: "Programmers worked alone and did not write programs using a standard approach. The way one programmer performs a function in one program might be performed a different way by another programmer."

However, unraveling a program to fix a problem is easy compared to unraveling an undocumented system. No road maps were left behind in many dp shops explaining how the programs fit together. "If we have someone around who knows how the programs fit together, then we can get on with solving the problem," said Thorsen. Tennant is lucky, he added; it has had a relatively stable staff, "which has been a real savior."

When such a nightmare hits, the first priority for most managers is to get back on a normal operating schedule. People are pulled off new projects until the problem is solved. Of course, to users and management waiting for the new project, this gives the appearance of a poorly managed operation. "We've never been able to communicate to management just exactly how bad the old systems were," said Thorsen, who estimates it will be 1983 before all the troublesome systems are replaced or upgraded.

> Standard Oil of Indiana rotates its middle managers through the position of general manager of information services.

Meanwhile, project management techniques and standard design and programming practices have gone a long way in polishing dp's poor reputation. "When priorities were set by people lining up at my door," recalls Valspar's Stevenson, "things tended to get chosen politically. Now, once the projects have been selected and voted on by an upper-level management committee, everybody knows where everybody else stands. If

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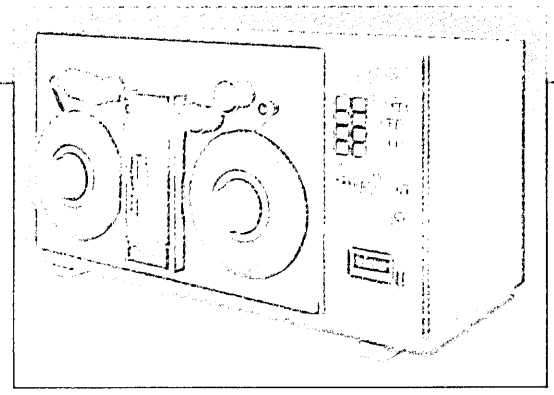

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someone's project is not being worked on, everyone knows why. If they don't like it, they tell their frustrations to their boss, who is involved in the selection process, instead of haranguing the programmers."

Dp managers are discovering another positive spinoff to having upper-level management involved on a regular basis (presidents and vice presidents often sit on project selection committees). The exposure seems

> Valspar Corp.'s dp group is hiring systems analysts who'll spend most of their time with specific user groups to anticipate their dp needs.

to be fostering a better understanding of what dp means to the health of the company.

Standard Oil of Indiana, Chicago, for instance, rotates its middle managers through the position of general manager of information services. The practice was started two and a half years ago, said present IS manager William Hutchinson, the second manager to be circulated through the slot. Prior to the IS post, Hutchinson was vice president of planning and economics for Standard's minerals company.

"Managers have trouble understanding exactly what systems analysis and programming is and why it takes so many people and costs so much," Hutchinson admitted. He agrees that the trend toward more management involvement will go a long way in demystifying this business of systems development.

And demystify, dp must. It's inevitable. Standardization and new, tighter management practices are only the first signs that dp has been forced out beyond its protective doors.

The explosive growth of terminals in every facet of the company's operation foretells of even more dramatic changes to follow. The ideal situation for this new age is to have users do their own applications. Moving toward that ideal are new concepts in database management and high level, powerful languages that will allow a person at a terminal to compile and manipulate computer information on his own.

But that's down the road a few years for most companies. Some organizations, such as the Social Security Administration, are just emerging from the dp cave. Social Security has only recently progressed to the stage of sending an analyst into the field to talk directly with users in an effort to improve communications and the types of programs and systems that are turned out. "We just started this on a large scale a couple of months ago," said Albert Marshall, an assistant dp director at the Great Lake Program Service Center in Chicago.

Most companies are still on the first rung of the ladder that takes the computers out of the dp center and into the hands of the user. Most dp managers are still wrestling with the effects of this first move, which, in many cases, has been to send a dp person out to work with user groups, directly.

"Users will say 'yes, that is exactly what I want,' but later find out they didn't understand what the dp person was giving them," said Valspar's Stevenson. "Unfortunately, when this happens the dp person delivers the product, then all the user has to say is that it wasn't what he wanted—that takes about 10 seconds. Now, you are off with two months more work on the same project."

