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'71
January 1

[redacted]

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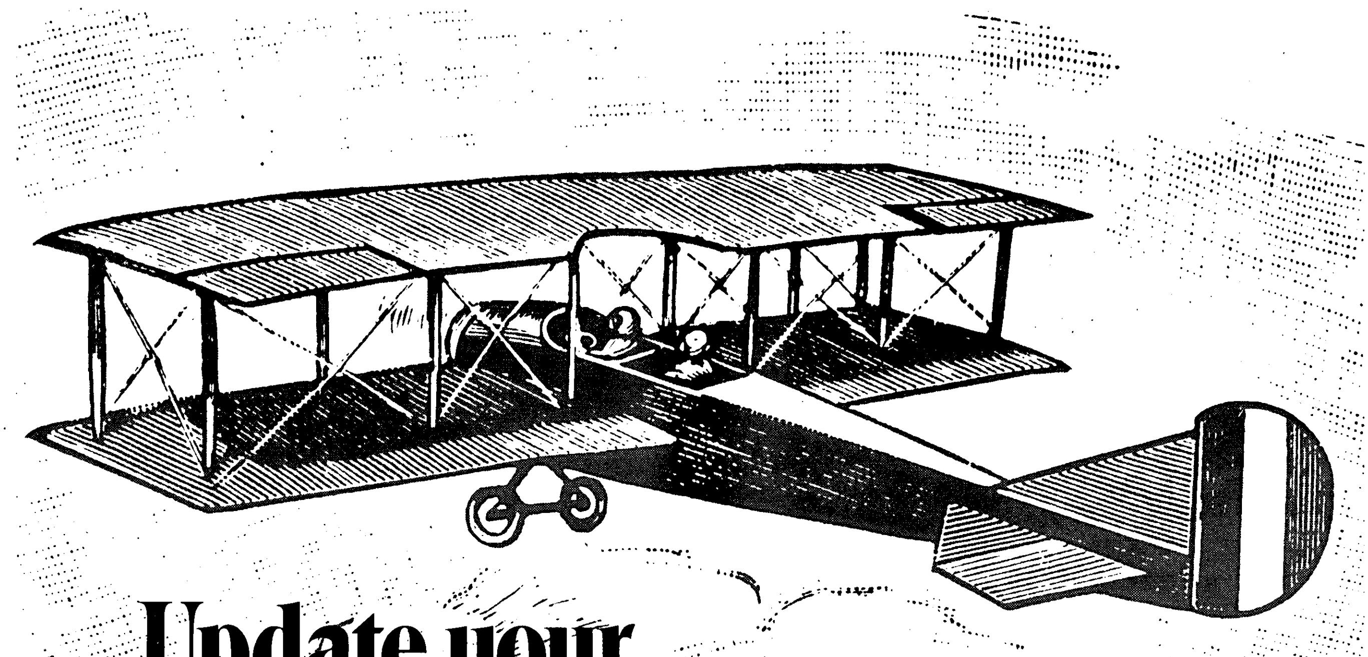

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CIRCLE 4 ON READER CARD

DATAMATION ®

JANUARY 1, 1971
volume 17 number 1

departments

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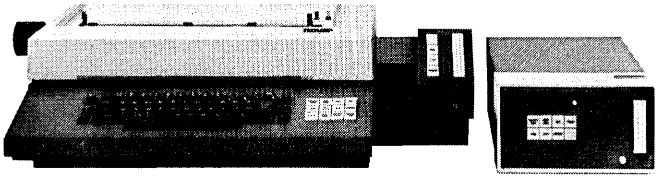

DATAMATION®

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ROBERT B. FOREST

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CALENDAR

DATE	EVENT/SPONSOR	LOCATION	CONTACT	COST
Jan. 12-14	4th Hawaii Int'l. Conference on System Sciences	Honolulu	HICSS-4 Univ. of Hawaii Honolulu, Hawaii 96822	Unknown
Jan. 19-21	Computer Designer's Conference/Exhibition	Anaheim, Calif.	I &SCM, Inc. 222 W. Adams St. Chicago, Ill. 60606	$3 at door $52, sessions
Feb. 9-11	WINCON Aerospace & Electronic Systems Convention	Los Angeles	W. H. Herrman, IEEE 3600 Wilshire Blvd. Los Angeles, Calif. 90005	$15, members $20, others
Feb. 9-11	COMPSO East	New York City	Computer Exposition, Inc. 37 W. 39th St. New York, N.Y. 10018	Prereg., free $2 at door
Feb. 15-19	Computer Display Equipment Exhibit	Frankfurt, Germany	U.S. Commerce Dept. BIC-932 Washington, D.C. 20230	$450, exhibitors
Feb. 17-18	AIAA Integrated Information Systems Conference	Palo Alto, Calif.	R. W. Rector Cognitive Systems 319 S. Robertson Blvd. Beverly Hills, Calif. 90211	$20, members $35, others
Feb. 18-19	ADAPSO 31st Management Conf.	Phoenix, Ariz.	ADAPSO 551 5th Ave. New York 10017	$80, members $100, others
Feb. 17-19	6th Annual Conference on Digital Computers in Process Control	Baton Rouge, La.	Dr. Cecil L. Smith Louisiana State Univ. Baton Rouge, La.	Unknown
Feb. 22-24	Canadian DP Institute Conference & Trade Show	Ottawa	Revett Eldred, DPI Box 2458, Sta. D Ottawa 4, Canada	Invitational, by request
March 8-10	AMA Management Systems EDP Conference	New York City	American Mgt. Assn. 135 W. 50th St. New York, N.Y. 10020	Unknown
March 9-11	ASM, AMS Business Equipment Show	Tulsa, Okla	A. O. Oyler, BEST Box 141 Tulsa, Okla. 74102	Free admission $215, exhibitors
March 10-12	4th Annual Simulation Symposium	Tampa, Fla.	Annual Simulation Symp. P.O. Box 1155 Tampa, Fla. 33601	$85
March 22-24	Numerical Control Society's 8th Annual Conference	Anaheim, Calif.	NCS 44 Nassau St. Princeton, N.J. 08540	$95, members $125, others
March 23-26	Information Industry Association 3rd Annual Meeting	Lancaster, Pa.	IIA 1025 15th St. NW Washington, D.C. 20005	$75, members $125, others $25, spouses
April 1-2	ACM Symposium on Information Storage & Retrieval	College Park, Md.	Dr. Jack Minker University of Maryland College Park, Md.	Unknown
April 13-15	Microwave Research Inst. Symposium on Computers and Automata	Brooklyn, N.Y.	Brooklyn Polytech. Inst. 333 Jay St. Brooklyn, N.Y. 11201	Unknown
April 14-15	ISA, IEEE Electronics & Instrumentation Conference	Cincinnati	William Meinders Husky Products, Inc. 7405 Industrial Rd. Florence, Ky. 41042	$2 registration

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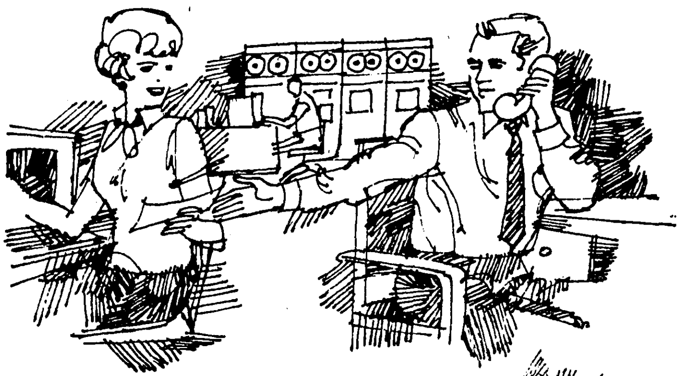

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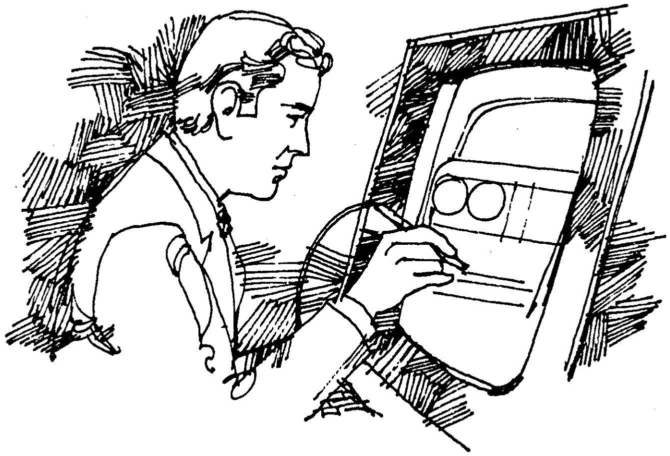

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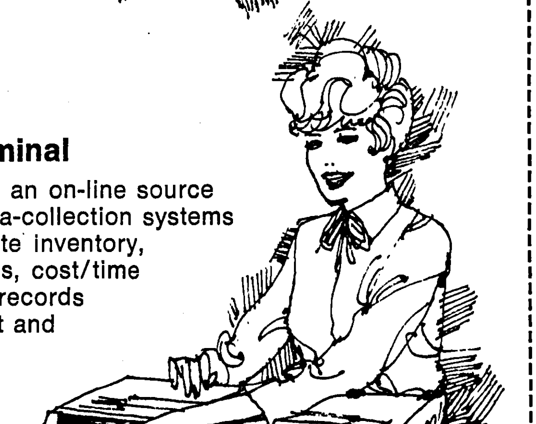

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Six copies of the draft manuscript, each complete with abstract, and illustrations (all of which will be retained) must be submitted. Please notify the Technical Program Chairman in advance of your intention to enter a paper.

PAPER DEADLINE APRIL 1, 1971

Ralph R. Wheeler
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Technical Program Chairman

1971 Fall Joint Computer Conference
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LETTERS

Do we decimal

Sir:

Perhaps the economic depression of the computing industry could be alleviated by the renewed manufacture of the UNIVAC II. I note that one UNIVAC II "has logged 558,571 hours" (see picture, p. 43, Nov. 1) or approximately 64 years—extremely productive for a machine less than 16 years old!

LEE E. HEINDEL
Holmdel, New Jersey

Another decimal decimated. It should have read 55,857.1 hours. And it was still going strong, up to 56,511.7, when last we asked.

Manuals dexterity

Sir:

In a recent article (Nov. 1, p. 32) on conversion to ANSI COBOL, the author notes in passing the value of 1) a documentation technique that clearly delineates language extensions and 2) a language differences manual. Neither of these items is necessarily obscure in concept, but it appears from the article that only one vendor saw them as essential—a vendor not particularly notable for frivolity.

That such items are not commonplace (and are consequently worthy of mention in such an article) is largely due to the user community's having a significantly higher tolerance for poor performance in documentation than it has for any other aspect of a product. And technical accuracy is only a part of documentation performance; most of us can be, and frequently are, accurate and incomprehensible in one breath.

It's curious that an otherwise pathologically cost-conscious group continues to close its eyes to the economics of user documentation. This is possibly because the mystique demands that one produce results in spite of the manual; a good manual takes all the sport out of it. It's an expensive hobby (pursued, I've noticed, with particular avidity by holdovers from the second and, sigh, first generations).

It is also expensive to develop good manuals. It's just more expensive not to. (This judgment tends to be strongly colored by which end of the process one happens to be involved in.)

Anyway, those of us who write the damn things, for reasons peculiar to the writer ego, cherish the fond belief that *someday* users will wake up and start demanding the same level of function and performance in manuals that they now find it reasonable to expect in code and, moreover, will evaluate competitive program offerings with this factor properly weighted in.

There are those among us who actually believe we could survive in that environment. It might take a little getting used to.

TRULY ANN DONOVAN
New York, N.Y.

Sic

Sir:

Reference "Key Notes" Letters (November 1, p. 11) by Pat B. Smith Though it still causes me pain, I have become more or less resigned to seeing "data is" and 'none are' as a part of modern grammar. However, I could not refrain from a giant shudder or spasm when, in the last paragraph of the reference I read, "source media is immediately—." I wonder how many medias are available.

Of course, media is a perfectly good singular noun but it pertains to 1. vocal stops; 2. median layers in the walls of lymph vessels and arteries or 3. mid vein or rib in the wings of some insects. Its plural is mediae.

Does anyone edit these contributions?

A. E. BRANDT
Gainesville, Florida

Not in this instance.

Here comes Mr. Yourdon

Sir:

After having retired to my home bombshelter to review the Nov. 1 issue, I find that you have provided definitive proof that IBM 360 is part of the hippy conspiracy to overthrow America.

The article, "Call/360 Costs," by Mr. Edward Yourdon is obviously the work of a large collection of highly educated radicals. The well written article outlining the economic structure of Call/360 and the excellent counterpoint batch cost analysis could not be the work of a long haired radical.

If it were not for the picture, I would have fallen for this heinous conspiratorial ploy.

SPIRO A. DOUGLAS
Stamford, Connecticut

P.S. The letter is not real, but then neither is the pictured Mr. Yourdon.

The real Mr. Yourdon, as he appeared (top) in these pages in April, 1969, and (bottom) as he appeared in Nov. 1, 1970. We see no radical difference.

Profit without honor

Sir:

The interesting article, "Call/360 Costs," by Edward Yourdon (Nov. 1, p. 22) would have been even more useful if the alternative assumptions, which turned loss to profit, had also been quantified.

However, I was somewhat confused by the apparent intermingling of cash and accrual accounting terminology. While it appears from the author's calculations that only income flows are actually being considered, the term "cash flow" was used frequently. For example, the so-called cash flow figures in the last line of Figs. 1 and 6 are really accumulated income.

Measuring cash flow in the examples given would require, at the least, taking into account the timing of cash receipts and expenditures and the effect of taxes on positive or negative cash flow. A comparison of cash flow and income flow in varying situations could be a valuable analytic tool (for example, if equipment purchase were an alternative).

More such articles encouraging the analysis of economic and financial issues in data processing should certainly be welcomed. Perhaps its current difficulties will encourage the industry to take a more rigorous approach to financial questions in the future.

THOMAS O'FLAHERTY
New York, New York

Auracle

Sir:
I must commend Edith Myers for her Oct. 1 article entitled "Golden Rule Days." The style is interesting and certainly lucid, and the points well taken and well researched.

I would, however, like to question the motivation of an article such as this. As a private edp school owner, it seems that one must wonder if it is not "let's beat the edp schools again" month.

Certainly there are problems with edp schools, but I find very little by way of conclusion in this article, and in fact at the end of the article one is completely puzzled as to whether the edp schools are doing a job or not. I would like to think that in general the edp schools are doing an effective job, despite the fact there are rotten apples in the barrel.

I graduated a leading ivy league university with an engineering degree many years ago; I could not get a job. Does this mean that this esteemed university should be censured? Does the small percentage of graduates of the edp schools who run into difficulty condemn the entire field?

I would like to suggest a parallel article of research. Why not survey the readership of the magazine and find out what percentage of programmers, data processing personnel operators, keypunch operators, etc., are graduates of private edp schools. I know there is a reluctance on the part of industry personnel to admit they are graduates of edp schools. It is not because these people are not qualified, but it is because of the aura status which has been developed over higher education. It is something which is slowly dissolving.

It has only been in the past year that the U.S. Dept. of Labor has come out with statistics to indicate that perhaps college is required for only 20% of the positions for which a college degree is now listed as a requirement. The fact of the matter is that most edp personnel do not need college. From a status appeal standpoint, from a screening viewpoint, many companies require college.

The verifiable facts are that the proprietary edp schools fulfill a very necessary need, and hopefully in the not too distant future those schools which accept unqualified applicants, those schools which do not do an effective training job, will be weeded out, and the entire training industry will obtain the status it deserves.

LESLIE BALTER
J. C. Technical Institute
Jersey City, New Jersey

Mrs. Myers was not questioning the quality of the schools' training, but the methods of recruitment.

Magneschism

Sir:
In response to Mr. Robert Bufford's letter in the Aug. 15 issue on keyboard data entry (p. 14). He indicated Sunline, Inc., of St. Louis, Mo., installed an H-120 computer with only magnetic tape input, using NCR 735-101 key tape units, in September, 1966. He felt this might have been a "first" in the United States.

To clarify the record: We at the Franklin Life Insurance Co. installed three Remington Rand Unityper I's in 1954 and began operations using a Univac I computer in January, 1955. This was an all magnetic tape installation until November, 1962, when we added a Farrington Optical Scanner for turnaround document input.

We started phasing out the Unityper equipment in September, 1966, in favor of the DURA-Mach 10 paper tape equipment, modified to our specifications. These units are presently being replaced by an IBM-1287 Optical Scanner, IBM-2740 and 1053 hard copy terminals, and IBM-2260 crt's complemented by Touch-Tone phones with audio response in the near future.

Our installation could have been the first all magnetic tape installation. I believe, however, that General Electric in Louisville, Ky., became operational a few months before we did, using a similar equipment configuration.

DEAN EDWARDS
Springfield, Illinois

Fearless opinion

Sir:
In my opinion, it should be possible to display a document on a cathode ray tube and, via keyboard entry, punch an image to match the document displayed. The basic concept would include elimination of key verification, particularly for systems using total-text for information storage and retrieval processes. The crt device (off- or on-line) would permit a portion (or all) of the document to be punched to be displayed (optically or electronically) to the approximate size of the character generated by a keyboard entry. As the operator keys a character, the character would be generated above or below the "photo-image" displayed character. Thus the keyboard operator is "forced" to enter all data and, visually, verify character pairs. The electronic cursor would always point to the last (or next) character punched. The operator (keyboarding while viewing the crt-displayed document) would thus always know if he has made a mistake by omission or otherwise. Corrections would be made immediately. When the keyed data on the crt matches the document-display image, the operator would signal (by key stroke) the crt device to transfer data to magnetic storage or other media for subsequent computer processing.

Is there any vendor who is currently marketing or building a cathode ray tube device with a keyboard which will accomplish the above concept? Specifically, will this keyboard:

> Project all or a given portion of a full-text document (such as a page from an encyclopedia) on the crt whereby the character size can be adjusted (enlarged or reduced) to match the character size generated on the crt for any given keyboard entry?

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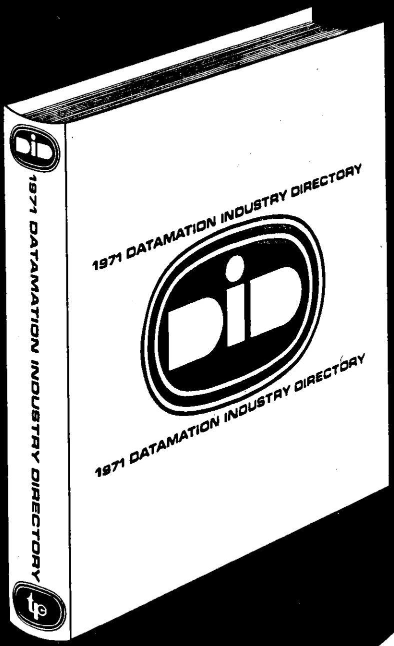

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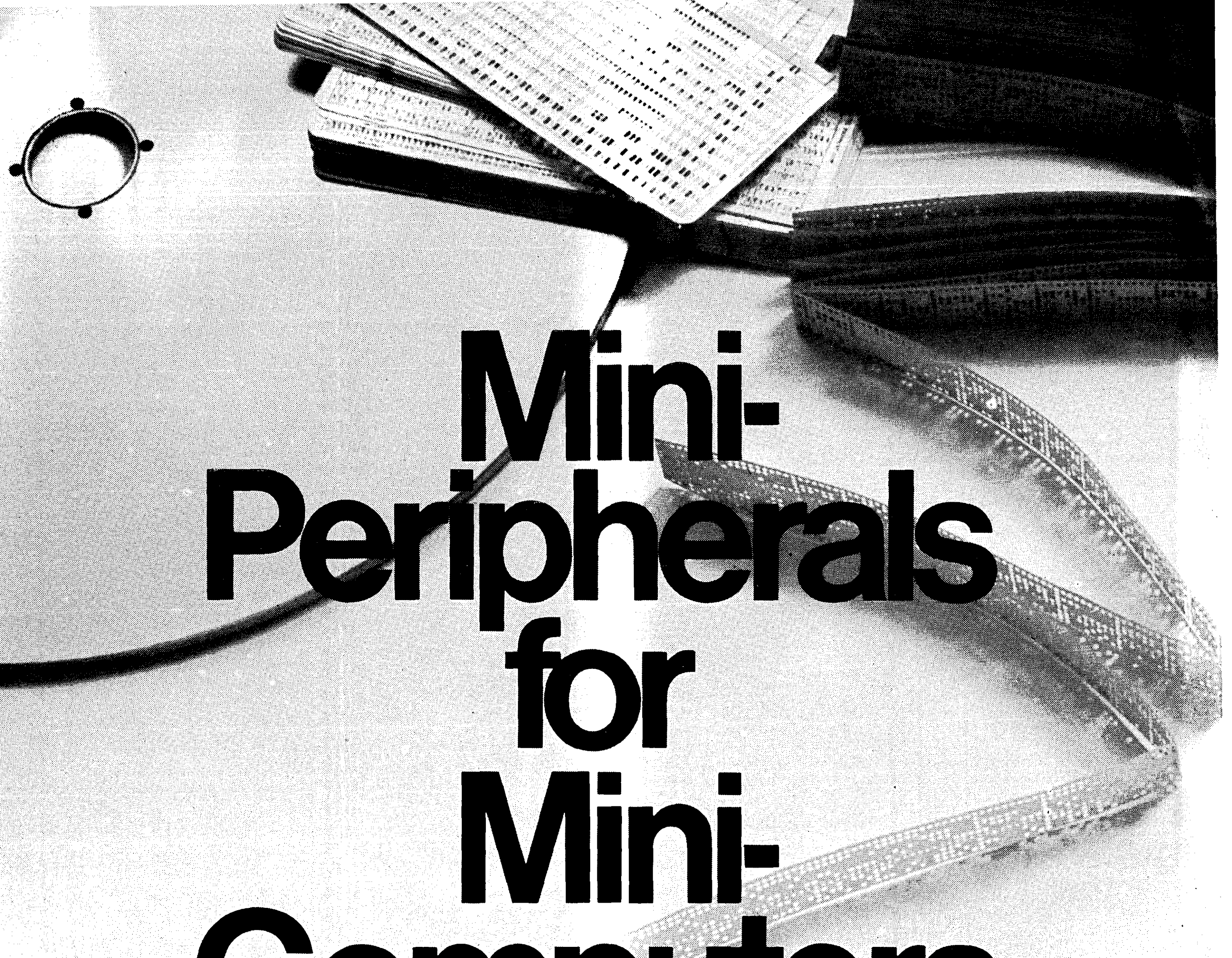

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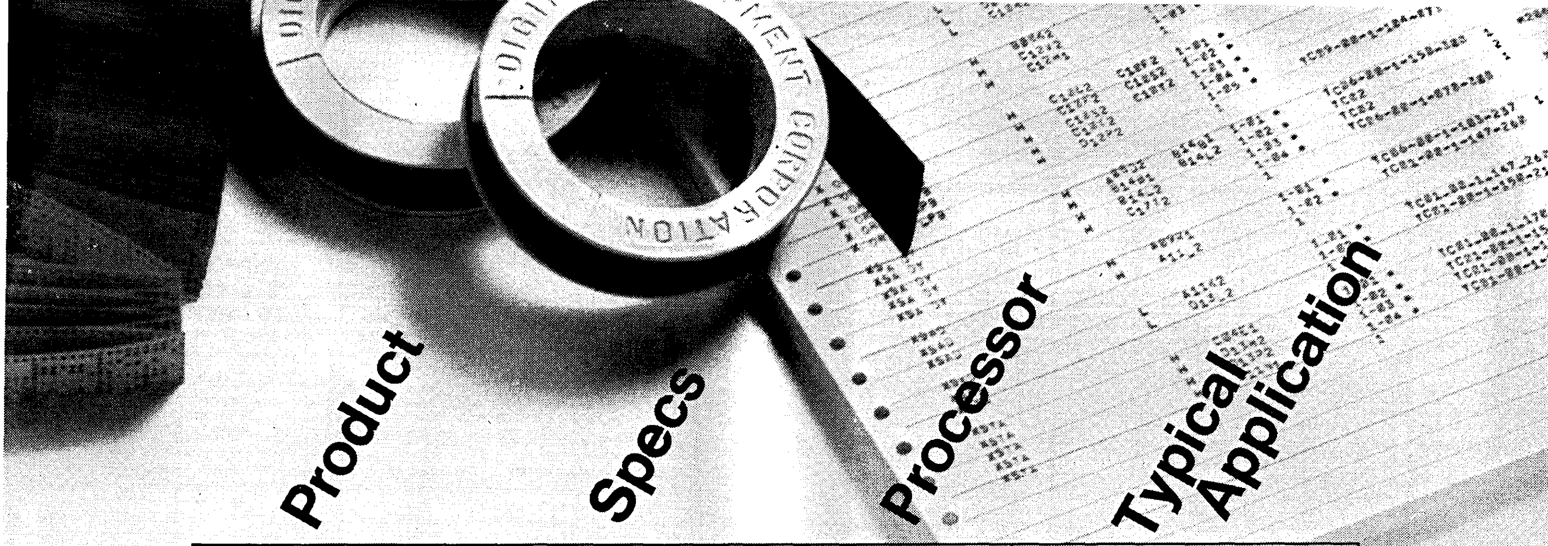

Product	Specs	Processor	Typical Application
DECwriter **LA 30**	An impact printer that is faster, quieter, and more reliable than teleprinters. 30 cps printing speed. 64 character set, ASCII 1968. 96 or 128 character keyboard.	All PDPs	Any application where conventional teleprinters are used: local and remote data entry, interactive computation, data logging, etc.
DECterminal **VT 06**	A low-cost CRT and keyboard for direct computer input/output, telephone line transmit/receive. All interfaces built in. Full ASCII keyboard, 1800 character image area.	All PDPs	Interactive terminal applications where hard copy output is not needed: graphic display from mass storage files, text editing, on-line debugging.
DECpack **RK 02, 03**	A disk file with moving head under electronic control. Reliable and quiet operation. Capacity 10 million bits, with 80 ms average access. Compact and low cost. Interchangeable disk cartridge.	PDP-11, 8, 12	Convenient storage of programs and data files in installations where several people use same computer.
DECprinter **LP 08, 11, 12, 15**	A low-cost, high-speed line printer with 80 or 132 columns and 64 or 96 character sets. Basic speed of 356 lpm can be increased to 1100 lpm for a 20-column line. Up to six-part forms for multiple copies.	PDP-11, 8, 12, 15	High quality alphanumeric printout for business and scientific reports.
DECmagtape **TU 10**	This magnetic tape system is IBM-compatible at 45 ips speed, densities: 200, 556 and 800 BPI, and 7 or 9 channels. Vacuum columns and a simple mechanism make it extra reliable.	All PDPs	Low cost file and program storage, preparation of data for processing on other systems, backup for disk files.
DECdisk **RS 64**	A low-cost, fixed-head disk with nominal capacity of 64K 16-bit words, expandable to 256K words. Average access time 16 ms. Real-time look ahead capability and cyclic redundancy error check.	PDP-11	Monitor program residence. Data file storage.
DECtape **TU 56**	A simple, compact, highly reliable magnetic tape system of proprietary design. Pocket-sized reels contain 2 x 10^6 bits. Read, write, search, or update in forward or reverse direction at high speeds.	All PDPs	Reliable, high speed alternative to paper tape. Used for program & data file storage.
DECscope **VR 14**	A versatile, low-cost CRT display. Combines high speed and high resolution for graphic and alphanumeric display. Features easy-to-read 63 square inch screen.	All PDPs	Manuscript editing, source data entry, interactive computation, file scanning and updating.

