In developing a prototype of an office communications system, an office study was first done to specify requirements for the prototype. The study focused on the productivity of three groups of employees: principals, clerical personnel, and secretaries. With requirements set by the management of the office used as a framework, application requirements for end users of an office communications system were established. From a subset of these requirements the prototype was developed.

The prototype system was designed as an experimental learning system to provide managers and professionals with an easy, fast, and direct method for handling their business communications. The prototype was set up on IBM premises for testing and evaluation. Results of this operation are included in the discussion.

An office communications system

by G. H. Engel, J. Groppuso, R. A. Lowenstein, and W. G. Traub

The term "office automation" generally refers to the machine-aided creation, communication, storage, retrieval, and control of messages and documents handled by professional, clerical, and secretarial personnel in an office environment. Motivated by the conviction that "office automation demands that the new office machines be linked together to form integrated systems,"[1] an office study was begun in 1975 by IBM's Data Processing Division in conjunction with one of its customers. The purpose of the study was to investigate requirements for an integrated office communications system and to provide a framework for developing a prototype of such a system.

For this study, an office communications system was defined as a computer-based system that provides integrated facilities for the processing of business communications more efficiently and economically with little or no use of paper records. An objective of the study and prototype was to find ways to increase the return on the investment in office personnel by handling a broad class of functions through terminal work stations, with increased labor

Table 1 Principal activity summary

Activities	*Average percent of time**			
	Level 1	*Level 2*	*Level 3*	*All*
Writing	9.8	17.2	17.8	15.6
Mail handling	6.1	5.0	2.7	4.4
Proofreading	1.8	2.5	2.4	2.3
Searching	3.0	6.4	6.4	5.6
Reading	8.7	7.4	6.3	7.3
Filing	1.1	2.0	2.5	2.0
Retrieving filed information	1.8	3.7	4.3	3.6
Dictating to secretary	4.9	1.7	0.4	1.9
Dictating to a machine	1.0	0.9	0.0	0.6
Telephone	13.8	12.3	11.3	12.3
Calculating	2.3	5.8	9.6	6.6
Conferring with secretary	2.9	2.1	1.0	1.8
Scheduled meetings	13.1	6.7	3.8	7.0
Unscheduled meetings	8.5	5.7	3.4	5.4
Planning or scheduling	4.7	5.5	2.9	4.3
Traveling outside HQ	13.1	6.6	2.2	6.4
Copying	0.1	0.6	1.4	0.9
Using equipment	0.1	1.3	9.9	4.4
Other	3.1	6.7	11.4	7.7
	100	100	100	100
Total number of principals	76	123	130	329

*Level 1 represents upper management.
*Level 2 represents other managers and management-equivalent personnel.
*Level 3 represents nonmanagerial personnel.

productivity and improvement in the quality of activities performed.

In this paper, the study is first described. Included are the major factors involved and the resulting requirements that led to development of the prototype. In the discussion of the prototype which then follows, the objectives of the system, its setup and installation, and its operational characteristics are covered. Finally, some of the results derived from the prototype operation are presented.

The office study

Our study partner was a multinational corporation with a consumer and industrial product line. The study site was the corporate and divisional headquarters for this company, where over 1,700 people were employed in a traditional decentralized administrative environment.

In the early stages of the study, it became evident that if we were to define a system that would help the office, it was important to know what people did with their time. Thus, the activities of three

groups of employees were examined: secretaries, clerical workers, and principals (which included both managerial and professional exempt personnel). People in each group were given questionnaires that asked them, among other things, to estimate the amount of time they spent in various activities. These estimates are summarized in the tables that are included. A word about each may be useful in order to understand some of the requirements that would be derived for this system.

principals

Activities among principals generally appeared to be consistent with the levels of the people responding (see Table 1). For example, scheduled meetings, unscheduled meetings, and travel, with 13.1, 8.5, and 13.1 percent, respectively, were very prominent activities among upper-management respondents. In contrast, more administratively oriented activities, such as filing, searching, and retrieving, were more evident among nonmanagement people (13.2 percent).