Stevenson's group is in the process of hiring systems analysts who will be expected to spend most of their time with specific user groups, attending their staff meetings and learning to anticipate their problems. "If the analyst is in effect a part of a certain division, then he should be able to perceive some of their problems and understand what would be needed," said Stevenson.

Basically, those are the expectations of most dp managers who have started some type of liaison program.

But a method is only as good as the people who use it. Standard Oil found this out. "The way it was supposed to work," said Hutchinson, "was that the user representative (the liaison person between dp and the functional departments) would go to the actual users and describe what was going to be done, then ask if it fit their requirements. Sometimes, though, people were busy and gave their replies only a passing thought. People were not spending enough time at the design phase to think the thing through. Later, they say, 'Gee, why didn't you ask me?' "

Bob Sisinni, director of Thermo King Data Center, says he's found a way that cuts down on that sort of back flow and makes users responsible for their actions. Thermo King, based in Minneapolis, is a maker of transport refrigeration units and is a wholly owned subsidiary of the Westinghouse Corp.

Like many dp managers, Sisinni's systems analysts or project leaders are assigned to work with a specific functional area, such as marketing, engineering, or manufacturing. After working with these groups, the analysts write a project description that is sent out for approval to all concerned supervisors, managers, and on up. "This describes the project, what it will do, how it will work, and what it will cost," said Sisinni. Each manager signs off on this project approval request.

As the project progresses and certain phases are completed, report profiles are written and sent to each user group for approval. These profiles detail the purpose of the report, source of its information, length of report, frequency of report, who will receive it, and what it will look like as a printout.

"When the users finally get the report, it's what they want. If it isn't, they have no one but themselves to blame," Sisinni said. "If they do come [to complain], they'd better look out. We take them to task royally. We haul out the original documentation and ask them if that is their signature. It's only happened once," he said.

Larry Wood, manager of special-purpose computing for Deere & Co., Moline, Ill., said he is seeing fewer users coming back at the tail end of a development project wanting to add this or that, but he attributes those instances to familiarity. "I think it's because users are better users. It's not their first system. They know what they can get out of the computer, and they can discuss more of the design criteria with dp people."

User documentation is another overlooked activity that is receiving special attention these days. Again, the rapid dissemination of terminals into the workplace and the need to explain how to use these terminals has pulled this activity out of the closet.

Clear and precise, easy to understand, user documentation is a strong protective measure against a user mistake that could, in extreme cases, bring the whole system down. With the programmer or analyst writing documentation, as is the case at most companies, there is serious question as to how easy to understand the material is.

"Problems occur when people try to do something with the system that it was never intended to do because the documentation doesn't tell them they can't do it," cautions Tennant's Thorsen.

While some input mistakes will be caught by error notes and prompts pro-

> Communication Sciences has hired a philosophy of language graduate as its staff editor to cut down on dp jargon.

grammed into the software, software is not to the point yet where user manuals are not needed. "About the only people who grew up with that kind of software support are those who did CDC's [Control Data Corp.'s] Plato system," said Communication Sciences' Rosen. "A great percentage of that programming is things that help you when you fail. This is not true with most programs."

Memory costs also play a role in how much "help" can be included in the computer system. It's still too expensive to include every possible situation, pointed out Rosen, whose company specializes in writing clear,

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comprehensive user documentation and training companies how to do their own user documentation.

Jargon is another pitfall. "It's the curse of every specialized industry," said Rosen. "Programmers could communicate to other programmers using that shorthand, but it doesn't work anymore when you get beyond the computer room. If you are putting terminals out in the hands of almost everyone, you've got to get out of jargon."

Rosen's company recognizes this shortcoming in the use of language and has hired a philosophy of language graduate as its staff editor. This person translates into plain talk the copy written by industry experts.

One indication that a company's user manuals may need some simplifying is the number of times users call on dp for help. Don Norman, vice president of information systems for Target, a company that operates a chain of discount stores, has noticed that users "do come to dp for help quite often." There, user manuals are written by dp members and sent to a special group in personnel charged with user training. "They are supposed to put it [the manual] into understandable English but, in reality, they do very little to our text," said Norman. Target is a wholly owned subsidiary of the Dayton-Hudson Corp., Minneapolis.

Norman's operation is considering the use of computer assisted instructions (CAI). "None of our operations are done like this as yet, but we are looking at it, particularly because of the number of on-line systems we will have out here." By the end of the year, Target will operate 150 stores and roughly 4,000 point-of-sale terminals, Norman estimated.