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CIRCLE 20 ON READER CARD

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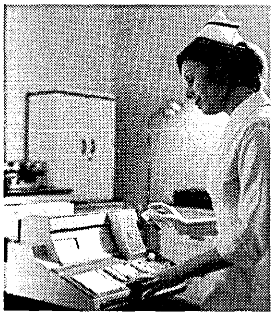

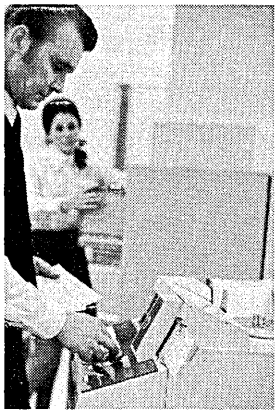

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LOOK AHEAD

IBM USES HOT IRONS TO PRESS SUIT

IBM came out with all legal cannons firing in its trade secrets suit against the beleagured Memorex. Lawyers are intrigued that IBM asked for an injunction with a specific time limit -- 30 months -- against Memorex's production or use of 3330-like components based on trade secret data. Says one: "That means IBM is not against copying, but by that time the 3330 will be competitively out of reach." At a minimum, IBM is said to be hoping to discourage more defection of key employees involved in peripheral development and to slow the leak of detailed intelligence on such items as the 3330 and 2319 control units and the "iceberg" Integrated File Adaptor. Technologically they are major IBM changes, and the me-tooers have been scrambling to find out enough to produce their own versions. Some think the case will be settled out of court, citing as a precedent in the 1969 IBM suit against Cogar. This claimed Cogar was using trade secrets on IBM's semiconductors and luring away IBM experts. That suit was settled amicably out of court.

STAR LIGHT, STAR BRIGHT CDC'S WISHES MIGHT ...

After an extensive sales effort, it appears as if Control Data has about locked up its first commercial sale for the super Star pipeline computer (April, p.68). A big Detroit company -- rumors say it's GM -- has been using the Star via terminals from Detroit for a year. And top-level approval has evidently been committed, if not inked, for an initial $2-million order for Engineering Model One. But the final order for the entire system may come to $15 million ... and we hear GM is thinking about five systems.

Meanwhile, back at the Lab (Chippewa), CDC's energetic recluse, Seymour Cray, is reportedly working away on the CDC 8000, a "special machine" that may have four times the power of the 7600.

THE VOICE WITH A SMILE ...AND A COMPUTER

The most natural data base in the world, the telephone book, has succumbed to computerization. In a pilot program in Oakland, Calif., eight Directory Assistance (Information) operators are turning to crt's rather than to voluminous directories and supplements for the answers to callers' questions. Their experimental system, devised by Bell Labs working with AT&T Directory Assistance people, covers 17 exchanges in the San Francisco Bay area, runs on an IBM 360/50, uses two 50K baud phone lines, a Honeywell 516 as a preprocessor, and eight crt's. It's faster (the operator simply keys in what info she gets from the caller and gets an instantaneous response), more up to date (a new phone number gets into the data base within 15 minutes of installation), and more useful (if your party's name is Mary Smith and you're unsure of the address, throw out a few guesses like, I think it's the 3400 block of Sixth St. and the computer will narrow the field fast, and you don't even have to be sure of the spelling beyond the first three digits) say telephone company officials.

370 MICROCODE: A FEW CONCESSIONS FROM IBM

More on IBM's stand on providing 370 microcode information: Responding to questions from SHARE, IBM said it will make available field engineering manuals on the 360/25 (which has writable control store) and is investigating other materials on the subject. It will provide nonconfidential information on software facilities used to develop microcode, but it will not support user-written microcode, which will be treated under the same rules as multiple supplier installations.

MODEMS ARE IN THE CHIPS

It appears to be time to put modems on MOS chips, so a Costa Mesa, Calif. firm is doing it. Modex Co. plans an early '71 introduction for an asynchronous modem on a 6 x 5-inch card, requiring less space, less power, and less money and capable of full and half duplex and simplex transmission to 1200 baud.

FIRM'S GOAL IS CRT ON EVERY MANAGER'S DESK

Control by CRT is the name of a year-old Torrance, Calif. company which this month will offer business packages on-line, using a General Automation 1830 computer, a CalComp CD 114 disc drive, and a 600-lpm printer to accommodate up to 45 terminals. Three Los Angeles customers have been signed up, says president and founder F.E. "Phil" Fillbach, and the company is negotiating with up to 50 others, who represent revenue of $300K a month. It also will sell franchises for the system through an affiliate, Management Automation. It aims at firms in the $250K to $3 million annual sales range, and claims it could do dp for a $250K company for $500 a month. Fillbach envisions the day when businesses will be controlled from crt terminals on every manager's desk and bases his hopes and the company's name on this.

RUMORS AND RAW RANDOM DATA

IBM has been accepting special requests (RPQ's) from Mod 30 users to extend main memory from the standard 64K to 94K. The import of this is unclear, but it could satisfy users who don't want 370's, users who need an interim solution until the 145 is out, and users tempted to switch to the larger memory RCA 2 and 3 (256K). . . When Datamation's resident computer genius resigned recently as the L.A. Traffic Commissioner, he was replaced by -- you'll never guess -- Rudy Vallee.

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CIRCLE 29 ON READER CARD


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EDITOR'S READOUT

Plus ça change, plus c'est la même chose.

One could also say: "The more the computer industry changes, the more it remains the same."

Indeed, there have been new developments—technological developments—maybe even breakthroughs. But as a result of these kinds of changes and new developments, the computer industry itself is forced to remain in a rather "same" position. That is, the change comes too fast or changes are made that we are not ready for, or the change implies an understanding that is missing from our current abilities.

So our theme says that the man in the street has had his life at times significantly eased as a result of computer developments, that user organizations have reorganized and restructured their environment in order to attempt to accommodate the requirements of the new technology, that the development of the technology itself has provided significant amounts of new ideas and principles and, finally, that the computer professional today is a different person from his counterpart in 1960 or before.

But the "sameness" within the industry to which I refer implies that repetitive challenges are presented with respect to efficient use of the available tools. In our search to improve the utilization of computers and to adapt them to more sophisticated applications, we find the goal often hindered by the advent of new technological developments. Byte-oriented computer systems introduced close on the heels of thousands of 1401 machines have created a world of emulation rather than a society of improved computer applications.

So what's the big deal? And where is all the progress? We have sophisticated operating systems, mass storage devices virtually unlimited in size, speeds a thousand times faster than we ever dreamed possible, multiprogramming and multiprocessing. Yet the average user (I think there are more average users than non-average ones) still has a problem converting from Autocoder to COBOL.

Yes, we do have changes and what have they really done for us? The concept of a computer utility has flopped, time-sharing companies are folding up their terminals, integrated management information systems no longer deserve sessions at the Joint Computer Conferences, the "checkless" society concept attained a formidable position whereby one can buy a pair of shoes in Wilmington, Delaware, and the concept of computer-assisted instruction can't get out of elementary school.

In addition, our training problems are as severe as they were 15 years ago, perhaps for different reasons, but nonetheless they are still with us. There is still talk about centralization versus decentralization of a computer installation and studies are still being made to prove how effective (or ineffective) a particular installation is. All this technological change and we are still doing the same old things.

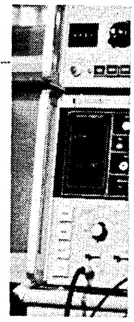
What is the most successful computer utility package that is marketed today? An automatic flowcharting program. What is the most successful computer application package? A payroll system. So look what all this change has given us. We are still trying to multiply hours times rate and document it.

There are dozens of other areas that could be mentioned to demonstrate the premise that there is a lot of change but very little progress. Thus my conclusion is that the computer industry has essentially stayed the same over the past years. We are constantly engaged in solving the same old problems—perhaps with different sets of tools. We have produced some kind of planned obsolescence that demands a periodic rewrite of existing systems. This change robs us of the time we need to become expert with our existing tools and to develop a scientific method to our madness.

As Ben Franklin once said: "Behold the turtle; in order for it to make progress it must stick its neck out." Unfortunately, the computer industry has developed the premise: "Behold the computer industry; in order for it to make progress it must redesign its shell."

—Howard Bromberg

Computers are still more visible than the people who run them



EDP Professionals

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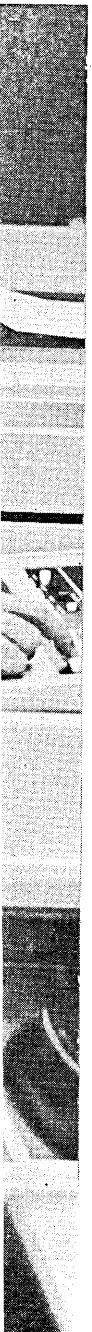
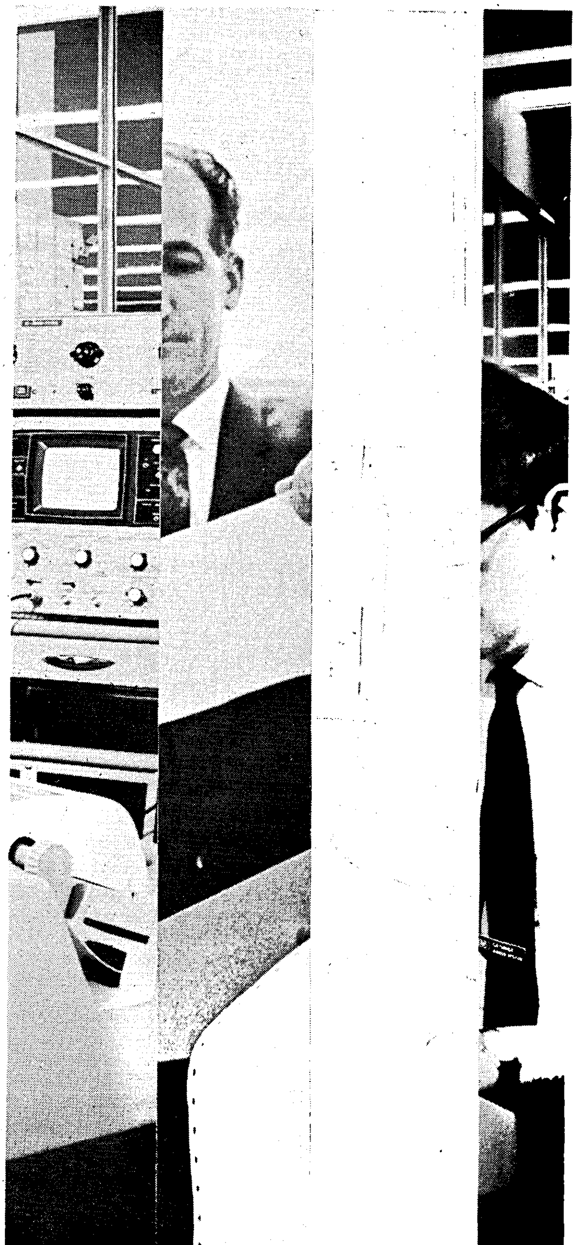
In the last decade the American public has become aware of the computer and the computing profession in a way never dreamed of by the pioneers of 1960. There are two separate streams at work. Before the computing profession could make itself known, the computer rudely thrust itself into the general consciousness.

In the mid-sixties the computer became if not important at least recognizable. Until that time it was merely an obscure calculating machine used primarily in the research laboratories and technical centers of a thousand scientific establishments. The date the computer-population explosion was triggered can be pinpointed—April 7, 1964, the introduction day for IBM's System/360. From that day the computer has been a factor on the national scene.

Even though the years have rolled by, the general public has yet to discover that computers are run by people. Unfortunately, the science fiction addicts and popular commentators perpetuated the widely held myth that giant electronic brains control their environment—not the other way around. A nation raised on a steady diet of television comedies, wrong bills from the neighborhood stores, and magazine cartoons cannot believe that man is usually the master of the machine.





Recent events have indicated that the computer is becoming a standard target for assorted radical groups, for hypersensitive civil libertarians, and for just plain scared average citizens. There is something eerie and uncomfortable about a winking, blinking mass of lights, whirling devices, and mechanical paraphernalia. It's a lot easier to attack, sometimes physically, a semihuman electronic scrap heap than to get at the real issues involved.

In some circles the computer is considered the symbol of all that it wrong with the slightly tarnished American dream. The people who staff a computing operation have all but disappeared from view under a pile of irrational, irrelevant invective. This applies equally to operations personnel, programmers, and the assorted users who really only care about getting answers.

It should be recognized by now that computing professionals are not real people in the eyes of the general public. A public inundated by matchbook covers offering careers in edp, a public trained to laugh at the malfunctions, a public accustomed to dealing at arm's length with the computer, simply isn't aware that there are people behind the scenes. We are perhaps a decade away from being recognized as the "powers behind the throne," or, as some have put it recently, "those who bow before false idols."

Even if the computing professionals have failed to make any serious impact on the general public, the computer has succeeded in a way undreamed of in 1960. The toy has grown up to become a very real and occasionally useful tool of American business. In the process the relationship between the world at

—the Blurred Image

by Philip H. Dorn

large and the profession has deteriorated to the point of nonexistence. A curious situation: the machine has developed a public image while those who control it have faded into the background of obscurity.

If the professional's image is vague, it is worth an examination of his essential role to try to understand what has happened. The computer professional, circa 1960, was probably a scientist, academically trained in another discipline, and essentially aloof from the world at large and even from other professional colleagues. A decade ago most of the pros were devoting their efforts to problems primarily of interest to the scientific community. Another sizable group dealt with military command and control systems. A bare handful of professionals had any awareness of the commercial side of the house except when their paychecks were late.

If anybody asked him what the role of the computer was, and if he deigned to answer, he would likely express the view that the computer was a purely scientific device best fitted to solving certain interesting problems in higher mathematics. However, it is still more likely that the question went unanswered since the 1960 vintage computer professional was far too busy trying to coax reproducible (not necessarily accurate) answers from a collection of balky vacuum tubes, unclogging jammed card readers, and picking up the remains of snapped magnetic tapes. Put at its simplest, our doddering ancient of a professional had his hands full just trying to get a few answers from far-from-reliable first-generation systems.

Coping with 1960 vintage software was by no means easy, even though in retrospect the simplicity makes it seem almost a student exercise. The computer professionals who constructed those primitives were often carving new ground and working out the rules as they went along. Who now recalls such momentous debates as row vs. column binary cards, or thinks of the difficulties when we first went card to tape instead of using the on-line reader, or still remembers the genius who first promoted the use of index register 4 as the transfer register on the 704?

The professional of 1960 was strictly working for himself and for his colleagues. Within the embryonic industry there were no public image worries, and more than sufficient technical problems to keep everybody happily employed.

Ten years and a few assorted wars later, the computer professional is beginning to emerge into public view. His tool, his toy of earlier years, had beaten him to center stage and created a multitude of problems in the process. There are again two sides to the case—the private and public—and it isn't clear that they can be separated.

The private world of the computer professional is friendly, clubby, and as in-bred as any long-established, Royally-chartered scientific society. Whether the participant seeks professional recognition in a technical society or in a user group, the pattern is essentially the same.

The technical societies have little or no public image. Perhaps an occasional Sunday supplement in the newspapers of the meeting city is noticed, but it is doubtful if the impression lasts for more than a few seconds. Testimony in Washington hearings is rarely given in the name of one of the formal edp groups; none of them have been famous for the boldness of their positions even when the subject under discussion is highly relevant, for example the FCC computer inquiry.

The user groups are even more shy—most bar the technical press totally while others allow their presence under the most restrictive circumstances. All work in the "user's only" atmosphere and are closed to the public. The reasons for this vary widely but to a large extent it is due to the informal nature of the proceedings in which bad data may be spread widely. (A parallel might be drawn with the legal system's adversary proceedings. A newspaper report limited to only the prosecution's side of the case would hardly be an accurate picture of the judicial proceeding.) Most user groups would rather have no reporting than bad reporting; since there are no known ways to guarantee accuracy, they have elected to work in private.

It's a strange situation! The computer exists but the computer professionals have no stature or impact outside of their own little world. While the fame of Thomas J. Watson, Jr., is widespread, his company and his colleagues are not at all well-known except as a typewriter manufacturer. If one considers that the computer may well be the central technological fact of the second half of this century, the paradox is startling. The public media typically mishandle any story relating to computers as a matter of course. Little wonder that the public image of the edp world leaves something to be desired.

Perhaps one reason that the industry has made so little impact on the public is the almost conscious attempt to stay out of the public eye. While this is not unusual in the scientific community, computing is no longer just an academic discipline. The lack of public positions, the attitudes of the user groups and technical societies, the defensive attitudes of most programmers and analysts when faced with inaccurate public reports all suggest that an entire industry is holding back for fear of being noticed. Why? Is there a collective sense of shame in the work? Is it of so little value to society that the future is dubious? Is the industry so out of tune that its goals cannot stand intensive examination by the practitioners or the public?

Is there a collective sense of shame in the work?

One possible answer is that most computer professionals regard the history of edp as so full of grandiose failures and public collapses that they are unduly sensitive about being exposed to the glaring light of publicity. This thesis may well be sound; certainly there is little doubt that the track record is far from good. It takes limited memory searching to dredge up some of the most publicized failures of recent times—the military systems that only became operative after becoming obsolete, the abandoned airlines reservations systems, the assorted ballot counting fiascos.

A public that reads a "gee whiz" story in its Sunday newspaper and then reads of these widely publicized failures can react with sadistic glee. So the industry pulls in its horns and hides at its little private confabs. An elementary attempt to bring things into the open, ACM '70, failed technically and financially, and is hardly likely to be repeated in the same format.

A decade ago our computing capacity was small; today it is gigantic. The machines have calculating speeds and mass storage devices that give price/performance ratios undreamed of in 1960. Most shops use multiprogramming, remote computing, and random storage techniques as a matter of course. At the same time, six years have been spent trying to convert from the second generation, the charlatans cannot be chased out of the edp education business, and installing economical computer facilities in our public schools to assist in instruction seems always to be just out of reach.

With the history of failure, with the difficulties in getting anything new done, with the long string of outstanding problems, with the antipublic attitudes, it is little wonder that the computer professional has so little image. The public view of computers is patently false, although this is not entirely the public's fault—the industry's view of the world is equally uninformed.

If the computing community cannot manage itself either in relationships at home or with the world at large, it is hard to see what good can be expected in future years. A pessimist might hold that the future is totally bleak, and as a profession computer people are doomed to deserved anonymity. Certainly there has been nothing in view lately that promises to change the picture. Perhaps this is precisely what the industry wants, the peace and quiet of academic surroundings. ■

Mr. Dorn is currently manager of advanced projects at Union Carbide Corp., where he has also served as a specialist in time-sharing and programming languages. He is a Datamation adviser and was president of SHARE (1969-70). He has a BA from Princeton in political science, and has done graduate work at Stanford Univ.

Now as then, data processing remains outside the company mainstream, its potential still unfulfilled

The Internal Isolation of

G

In years past, information was processed with sorters, collators, and tabulators. Systems were rather straightforward, machinery was fairly inexpensive, and the results were a simple reflection of the business activity for the immediate past period. The tab shops and their managers served at the pleasure of the company's managers, who were keenly interested in the listings of each quarterly financial report. Communication with management was no problem because the jargon emphasized the company's business application.

But as the economy expanded and business boomed, the need for information became critical; tabulation of historical information was just not sufficient. The evolution toward the integration of historical information, predictions, and simulation occurred along with advances in technology—up to a point!

In the majority of installations, computers are not being used for new purposes; they are instead performing administrative tasks that are also being performed by tab equipment, bookkeeping machines, or pen and pencil. Further—and here one may be critical—the qualitative characteristics of the computer are not being utilized in the solution of most administrative problems. The systems design for computers too often parallels the approach used with simpler, less expensive equipment. In the everyday world the computer is not so very special; it is merely an expensive species of the genus *Office machines.* If, how, and when the computer will escape to some new order of classification are open questions.

Each technical advance—e.g., improved mass storage—allows a few installations to assume some sort of quasi-operational role within an organization. But for every computer system removed from the humdrum, there are many new installations at the low end of the scale where the owner/manager has decided to experiment with using the latest computer technology—for payroll.

There are important structural barriers to new ways of using computers. These barriers have to do

the DP Department

by Louis B. Marienthal

with fundamental characteristics of organization and management, and they are basically impervious to advances in technology. As discussed below, the success of the computer in its role as an office machine is somewhat self-perpetuating. Thus, the new levels of technology (with new levels of theoretical utility) reproduce—with only a few exceptions—the same discussions of "Why Computer Potential Is Unrealized."

The senior executives in most organizations who set policies about computers are not computer professionals. They are ex-salesmen, ex-factory men, or ex-financial men. They are old enough to have graduated from college before there was a Univac I and to have changed jobs several times before there was a 1401.

For most user organizations, data processing is a staff function; a computer does not directly sell, nor does it directly manufacture. Computer data processing is a kind of elegant score keeping technique aiding the line functions of selling and manufacturing. The score keeping was, of course, accomplished before computers, and in most areas could still be accomplished without computers. Unlike any other staff function, data processing involves substantial start-up costs, a highly visible recurring expenditure, a delayed return that is difficult to measure, and a commitment that cannot be easily terminated without the total abandonment of the historical investment. The senior line executives of today consider data processing to be a major management headache; to some degree they establish policies out of fear.

The data processing department is a cost center, and for the great majority of users, computer processing is a tactic to be employed when administrative problems reach a critical size. In most cases new computer equipment is economically justified application by application, just like any piece of office equipment, past and present.

During the 1960s, economic considerations provided the compelling force to introduce computers into new environments. The costs of paying, housing, and managing clerical personnel rose continuously. Periodically new lines of computer equipment with progressively improved price-performance ratios became available; not surprisingly, computers were progressively applied to the solution of more and more, smaller and smaller administrative problems.

There is some evidence that senior executives (through farsightedness or fear?) are willing to bend the rules, but the great majority still expect a reasonable return on expenditures for data processing. In any drive to cut costs, one of the first areas to get the ax is anything in the data processing department not directly connected with current operations. We all know many examples of the sudden termination of long-range projects in early 1970 when the effects of the recession began to be felt.

The success of computers in assuming individual administrative tasks tends to focus attention on these tasks. If the payroll, or billing, or statements, or whatever is not produced on schedule, the manager of the dp department may get fired. It becomes an imperative that the continuity of the successful applications be preserved. The preservation of the going systems usually leaves skimpy resources for a strategic rethinking of the information processing function as a whole.

The essential problem is to advance while holding the gains of the past.

In a typical data processing environment, there is steady pressure from gradual increases in volume and sporadic requests from operating management for modest extensions of current systems. The preservation or maintenance of current jobs involves the manager of data processing in many difficult technical decisions involving alternative ways of expending data processing resources, e.g., install additional equipment, install different equipment, reprogram for greater efficiency, operate during an additional shift. The greater the existing workload, the larger the inventory of on-the-shelf programs, the more complex are the problems of the data processing manager.

The essential problem is to advance while holding the gains of the past. The reckless buying of each new advance in hardware and/or software merely makes holding the gains of the past a continuing battle. In many ways, data processing management is a defensive ball game.

As an example, let us assume a typical distribution company with a smoothly operating 360/30. Old 1401 programs are still being run in emulation for the payroll, but the major systems (inventory control, accounts payable, and accounts receivable) were designed and programmed for the 360. We might further assume that computer operations nearly fill two shifts and that there are five people on the systems programming staff—including one who is fully occupied with routine maintenance and another who spends nearly full-time with DOS problems. There is, of course, a long list of projects for the uncommitted systems/programming resources: an improved inventory model, additional sales analyses, general ledger, etc.

In a static data processing world, one could quickly determine whether reprogramming the payroll or purchasing an available package would be worthwhile. A new payroll system would reduce computer running time and eliminate the emulation hardware. But the benefits are all internal to the data processing department and the dollars of reduced rental—equivalent to one clerical salary—are not going to be noticed in the over-all p&l.

Of course, the data processing world is not static, and salesmen descend on our dp manager offering, (1) new equipment that provides much improved throughput for the same money, and (2) a generalized file management system. The new equipment could *almost* run with existing programs (except the payroll) and use maybe 10 hours per day; alternatively the new equipment could run with the file management system, which could *almost* reproduce existing computer functions, and use maybe 15 hours per day. Any kind of conversion will obviously eat up many man-months of systems/programming time and delay the improved inventory model and other projects useful to operating executives in the company.

The problem is now complicated, and the amounts of money involved are of interest to the company president. If our dp manager is capable, he will not only be able to present a succinct analysis of the alternatives, but will be clever enough to keep the focus on the internal problems of running the computer installation. If the president gives the matter some thought, he might discover that many of the various ways of spending money for data processing divert the data processing resources *away* from the basic business of the distribution company. He might even get the idea that the company exists to provide a hospitable environment for the computer installation.

The company president will remember the delivery of the 360, which was many times more powerful than the old 1401 and which allowed the programming staff to use COBOL—in order to ease the problem of program changes and extensions. He remembers that the conversion was not too bad—certainly better than the original installation of the 1401—but that nothing new came out of the computer department for six months while the new inventory system was being programmed. The president also knows that the total data processing budget has increased every year and that system changes and extensions have been made with some difficulty in spite of COBOL.

The new computer proposed to replace the 360 is not the end of the line, and the new file management system will be replaced by something with greater flexibility. Even if advancing technology were to make each new conversion easier than the previous one, on each new occasion there will be more to convert. We and the company president know that conversions always cost some money and an unpredictable amount of time.

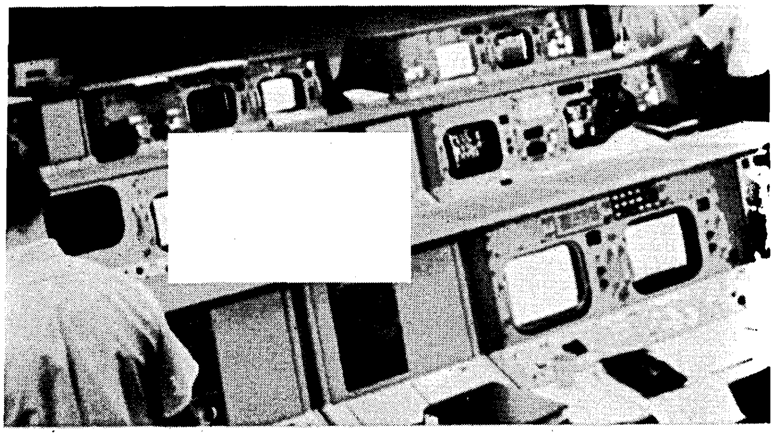
To the president, our dp manager seems to be more often concerned with the problems of how to do it than with the policy questions of what to do. We cannot be surprised that the president and other senior executives consider the dp manager to be a high-class technician who understands tapes and terminals but who fails to understand the sources of company profit.

