Approved January 28, 1985
Date

MINUTES OF THE HOUSE COMMITTEE ON COMMUNICATION, COMPUTERS AND TECHNOLOGY.

The meeting was called to order by Representative Jayne Aylward at
Chairperson

3:30 ~~a~~/p.m. on January 23, 1985 in room 522-S of the Capitol.

All members were present except:
Representative Chronister (excused)
Representative Erne (excused)

Committee staff present:
Ray Hauke, Research Department
Scott Rothe, Research Department
James A. Wilson, III, Senior Assistant Revisor
Jean Mellinger, Secretary to the Committee

Conferees appearing before the committee:
Dr. Russell Getter, Division of Information Systems & Computing

Chairman Jayne Aylward opened the meeting. Proposed committee rules were passed out to be reviewed by the committee for adoption at a later meeting (Attachment 1).

The chairman introduced Russell Getter who spoke on background on computers (Attachment 2). He also distributed an article "Looking Ahead: Key Forces That Will Shape the World of Computing" (Attachment 3); an article "Information Resources Management, State Information Systems: Cutting Processing Costs" (Attachment 4); a chart "Percent of Capacity of Usage" (Attachment 5); a document "Upgrading the Sperry-Univac Computer System" (Attachment 6); an article "Watchdog agency draws criticism for costly, incomplete computer" (Attachment 7); a KIPPS Status Report (Attachment 8); a list of IBM Compatible Vendors (Attachment 9); a memo to Russell Getter from John Carey Brown (Attachment 10); a summary of a budget sheet (Attachment 11); and a Glossary (Attachment 12). He also distributed a special packet to new members of the committee.

Chairman Aylward asked if any money was spent on disk drives for the IBM computers last year. Dr. Getter replied that from $3,500 to $3,800 had been spent for modernization efforts. She asked him to get the exact amount.

The chairman inquired concerning the plans for the IBM 3033 when the 3081 was purchased. Dr. Getter said the 3033 would go to the Department of Human Resources where they currently have two main frame centers which are independent operations.

Chairman Aylward asked if they had plans to come forward with any proposal for distributed data processing. Dr. Getter replied that the Secretary of Administration has given instructions to present to him on March 1 a plan for distributed network processing. The chairman requested that the committee hear about it as soon as possible.

The chairman asked if there was a deadline on the internal study being done of KIPPS by Carey Brown or if it was complete. Dr. Getter said the study relates to what they currently have and he has been doing research concerning the vendors and software and what other states are doing. What he has done is in the form of the memo presented today.

Representative Friedeman said that he thought the memo from Mr. Brown didn't sound too encouraging as far as our software program is concerned and asked if he was misreading it. Dr. Getter replied that this was just a periodic report and stated that he was very enthusiastic about the possibilities for personal payroll processing. He said some of the vendors claim they can match the state's needs by 95%. He urged the committee to invite in vendors of those personnel payroll programs and said such vendors are in abundance.

Representative Roper mentioned the cold site expense of $25,000 for three years and asked if that was ongoing. Dr. Getter assured him that it was a three-year contract and was needed because of the critical applications on that system and they have no place to go to back it up. At the end of 1988 when that system is phased out, if the state moves toward an IBM compatible environment, they can all back one another up.

Chairman Aylward asked if, since it was a cold site with no equipment, in case of a disaster, equipment would be moved in there. Dr. Getter said it would.

Representative Sallee inquired as to what would happen to the Sperry equipment if it were phased out. Dr. Getter explained that there are dealers in used Sperry equipment in Ohio, and the Kansas equipment would be put on the market.

The chairman asked if the cold site was far enough away to be of value in case of a national disaster. Dr. Getter said it was fairly close in Topeka, as plans stand now. There is a cold site in operation in Olathe, but it is full. If they could trade contracts, it might be wise to do that. These cold sites back one another up.

Chairman Aylward asked about the plans for the storage of all the software, now in the Judicial Center or the State Office Building. Dr. Getter said they have plans to distribute it further, but the plans are not in place as yet. The chairman asked the anticipated date for this. Dr. Getter said he had the first draft now. The chairman said the committee would be interested in seeing it if it is finished before the end of the legislative session.

The chairman suggested that the members, especially the new members, read Proposal No. 9 from their copy of the Interim Committee Proposals and read the recommendations and background on that as well as the majority and minority reports. She mentioned that Sperry-Univac people will be before the committee next week.

The meeting adjourned at 4:00 p.m.

The next meeting of the committee will be held at 3:30 p.m. on Thursday, January 24, 1985.

STATE OF KANSAS

JAYNE AYLWARD
REPRESENTATIVE, SEVENTY-FOURTH DISTRICT
DICKINSON AND SALINE COUNTIES
ROUTE 2
SALINA, KANSAS 67401

TOPEKA

COMMITTEE ASSIGNMENTS
MEMBER: ASSESSMENT AND TAXATION
LEGISLATIVE, JUDICIAL, AND CONGRESSIONAL APPORTIONMENT
COMMUNICATION, COMPUTERS AND TECHNOLOGY
FEDERAL AND STATE AFFAIRS

HOUSE OF
REPRESENTATIVES

PROPOSED COMMITTEE RULES
COMMUNICATION, COMPUTERS AND TECHNOLOGY
1985 SESSION

The purpose of these rules is to facilitate the understanding of members of the Committee and the public in reviewing the flow of legislation through this committee. Unless stated to the contrary herein, the rules of the House or Robert's Rules of Order will apply.

1. Items listed on the agenda must be brought before the committee in order of appearance. However, if the agenda states that any items previously heard may be brought before the committee, the chair may bring to a vote bills previously heard.

2. Original motions and substitute motions shall be in order when a bill is pending for consideration. A substitute motion may not be made which is contrary to the original motion.

3. An amendment to a bill must be "germane" to the area of law that is being proposed or changed. Since committees serve the purpose of examining issues for which there may be multiple solutions or approaches, "germaneness" will be interpreted as broadly as possible.

4. The question of adjournment shall be reserved to the chair and no motion to adjourn shall be entertained.

5. A motion to "lay on the table" shall be in order at anytime a question or series of questions (including an original motion and a substitute motion) are pending. The motion is non-debatable and requires a majority vote to pass.

6. A motion to "take from the table" shall be in order when such item is on the agenda or is taken up by the chair. The motion requires a simple majority and is debatable.

7. When time is separately reserved on the agenda for proponents and opponents of an issue and the time expires for either side, the testimony shall cease. Witnesses will be recognized in the order they have submitted their names to the committee secretary.

8. All witnesses shall have testimony written and shall provide 20 copies to the committee secretary at the time of appearance.

9. At the option of the chair, all who are scheduled to testify on a bill may be required to submit written testimony 24 hours in advance of the hearing for distribution to committee members.

10. A motion to report a bill "without recommendation" shall not be in order.

1/23/85 (Attachment 1)

COMPUTER OPERATIONS OVERVIEW
January 15-31, 1985

I. Wise use of the State's resources in communications and computing

A. Inventory control system
B. Maximum volume discounts
C. Equipment compatibility with:
   1. Existing equipment, or
   2. Plan for change
D. Performance integrity not degraded
E. Financing at lowest possible cost
F. Purchases have long term value
G. Purchases based on meaningful competition
H. Realistic depreciation schedules
I. Unit costs at lowest possible level
J. Meaningful central planning

II. IBM Center and Sperry contractual obligations--Totals

	FY	Sperry	IBM Center
A.	85	2,257,564	2,960,839
B.	86	2,248,344	2,802,493
C.	87	2,248,224	2,193,148
D.	88	1,631,517	1,690,271
E.	89	1,410,126	1,458,116
F.	90	828,922	1,282,565
	Totals	10,624,697	12,387,432

Grand Total 23,012,129

These are the current contractual obligations as of 9/11/84 for our entire computer center covering lease, purchase and maintenance of hardware and software.

III. IBM Center and Sperry continuing operations

	FY	Sperry	IBM Center
A.	85	3,109,670	5,343,514
B.	86	3,203,923	5,482,478
C.	87	3,203,803	4,873,133
D.	88	2,587,096	4,370,256
E.	89	2,365,705	4,138,101
F.	90	1,784,501	3,962,550

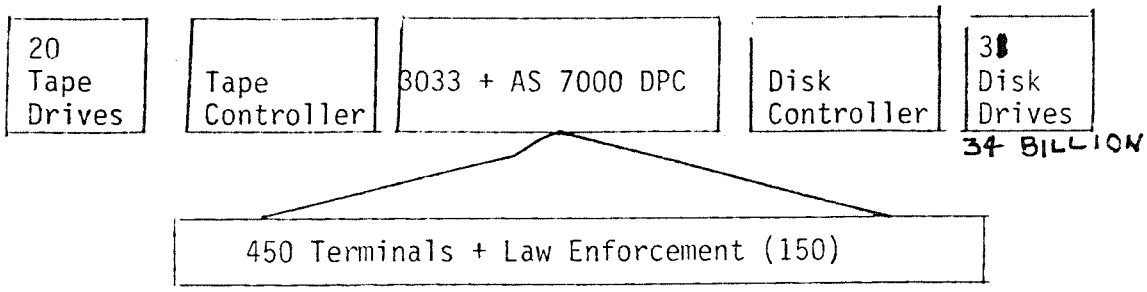
Note for Fiscal Analysts: The figures above are the on-going cost of operations, including existing contracts in II above, existing operations personnel, expected additional budgeted acquisitions in FY85, and a portion of other shared cost centers. From the large spread sheet that was used to prepare the impact analysis of phasing out Sperry-Univac these figures can be computed as follows: Sperry--Univac operations base budget + 22.1% (other cost centers base budget); IBM Center--IBM operations base budget + 45.1% (other cost centers base budget).

(attachment 2)
1/23/85

IV. Major objectives

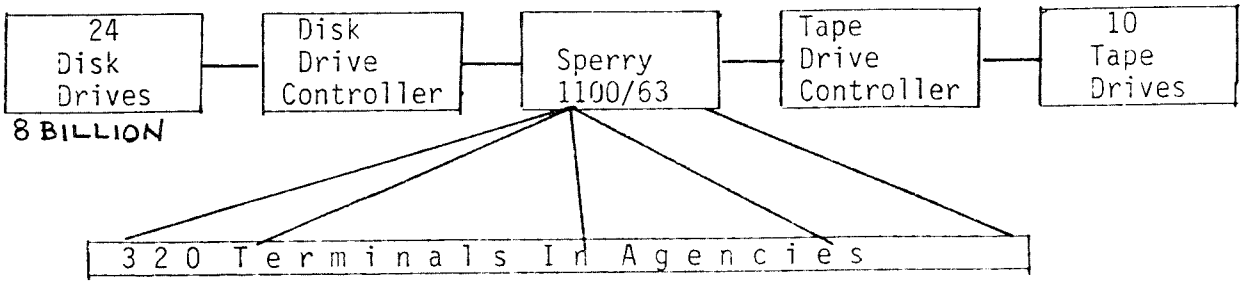
A. Reduce debt
B. Reduce costs of data processing per unit of output
C. Institute 5-year planning cycle
D. Provide certainty for critical applications, e.g.,
   1. Money-in
   2. Money-out
   3. Audit trail

V. Current IBM compatible configuration



A. IBM 3033: 5 MIPS
B. AS 7000: 4.5 MIPS
C. Usage rate: (See handout)
D. Must have upgrade at move to Santa Fe

VI. Sperry configuration



A. 1100/63: 3.4 MIPS
B. Usage rate: 97 percent, with peaks of 99.7 percent
C. Growth rate: 12 percent, after KIPPS revision
D. Management restrictions/modifications
    1. Restrict use of Agency MAPPER
    2. Separate student processing in KIPPS
    3. Partial redesign of KIPPS
        a. Data compression
        b. Eliminate duplication
        c. Complete documentation for easier use
    4. New KIPPS manager (Don Clingenpeel)
    5. Structured design (retroactivity and for the future)
    6. Internal study of KIPPS (Carey Brown)
    7. Programming standards enforcement

VII. 1984 Legislative Session - Sperry history and decisions

A. Payroll crisis at KU
B. FY84 expenditure: $2.6 million
C. FY85 request: $4.5 million
D. FY85 base budget (with contracts): $3.2 million
E. Legislative appropriation (with Finance Council approval)
    1. $300,000 for Regents withdrawal from KIPPS
    2. $ 50,000 for consultants
    3. $300,000 for <u>hardware</u> (disk drives)

VIII. Actions taken

A. Regents withdrawal agreement (payroll module only)
    1. Not final action on Personnel/Payroll processing
    2. Schedule and $ distribution

a.	WSU	Mar. 1, 85	$15,000
b.	KSU	Apr. 1, 85 or later	25,000
c.	KU/KUMC	Apr. 1, 85	110,000
d.	ESU	Aug or Sept, 85	20,000
e.	FHSU	Aug 1, 85	75,000
f.	PSU	Oct 1, 85	35,000
g.	KTI	Oct 1 85	20,000
			$300,000

B. Consultants
    1. Stiles Roberts
    2. Ken Orr
    3. Marlin Mackey
    4. Recommendation: Do <u>not</u> upgrade Sperry
C. $300,000 for <u>hardware</u> was not spent
D. Instead, request $300,000 supplemental for <u>software</u>

IX. Current KIPPS report

A. Machine overloaded, given current version of KIPPS
B. Current version of KIPPS incomplete
   1. Does not provide for batch updating
   2. Does not provide for distributed processing
   3. Does not meet needs of Regents institutions
   4. Contains data on unresolved policy issues, e.g., FTE--daily or annualized?
   5. Contains duplicate data
   6. Some users still cannot input data correctly
   7. Daily modifications and/or corrections necessary
   8. Current backlog of work (see handout)
C. Current machine (Sperry 1100/63, with peripherals) ought to be large enough to run Personnel/Payroll/Accounting system.
   1. Mapper not good for large databases
   2. KIPPS software could be more efficient
D. Sperry machine NOT compatible with IBM compatible equipment
E. No backup for Sperry system

X. Lowest cost AND highest quality Personnel/Payroll processing can be accomplished in an IBM compatible environment

A. IBM compatibles comprise 70-80 percent of the market
B. Result: Applications software is written for IBM compatible machines
C. Advantages of commercially available software
   1. Mistakes and errors removed
   2. More efficient
   3. Adaptable to changing conditions
   4. Many experts for implementation
   5. Maintenance and updating are accomplished by all users -- not just one
D. Saves State of Kansas $7.7 - $8.0 million (see handout: Impact Analysis)

XI. Recommendations

A. Continue to use existing Sperry equipment through end of FY88
B. Do not upgrade Sperry equipment
C. Purchase IBM compatible software in FY85
D. Upgrade the IBM-compatible center to the following 21 MIPS center upon the move to Santa Fe
   1. IBM 3081 K, or its equivalent (15 MIPS)
   2. AS 7000 (owned) (4.5 MIPS)
   3. AS 5000 (owned) (1.5 MIPS)
E. Begin adaptation to IBM compatible center in FY86
F. Begin migration of applications to IBM center in FY87

Looking Ahead:

Key Forces That Will Shape The World of Computing

The third wave has engulfed the world of computers—the microcomputer. As it surged beyond the point reached by its predecessors, the mainframe and the minicomputer, the microcomputer wave deposited active elements on the shores of the world of computing. These catalytic agents have now transformed computing, those who use computers, and even the nature of our society and life in this century.

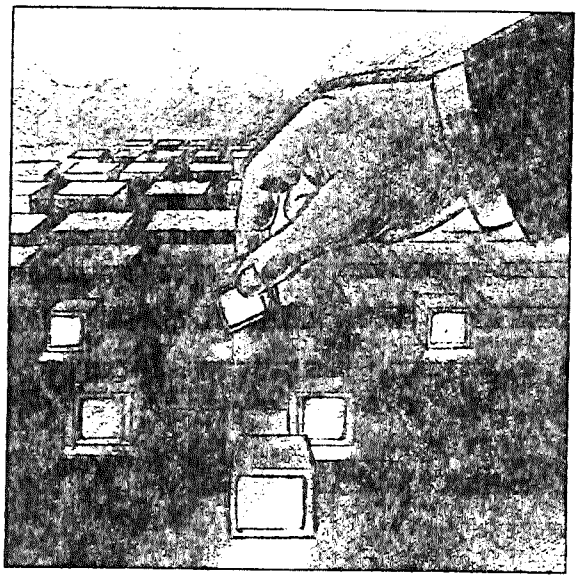
The past 25 years have seen vast changes. The first was the advent of large-scale computers in the early sixties. The descendants of these machines are mainframes or host processors. This technology brought centralized data processing, the professional EDP staff, and the MIS department in large organizations.

In the seventies, the second wave—the minicomputer—decentralized computer processing. Lower-cost minicomputers meant that individual depart-

1/23/85 (attachment 3)

1

There Will Be a Computer on Almost Every Desk by the Early Nineties.



ments and smaller companies could afford their own computers. And many more people had access to computer technology, specifically software know-how.

Today, the microcomputer has enabled a new group of hands-on users to participate in the computer world. The lower cost of entry-level hardware and the increased number and quality of software applications are revolutionizing computing. And the changes are just beginning to gather force. They will penetrate more than computing. The entire modern world will experience the effects of the microcomputer wave.

This impact comes when social scientists are observing huge changes in all walks of life. As John Naisbitt argues in *Megatrends*, many feel we must prepare to deal with changes by adopting a new strategy. Naisbitt proposes his megatrends tactic, incorporating careful observation of the present and a continuing review of the past to discern the major patterns of change that will determine the future.

Taking a cue from Naisbitt, I have looked at the forces changing computing and have identified 15 dramatic results of the microcomputer wave. With a bow to Naisbitt, I call this approach "megacomputing" and the 15 changes I predict, "megacomputing trends." I present the 15 changes—change-agents as well—as the rational basis for megacomputing planning, preparing for the future by broadly analyzing the effects of the microcomputer wave.

In the same way that the telephone, the typewriter, and the photocopier have become basic business necessities, the keyboard and video display will become indispensable tools for every office worker at all levels by the beginning of the next decade. As a matter of fact, many information workers will probably have more than one desktop or portable, integrated workstation: in their offices, their homes, and even in their briefcases.

Low cost is the most important factor responsible for this rapid proliferation of personal computers. Priced at $3,000 to $5,000 and offering increasing capabilities, video-based workstations contribute more to an organization while costing less in proportion to the overall expense of maintaining employees. Productivity increases of 5 to 10 percent pay back investment in microcomputers in less than a single year.

Entry-level employees with computer skills will help to enhance the effectiveness of the new dependence on the computer for business. They will have been introduced to computers at a very early age, never having known what the world was like without them. Computer skills learned in the classroom will have reinforced the video-game generation's experience. This new generation in the work force will find the computers on their desks very familiar.

Illustration: Ivan Powell

2

By the End of the Century, at Least as Many Computers as TV Sets Will Operate in the Home.