In addition to demanding clear and precise language in user documentation, Rosen is adamant about explaining to users how they fit into the total systems picture. "Since major systems often involve people from several areas of the company, it helps if they understand where they fit in and what their part in the total system is." He also recommends including some history about the system and what it replaces. "Most user documentation doesn't tell you what happens to the old ways of doing things, which methods are kept and which go."

Without question, dp has its hands full simply coping with all the changes to its old ways of operating. While such things as structured systems development and project management techniques have gone a long way in streamlining operations, the department still faces the age-old dilemma: how to deal with a seemingly infinite demand with finite resources. All requests for changes, enhancements, and new tools cannot be answered. Some get passed over and someone gets frustrated.

More and more, this frustration is resolved with the purchase of a micro or minicomputer or time on a timesharing service. The scenario might go something like this, relates one dp manager: "You have an influential vice president pounding on the president's desk saying 'I can't get anything out of dp,' and dp is up to its ears, anyway. The president lets him go out and get his own mini or micro or rent some time. Pretty soon, you have this fragmented, disjointed thing."

While user-friendly languages directly address the overload problem, they are too new to have had an impact on the dp operation, say several dp managers. Meanwhile, the independent use of micros and minis is increasing and it's creating new wrinkles for those who manage corporate information.

"I don't think there is any question that micros can be a very positive force in augmenting the things a user can do, but there are dangers if they are not managed right," cautioned Tennant's Thorsen.

The independent use of micros and minis is increasing and it's creating new wrinkles for those who manage corporate information.

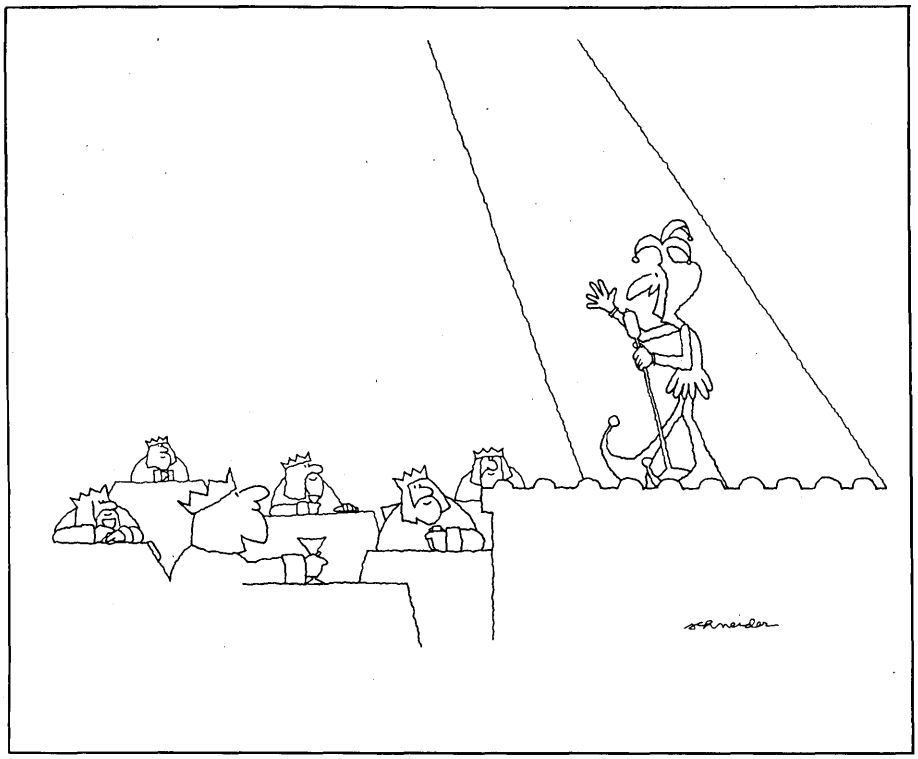
Among the issues that concern dp managers are securing data on independent systems, duplication of functions and data that are on a system elsewhere, loss of data to the corporation, and an askewed representation of computing costs to the corporation.

Like most departments within a company, the dp department is subject to controlled growth. When a group adds its own machine, however, more programmers are often introduced. "They may not be called programmers," noted Deere & Co.'s Wood. "They may be called engineers. So on the one side you have management telling the dp department they can't hire any more programmers, while users go off and bring in more programming talent."