Upper-level management appeared to avoid administrative work and concentrate on communications-oriented activities. Their ability to avoid administrative work appeared to depend on the degree of support they received from subordinates and on the percentage of their work delegated to these people.

Even so, there was evidence that even more work could have been delegated if the proper people or systems were available. When asked if there were tasks that they do now that others could do for them, 51 percent of the principals indicated that they had one or more such delegable tasks. At the time this study was made, principals were spending 14 percent of their work month doing tasks that, in their opinion, others could do for them. Our analysis of these tasks showed that many of them could be done by less highly compensated people and involved such activities as copying, calculating, assembling data, typing, covering telephones, and filing and retrieving documents. In many cases, (45 percent of the time) the tasks would have to be done by other principals. However, trained secretaries or clerical workers could do 55 percent of the delegable tasks.

Table 2 Secretarial activity summary

Activities	*Average percent of time*
Writing	3.5
Mail handling	8.1
Bulk envelope stuffing	1.4
Collating/sorting	2.6
Proofreading	3.9
Reading	1.7
Typing	37.0
Telephone	10.5
Copying or duplication	6.2
Conferring with principals	4.3
Taking shorthand	5.5
Filing	4.6
Pulling files	2.8
Keeping calendars	2.6
Pick-up or delivery	2.2
Using equipment	1.3
Other	2.0
	100
Total number of secretaries	123

secretaries and clerical workers

This led to an analysis of secretarial and clerical activities to determine what these people were doing and where savings might be made.

Among the secretaries, typing was by far the number one activity, but it varied with the number of principals supported by a secretary (see Table 2). Thus, private secretaries supporting a single professional estimated that they spent only 26 percent of their time typing. By contrast, secretaries who supported more than four principals estimated that 45 percent of their time was devoted to typing.

With the extra time available to them, it appears that private secretaries do more administrative work, such as conferring with their manager, keeping calendars, taking shorthand, and handling mail.

On the other hand, secretaries with heavy typing workloads had time for little else. To the extent that their typing productivity is improved, they will have more time available for administrative support of principals or more time for typing—if that's what's needed.

Clerical activities did not fit any single pattern, other than to show that at least 41.9 percent and as much as 58 percent of the time is spent in paper handling (see Table 3).

information flow

In addition to understanding what people did with their time, a considerable amount of study activity was devoted to understanding the paperwork process within the company. For example, conventional business correspondence—letters and memos—were sampled to determine where they were coming from and where they were going. The results are shown in Table 4. The pattern that emerged, on both the incoming and outgoing side, was that a substantial amount of the paper stayed within the company: 75 percent of the incoming letters and memos originated within the company and 81 percent of the outgoing documents remained within the company.

A lot of time was spent in copying, and we found that for each original, six copies were made on average. Most of these were machine copies and the time devoted to making them was very much disliked by the secretaries. It was also partly unproductive time in that it involved traveling to and from the copiers, waiting for them to become available, and not infrequently finding them to be out of service.

management requirements

Although the data collected provided an interesting statistical picture of the company studied, a large part of our understanding of the organization, and the direction in which it wanted to move, came from interviews with employees, who ranged from clerical personnel and secretaries to corporate executives.

From the management team, in particular, we were able to derive a set of company office system requirements or objectives that were to guide us throughout the study. These objectives were:

1. Increase professional and managerial productivity.
2. Grow in stages.
3. Fit within the existing organization.
4. Tie in to data processing applications.

Table 3 Clerical activity summary

Activities	*Average percent of time*
Filling out forms*	8.3
Writing*	7.3
Typing*	7.8
Collating/sorting*	5.2
Checking documents*	10.4
Reading*	2.9
Filing†	5.9
Looking for information†	10.2
Telephone	9.2
Copying or duplicating	3.9
Calculating	10.3
Meetings	1.9
Pick-up or delivery in HQ	0.8
Scheduling or dispatching	1.2
Using a terminal	6.3
Other	8.4
Total	100
Total number of clerical personnel	115

*Primary paper-handling activities (41.9 percent)
†Secondary paper-handling activities (cumulative total = 58 percent)

In deriving the first objective, we found that the exempt population at the customer site was twice as large as the nonexempt population, which was composed mainly of secretaries and clerical workers. The customer was at a point where the exempt staff output was not increasing at the rate that other areas in the company were increasing. Something was needed—equipment, procedures, other motivators—that would allow these people to become more productive.