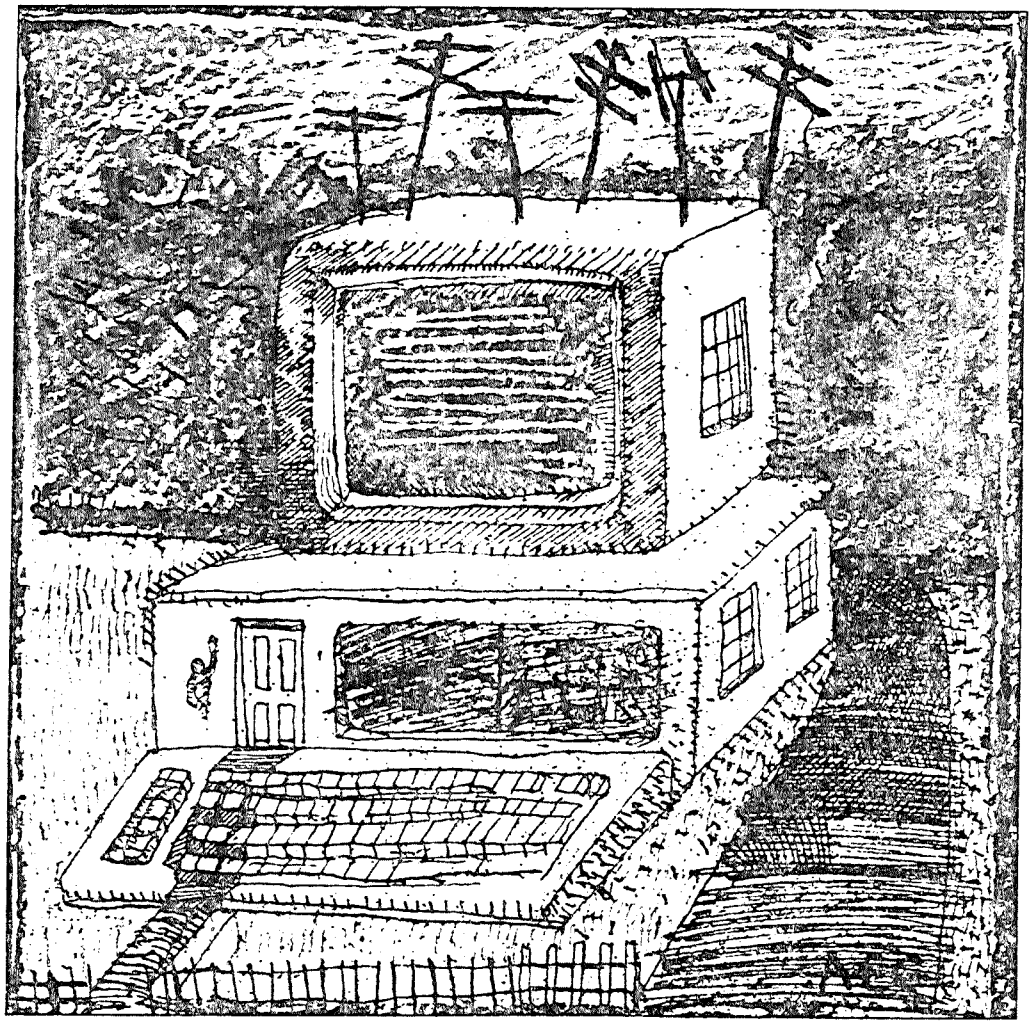


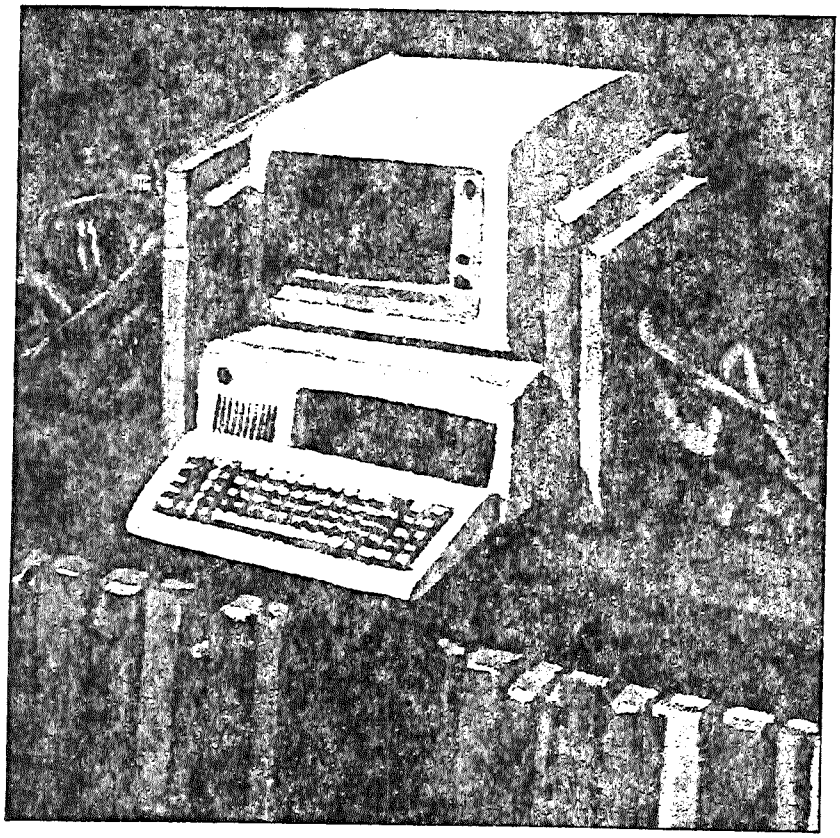
Illustration: Alan Cober

Several years ago, I was rather skeptical of predictions of the computer's widespread use in the home in the near future. Now, however, I find myself astounded by the rapid acceptance of the microcomputer for such uses as recordkeeping, word processing, education, housekeeping, personal finances, and entertainment. I predict that by the end of this century, computers in the home will equal or outnumber television sets. In fact, each television and telephone openly invites the owner to attach a computer. Or perhaps the TV and/or the phone will actually encompass the computer. New software will make many more applications possible, sweeping the home computer market as dramatically as *VisiCalc* captured the professional market several years ago.

A clue to the force that will drive the home computer market is the banking industry's determination that banking at home electronically is an economically sound approach to controlling banking expenses. Banking via personal computer will alone anchor the computer solidly in the home. Videotex services and educational software targeted at the family will make the home market even stronger.

3

Computer-Based Word Processing Will Be the Means for Recording and Transmitting the Written Word.



First the alphabet, then paper, the printing press, and the typewriter made the written word easier to disseminate. Now electronic processing of words does the job for today's communications. If not already the established leader in computer uses, written communications will become the most popular application for computers.

No single word processing applications program will serve the needs of the entire market. The requirements of student, secretary, information worker, manager, and professional writer will encourage development of many different types of word processing systems—simple line editors, memo writers, manuscript developers, engineering documentation systems, and record-keeping facilities. Many alternative software and hardware combinations will be designed to support the needs of this broad spectrum of users. This technology should in turn promote improved communication skills. Spelling checkers, syntax analyzers, automatic indexing systems, and thesaurus support will be widely available. Imagine the fast progression grade-school students will be able to make using these kinds of learning aids and the time businesspeople will save by having the personal computer handle grammar and style while they concentrate solely on composing correspondence, planning strategy, and so forth.

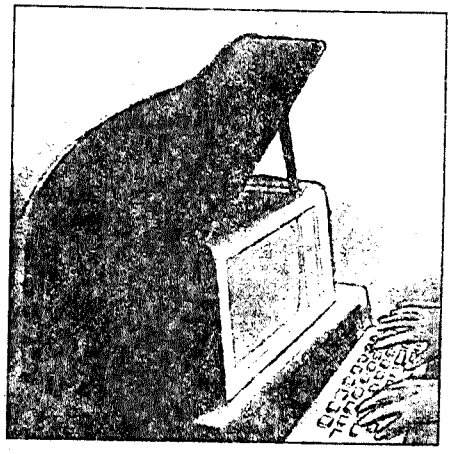
Suppliers of word processing products will proliferate to meet the incredibly expanding needs of a marketplace that encompasses office, home, and school. Word processing's effect on the handling of words will be similar to that of the pocket calculator on the handling of numbers.

Capturing text electronically is just a small step away from transmitting it electronically. New forms of electronic mail will ultimately replace many of the ways people presently communicate with each other.

Illustration: Barry Root

4

The Personal Computer Will Be a Paradigm of Performance, Leading the Way to Increased Productivity.



To increase their levels of productivity, individuals must be motivated. Yet even when motivated, they still often find it difficult to judge their own behavior objectively. No absolute guidelines can tell them what and how to improve. They lack a paradigm of performance. The personal computer, however, has begun to supply one.

The small computer can be both a measuring device and an instrument of improvement. Though inanimate, it can establish a paradigm of performance for the individual. It guides the user, leading and setting the pace for handling specific tasks. The personal computer conducts a consistent, unthreatening dialogue with the user, helping to improve his or her performance without causing jealousy, resentment, or a diminished self-image.

Using the microcomputer, a worker responds faster; the computer sets the pace of execution via screen-generated prompts. The computer user develops more far-seeing, in-depth, and alternative strategies by following the step-by-step chain of operations set up by the computer hierarchical menu structures and multiple processing paths. And the user's ability to consider and execute several processes at the same time is enhanced by the computer's multitasking features.

Substantial technological improvements enable the microcomputer to respond quickly to requests for multitasking operating systems and to create new user interface environments. These new environments offer additional data processing facilities, including fast screen painting and response, full screen-editing operations, bit-mapped graphics, additional input devices ("mouse" and touch-activated devices, for example), screen system management via windows, and user environments with all these features as well as general-purpose functions and operations that improve user comprehension when dealing with many applications.

Recent advances in overall hardware performance have yielded empirical data that suggest that the performance of the terminal operator increases as the response time of an on-line data processing application decreases. In selected studies reported by IBM (see *The Economic Value of Rapid Response Time*, IBM Document GE 20-0752-0, November 1982), end-user performance is optimal when response time is decreased from the 2 seconds promoted in the seventies to as low as 3/10 of a second. Several experiments cited in this report indicate that terminal operators can improve their productivity by as much as 100 percent when these changes in hardware performance are in place.

Observations of individual performance with a spreadsheet program or word processing package confirm these findings. The end user can become a virtuoso at the keyboard, performing with remarkable gusto, paced by screens that move and flash with unusual speed. No wonder software is now being appraised as much for its screen performance as for its practical usefulness.

But response time is not the only consideration in improving the performance of the computer user. Multitasking or concurrent operations add another dimension. When the user can perform overlapping tasks, he or she is encouraged to accomplish more per unit of time than ever before.

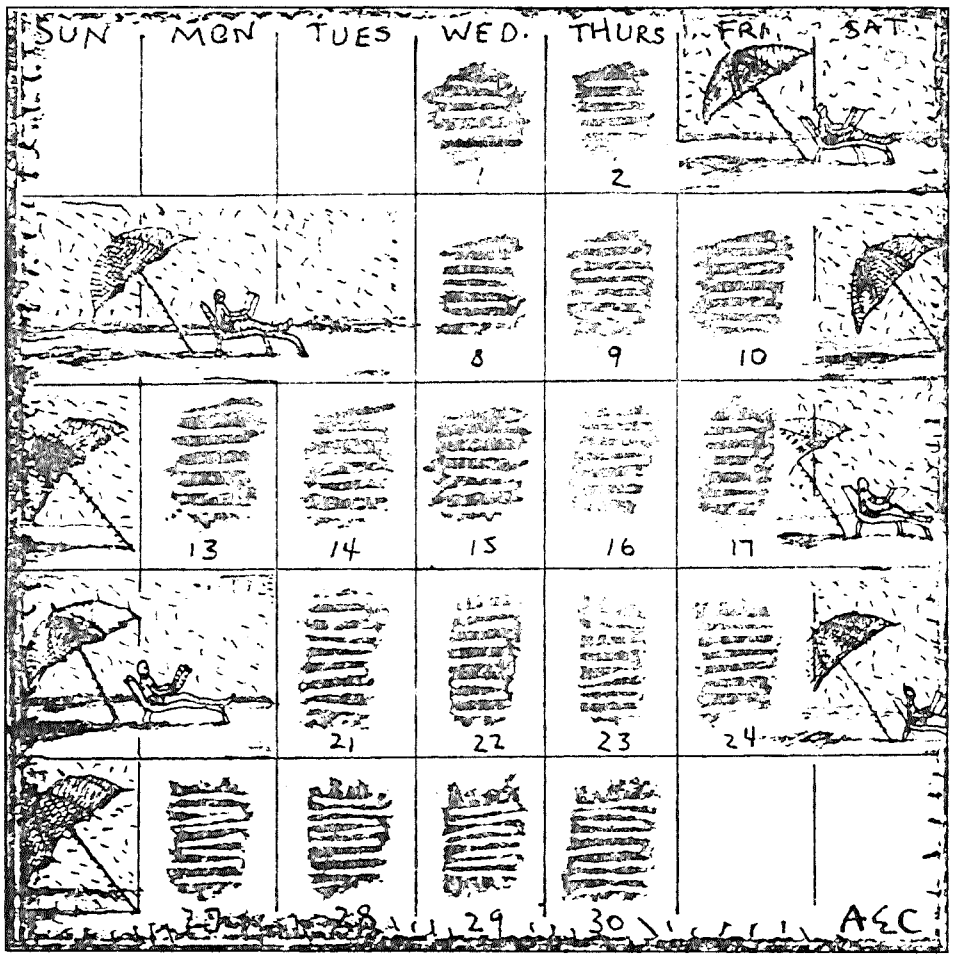
Finally, new man/machine interfaces further accelerate ease and comfort of computer use, also improving user productivity. These creative interfaces include bit-mapped graphics, including icons and windows of the sort that adorn Apple's Lisa and VisiCorp's Visi On, as well as touch-sensitive color graphics, such as those in Interactive Images's Easel system.

Armed with such intellectual stimulants and analytical tools, computer users find that they can increasingly control and improve output. Inspired by success, they generally renew interest in the job, conceive and develop new approaches and solutions to old problems, and assume more responsibility.

Illustration: Ivan Powell

5

Desktop Computers Will Lead to Overall Personal Productivity Increases of up to 20 Percent.



These benefits of the microcomputer wave will improve workers' overall personal productivity. Supported by a desktop system as a component of departmental computing, workers will increase their efficiency in handling conventional tasks such as organizing schedules, keeping calendars, writing memos, filing electronically, preparing for meetings, tracking events and projects, managing phone communications, and coordinating their efforts with those of other personnel. In addition, software developments will create new capabilities for individuals, leading to their even more effective performance or ability and readiness to assume more responsibility.

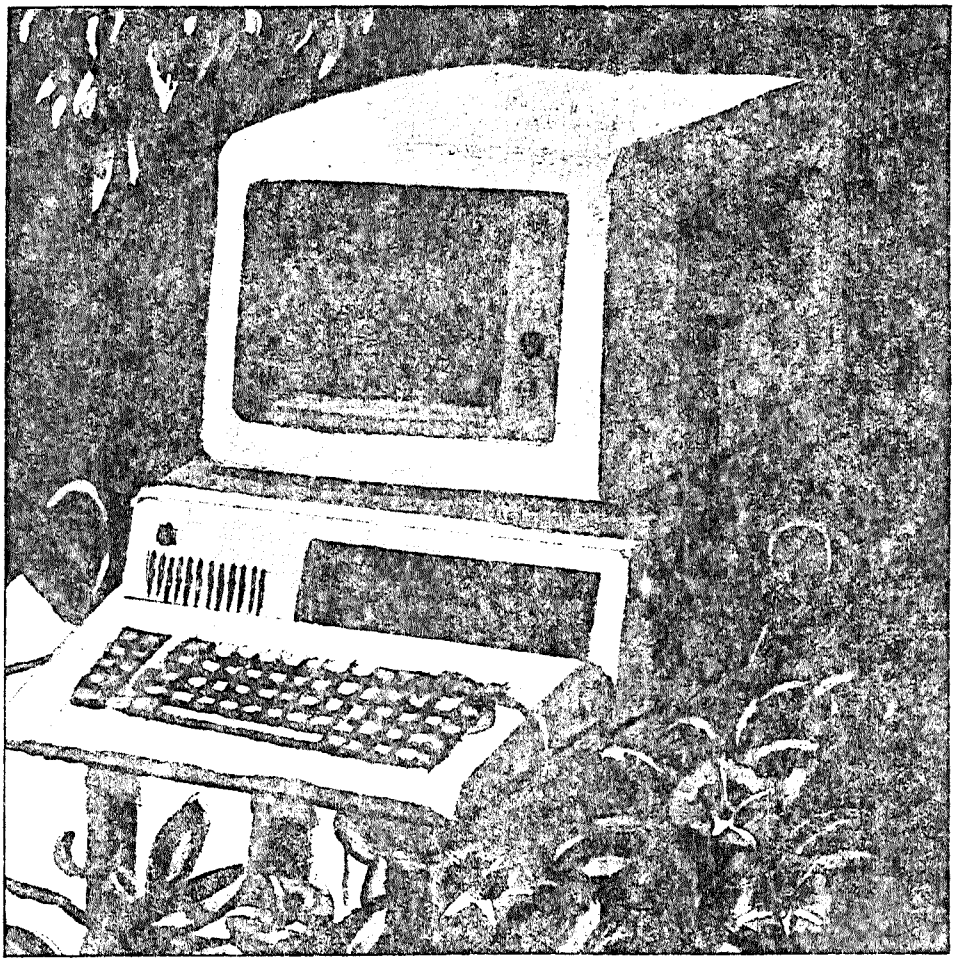
All these advantages will give them each an additional hour or two in the day. This additional time can lead either to a shorter work week or increased production, both in turn increasing productivity. Widespread use of computers in home and at the office, along with word processors, spreadsheet analyzers, and record keepers, will thus improve individual productivity by as much as 20 percent.

Students, housekeepers, salaried employees, and independent business owners will all benefit from the savings of up to 2 hours a day. The 1-year value of this improvement, measured in relation to the economic value of the individual worker's output, approximately equals the cost of the computer system. In other words, the system can easily pay for itself in 1 year.

Illustration: Alan Cober

6

People Will Communicate More, and More Effectively, via Computer Networking.



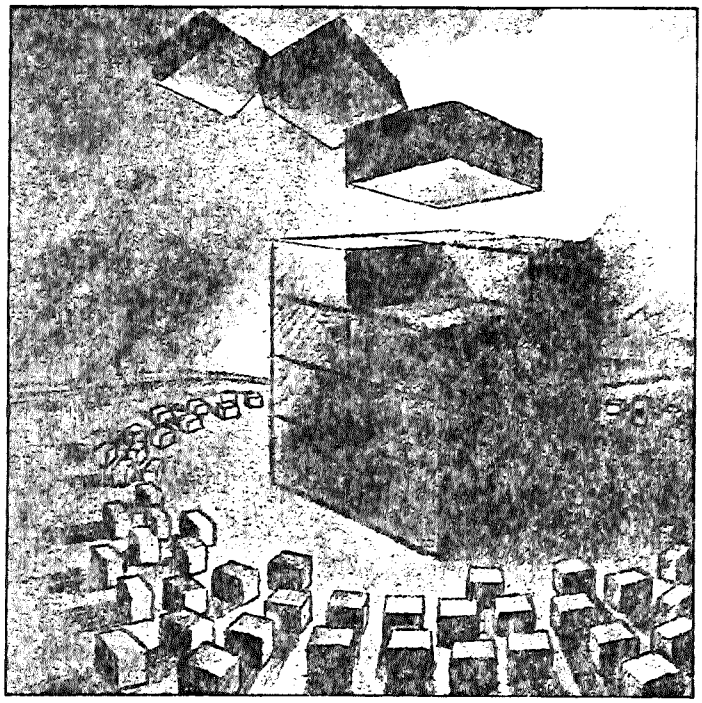
Yes, the personal computer is having a profound impact on individuals' performance, but individuals don't work alone. Their relationship to organizations and to co-workers means that networking will grow more important—at the local level and on a remote basis. The local area network will be the key to intra- and interorganizational communicating via shared resource facilities as well as shared file capability. Electronic mail, file transfer, and data sharing will link an electronic community of users shaped by the needs of "departmental" computing, rather than the more impersonal corporate or organizational MIS data-processing-type computing.