What needs to happen, said Wood, is that the overall attitude toward computing should change a bit. "If dp would accept smaller computers they would end up with control of those machines. But too often they say: 'I'll stick with IBM and anything else is not mine.' "

Many dp departments have already taken the offensive and set up special information centers or simply let it be known they will help other departments that have computers. That is one way of insuring that established programming and documentation methods will be applied throughout the company, and also helps the dp manager keep an eye on the type of information and functions being used.

According to Thorsen, who is very concerned about compatibility among all computers used in his company, the "real benefits" to the office will come with the ability to link everything together via communications links. ❋



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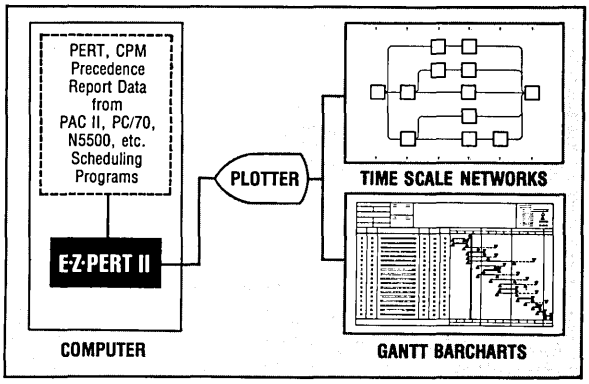

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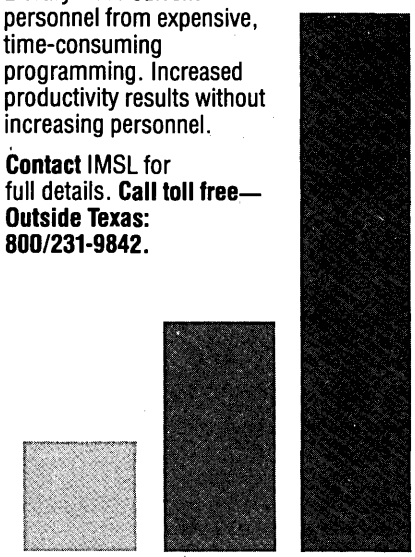

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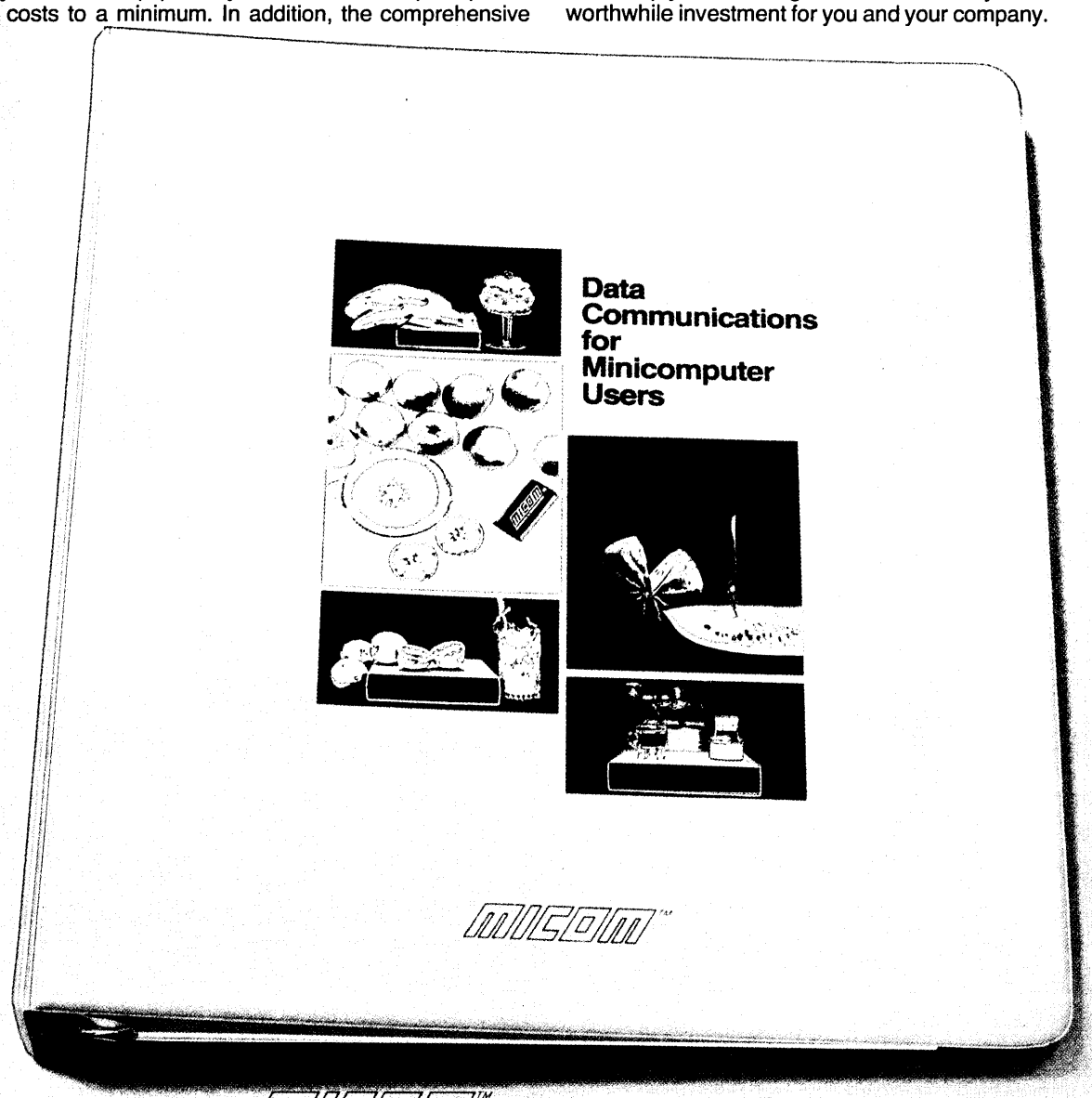