This reason was the primary motivation for this customer's interest in office communication systems. Not only were there twice as many exempt employees as others, but their total cost was more than four times the nonexempt labor cost. Thus, even small productivity gains might have had high value to the customer.

This is not to say that the customer was not interested in improving secretarial productivity; they were, but not as an end in itself. Thus, they accepted the idea that to increase principal productivity, it might be necessary to first improve that of the secretaries so that they could provide better support to principals by either handling an increased typing workload or accepting more administrative work.

For the second objective, we found that to achieve maximum value from an office communications system, almost all company locations would need access to it, and most employees in those locations would have to become users. Great risk would thus be involved. Not only might such a system be potentially expensive, but the application itself was untried and untested and the question of user acceptance of an office system had not been answered.

The customer was committed to minimizing these risks and felt that an office system would have to grow in stages, starting in departments with potentially high value before moving to other departments and locations. In this way, the financial risk would not only be minimized, but as the state of the art advanced, the company would be able to take advantage of new technological breakthroughs as they occurred, provided the communications interface was defined.

Concurrent with the concept of growing in stages, the customer was also anxious to avoid disruption of their established organization by introduction of office communications system concepts. As a matter of philosophy, they wanted the system to fit the users and not the reverse, thus providing the third objective. Practically speaking, they wished to avoid clustering the secretaries into groupings simply because of the physical limitations of the machines (such as cable lengths) or because the economics of the system required grouping in order to reduce work station costs.

Table 4 Document flow

Copies of outgoing documents	*First two combined*	*First three combined*	*First four combined*
24% to dept. files			
19% routed in dept.	43%		
24% other HQ dept.		67%	
14% other company locations			81%
19% outside company			
Incoming letters and memos			
3% from same dept.			
14% other HQ depts.	17%		
58% other company locations		75%	
25% outside company			100%

This desire did not mean that the customer would not accept a reorganization in order to achieve efficiency of operation; however, it was clearly indicated that such a reorganization would be a by-product of an office communications system, rather than a prerequisite to such an installation.

In deriving the fourth objective, we observed that this customer was aware, as are many others, that employees who were not working in data processing were becoming more and more familiar with computer concepts. Many of those employees were in touch with data processing daily. At the very least, they were providing input to or receiving output from computers.

The real revolution, however, was occurring among a smaller group of noncomputer professionals who were doing terminal data entry or inquiry. They were the forerunners of the on-line office system users.

They, and their managers, realized that office communications, to be meaningful, would involve not only access to text documents, but also integration with data processing applications as well. The more prescient users could foresee a single user interface to all computer applications. At the very least, each user would have a single physical terminal connected to all systems.

application requirements

With the management requirements as a framework, the study team proceeded to define application requirements for end users of an office communications system. These requirements would become the basis for system design and development for a prototype office communications system. The major functional areas are now described.

Document capture—So-called image documents—material originating outside of the system—must be converted into system documents via scanning devices. Incoming mail, magazine articles, photographs, handwritten notes, charts and graphs—anything that a user wishes to preserve in noncoded form—should be entered using scanning devices.

Document creation—Entry, edit, correction of text, and limited (line and character) graphics are required for the preparation of correspondence, reports, forms, and other basic business documents. This operation could be done either interactively (via a display) or off line via a text-editing unit (for example, a magnetic card device) with batched input to the system.

Forms, such as check requisitions, expense accounts, personnel change authorizations, etc., should be stored internally so an authorized person could display them and fill in the blanks. If the form is for intraheadquarters use, such as a requisition, it should be transmitted to the proper receiving department upon request without hard-copy output at the originating station. A system facility for the definition of such forms is needed.