The personal computer on every desk will be as familiar and as oft used as the telephone—both allow people to communicate better, easier, and faster. They complement each other, the telephone offering voice and the computer adding memory and information storage. Their combined facilities will merge and become a multifunctional workstation operating in a network environment.

Local area networking and wide area communications will connect people in new ways, letting them transfer data and share hardware and databases. Electronic mail will greatly improve communications, through its speed and ability to file, archive, and reduce inefficiencies automatically (a relief from today's "telephone tag").

7

The Widespread Use of the Personal Computer Will Encourage the Growth of the Mainframe, Not Inhibit It.



Some have already proclaimed the demise of the mainframe. In fact, many have dubbed mainframes present-day dinosaurs. But I predict that mainframes will increase in size, number, and performance—because of the personal computer, not in spite of it.

The surging microcomputer wave and the likelihood that the sales of personal computers will surpass those of mainframes will increase the need for host processors dramatically in the next 10 years. Two trends support this prediction. First, applications to exploit new opportunities for linking micros to mainframes to create distributed data processing environments will become more and more complex. Home banking alone will demand many of these links. Second, the need—and competition for—more and more information will explode the data generation and distribution market (which is basically based on mainframes), offering formatted data and videotex products. Larger-scale computing will grow in demand in response to this need for more and better information.

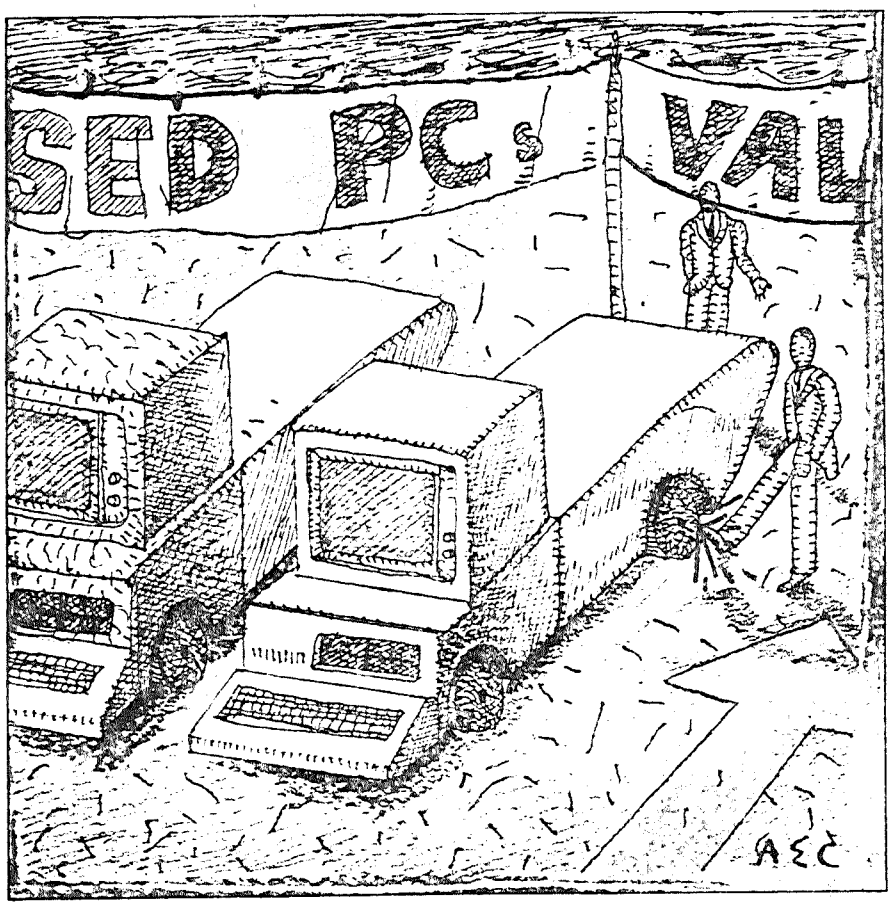
Picture millions and millions of small computers on desks throughout corporate America. Much activity will be local, both in terms of processing and data needs, but a great need will emerge for access to other computing points, whether centralized mainframes in the corporate hierarchy, other personal computers, or publicly available utilities, as sources of data banks and auxiliary services. Individuals will want to connect with other computers to execute host-based applications, send or get a file to or from a mainframe, access data from mainframe databases, use the mainframe as a back-end processor, send messages electronically, enter data for processing by the mainframe, and execute applications developed for distributed processing.

The potential impact of the microcomputer on mainframe computing needs is apparent when you look at the situation this way. First, accept the prediction that more than 30 million personal computers will occupy desks throughout the United States, and then assume that on the average each user will require connection to some host/mainframe 20 minutes a day over a peak 5-hour time frame. You'll see that with the average host supporting 10 personal computers at any time, 20,000 additional mainframes will be required to support this load.

Illustration: Ivan Powell

8

The Economics of Computer Hardware Will Become More and More Like That of the Automobile Market.



The American automobile industry is a model for the future economic evolution of the computer hardware sector. Three factors are characteristic of this industry: mass production is the basis of economies of scale; standardization permits use of interchangeable parts and encourages the growth of ancillary, third-party suppliers; user interfaces are sufficiently alike that consumers are familiar with the use and requirements of various vendors' products.

Each automobile supplier is essentially selling the same product "under the hood," the outer shell of the vehicle is what differs the most markedly from vehicle to vehicle. While most of the automobile's internal mechanisms, especially the engine, remain pretty much the same over time, the external appearance receives an annual "face lift" to satisfy or attract new consumers. Most people buy new models for their new looks and style rather than for any improvements in automotive technology.

Computer hardware vendors have now almost reached the point where these same factors will determine the personal computer market. At $5,000 to $10,000 a unit, computer hardware will be viewed and merchandised in exactly the same way as the automobile in the next few years. People will replace their systems with newer models every 3 or 4 years. Just as a vast used-car market has developed, so too will a similar business grow for computer "retreads." Indeed, the Model T of the computer world is the already "old-fashioned" 8-bit CPU. And today's "standard six" is the 16-bit machine, with the 32-bit model fast becoming the "standard eight."

Illustration: Alan Cober

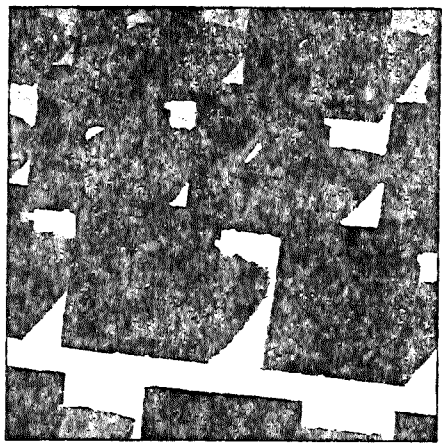
9

Standardization of Software Is Becoming the Dominant Influence on Data Processing.

Just as hardware is reaching a level of standardization, software is also becoming more uniform, but much more slowly. The general environment for software users, specific functional areas (spreadsheet, word processing, and database), and data formatting are all virgin territory for standardization. The economics of the software market are not yet strong enough to force the kind of progress the hardware market has seen. And no clear leader in software has emerged to compare with the influence and the power of IBM in hardware.

However, it's only a matter of time before the underlying pressures for standards force a change. Take user environment. Why should users be confronted with differences that are purely a question of arbitrary choice in language? Since commands like COPY and PIP are intrinsically the same, the software industry should either accept them as interchangeable terminologies or select one as the standard designation. Help, Escape, Return, and Master Menu should all designate standard requests in every product, and in all cases you should be able to select them by using the same method. Actually, screen presentation, cursor movement, and selection of options are becoming increasingly similar.

As far as applications are concerned, much has already been standardized. The standardization of commands and operations among competing word processing systems, for instance, is astounding. They all have Insert, Delete, Search, and Print, and these common functions are used most of the time. With mature, well-understood applications, probably 20 percent of the functions and features serve the user 80 percent of the time. Even more



astounding, users can generally handle 80 percent of the jobs to 100 percent satisfaction with these basic functions and features.

The most important standardization yet to be attained will affect data formatting and communications. When these are more uniform, computing will go beyond supporting the user infrastructure and contribute to more efficient software production. Such software standards will parallel those of any mature industry, as with standards for phonograph records, cassette tapes, and film cartridges to accommodate the design of the various hardware devices that require them.

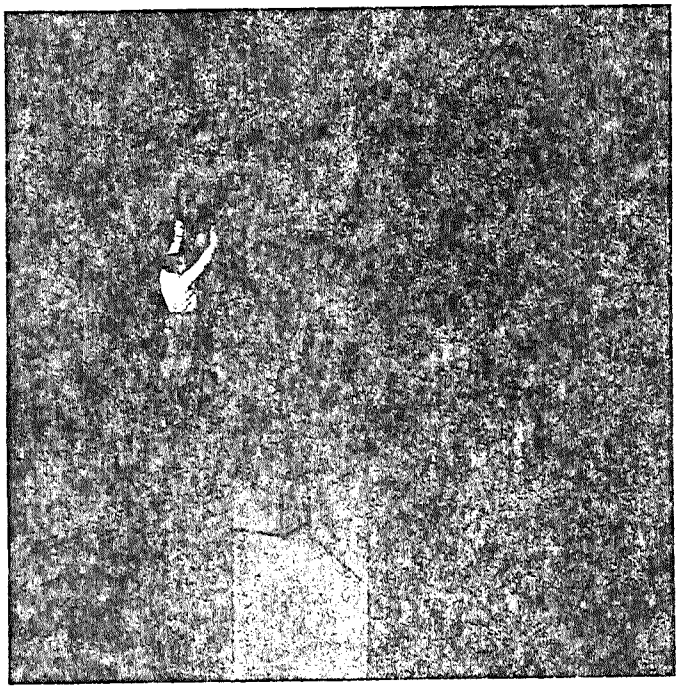
Some data-formatting standards are already common throughout the industry, including ASCII files, the simplest and most common denominator of likely file content and format, limited to "text" or what are often called print files; MS-DOS files, nearly a standard owing to the current dominance of the Microsoft operating system, MS-DOS (adopting this "standard" presupposes that you also accept consistency with the associated file directory system); SYLK (SYmbolic LinK) files, a standard promulgated by Microsoft that encompasses file formats that mix data and formulas, designed to make a highly encoded or binary file readable (the genesis of this attempt at standardization was the well-known *MultiPlan*); and DIF (data interchange format) files, the actual standard of file representation, with objectives similar to those of SYLK and advocated by Personal Arts Inc. and adopted by a number of vendors, solely because of the popularity of *VisiCalc*. In addition to these efforts to standardize file formatting, other activities focused on the goal of achieving commonality in file communication protocol. One of these efforts, introduced by Microcom, produced Microcom Networking Protocol (MNP). With MNP, error-free transfer of files from one computer node to another is possible within the framework of the International Standards Organization's reference model of open systems interconnection.

Only a beginning, these efforts may not be sufficient for the long run, when more sophisticated formats and structures will be required, especially for mainframe computing. Already, vendors have moved in the direction of IBM's standard protocols, such as Systems Network Architecture for general communications, and other standardization schemes, such as Document Control Architecture for standardizing directives that control document format and Document Interchange Architecture for interchanging protocols (specifications for transmitting and receiving documents).

In a few more years, such formatting and communication standards will be more prevalent. Both the industry and the users will demand them increasingly, giving impetus to even more standardization in the next decade.

Illustration: Barry Root

10
Software Will Be Expendable.



With the advent of mass purchasing of personal computers, software became a consumer product. A variety of retail distribution outlets opened to transact business selling software, prompting *Business Week*'s cover story on the phenomenon in its February 27, 1984, issue. And the trend has really just begun; in fact, software products are fast becoming expendable consumer goods.

In accounting, expendable goods are purchased items expensed on a current basis. Typically, good accounting practice defines the expendable item as one whose value to an organization endures less than 1 year, or whose cost is less than some reasonably agreed on amount. Items totally expensed within a relatively short accounting period are not considered assets worthy of being recorded on a company's yearly balance sheet and subsequently depreciated.

Software seems to be heading in this direction. I predict that it will become a low-cost, replaceable item for a number of reasons. First, the price of a software unit is already relatively low—in the $250 to $500 range. And large organizations will buy software in large quantities, at discounts of 30 to 50 percent. Second, software is revised within surprisingly short intervals; often less than a year elapses between revisions. These new versions are usually available to existing users for a modest replacement fee. Often, new revisions replace earlier versions entirely. Third, new, competitive products catch the interest of the consumer, making previously available items seem obsolete. And as data- and file-formatting standards become more prevalent, replacing old software with new software will become relatively easy. Fourth and last, buyers can often justify purchasing software on the basis of a single project and therefore write the cost off over the lifetime of such an activity. This is clearly the case, for example, with a $250 spreadsheet program used to produce and analyze dozens of comparative financial models for a single corporate acquisition study. The fact that the spreadsheet package may be used to analyze other acquisitions does not alter the intent of the initial purchase.

People will therefore accumulate software the same way as they do books, magazines, and other collectible items. Users will take programs off their shelves from time to time as they need them. The rest of the time many of them will accumulate dust as they line the walls decoratively, like so many books on the shelf.

Illustration: Ivan Powell

11

The Applications "Backlog" Will Disappear.

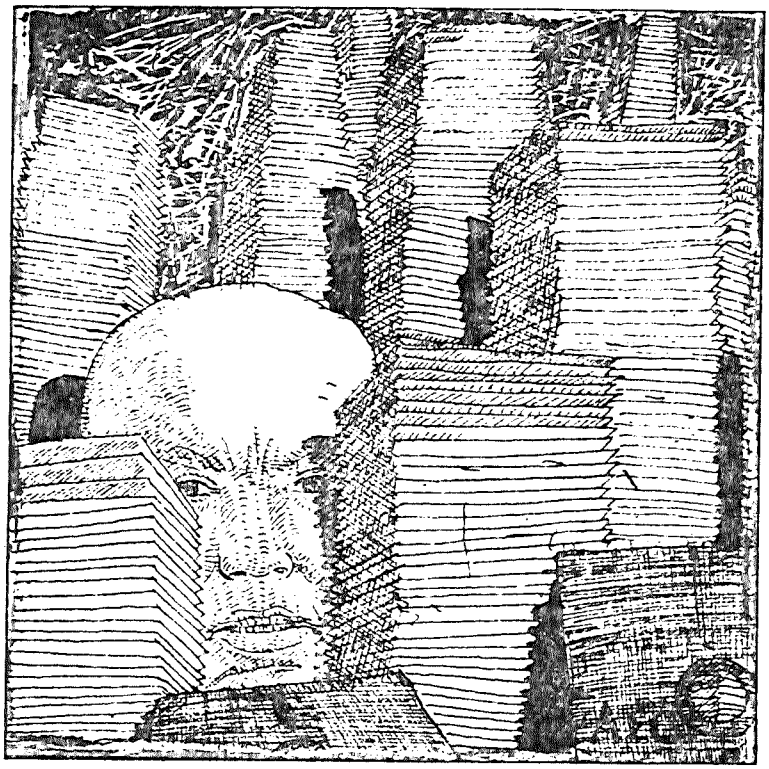


Illustration: Alan Cober

During the past decade, industry reports on the growing applications backlog plaguing computer users in large organizations have alarmed many businesspeople. Popular belief maintains that large organizations currently have software backlogs of more than 30 months; in other words, at any point in time the existing software development staff could be kept busy for 30 calendar months handling only those tasks already identified and targeted for completion.

Some statistics have also pointed to a so-called hidden backlog, no less in size than the expressed demands. This hidden backlog reflects user needs that are not even submitted to MIS departments because users believe that they would arouse little interest or no response. Users generally abandon requests for support when they feel that the best outcome expected would only solve tomorrow's problem with yesterday's specifications.

Soon users will break their dependency on the professional MIS staff. The personal computer will increasingly give them new tools and solution-oriented software so that even those without much training will be able to solve their own problems, and do so on a current basis. What will happen is that needs for computer assistance will be one of two kinds: those which are organizational, requiring complex, integrated applications performed by centralized, professional data processing personnel, and those which are individual and based more on demand and geared to a particular result, readily handled in the software environment of the personal computer and by the relatively untrained user. When this breakdown of needs into those which are organizational and those which are individual is a fact of business life, the 80/20 rule will apply. Then 80 percent of the tasks required will be accomplished via personal computing, leaving 20 percent to be handled by centralized data processing departments.

More than eliminating backlogs, this change will make computing more democratic. For the first time responsibility for solving problems and the tools for solving them will both be in the hands of those who count most—the end users.

12

Computing Will Be Done in Two Tiers.

The computing environment is rapidly moving into a two-tiered structure with the user at one end and some form of centralized processing at the other. Under this structure, intelligent processing nodes located with individual information workers, professionals, support personnel, and production workers will be connected to central processors and public utilities. This is a departure from earlier structures typified by dumb terminals connected in an on-line or time-sharing mode to a host processor.

Once, it looked as if three levels of computing might emerge. In that case, the middle element, often represented by the minicomputer, would have reflected divisional or departmental computing. But it is now clear that such an intermediate level is neither necessary nor economically justifiable. In the future, departmental computing will be handled by linking personal computer nodes into local area networks, with shared resources and databases.

Illustration: Barry Root

13

Application Generators Will Become Less Important.