Within the dp departments of typical computer users, there is one common, usually unvoiced, complaint: "We are not appreciated." It is indeed true that few people outside of the dp department realize the grinding work involved in the implementation of a new system, the round-the-clock effort of the conversion, and the exasperation when an unrelated trivial event spoils the evidence of six months of intellectual triumph.

Of course, the lack of appreciation is a two-way street. Too few data processing personnel will recognize that people from other departments are either intelligent or hard working. Fewer still will concur with the proposition that there is little pragmatic difference between a basic logic flaw in a system and some trivial anomaly within a data set; that either error might swamp personnel from other departments in extra work is too often met with a shrug of regret.

Commonly, data processing people eat lunch together, talk computer shop together, and party together. With some reason, private or semiprivate offices are often provided to programmers and not, for example, to accountants of the same pay grade in the organization; occasionally, and for no good reason, general rules regarding dress and hours of work are relaxed for data processing personnel. The special treatment and clubish behavior are, of course, resented by personnel in other departments and counterproductive to the position of data processing within the organization as a whole.

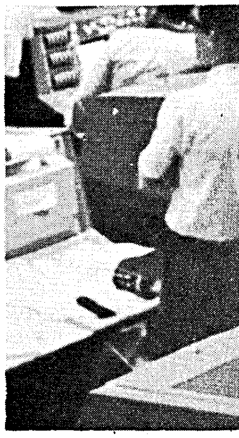
Technological change accentuates the introverted character of the data processing department. Scarce r&d resources are sometimes devoted to studies of new types of devices—terminals, communication controllers, etc. When the characteristics of the devices are thoroughly understood, a study is then made to see how such a device might be employed. We have all seen many examples of solutions in search of problems.



New computers have greater potential throughout than old computers. Sometimes, using the new computer with elegance becomes an ethic—as if the machine possesses a psyche that would be damaged if it were not loaded in multiple partitions. Taking advantage of new levels of machine capacity always requires the expenditure of programming effort—and a corresponding delay on applications work. Sometimes the continued "misuse" of a new computer allows data processing to increase its contribution to successful over-all company operations.

There is no doubt that continuity of systems/programming personnel is an absolutely essential ingredient in a successful data processing operation. For the sake of continuity, we might sometimes justify special employee perquisites, r&d studies of new devices, and efficiency-oriented programming projects. But there is the nagging thought that because such activities serve to enhance the status of personnel in the data processing profession, and, because few computer-user organizations are able to offer unlimited upward opportunities, senior professionals will be encouraged to change jobs.

In 1970, as in 1960, the new developments in hardware and software have created a body of skills more easily transferred from one company to another than from the computer department to, say, the sales department. Any sort of interdepartmental rotation plan is a laughable idea precisely because computer skills are specialized and valuable. The techniques of the trade (or profession) make it hard for dp personnel within user organizations to realize that their pay is based on the fortunes of the distribution business or insurance business or whatever.



The technological advances of the past 11 years have, of course, given us a sense of assurance. In general, a problem is not avoided because it is complex, the subject of machine errors is hardly ever discussed, and computer down-time is an aggravating surprise. But:

1. Within user organizations the computers of today are employed for much the same sort of administrative purposes as they were ten years ago, and with some obeisance to the professional sensitivities of programmers, data processing projects are generally authorized—one at a time—on the basis of economic calculation.
2. Computer departments have acquired their own overhead consisting of on-the-shelf systems that need to be kept current and the new technological developments that "need" to be assimilated; this overhead subtracts significantly from the potential services that might be provided to the using organization.
3. The data processing department is typically a kind of foreign body within the host organization creating special problems of interdepartmental communication and personnel management.

The data processing department is typically a kind of foreign body within the host organization . . .

The data processing shop that concentrates on loading equipment with miscellaneous administrative tasks is merely a collection of office machines managed by a technician. The hardware can change every five years, but this common type of installation may well be called a high-cost anachronism.

Most of the opinions in this article have been expressed many times since the days of the first commercial installations. It would seem that the managerial and psychological problems of fitting an administratively oriented computer department into a user organization have been largely unaffected by advances in technology.

There are, of course, many computers operating today that cannot be classified as administratively oriented. Applications such as on-line savings and loan, airline reservations, and even the banks' processing of the commercial checks are thoroughly intertwined with the line functions of the industries. In commercial enterprises of modest size, administrative functions of prebilling, inventory control, and accounts receivable are now evolving into a direct computer link between the registration of an order and the shipment of merchandise.

While improved hardware and software will allow further extensions of computers into line functions, a broad range of data processing service organizations is being established. It is now possible for the alert dp manager to farm out many of the extraneous administrative applications to outside service companies and concentrate in-house resources on the basic functions of the user organization. If the dp manager can shed some of his preoccupation with the techniques inside his shop, he will be able to integrate himself and his department into the employer organization.

Future demands for computer services will come from executives who have been trained and/or are experienced with computers. Many will have had easy access to high-capacity equipment while completing their MBA projects in college, and their expectations in the business environment will be high. They are not likely to listen to endless arguments about internal problems of the dp department; they will be concerned with the end product, whatever its source. If the internal dp department doesn't produce, company management will turn to outside vendors. One way or another, the internal isolation of data processing from the mainstream of company business will end. ■

Mr. Marienthal is currently manager in the Management Consulting Department of the Los Angeles office of Peat, Marwick, Mitchell & Co. Prior to joining this company in 1961, he worked at Burroughs and Univac. He holds a BA in economics from Stanford Univ., and a second bachelor's degree from the American Institute for Foreign Trade in Phoenix.

It's 20 years later— and the man in the street still admires and fears the computer

. . . but the

The man in the street has always reacted to computers with a highly ambivalent mixture of respect and fear. This was true in 1950, it was true in 1960, and it is true today. It seems to me that he has always had realistic grounds for both the admiration and the distrust. The more computers become a pervasive part of everyday life for all of us, the more it becomes true that they are to be both admired and feared.

A decade ago second generation (transistorized) machines were just becoming firmly established. Although the move from tubes to transistors did not involve a fundamental change in organization or use of computers, the increase in reliability and the reduction in cost added up to a huge push toward wider utilization. Things that were before only speculation were tried out, and things that had been pilot projects went into full-scale operation.

A decade ago there were lots and lots of problems with computer projects. Wings fell off of airplanes, department store bills for six million dollars were sent to customers, one suburban magazine subscriber got 700 copies of his magazine, a defense system almost tried to shoot down the moon. These kinds of things are presumably so familiar to most DATAMATION readers that they need not be elaborated.

The thing is, in 1960 it was possible to say, "Well, computers are new. As soon as we get the bugs out, everything will be as rosy as the initial claims said they would be." This seemed like a reasonable statement, since it was true that there wasn't much experience to go on, and the machines were new, and the people running them didn't have enough training.

And what is the story today? With the newer applications there still isn't much experience to go on, the machines are still new (since often replaced), and the people running them most distinctly still don't have enough training.

I suggest that we ought to learn three lessons from this situation:

1. The systems that have been running a long time, that have not had too many changes, and that permit tight control over the man-machine interface tend to be doing more or less what they were designed to do.

Ambivalence Lingers

by Daniel D. McCracken

The established airline reservation systems work fairly well. Of course they screw up sometimes, and when they do it tends to be a total mess, but this happens with nothing like the frequency it once did, and the overall service is much better than it could possibly be without computers. Similar things could be said about many other applications: payroll, telephone billing, magazine subscription fulfillment, etc.

Yes, I know, there are hundreds of horror stories to be told about all of these. I repeat: I say only that *by and large* these systems are doing pretty much what they were designed to do, that they are doing it far better than they did when they first went on the air, and probably (I think) better than they could be done manually. (Bear in mind that the volume of business has risen dramatically in the years since computers were introduced in many of these businesses. It is not entirely clear that the airlines could handle today's business at all with manual reservations systems. We should not compare today's computers with the best manual systems of ten years ago, but with what the manual systems would be doing today.)

2. Almost every new system is going to be a bloody mess at first. Above a certain level of complexity, and it isn't a very high level, it does not seem to be possible to anticipate the problems well enough to avoid intense startup pains. Many of the systems that today are functioning smoothly were absolute nightmares for a while. I think specifically of the airline reservation systems. Even though there is by now extensive experience with such systems, when new ones are put online they seem to go through exactly the same startup agonies. If the perpetrators are to be believed, pretesting doesn't really do that much good. No matter how thoroughly you test and simulate, the first day online with the public will be traumatic—for you and the public. By now the man in the street knows this, at least as he experiences it.

3. A system that cannot be annealed in the furnace of everyday usage with live end-users probably cannot ever be made operational. An election system that gets exercised only once every four years (or even every two years) will almost surely mess things up. Simulation just isn't good enough. I pick that example because, (a) it is one of the longest-running systems known to the general public, and therefore presumably thoroughly tested, and (b) it is one that most consistently mucks things up. Despite the advantage of a decade-and-a-half of experience, despite man-centuries of testing, despite the fact that the computational job is extraordinarily well-defined—despite all this, there continue to be major blowups. Not only that, in several cases the corporate reputations of the giants in the field were on the line in the most evident way possible, which would lead one to think that no expense had been spared in the preparations.

This is not said just to enjoy my monthly flogging of industry whipping boys. The tentative lesson is the subject, and I think that the lesson is that possibly there are some things that are not doable with computers. Our habit runs contrary to statements like that, but it might be true anyway.

. . . possibly there are some things that are not doable with computers.

Let me try to defend some of what I have said, in terms of the impact on the man in the street, and then offer a couple of suggestions for what we might try to do about it.

One day last year I got a bill from a certain credit-card company, containing a charge for an airline ticket from Denver to Montreal. I hadn't taken any such trip, and inspection showed the charge slip to have been signed by somebody else entirely—but it had my account number on it. I wrote an emotionally neutral letter pointing out the mistake, which was not answered for seven weeks. During that time I received a past-due notice and a threatening letter. More letters from me, more threatening letters from the computer, including a "final notice." A computer-signed letter said it would all be taken care of, but that was followed by more threats. I finally got the attention of a human being after my letter outlining the situation was published in the New York Times. (The Times reporter who wrote the article that spurred my letter said he got more mail on that one story than on anything he had ever done in a dozen years as financial reporter.) Well, stories like this are so common, I suppose, as to be a bore, and I won't go through all the details.

The thing is, the man in the street is getting this treatment, too. An ad in the "Public Notices" section of the Times—the small print personals—read, "Holders of American Express Cards. Subject to over-billing harrassment? Contact Box — Times. View to group legal action." I don't know exactly what the problems are in this business (my request for an interview was never answered). Maybe the credit card business depends too heavily on the input-preparation skills of people who do not realize what is involved. Maybe there are economic factors that make it a questionable application in the first place. But all that John Q. Public knows is that he keeps getting wrong bills, through absolutely no fault of his own, and the computer is a great deal less responsive to his complaints than the human beings used to be. This seems not to have changed materially in ten years.

Might it be better not to have election predictions than to disenfranchise the people of Hawaii . . . ?

It is a rare week that goes by without a newspaper story about a computer foulup. Seven hundred welfare checks were sent out in error because somebody dropped a card in a COBOL deck. A computer vote-counting system messed up so badly that it probably cannot recover, ever. The Apollo 11 computer almost forced an abort of the moon landing, although nothing was actually wrong. Stories like these are part of the national mood at this point. The man in the street is still in awe of the machines, because of the stories he also hears about truly impressive achievements (Apollo would not have been there at all without a lot of computers), but he is beginning to wonder whether he should make some connection between the admiration and the fear. Might the weaknesses he hears so much about compromise the successes? Might the negative aspects be so serious as to invalidate the positive? Might it be better not to have election predictions than to disenfranchise the people in Hawaii, whose presidential votes are made pointless by the announcement that Smith or Jones has already won before they even go to the polls? Might the problems in developing complex systems that cannot be tested under realistic conditions make it advisable not to build an ABM system?

What does this say to us, who are designing and implementing computer systems? I propose four lessons.

1. Admit that the job is tougher than we thought. Just because it is easy enough to say "in principle" how a proposed system could work, doesn't mean it won't be a difficult job. Sure you've written six payroll systems—but on startup day a lot of people are going to be inconvenienced by your mistake. It's inevitable, apparently. Don't pretend that this time your work is going to be perfect. All the experience of the last 20 years says otherwise.

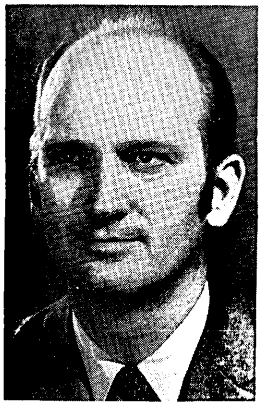
2. Get over the idea that the computer can do everything. A distressing proportion of the computer foulups reported in the press are instances where the system was designed to try to handle more than it was really capable of; if a human being's judgment had been brought in sooner, not much of a problem would have developed.

3. Put supreme effort into devising thorough tests before going online. It won't work, of course, in the sense of preventing all foulups, but it could reduce them enough to matter. Try the system out on employees, or hire some people to play "typical user," or maybe put the system online with one small fraction of the eventual user population. All our experience says that without this kind of shakedown you haven't a snowball's chance in hell of a smooth startup. As a matter of fact, our experience says that a smooth startup is impossible, period. But the trauma can be reduced somewhat.

4. If you're faced with an application that is inherently untestable under realistic operating conditions, consider seriously not doing it. If you are the boss, think about canceling the project. If you are not the boss, think of protesting and/or resigning. It is not true that well-intentioned bright people can do anything. Nobody is going to invent a perpetual motion machine. Could it be that some things having to do with computers are also impossible?

The man in the street is nervous. He has seen the same problems that appeared at the start of the computer era repeated with every new application. He has seen that computers can turn out garbage faster than a human being ever dreamed of doing. He has seen that a poorly-designed system (although he doesn't know that that is the problem) can be wildly unresponsive to human needs. I think he's beginning to wonder whether, on balance, the computer really is a blessing.

Are we responding to his concerns? ■



Mr. McCracken is a consultant on programmer education and the author of 10 books introducing programming to beginners. In 1966 he entered Union Theological Seminary, intending to become a minister. He received his bachelor of divinity degree in May, 1970, but has decided to return to computing. He is a Datamation contributing editor.

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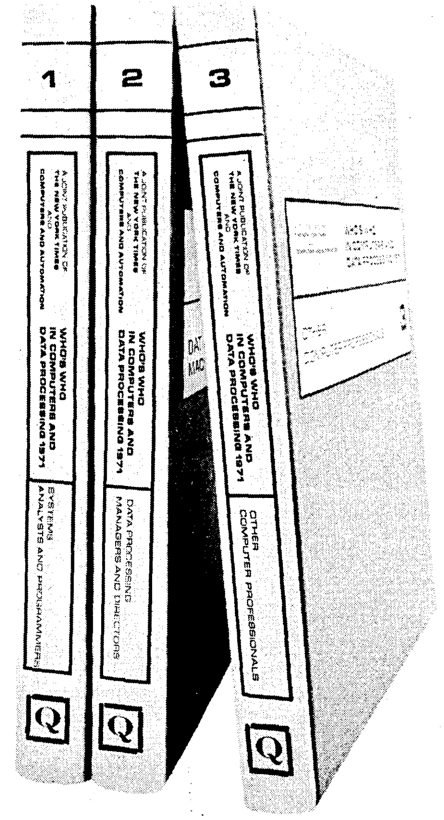

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Characteristics and role of software computer performance measurement technology

A Software View of

M

In the two years since Boole & Babbage delivered the first commercially available computer performance measurement products, the field has grown to the point where it is one of the most active and talked about areas in computing.

As with many new areas, this has been a time of experimentation, learning, and application to a wide variety of current problems. This period has been characterized by some important successes, which is why current interest is so high. It has also resulted in an argument focused on the two competing technological forms which measurement tools have assumed—software and hardware.

A deeper understanding of the central problems of computer performance measurement is only now beginning to be recognized as a prerequisite to further advancement of the art. This article is an attempt to describe the characteristics and role of software measurement technology, and to point out some of the more basic problems a manufacturer of such tools is concerned with.

The basic problem in computer performance measurement is to identify the proper variables to be measured—not how to measure variables. The basic technology of building both software and hardware measurement tools is reasonably well understood. Each approach has its own operational advantages and disadvantages, and each approach can obtain data on variables that the other cannot. But the mere collection of data is a useless exercise unless an understanding exists of how it is to be used. Thus the focus of computer performance measurement must always be on an understanding of the relationships between the structures of software and software-driven hardware configurations, and how these relationships result in performance levels.

Stated in this manner, it can be seen that performance measurement is inextricably linked to the study of the natural laws governing the behavior of software *in situ*, a field for which I have coined the term "software physics." Taking our lead from the physical sciences in general, we find two types of activities useful in understanding what instrumentation requirements exist. From a theoretic point of view, we should always be able to directly relate current and future variables (measures) to the role they play in determining actual computer performance. From a practical point of view, the instrumentation and data reduction techniques used in the various measurement tools must be adapted to the operational requirements of the environment in which they are to be used. Because this is an article on software measurement techniques, these points of view will be considered within the framework of software measurement technology.

Before going into the discussion, an important practical consideration for the users of measurement tools should be brought out. Because of the relative newness of performance measurement as a field, the vendors of these products or services must provide proper initial guidance and education in what to measure and how to use the reports provided. To the extent assistance is inadequate, the user must provide his own analysis and interpretation of the measures, which may result in incorrect decisions and actions. This condition will continue to exist for several years until the computing community has had sufficient time to assimilate and verify the validity and usefulness of the measures being supplied.

But the mere collection of data is a useless exercise . . .

Measurement Tools

by Kenneth W. Kolence

With a bit of simplification, the variables currently being measured in software physics can be classed as either quantitative variables or descriptive variables. Quantitative variables are concerned with the magnitude of some quantity, such as cpu active time. Descriptive variables identify which of a perhaps very large number of different system elements are being considered. For example, when measuring the work performed or energy used by a given program (i.e., the percent of available cpu cycles being utilized), it is necessary to identify each module and overlay segment individually and to show the cpu activity requirements of each. The module and segment names are the descriptive variables, the cpu activity associated with each is the quantitative variable.

Descriptive variables and quantitative variables must often be combined to present a usable set of measurements. One of the great advantages of software tools is their ability to obtain both from the system itself. This eliminates the necessity for using manual techniques to obtain or correlate information on what elements were active during the data collection process. When the descriptive data required is not available through console logs or other means, then either a pure software approach must be used or special software supplied to obtain the needed descriptors in a manner which permits proper correlation.

One of the most basic requirements on software measurement technology is the ability to extract from memory the necessary descriptive and quantitative variables. This is conditioned on the timing and form in which such variables are retained in memory, which in turn tends to be a function of the structure of the operating system, compilers, etc. Thus software measurement tools are at least operating system dependent, and can be compiler dependent or even problem program dependent. For example, the Boole & Babbage program evaluator (PPE™), as currently supplied to os customers, has a different data extractor program for each of the three different os configurations (PCP, MFT and MVT). Completely new PPE products have had to be developed for other operating systems available on the IBM 360 and other machines.

The software approach requires code embodied as either a separate program, as special changes to the software being measured, or to the operating system itself. Again, the variables to be measured and to a lesser extent, the structure of the operating system, dictate the extent to which special code changes must be used.

Ideally, the act of taking a measurement should not alter the system being measured nor require the system to be altered beforehand. While generally speaking this ideal can only be approached, not attained, any measurement tool that does not require system or program modification is more desirable than one that does require such changes. At least two conditions exist under which changes potentially may be useful.

The first condition is uniquely related to the operating system structure and the measures to be extracted. Certain descriptive variables, such as overlay or subroutine name, may only be fleetingly available. For example, consider an overlay supervisor which does not retain the overlay segment name once the overlay is loaded. This is a vital descriptive variable, and without it meaningful code activity reports cannot be generated. If this is the case, special code must be inserted to capture and retain this data at the instant it is available. Fortunately, most modern operating systems—particularly os—retain the basic variables of interest in internal tables, obviating the need for changes.

The second condition where code change may be useful is when the variable to be measured is expressed in terms of an absolute count of the number of times some event has occurred; e.g., the number of times a certain subroutine has been entered. The problem here is that code must be activated each time some special event occurs, and at no other time. Such measures are often called *event-dependent* measures. The code to collect the number of counts is normally included in the code over which the measurement is being taken. Special instrumentation of large programs is usually accomplished through use of these "active software probes," and the cost of inserting and using them in programs undergoing extensive testing can be quite high.

Ideally, the act of
taking a measurement
should not alter the system . . .

The successful development of a software measurement technology required a technique by which data about the system could be extracted without significantly altering the run characteristics of the system. This involves three parameters: cpu cycle requirements, I/O activity, and core usage. The first two design parameters were achieved through use of the observation made by the author *circa* 1961 that a large variety of important quantitative variables can be expressed as a percentage of some total time, rather than an absolute count. Thus, classical sampling techniques can be used instead of activating special code or going to the technqiues of trace routines. Further, if the frequency of sampling is less than the minimum time in which some event can occur, then other measures of interest can also be supplied. Thus, even though the sampling techniques are used, software measurement products can obtain the cylinder addresses of successive head movements on discs by using a sample interval less than the minimum positioning time.

The third design parameter—minimal core usage—was resolved by the simple expedient of separating the data extractor mechanism from the data analysis function. Fig. 1 illustrates this structure for the Boole & Babbage program evaluator (PPE) and configuration evaluator (CUE).This had several other important benefits, such as the ability to combine and/or reanalyze raw data in various ways. While some software measurement tools were built with the extraction and data reduction mechanisms combined, experience with them has tended to further strengthen the case for separation of these two functions.

The techniques of sampling as used in software measurement products are based on relatively straightforward mathematical concepts, but at least one common misconception is so widespread that it deserves clarification. The key to a successful sampling technique is that a certain number of samples must be collected randomly with respect to the variables being observed. That is, randomness in the sense that synchronization of sampling with the occurrence of some event in the system must be avoided. However, given the randomness of observation, the accuracy of the data obtained is then a function of the number of samples taken, *not* the frequency of sampling. Fig. 2 shows the curves by which the accuracy of data obtained in this manner can be obtained. It is interesting to note that for a one-hour program a sample frequency of one-half second, for a total of 7,200 samples, results in data accurate to within 1.5% with a confidence level of 99%. The cpu cycle needs of an extraction mechanism would be much less than 1% in this instance.

The use of sampling techniques solved the problem of how to obtain data with an acceptably low cpu overhead rate. Because of the small volume of data collected, it also solved the important problems of data collection and reduction, both in terms of the amount of tape or disc space required to store the raw data collected and the time required to process it into

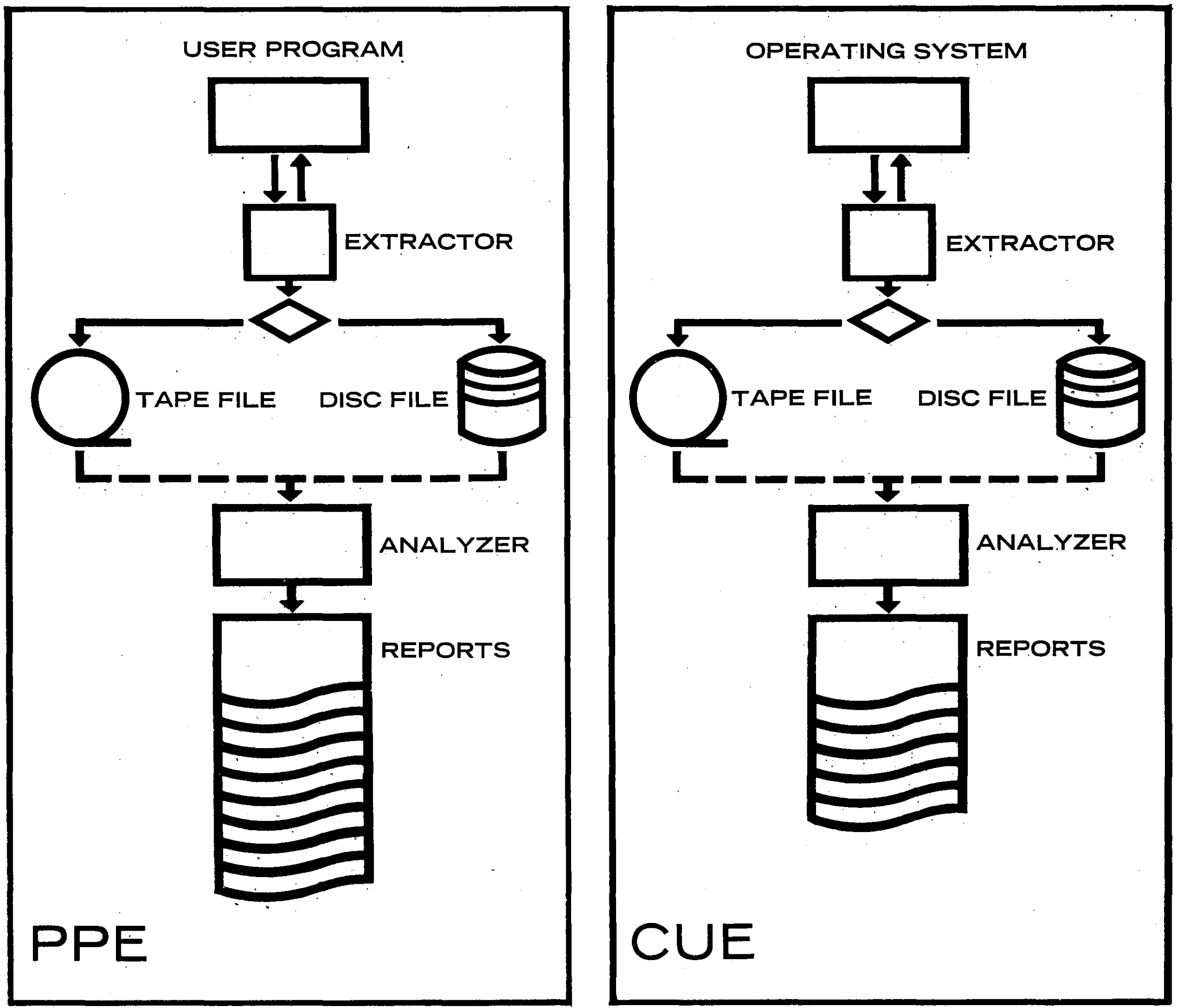

Fig. 1. Extractor-analyzer structure of software measurement tools.

reports. With these problems resolved, and more importantly, with at least some initial understanding of the important variables to be measured, software performance measurement became a viable technology.