Distribution and receipt—This facility should provide for the distribution of correspondence to an electronic "mail box" of designated recipients. Documents may be those created via the system or captured by scanning. Functions would include logging of mail, control of the status of work-in-process (if a task is interrupted or passed from one user to another) and disposition. Security would be provided for control over document access, modification, filing, duplication, destruction, etc. It would include audit trails of access, modification, receipt, and duplication. Documents may be "distributed" for formatting as hard-copy output for destinations external to the system.

File, search, and retrieval—Electronic filing of documents during active use should include capabilities for creating multiple personal files (folders), establishing descriptor indexing schemes (e.g., date, originator), or full text automatic indexing.

The system would actually retain only one copy of a completed document. Documents could be moved automatically to lower-cost archival storage when current need was ended.

Provision for identification of desired documents could be done via indexes, or keywords, alone or in combination, through search queries. The document could then be accessed and reviewed.

Format and output—Where hard copy is desired, formatting may be done. Formats should contain headings, footings, prestored

units (paragraphs, addresses, etc.) and computed fields. Output may be directed to any appropriate printer—local, subsystem, or system, proof quality or finished copy, character or image. Multiple copies may be produced including copies of external documents that were captured via scanning.

Personal services—Such services include the following:

- Follow-up files. Follow-up (or action files) may be kept by any user. Entries into such a file are typically due to receiving or distributing a document. Part of the filing may be an entry into the follow-up file with the system automatically supplying an action due date or the user keying an action due date. The user can also create entries in the follow-up file that are not associated with documents (e.g., meeting dates, appointments, etc.). The user may then, at any time, cause an automatic display or printing of the action file by due date, all future dates, this date, etc.
- Instruction and prompting. The system must support the self-training of users via computer-assisted techniques. Prompting facilities must be available to permit predefinition of procedures required to perform any well-defined tasks. Aids for helping—error diagnosis, tutorials—must also be an integral part of the system interface to the user.
- Calculation. The system should include calculator capabilities to allow definition by the user of such items as number of memories, more complex functions (such as square root, interest compounding, percentages, etc.). The most common functions will be predefined within the system. This capability should also be used with sets of numbers entered as text, in order to add or subtract them or verify previously entered totals.
- Automated correspondence. The system must allow for the easy creation of form letters, letters composed of standard paragraphs, and letters automatically generated when a specified event occurs (e.g., a new employee hire).
- List creation. The system requires facilities to allow the user to define, maintain, and use various lists (such as mailing lists and telephone directories).

System services—These services include the following:

- Security. A security scheme is required to protect the system from access by unauthorized persons. Because the system will store sensitive information (personnel data, profit figures, contract backup), additional protection will be needed to control access to this information by legitimate system users.
- Accounting. Extensive facilities are needed to collect data about system use so that costs can be determined and properly allocated among users.

- Data base interface. A capability is required to permit authorized users to extract structured data from data processing files, to pass updated and new information from the office system to data processing files, and to execute data processing programs.

An office communications system prototype

objectives of prototype system

Our ability to develop a system that met the requirements in detail as specified in the results of the joint study varied considerably. For some requirements, the state of the art had just not advanced to the point where a practical system solution was possible. For other requirements, the technology was available, but only at prohibitively high costs.

As extensive as our study had been, we also began to find that there was much more to be investigated. We were at a point where we could either do more studying or do something else, and the choice was for something else—a prototype system.

Our primary objective was to develop, based on some subset of the requirements derived from the joint study, an office communications system that could be used directly by and be of benefit to principals.

Not only did we want to give principals a system that they could use, we also wanted to give them something they would value. Our joint study had shown us that productivity of principals was the real interest of management. We also knew that we could increase secretarial productivity via improved typing systems and administrative aids. The question was whether we could do the same for principals.

This question and others needed answering, and a prototype system seemed to be an ideal way to help find the answers. Thus, a prototype would serve as an experimental learning system. It would allow us to validate existing requirements, develop new requirements, test human factors, and develop and evaluate tools and techniques for assessing value and usability to principals.