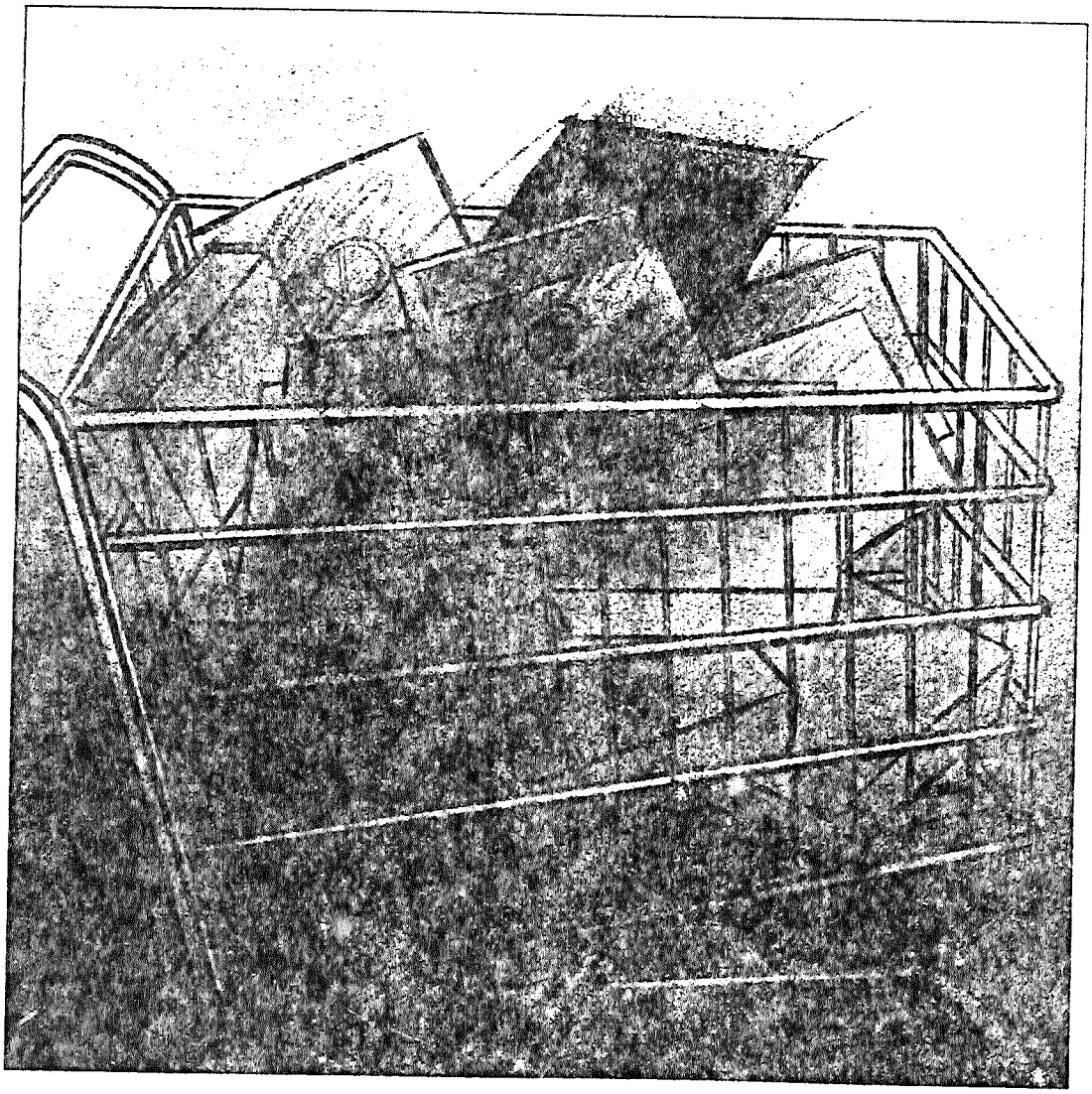


Illustration: Ivan Powell

Application generators are typically software systems that create directives to dictate the logic of input, processing, and output comprising a specific application quicker and easier than individual software programs. Often, application generators are designed to give end users powerful means with which to specify and generate custom-oriented applications. This purpose is antithetical to the dominant and growing trend to off-the-shelf, reasonably priced solutions for an endless variety of applications.

Who really needs an expensive application generator if the solution is only a few hundred dollars away via a software program? Perhaps the need for these systems is limited to turnkey vendors who build applications; the end user certainly does not need application generators. Therefore, their market is relatively small, and demand will be modest. Eventually, they will become obsolete for the purposes of the end user.

14

Executives Will Use the Computer Keyboard Enthusiastically.

Assertions that executives will not use keyboards are excuses for failing to provide adequate support systems for decision makers. No evidence shows that top management will not use a personal computer. I predict that executives will be enthusiastic personal computer users.

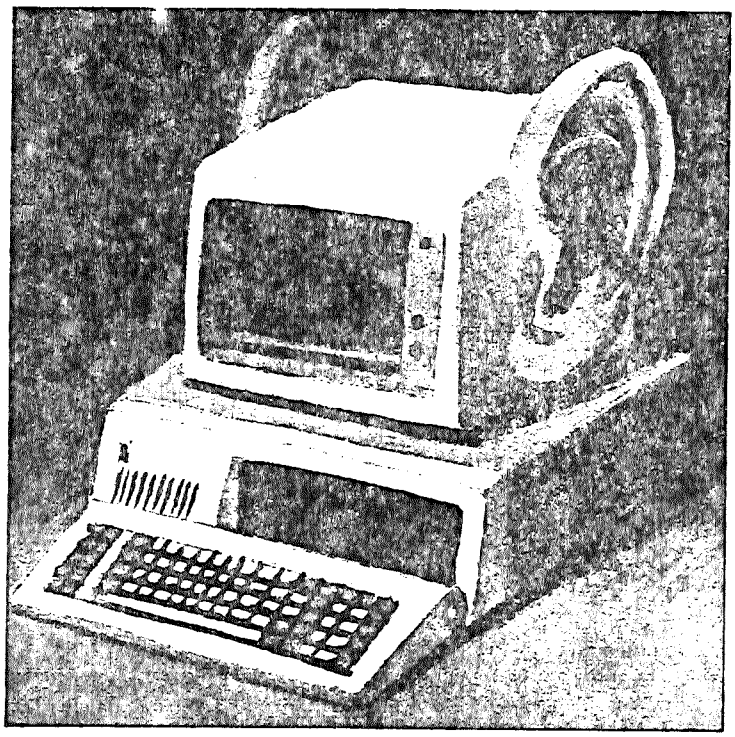
New software will help executives improve their performance. This is a motivation for executives to use computers. Also, alternate input devices like pointing devices and touch-sensitive screens make personal computers easier to use.

Also, today's heirs to executive positions in corporate America already have computer exposure. These executives recognize the value of the computer and will demand its constant aid. In the future, executives who ignore the power of the personal computer will be unable to compete in a business world moving at an accelerating rate. Management without the computer will be the exception.

Illustration: Alan Cober

15

Voice Input Is the Sole Remaining Untapped Innovation in Computing (and the Most Promising One).



With hearing, touch, and sight already incorporated into the most common computing systems today, the single dimension left to be exploited is sound. Since sound synthesis is already widely practiced, the remaining challenge facing developers is voice recognition.

Although modest capability for voice recognition already exists, vocabulary is limited. By the end of this decade, however, computers will be able to recognize more of the spoken word. Voice input will play a most important role in replacing the usual keyboarding and menu selection alternatives as well as providing a path for entirely new computer applications and markets. These new opportunities include adapting computers for environments where keyboarding is not possible or is limited, and for use by the handicapped; using computers to respond to and coach new learners of an application as well as to redirect procedures of users who are making errors; eliminating intermediate work steps such as transcribing dictation or other writing tasks; and transforming every telephone into a full-fledged computer terminal for both input and output.

These dramatic changes all reveal the need for more megacomputing, looking at the world of computing with an eye to the future and what it will bring. To prepare for this new world—battered into a new configuration and given new vitality by the third wave, the microcomputer—strategists and planners must examine where the computing world is going and how it will affect other aspects of the way modern men and women work and live.

In *Megatrends*, Naisbitt says that the wide availability and dissemination of information will be the "great equalizer" heralding a more egalitarian society. He predicts that "the computer will mask the pyramid" created by organizational hierarchies and information overloads. These 15 megacomputing trends will indeed affect personal productivity and extend the individual's activities as well as his or her control over wide responsibilities. And the microcomputer wave, essentially the personal computer, will be the means that will make these changes a reality in the next decade, creating a new world where people and computers work in new ways to shape the future. ■

Illustration: Barry Root

State Information Systems: Cutting Processing Costs

• State governments are experiencing a high demand for data processing and telecommunications services.
• To control costs, states must halt the proliferation of duplicative data center operations.

State governments like the Federal Government, are experiencing a rapid escalation in demand for data processing and telecommunications services. The costs of supplying these services are also escalating as states seek to acquire equipment and personnel resources to meet the growing demand. To control costs and meet demand, states will have to make maximum practical use of equipment and personnel. This means they will have to bring a stop to the proliferation of independent and duplicative data center operations.

Currently, most electronic communication within states is comprised of separate voice and data networks. Telephone systems are commonly multi-vendor networks consisting of equipment ranging from modern to archaic, with service levels varying by location. And data communication is usually managed by multiple state data centers.

In most states, major data communication networks are discrete, and there is a great deal of redundancy among the networks. Data processing services for state governments are generally supplied by the multiple data centers.

These centers are separately managed, not electronically connected, do not operate in compatible environments, and have limited floor space for expansion. The autonomous nature of the data centers prevents effective use of personnel at a time when skilled data processing professionals are difficult to find and expensive to retain.

Given the current rate of increase in expenditures and the escalating demand for data processing and telecommunications services, annual expenses could double by 1990. A way must be found to meet these demands that provides a cost-effective return on taxpayer dollars. Such a solution should make it possible for states to gain the advantages inherent in economies of scale and the application of proven state-of-the-art technologies.

This goal can be met through the establishment of centrally managed, integrated computer and communications utilities that provide high-quality service in a cost-effective manner. However, to achieve these cost savings and efficiencies, states will be required to make more tough economic and management decisions.

A Suggested Solution—

In most states, the development of an integrated statewide telecommunications and data processing network will require a significant initial capital outlay.

A major portion of these expenditures would go for the construction of a state headquarters facility for hardware and personnel. The headquarters facility would coordinate and support data processing and telecommunications services at other sites. But, the most important, and most difficult, step in the creation of a unified communications network will be the establishment of a management team that has the authority to govern the creation of the new network. Under this management team, all existing large computer centers would be electronically connected and would eventually operate with totally compatible hardware and software.

All discrete data networks and existing multiple voice networks would be replaced by a single, statewide communications utility capable of voice, data, and image transmission.

• **Leveraging Critical Skills**—This new environment would increase the productivity of critical personnel through the establishment of centralized support groups for software, communications, technical training, and high-volume output control.

Initially, the software support staff would be responsible for working with new computer and communications utility management to develop a standardization schedule for the data centers, and for assisting the data centers in installing and replacing software packages. The software support staff would also be responsible for maintaining all systems software at the central data center and for assisting the other centers in solving systems software problems. Once the standardization process was underway, this group would also be responsible for issuing all software products to the data centers.

A complementary group, the centralized communications support staff, would be responsible for managing the creation of a telecommunications network that combines voice, data, and image transmission. It would assist in the selection of network concentration nodes, assist in the installation of communications equipment throughout the state, and maintain the entire integrated communications utility.

A centralized training staff would be responsible for recruiting and training computer operations personnel for all data centers and for developing ongoing computer-based instruction for the continuing education of data center personnel. Centralized training would both ensure the standardization of data center operational procedures and allow data centers to share resources when staffing level imbalances occur.

• **New and Improved Products**—The unified structure would also provide new and enhanced capabilities to all state agencies in such areas as office automation, electronic mail, and payroll and personnel services.

For example, all network users would have the ability to access a statewide payroll system in order to electronically submit update transactions. Personnel and other administrative functions that have been supported separately by various data centers could be consolidated to create integrated administrative information data bases. The centralization of these functions would make possible uniform administration and reduce the maintenance costs inherent in duplicative systems.

• **Improved Disaster Recovery**—The development of integrated computer utilities would significantly improve disaster recovery capabilities in most states. The compatible data centers would adopt identical operating systems, tape library and disk management systems, and operational support software packages. As a result, the data centers would be able to share resources to assist in recovering from a disaster in any individual data center.

An off-site tape library could be established at the central data processing facility to store backup for all critical production files.

• **Balancing Data Center Work Loads**—The creation of a central data center, and the standardization of other data centers, would provide states with new capabilities to shift work loads among centers. As new applications were developed, the central data center could be utilized to balance production loading in the computer network by assuming responsibility for the execution of these new applications. Existing production jobs could be transferred to the central data center to further assist in balancing work loads throughout the computer network.

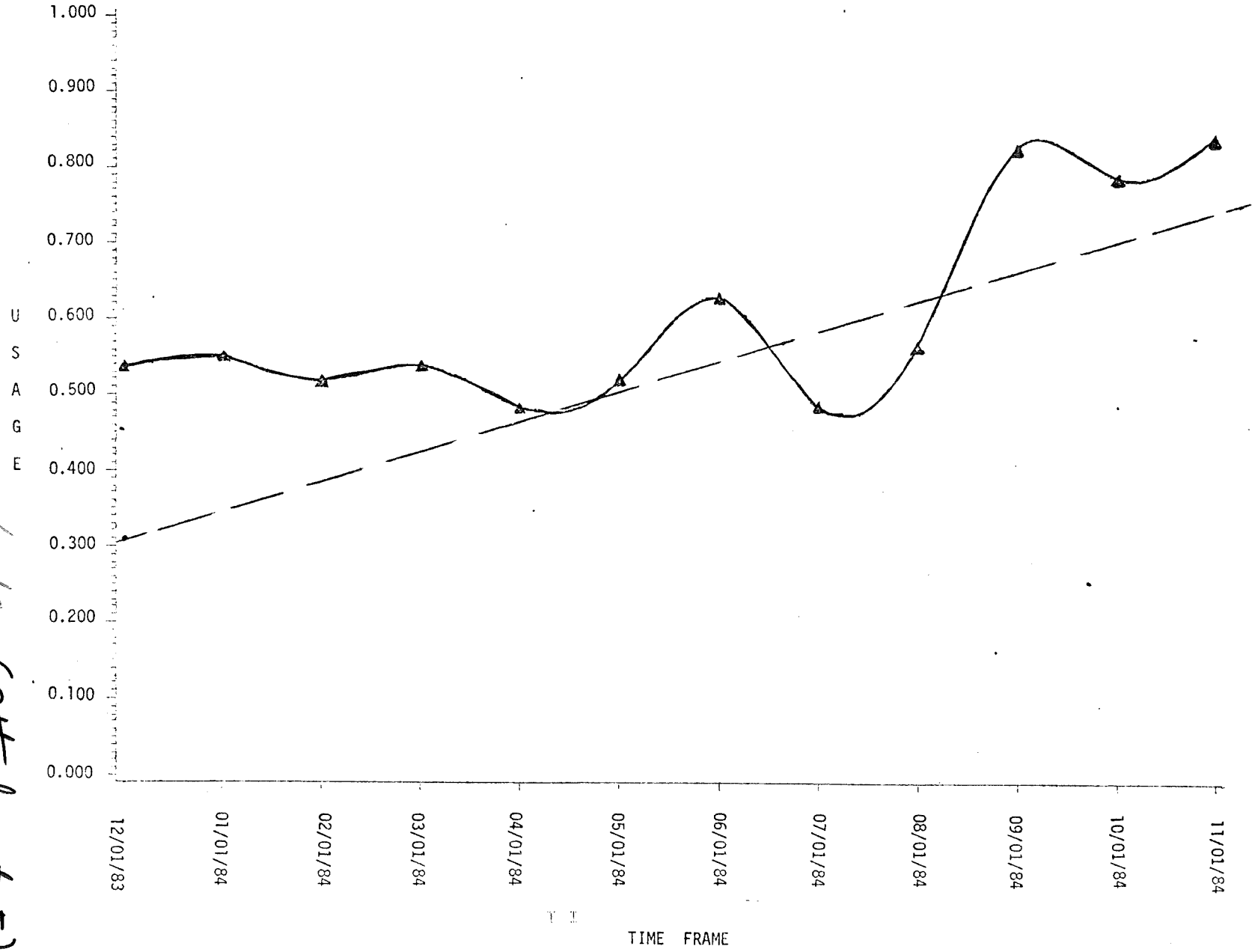
For state governments, like their federal counterpart, the cost savings and efficiencies inherent in systems integration are rewards well worth the effort and could well help relieve the pain now expected as a result of the anticipated Federal financial belt-tightening.

1/23/85 (attachment 4)

PERCENT OF CAPACITY

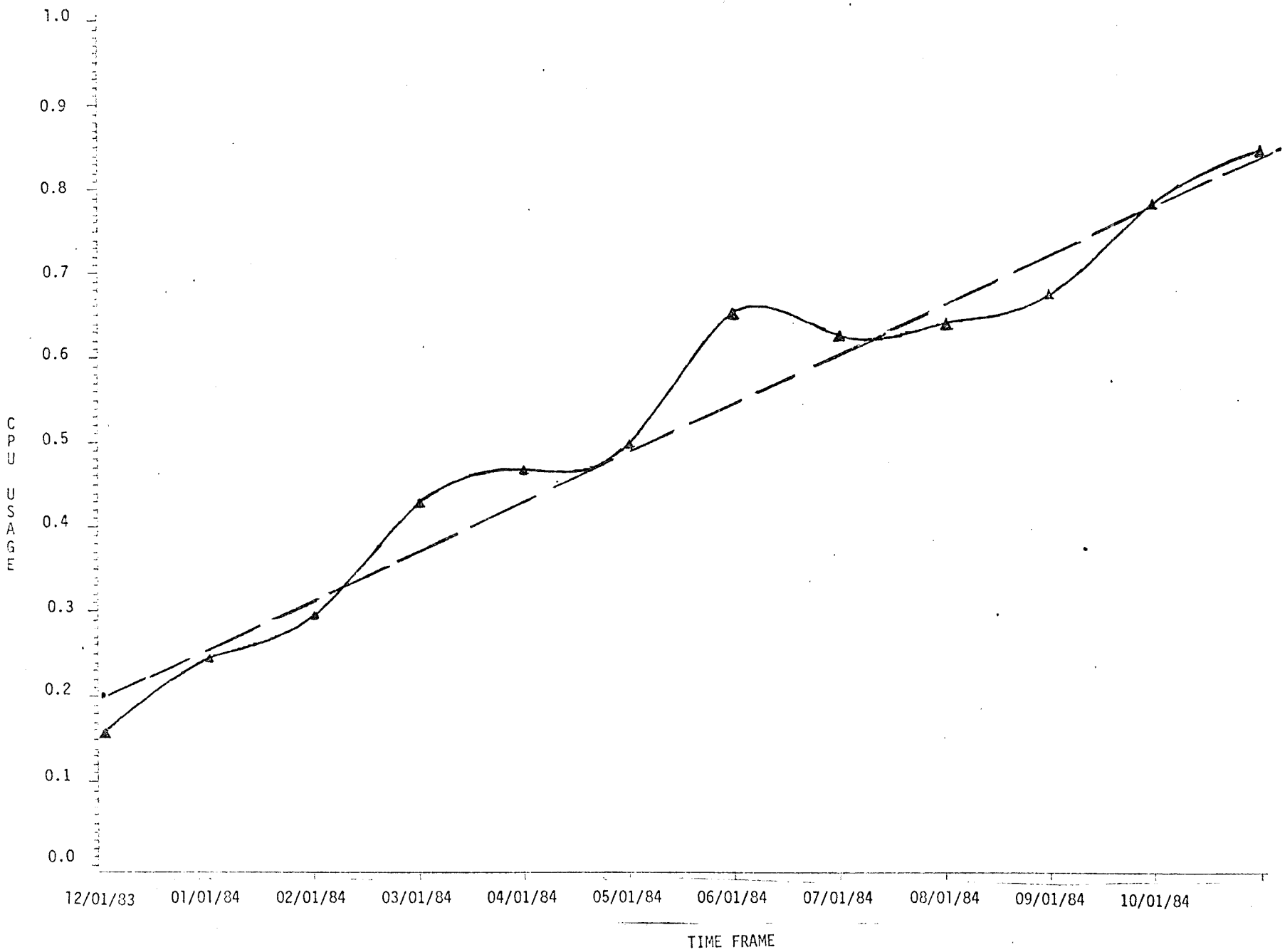
CPU USAGE

IBM 3033



11/3/85 (attachment 5)

PERCENT OF CPU
USED BY ALL APPLICATIONS
NAS/7000



UPGRADING THE SPERRY-UNIVAC COMPUTER SYSTEM

February 1984

I. INTRODUCTION

The largest application in the Sperry-Univac Computer Center is, and will be, the Kansas Integrated/Personnel Payroll System (KIPPS). This system includes four major components: (1) Applicant, (2) Position, (3) Employee, and (4) Payroll. The first three components are fully implemented statewide. The fourth is implemented for approximately one half of the State's employees. In other words, all State employees are managed with KIPPS, but only half of them are being paid by it. The remaining employees are paid through the old payroll system.