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MICOM SYSTEMS, INC. • 20151 Nordhoff Street • Chatsworth, CA 91311 • Telephone (213) 882-6890 • TWX 910/494-4910
Eastern Regional Sales and Service • Plaza Nine, Suite 514 • 900 Route 9 • Woodbridge, NJ 07095 • (201) 750-1120
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CIRCLE 2 ON READER CARD

WE FOUND A HOLE IN THE OBSOLESCENCE THEORY

The business community is paying a high price for the rapid pace of developments in data communications. Because new equipment has a nasty habit of rendering current models obsolete.

Teletype Corporation is doing something about it. In our industry we're one of the few companies manufacturing its own customized MOS Chips. And it's helping us build future flexibility into our data terminals.

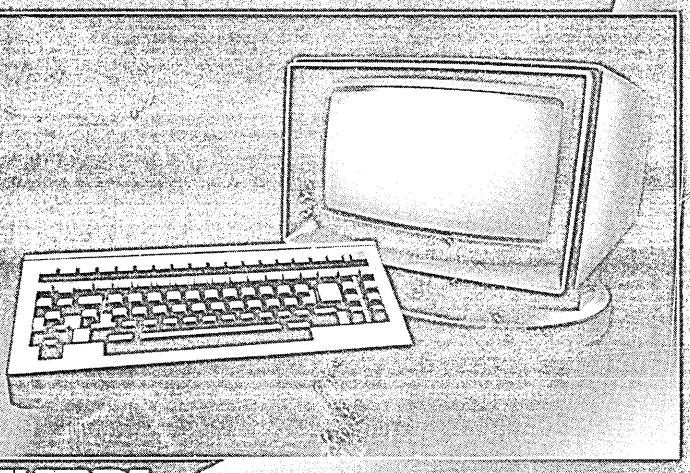
Modular design and built-in electronic adaptability let us redefine and enhance our equipment long after it's gone on line.

So our customers can have the newest features. Without absorbing losses in the form of prematurely obsolete equipment. Or paying for brand-new terminals. Or disrupting their entire system.

In business, keeping pace with data has become crucial. The distance between managers and critical information has widened to alarming proportions.

Teletype Corporation is helping bridge that gap. As a member of the Bell System, we're coupling their communications knowledge with our own research and development.

And it's working. We're making early obsolescence a thing of the past. So you won't have to fear the future.



TELETYPE
WHERE DATA BECOMES INFORMATION.

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CIRCLE 3 ON READER CARD