We did not know what effect a prototype system would have on an organization. We decided to make our own organization—headquarters of the IBM Data Processing Division—the site for our prototype test.

test site selection

Our search for a suitable department for the test site was based on the following criteria:

1. A strong desire by the management of the department to participate in the test, including a commitment to cooperate by all department staff members.
2. A department composed largely of managers and professionals, supported by a secretarial staff.
3. A reasonable amount of communication *among* department managers and professional staff. This criterion was necessary in order to better evaluate the distribution functions of our prototype.
4. An ability to easily create document data bases that would later be accessed for search and retrieval.

survey of test department

We examined several departments at the headquarters location and finally determined that the Account Marketing Department would be the best site. The department consisted of approximately 50 people, headed by a director with five managers reporting to him. Secretarial support for the director, managers, and professionals was provided by eight secretaries. Account Marketing was then surveyed in more detail to better understand their "current system."

Principals were asked to fill in questionnaires and telephone logs. They were also interviewed to get a more in-depth understanding of their jobs and their expectations of an "office system."

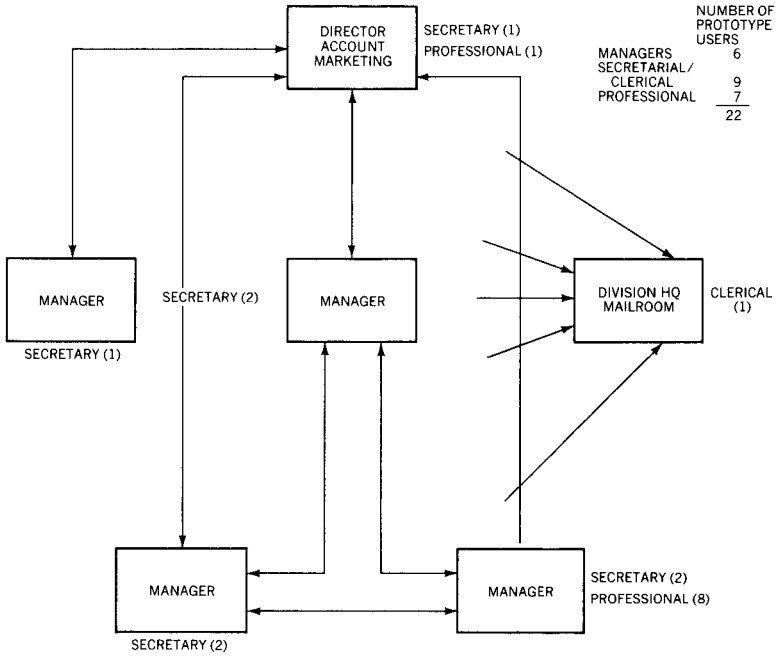
Both at IBM and at the customer many of the activities of the principals were similar. Use of the telephone, attendance at scheduled meetings, and travel, which ranked highest for upper management at the customer, also were the highest-ranked activities among Account Marketing management. Other activities between the two groups also compared favorably, e.g., mail handling: customer, 4.4 percent, IBM, 5.6 percent; filing: customer, 2.0 percent, IBM, 1.7 percent, etc.

The secretaries were also surveyed. They were asked to estimate how they spent their time during the week, and many of the results closely matched those from the customer. For example, typing was the number one activity of both groups, 37.0 percent for the customer and 41.6 percent for IBM. The telephone ranked second with 10.5 percent for the customer and 11.1 percent for IBM. Ranking third with both was mail handling, which was 8.1 percent for the customer and 8.8 percent for IBM.

Installing the prototype

Upon completion of the survey, a specific group of people was selected to use the prototype. Figure 1 shows the Account Marketing configuration as originally installed.