In a somewhat oversimplified fashion, the key relationship in performance measurement can be expressed mathematically in the form

$$E_c = Sx$$

S (throughput rate) represents the number of "software units" (e.g., programs, subroutines, application systems, etc.) processed per unit time. Its units are "software units per unit time."

x (average cpu work per software unit) represents the average number of cpu cycles used per software unit in a given job mix. Its units are cpu cycles per software unit. Note that this measure remains relatively constant in both stand-alone and multiprogramming environments.

E_c (configuration efficiency) represents the efficiency of use of the cpu cycles of a configuration for the job mix represented by x, and has units of cpu cycles per unit time. In a restricted sense, E_c represents the useful software work per unit time, or power used by the configuration in processing the given job mix. (When divided by the total number of cycles available per unit time, E_c becomes the directly observable variable "% cpu busy.")

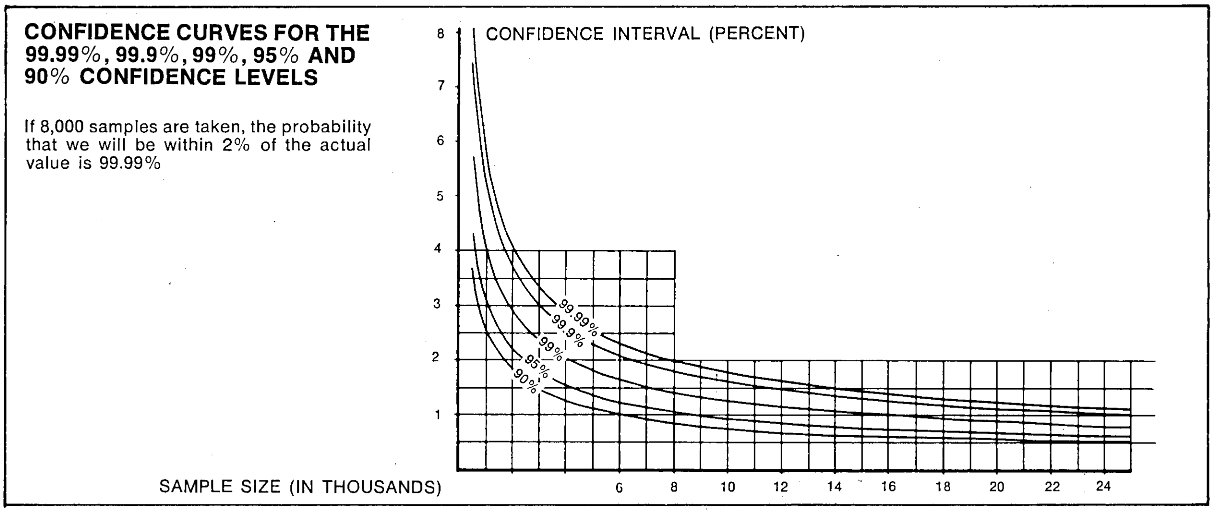

Fig. 2. Accuracy of data as a function of number of samples.

In some real sense, the variable S represents the throughput rate of a given job mix for a given configuration. The basic equation can be solved for S, giving

$$S = \frac{E_c}{x}$$

From this it can be seen that throughput can be increased in one of two basic ways for a given job mix. E_c, or its equivalent "% cpu busy" can be increased, or x, the average cpu cycle requirement of the job mix, can be reduced. One or the other of these goals are primarily addressed by all currently available measurement products.

If we let E_w represent the "wait time" for a configuration and job mix combination, it is apparent that the conservation law of interest is:

$$E_c + E_w = K$$

where K is a constant equal to the total available cpu cycles per unit time. Therefore an increase in E_c can only come from a reduction in E_w or its equivalent variable "% cpu wait."

E_w represents both the avoidable and nonavoidable wait times in the configuration-job mix system, some of which are caused by the hardware configuration, some by the systems software, and some by the problem programs. The class of measurement tools called Configuration Evaluators (hardware or software) attempts to locate the elements in the overall system which cause an avoidable wait time. Thus they all related to the fundamental variables E_c and E_w or their equivalents "% cpu busy" and "% cpu wait."

There are many kinds of causes of cpu wait which are theoretically avoidable. To the extent these causes result in I/O caused waits, however, they can be detected by measuring I/O path availability and queue properties. Both measures are required, since the latter measure normally shows the impact of the access characteristics of a given peripheral, while the former tends to show channel and controller clogging. In our experience to date, the access properties of devices seem to play a significantly larger role in generating avoidable wait than has been generally recognized.

Because queue data is maintained as tables in core, software techniques which can obtain this class of data have significant advantages over techniques which cannot obtain queue data. Boole & Babbage's configuration evaluator (CUE) supplies queue data as well as other measures designed to pinpoint areas of avoidable cpu wait.

Fig. 3a and 3b are examples of the measures provided by CUE to identify both the sources and magnitudes of configuration related cpu wait time.

(Continued on page 36)

At least two approaches to decreasing cpu wait generated by the access properties of peripherals exist: reduction of the frequency of seeking, or reorganization of the data sets on discs to reduce the average seek delay time. Software configuration evaluators can supply measures appropriate to both tasks. (A product is on the market now which optimizes the organization of data sets on disc with respect to the average access time, based on data collected by a configuration evaluator.)

Returning to the basic equation, $S = \frac{E_c}{x}$, configuration evaluators provide measures of the components of E_w, or "% cpu wait," in an attempt to increase "% cpu busy" (E_c) for a given workload. As can easily be seen, the throughput rate S increases linearly with an increase in E_c or, what is the same, a decrease in E_w. In practice, very significant increases in throughput rates are now being routinely obtained through the use of software configuration evaluators.

The other variable in the equation is x, the average cpu cycles per software unit in the job mix. If we let x_p represent the average cpu cycle requirement of problem programs in the mix, and x_s, the same for systems software[1], then:

$$x = x_p + x_s$$

If there are n jobs in the mix, and m of them are problem programs, then:

$$x = \frac{\sum_{i=1}^{m} x_{pi}}{m} + \frac{\sum_{j=1}^{(n-m)} x_{sj}}{(n-m)}$$

where $x_p = \frac{\sum_{i=1}^{m} x_{pi}}{m}$, and $x_s = \frac{\sum_{j=1}^{(n-m)} x_{sj}}{(n-m)}$

Program evaluators focus on identifying the cpu cycle requirements of each section of a program, with the intent to reduce the cpu cycles required through

EQUIPMENT SAMPLED	AMOUNT OF TIME	PERCENTAGE OF TOTAL TIME
CPU BUSY	2679.84 SEC	37.22
CPU BUSY IN SUPERVISOR MODE	303.84 SEC	4.22
CPU WAIT AND NO DEVICE BUSY	578.88 SEC	8.04
ANY CHANNEL BUSY	3060.72 SEC	57.46
CPU BUSY AND ANY CHANNEL BUSY	1514.16 SEC	21.03
CPU BUSY AND NO CHANNEL BUSY	1355.94 SEC	18.82
CPU WAIT AND ANY CHANNEL BUSY	2622.96 SEC	36.43
CPU WAIT AND ONLY CHANNEL 1 BUSY	1779.84 SEC	24.71
CPU WAIT AND ONLY CHANNEL 2 BUSY	275.04 SEC	3.82
CPU WAIT AND ONLY CHANNEL 3 BUSY	180.72 SEC	2.51
CPU WAIT AND CHANNEL 1 BUSY	1844.64 SEC	25.62
CPU WAIT AND CHANNEL 2 BUSY	611.28 SEC	8.49
CPU WAIT AND CHANNEL 3 BUSY	317.52 SEC	4.41
CORRELATION COEFFICIENT OF CHANNEL BUSY AND CPU IN WAIT STATE:		
CHANNEL 1 0.72		
CHANNEL 2 0.14		

Fig. 3a.

EQUIPMENT SAMPLED	AMOUNT OF TIME	PERCENTAGE OF TOTAL TIME
CHANNEL 1 AND CHANNEL 2 BUSY	181.44 SEC	2.52
CHANNEL 1 AND CHANNEL 3 BUSY	75.60 SEC	1.05
.	.	.
CHANNEL 0 BUSY	79.20 SEC	1.1
MULTIPLEXOR CHANNEL IN USE	5909.76 SEC	82.08
CHANNEL 1 BUSY	2298.24 SEC	31.92
CHANNEL 2 BUSY	802.08 SEC	11.14
CONTROL UNIT 03 BUSY	0.0	0.0
CONTROL UNIT 13 BUSY	1285.20	17.85
NO DEVICE BUSY	1231.92	17.11

DEVICE TYPE	DEVICE ADDRESS	AMOUNT OF TIME BUSY	PERCENTAGE OF TOTAL TIME BUSY	RATIO OF TASKS WAITING TO TOTAL SAMPLE INTERRUPTS	RATIO OF TASKS WAITING TO TOTAL SAMPLE INTERRUPTS WHEN DEVICE NOT BUSY
				(WHEN CPU IN WAIT STATE)	
2540	00C	3751.20 SEC	52.10	0.620	0.100
2540	00D	6.48 SEC	0.09	0.011	0.004
1403	00E	3243.60 SEC	45.05	0.112	0.070
2311	130	21.60 SEC	0.03	0.0	0.0
2311	131	3610.08 SEC	50.14	0.284	0.020
2311	132	1190.88 SEC	16.54	0.079	0.001
.	.	.	.	.	.
2314	282	4710.24 SEC	65.42	0.670	0.010
2314	283	2534.96 SEC	35.18	0.382	0.005
2314	284	0.0	0.0	0.0	0.0
2314	285	404.69 SEC	5.62	0.004	0.001

Fig. 3b.

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[1] While an intuitive distinction between problem and systems programs may be adequate, the following tentative distinction may be more useful:
the data domains of all x_{pi} are non-executable symbols,
the data domains of all x_{sj} are software
Under this definition, compilers are x_{pi}, initators x_{sj}, etc.

recording of those portions requiring significant time. In practice, it has been found that 25% to 35% reductions in cpu cycle usage can be obtained with about a man-day's worth of effort.

Program evaluators are fundamentally oriented toward software techniques because of the need to identify overlay segment names, and because they must only be operative when the software being observed is operative. The classic report produced by program evaluators is the so-called "histogram" report, shown in Fig. 4 as given by PPE.

Clearly, program evaluators are most useful when used on a job mix containing programs which are either run frequently or which take a long time when run. The most effective technique is to maintain a list of the top ten "cpu cycle using" programs, and to continuously work on these to reduce their cpu cycle requirements. As improvements are made on one, other programs usually then move up the list for rework.

```
CODE EXECUTION FREQUENCY FOR EACH INTERVAL (EXCLUDING DSOW WAIT)
STARTING  ENDING    INTERVAL  CUMULATIVE  HISTOGRAM--% OF TIME (EACH * = 0.5%)
LOCATION  LOCATION  PERCENT   PERCENT     .0      4.0      8.0      12.0      16.0

000000    00061F     0.00      0.00       __
000620    00068F     7.39      7.39       __**************
000690    0006FF     0.0       7.39       __
000700    00076F     1.56      8.95       __***
000770    0007DF    15.59     24.54       __*******************************
0007E0    00084F    13.94     38.48       __***************************
000850    0008BF    12.58     51.06       __*************************
0008C0    00092F     2.39     53.45       __****
000930    00099F      .41     53.86       __
0009A0    000B5F     0.0      53.86       __
000B60    000BCF     1.28     55.14       __**
000BD0    000C3F     1.84     56.98       __***
000C40    000CAF     3.45     60.43       __******
000CB0    000D1F      .30     60.73       __
000D20    000D8F      .04     60.77       __
000D90    000DFF      .13     60.90       __
000E00    000E6F      .24     61.14       __
000E70    000EDF      .23     61.37       __
000EE0    000F4F      .18     61.55       __
000F50    001318     0.0      61.55       __
```

Fig. 4. Sample of code activity histogram.

When both configuration and program evaluators are used together, the potential for improvement in S, the throughput rate, becomes astonishingly high. Many instances of three or four to one overall have been reported from users of these kinds of tools, although these are exceptional. Throughput rate improvements of two to one for production do appear to be routinely achievable, however, in a majority of installations. In fact, it is the recognition by many of this possibility that has lead to the deep interest in performance measurement that the industry is now experiencing.

The potential user of performance measurement tools has probably not had much experience with their use, and he may also be confused as to functions for which these tools may be suitable. Furthermore, he should realize that the introduction of measurement into his organization will require effort and manpower. Unless this effort is directed and supported, most if not all of the benefits hoped for will not be realized. Thus, the selection process should start with the assignment and involvement of the individual or individuals who will ultimately be responsible for using the tools.

Once this has been done, the prospective user should begin to educate himself and his organization in what is available, how these tools have been used by others, and what kinds of successes and failures others have had. (Most manufacturers of these tools will provide customer references upon request.) From this survey, the prospective user can begin to formulate his goals and a plan for selecting and using measurement tools.

The plans developed should provide for at least the following types of activities, some of which are concurrent:

1. Tool selection and cost justification,
2. Initial learning and experimentation,
3. Identification of major areas of potential performance improvement,
4. On-going monitoring of performance levels,
5. Procedures for implementation and verification of improvements recommended, and
6. General education of organization personnel in measurement.

The determination of which measurement tool or tools to obtain should be based partially on the measures desired and partially on availability and cost. Strictly speaking, the desirability of software or hardware is not in itself a primary consideration except within the framwork of these analyses.

Currently there are only a few true computer performance measurement products on the market. (I do not classify the multitude of accounting routines as performance measurement tools.) Therefore, it is quite possible that the user will only have a few choices available to him. If a comparative analysis of several different measurement products indicates that more than one is satisfactory, two factors should be considered: expected life and cost.

Currently there are only a few true computer performance measurement products on the market.

The basic factor is, of course, the expected life of the measurement product. Some factors to consider here are:

1. Does the manufacturer guarantee to maintain and support it for a reasonable length of time, and
2. Is the operating system for which it is designed expected to remain in the installation, or if not does the manufacturer provide "trade-in" credits on the

expected new operating system.

Once the expected life of the measurement product is judged satisfactory, questions on the cost of taking a measurement must come into play. It is an axiom that the expected return from a measurement activity must be much greater than the cost of taking the measurement. If not, overall costs are simply increased. Cost, however, must be properly calculated, and consideration of the factors of cost will materially assist the potential user in selecting a measurement product either software or hardware.

The major categories of cost are:

1. Initial or start-up cost,
2. Maintenance costs,
3. Set-up costs for a given measurement,
4. Measurement costs,
5. Data-reduction costs (machine time), and
6. Data anlysis costs (report analysis and usage).

Both initial and maintenance costs are amortizable over the *total* number of measurements expected to be taken, while the remaining four cost elements are associated with each *individual* measurement. Thus, it is particularly important that the latter four be kept to a minimum. Of these four, set-up and data-reduction costs particularly should be scrutinized since either can be a major cost element in relation to the other two.

The user can expect to see a rather bewildering variety of products and claims in the next few years . . .

Currently the industry is in the earliest phases of understanding and use of computer performance measurement. In fact, it is very reminiscent of the early days of higher level languages and operating systems. As in those days, many arguments are raging over what will ultimately become matters of taste. However, many people are beginning to both explore and apply the existing tools, and the results have been so impressive that a great deal of interest exists. This preliminary interest is attracting other companies into the field, and competition is really just now beginning. The user can expect to see a rather bewildering variety of products and claims in the next few years, and he should demand proof of these claims whenever they are made.

Other than the prediction of a wider choice of products, the future of computer performance measurement is only clear in one respect: measurement tools will become as generally used as compilers are today. In other respects, the future cannot be accurately forecast because we are only at the beginning. However, some interesting conjectures can be made on at least two subjects: the roles of the computer manufacturers versus the "independents," and the future of the "hardware-software" dichotomy in measurement tools.

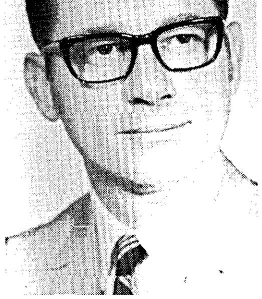
In computer performance measurement, as in most other advances in the use of computers, the initial thrust will probably come from outside of the computer manufacturers. The independent manufacturers of performance measurement tools and the users will be the primary sources of ideas and products, since the computer manufacturers have a definite negative economic incentive to improve the throughput performance of their existing machines. However, the next machine generation several years from now will probably take measurement requirements into account. Classically, computer manufacturers have incorporated features in new machines only after extensive experimentation by users has proven the usefulness of the ideas. Some very small capability has already been provided for S/370, for example.

The hope for the users, who have never really had a true competitive market operating, is that the independents can develop, extend, and establish themselves well enough to become a strong force in computer performance measurement. If this occurs, the relationship between manufacturers, independents, and users will strongly contribute to a rapid and widespread growth of measurement in all areas of computing. For a wide variety of reasons, I predict that this will come about.

Insofar as the current "hardware-software" dichotomy and arguments are concerned, increasing sophistication on the part of both users and suppliers of measurement products will quickly place the usefulness of both approaches in their proper perspective. Each has a role to play, and each role is largely different from the other.

Attempts will be made, of course, to extend one technique too far into the domain of the other, and the resultant "kludges" will quickly show what techniques are applicable for certain classes of measures. The relatively small overlap in function between the two techniques will be resolved on the basis of taste, cost, and availability, and several years from now everyone will know when to use which approach.

Combinations of hardware and software approaches to measurement are to be expected also, although the relative merits of these hybrids are yet to be proven. In any event, the current existence of several strong independent manufacturers of computer performance measurement tools, all of whom have both hardware and software expertise, should result in many interesting new product announcements in the coming year. ■



Mr. Kolence, president of Boole & Babbage, Inc., has been active both professionally and technically in computing since 1953, when he worked on the Illiac I at the Univ. of Illinois. He holds a BS in physics and an MS in math from there. His current work in measurement is an outgrowth of his larger interest in contributing to a discipline of software engineering and software physics.

A Conference Report

Microprogramming

The Third Annual Workshop on Microprogramming was held this year at the Statler Hilton Hotel in Buffalo, N.Y., on October 12th and 13th. Jointly sponsored by the ACM Sigmicro Group and the IEEE Computer Group, the workshop was co-chaired by Profs. Michael J. Flynn of Johns Hopkins University and Robert F. Rosin of the State University of New York at Buffalo.

The workshop agenda was divided into four parts—two were devoted to large sessions at one of which papers of general interest were presented and the other was a panel discussion. The other two parts featured several parallel sessions: papers and informal presentations in the areas of Engineering Aspects, Architecture and Language Aspects formed one set, and the topics of Microdiagnostics, Emulation, Operating Systems and Applications formed the other. The papers themselves ranged from hardware oriented topics such as "Self-Checking Micro Program Controls" to higher level machine independent languages for writing microcode and even to Microprogramming and Operating Systems Organizations. Attendees seemed roughly divided between those with engineering backgrounds and those with software or programming backgrounds, with perhaps more of the latter.

The initial session of topics of general interest contained three papers. The first described the recently announced Standard Computer Corp. MLP-900 multilingual processor, a microprogrammed processor with an on-line alterable control memory. The second described functional memories and their microprogramming implications and the third various techniques for integrating emulators within multiprogrammed operating systems, specifically IBM's System/370.

Other formal papers included: "Design and Construction of a Pedagogical Microprogrammed Computer," "Microdiagnostics for the IBM System/360 Model 30," "A Survey of Techniques for Optimizing Microprograms," "A Multi-Emulator Operating System for a Microprogrammable Computer," "Microprogramming and Numerical Analysis," and "Microprogrammed Operating Systems."

The final session of general interest was dedicated to a panel discussion entitled, "A Macro View of Microprogramming." Predictably, the discussion revolved around the questions of what exactly is microprogramming, what part does it play in the computer industry, and what is its future.

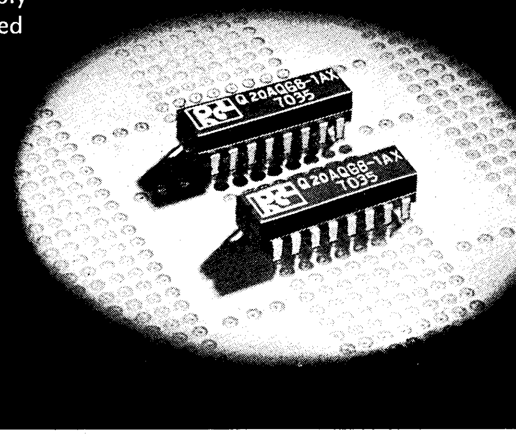
Several attempts were made to define microprogramming. The most precise definition presented was that microprogramming is that part of all programming which allows the programmer to control actual data paths —on the level of choosing data buses, for example—within a cpu.

Later, the discussion became more general with the following two general observations being made: (1) Microprogramming allows the programmer to tailor computer hardware and architecture to his needs and rectify design errors after-the-fact, and (2) microprogramming is a way to improve efficiency and performance.

Finally, the observation was made that many computer professionals, who were suddenly becoming interested in microprogramming, were finding that many of the problems they faced ten years ago in software design were returning to haunt them in microcode design.

A limited number of extra copies of the preprints will be available through ACM Headquarters.

—**William H. Josephs**



Hardware that keeps tabs on what all that other hardware is doing

Monitoring: a Key to

With the billions of dollars in installed computer equipment deployed, with the huge amounts of money needed to operate, program, and maintain this hardware, the necessity to increase efficiency is becoming more and more apparent to users. Monitoring and increasing the effectiveness of existing computer hardware and software seems to be preferable to buying more hardware and hiring more people. These are tough days for many large companies, in operations, in gross revenues, and in net profit. In response to this cost squeeze (data processing accounts for up to 10% of a modern company's capitalization and annual operating expenses), major improvements in efficiency have already been achieved by many large users.

Nevertheless, recent statistics in the U.S. and Europe show the average large cpu to be only 30% active, many operating at 10% and below. Achieving the versatility of complex systems, users have been forced to ignore the need for basic efficiency. In general, today's systems are poorly coordinated and wasteful, the cpu idle much of the time, with minimal cpu/peripherals overlap, and poor balance between overall hardware and software systems and the work they are performing. The price of such inefficiency is high, not just in the expense of people/equipment overcapacity, but in terms of simple job turnaround time and system throughput rate—the very needs for which the equipment was originally installed.

The computer industry's technology gap is becoming increasingly evident. Most of the newest hardware is basically efficient, but the systems—including device interaction and peripheral choice (and arrangement), as well as software organization—have fallen behind. Hardware development has reached a point of diminishing returns, with the critical goals of low cost for high speed increasingly elusive. Systems coordination has become crucial. Particularly in average-or-larger installations, improving current systems is unquestionably more profitable than turning to the unproved capabilities of next-generation hardware. Yet many of these larger systems are using job streams that "just grew" to handle growing workloads.

Job stream organization—optimizing all available resources—is basically a logistics problem. Hardware includes the cpu, memory, tapes, discs, card readers and other peripherals. Software includes assemblers, compilers, operating systems, sorts, RPGS, subroutine libraries, and so on. These resources, functioning together, comprise a system. Optimizing could mean improved balance between resident and nonresident routines; a change in the number, type, speed, and organization of system components; greater interaction between peripherals; increased cpu-I/O overlap; redistribution of peak loads and other bottlenecks that degrade system performance; increased overall efficiency and throughput or, alternatively, lower costs. Table 1 lists seven objectives of performance measurement.

Before system elements can be rearranged efficiently, thorough evaluation is needed. The facts needed are: Precisely what is the system doing? When? Why? With what priority? To what end is the system calling on its various central and peripheral resources? Before the advent of monitoring devices, these questions were answered intuitively. Even sophisticated simulation and benchmark routines used theoretical models or hypothetical situations. Today, fortunately,

Cost Efficiency

by C. Dudley Warner

one can get the facts to identify the problem and pinpoint the solution. There is no alternative. The system must be monitored or measured to determine as precisely as possible what is really happening. Only with the hard facts of the real world can sensible remedial action be taken.

The two basic approaches to system measurement today make use of hardware and software monitors. Although both have their merits, the hardware monitor does not degrade or interfere with the system it is measuring and requires no system overhead. A software monitor, on the other hand, is a program itself. An "artificial" situation is created when it is being run because the monitored routines must wait for it. It also uses system resources and adds to system overhead.

Hardware monitoring devices are now being offered for sale and lease to computer users by several independent companies, whereas early devices used by manufacturers were not marketed to their customers.

PERFORMANCE MEASUREMENT OBJECTIVES

1. Achieve a better balance between resident and transient routines
2. Identify areas of poor cpu and I/O overlap
3. Locate bottlenecks that degrade system performance
4. Determine when and why peaking problems occur
5. Find out whether other I/O devices can be more effective
6. Balance the foreground and background in teleprocessing systems
7. Discover what routines use the greatest time

Table 1.

Basically, the monitoring devices use sensors attached to specific signal wires, to measure the presence or absence of electrical impulses. For example, a sensor can monitor a signal that is present only when the cpu is in "wait" state. Absence of this signal would, conversely, indicate the "cpu-active" state.

Monitoring a signal does not affect either the signal or the system. The monitor examination, like an oscilloscope, does not interfere with or degrade system operation. The signals are typically routed into a programmable plugboard, in which wired logic can be used to produce data or information on combinations of functions, such as total I/O time or I/O-cpu overlap. For example, in a system with three channels, signals for each channel would be routed through an OR function into a timing accumulator to indicate a "channel busy" state. Those same signals, routed to an AND function and mixed with the cpu-active signal, provide the cpu-I/O overlap measurement. Many of the most significant system activities—those affecting most critically the economic performance and throughput of the system—can be derived from such monitoring. Table 2 provides a partial

> Only with the hard facts of the real world can sensible remedial action be taken.

listing of the aspects that can be measured most readily.

Typically, information obtained through the sensors is summarized and written (usually on tape) before printing. Periods of time selected for analysis may range from a millisecond to hours. The data are then processed separately (not as a simultaneous "overhead" function) by a program which produces numbers and graphs showing the results of the measurement. Based on this output, analysts can identify problem areas and decide on appropriate action.

What kinds of data do monitors measure? What is the logical starting point? Users find an overall system utilization profile an ideal and highly useful initial monitoring application. Another important aspect to examine would be the proportion of time the cpu is active vs. waiting time. For example, a cpu waiting 75% and processing 25% might indicate too large a processor for the tasks at hand. Conversely, a cpu processing 75% of the time and waiting 25% might be approaching saturation. More operational details are needed before meaningful conclusions can be drawn, but the finger is pointed by data that reveal suspected —and unsuspected—conditions.