The major benefits of this application go beyond employing and paying people. KIPPS provides executives at all levels of State government the features needed to effectively access and analyze personnel/payroll management information. Even in its incomplete implementation status, several State managers, knowledgeable in the use of KIPPS, have taken advantage of these opportunities.

II. BACKGROUND

During the 1980 planning for the KIPPS development project, the State selected the Sperry-Univac software product, MAPPER. MAPPER is an easy to use data base management/programming language. This fourth generation systems development tool permits the fast implementation of systems by allowing user personnel to write many of the programs themselves. To operate this software, the State entered into a seven year lease agreement with Sperry-Univac in 1980 for a Model 1100/60 computer and associated peripheral equipment. As the planned development of KIPPS progressed, this hardware configuration was updated periodically to meet the expected workloads. At the present time, the configuration is composed of three central processing units, ten magnetic tape drives, approximately eight billion characters of disk storage and over 250 terminal devices.

III. PROBLEM

At this time, this equipment cannot provide adequate terminal response time because of the heavy workloads in KIPPS. The Sperry-Univac equipment is experiencing a severe capacity problem. The mainframe now indicates routine use levels around 94%, reaching as high as 99% during peak periods.

(Attachment 6)
1/23/85

During the spring and summer of 1983, State and Sperry technicians modeled the remaining expected KIPPS workloads. The resulting statistics indicated that the FY 1984 upgrade would handle the added workloads. Further supported by the data contained in the individual agency long range plans, and given the budget restraints imposed at that time, it appeared reasonable to believe that no mainframe upgrade would be needed until FY 1986. However, the consensus was that it would be "tight". A moratorium on the development of new Sperry applications was imposed until KIPPS was fully implemented in order to see if there would be any leftover resources. It is now evident that the forecasts were too low.

Considerable efforts have been made to make the application programs more efficient and have resulted in some performance improvements. However, not enough resources have been or can be recovered to fully implement the remaining 12 agencies in the KIPPS payroll component.

IV. FORECAST UPDATED

During early December 1983, Sperry technicians remodeled the KIPPS workloads based on the most recent KIPPS experiences. They also interviewed several major State users to determine their Univac needs and desires. Although Sperry's final conclusions are not published as of this writing, preliminary findings described indicate several factors/concerns:

1. Sperry recommends the use of a 70% system utilization threshold rather than the 80% factor used for State long-range planning. The 70% factor should improve response time, but will require more processing power than for the 80% threshold used for State planning.

2. It is expected that implementing the remaining 12 agencies will create a 37.5% increase to the current KIPPS workloads during peak periods.

3. It is expected that KIPPS use and data base size will grow around 12% every six months through FY 1986. This growth will result from four factors: (1) addition of new data elements required to comply with future administrative and statutory reporting/operating requirements; (2) increase in numbers of transactions recorded and reported; (3) additional agency and staff usage of MAPPER in lieu of manual methods to meet management data needs and reporting requirements; and (4) expansion of the reporting capability to support other auxiliary functions such as budget, grant and other cost funding systems.

4. Based on the preliminary findings described from the Sperry interviews, it is evident that the long-range planning and budgeting review processes tend to discourage the generation of data processing wish lists. Sperry disclosed that several users wanted to develop many other MAPPER systems--not KIPPS related. These unplanned systems would more than triple the current need for computer resources just to operate them.

Nevertheless, it now appears that about an 80 - 100% system upgrade is needed to implement the remaining agencies into KIPPS and to provide all agencies reasonable response times during peak workload periods.

V. OPTIONS

In order to meet these anticipated KIPPS workloads, five Sperry equipment options have been identified. Each option views the estimated life-cycle costs during FY 1984 through FY 1991. All cost data are incremental costs (in addition to existing Sperry contracts) and are expressed as constant 1984 dollars.

Option 1: No Upgrade In The State Office Building

Description: Do not add a processor beyond that already present. The purpose of this option is to have KIPPS and its users run in the current environment, freezing the KIPPS project where it is, continuing the moratorium on development of new Sperry systems, and limiting or restricting use of existing systems. The next Sperry system upgrade (1100/90) would be done in the Santa Fe Building.

Benefit: The major benefit is that it is the cheapest immediate direct cash outlay alternative.

Costs (ESTIMATED): The initial costs are primarily indirect: (1) the continued use of two payroll systems, (2) the delay of KIPPS management benefits until a later date and (3) the worsening of performance problems. These costs are significant and will be avoided if other options are selected. It will not provide reserve computer resources to handle mechanical failures or when other situations disrupt the normal processing schedules. The result may include delayed issuance of paychecks, overtime expenses for agency personnel, etc. The upgrade costs in the Santa Fe Building will be around $19,859,760 for a capital lease or around $13,041,414 for purchased equipment (includes computer equipment, ancillary equipment, people, and consultant costs). However, combined with the indirect costs to the State caused by the two year delay, the total costs for this option will far exceed these amounts. (See appendices 1 and 2.)

Comment: This action would forestall effective use of CASK and other existing systems to meet current and future data reporting requirements. It would also promote pressures to seek other data processing options, thus establishing the climate: (1) for performing data manipulation manually, or (2) doing without, or (3) for the acquisition and proliferation of data processing equipment and facilities in the agencies.

Option 2: 1100/64 Upgrade In The State Office Building

Description: Add one processor to the existing Univac computer complex along with some peripheral equipment. The purpose here is to continue to implement as many other agencies as possible with a minimal upgrade. The major Sperry system upgrade (1100/90) will be done in the Santa Fe Building.

Benefit: This option is the second smallest immediate direct cash outlay.

Costs (ESTIMATED): Adding the fourth processor (1100/63 to 1100/64) in the State Office Building and the future upgrade in the Santa Fe Building will cost around $24,603,908 for a capital lease or around $16,571,146 for a purchase (includes computer equipment, ancillary equipment, people, and consultant costs). (See appendices 1 and 2.)

Comment: It is doubtful that this option will provide enough computer resources in the State Office Building to fully implement KIPPS and provide adequate levels of service to terminal users. It again will not provide reserve computer resources in the State Office Building to handle mechanical failures or when other situations disrupt the normal processing schedules. The result may include delayed issuance of paychecks, overtime expenses for agency personnel, etc.

Option 3: Added Computer Complex In The State Office Building

Description: Add a comparable computer system side-by-side to the existing system thereby doubling the processing power. The purpose here is to provide the computer resources needed to fully implement the remaining agencies into KIPPS only and address the KIPPS usage growth anticipated. The next Sperry system upgrade (1100/90) would be done in the Santa Fe Building.

Benefit: This option offers an equipment proposal to fully implement the remaining agencies into KIPPS during FY 1984-1985.

Costs (ESTIMATED): The total estimated costs for this option is around $27,862,153 for a capital lease or around $19,305,763 for a purchase (includes computer equipment, ancillary equipment, people, and consultant costs). (See appendices 1 and 2.)

Comment: This option has the reasonable potential to fully implement the remaining agencies into KIPPS during FY 1984-1985.

Option 4: 1100/90 Upgrade Now

Description: Add a large scale 1100/90 computer complex to the existing 1100/60 computer complex. The purpose is to meet now the KIPPS processing requirements anticipated over the next 5 - 7 years.

Benefit: This option would provide a 4 - 5 time increase in computing resources.

Costs (ESTIMATED): The total estimated costs for this option is around $22,176,701 for a capital lease or around $15,358,355 for a purchase (includes computer equipment, ancillary equipment, people, and consultant costs). (See appendices 1 and 2.)

Comment: This is really Option 1 until the new equipment is delivered, and then the processing power is available for only one year until the move to the Santa Fe Building. It complicates the relocation move.

Option 5: Future 1100/90 Upgrade

Description: Commit to Sperry to acquire a large scale 1100/90 computer complex for the move to Santa Fe Building. The purpose here is to have Sperry provide whatever interim equipment is needed in the State Office Building to fully support KIPPS at discounted prices.

Benefit: This option offers the same benefit as Option 3 with the interim upgrade equipment costs for the next few years being discounted by Sperry until the move to the Santa Fe Building. It does resolve the relocation move strategy and risks.

Costs (PROVIDED BY SPERRY): The total costs provided by Sperry and Architectural Engineers is $20,762,252 for a capital lease and $14,828,447 for purchase (includes computer equipment, ancillary equipment, people, and consultant costs). (See appendices 1 and 2.)

Comment: This comprehensive alternative provides a long range solution.

VI. SUMMARY

In effect, we can upgrade or not. If we choose not to upgrade (Option 1), the expected annual KIPPS growth will only increase the capacity problems. Some agencies may have to revert to the old payroll system and be taken out of KIPPS completely. The resulting manual workloads will create several problems in both A&R and DPS. Operating two payroll systems for that long will also create unplanned maintenance workloads in DISC.

If we choose to upgrade, the choices are varied. One option (Option 2) upgrades the equipment without much hope for complete success in the State Office Building. The processing power guarantees offered by getting the large upgrade option now (Option 4) can possibly create similar problems as for not upgrading because of the late equipment delivery, and can create relocation problems resulting in processing delays in the future. An interim upgrade that defers the acquisition of a large computer system until DISC relocates to the Santa Fe Building presents attractive options. One of the two (Option 5) includes "Sperry guaranteed" sufficient processing power now, but with longer commitments; the other (Option 3) provides the equipment deemed needed now to fully implement the remaining agencies into KIPPS without committing to future Sperry equipment upgrades, but with greater overall costs.

dj29/DJ3

APPENDIX 1 - LEASE*

LEASE

	FY84	FY85	FY86	FY87	FY88	FY89	FY90	FY91	TOTAL	
OPTION 1										
equipment	0	0	0	3851952	3851952	3851952	3851952	3851952	19259760	No upgrade in the
people	0	0	0	100000	100000	100000	100000	100000	500000	State Office
consultant	0	0	0	100000	0	0	0	0	100000	Building
SUBTOTAL	0	0	0	4051952	3951952	3951952	3951952	3951952	19859760	≈ 20 million
OPTION 2										
equipment	0	614532	614532	4466484	4466484	4466484	4466484	4466484	23561484	1100/64 upgrade in
AC/Struct	0	60000	0	0	0	0	0	0	60000	the State Office
people	0	54632	54632	154632	154632	154632	154632	154632	882424	Building
consultant	0	0	0	100000	0	0	0	0	100000	
SUBTOTAL	0	729164	669164	4721116	4621116	4621116	4621116	4621116	24603908	≈ 25 million
OPTION 3										
equipment	0	929196	929196	4781148	4781148	4781148	4781148	4781148	25764132	Added Computer
people	0	264003	264003	264003	264003	264003	264003	264003	1848021	Complex in the
consultant	0	100000	0	0	0	0	0	0	100000	State Office Buildir
AC/Struct	0	150000	0	0	0	0	0	0	150000	
SUBTOTAL	0	1443199	1193199	5045151	5045151	5045151	5045151	5045151	27862153	≈ 28 million
OPTION 4										
equipment	0	3851952	3851952	3851952	3851952	3851952	419460	419460	20098680	1100/90 update
AC/Struct	0	230000	0	0	0	0	0	0	230000	now
people	0	264003	264003	264003	264003	264003	264003	264003	1848021	
SUBTOTAL	0	4345955	4115955	4115955	4115955	4115955	683463	683463	22176701	≈ 22 million
OPTION 5										
equipment	61623	972750	2536868	3531180	3531180	3531180	2952870	1466580	18584231	Future 1100/90
consultant	0	100000	0	0	0	0	0	0	100000	upgrade
people	0	264003	264003	264003	264003	264003	264003	264003	1848021	
AC/Struct	0	230000	0	0	0	0	0	0	230000	
SUBTOTAL	61623	1566753	2800871	3795183	3795183	3795183	3216873	1730583	20762252	≈ 21 million
BASE										
SPERRY CENTER	3299383	3616638	3616602	3616602	3234492	2938098	2292510	2077314	24691639	

*NOTES:

1. All costs are expressed as 1984 constant dollars.

2. The costs for each option are incremental costs to the base Sperry Center.

APPENDIX 2 - PURCHASE*

PURCHASE

	FY84	FY85	FY86	FY87	FY88	FY89	FY90	FY91	TOTAL	
OPTION 1										
equipment	0	0	0	10763574	419460	419460	419460	419460	12441414	No upgrade in the State Office Building
people	0	0	0	100000	100000	100000	100000	100000	500000	
consultant	0	0	0	100000	0	0	0	0	100000	
SUBTOTAL	0	0	0	10963574	519460	519460	519460	519460	13041414	# 13 million
OPTION 2										
equipment	0	2522900	94068	10857642	513528	513528	513528	513528	15528722	1100/64 upgrade in the State Office Building
AC/Struct	0	60000	0	0	0	0	0	0	60000	
people	0	54632	54632	154632	154632	154632	154632	154632	882424	
consultant	0	0	0	100000	0	0	0	0	100000	
SUBTOTAL	0	2637532	148700	11112274	668160	668160	668160	668160	16571146	$ 17 million
OPTION 3										
equipment	0	3660408	184320	10947894	603780	603780	603780	603780	17207742	Added Computer Complex in the State Office Building
people	0	264003	264003	264003	264003	264003	264003	264003	1848021	
consultant	0	100000	0	0	0	0	0	0	100000	
AC/Struct	0	150000	0	0	0	0	0	0	150000	
SUBTOTAL	0	4174411	448323	11211897	867783	867783	867783	867783	19305763	# 19 million
OPTION 4										
equipment	0	10763574	419460	419460	419460	419460	419460	419460	13280334	1100/90 update now
people	0	264003	264003	264003	264003	264003	264003	264003	1848021	
AC/Struct	0	230000	0	0	0	0	0	0	230000	
SUBTOTAL	0	11257577	683463	683463	683463	683463	683463	683463	15358355	* 15 million
OPTION 5										
equipment	61623	3907151	4537560	3654876	489216	0	0	0	12650426	Future 1100/90 upgrade
consultant	0	100000	0	0	0	0	0	0	100000	
people	0	264003	264003	264003	264003	264003	264003	264003	1848021	
AC/Struct	0	230000	0	0	0	0	0	0	230000	
SUBTOTAL	61623	4501154	4801563	3918879	753219	264003	264003	264003	14828447	* 15 million
BASE										
SPERRY CENTER	3299383	3616638	3616602	3616602	3234492	2938098	2292510	2077314	24691639	

* NOTES:

1. All costs are expressed as 1984 constant dollars.

2. The costs for each option are incremental costs to the base Sperry Center.

Watchdog agency draws criticism for costly, incomplete computer

The New York Times

WASHINGTON — The General Accounting Office, the congressional agency that investigates waste in the executive branch, has itself been accused of spending almost $13 million in developing a computer system that never was completed.

The criticism came in a report by the Senate Governmental Affairs Committee. Sen. William V. Roth Jr., a Delaware Republican who is the committee chairman, said the General Accounting Office's problem was "particularly disturbing" because the agency was "in the business of auditing and evaluating the procurement activities of government departments and agencies around the world and providing expert advice to the Congress on procurement policies."

Mr. Roth said his committee's investigation indicated that management errors by the agency were the major reason for the failure of what was to be the Consolidated Administrative Management Information System.

But Charles A. Bowsher, head of the General Accounting Office, said in a letter to Mr. Roth that he believed the blame should be attributed to poor management of technical issues by Boeing Computer Services, contractor for the project. Boeing Computer is a division of the giant Seattle-based aerospace company.

A spokesman for Boeing, John W. Alter, explained that because of a company policy to close from Christmas to New Year's, it could not comment.

The General Accounting Office was established by Congress in 1921 to give it a way to investigate spending by the executive branch. It has about 5,000 employees and an annual budget of $294 million, and it submits hundreds of reports to Congress each year on the various weaknesses of the federal government.

The Senate committee said that while the General Accounting Office was having trouble with the new computer system, it also was investigating efforts by the Social Security Administration to buy a $115 million computer network linking 1,350 of its offices. On July 9 the General Accounting Office issued a report that criticized the Social Security Administration's procedures on the project.

The Senate committee's report said work on the General Accounting Office's new computer system began in November 1980. The goal was to build a system that would take over all the agency's administrative procedures, provide accurate and timely information to its investigators and minimize unnecessary duplication.

The project was to replace 18 different systems now used to help manage in such areas as personnel and payroll. Seven companies submitted bids, and Boeing's bid of $13.9 million was selected as the best on June 25, 1981.

"As early as August of 1981," said the Senate report, issued Wednesday, "there were indications that Boeing's original cost estimates for completion of the project were unrealistic."

(attachment 7)
1/23/85

K I P P S S T A T U S R E P O R T

JANUARY 16, 1985

SECTION 1 - ACTIVITIES IN PROCESS OR PENDING

(AN ACTIVITY THAT HAS BEEN CHANGED SINCE THE LAST REPORT IS INDICATED WITH AN *)

REF	P	DESCRIPTION		ORIG MNDY	CURR MNDY	AS	ST
E064	1	SALARY OVERPAYMENT ENHANCEMENTS		5.0	5.0	TH	
M072	1	REVISE W-2 FILE (YEAR-END PROCESSING)		30.0	2.0	TG	IP
E126	1	W-2 FILE SALARY OVERPAYMENTS UPDATE PRIOR YEAR	(1005)	3.0	3.0	MG	
E146	1	UPDATE KIPPS W-2 FROM OLD PAYROLL SYSTEM PAYTAPES	(1077)	18.0	18.0	LH	
E152	1	CHECK FOR PLACE TO FIND CURRENT YTD TOTALS	(1096)	3.0	3.0	DA	
E154	1	MOVE SALARY OVERPAYMENTS PER-REIM W-2 FILES	(1099)	3.0	3.0	MG	
E155	1	FIND W-2 FILES IN SUS-RES FROM SALARY OVERPAYMENT	(1100)	3.0	3.0	MG	
E156	1	FIND W-2 FILES IN PAY CALC CLEANUP FROM SAL-OPAYS	(1101)	3.0	3.0	MG	
M276	1	ALLOW PAYROLL TO ADD GHI CODES	(1113)	6.0	6.0	MG	
M278	1	PRINT FEDERAL EMPLOYEE W-2 FORMS	(1115)	6.0	6.0	TG	
E043	3	ADD W-2C FLAG TO W-2 FILE (799)		1.0	1.0	MB	
E077	3	ADD DUMMY SAL EXP LINE FOR WCI ADJ IN BATCH PAYCALC	(883)	2.0	2.0	RA	
E107	3	ADD BENEFITS CROSS TO KPERS EXTRACT	(925)	5.0	5.0	JA	IP
E108	3	ADD BENEFITS CROSS TO TIAA EXTRACT	(926)	5.0	5.0	JA	IP
M025	3	PAY CALC CLEANUP - PROBLEM WITH MULTIPLE REFUNDS		3.0	3.0	DG	
M044	3	INCORRECT COMP TIME BALANCE SHOWN ON LEAVE INQUIRY		1.0	1.0	DG	
M075	3	DIFFERENCE OF OPINION ON SPLITTING LEGISLATIVE PAY	(838)	1.0	1.0	LH	
M198	3	REPRODUCE KIPPS PAYROLL MICROFICHE	(1028)	4.0	4.0	RA	
M204	3	MODIFY PAY CALC CLEANUP W-2 UPDATE FOR REFUNDS	(1032)	4.0	4.0	DG	
M207	3	PAY CALC CLEANUP MISSED SOME REFUNDS	(1036)	1.0	1.0	DG	
E134	3	MODIFY PAY CALC CLEANUP FOR REFUNDS CASK TRANS	(1039)	4.0	4.0	DG	
M234	3	SUPPLEMENTAL NOT CALCULATED CORRECT	(1071)	3.0	3.0	DA	
M266	3	SUPPLEMENTAL WITH EMPLOYEE ON MULTIPLE POSITIONS	(1095)	6.0	6.0	DA	
M269	3	CHANGE REFUND BACK DEDUCTION RUN	(1105)	8.0	8.0	JA	
M272	3	GHI REPORT FOR KU-MED THREE PAY MONTH	(1108)	6.0	6.0	BB	
M280	3	POSITION WITH NEW FUNDING CHARGED TO OLD FUND	(1116)	5.0	5.0	BB	

L E G E N D

REF -
- U=UNSUPPORTED BY ENHANCEMENT REQUEST OR MAINTENANCE REQUEST
- E=ENHANCEMENT REQUEST REFERENCE NUMBER
- M=MAINTENANCE REQUEST REFERENCE NUMBER

P - PRIORITY, AS ASSIGNED BY DISC. IN MOST CASES, THIS IS THE SAME PRIORITY REQUESTED BY THE USER.
- 1=U=URGENT (IMMEDIATELY)
- 2=H=HIGH (BY NEXT PROCESSING RUN)
- 3=M=MEDIUM (AS TIME PERMITS)

ORIG MNDY=NUMBER OF WORK DAYS ORIGINALLY ESTIMATED TO COMPLETE ACTIVITY

CURR MNDY=NUMBER OF WORK DAYS CURRENTLY ESTIMATED REMAINING TO COMPLETE ACTIVITY

AS - PERSON RESPONSIBLE FOR THE ACTIVITY. NOT NECESSARILY THE PERSON WORKING ON THE ACTIVITY.