Figure 1 Initial Account Marketing installation configuration



installation

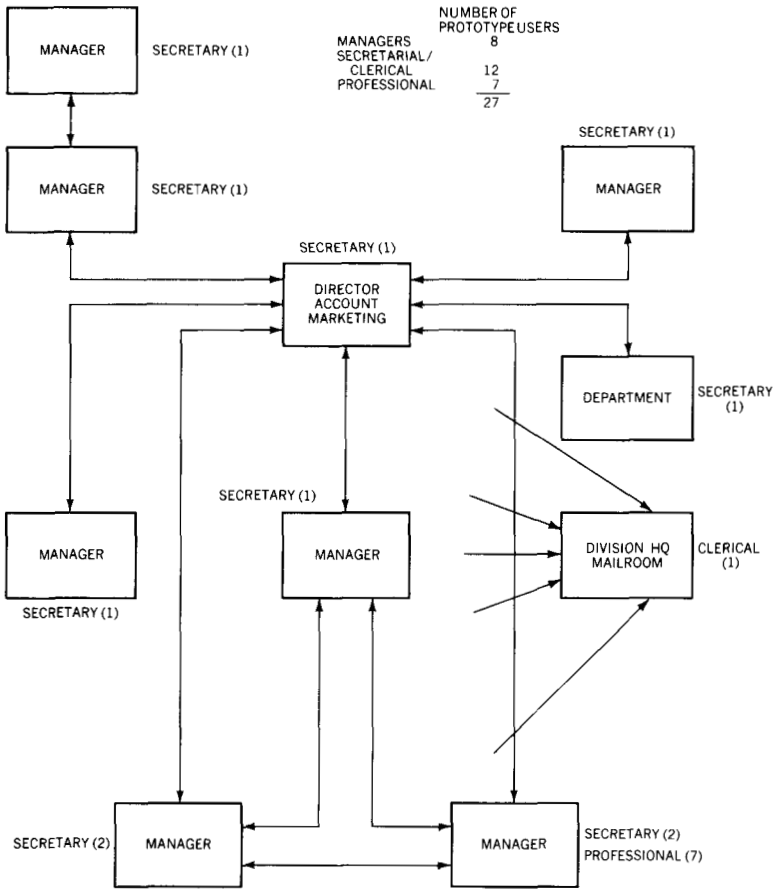
The initial task was equipment procurement, which began in September 1977. The second task was modification of the facility. Thirty-eight coaxial cables were installed, running from the computer room to the Account Marketing Department. While the computer was being installed, the user's work area was redone, and work station equipment was installed. Communication features were added to existing IBM magnetic card typewriters, tables were procured on which to place IBM 3277 Display Stations; extension cords and electrical adapters were added to accommodate the extra equipment. Extra telephones and their couplers were installed so that an IBM Communicating Mag Card/Selectric Typewriter (CMC/ST) could link to the host CPU.

In retrospect, the time anticipated for the installation period was inadequate and problems were unforeseen. Possibly a distributed system would have been less subject to facility modifications, and the attendant cable stringing that the CPU installation required could have been reduced. Whatever the design, detailed plans must cover all aspects of the installation from CPU to end user to ensure a smooth evolution into an automated office.

training

Training for the prototype users was conducted on an individual basis. Two two-hour hands-on sessions were conducted with the secretaries to familiarize each one with CMC/ST functions. An-

Figure 2 Final Account Marketing installation configuration



other two-hour session was used for instruction on the display station that complemented each secretarial work station.

The principals were treated less formally. Once the secretaries were trained and were using the system, the principals were given a one-hour hands-on session in their own offices.

All users were provided with user guides for reference.

Although procedures were discussed during the training period and an operational procedures manual was prepared, unanticipated problems occurred. Throughout the succeeding three months, sessions were held with the secretaries to discuss these operational and procedural problems. One combined meeting of principals and secretaries was also held to gather feedback from all users.

Prior to the operational period, all secretaries were requested to save the magnetic cards for the documents they created. These

cards were loaded into the prototype and provided a base of six months of information with which to begin the test period.

On April 17, 1978 the system became operational, two weeks after it was first available. It remained in Account Marketing until December 1978.

As the test period progressed, many changes occurred in the Account Marketing Department. A new director was named, the organization grew from five managers to ten, the secretarial support increased from eight to twelve and had a turnover of 60 percent, and the original eight professionals had a turnover of 63 percent. Figure 2 represents the final Account Marketing configuration at the end of the test period.

This turnover caused many unexpected operational problems but also provided an awareness of the dynamics of the office. Cables had to be restrung, new phones were installed, and electrical outlets were added to the area. These problems and the ones associated with training and education should be taken into account when planning an automated office.

system operations

As with any computer system, questions concerning the operation of the office system must be answered. What are the available hours? Who operates the system? To which organizational structure does it report? How long is information retained on line and off line?