WHAT CAN BE MEASURED

1. **"Active" time of cpu**
2. **Problem vs. supervisor time**
3. **Activity by region (e.g., core "mapping," data set organization, file structure)**
4. **Task-switching frequence**
5. **Instructions executed**
6. **Program and routine timing**
7. **I/O organization and selection by:**
   - **a. Channel**
   - **b. Controller**
   - **c. Device**
   - **d. Component (e.g., disc arm)**
8. **Overlap of cpu-I/O**
9. **Multipath balance**

(Note: Many other functions can be monitored, measured and analyzed at the option of the user.)

Table 2.

Relevant information includes the comparison of system time spent on problem programs and in the supervisor or operating system. In a multiprogramming environment, regions or partitions are monitored for task-switching frequency and utilization. The number and type of instructions being executed in a given time span can be measured. Individual programs and routines are timed. One can measure I/O utilization—by channel, by controller, by device, or by device component. How much of the time do cpu and I/O overlap? In multipath situations, is there high utilization in one path, none in another?

Monitoring really pays off when considering whether a larger processor is required to increase throughput or whether systems adjustment or reconfiguring, either in hardware or software, can solve the problem (as it usually can). Sometimes identifying the problem is the mystery.

An early instance of problem detection by monitoring occurred a few years ago when a major airline was trying unsuccessfully to go on-line nationwide with a new computerized reservation system. Using excellent simulation techniques to detect potential overload, the airline had successfully brought in all regions (comprising 50% of activity) except the last and busiest, which accounted for 40% of the load. But when New York was put on-line, the system became saturated. Monitoring revealed that just before New York was brought in, the existing load, thought to be 50%, was really 90%. The explanation was a monumental lesson in human psychology. What the simulators could not know was that each operator, after keying in reservation data, would immediately inquire to verify that the system had really accepted the data—they simply did not trust the computer. The solution was anticlimatic—a wiggle of the typewriter ball confirmed "data in."

> Sometimes identifying the problem is the mystery.

The obvious solution to the throughput problem is often misleading. Recently, a major computer manufacturer was confronted by a bank which had replaced its older computers with a third generation system, got no more throughput, and changed to an even larger cpu—still with no increase in throughput. The customer, convinced that the system was processor limited, found that his seven most important jobs were using all available cpu time. A system measurement was requested to verify this. It was decided to monitor for several days to get a true system profile, not just the seven jobs. The results were illuminating; though those seven jobs were cpu-bound, the cpu was processing only 15% of the total time.

The real problem was the system's operational logistics. There were many short jobs, each needing a new I/O setup. The physical arrangement of the equipment was poor—crowded and disorganized. Finally, the bank still used 80-column cards as basic source information. Discs and tapes contained 80-card records, gaps, rotational delay, seek time delay, and so on. They did not need the larger cpu; when the physical problems were cleared up, the work could have gone on a smaller third generation machine than the one originally selected, and with time to spare.

Such examples are not atypical. For almost every large computer in the field situations exist that have given the user severe operating and economic problems. Now, with the advent of serious monitoring activities, solutions are being found and implemented.

> For almost every large computer in the field, situations exist that have given the user severe operating and economic problems.

Experience has shown the need to examine hardware monitor tape files in many different ways and over different time intervals, thus calling for the data reduction process to have a highly optimized work file as input, rather than a monitor tape. Many data

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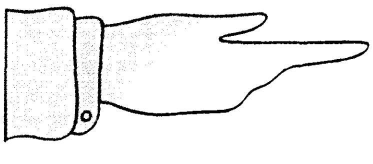

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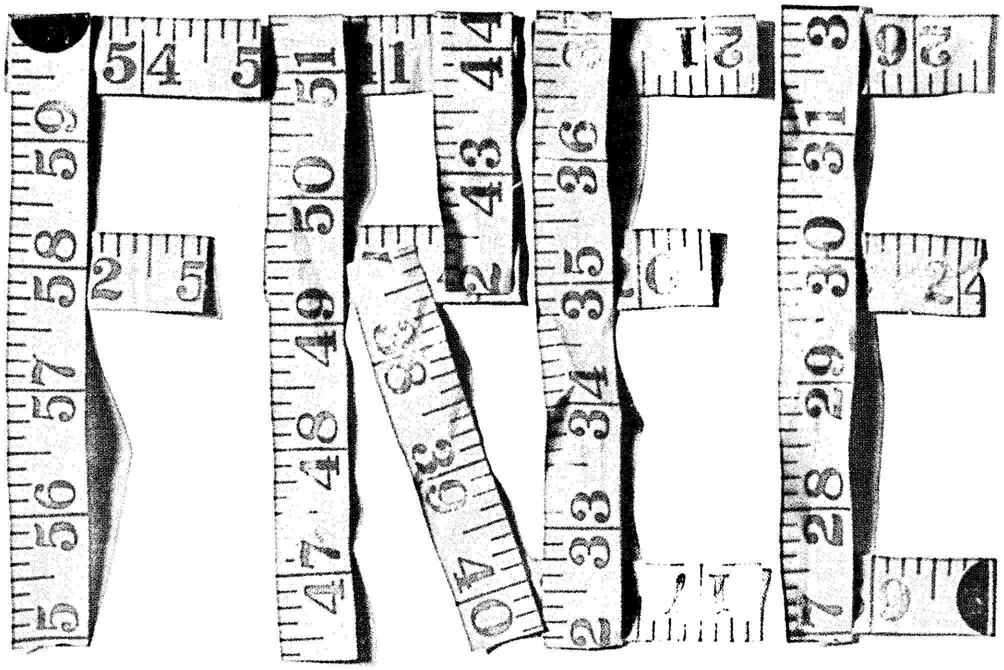

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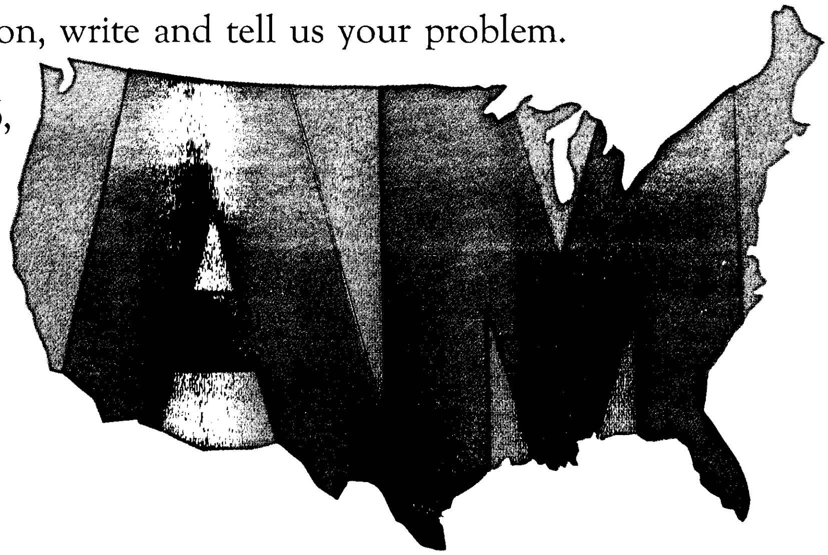


Computer Support Systems
Addressograph Multigraph Corporation

reduction phases can then be run against the same work file without the overhead that goes with tape processing and editing.

Software adds important new capabilities to the hardware monitor, significantly increasing the usefulness, power and flexibility of such systems. The first software specifically designed to simulate hardware changes based on actual measurements made by hardware monitors has just been announced by Computer Synectics, and deserves mention. In addition to the 16 hardware accumulators provided by the hardware monitor, this software provides 19 pseudo-accumulators and time of day. A powerful set of operators is provided to manipulate these pseudo-accumulators. Virtual simulation of a wide range of possible hardware and software alternatives is thus made feasible, which can give rise to marked improvements in overall system performance, but based on recorded data about the user's actual job mix and working environment rather than on theoretical factors alone, and before equipment is physically changed or installed. And these advances are achieved without the inclusion of a minicomputer in the hardware monitor.

In addition, such software—when properly tailored to the characteristics of the hardware monitor—can greatly increase the number and type of reports that can be produced to include such items as numerical management reports (interval, intermediate, statistical and final summaries, for example), graphic management reports (interval and composite histograms) and, additionally, text printing capabilities to give various types of user-defined information before the actual tape or processing phase. Further work has gone into the creation of graphic plotting capabilities, to add detail to the previous time plotting of events.

Further, the general accumulator for calaculating percentages can now be specified by the user, rather than assumed automatically by the system. For each individual measurement, the user can specify a different base accumulator if desired. The properly designed program operates in separate phases to give the user considerable flexibility in selecting which data will be used for reduction and analysis.

With the rapid increase in the number and type of companies active in developing and manufacturing monitors, it is instructive to trace their growth and project the type of company and product that will be emerging in the future. Monitoring is already acquiring stature and momentum, and is becoming accepted by management (both general and data processing). This has caused users' needs to become better defined, and has "focused" the product and its characteristics. For example, despite current differences between proponents of hardware or software concepts, the emerging monitor specialists such as Computer Synectics (hardware) and Boole and Babbage (software) are reaching across to maximize their use of the "other" capability, and create a more sophisticated end product embodying the best of both approaches. This trend will accelerate as both concepts are perfected and become more widely used throughout the industry.

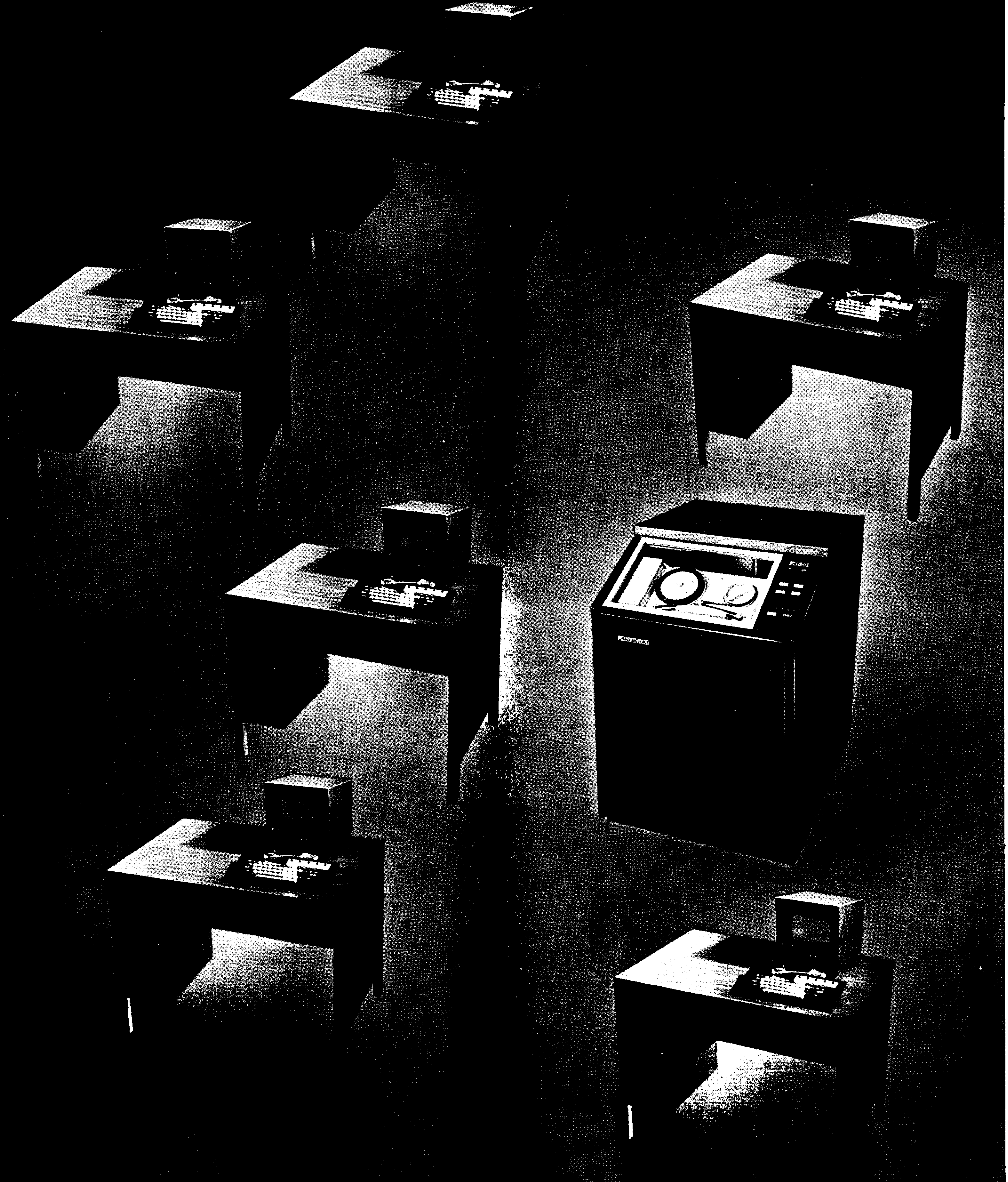
Peripherals manufacturers whose penetration depends on showing users good economic return will step in, as will minicomputer makers. Both groups are well placed, and have the engineering, manufacturing, and marketing muscle to meet market needs. For them, entree to big computer users that the monitor provides would be a useful marketing edge. Alert software/service bureau/time-sharing operations will supply their own marketplace stimulus, offer ing monitoring services on a consulting basis that will provide excellent insight into prospects' operations.

It is unlikely that the large mainframe manufacturers will enter the fray specifically with their own monitors or equivalent hardware/software approaches. Most differences in user cost-performance with a given size and type of machine stem from the applications, systems, and job mix, rather than directly from the hardware itself—the familiar story of drivers getting widely varying gasoline mileage from similar cars. And these factors are beyond the direct (or even indirect) control and interest of the mainframe manufacturers. Further, the total size of the monitor market, not yet measured or even estimated by industry watchers, is not at a level where the major systems suppliers would derive significant economic return from a product.

It is unlikely that the large mainframe manufacturers will enter the fray . . .

Evaluating monitors and suppliers is similar to the task of selecting and evaluating computers. What do you want to monitor? Your use of resources? The need for increased efficiency? The difficulty of deciding about new hardware or software? The problem of identifying the problems? Once the decision to get a monitor is made, a list of applications and needs will provide the basis for evaluating the responses and specifications of the various makers. Monitors are now being bought and used with the same professionalism and seriousness of, say, cost accountants. Users are starting to realize that "computer cost accounting" by monitor is an acitivity—like cost accounting itself—that must be done continuously if the user is to remain healthy and efficient. ■

Mr. Warner is currently chairman of the board of Computer Synectics, Inc., a Santa Clara, Calif.-based manufacturer of computer performance measurement devices which he founded. Prior to this, he spent eight years with IBM, developing and applying measurement equipment. He was the principal designer of IBM's current measurement product, the Basic Counter Unit. Mr. Warner received his electrical engineering education at Chaffey College, Calif., and UCLA.



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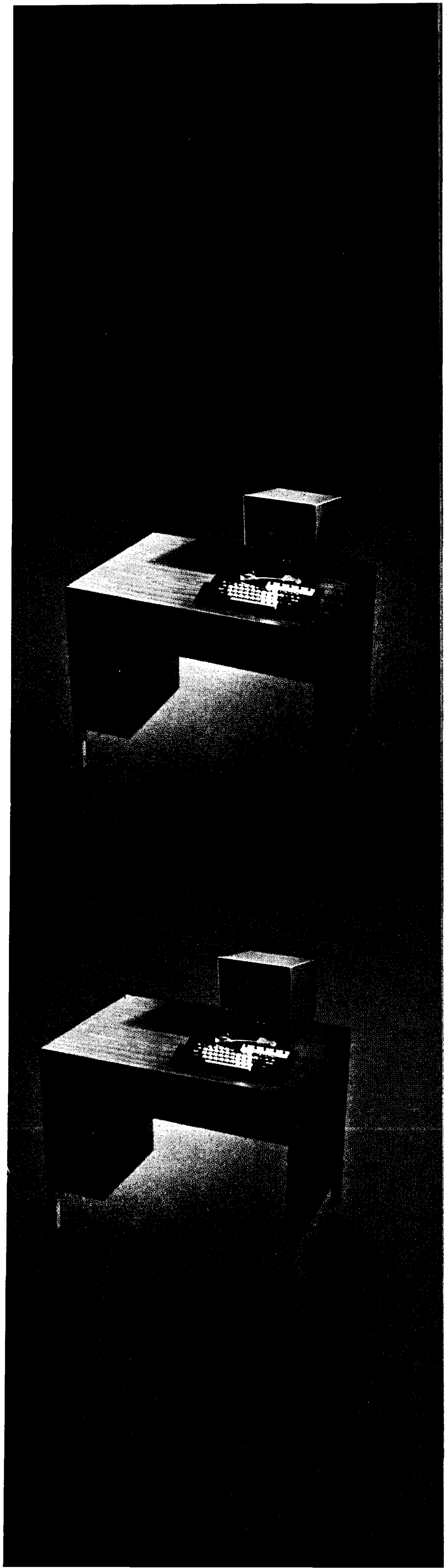

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CIRCLE 31 ON READER CARD

The American National Standards Institute is going to announce a Standard for Identification of Individuals for Information Interchange— and it should be a big help

ANSI Identification

by T D C Kuch

Those of us who have ever tried to write programs to determine if "John Smith" on one file is the same person as "John Smith" on another file, where a unique identifying number is not available, will greet the forthcoming American National Standards Institute (ANSI) Standard "Identification of Individuals for Information Interchange"[1] with wild glee.

For those of you who haven't wrestled with this problem, and perhaps don't see what all the fuss is about, I give a real-life example:

The object: to construct a data base of all voters in state S, incorporating into it all data which are matters of public record, or which have been volunteered to it by individuals (in this case, members of or donors to a particular political party).

Sources of data: county voter registration records, the coding of which varies from county to county, donation pledge cards, and other sources.

Suppose we receive data from several different sources for Thomas Patrick O'Neal, Jr., and that we want to associate all these data as belonging to one specific, identifiable individual. His name might easily enter the system in all the following forms, and more:

Thomas P O'Neal Jr
Thomas Patrick Oneal, Jr.
Oneal Thomas Patrick Jr
O'Neal Jr., Thomas P.
etc. etc.

Unless the coding of data at their source can be held to one standard, this sort of mish-mash is very likely. In a first-name-first situation, it is even impossible, without extra-system knowledge, to determine, for all persons, which name is the surname.[2]

With conditions like these, any standard at all would be welcome, and we could thank ANSI even if they had done no better than they sometimes do. The standard on identification of individuals, however, is a fine job, painstakingly and well thought out, and is eminently suitable for use, both inside and outside the data processing community.

In brief, and omitting special conventions for unusual cases, individuals are identified in this format: nnn-nn-nnnn Last(Suffix),First,Middle,/ where nnn-nn-nnnn is the Social Security account number, and Suffix is a genealogical modifier (Jr, III, maiden name, etc.). All elements except the Social Security number are of variable length. In the most complex situation the format becomes quite involved, but no more so than is necessary.

Example: Thomas Patrick O'Neal, Jr., Social Security account number 123-45-6789, has the nickname Tom; he at times uses II instead of Jr.; he writes articles for DATAMATION under the name Oswald I. Orthmutt; he has a second middle name of Seamus, often shortened to Sam.

His employer's computer system records only the minimum information required by the ANSI Standard (the Record Name):

123-45-6789 O'Neal (Jr), Thomas, Patrick,/

For another application, all the detailed information is coded:

123-45-6789 O'Neal (Jr) (II), Thomas, Patrick,
Seamus, (Tom) (Sam), #Orthmutt, Oswald, I,/

In a third application, records are matched from the previous two sources. Even without the Social Security number, virtually positive identification of O'Neal is assured, without overly complex programming being required. The necessary matching algorithm can be subroutinized for general use.

Design considerations

The Draft Standard, with its appendices and expository remarks, runs to 47 typewritten pages. Those who are interested in the rationale behind the format[3] should write ANSI for a copy. There is space here only for a brief list of the more interesting design criteria.

1. The form of the name to be used is as given by the individual, including capitals and lower-case letters, and including special characters available in ANSCII,[4] except those reserved for punctuation in the present standard.

2. The length of the name part of the identifier varies from four characters (, , , / which would apply to a person with a known Social Security number and

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[1] "Draft ANSI Standard Identification of Individuals for Information Interchange, X3.8/128 (Revised June 1970), X3.8.3/55 (Revised)" and "Draft Expository Remarks 69/11/20," ANSI, 1430 Broadway, New York, N.Y. 10018.

[2] For example, Frank Lloyd Wright and David Lloyd George. One Lloyd is a middle name; the other is the first half of a double-barrelled last name.

[3] Especially those interested in the selection of Social Security account number as the numeric part of the identifier, a decision the present article does not examine.

[4] The American National Standard Code for Information Interchange, formerly USASCII, originally ASCII.

an unknown name) to a theoretically infinite number of characters.

3. The Standard is flexible in design, but strict in application. In the interests of being applicable to organizations with limited capabilities, however, there are a number of options, which have the status of being recognized, but not recommended. Some of these are: truncation of surname to 12 characters, first name to 5, and middle name to 3; omission of hyphens in the Social Security number; inclusion of a check digit as the 10th character of the Social Security number[5]; use of a non-ANSCII character set; and use of upper-case characters only.

"Common Sense" order:	"Telephone Book" order:	EBCDIC order, upper-lower case:	EBCDIC order, upper case only:	ANSCII order, upper case only:	ANSCII order, upper-lower case:
Dewey,James,John,/	Dewey,Jas,John,/	deWold,James,Al,/	DEWEY,JAMES,JOHN,/	DEWEY,JAMES,JOHN,/	DeWitt,H,Richard,/
DeWitt,H,Richard,/	DeWitt,H,Richard,/	Dewey,James,John,/	DEWITT,H,RICHARD,/	DEWITT,H,RICHARD,/	Dewey,James,John,/
deWold,James,Al,/	deWold,Jas,Al,/	DeWitt,H,Richard,/	DEWOLD,JAMES,AL,/	DEWOLD,JAMES,AL,/	deWold,James,Al,/
Diamond,Edward,H,/	Diamond,Edw,H,/	Di Angelo,Tony,,/	DI ANGELO,TONY,,/	DI ANGELO,TONY,,/	Di Angelo,Tony,,/
Di Angelo,Tony,,/	Di Angelo,Tony,,/	Diamond,Edward,H,/	DIAMOND,EDWARD,H,/	DIAMOND,EDWARD,H,/	Diamond,Edward,H,/
MacKenzie,Leo,,/	MacKenzie,Leo,,/	Mackey,Rufus,Orr,/	MACKENZIE,LEO,,/	MACKENZIE,LEO,,/	MacKenzie,Leo,,/
Mackey,Rufus,Orr,/	Mackey,Rufus,Orr,/	MacKenzie,Leo,,/	MACKEY,RUFUS,ORR,/	MACKEY,RUFUS,ORR,/	MacKinnon,F,Earl,/
MacKinnon,F,Earl,/	MacKinnon,F,Earl,/	MacKinnon,F,Earl,/	MACKINNON,F,EARL,/	MACKINNON,F,EARL,/	Mackey,Rufus,Orr,/
Onaka,Toshiro,,/	Onaka,Toshiro,,/	O'Neal,Thomas,P,/	O'NEAL,THOMAS,P,/	O'NEAL,THOMAS,P,/	O'Neal,Thomas,P,/
O'Neal,Thomas,P,/	O'Neal,Thos,P,/	Onaka,Toshiro,,/	ONAKA,TOSHIRO,,/	ONAKA,TOSHIRO,,/	Onaka,Toshiro,,/
Smith,John,R,/	Smith-Hall,John,,/	Smith Hall,S,F,/	SMITH HALL,S,F,/	SMITH HALL,S,F,/	Smith Hall,S,F,/
Smith(Jr),John,R,/	Smith Hall,S,F,/	Smith(Jr),John,R,/	SMITH(JR),JOHN,R,/	SMITH(JR),JOHN,R,/	Smith(Jr),John,R,/
Smith-Hall,John,,/	Smith,John,R,/	Smith-Hall,John,,/	SMITH-HALL,JOHN,,/	SMITH,JOHN,R,/	Smith,John,R,/
Smith Hall,S,F,/	Smith(Jr),John,R,/	Smith,John,R,/	SMITH,JOHN,R,/	SMITH-HALL,JOHN,,/	Smith-Hall,John,,/

Table 1. Varying sequences of 14 names coded according to the ANSI Standard (sorted on the entire field; if the sort were by subfield, ending with a comma, John R. Smith would become the first Smith in the four EBCDIC and ANSCII columns).

ANSI remarks that "The name style should facilitate alphabetizing and filing needs." Unfortunately, the collating sequence of the ANSCII itself makes this difficult. Further, the upper-case only "non-recommended option" changes the sequence of many names, and using EBCDIC in lieu of ANSCII (as most users will do) also affects the sequencing of a list of names. Table 1 illustrates "common sense" ordering of a handful of names[6], "telephone book" ordering, and four ways of machine-sorting. Examination of this table will show the extent of the problem. The Standard might have been reworked to accomplish "common sense" ordering of names in upper-lower case ANSCII, but the use of EBCDIC or upper-case only would still affect the sequence.

Privacy

Every proposal concerning machine-manipulation of names of individuals, these days, tries to justify itself against the inevitable accusations of invasion of privacy. The ANSI Standard is no exception. ANSI takes a rather weak defensive position, and an ingenious and, it seems to me, quite good positive position. First for the defense:

There should be no technical barriers to information exchange; any necessary controls can be accomplished by penalties for disclosure of confidential information.

This is the common practice of shifting the burden of protecting the public to non-computer people, most of whom don't understand the problem, or don't see that there is a problem at all.

ANSI's positive approach is better: Social Security number is inherently non-significant (that is, from the number itself nothing can be derived about a person). This provides a measure of protection. Further, a great deal of personal data is now being collected solely for the purpose of record-matching. Adoption of this Standard would reduce the amount of information that need be given to banks, shops, employers, the government, and other organizations.

The implication is also made that a determined effort to invade privacy will inevitably succeed, regardless of laws, standards, or the state of technology. Depressing, but true.

Time for action

ANSI standards are famous for being not binding. It is up to the industry (that's us) to want to comply. In this case I think that system designers should take the initiative and design the ANSI Standard for Identification of Individuals into their systems, whether an interchange of information with another organization is contemplated or not. The Standard works well in both cases. ■

Mr. Kuch is head of the planning and development unit, adp management staff, of the National Cancer Institute in Bethesda, Md. He has been active in the computer business since 1960 and his previous experience includes jobs with Applied Data Research and Honeywell.

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[5] ANSI would have preferred, of course, that the Social Security number contain a check digit itself; lacking this, they declined to impose the requirement on users of the Standard.

[6] These names are obviously hard cases, and not typical. However, in a file of names of non-trivial size, names like these will occur.

Facilities Management Users Not Sure They're Using--If They Are

The user's attitude toward facilities management at this stage of its struggling growth is uncertain, and this very uncertainty retards the development of what many consider to be the business factor in the industry with the greatest immediate potential. (Microwave dp communication has yet to, heh, heh, get off the ground.) The trouble is, most facilities management contracts are for five or so years, and the returns simply aren't in yet, with some exceptions. And those users who do have opinions usually prefer to issue them anonymously.