RA	BOB ANDERSON	DG	DIEGO GARCIA	TH	TERRI HIPSHER
JA	JIM ASHLOCK	TG	TIM GRIFFIN	DR	DARREL RANGEL
BB	BETTE BRINGLE	MG	MARGARET GUNSELMAN	WS	BILL SOUTHARD

(attachment 8)
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MB	MIKE BURRIS	JH	JOYCE HANSCHU	MT	MARK TORREZ
DC	DON CLINGENPEEL	IH	IVAN HATCH	DW	DON WILLIAMS
RD	RAY DASHNAW	LH	LARRY HAYES	TK	TAMMY KERWIN
DA	DON ANDERSON	MM	MARK MAENDELE	JG	JOHN GONZALEZ
KC	KATHY CUMMINGS				

ST - STATUS OF THE ACTIVITY

IP=IN PROCESS (ACTIVE) BLANK=NOT YET BEGUN OH=ON HOLD

..... SECTION 2 - ITEMS BEING REVIEWED FOR APPROVAL .....

REF-	ITEM	SENT -TO-	DATE -SENT-	---COMMENTS---
XXXX	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	XXX	XXXXXX	XXXXXXXXXXXX
E079	SUM UP LEG LEADER AND LEG ALLOW IN EXTRACTS	DAR	841009	(608)RESUB DI
E017	CHANGE PRRPR32	DAR	841217	(488)RESUB DA
U010	DEVELOP SUMMER LEAVE WITH BENEFITS PROCESS	DAR	840615	
U039	FILE MAINT RUN - REFUNDS (10C)	DAR	840625	
E090	WRITE NEW UCI STAT REPORT BY AGY FOR DHR	DAR	841205	(637)RESUB DIS
U003	REWRITE FUNDING VERIFICATION	DAR	840709	
E057	MODIFY REPORTS THAT ACCESS SAL EXP	DAR	840824	(567)RESUB DAR
M023	WCI ADJUSTMENT SHOWING AS PAY INSTEAD OF DEDUC	DAR	840823	(752)RESUB DAR
E055	INCLUDE K DOCUMENTS IN PRT143 REPORT	DAR	841214	(565)RESUB DAR
U034	FILE MAINT RUN - SALARY EXPENDITURES	DAR	841126	RESUB DIS
M039	ERRONEOUS ASTERISK LINES WRITTEN TO SAL EXP	DAR	840824	(785)RESUB DIS
E130	ADD SALARY EXPENDITURE INQUIRY	DAR	840830	(718)
E066	EXPLAIN WHERE TO GET INFO FROM NEW SAL OVERPAY	DAR	841107	(878)RESUB DAR
E068	BATCH PAYCALC ADDS REFUND AMT INTO YTD GROSS	DAR	841009	(860)RESUB DIS
M109	CLEANUP TRANS NOT WRITTEN CASK RID - ARREARAGE	DAR	841001	(898)
E118	ADD ERROR LISTING TO GHI REPORT DIFFERING DED	DAR	841016	(967)
M149	SALARY ADV NOT WRITING CORRECT WARR ISSUE DATE	DAR	841018	(968)
U044	FILE MAINT RUN - W-2 FILE	DAR	841026	
E090	ADD EDITS FOR CLEARING FUNDS TO PAY CALC CLNUP	DAR	841029	(902)
M099	RUN 20-290 TO 100-1090 MISMATC AGY 33100,67000	DAR	841101	(874)RESUB DIS
E114	CHANGE PAY CALC CLEANUP TO WRITE AGY USE FIELD	DAR	841102	(939)RESUB DIS
E117	ADD Y-T-DTE UPDATE ROUTINE TO PAY CALC CLEANUP	DAR	841102	(963)
E076	ADD "F" LINE TO SALARY OVERPAY RID, DATA BASE	DAR	841105	(869)
M095	BATCH PAYCALC SUSPENDED PERSON TC POCK FILE	DAR	841106	(863)
M173	SALARY OVERPAYMENT INFORMATION IN WRONG FIELDS	DAR	841126	(1000)
E070	DO NOT UPDATE YTD EARNINGS ON PRIOR YEAR OVERPA	DAR	841126	(872)
M097	UPDATE W-2 FILE FROM SAL OVERPAY-PERS REIMB	DAR	841126	(870)
M161	SALARY OVERPAYMENT PERSONAL REIM FROM X EMPLOY	DAR	841126	(984)
M157	OVERPAYMENTS - MULTIPLE AGENCY PROBLEM	DAR	841126	
E061	MODIFY SAL OVERPAY TO RECORD YTD DIFFERENTLY	DAR	841126	(878)
M117	REF PRIOR IMPL EXPEND NOT MATCHING RECEIPTS	DAR	841130	(912)
E129	COMBINE ALL DOCS 500-505D SALARY EXPENDITURES	DAR	841207	
M206	PAY CALC CLEANUP - OVERPAY USED WRONG W-2 CODE	DAR	841207	(1035)
M226	REFUNDS PRIOR - CHANGE GHI EDITS	DAR	841211	(1059)
E128	W-2 FILE ARREARS PAY CALC CLEANUP UPDATE PRIOR	DAR	841212	(1037)
M235	REFUND CLEANUP RUN DEDUCTION CODES 01 OR 02	DAR	841212	(1074)
M236	ARREARAGES CLEANUP RUN YTD RECORDS INCORRECT	DAR	841212	(1075)
E145	ADD NEW EDIT FOR VERIFICATION GASDHI PAYOUT	DAR	841219	(1067)
M231	SALARY OVERPAYMENT NOT COMPARE ON POSITION NO.	DAR	841226	(1064)
M184	SALARY OVERPAYMENT PERS REIM PAY FREQ	DAR	841126	(1015)
M264	SALARY EXPENDITURE ROUNDING PROBLEM	DAR	841226	(1091)
M265	YELLOW SHEET EXTRACT 18TH TO END OF MONTH	DAR	841226	(1092)
M131	SALARY OVERPAYMENT - WRITING WRONG AGY TO SAL	DAR	841126	
E157	NO REFUND FOR EMPLOYEES IN AGENCIES NOT ON KIPP	DAR	841227	(1102)
M270	REFUND ADJUSTMENT RUN MESSAGE ERROR	DAR	841227	(1106)
M267	ALLOW NEW AND UPDATE W-2 FILE AT SAME TIME	DAR	841228	(1101)
M271	ERROR MESSAGES IN ERROR ARREARAGE CLEANUP RUN	DAR	850102	(1073)
M260	ALL CANCELLED WARTS NOT ON GROUP TERM LIFE RPT	DPS	850102	(1097)
M268	MULTIPLE OVERPAYMENTS ON SALARY PAYMENT CLEAN	DAR	850109	(1104)

E153	UPDATE W-2 FILES FROM REFUND ADJUSTMENTS	DAR	850111	(1098)	*
M263	MAINLINE PAYROLL BATCH TOO LARGE	DAR	850111	(1090)	*
M063	CHECK TRANSACTIONS OUTPUTTED BY REFUND PR IMPL	DAR	850114	(822)	*
M284	REFUND RUNS ENCUMBER 143 EXPENDITURES	DAR	850114	(1121)	*
M281	SUSPENSE RESOLVE NET PAY ADJUST ERROR	DAR	850114	(1117)	*
E163	CREATE THREE NEW REPORTS FOR LEGISLATURE	DAR	850116	(1122)	*
E129	W-2 FILE ARREARAGES PER REIM UPDATE CASH COLL	DAR	850116	(1008)	*
M249	REPORT ANNUAL LEGISLATIVE ALLOWANCE TOTALS	DAR	850116	(1087)	*
E164	MODIFY GHI TABLES TO ALLOW FOR NEW CARRIER	DAR	850116	(1125)	*
M259	CHECK ALIGNMENT OF W-2'S FOR 1984	DAR	850117	(1107)	*
E112	KPER DEDUCTION WORDING ON W-2 FOR 1984	DAR	850117	(948)	*
E131	W-2 FILE CASH COLLECTION UPDATE CASH COLL FIELD	DAR	850116	(1010)	*

..............SECTION 3 - ITEMS APPROVED THIS PERIOD.....

M187	NEW OASDHI RATES	DAR	850110	(1018)	*
M283	ADJUSTMENT RESOLVE LABEL MISSING	DAR	850109	(1120)	*
M282	DATES MISSING RETIREMENT CODE UPDATE RUN	DAR	850110	(1118)	*
M112	SALARY OVERPAYMENT - PERSONAL REIMBURSEMENT	DAR	850116	(545)	*
E051	'A' LINE MISSING IN 10C FOR REFUNDS PRIOR IMPL	DAR	850116	(819)	*
E016	REFUNDS - WRITE CURRNT DATE TO 'A' LINE (111-6)	DAR	850116	(755)	*
E115	REFUNDS - CHG DATA BASE FORMAT TO OLD VERSION	DAR	850116	(686)	*
E027	ADDITIONS TO DATA BASE FOR RECONCILIATION	DAR	850116	(521)	*
M168	REFUNDS PRIOR TO IMPLEMENTATION- UPDATE OF YTD	DAR	850116	(655)	*
E045	SALARY OVERPAY - CASK TRANSACTION CHANGES	DAR	850116	(555)	*
M137	SAL OVERPAY-PERS REIMB WRITING TAB LINE	DAR	850116	(603)	*
M138	SAL OVERPAY-PERS REIMB DUPLICATED SAL EXPS	DAR	850116	(604)	*
M175	W-2 UPDATE PROBLEM FROM SALARY OVERPAYMENT	DAR	850116	(660)	*
M184	SALARY OVERPAYMENT PERS REIM UPDATE YTD GROSS	DAR	850116	(673)	*
E042	WRONG OBJECT CODE EMPLR OASDHI - PAY CLEANUP	DAR	850116	(806)	*
M094	SALARY OVERPAYMENT WRITING FY84 TO CASK WORK	DAR	850116	(861)	*
E072	ADD NEW FIELDS TO SUSPENSE FROM SAL OVERPAY	DAR	850116	(866)	*
E073	ADD NEW FIELDS TO SAL OVERPAY SUSPENSE RESOLVE	DAR	850116	(867)	*
M111	PAY CALC CLEANUP DUPLICATED REC IN CASK WK RID	DAR	850116	(900)	*
E091	ADD NEW SAL EXP DEDUCTION CODES TO M25C, 225B	DAR	850116	(903)	*
M133	PAY CLEANUP NOT WRITING AMT COLLECTED TO CASK	DAR	850116	(941)	*
M134	SAL OVERPAY NOT CONSIDERING CANCELLED WARRANTS	DAR	850116	(942)	*
M156	SALARY OVERPAYMENT PAY DETAIL NOT AGREE EXPENDS	DAR	850116	(978)	*
M165	SALARY OVERPAYMENT ADJUSTMENT RESOLVE COMBINE	DAR	850116	(987)	*
E127	W-2 FILE SALARY OVERPAY PER REIM UPDATE CASH	DAR	850116	(1006)	*
E127	MODIFY UPDATING 500-505D SALARY EXPENDITURES	DAR	850116	(714)	*
M209	PROBLEM UPDATING 500-505D SALARY EXPENDITURES	DAR	850116	(717)	*
M211	REFUND PRIOR IMPL NOT WRITING K DOCUMENT NO	DAR	850116	(1042)	*
M053	REFUND RECEIPT TRANS PER FISCAL YEAR	DAR	850116	(878)	*
E098	REFUNDS - HANDLE MULTIPLE PAY PERIODS	DAR	850116	(667)	*
E096	SALARY OVERPAY-PER REIM-WRITE TO ALL LINES	DAR	850116	(886)	*
E092	REFUNDS AND REFUNDS PRIOR TO IMPL - KPERS MODS	DAR	850116	(635)	*
M087	REFUND ADD REFUND AMT TO YTD REF FOR SPEC WAR	DAR	850116	(856)	*
E115	CHG SAL OVERPAY TO SUM NET OVERPAYS IN 8C,M25D	DAR	850116	(943)	*
M210	'9' NOT IN SAL EXP COLS 131-1 FOR WAGE ASSN	DAR	850116	(1040)	*
M017	TABLE MAINTENANCE - DISTRIBUTION CODES - DEL	DPS	850116		*
M205	ACCRUAL PROBLEM - UNCLASSIFIED TEMPORARY EMPL	DPS	850116		*
E081	ADDITION OF ELEMENT TO DATA BASE - SUPVISORY T	DPS	850116		*
E058	ADD DELETE FEATURE TO SECURE	DPS	850116		*
M150	ACCRUAL FOR 61000 TEACHERS WRONG FOR 9/17/84	DPS	850116		*
M123	TIME REPG PICKED UP WRONG RATE FOR MULT RATES	DPS	850116		*
M182	AGENCY 38500 GIVEN SORT OPTION FOR POSITION IV	DPS	850116		*

E132	PROVIDE UPDATE TO SALARIES OF CERTAIN TITLE CD	DPS	850116	
M218	SHIFT OVER PRINTING ON APPLICATION MAILERS	DPS	850116	
M219	MODIFY APPLICANT SCORING FOR VETERANS PREFER	DPS	850116	
M220	ADDRESS PROBLEM IN APPLICANT LETTERS	DPS	850116	
M221	APPLICANT SCORE EXCEEDING 100.00	DPS	850116	
M243	JUDICIAL RATE WRONG AFTER PERCENT CHANGE	DPS	850116	
M244	CHANGE SCORE RUN DOES NOT UPDATE MAILER	DPS	850116	
E148	ST PRINTER SPECIAL TITLE CODE SALARY INCREASE	DPS	850116	
M241	CORRECT PAY RATE ON CERTIFIED LISTS	DPS	850116	
M254	SALARY CHANGE WITH NEW GEOGRAPHIC LOCATION	DPS	850116	
M253	TAKE TERMINATED EMPLOYEES OFF TRANSFER LISTS	DPS	850116	
M214	MODIFY APPLICANT LETTERS FOR NEW DPS PROCEDURES	DPS	850116	
M261	INQUIRY GROSS PAY NOT STATED CORRECTLY	DPS	850116	
M255	EMPLOYEE AGENCY 36300 NOT ACCRUING	DPS	850116	
M252	TERMINATING EMPLOYEES STANBY PAY SHOULD BE 1.00	DPS	850116	
M242	DUPLICATE NAME ON CERTIFIED LISTS	DPS	850116	
M192	ACCRUAL FOR MISC EMPLOYEE IN AGENCY 62800	DPS	850116	
M274	AGENCY CONDITIONAL EMPLOYEE LIST	DPS	850116	
M279	UNCLASSIFIED SALARY APPROVAL FOR NEW YEAR	DPS	850116	
E149	MOVE WORKERS COMP UPDATE TO AGENCY MENU	DPS	850116	
E025	WARRANT CROSSFOOT RUN	DAR	850116	
E008	FILE MAINT RUN - ARREARAGES (8C)	DAR	840911	
E019	CHANGE "B" RECORDS ON KPER BUYBACK END DATE	DAR	840822	
E056	CHANGE SUBTOTALS IN PR40 TO MATCH PR32	DAR	840911	(828)
E060	D OF A CLEARING SHOWING AS PART OF FUNDING	DAR	840910	(848)
E075	MODIFY ALL RPRTS - ADDITION OF F LINE, M250,8C	DAR	840924	(868)
E086	MODIFICATIONS TO W-2 FILE FOR KPERS	DAR	841121	
E113	CHG REF, REF PRIOR IMPL WRITE NET TO "P" DOC	DAR	841010	(938)
E116	ADD $2.00 FEE TO 543 TOTAL IN KIPP01	DAR	841010	(944)
E248	CHANGE LEGISLATIVE EMPLOYEES TO REQUIRE TIME	DAR	841219	(1085)
M114	ADJMR02 WRITING WRONG DISTRIBUTION CODE	DAR	850116	(909)

..... END REPORT .....

IBM COMPATIBLE VENDORS*

Central Processing Units
- IBM
- National Advanced Systems
- Amdahl
- Third party marketplace

Tape Drives
- Telex
- IBM
- Storage Technology Corporation
- Third party marketplace

Disk Storage
- IBM
- Storage Technology Corporation
- National Advanced Systems
- Memorex
- Third party marketplace

Terminal Equipment
- IBM
- Telex
- Harris
- Courier
- Lee Data
- Beehive
- Third party marketplace

Distributed Systems that function through IBM compatible communications controllers
- IBM
- Harris
- Data General
- Wang
- Burroughs
- NCR
- Third party marketplace

*This listing should not be regarded as complete. Other vendors may also manufacture compatible equipment in some or all of these areas.

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STATE OF KANSAS

JOHN CARLIN
Governor

DEPARTMENT OF ADMINISTRATION
Division of Information Systems
and Communications
DIRECTOR
124-South, State Office Building
Topeka, Kansas 66612-1503
(913) 296-3463

Deputy Director
Information Systems
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Telecommunications
503 Kansas Avenue, Room 240
Topeka, Kansas 66603-3494
(913) 296-4124

M E M O R A N D U M

TO: Russell Getter, Director, DISC

FROM: John Carey Brown, EDP Policy Analyst, DISC JCB

DATE: January 21, 1985

SUBJECT: Payroll/Personnel Systems

According to the last NASIS Report, twenty-seven states operate payroll/personnel systems in a "large" IBM environment (OS/VS, MVS, Etc.). No state gave a clear indication of using an integrated package (all data elements in the NASIS document the same), no state was using UNIX on payroll/personnel, many of the systems in use date from the mid-1970's, most are done in COBOL, and few use fourth generation languages (NATURAL, NOMAD2, FOCUS).