Another, continuing, obstacle to a review of user reaction is the meaning of facilities management. As outlined in a previous report on FM (April, 1970, p. 187), the definition is varied and unagreed upon. "The simple definition is the takeover of all edp operations — equipment, people, and functions — of a business by a service company." However, it is rarely that simple. There are the questions of on- or off-site operations, full or partial service, startup or system repair, FM personnel or client personnel, and the decisions are so various that many FM companies have found it necessary to diversify into service bureaus and the like in order to accommodate the customer.

When Pepsico and its subsidiary, Frito-Lay, cancelled their FM contracts with Ross Perot's Electronic Data Systems after three years, the word was that it had been planned all along, that the contract was only to have been in force until the two companies felt they could go it alone. Thus, FM in those cases could be defined as merely the education of an edp department. Perhaps a proper definition will come from the work of a Committee for Data Facility Management, which has been set up by ADAPSO for just that purpose — to define, organize, and implement standards for FM. The committee is headed by John P. Mooney, president of International Computer Management Corp., NYC.

EDS is still the obvious kingpin amoung FM firms, although it and many others lately prefer to eschew the term facilities management (perhaps considering it a bit overpowering for potential customers) and have come up with euphemisms. Computer Sciences Corp.'s is Comprehensive Information Service. Whatever it's called, it amounts to the same thing — which is, as noted, many things. One fact seems clear — there is a predestined market saturation. All FM firms are after the same operations — insurance, publishing, printing, banking, advertising, inventory control, and food processing. EDS began and all follow.

One happy fella

In the insurance market, EDS has instituted a plan for Southwestern Life Insurance Co., Dallas (which has $5 billion in insurance in force), called the "industry center" system, and hopes to establish a half-dozen or so such centers "eventually," each with the capability of handling several insurance companies.

At Southwestern Life, vp A. E. Wood said, "We are very pleased with our agreement and the further we get into it the more we are sure we did the right thing." Wood said the decision to go into a facilities management agreement with EDS had been fully discussed with his own people. "We called in our key edp personnel and explained the situation to them. The initial reaction was somewhat lukewarm. However, we asked *their* recommendations. The recommendation was an unqualified go-ahead, and our people are wholeheartedly behind the program today."

Southwestern had about 80 people in its dp department. About 40 were retained to do tasks not included in the EDS proposal, and the rest were assigned to other jobs within the company. EDS helped the insurance firm dispose of its hardware, much of which had already been written off.

"The back-up equipment offered by EDS was one of the great selling points we could see in this agreement," said Wood. "We won't save an appreciable amount of money on operation, but the efficiency of our operation will be improved in great measure. To do the same job internally would have taken us two or three times as long, and we still would not have benefited from the continual upgrading we expect to see with EDS."

Early returns

All users of FM are not as willing to speak up as Wood. They have opinions, most of them favorable, depending on the situation, but early returns, they imply, can be misleading and they want to be sure. One user, a nationwide firm involved in the operation of recreational facilities, seems typical of the genre. With a gross yearly income of around $40 million, the company found itself processing uncoordinated data at three different locations on three different makes of hardware, with subsequent loss of money, information, and control. The firm hired an experienced dp manager to study the situation and who then recommended FM. The FM firm selected was chosen on the basis of one man in the company that the dp manager came to know and respect. On such exhaustible resources are business relations built.

The FM firm, as do most in similar circumstances, checked out the existing dp personnel (about 25), hired all those who wished to and were capable of working for the FM firm (and provided equal or superior employee benefits than the client firm), and discharged the rest. It disposed of the client's existing hardware and is now doing the work off/site at its own facility.

The client firm's dp manager remained in the client's employ, nominally in charge of the whole operation, but responsible mainly for liaison. Thus far, a cost saving of 20% has been effected in the first year of a five-year contract and the company is happy. Its only concern with such a contract is the viability of the FM outfit. Will it still be around five years from now? It takes considerable research, knowledge of people, and faith to sign such five-year contracts. Most FM firms are obliged to provide outs in their contracts for customers who may become disenchanted; otherwise, no signature.

Personnel problems

In the majority of cases, edp personnel are happy to leave the parent company to go with an FM firm that is taking over. Usually, they have risen as far as they can within the company (and bear the onus of somehow being "different"). They enjoy the comforting climate of a dp-oriented company, and the prospects for promotion are much better. However, another side to that is that most client companies are unwilling to surrender completely all of their edp facilities and personnel to an FM firm, preferring, as did the recreational firm, to maintain at least nominal control over the operation by putting at least one of their employees in charge of the transition and future function.

The reasons for users using are many, including inability to maintain sufficient expert staff (although not so much in the now recession as in the prosperous past), the desire to get rid of the headaches of facility and system maintenance, the glittering prospect of cost reductions, and, finally, management's relief in not having to understand anything anymore. Even so, there has been no concerted rush on the part of business to take advantage of the FM panacea. This may be attributed to the recession (which FMers thought would send them economy-minded customers in droves, but which instead has made them reluctant to innovate), and to the simple joys of possession and wanting to run one's own show, even if one doesn't know what one is doing.

Then again, things are not helped by the attitude reflected in one FMer's remark at the last American Management Association seminar on facilities management: "The relationship between the FM company and the customer is one of war!" With a projected $50 billion volume in the computer industry in 1975, and a projected 30-40% of that volume susceptible to facilities management, FMers should want a peace of that business.

— Aubrey Dahl

DEC Clears Decks for Commercial Warfare on EDP Mainframe Goliaths

While IBM and Honeywell are engaged in a frontal assault on Digital Equipment Corp. in the minicomputer market, Digital has been systematically and quietly gearing up for what might best be described as guerrilla warfare attacks on all of the mainframe edp giants, including IBM and Honeywell.

DEC, which is clearly the king of the minicomputer market, hasn't entered the edp and commercial market place with a huge thunderclap. There have been no announcements of big new machines and none is expected. However, when lumped together, a group of recent DEC peripheral and software products clearly spell Electronic Data Processing.

"We're moving slowly into the commercial market," says Nick J. Mazzarese, DEC's vp for small computers. "We're being very specific and direct in the short term. We're learning. It seems stupid to go charging into that market."

Recent DEC peripherals that are certain to spur the Maynard, Mass., company's growth in the commercial dp area include the DECwriter, which is an inexpensive 80-column teletypewriter; and the DECpack, a low-cost random access mass storage device. "We're not advancing the state of the art with these peripherals," says Mazzarese, "these are solid meat-and-potatoes products."

Designed specifically for use with minicomputers, the DECwriter is a dot matrix impact printer with keyboard that operates at a speed of 30 cps. It utilizes solid state control "to give high reliability and quiet operation." The DECwriter costs $2500. Deliveries will begin in the spring. The DECpack is a removable disc pack for DEC's PDP-11 minicomputer and offers a 600K-word disc drive. The unit is priced at $7200. The DECpack is best suited for systems where large volumes of programs and data are developed and maintained for one or more users. Deliveries will begin in November, although an alternative system by another supplier will be available before then.

"And we'll be coming out with more products," adds Mazzarese. "Out strategy will be to product them to death."

New company profile

As might be expected, the new drive into commercial areas is beginning to cause some fundamental changes in the overall company profile at DEC. For instance, Mazzarese notes that the firm is going through something of a transformation, moving from a company emphasizing engineering to a company that will be paying more attention to the classical methods of edp marketing. In the past, DEC sold almost exclusively to sophisticated users of computers — users who could take a DEC computer and write their own software for it and do much of their own hardware configuring.

Initially, Mazzarese expects DEC will be picking up most of its commercial business from customers who already have DEC machines. As an example, Digital is offering a business data processing system for newspapers which are already using DEC machines for typesetting. "I have a feeling that we'll do better with the sophisticated edp users," notes Mazzarese. "We're more likely to get the IBM customer who has been through it all, I think, than someone who has never had a computer before. We're less expensive. For instance, the IBM minicomputer system sells for about the same price as two of our systems."

Business-oriented language

Another weapon DEC is using to make a thrust into the commercial area is a business-oriented language it calls DIBOL (Digital Equipment Business Oriented Language). Designed for use with DEC's PDP-8 comptuers, DIBOL looks exactly like FORTRAN but is structured much like COBOL. The company says DIBOL is gaining high acceptance from customers.

"The small computer," says John B. Cohen, who designed DIBOL, "is more than adequate to handle the information processing for a small to medium size business. However, its use up to this point has been limited. This may be because inexpensive computers had to be programmed in machine language. We get around this problem with DIBOL."

As an example of how DIBOL can be useful — and inexpensive — in small business environments, Digital presents what it believes could be a typical system: an 8K PDP-8 minicomputer, three mag tape units, and a teletypewriter to handle accounts payable, accounts receivable, and inventory control. The system would cost about $30,000.

In another area, DEC has been moving into the edp market with its medium-scale time-sharing machine, the PDP-10. Like minicomputers, the PDP-10 has been selling primarily to sophisticated scientific and industrial computer users. And only in recent months has the firm been harnessing the PDP-10 to provide a broad spectrum of commercially oriented applications. And there are indications there will be more of these coming in the future.

"We're making a strong commitment with the 10 to broaden our edp capabilities," says G. C. Belden, Jr., market group manager for the PDP-10. "For instance, one of our objectives is to provide and maintain a concept of standard COBOL operations." Belden says DEC intends to stick with the single machine approach — in this case, the PDP-10 — and to broaden its range of capabilities and pricing structure to make it competitive over a wider range.

Belden sees the 10 as being competitive with IBM's 360/40 to 75 machines and with some of the 370 machines.

In addition to DEC's COBOL compiler, recent PDP-10 products that will improve the machine's edp punch include multiprogramming batch processing software and a remote batch terminal. The multiprogramming software improves throughput by overlapping computerbound jobs with I/O bound jobs and also permits users with short jobs to improve turnaround time while longer jobs are being run.

The terminal hardware package—consisting of the DC71 remote station and a DS10 synchronous line interface — is configured around DEC's PDP-8/I computer and includes a card reader and a printer. The synchronous line interface joins the PDP-10 I/O bus with a single line synchronous modem.

"We're in an overlapping market now and will continue to broaden these and, further, go after new commercial markets," says Belden. He observed that the PDP-10s which once were used almost exclusively for scientific or industrial applications, are being used increasingly for commercial purposes. Belden noted that some colleges that have used 10s for scientific purposes are now using them for payroll and other commercial applications.

DEC's minicomputer marketing force gives the company something of a Trojan Horse capability for selling the PDP-10. "Our minicomputer salesmen give us a foot in the doors," says Belden. "We're getting in through the plant and not through the accounting office."

— **W. David Gardner**

All for One and One for All...to a Degree

International Data, the joint study company formed by Control Data Corp., Great Britain's International Computers Ltd., and France's Compagnie Internationale pour L'Informatique, is definitely not a prelude to any merger or acquisition, emphasized E. C. H. Organ, ICL's assistant managing director, in a recent interview with *Datamation*.

The firms instead intend that International Data will provide the means to broaden their markets and services beyond the scope of their individual product lines. In essence ID's charter initially is to develop and recommend standards for the future product lines of all three companies. While each company maintains its independence and is not bound by the recommendations, obviously they are aiming at compatibility.

And that should lead to more licensing among the three to manufacture and/or market each other's products. And, for both political and technical reasons, that could lead to a greater penetration for each in world markets — most particularly for CDC abroad and ICL in the U.S. and the Common Market.

The venture is still very much in the embryonic stage, so a specific plan has not been disclosed. It grew out of long-term cooperation between CDC and the two European firms. As a formal organization it is probably an international first. It has the long/range potential of being an extremely significant factor in the industry *because* it is not limited to the three founders, noted Organ. If there is enough willingness to cooperate among the world's edp manufacturers (and that's a lot of good will), the venture could lead someday to standards not of IBM's making.

Mr. Organ did pontificate on the potential of ID cooperation. The standards, it is hoped, will extend to components, peripherals, interfaces, communications and related gear, and software. On items like components, the volume buying power and hence the price break for three or more firms is naturally better than one, he said. Too, where firms have a common product need, they can share development and even tooling costs.

Advance knowledge of the various product lines also means that a member rather than setting up to manufacture a product where his market is uncertain or marginal can obtain a license to market the units produced by a brother firm.

The product lines of the three firms are more complementary than competitive and are likely to stay that way in the future. As has been projected, this kind of venture may mean the Europeans won't build super systems like Control Data's although Mr. Organ said ID cannot prohibit any member from competitive development. In the near future, while the three cannot do anything about current systems compatibility, they will be working on peripheral interface.

— **Angeline Pantages**

Bendix Comes Back and Backs Logitron

Since it sold its computer division to Control Data seven years ago, Bendix Corp. has had little identification with the edp industry. But last month the company made it clear it hasn't turned its back on this growth market.

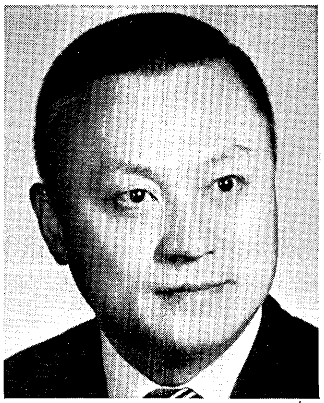
At the FJCC, Bendix blossomed out with three edp industry products — a microfilm plotter, an automated drafting system, and a portable crt/keyboard terminal. All three products had been introduced before. But what was new about one of them — the portable terminal — was that Bendix had gone out and bought an ailing company to add the terminal to the new products its Advanced Products Div. has been aiming at "selected growth markets."

The terminal is the Logiport/1, introduced last spring by Logitron, Inc., of Cambridge, Mass. The firm was formed two years ago by former students and graduates of MIT and the Harvard Business School.

Logitron gained notice both for the product and for the youth of its officers. The president, Derick O. Dahlen, 22, once had to postpone a directors meeting to meet with his draft board in Minnesota and convince them he should not leave Logitron. Convincing investors in a down economy was another matter. With assets of $112,000 and liabilities of $374,000, Logitron late last summer filed under Chapter 11 of the Bankruptcy Act and began looking for someone to rescue it. (See Oct. 1, p. 71.)

Bendix said it paid cash for Logitron, but wouldn't say how much. It will operate it as a subsidiary, headed by C. B. Sung, vp and group executive of the Bendix Advanced Products Div. Sung succeeds Nicholas J. Covatta, 24, who was named executive vp and general manager. Dahlen continues as president.

In announcing the acquisition, Sung said Bendix will fully commit its top management, facilities, and financial resources. Dahlen put it another way: "We used to get a big order and then have to spend weeks getting money to produce the equipment. Now we just pick up the phone and the money comes."



C.B. SUNG OF BENDIX: new man at Logitron

Pitney Bowes Now in Credit Card Checking

Pitney Bowes Corp., the doyen of postage metering equipment, has moved further into the retail money market with a credit card authorization system. This is the company's second venture in the retail arena. The first is the joint venture, Pitney Bowes-Alpex, Inc., with Alpex Computer Corp., which manufactures and markets the SPICE electronic cash register equipment.

The credit card system includes encoding and terminal equipment. It will be an on-line system. The company says a card query and report takes less than 10 seconds of chargeable line time to perform.

Encoders will be attached to existing card embossers. A company spokesman said the units would be custom items ranging in price from $5,000 to $15,000. The encoders will place fluorescent code based on the "two out of seven Touch-Tone code" on the cards.

The terminal units will be available with card status display of yes, no, and a variable message, with or without keyboard. Purchase price for the terminal is between $200 and $500. Pitney Bowes expects they will be leased rather than purchased.

Next month National Data Corp., the custodian of card data for 25 of the 26 major U.S. oil companies and Master Charge, will field-test the system. In the past National used the telephone for credit checks.

If all goes well, commercial deliveries of the Pitney Bowes credit authorization system equipment will begin this summer.

ACT/GE on Inside Track at NYC Trade Center

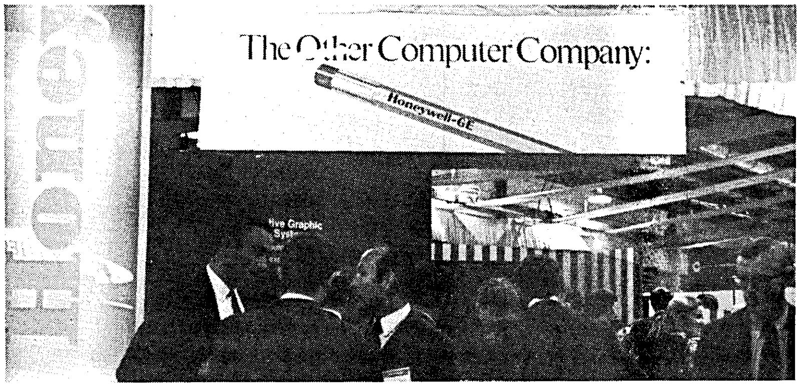
Advanced Computer Techniques Corp. (ACT) and GE Information Services Div. are the edp concessionaires for the New York World Trade Center, operated by the Port of New York Authority. The two 110-story trade center towers are wired for terminal plug-in.

ACT, which is the prime contractor for the combine, will supply training, software, design and consultant services. GE will provide its Mark II service for batch and real-time processing.

ACT/GE, selected from a field of 11 bidders, will not have an exclusive market at the trade center. Outside dp services can do business at the complex. But ACT/GE will have the inside track with the Port Authority in development of Interfile, a data base of all international trade regulations, rates and vital statistics. ACT will establish the standards for Interfile, which will be the first such data bank. All international trade centers — there are at least 10 planned, building, or built — will develop compatible Interfile systems. If compatability is taken seriously, this could mean a nice slice of business for Honeywell's (previously GE's) European time-sharing services and ACT.

Fed Contract Launches Black-Owned DP Firm

Through the joint efforts of two firms and the federal government, a new black-owned data processing firm has been launched in Huntsville, Ala. Called Data Processing Associates, Inc., the group was awarded a one-year $350,596 contract by the General Services Administration under provisions of the Small Business Act



When you're only No. 2, you try harder. Honeywell took out an eraser to unannounce its famed slogan during the Fall Joint Computer Conference in Houston.

which permit negotiation of a contract with a minority-owned company on a noncompetitive basis in order to help the new venture succeed.

In this case, the firm was virtually established to secure the contract; it was formed only a month prior to the award, and did no other work. The contract amounts to facilities management, with DPA personnel from programmers to keypunchers staffing a 7094 and 1401 installation.

Financial backing for the company came from two sources: Triana Industrial Corp., a black-owned firm chartered to establish minority businesses and create job opportunities, which provided 51% of the capital; and Computer Science Corp., which put up the remaining 49% under a divestiture agreement that provides for its stock ownership to eventually revert to DPA. The new company has 24 people, about 40% of whom are black. Of three officers, two are black, including founder Nathaniel E. Griffin, president, a former CSC manager at the Marshall Space Flight Center. But DPA is an equal opportunity employer, as the government requires, despite the special government provisions for minority-owned firms.

Programmers, Anaysts Claim 2,000 Members

The four-month-old Association of Computer Programmers and Analysts (ACPA) formed chapters in New York City and Washington, D.C., and reported national membership of close to 2,000. Other chapters are being formed in Houston, Cincinnati, Las Vegas, Los Angeles, San Francisco, and West Point, N. Y.

Next step, according to Paul Notari and Marvin Rubenstein, president and executive vp of ACPA, will be initiation of workshops for members and nonmembers. Three workshops on advanced COBOL techniques will be presented in New York this month by Peter Martin, advisor in programmer and operator courses at Esso Mathematics and Systems Inc.

The executives report membership applications are being received at the rate of 50 to 60 a week. They expect this to increase to around 100 a week as chapters are formed.

A block to membership for some may be confusion over the association's aims. Rubenstein said he is continually forced to deny that ACPA is a union. He noted that one person claimed it was because one of its goals is "to promote the spirit of brotherhood amongst members."

ACPA does, however, quietly do some job placement for members. Rubenstein said about 30 members are unemployed at present.

Talk at ACPA is not of wages and benefits, but of performance standards and professional certification. The association has been critical of ACM and DPMA efforts in these areas from its start. Now a member of AFIPS' Professional Certification and Ethics Committee, it is critical of that group's efforts too.

Rubenstein, who took part in the committee's meeting to discuss the State of California's plans to license programmers (Nov. 1, p. 97), said the group meant well, but was unrealistic in planning a sequence of surveys and recommendations that by mid-1972, at the earliest, would provide examination for junior-level certification only. The state government, he said, would not wait.

ACPA, which is already ahead of the other organizations by having a code of ethics, is formulating a certification program. The executives did not say when it would be completed.

The 1110: Good Speed, Size for the Price

In case anyone was wondering what was holding up the announcement of Univac's largest and most sophisticated computer developed to date, it turns out that the firm was only waiting for Nov. 10 to roll around. What rolled out seems to have been well worth the wait, for the 1110 is a potent piece of machinery — guesstimated to be 3-5 times as powerful as its successful 1108 predecessor even in its smallest configuration. A multiprocessing system, the minimum configuration of the 1110 includes two command/arithmetic units (CAUs) and one input/output access unit (IOAU). This can be expanded to a 2x2, 4x2, or even a 4x4 configuration.

Each CAU is rated at 1.7 million instructions/second operating on 36-bit words. Each performs logical, control, and arithmetic functions, and has a four-deep instruction overlap — four instructions can be in different stages of execution simultaneously, with only 300 nsec required to do simple ones. Character-oriented instructions allowing decimal addition and subtraction, and editing and translation capabilities are also present among the 186 basic machine instructions, as are interregister operations. There are 112 registers, 56 for system usage and the other half for programmers to play with. These operate at 75 nsec.

Main storage on the 1110 is comprised of plated wire that can be read in 320 nsec and written in 520 nsec. Up to 256K words can be attached in 32K banks with the basic ration being 96K. It apparently isn't too hard to attach a cache memory to the 1110 should the vendor decide to do it, but Univac feels IBM has something to learn about running cache memories in a multiprocessing environment. But there is already talk about future 1110's (1112's?) not being members of the "cache-less society."

Extended storage is provided by good old core, cycling at 1.5 usec.

Building block sizes here are 128K in size, the minimum allotment consisting of 256K expandable to over one megawords. This storage is also directly addressable and executable. Four-way core interleaving on up to 40 levels is provided.

The internal code of the 1110 is left up to the user's discretion — "bytes" can be defined as having 6, 8, 9, 12, or even 18 bits, and information entered at the console is handled in ASCII code. Since the software supplied is also ASCII coded, the 1110 is basically an ASCII machine.

The arithmetic base is binary and decimal with most all of it done in the hardware. Even binary to floating-point coversion is done in this manner.

The IOAU performs the I/O functions, and each IOAU may control 8-24 channels. Maximum channel rates are 600,000 words/second for data going directly to memory, and 500,000 words/sec if it's coming out. The maximum aggregate data rate per IOAU is 4 megawords/sec.

Still in the hardware area we find a C/SP, which stands for communications/symbiont processor. This unit handles code translation, error detection and correction, interrupts, buffer packing/unpacking, and card and printer peripherals. Communications facilities accommodated range from 10 cps telegraph lines to 50 kilobaud broadband lines. Again plated wire is used for 32-128K 16-bit words in the IOAU, depending on how large a terminal network is being supported. This memory cycles at 630 nsec both reading and writing.

Along with the C/SP, several other peripherals made their debut with the 1110, including a disc subsystem, an upper/lower case printer, the model 20 UNISERVO tape drive (a 200ips model transferring data at 320 KC), and a 1,000-cpm card reader. These units can go with any 1100 series hardware.

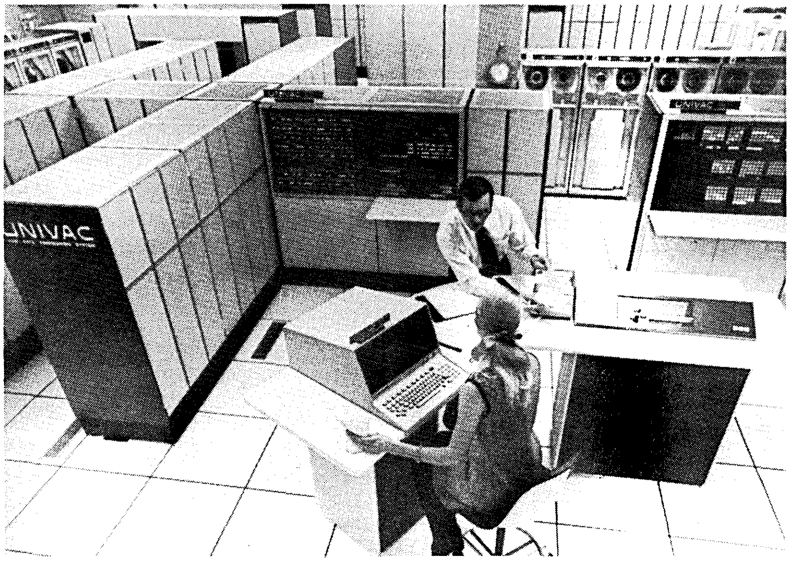
EXEC 8 has been upgraded to handle all of this hardware and is probably going to find itself called EXEC 10 before long. Conversational FORTRAN, BASIC, a text editor, and COBOL, can all be handled while doing batch, remote batch, demand, and real-time processing simultaneously. Guesses on the number of terminals supported range from a conservative 150 up to 300.

Pricing strategies for the 1110 are interesting. There are several hundred 1108s in the field, and their typical configurations are a $48-55K/month range. The smallest 1110 has 96K more memory than the largest 1108, and comparable configurations for the 1110 are only a little above the 1108 range at $60-65K/month. For comparison, the 370/165 is $70K or more per month, and the 1110 is expected to compare "very favorably" with the 370. Although there is no IBM emulation yet, Univac is reportedly studying it "very hard."

Included in the $60-65K monthly rental are the two CAUs, one IOAU with 24 channels, a console, 96K of plated wire memory, 256K of extended storage, and a complement of drums, tapes, a printer, a punch, and a reader. The 1110 is both hardware and software compatible with previous 1100 series offerings, so current 1106/1108 users might have most of the makings of an 1110 lying around the shop. In that case, the basic 1110 without peripherals goes for approximately $44,200/month on a one-year contract.

More bang for the buck, more speed, and more communications characterize Univac's new pride and joy. It will try to keep 1108s from becoming 370s, and all in all stands a good chance of attracting some White Plains customers. For information:

CIRCLE 400 ON READER CARD



New U.K. Time-Sharing Service, in Color Yet!

Autonomics, Ltd., a subsidiary of Britain's Miles Roman Group of computer software companies, has invested more than $5 million in a new time-sharing system that will provide the United Kingdom with an auditing accountancy service. The U.K. market for this type of service is put at $25 million annually.

Of the invested capital, $1.25 million has been provided by the government-sponsored National Research and Development Council (NRDC), with the remainder provided by sources in London's financial district, the City.