I listed the 27 in order by how much their population differed from ours on an assumption the state's size would affect employee count and personnel/payroll functions/size:

Population Difference*	State	Population Difference*	State
0	Colorado	- 1.6	North Dakota
0	Mississippi	- 1.7	Delaware
- .1	Oregon	+ 1.7	Maryland
- .3	Arkansas	- 1.7	Nevada
+ .4	Oklahoma	+ 1.7	Tennessee
+ .4	South Carolina	- 1.9	Wyoming
- .7	Nebraska	+ 2	Wisconsin
+1	Kentucky	+ 2.4	Georgia
-1.2	New Mexico	+ 2.9	North Carolina
+1.3	Alabama	+ 3.5	Massachusetts
-1.4	Hawaii	+ 5	New Jersey
-1.5	South Dakota	+ 9	Texas
+1.6	Minnesota	+ 8.5	Ohio
-1.6	Montana	+17.8	California

* In millions

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The remaining states from the survey are listed below, with an indication of the preliminary reason for not including them further at this point:

Alaska - DOS-Based system(s)
Arizona - Honeywell site
Connecticut - Sperry site
Florida - Multiple vendors
Illinois - Multiple vendors
Indiana - NCR site
Iowa - Proprietary site
Louisiana - Honeywell site
Maine - Honeywell site
Michigan - Burroughs site
New Hampshire - Honeywell site
Rhode Island - DOS-Based system
Vermont - DOS-Based system
Virginia - Multiple vendors
West Virginia - Digital site

Another indicator of potentially useful sites was a January 1983 survey performed by the State of New Jersey. From that survey, the following states (of the "useable" 27 listed above) were operating "integrated" payroll/personnel systems, as compared against "interfaced" systems.

Arkansas (redesign in process)
Idaho (redesign in process)
Minnesota (redesign in process)
Montana
Nevada (redesign in process)
Wisconsin (redesign in process)
Wyoming (redesign in process)

In addition, three states not responding to the NASIS survey, Utah, Washington, and Missouri, also indicated they were operating integrated systems in an "IBM" environment.

The Tennessee Department of Transportation did a survey of the states in October, to identify accounting system approaches used by state transportation departments, who must account for large complex projects with both state and federal funding. Of the 34 states in the survey, twelve indicated use of a "Big Eight-Type" accounting firm in the development or implementation of the project, four implemented a "custom" solution with work done either by a Big-Eight firm or a big project firm (McDonnell Douglas Automation), and eight indicated they acquired a package.

Five package vendors were described in the Tennessee survey. Of these five, three do not have payroll/personnel systems in their product line. I contacted the other two, MSA and AMS, and they are included in the list and discussion that follows.

During the past several months, we've contacted numerous vendors. Of those, the following appear to have significant promise for the reason(s) shown (listed alphabetically):

American Management Systems (AMS)
20 North Clark Street
Chicago, IL 60602
Contact: Don Quinn, Regional Sales Manager
(312)-269-0275

AMS delivers a well-respected government-oriented product line. Their strongest offerings are in financial packages, and they themselves point out that their own payroll/personnel package is appropriate only for smaller cities and county governments. In cases where larger payroll/personnel systems are required (like ours would be), they recommend pairing their packages with those from Integral Systems, Inc. (ISI), covered below. AMS was the company selected to develop and install from scratch a complete new data center and all the financial management software used during the New York City financial crises a couple years ago.

Cullinet Software, Inc.
35 Corporate Woods
9101 West 110th Street
Overland Park, KS 66210
Contact: William A. Archer, Account Executive
(913)-451-0085

Cullinet has delivered a very successful data base package (IDMS) for years, and released a relational version (IDMS/R) within the last couple of years. During the same time, the company has broadened their basic product line offering to include: a Fourth Generation Language, connections to distributed and office automation processors (WANG, Data General, DEC, etc.), data dictionaries, teleprocessing monitor programs (CICS replacements), automatic documentation, report generator, and artificial intelligence packages. At the same time, Cullinet has also entered the application software marketplace, delivering a full range of packages for manufacturing, banking, and service industries. Payroll/personnel and financial packages are included in these offerings.

Information Science, Inc. (InSci)
2 North LaSalle Street, Suite 750
Chicago, IL 60602
Contact: Pat Pedicone, Account Executive
(312)-641-2301

Information Science, Inc. (InSci), specializes in payroll/personnel software packages. Their product line includes not only payroll/personnel packages, but also pension programs (defined benefit as well as defined contribution type, health claim administering systems, and flexible fringe benefit ("cafeteria") systems. InSci is really an offshoot from an earlier (late 1960's and early 1970's) WANG effort to enter the applications software market. Their software currently runs not only on IBM and compatible mainframes but also on WANG systems in either a distributed or standalone mode.

Integral Systems Inc. (ISI)
1431 Opus Place, Suite 602
Downers Grove, IL 60515
Contact: Jim Kirk, Sales Manager
(312)-810-1400

Integral Systems Inc. (ISI) is another company that specializes in payroll/personnel software packages. They reportedly are favored heavily by the college and university community across the nation for the flexibility of their package, and their installed customer list at least shows they have a wide following in this area. ISI has another advantage in that they work with the data base packages we already have installed, and the mainframe relational data base packages (IDMS/R and ADR Datacom/DB) that are most often found in the marketplace. Fort Hays State University has reportedly already signed a contract with ISI for providing their internal payroll/ personnel system as they work to migrate from the KIPPS system.

Management Science America (MSA)
10401 Holmes Road, Suite 311
Kansas City, MO 64131
Contact: Bruce Switzer, Marketing Representative
(816)-941-3603

Management Science America (MSA) is absolutely the largest company in the packaged software industry. They are very proud of the fact, for instance, that they spend more annually on "Research and Development" for their packages than many of their competitors take in as gross revenues for the year. MSA's product line is a full set of packages, including payroll/personnel, accounts receivable, general ledger, accounts payable, purchasing, inventory, and budgetary control, along with offerings for manufacturing companies and other industries which don't match our immediate needs. MSA packages also work with the data base systems we already have and the two mentioned above as well (IDMS/R and ADR Datacom/DB).

None of the Kansas regents institutions are presently using a commercial payroll/personnel package, although some are being pursued or considered. As far as Database systems go, the following are in use at this time (for administrative work):

WSU - DL/1*
KSU - IDMS
KU - DL/1*
KUMC - DL/1*
ESU - DL/1*
FHSU - DL/1*
PSU - Information (PRIME)

* Called IMS in the MVS Shops, DL/1 in the DOS Shops. Usually run under DOS under VM in several shops.

JCB:ee
jcb28/JCB

IMPACT ANALYSIS

	PHASE OUT SPERRY-UNIVAC							KEEP SPERRY-UNIVAC						
	FY85	FY86	FY87	FY88	FY89	FY90	TOTAL FY86-FY90	FY85	FY86	FY87	FY88	FY89	FY90	TOTAL FY86-FY90
IBM OPERATIONS:														
LESS: AS 5000 CPU & PERIPHERALS	0	0	0	0	0	0	0	0	0	-146076	-146076	-146076	-146076	-584304
LESS: OLD STC DISK STORAGE	0	0	0	0	0	0	0	0	0	-199068	-199068	-199068	-199068	-796272
REPLACE UNIVAC TERMINALS WITH IBM	0	39600	269935	269935	269935	269935	1119340	0	0	0	0	0	0	0
REPLACE 3081-K CPU WITH 3084-Q (NET)	0	0	0	0	0	855420	855420	0	0	0	0	0	0	0
10 DISTRIBUTED MINICOMPUTERS	0	0	909720	909720	909720	909720	3638880	0	0	0	0	0	0	0
SUB-TOTAL	0	39600	1179655	1179655	1179655	2035075	5613640	0	0	-345144	-345144	-345144	-345144	-1380576
UNIVAC OPERATIONS:														
BASE BUDGET	2880301	2956626	2956506	2339799	2118408	1126804	11498143	2880301	2956626	2956506	2339799	2118408	1537204	11908543
LOANER 4TH CPU FOR 1100/63	0	0	0	0	0	0	0	0	27756	0	0	0	0	27756
ADD 1100/91 CPU & SOFTWARE	0	0	0	0	0	0	0	0	367288	1101864	1101864	1101864	1101864	4774744
ADD DISK STORAGE 4X4 8480	0	0	0	0	0	0	0	0	72056	216168	216168	216168	216168	936728
ADD 4 TAPE, DRIVES	0	0	0	0	0	0	0	0	15104	45312	45312	45312	45312	196352
ADD CASHE STORAGE 2X2	0	0	0	0	0	0	0	0	74792	224376	224376	224376	224376	972296
UPGRADE TO 1100/92 CPU & SOFTWARE	0	0	0	0	0	0	0	0	0	650568	650568	650568	650568	2602272
LESS: 1100/63 CPU & SOFTWARE TRADE IN	0	0	0	0	0	0	0	0	0	-638700	-463506	-405108	-153612	-1660926
ADD TWO DCP-40 COMMUNICATIONS PROCESSORS	0	0	0	0	0	0	0	0	37692	113076	113076	113076	113076	489996
COMUNICATIONS LINK WITH SANTA FE	0	7320	21961	21961	21961	7320	80523	0	7320	21961	21961	21961	21961	95164
MOVE TO SANTA FE BUILDING	0	0	0	0	0	0	0	0	88426	0	0	0	0	88426
ADDITIONAL FREIGHT	0	0	0	0	0	0	0	0	8500	2800	0	0	0	11300
RELOCATE COMMUNICATIONS CIRCUITS	0	0	0	0	0	0	0	0	17500	0	0	0	0	17500
LESS: PHASED OUT OPERATIONAL POSITIONS	0	0	0	0	0	-211690	-211690	0	0	0	0	0	0	0
10 DISTRIBUTED MINICOMPUTERS	0	0	0	0	0	0	0	0	0	1377120	1377120	1377120	1377120	5508480
SUB-TOTAL	2880301	2963946	2978467	2361760	2140369	922434	11366976	2880301	3673060	6071051	5626738	5463745	5134037	25968631
UNIVAC SPACE REQUIREMENTS:														
BASE BUDGET	120543	126443	126443	126443	126443	42148	547920	120543	126443	4312	4312	4312	4312	143691
COLD SITE FOR DISASTER RECOVERY	0	6888	6888	6888	0	0	20664	0	6888	6888	6888	24006	24006	68676
ADDITIONAL 5,866 SQ. FT. SANTA FE BLDG.	0	0	0	0	0	0	0	0	62375	187125	187125	187125	187125	810875
SUB-TOTAL	120543	133331	133331	133331	126443	42148	568584	120543	195706	198325	198325	215443	215443	1023242
SYSTEMS DEVELOPMENT:														
PURCHASE KIPPS PACKAGE	300000	0	0	0	0	0	0	0	0	0	0	0	0	0
ADAPT KIPPS PACKAGE	0	350000	0	0	0	0	350000	0	0	0	0	0	0	0
SUB-TOTAL	300000	350000	0	0	0	0	350000	0	0	0	0	0	0	0
GRAND TOTAL	3300844	3486877	4291453	3674746	3446467	2999657	17899200	3000644	3868756	5924232	5479919	5334044	5004336	25611297
SAVINGS TO PHASE OUT SPERRY-UNIVAC	-300000	381889	1632779	1805173	1807577	2004679	$7712097 Net Savings							

(Attachment 11)

Atch. 11
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GLOSSARY

3270	IBM's designation for a series of terminals, printers, and data communications controllers used mostly on its large mainframe computers.
3274	IBM's designation for its cluster controller used to hook terminals to its mainframe computers.
3278	The IBM designation for one of its most popular terminals for mainframe computers.
3705	The IBM designation for it's communications controller used as a front-end processor. This is a specialized computer designed to handle data communications for the 370-series computers.
ACOUSTIC COUPLER	A type of low-speed modem frequently used with portable terminals. It sends and receives data using a conventional telephone handset and does not require a permanent connection to the line.
ACU	See AUTOMATIC CALLING UNIT.
ANALOG	Refers or pertains to a signaling technique in which a transmission is conveyed by modulating (varying) the frequency, amplitude, or phase of a carrier. An analog signal is typified by a continuous wavelike pattern. Analog signaling is generic to the public switched telephone network, as well as to certain other audio frequency and radio frequency facilities. A digital baseband signal generated by a business machine must be converted to analog form in order to transmit that signal over an analog facility, e.g., a voice-grade telephone line.
ASCII	American National Standard Code for Information Interchange. (1) A coded character set consisting of 7-bit coded characters (8 bits including parity check) used for information interchange among data processing systems, data communication systems, and associated equipment. The ASCII set consists of alphanumeric characters, control characters, and graphic characters. (2) A widely used asynchronous protocol based on ASCII code.
ASYNC	Asynchronous Communications. This is a mode of transmission that uses a start and stop bit to frame a character. Generally bits within a character occur at well-defined intervals, but they are not precisely timed in synchronous transmission. In asynchronous communications, characters do not recur at any predictable interval.
ATTENTUATION	A decrease in magnitude of current, voltage, or power of a signal in transmission between points that may be expressed in decibels.
AUDIO FREQUENCIES	Frequencies that can be heard by the human ear (usually 30 to 20,000 hertz).

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AUTOMATIC CALLING UNIT	A device which permits a computer to dial calls automatically.
BACKUP FILE	A copy of a file created for protection in case the primary file is unintentionally destroyed.
BANDWIDTH	The range of frequencies that can pass over a given circuit. The bandwidth determines the rate at which information can be transmitted through the circuit. The greater the bandwidth, the more information that can be sent through the circuit in a given amount of time.
BASEBAND	Pertains or refers to a signal in its original form and not changed by modulation. A baseband signal can be analog (e.g., originating from a telephone set) or digital (e.g., originating from a business machine).
BAUD	A measure of data rate, often used to denote bits per second. A baud is equal to the number of discrete conditions or signal events per second. There is disagreement over the appropriate use of this word, since at speeds above the 2400 bps, the baud rate does not equal the data rate in bits per second.
BCD	Binary Coded Decimal. A binary-coded notation in which each of the decimal digits is represented by a binary numeral, e.g., in binary-coded decimal notation that uses the weights 8-4-2-1, the number "twenty three" is represented by 0010 0011 (compare its representation 10111 in the pure binary numeration system).
BEL	Transmission units giving the ratio of two powers. The number of bels is equal to the logarithm to the base ten of the power ratio.
BERT	Bit Error Rate Test. A test conducted by transmitting a known pattern of bits (commonly 63,511, or 2047 bits in length), comparing the pattern received with the pattern transmitted, and counting the number of bits received in error. Also, see BIT ERROR RATE. Contrast with BLERT.
BINARY CODE	A code using two distinct characters, usually the numbers 0 and 1.
BINARY SYNCHRONOUS COMMUNICATIONS	A half-duplex, character-oriented data communications protocol originated by IBM in 1964. It includes control characters and procedures for controlling the establishment of a valid connection and the transfer of data. Also called bisync and BSC. Although still enjoying widespread usage, it is being replaced by IBM's more efficient protocol, SDLC.
BISYNC	See Binary Synchronous Communications.
BIT	The smallest unit of information used in data processing. It is a contraction of the words "binary digit."

BIT RATE	The speed at which bits are transmitted, usually expressed in bits per second (bps).
BIT STREAM	A continuous string of bit positions occurring serially in time.
BNA	Burroughs Network Architecture.
BPS	Bits Per Second.
BROADBAND	Refers or pertains to an analog circuit that provides more bandwidth than a voice-grade telephone line, i.e., a circuit that operates at a frequency of 20KHz or greater. Broadband channels are used for high-speed voice and data communications, radio and television broadcasting, some local area data networks, and many other services. Also called wideband.
BSC	Binary Synchronous Communications. A half-duplex character-oriented data communications protocol. Although still widespread, it is being replaced by SDLC.
BTAM	Basic Telecommunications Access Method. IBM's lowest level I/O macro-routine support for providing communications programs on a host computer.
BUFFER	(1) A temporary storage area that can be a special register or an area of storage. Buffers are often used to hold data being passed between processes or devices that operate at different speeds or different times. (2) An isolating circuit used to prevent a driven circuit from influencing the driving circuit.
BUS	(1) A wire or group of wires that allows memory, central processing unit and I/O devices to exchange information. (2) A conductor used for distributing power to various elements of the system. DC power distribution and ringing voltage distribution conductors are referred to as buses.
BUSY HOUR	The continuous one-hour period which has the maximum average traffic intensity.
BYTE	(1) A group of 8 bits handled as a logical unit. (2) The smallest memory-addressable unit of information in a memory system. (3) A sequence of adjacent binary digits operated upon as a unit; usually shorter than a word.
CCITT	International Telegraph and Telephone Consultive Committee. A group within the International Telecommunications Union (ITU) that recommends data communications standards.

CELLULAR RADIO	A technology for advanced mobile telephone service in which a geographic area is divided into hexagonal cell sites that fit together to form a honeycomb. Each cell contains a radio transceiver and a controller, which under the direction of a central switch manage the transfer of mobile phone calls from one cell to another.
CHANNEL	(1) In data communications, a one-way path along which signals can be sent between two or more points. Contrast with circuit. (2) In telecommunications, a transmission path (may be one-way or two-way, depending on the channel) between two or more points, provided by a common carrier; also called a link, line, circuit, or facility.
CICS	Customer Information Control System. IBM's software tool designed to simplify the on-line communications interface between user-written applications programs and the IBM operating systems.
CLUSTER	A group of terminals or other input and output devices that share a common communications path from a computerized system.
CODEC	An acronym for COder-DECoder. A circuit that converts analog (audio) signals to digital code, and vice versa. Refer to pulse code modulation (PCM).
CONCENTRATOR	A switching entity for connecting a number of inlets to a smaller number of outlets.
CONDITIONING	The transmission which alters the electrical characteristics of a transmission facility (i.e., a telephone line) in order to improve the quality of the signal. When a telephone line is conditioned, excess noise is reduced, and its ability to carry a clear data signal is improved.
CROSS-BAR SWITCH	A switch having multiple vertical paths, multiple horizontal paths, and electromagnetically operated mechanical means for interconnecting any one of the vertical paths with any of the horizontal paths.
CSMA	Carrier Sense Multiple Access. A local area network access technique in which multiple stations connected to the same channel are able to sense transmission activity on that channel and to defer the initiation of transmission while the channel is active. Sometimes called contention access.
CSMA/CD	Carrier Sense Multiple Access with Collision Detection. A refinement of CSMA in which stations are further able to detect the interference caused by simultaneous transmissions by two or more stations ("collisions") and to retransmit colliding messages in an orderly manner.
DAA	See Data Access Arrangement.
DATA	A general term used to denote any or all facts, numbers, letters, and/or symbols.

DATA ACCESS ARRANGEMENT	A small wall mounted box containing an isolation transformer designed to prevent signals harmful to the network from being sent down the network from un-registered communications devices. These units are rarely used now that FCC registration of communications devices has become standard.
DATA BASE MANAGEMENT SYSTEM	A scheme used to create, maintain, and reference a data base.
DATA SERVICE UNIT (DDS)	A device that replaces a modem on a Dataphone Digital Service (DDS) line. The data service unit regenerates the digital signals for transmission over DDS.
DATA SET	A synonym for modem used by AT&T and a few other vendors.
db	See Decibel.
DCO	Digital Central Office. A telephone central office capable of digital communications.
DDCMP	Digital Data Communications Message Protocol. A synchronous protocol developed by Digital Equipment Corporation.
DDD	See Direct Distance Dialing.
DDS	Dataphone Digital Service. An AT&T leased line service offering digital transmission at speeds ranging from 2400 bps to 1.544 bps.
DECIBEL	A tenth of a bel. A unit for measuring relative strength of a signal parameter such as power, voltage, etc. The reference level must always be indicated, such as 1 milliwatt for power ratio.
DEMODULATION	The opposite of modulation: the conversion of a signal from analog to its original (e.g., digital) form.
DEMULTIPLEX (DECONCENTRATE)	A reversal of multiplex action. A group of separate signals derived from the complex multiplex signal.
DIBIT	A group of 2 bits. The four possible states for a dibit are 00, 01, 10, 11. In four phase modulation each possible dibit is encoded as one of four unique carrier phase shifts.
DIGITAL	Referring or pertaining to a signaling technique in which a transmission is conveyed by generating pulses of electromagnetic energy in a discontinuous (i.e., on/off) coded pattern representing, for example, bits in a data stream. Contrast with analog.
DIGITAL SIGNAL	A series of pulses or rapidly changing voltage levels that vary in discrete steps or increments.