The time-sharing system will feature a number of computer centers, each equipped with multiple-computer configurations using Computer Technology Ltd. Modular 1 computers. London alone will have four computing centers.

The Modular 1 is available in two basic versions — a 4K core store with cycle time of 2 usec; and an 8K core store with a 750-nsec cycle time.

The auditing system has been designed to enable each Autonomics customer to have a tailor-made system, using the company's ACE programming language that incorporates conventional accountancy terminology. Communication with the system is achieved through a unique color visual display terminal designed for Autonomics by Ferranti Ltd.

This terminal features an optical window set in the rear of a crt through which the customer's business forms are projected on the specially coated face of the tube. The computer is programmed so that it will fill in the business form in a conventional manner, and the images thus generated are stored on 35mm color film. A conventional hard copy line printer is also included.

Autonomics claims the terminal enables any business to hook up to the system without any changes in existing auditing procedures.

The new system was launched shortly after Baric (a computer bureau consortium comprised of Barclays Bank and International Computers Ltd.) and International Data Highways (a member of the Reed/International Publishing Corp. group) were established, and hopes to overshadow these two more specialized auditing and stock control time-sharing systems.

Blanda Diet Too Much for Computerized Football

Every Saturday night during the professional football season, many radio stations around the country broadcast a computerized pre-version of the NFL game that would be seen live the next day on network television. A project of Javelin Sports Corp., with programming by Hi-Score Enterprises of Encino, Calif., the shows were intended only for entertainment and no predictive powers were claimed. Still, it's interesting to take a look at how things came out, at least by the end of November.

Alas, by that time, the broadcast games had yielded a record of three rights, six wrongs and three ties. However, overall pregame "predictions" of nonbroadcast games (all run on a 360/30 with a data base of over 20,000 pro football plays, conditions, and alternatives) gave the show a record of 43 rights, 22 wrongs, and 7 no-decisions. For the Sunday of Nov. 22, the nonprognosticators picked 9 out of 11, with one tie.

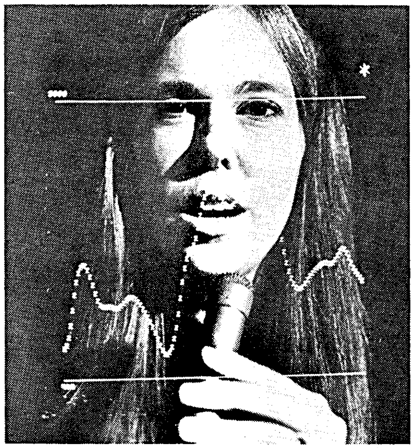
The program broadcast a doubleheader the night of Nov. 21: the Dallas Cowboys vs. the Washington Redskins, and the St. Louis Cardinals vs. the Kansas City Chiefs. It had Washington beating the Cowboys 16-15. Actual final score: Cowboys 45, Redskins 21. In the other game, the computer and its programmer decided that the Chiefs would beat the Cards, 23-16. Actual score: Chiefs 6, Cards 6.

However, all was not lost. A first down margin of 15 to 10 for St. Louis was predicted and it came out 17-11. Total yardage for the Cards was computerized at 286 and the actual yardage was 272.

The show's producer told *Datamation* that many times the program had correctly forecast the trend of a game, even though the real final score didn't indicate it. For instance, in the first Kansas City vs. Oakland game, it had the Chiefs winning by 10 points. With the score 17-14 in the final minutes and the Chiefs ahead, Kansas City was driving for a touchdown that would have provided the 10-point margin, when Oakland defensive lineman Ben Davidson fouled a recumbent Len Dawson, who had just made a long run, and Kansas City end Otis Taylor got so angry he flailed away at Davidson. Result: offsetting penalties, return of ball to original line of scrimmage, failure of Kansas City to advance, turnover of ball to Oakland, game-tying 52-yard field goal by George Blanda in waning seconds.

Now, just how does anyone program as a causative factor a 43-year-old quarterback with 20 years in the NFL, greying hair, a paunch, and a knack for the dramatic, who then proceeds to win Oakland's next three games in the last minutes?

He was in a loop.



Talk, talk, talk. The latest word comes from three Bell Labs engineers, L. R. Rabiner, R. W. Schafer, and J. L. Flanagan, who have devised a method of producing computer-spoken synthetic speech using, they say, about one-fiftieth the amount of digital storage capacity that is now used to record natural speech. The pattern above, foreground (background is speaking lady), changes as new words are formed. The digital translation is stored in a computer for possible use giving weather reports, status reports from aircraft and space vehicles, or telling you you have the wrong number, again.

Family That Plays Together Stays

You work with computers all day. You are tired and weary when you go home at night. You may love your computers or you may hate your computers, but whichever the case, you want to share your feelings with your loved ones at home. Alas, your loved ones at home just don't understand computers. You are becoming paranoid. What do you do?

You suffer, of course. But you just might try giving your loved ones — or anyone else for that matter — a game called Bugs and Looops (sic), a simple game that is designed to teach people the basics of computers as painlessly as possible.

The game consists of eight "computer" cubes, one pad of programming sheets, one computer board, and one instruction booklet. The booklet, while describing the six games that can be played with the game kit, also serves as a subtle primer on computers, describing the basic concepts (input/output, memory, processing, programming) that make computers work.

The game was designed by Peter Kugel, a software specialist at MIT's Electronics Systems Laboratory. About Bugs and Looops, Kugel says:

"The computer in Bugs and Looops is only a bunch of cubes, moved around by people's hands, while real computers are expensive electronic machines with flashing lights, wires, and complicated circuits. In spite of the differences, the general kinds of things that go on in the Bugs and Looops computer correspond to the kinds of things that go on in real computers."

The small, hand-operated "computer" is based on the Turing machine, which was created in England in the 1930s. Its switching elements are Lucite cubes, colored on four sides with a two-bit word size. The computer is operated by the players' fingers (two, three or four people can play the game). Four relatively simple games can be played with the kit before reaching the Bugs and Looops game in which each player, in turn, adds an instruction to a program that all players share. He then executes the program. The player who can produce the most action with the fewest bugs or loops, wins.

A more sophisticated game is called Time-Sharing. In Time-Sharing, each player writes instructions on his own program, but all players use the same computer.

"Bugs and Looops may be a step backward in computer development," says Kugel, "but we think it is a step forward in computer education."

Bugs and Looops is priced at $6 and sold by Creative Specialties Inc., 83 Prospect St., West Newton, Mass. 02165.

NEW COMPANIES

General Electric's still around. Its Telecommunication Products Dept. bid for a bigger slice of the data communications equipment market with formation of a new **Data Networks Operation,** at Lynchburg, Va., to design, produce, and market data network products; including the GE Digi-Net lines of modems, multiplexors, concentrators, and acoustic couplers . . . The Westinghouse Tele-Computer Systems Corp. and Baring Brothers & Company, Ltd., jointly formed **Westinghouse Management Systems Ltd.** to provide consulting services in the U.K. . . . **Medical Computer Services Inc.** was formed in King of Prussia, Pa., to provide on-line or batch dp services to doctors, hospitals, and nursing homes . . . Data 100 Corp., Minneapolis, moved into Canadian markets with formation of **Data 100 Ltd.,** Toronto . . . Tracor Data Systems, Austin, Texas, added muscle to its marketing arm with organization of **Tracor Data Systems Marketing, Inc.,** San Francisco, to handle domestic and international marketing of all computer products produced by Tracor and its affiliates.

There isn't any faster food than ice cream, but these nippers seem more interested (sure) in Honeywell Information Systems' new TraCom (Transaction Communicator) point-of-sale information system keyboard designed for fast-food franchises. Powered by an H112, the system serves as an electronic cash register and is capable of providing store managers with information on sales, cash, inventory, taxes, and profit-and-loss data. Quick, before it melts.

MERGERS, ACQUISITIONS

Optimum Systems, Inc., the Palo Alto computer services company, moved into the south by acquiring **Delta Computer Corp.,** Baton Rouge, La. The firm's interest was in Delta's subsidiary, **Automated Systems, Inc.,** a dp service company, which also has facilities in New Orleans and Lafayette, La., and Jackson, Miss. It will be operated as a wholly owned subsidiary of Optimum, a privately held company which did not disclose financial terms of the acquisition . . . Two expansion moves were announced by **URS Systems Corp.,** San Mateo, Calif. It will acquire **Computer Programming, Inc.,** of Greenville, S.C., a firm providing software for small business computers. It also signed a licensing agreement with **Systems & Programming Services,** also of Greenville, giving it access to packages SPS has developed for the Burroughs L-2000 computer. URS will market the packages in the western U.S. . . . **Advanced Data Corp.,** a publicly held dp and information services company in Philadelphia, will merge with **Motek Corp.,** privately held holding company which operates **DataFlo, Inc.,** Lansdale, Pa., service bureau, and a trucking company called **Lansdale Transportation Co.** . . . **Computer Financial, Inc.,** a Los Angeles leasing firm, acquired **NCI Datacenter,** Phoenix, which is in the same business . . . **Photon, Inc.,** Wilmington, Mass., maker of phototypesetting equipment, is working out arrangements to acquire **Bridge Data Products, Inc.,** Philadelphia peripheral firm.

SHORTLINES

People problems, specifically pollution and mental health, were beneficiaries of two recent financial commitments. Polytechnic Institute of Brooklyn's Electrical Engineering Dept. will develop technology for development of automated networks for air pollution monitoring under a $20,000 grant from the New York State Science and Technology Foundation; and Informatics Tisco, Inc., will abstract and index documents from worldwide mental health literature under a $217K contract from the National Clearinghouse for Mental Health Information . . . Annual sales of business forms used with equipment will mushroom in the next five years, according to Robert I. Verb, director of graphic services for Management Concepts, Inc., who predicted at a meeting of the National Business Forms Association that the sales level will go from a present $25 million to $250 million by 1975 . . . Service Bureau Corp. established a daily accumulaton of stock and bond prices supplied by the Bunker-Ramo Corp. as a centralized data base that can be accessed from major cities through customer terminals linked to its CALL/360 time-sharing system . . . Only typesetting jobs involving considerable updating and/or extensive cross-referencing will be accepted by CompuComp Corp., New York City, under a new "specialization policy" which saw it phasing out its RCA VideoComp, though it retains a 360/30 and its programming staff . . . The Commerce Dept. reports shipments of electronics components in the '60s climbed from $2.49 billion to $4.86 billion, paced by integrated circuit packages which went from $14 million to $760 million. ■

Treat yourself to an electronic peripheral package that offers the application simplicity of punched tape with the performance and convenience of "snap-in" magnetic tape cassettes

Philips Professional Cassette system

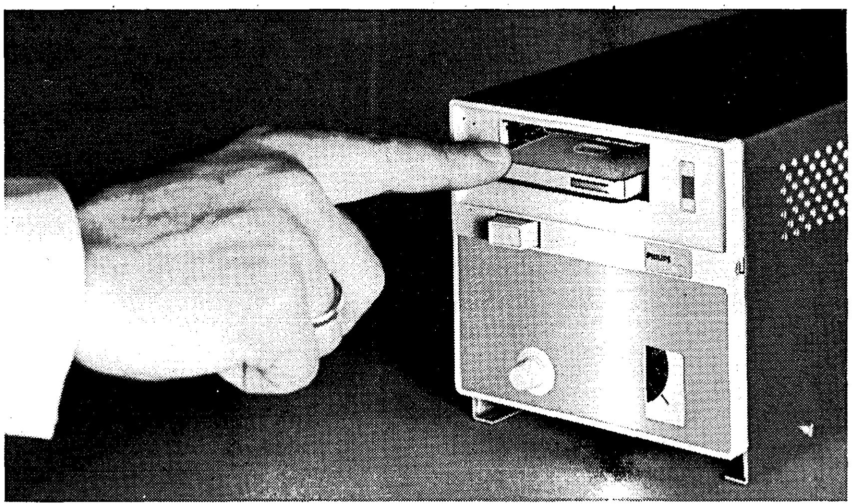
The inaugurators of the famous Compact Cassette system have pleasure in announcing that a fully-fledged Professional Cassette System, based on the original concepts is now available.

Consisting of a synchronous bi-directional cassette deck and Professional Cassette, the system complies with ECMA standards for the inter-change of digital data on tape cassettes.

The Professional Cassette is a logical development of the domestic unit and whilst retaining the same dimensions, features completely new materials and a precision of finish to meet the exacting specifications of professional use. It includes a sturdy metal frame to ensure maximum long term stability and to eliminate electro-static build-up. A highly accurate, friction-free system of tape guides and close tolerance cassette positioning spigots form part of this single frame.

Two holes at the rear of the cassette provide for write enable and, when closed with replaceable plugs, ensure that recorded data is guarded against accidental erasure. A third hole, also at the rear of the cassette, off-set from the cassette centre line, provides track discrimination.

Reliable read after write and bi-directional read operation, is assured by an accurately tensioned, extra-wide pressure pad, which together with full mu-metal screening guarantees clean, close tolerance data handling. The cassette contains 282 ft. of tape certified for digital data handling.

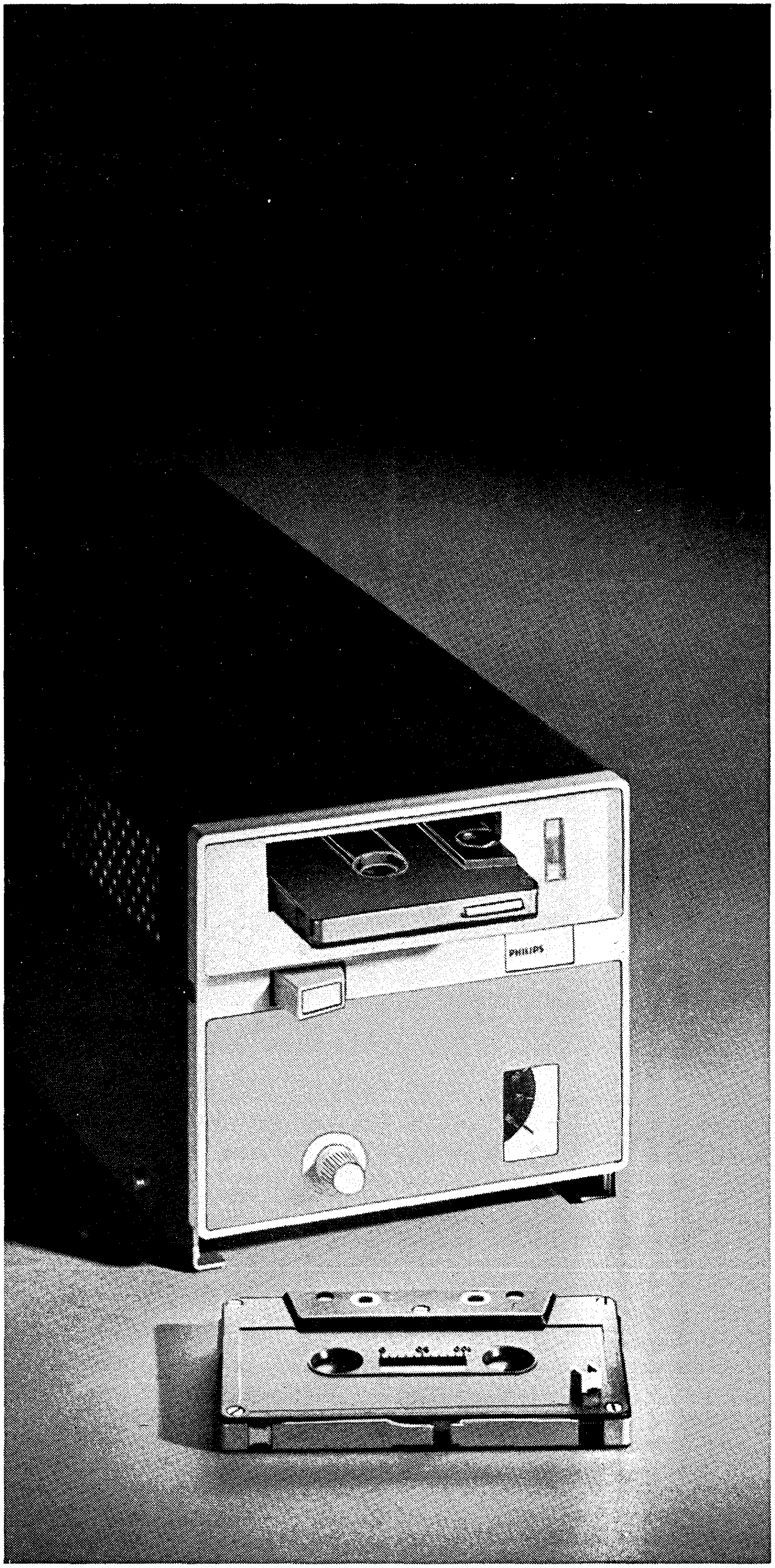


The cassette deck has been designed with all the features deemed desirable for this particular type of peripheral equipment. It's available as a mechanical tape drive, less electronics, or as a complete digital recorder with function logic and read/write electronics.

The unit is standard for single track bit serial recording at 800 bpi in the P.E. (phase encloding). mode as per ECMA proposed standard. As the recording method (P.E.) is self-clocking, synchronisation presents no problems. Skew effects are eliminated with the single track recording. The unit is completely electronically controlled and features a "select" function, enabling "unit select" operation in a system of up to four decks. Four decks fit snugly side-by-side in a standard 19″ rack. Cassette loading is reduced to just a simple matter of putting the cassette in a slot, the deck automatically takes care of guiding and positioning. A signal lamp on the deck front panel serves to indicate when lit that a cassette is in position and the deck has been "selected." Percentage of tape used is indicated by an accurate counter, also mounted on the front panel.

Functional specification

Where applicable the system has been designed to meet the ANSI, ECMA and ISO proposed standards' requirements.



The Philips Professional Cassette for digital application, stores a maximum of over five million bits when recorded at 800 bpi. The Philips Professional Cassette Deck for digital applications has the following specifications:

Speed: 3¾---7½ ips (± 1%)
bi-directional, capstan control.
Short term average bit spacing:
± 2% of bitcell time.
Rewind speed:
40 sec. for 282 ft. of tape.
Start time till short term average bit spacing: 15 ms.
Stop time till stand still: 20 ms.
Recording mode: single track half width phase encoding.

Read after write facility with 0.15 inch distance between read and write gap.
Data format:
bit serial, character serial, P.E. recording.
Inter block gap 0.7″
Variable record length.
Bit density 800 bpi (1600 fci).
Data transfer rate:
750 characters per sec.
Operating voltage:
24 V d.c. (± 10%).
Electronics:
DTL/T^{2}L compatible.
Dimensions of the mechanical deck:
front cover: 4.4 x 5 inches.
depth: 7 inches.
Weight of the mechanical deck:
5 lbs.
Operating conditions:
Temperature range: 40-110°F.
Humidity range:
10 - 90% non condensing.
Price:
Single unit price $ 485 complete.
Discount: price brackets available upon request.
Delivery starts in 1971.

PHILIPS

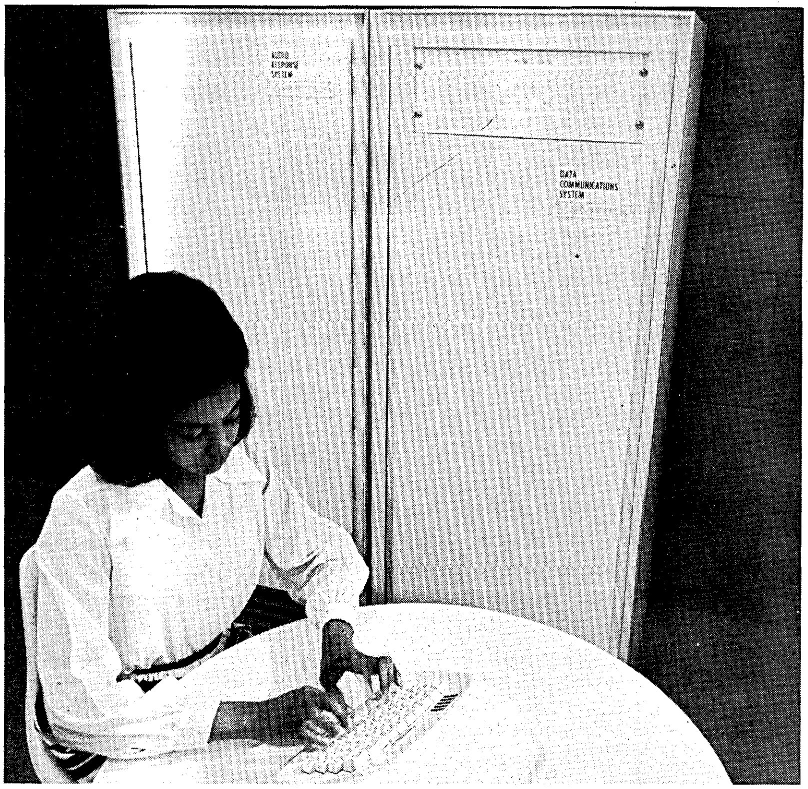
For further details:
N.V. Philips' Gloeilampenfabrieken,
ELA Digital Recording Division,
Eindhoven, The Netherlands.

PHILIPS

CIRCLE 40 ON READER CARD

PRODUCT SPOTLIGHT

Audio Response System



Less expensive than comparable crt systems, voice response systems can even become cheaper than tty systems if the application is a large enough one. However, audio response units have not, for several reasons, including expense, received wide acceptance. Part of the user acceptance problem was probably that voice response systems have been sold piecemeal, with a purchaser having to somehow get it on the air.

This manufacturer has taken a different tack by providing a complete turnkey installation based on the model A500 audio response unit which provides a 32-word vocabulary and eight lines, expandable up to 16 lines and 256 words. The vendor suggests a 4:1 ratio in lines to terminals, which means this configuration would accommodate 64 terminals, 16 simultaneously. For expansion beyond this point, concentrators are used, each of which can be expanded to control 64 terminals.

Terminals may range from basic 12-key Touch-Tone units to alphanumeric terminals (both supplied by the vendor). The simple Touch-Tone unit is priced at $300, so that is the reason the system attains a lower system price than tty networks. Up to 44 user-selected keys are allowed on the alphanumeric terminal version, which is priced at $600.

Equipment enabling the WARS system to work on the dial network is supplied, or the system can work in-house. All the necessary acoustic couplers are included in the package. Words can be recorded in either male or female voice. Terminals can also have earphones and ASCII plugs allowing a tty to record hard copies.

A 32-terminal WARS system for in-house or dial-up usage would start at approximately $59,500 on purchase, including couplers and Touch-Tone terminals. These prices include equipment warranty and installation. WAVETEK CO., San Diego, Calif. For information:

CIRCLE 362 ON READER CARD

Large-scale Computer

With a single cpu, from one to 11 i/o processors, and a 900-nsec core memory, the Sigma 9 comes off as a very powerful Sigma 7—the vendor rates it at 1.5-3 times the power of a 7—and multiple-cpu configurations are planned for sometime downstream.

Core rations start with a basic 128K, 32-bit word allotment expandable in 32K increments up to 256K, and then 64K modules can be added until the maximum of 512K is attained. Up to 224 priority levels are part of the Sigma 9, as are: four-way memory interleaving; 32 general-purpose registers (expandable to 64); half-word, full-word, and double-word fixed-point arithmetic; and 32-bit and 64-bit floating point calculations. Decimal hardware operates on numbers up to 31 digits plus sign.

Real, virtual, and real-extended addressing is allowed for over 100 major instructions. Add times are given as 730 nsec for a full 32-bit fetch/calculation/store cycle.

Each asynchronously operating input/output processor (IOP) handles up to 32 peripheral devices on two channels. In the multiplexing mode, channel rates go up to 900KB. Channel rates go up to 3 megabytes for attaching disc storage. Filling out the system features are byte-string manipulation capability, two standard real-time clocks (and two more optional), a memory map, power fail-soft, snapshot diagnostics that can either be administered on site or from remote terminals, and a watchdog timer.

Probably the most significant aspect of the Sigma 9 announcement is an operating system that is also available to Sigma 6 and 7 users. It took four years of development of xos to enable it to handle scientific or commercial applications with equal facility. Multiprogramming for local and remote batch as well as interactive time-sharing alongside real-time processing in COBOL, FORTRAN, FLAG, META-SYMBOL, SORT/MERGE, BASIC, and utility packages pretty well covers the spectrum of software needs. The UTS (Universal Time Sharing) system is also available to Sigma 9 users.

A typical Sigma 9 configuration is ballpark priced at $1,760,000 or approximately $34K/month on a lease contract. Since the 9 won't be available until the third quarter of the year, a Sigma 7 will be provided free to users who need something in the interim. XEROX DATA SYSTEMS, El Segundo, Calif. For information:

CIRCLE 363 ON READER CARD

(Continued on page 69)

360-370 Tape Subsystem

Faster access and rewind, variable density and tape format handling, direct connect of each drive to the controller, control by ROM, and extensive use of monolithic circuitry are the major features of the three-model 3803/3420 magnetic tape subsystem line.

The 3803 controller is smaller in size due to the use of monolithics, and directly connects to each drive rather than through the serial drive-to-drive to controller linkage that has been used in the past. With the radial interface a drive can go out of operation without affecting other drives or the controller. Up to eight drives can be attached to the 3803 controller, and as many as 16 can be combined with four control units for maximum switching flexibility. Automatic switching is optional.

The three 3420 drives, models 3, 5, and 7, range from 7-track, 556 bpi, 75 ips units transferring data at 120KB, to 9-track, 1600 bpi models moving tape at 200 ips and 320KB. Price of both controller and drives is based on recording features selected. Rental for the 3803 is between $675 and $750; purchase price ranges from $30,380 to $33,760. Prices for the 3420 units start at $440/month and range up to $695/month. Purchase prices are between $19,810 and $31,280. Delivery of the 3803/3420 will begin in October. IBM, White Plains, N.Y. For information:

CIRCLE 364 ON READER CARD

Data Terminal

The T-1800 receives incoming data over voice-grade lines and stores it on half-inch tape. Error control, transmission electronics, a Bell 202C2 compatible modem, and line discipline logic are all part of the package. Data transmission is at speeds from 600 to 1,800 baud, into a 2K buffer store. The unit is coding insensitive, and is compatible with all other equipment from this vendor, as well as from IBM.

The vendor claims that the calculated undetected error rate, when talking to compatible equipment, would be one error every 400 years.

In typical configurations, the T-1800 will lease under $750/month including the modem, or can be purchased for approximately $13K. TALLY CORP., Kent, Wash. For information:

CIRCLE 366 ON READER CARD

Process Control Computer

Built around a 1-μsec, 16-bit mini with memory expandable from 8-64K, this 72-instruction computer is called the LN5100. Its capabilities range from simple data logging and analysis up to the control of entire processes where the computer not only regulates but also optimizes functions. Indexing, indirect addressing, a priority interrupt scheme, and a 2-μsec add time, qualify the LN5100 for controlling equipment like blast furnaces and mineral processing equipment.

The software supplied is called CAMP—Controls And Monitoring Processor—and comes with the 5100 for approximately $50K. LEEDS & NORTHRUP CO., North Wales, Pa. For information:

CIRCLE 367 ON READER CARD

Minicomputer tape bank

Minicomputer users can gain the flexibility of larger machine configurations through the use of the Cartrifile 4196, a bank of four independently controlled ¼-inch tape transports. With the 4196, the small cpu can be made to match or merge files, or even do sorting.

Selectable word lengths of 8-, 12-, or 16-bits can be used, and transfer rates to 18,000 bps are claimed. The mtu's have simultaneous read/write capability and provide on-line storage of up to 1.25 million bytes.

Available in 30 days ARO, the 4196 is delivered with an interface to a Hewlett-Packard, Data General, Varian, Honeywell, DEC, or Interdata minicomputer and necessary cables for $6050. TRI-DATA CORP., Mountain View, Calif. For information:

CIRCLE 365 ON READER CARD

Portable Terminal

The 123T data communications terminal weighs under 30 lbs. and operates through an acoustic coupler and any 115 volt outlet. All 128 ASCII codes can be generated from the keyboard with preselected odd or even parity. Single or multicopy 8½-inch paper can be sprocket fed or prick-pin fed, while single sheets in sizes from 5 to 8½ inches may be pressure roll fed as on an ordinary typewriter. Half- or full-duplex operation up to 110 baud is switch selectable. The price is $2100. MITE CORP., New Haven, Conn. For information:

CIRCLE 380 ON READER CARD

2314 Disc Packs

Most disc packs and disc cartridges, are coated with an oxide like magnetic tape uses. This 2314 pack uses a coating called Cambricoat instead, which is plated directly onto each disc without multiple layers of copper or nickle-cobalt or whatever. Still, the vendor claims that the plating requires no protective overcoat since in contact scanning tests it has survived 50,000 starts and stops.

The resulting 2314 packs are marketed for $325 in quantities of 10 or less. CREATIVE MEMORIES, INC., Santa Monica, Calif. For information:

CIRCLE 368 ON READER CARD

CRT Display Copier

Hard copies are produced from a crt display by the Model 9750 Display Copier. Using a 9-inch crt, it requires 12 seconds for the first copy and 8 seconds for successive copies, at a cost estimated at under 2¢ each by the vendor. Price of the unit, including its own crt, is about $2500, or $1900 for the copier alone.

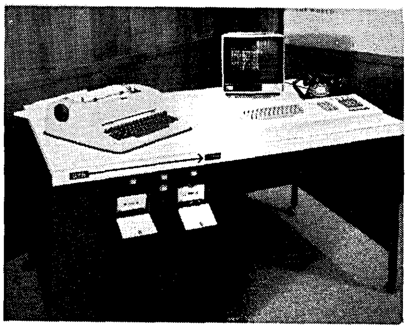
The unit may be operated from one or more crt terminals and may be remotely located. Delivery is from stock. A. B. DICK AND CO., Chicago, Ill. For information:

CIRCLE 369 ON READER CARD

(Continued on page 70)

Batch/Editing Terminal

The 200BDT batch terminal, also available as an off-line text editor, uses an alphanumeric keyboard similar to an IBM 2265, a Selectric I/O typewriter, a Japanese tv monitor, and the vendor's microprocessor, all neatly mounted in a desk configuration that shouldn't frighten the operator. All data entered through the keyboard is displayed on the tv, with upper case characters standard, and lower case optional. Storage of up to 3.25 million characters is provided by dual Norelco magnetic tape cassettes. Hard copy output, provided by the Selectric, may be done concurrently with recording on tape, or independently.



Communications facilities include an EIA interface, synchronous or asynchronous transmission, switch-selectable speeds between 600 and 4800 baud, and ASCII or other standard code. Accumulated data may be automatically transmitted, and return messages from the central computer may be recorded while the 200BDT is unattended. Error control during transmission is provided by vertical and longitudinal redundancy checks performed by the central computer. Each block of accumulated data is retained in the buffer until the computer requests the next block; thus, if errors are detected, the computer can demand retransmission of a block until error-free reception is obtained. The 200BDT itself performs vertical and longitudinal parity checks on incoming messages and can request retransmission.

The text editor, called the 1000TE, is an off-line word processor which is essentially the 200BDT without communications capability. Prices start at $9,500 for the text editor and rise to $12,500 for a maximum configuration of the batch terminal. Delivery requires 60-90 days ARO. SYS COMPUTER CORP., Hackensack, N.J. For information:

CIRCLE 373 ON READER CARD

OEM Keyboards

Said to be the first LSI/MOS keyboard, the C-P unit encodes up to nine bits and four levels on one MOS chip. Up to 88 keys are possible (anyone for the first MOS/LSI piano?), and standard features include TTL/DTL compatibility, two key rollover, three modes at no extra cost, positive or negative logic, direct functions, etc.

Single unit prices for tty model 33 and 37 format keyboards are $250, and quantity orders drop the price under $100. Many other configurations are also available. CLARE-PENDAR CO., Post Falls, Idaho. For information:

CIRCLE 381 ON READER CARD

Modem

Switch-selectable baud rates of 7200, 4800, or 3600 bps over C2 conditioned lines are claimed for the DS-7200. The synchronous unit will operate over commercial or military voice-grade circuits using land line satellite and microwave facilities, and even submarine cable.

Interface specifications read RS-232-B/C, and operation modes can be full-duplex, half-duplex, or simplex. The DS-7200 can be purchased for $9950, or lease/rental arrangements can be made. UNITED BUSINESS COMMUNICATIONS, Shawnee Mission, Kan. For information:

CIRCLE 382 ON READER CARD

Peripherals Interface

The Model 761 buffer unit permits the interface and operation in an off-line mode of various noncompatible peripherals, such as tape drives, printers, and card readers/punches. For example, a unit sold to a magazine circulation organization interfaces an IBM 2415 dual magnetic tape drive to a specialized address label printing system. Price range is $15-25K; a basic unit has only 1K memory. Delivery requires 10 to 12 weeks ARO. SYSTEMS CONCEPTS, INC., Whitestone, N.Y. For information:

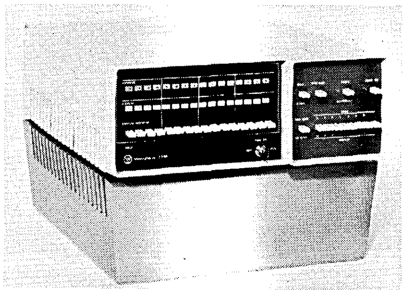
CIRCLE 383 ON READER CARD

Minicomputer

This manufacturer's entry into the mini market is the first of at least three units that will be offered. The 2500 is a wedding of Prodac 2000 and other of the company's control computer technology with mini essentials.

The marriage has produced a 16-bit word, 850 nsec machine, which in a 4K configuration sells for $9950. A system with 16K of memory and an ASR 33 is priced around $11,800.

The 2500 features memory expansion to 64K in 4K, 8K, or 16K increments; 16 fast access registers; two-level index registers; up to 62 buffered and 128 direct I/O channels; up to 120 external interrupts; direct and single-level indirect addressing; pre- and post-indexing; double-precision arithmetic; and hardware multiply and divide. Options include direct memory-access I/O, memory parity check, memory write protect/privileged instruction mode, and 32-bit floating-point arithmetic.



Software for the 2500 includes an assembler with macro features, a FORTRAN IV compiler, a real time executive, and the usual utilities and debug packages. Many of the programs have been used with the Prodac 2000.

In addition the vendor is preparing BASIC compilers for 4K and 8K and up configurations, a larger FORTRAN IV compiler and an RPG package. Initial marketing emphasis will be on oem. Deliveries will begin in April. WESTINGHOUSE COMPUTER DEPT., Orlando, Fla. For information:

CIRCLE 370 ON READER CARD ■

Chemistry Data Base

This vendor's *Handbook of Chemistry and Physics* is the Bible for scientists in those fields. Now all 466 pages from the 51st edition of that publication have been put on tape, plus some related entries, including digitized representations of the infrared, ultraviolet, and nuclear magnetic resonance curves, the Chemical Abstract Registry number, and the Wiswesser line notations for each of the approximately 15,000 compounds on file.

CODAB/ORCHEM is organized sequentially by compound in either EBCDIC or ASCII form on the 9-track, 800-bpi tape. Preceding each compound field there is a directory entry defining the records in the field. CODAB/ORCHEM will lease for $60/month starting late in 1971. A sample tape containing 500 compounds will be ready in March. SCIENCE DATABANK, INC., Cleveland, Ohio. For information:

CIRCLE 350 ON READER CARD

DOS Simscript

Two components comprise SIMSCRIPT II PLUS for DOS 360 computers: The first is a compiler that requires 150K bytes under an OS/360 environment, and the second part of the package is a runtime monitor for running the compiled program on 360s having as little as 64K. The package is mailed out with documentation on a tape in object-deck format. (The vendor states the only problem with this method of delivering SIMSCRIPT packages has been having the tapes X-rayed by airport personnel searching for bombs.)

The run-time system, including dynamic storage allocation capability, leases for $100/month. The compiler rents for $6K for a one-year contract. Installation, system maintenance, quarterly language updates, and membership in a user's group are included in the prices. SIMULATION ASSOCIATES INC., New York, N.Y. For information:

CIRCLE 351 ON READER CARD

File Maintenance

GTFM is a generalized table file maintenance program intended to obviate the need for recompiling data files every time a table change is required. Changes necessary to the files go through an update program capable of searching up to 99 separate tables using nine search methods. The alterations are edited for data type, range, etc., and tables are protected using a numeric password. GTFM can also list the tables and provide an audit trail of the changes performed on the files.

The COBOL package requires a maximum of 100K bytes on a 360, plus approximately 3K for each table being maintained. No changes to the OS system are necessary for GTFM implementation. GTFM, including installation, a seminar, and documentation, can be rented for $9500 on a three-year lease. COMPUTER SERVICES CORP., Southfield, Mich. For information:

CIRCLE 357 ON READER CARD

360 Utilities

Dump/Restore/Copy is the name of this package and describes exactly what the package does: handle the dumping of disc files to master tape and the restoring of the files from tape to disc. It is said to have advantages for users of 360/DOS systems with 2311 and 2314 drives. One claim is that it is faster than supplied software when copying variable-length records like those in DOS residence files or indexed sequential files, and the company gives a 30-day free trial for comparison. The package also optimizes output blocking by allowing use of larger buffer areas, which in turn reduces the amount of tape needed.

Dump/Restore/Copy operates in 32K of core. It can process direct, sequential files and entire disc volumes of the normal or double-disc initialization variety, and it verifies data after each disc write.

The utility program has a $700 price tag which buys an operations manual, a self-loading object deck which can be cataloged, and maintenance. Source programs are available to those who need them, and updates will be provided for five years. WESTINGHOUSE TELE-COMPUTER SYSTEMS CORP., Pittsburgh, Pa. For information:

CIRCLE 398 ON READER CARD

Object Relocation

SELFRELO is an extension of DOS. It adds 480 bytes to system supervisory but reportedly reduces disc storage overhead by ending the need to catalog a program more than once for its use in any partition.

The $3K system provides relocatability for COBOL, ALP, FORTRAN, PL/I and RPG object programs, overlays, root phases, phases with COMMON references, and multitasking. A control card option during CATAL function automatically activates the relocation, and no additions to object programs are needed. WEBSTER COMPUTER CORP., Danbury, Conn. For information:

CIRCLE 352 ON READER CARD

Test Program Monitor

ALU monitors the execution of test programs running in a DOS/360 environment, traces logical records as the jobs enter and exit, and prints these traces out in event sequence along with the regular program report. A nice feature of ALU is its ability to intercept any program "checks" that occur so that they may be analyzed for data exceptions and prevent cancellation of the test.

Only about 3K bytes of core are required for the BAL module to monitor any language program. No software changes are necessary to the DOS system. Installation for the $1750 package is optional. INTERNATIONAL SYSTEMS, INC., King of Prussia, Pa. For information:

CIRCLE 353 ON READER CARD

Securities Selection

A user of PORTFOLIO supplies such inputs as the name, number of shares, and current price of securities held; a list of contemplated securities; the amount of cash he wishes to invest; and whether the investment goal is maximum profit or minimum risk.

For output, the user receives a list of stocks to buy and which ones to unload. The package is written in FORTRAN and typically requires 42K on a Univac 1108.

Unfortunately, the purchase price of one million dollars means a prospective purchaser was probably good at playing the market already. SCI-TEK, INC., Wilmington, Del. For information:

CIRCLE 354 ON READER CARD ■

WORLD ROUNDUP

ON WITH THE SEVENTIES

In a very real sense, the year of reckoning has arrived for the British. On Feb. 15, the U.K. will change its currency system to at last have a decimal monetary unit in line with the rest of the world.

For the computer users this presents some problems, but attention is focussed most closely on the way the major banks have to cope with the monetary change in the course of one weekend. A second reason for the spotlight to fall on the banks is connected with a bitter battle being played out between Burroughs and IBM.

The banking structure in the U.K. is unique in that the market is dominated by four big groups that have about 12,000 branches spread throughout the country to account for the large majority of routine banking. These groups have all centralised their accounting onto computers, and they have 48 hours in which to reorganise their master files. It happens that the decision to go decimal was made over three years ago when the banks were planning to bring their branches on-line to their computer centres. This is a market with about $450 million invested or committed in computing, and as such represents some 6% of the U.K. market.

As little as four years ago, IBM had a firm grip on all but a smattering of the business. Then Burroughs stole a march by bringing out the 8500 and then the TC500 terminals just at the crucial moment for two of the users. The ill-fated 8500s have since been swapped for 6500s, and thereby hangs the tale.

By last year more than 10,000 terminals were on order for these organisations. When Burroughs first invaded the banks, the lost business that hurt IBM's pride most was Barclays choice of a B8500; the Midland Bank also was not a committed IBM user. Then the arrival of the TC500s added insult to injury, but also provided the impetus to some special terminal developments from IBM's product lab in the U.K. at Hursley. The question now is how many users are going to make D-day with their on-line systems working.

The switch from the B8500s to 6500s hindered Burroughs, and successive slippages have pushed the dates for most of the on-line operations to some misty time months ahead. It has been left to the smallest of the four users, Lloyds Bank, to come clean first with all customer accounts being processed by two IBM twin 360/65s. The Bank separates its various offices into full-branches and sub-branches. They feed data into a centre either in London or at Birmingham. There are 2,350 offices altogether.

The most galling prospect for Burroughs will be to watch the development of the sector of Barclays work handled by 360/65s go smoothly, while sweating out the problem with the B6500s, which are intended to convert eventually the bulk of customer account processing to on-line. This hardly assists the Burroughs cause to educate users away from some IBM philosophies to those of the 6500. Much appears to hinge on the Burroughs claims for the high degree of parallel program processing possible on their system.

With the knowledge that the Burroughs discs are slower by about three to one than the big IBM 2314 discs, there is some nail biting going on in the software enclaves.

In spite of this agitation, Burroughs seems well placed for further 6500 orders for the finance market in Scandinavia. In other markets Burroughs is vying with IBM at the big end of the range. A B6500 contract has been picked up from Atomic Energy Industries in Sweden, and IBM has notched a second 360/195 for $8 million in the U.K. from the government-funded Rutherford High Energy Laboratory. The first 195 is for the Meteorological Office.

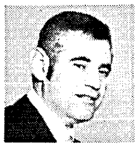
The last two orders were for users close to CDC's heart, and the marked lack of success has undoubtedly provided the catalyst for a joint venture between the U.K. manufacturer ICL, France's CII, and CDC. This arrangement had been talked over for months. A joint study company called International Data has been formed to provide a cross-fertilisation on research, software, and product know-how. But the underlying motive must be to provide a lever for any combinations of these three when fighting the common enemy.

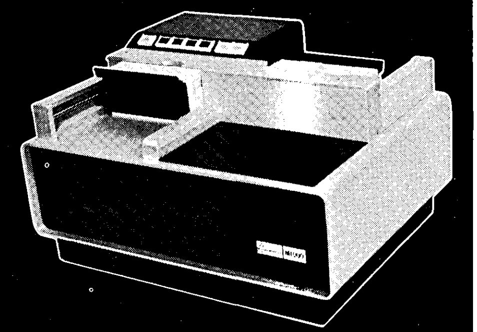
The Rutherford order is also a straw in the wind about government attitudes of the new administration in the U.K. The Rutherford Laboratory had been pressing for a 360/195 before the election last June but was meeting resistance in government for buying from anyone except the local manufacturer, ICL. The defeated socialist government had a strong anti-IBM element, now suddenly dissipated.

A touching sidelight to the industry has followed the appointment of A.K. Watson, chairman of IBM World Trade, as Ambassador in Paris; the British government has now appointed Lord Cromer (a former Governor of the Bank of England), chairman of IBM United Kingdom, as the new Ambassador to Washington.

BITS AND PIECES

France had around 4,500 computers in service at the end of 1969, and predictions are for a rise to about 8,000 by the end of 1972...Another forecast is for the number of persons in the computer industry in Germany to rise from 33,000 now to 170,000 in 1980, and in France from 30,000 to 130,000...France's leading labor union now has a 360/20 to work for it.



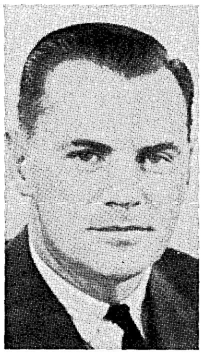


PEOPLE

"He is all of the good-looking movie stars rolled into one," a lady trade reporter once exclaimed of **F. G. "Buck" Rodgers**, who until last October was president of IBM's Data Processing Div.

Whatever his looks, in his three years with the division Rodgers had been deeply involved in "all of the furiously competitive computer industry's recent history"—the eventful period of antitrust suits, generous settlements of two of them, the advent of unbundling, a barrage of late 1970 product announcements, the full use of integrated circuit memories, and a fight against the threat of competition from independent peripheral manufacturers. It was also a period in which IBM in 1970 had failed to meet its sales quota. Some reports had them as low as 50-60% of quota. But IBM could hardly blame Rodgers; his appointment to Armonk as corporate director of marketing was a fitting tribute to the handsome marketing man and brilliant manager who had served the DP Div. well for five years before taking over as its president.

R. A. Pfeiffer, Jr.



F. G. Rodgers

Rodgers is succeeded by **Ralph A. Pfeiffer, Jr.**, the division's former vice president who earlier had managed marketing in the lucrative Washington, D.C., market. Also at Armonk, N.Y., IBM named **Gilbert Jones** to take over full-time command of World Trade Corp. as its chairman—a post he once held on a part-time basis while serving as senior vp and chairman of the management committee, now headed by **John R. Opel. Paul J. Rizzo** was named vp for corporate finance and planning, and **P. Martin Foley** was named controller. ■

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BOOKS

***Information, Mechanism, and Meaning,* by Donald M. MacKay. M.I.T. Press, Cambridge, Mass., 1969. 196 pp. $2.95, paperback.**

Information, Mechanism, and Meaning is a collection of papers, articles, and broadcasts on information theory and its applications. The selections reflect 20 years' work ranging from the subject's inception in the late 40s to the present. The author, Donald M. MacKay, is head of the Research Department of Communication at the University of Keele in England.

In his 1948 paper, C. E. Shannon explicitly avoided the inclusion of "meaning" into his theory of communication. The problem is rather, he claimed, "that of reproducing either exactly or approximately a message selected at another point." ("The Mathematical Theory of Communication," p. 32.) Semantic considerations are no doubt useful in the problem of estimating the transmitting capacity of a channel, but the fundamental notions of Shannon's theory are of much wider import. One of Donald MacKay's purposes in the present work is to explore these ideas in the more general context of human interaction. Therefore, he must necessarily face the problem of explaining the role meaning plays in the exchange of messages.

MacKay describes the communication process as fundamentally paradoxical. A message, meaningful to its originator, is encoded and then transmitted by a purely mechanistic process over a mechanistic medium to a recipient in whose mind it once again becomes meaningful. The paradox lies in the fact that the message can assume this twofold character; its descriptions seem mutually exclusive. MacKay's analysis of the process, which he claims resolves the paradox, goes as follows: at any given time a person's brain may assume one of a set of possible neural states; the receipt of a message causes a member of this set to be selected, i.e., a particular reaction to result from the receipt of the message; the original meaning of the message then is the selective function its originator intends to perform on its recipient and the received meaning is the selective function actually performed. The paradox is resolved because one need only consider the message's selective function.

It is not clear that MacKay has indeed resolved his paradox. His analysis has some credibility for peoile experienced in communication, but what about children learning the process? MacKay presupposes that they would somehow possess the same set, or a subset, of the tentative responses their experienced teachers possess. Since communication is a social skill, these responses would have to have been learned; prior information would have to have been communicated to the child. Somewhere theory must stop this regression by explaining the origin of a set of primitive responses in terms of which it is possible to learn communication. Here MacKay's theory fails. The problem of explaining meaningful behavior seems to exceed in complexity the explanatory power of MacKay's theoretical machinery.

Information, Mechanism, and Meaning raises difficult and profound questions about the functioning of the mind and the interaction between human beings. For this reason we can be grateful for its appearance. The information scientist can profit from the results of the philosopher and linguist, and vice versa. As a contribution to that end MacKay's book is valuable.

—JAMES MORRIS

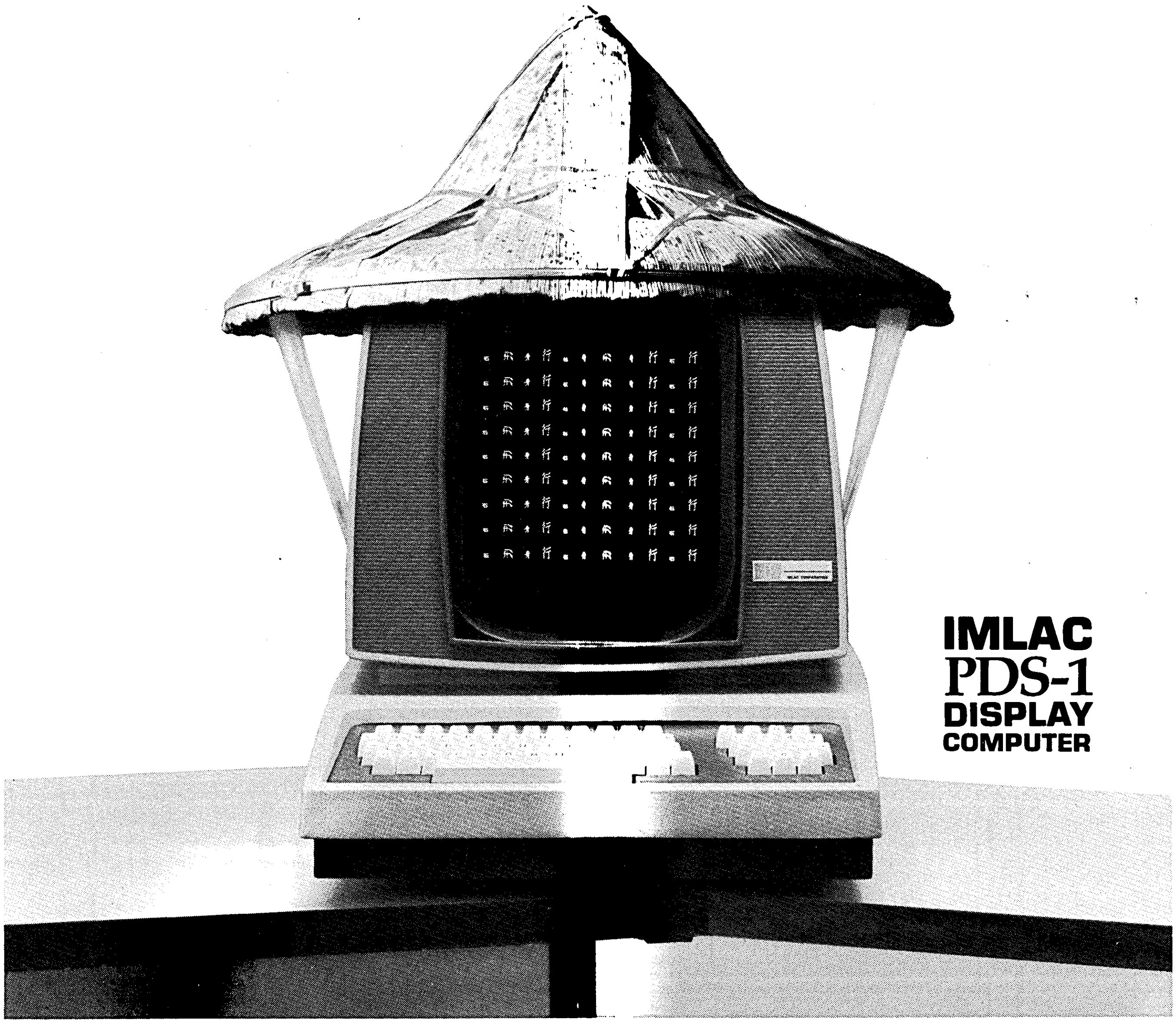
BOOK BRIEFS...

***Information Storage and Retrieval Systems for Individual Researchers,* by Gerald Jahoda. Wiley-Interscience, New York, 1970. 148 pp. $8.95.**

This book is addressed to the researcher in any subject field who desires to improve the index to his document collection or to start an index but does not quite know how to go about it.

Several types of index systems are described, including controlled index vocabularies, coordinates indexes, KWIC and KWOC indexes, and citation indexes. Help is given in the planning, design, and evaluation of different personal indexes.

A book of this nature has long been needed for the individual researcher who wishes to improve the retrieval of information from his own document collection. ■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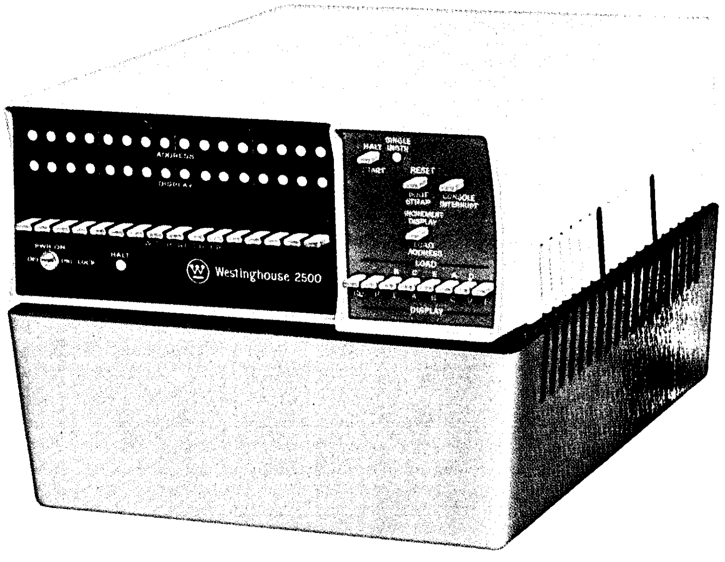

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