DIGITAL-TO-ANALOG (D/A) CONVERTER	Circuitry which changes digitally encoded data into an analog signal. A modem.
DIGITAL TRUNK INTERFACE (DTI)	A subsystem that provides direct digital interfacing between the DCO and T1 span lines. When a T1 span is not fully utilized, trunk additions to its maximum capacity of 24 are made by software program updates.
DID	See Direct Inward Dialing.
DIRECT DISTANCE DIALING	A telephone exchange service which enables the telephone user to call other subscribers outside his local area without operator assistance.
DIRECT INWARD DIALING	This service allows an incoming call from the exchange network to reach a station off a Centrex or PBX without operator assistance.
DOWNLOAD	Send a file from a larger or remote computer to a smaller or local one.
DSU	See Data Service Unit.
DTMF	Dual tone multifrequency signaling. A method of signaling in which a combination of two frequencies, each from a group of four, are used to transmit numerical address information.
EBCDIC	An acronym (pronounced ip-sa-dik) for extended binary-coded decimal interchange code. This is the code that IBM uses for representing characters and control values on its large computers.
EIA	Electronic Industries Associations.
EMULATE	To imitate one system with another, so that the imitating system accepts the same data, executes the same computer programs, and achieves the same results as the imitated system.
EQUALIZATION	The introduction of components to an analog circuit by a modem to compensate for attenuation or delay distortion. Generally, the higher the transmission rate, the greater the need for equalization.
ETHERNET	A local area data network, developed by Xerox Corporation and supported by Intel Corporation, Digital Equipment Corporation, and Hewlett-Packard.
FACSIMILE	A system for the transmission of images. The image is scanned at the transmitter, reconstructed at the receiving station, and duplicated on some form of paper.

FAX	See Facsimile.
FDM	See Frequency Division Multiplexing.
FIBER OPTICS	Technology that uses light as a digital information carrier. Fiber optic cables (light guides) are a direct replacement for conventional coaxial cables and wire pairs. The glass-based transmission facilities occupy far less physical volume for an equivalent transmission capacity, which is a major advantage in crowded underground ducts. The fibers are immune to electrical interference. In addition, the cable can be manufactured for far less and installation and maintenance costs are less.
FIRMWARE	(1) A computer program that is incorporated, at least temporarily, as machine hardware; for example, instructions contained in a read-only memory (ROM). Sometimes referred to as microprograms. (2) A permanent program stored on ROM in an I/O page. Used for bootstrap operation.
FOUR-WIRE CHANNEL	A circuit containing two wire pairs (or their logical equivalent) for simultaneous (i.e., full-duplex) two-way transmission. Contrast with two-wire channel.
FRAME	A complete series of encoded bits containing the necessary information to reconstruct the sampled data for all channels of the digital group.
FREQUENCY DIVISION MULTIPLEXING	FDM partitions a limited bandwidth communications channel into a group of independent lower speed channels, each of which utilizes its permanently assigned portion of the total frequency spectrum. Each channel in the sharing group thus uses one frequency slot which contain the unique pair of frequencies needed for transmitting its binary data signals.
FRONT END PROCESSOR	A computer used to enter, check or compress data before it's sent to a mainframe for further processing.
FSK	Frequency Shift Keying. A method of modulation that uses two different frequencies to distinguish between a mark (digital 1) and a space (digital 0) when transmitting on an analog line. Used in modems operating at 1200 bps or slower.
FULL DUPLEX	(1) Describing a communications channel capable of simultaneous and independent transmission and reception.
GARBAGE	Meaningless signals or bit patterns in memory.
GATEWAY	A connection between two dissimilar networks. One way of connecting PC's to mainframes is through a local area network (LAN) of PC's hooked up through a gateway to a mainframe network.

HALF-DUPLEX	Pertaining to a communication system in which two-way communication is possible, but only one way at a time; for example, a ham radio or radio telephone with a pushbutton on the mouthpiece.
HDLC	High-level Data Link Control. A bit oriented protocol developed by ISO (International Standards Organizater). It is the basis for SDLC, VDLC, etc.
HERTZ	A measure of electromagnetic frequency; the number of cycles.
HZ	See Hertz.
IEEE	Institute of Electrical and Electronic Engineers.
IEEE-802	An IEEE committee developing a standard protocol for local area networking.
INFRARED	Pertains to the frequency range in the electromagnetic spectrum that is higher than radio frequencies but below the range of visible light.
INTERACTIVE	A technique of user/system communication in which the operating system immediately acknowledges and acts upon requests entered by the user at a terminal.
INTERFACE	A shared boundary connecting two subsystems.
INTERRUPT	A signal that, when activated, causes a transfer of control to a specific location in memory, thereby breaking the normal flow of control of the routine being executed. An interrupt is normally caused by an external event, such as a "done" condition in a peripheral. It is distinguished from a trap, which is caused by the execution of a processor instruction.
ITU	International Telecommunications Union. The parent organization of the CCITT.
LAN	See Local Area Network.
LIGHTWAVE COMMUNICATIONS	See Fiber Optics. The term "lightwave communications" is sometimes used in place of "optical" communications to avoid confusion with visual information and image transmission such as facsimile or television.
LIMITED DISTANCE MODEM	A short-haul modem or line driver that operates over a limited distrance. Some limited distance modems operate at higher speeds than modems that are designed for use over analog telephone facilities, since line conditions can be better controlled.

LINE CONDITIONING	An adjustment of the properties of a leased communications line to bring the line's characteristics within the limits specified in a tariff. Line conditioning generally improves the frequency response and delay considerations of the line. Line conditioning services provided by the telephone company are designated as Type C (e.g., C1, C2, or C4) or D.
LINE DRIVER	An alternative device to a modem when transmitting via EIA cable over short distances, e.g., a few hundred feet. The line driver amplifies the signal and reshapes distorted pulses.
LINE HIT	A disturbance causing a detectable error on a communications line.
LOCAL AREA NETWORK	A user-owned, user-operated, high-volume data transmission facility connecting a number of communicating devices (computers, terminals, word processors, printers, mass storage units, robots, etc.) within a single building or campus of buildings.
LSI	Large Scale Integration.
MACRO	An instruction in a source language that is equivalent to a specified sequence of machine or assembler instructions. An acronym for MAChine ROutine.
MACRO FILE	(1) An ordered collection of macro instructions. (2) Macro source in machine-readable format.
MHZ	Megahertz. A unit equal to 10^{+6} hertz; a measure of analog frequency.
MICROCOMPUTER	(1) A computer whose major sections - CPU, control, timing, and memory - are all contained in a single, integrated-circuit chip, or, at most, a few chips; in other words, an LSI computer. (2) A general term used to describe small computers. In this sense, small usually implies both the computer's physical size and its work size (data-path width). Most microcomputers are designed with a 16-bit word size, but sizes from 8 to 18 bits are considered in the microcomputer range.
MICROWAVE	Pertains or refers to the upper portion of the radio frequency range, specifically 890MHz and higher.
MODEM	A contraction of modulate and demodulate; a conversion device installed in pairs at each end of an analog communications line. The modem at the transmitting end modulates digital signals received locally from a computer or terminal; the modem at the receiving end demodulates the incoming signal, converting it back to its original (i.e., digital) format, and passes it to the destination business machine.

MODULATION	The application of information onto a carrier signal by varying one or more of the signal's basic characteristics (frequency, amplitude, or phase); the conversion of a signal from its original (e.g., digital) format to analog format.
MULTIPLEX	(1) To interleave, or simultaneously transmit, two or more messages on a single channel. (2) The technique by which a single communications channel is shared by a number of users, either by time-sharing or by frequency separation.
MULTIPLEXER	A device that combines inputs from two or more terminals, computer ports, or other multiplexers, and transmits the combined data stream over a single high-speed channel. At the receiving end, the high-speed channel is demultiplexed, either by another multiplexer or by software.
MULTIPOINT	Pertains or refers to a communications line to which three or more stations are connected. It implies that the line physically extends from one station to another until all are connected. Contrast with point-to-point.
NAILED-UP CONNECTION	A special circuit which has a reserved timeslot in the bit stream and the matrix so that a path is always available.
NETWORK	A system of mutually-communicating devices (e.g., computers, terminals, peripheral devices, process controllers) connected in common and for a purpose by one or more transmission facilities.
NODE	In a topological description of a network, a node is a point of junction of the links. The word has also come to mean a switching center in the context of a data network, particularly in packet switching.
NONRETURN TO ZERO	A digital signal that remains at a constant level until a change of logic state occurs.
OFF-LINE	(1) Pertains to equipment or devices not under direct control of the CPU. (2) The mode of operation of a system that is intentionally brought about by maintenance personnel, or by the system itself, in which certain circuits, units, etc., are not available for normal operations.
ON-LINE	(1) Pertaining to equipment or devices directly connected and under control of the CPU. (2) That mode of operation of a system that is intentionally brought about by maintenance personnel, or by the machine itself, in which certain circuits, units, etc., are made available for normal operation.
PABX	Private Automatic Branch Exchange. A private branch exchange that provides access to and from the public telephone network without operator intervention. See PBX.

PACKET SWITCHING	A technique in which a message is broken into smaller units called packets, which may be individually addressed and routed throughout the network possibly using several different routes. The receiving end node ascertains that all packets are received and in the proper sequence before forwarding the complete message to the addressee.
PARALLEL TRANSMISSION	The simultaneous transmissions of all the bits making up a character or byte, typically, between a computer and directly connected peripherals. Parallel transmission requires a separate data path for each bit. Contrast with serial transmission.
PARITY	A constant state or equal value. Parity checking is one of the oldest error checking techniques. Character bit patterns are forced into parity (total number of one bits odd or even) by adding a one or zero bit as appropriate, as they are transmitted; the parity (odd or even) is then verified upon receipt by the receiving device.
PARITY BIT	A check bit appended to an array of binary digits to make the sum of all the binary digits, including the check bit, always odd or always even.
PARITY CHECK	(1) A check that tests whether the sum of all the bits in an array is odd or even. (2) A check that tests whether the number of ones (or zeros) in an array of binary digits is odd or even.
PASSWORD	A word or string of characters that is recognizable by automatic means and that permits a user access to protected storage, files, or I/O devices.
PBX	Private Branch Exchange. A telephone exchange on the user's premises with access to the public network. In some countries it refers to a manually operated exchange; in modern American terminology it refers to a manual or automatic exchange.
PBX TRUNK	A PBX trunk is subscriber line or loop trunk circuit used to provide service between a PBX and the CO that serves it. Refer to private branch exchange.
PCM	See Pulse Code Modulation.
PCM WORD	An 8-bit code group representing a specific quantized level.
PEAK HOUR(S)	Those hours that have an average calling rate that is 30 percent more than during a busy hour.
POINT-TO-POINT	Pertains or refers to a communications line to which exactly two stations are connected. Contrast with multi-point.
PORT	An access at the I/O position of a circuit that allows transmitted or received signals to enter/exit.

POTS	Plain Old Telephone Service. An acronym used by the telephone industry for conventional telephone service.
PROTOCOL	A set of procedures for establishing and controlling transmissions. Examples include BSC and SDLC.
PROTOCOL CONVERSION	The process of translating the protocol native to an end-user device (e.g., a terminal) into a different protocol (e.g., ASCII to BSC), allowing that end-user device to communicate with another device (e.g., a computer) with which it would otherwise be incompatible. Protocol conversion can be performed by a dedicated device (a "protocol converter"), by a software package loaded onto an existing system, such as a general-purpose computer, front-end processor, or PBX system, or by a value-added network, such as Telenet.
PSK	Phase Shift Keying. A method of modulation that uses the differences in phase angle to indicate a certain bit of dibit. A reference oscillator determines the phase angle change of the incoming signal, which in turn determines which bit or dibit is being transmitted.
PULSE CODE MODULATION	Representation of a voice or other analog signal by sampling at a regular rate and converting each rate to a binary number. 8,000 samples per second is standard for telephone speech.
RADIO FREQUENCY	A frequency that is higher than the audio frequencies but below the infrared frequencies.
RANDOM ACCESS MEMORY (RAM)	(1) A memory that stores information in such a way that each bit of information can be retrieved within the same amount of time as any other bit. (2) True RAMs are static devices; for example, core memory and solid-state memory. Many so-called random access devices, such as floppy disks and magnetic tape units, are, in reality, cyclic access devices.
READ ONLY MEMORY (ROM)	(1) A memory that can be read from, but not written into. (2) A memory in which information is stored permanently; for example, a math function or a micro-program. A ROM is programmed according to the user's requirements during memory fabrication and cannot be reprogrammed.
REDUNDANT	A system that contains duplicate components for backup support in case of malfunctioning of the single operating unit.
REGISTER	A device capable of storing a specified amount of data, such as one word.

REPEATER	(1) A device whereby currents received over one circuit are automatically repeated in another circuit or circuits, generally in an amplified and/or reshaped form. (2) A device used to restore signals, which have been distorted because of attenuation, to their original shape and transmission level.
RETURN TO ZERO	A digital signal that returns to a reference level after each bit.
RF	See Radio Frequency.
RJE	Remote Job Entry. The entering of data through a remote terminal onto a mainframe for batch processing.
RO	Receive-Only. A teleprinter terminal without a keyboard for data entry.
RS-232-C	A specification published by the EIA that establishes mechanical and electrical interface requirements between computers, terminals, modems, and lines. The standard applies to both synchronous and asynchronous serial, binary, data transmission at speeds to 20 Kbps in full or half duplex mode. It is terminated in a 25 pin connector.
RS-449	An EIA standard that provides more extended interface than RS-232. It is designed to slowly replace RS-232, although RS-232 seems to be quite entrenched and shows no sign of retiring yet. Transmission rates up to 2 mbps are possible using RS-449.
SDLC	Synchronous Data Link Control. An IBM communications line discipline or protocol associated with SNA. In contrast to BSC, SDLC provides for full-duplex transmission and is more efficient.
SERIAL	(1) Pertains to the time sequencing of two or more processes. (2) Pertains to the time sequencing of two or more similar or identical processes, using the same facilities for the successive processes. (3) Pertains to the time-sequential processing of the individual parts of a whole, such as the bits of a character.
SERIAL TRANSMISSION	The transmission of a character or byte of data one bit at a time. Contrast with parallel.
SIMPLEX	(1) In communications, pertaining to a channel that operates in one direction only. (2) In signaling, an arrangement where a supervisory signals are transmitted in a balanced manner to both conductors of a conductor pair.

SNA	Systems Network Architecture. IBM's standardized relationship between its Virtual Telecommunications Access Method (VTAM) and the Network Control Program (NCP/VS). SNA comprises the logical structure, formats, protocols, and operational sequences that govern information transmission through an IBM network.
STAR	A network topology in which each station is connected only to a central station by a point-to-point link, and communicates with all other stations through the central station.
START BIT	Asynchronous transmission, a signal used to signify the beginning of the transmission of a character.
STATISTICAL MULTIPLEXING	A time-division multiplexing technique in which timeslots are dynamically allocated on the basis of need, i.e., to equipment with data to be transmitted.
STOP BIT	In asynchronous transmission, the quiescent state following the transmission of a character; usually required to be at least 1, 1.42, 1.5, or 2 bit times long.
STORE AND FORWARD	Pertains or refers to a method of queueing messages and transmitting them when a facility becomes available. Synonymous with message switching.
SUBSCRIBER LINE CONCENTRATOR	A remote switching system providing the first stage of switching near a group of subscribers.
SUBSCRIBERS LINE	The telephone line connecting the exchange to the subscriber's station.
SYNCHRONOUS	Having a constant time interval between successive bits, characters, or events. Synchronous transmission uses no redundant information (such as the start and stop bits in asynchronous transmission) to identify the beginning and end of characters, and thus, is faster and more efficient than asynchronous transmission. The timing is achieved by transmitting sync characters prior to data; usually, synchronization can be achieved in two or three character times.
TCAM	Telecommunications Access Method. An IBM language for creating communications applications programs and message control.
T-CARRIER (BELL SYSTEM)	A hierarchy of digital systems designed to carry voice and data signals in digital form. T1 carrier has 24 PCM channels with a line rate equal to 1,544,000 bits per second.
TDM	See Time Division Multiplexing.
TELEPHONY	A system of telecommunications set up primarily for the transmission of speech.

TERMINAL	(1) A point at which information can enter or leave a communication network. (2) An I/O device associated with a particular program; usually one capable of two-way communications. (3) An I/O device, such as a teletypewriter, that includes a keyboard and a display mechanism. A terminal is used as the primary communicating device between a computer system and a person.
TIE LINE	A private line communications channel of the type provided by communications common carriers for linking two or more points together. Called interswitchboard line or tie trunk.
TIME-DIVISION MULTIPLEXING (TDM)	A technique for sharing a single communications line among several data streams by dividing the channel capacity into time segments. Contrast with Frequency-Division Multiplexing.
TOKEN PASSING	A local area network access technique in which participating stations circulate a special bit pattern (the token) that grants access to the network to each station in sequence; often used in networks with a ring topology.
TTL	Transistor-Transistor Logic. A type of signaling in which a nominal +5V is equated with the logic 1, and a nominal OV is equated with logic 0.
UDLC	Universal Data Link Control. A bit-oriented protocol based on HDLC developed by Sperry Univac.
UPLOAD	Send a file from a smaller computer or local one to a larger or remote computer.
VALUE ADDED COMMON CARRIER	A corporation that sells services of a value-added network (VAN). A network that provides services beyond point to point communications.
VAN	Value Added Network. A public data communications network that provides basic transmission facilities (generally leased by the VAN vendor from a common carrier) plus additional ("enhanced") services such as computerized switching, temporary data storage, error detection and corrections, electronic mail services, etc.
VOICE-GRADE CHANNEL	Channel with bandwidth equivalent to a telephone line obtained through the public telephone network. The maximum potential bandwidth of a voice-grade channel is approximately 20K hertz; however, most voice-grade channels in a transmission facility are usually spaced 4000 Hz apart, and not all of that bandwidth is generally available to a user due to the presence of noise-limiting loading coils; the telephone network itself is usually defined in terms of channels with frequencies of from 300 Hz to 3400 Hz.

VTAM	Virtual Telecommunications Access Method. An IBM communications I/O control programming software that uses virtual techniques.
WATS	Wide Area Telecommunications Service. A voice-grade service from AT&T. Usage charges for WATS are based on fixed monthly rates for specified service access, rather than on per-call rates.
WORD	(1) The number of bits needed to represent the largest data element normally processed by the computer. (2) Sixteen binary digits treated as a unit in the PDP-11 processor memory.
WORD LENGTH	The number of bits or other characters in a word.
X.21	A CCITT technical spec that describes the interface used in X.25 protocol and in certain types of circuit-switched data transmissions. It is comparable to RS-232.
X.25	A CCITT standard for packet switching procedures. It describes the construction of each packet. It uses the procedures of the HDLC protocol for the link layer and X.21 (a functional equivalent to RS-237) for the electrical connection.

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