The interview responses to the questions on availability had mostly to do with the hours of system availability rather than the inoperable time of the prototype. The users saw a need for an office system to be available from early in the morning to late in the evening. This time frame would not only accommodate the early and late workers but also make the system available for people in other time zones and for people who may travel or work at home.

Another area of operational concern is the protection of the information in the system. The prototype has the capability of setting parameters relative to (disk) space and time (days, months, years) that control the amount of information retained in the active (on-line) system. Once those thresholds of space and time are exceeded, documents (information) are rolled out of the active system to an archive (off-line tape storage).

A company-wide office system would have to take the information protection a step further. Information required by law to be retained would have to be designated and protected accordingly. Information necessary to reconstruct the business in case of disaster would also have to be distinguished and protected. Our

prototype only provided the archive-level of protection described above. The whole area of records management and protection of corporate assets must be accommodated in any automated office.

As the prototype period progressed, it became evident that an office system does not operate on its own. An operations staff is required to perform the following duties:

1. Daily startup of the system.
2. System backup on a scheduled basis.
3. Recovery operations as required.
4. Operating system maintenance.
5. Office system maintenance.
6. Application code enhancements and testing.
7. User education and liaison.
8. Equipment coordination.

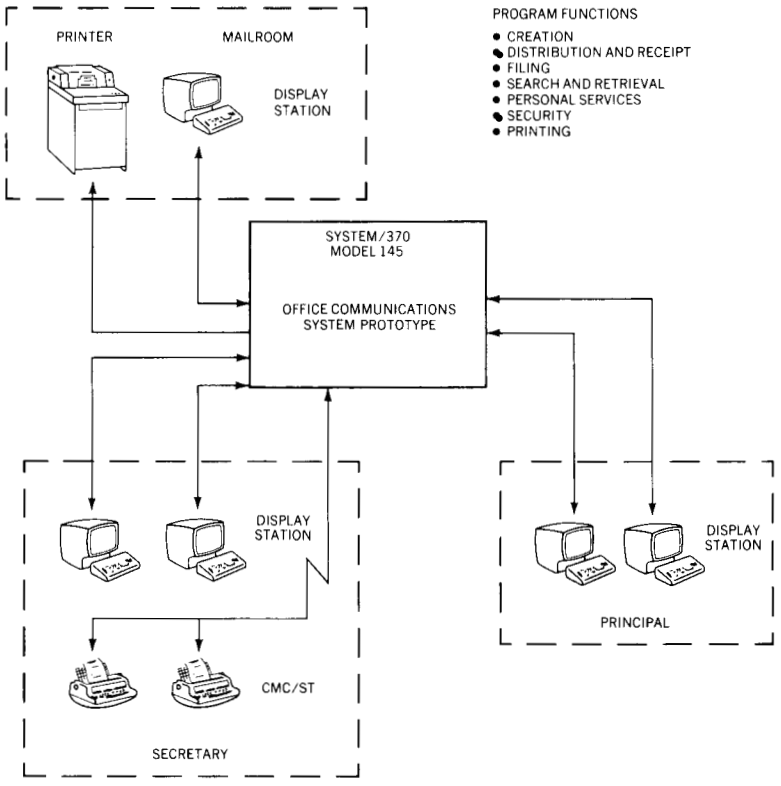
Because we were operating as a prototype installation and had a minimal operations staff, the above operational requirements became evident very quickly. Also at question was the organizational position of an office system operation. For example, in our divisional headquarters, the logical position might be in the organization that supports the branch offices. This organization has responsibility for all computers, a majority of the programmers and analysts, and the operations staff to support the division from an administrative perspective. Since they already provide a support function for many departments, they could be the logical choice to have the office systems responsibility.

Functional description of prototype system

The office communications system prototype is an internal program designed to provide managers and nonmanagerial professionals with an easy, fast, and direct method for handling their business communications. More specifically, it was to give the ability: to look at their mail, to search for and retrieve documents (memos, reports, messages, etc.), and to print, file, suspend, circulate, or pass documents stored in electronic or paper files by date/date ranges, originator, addressee, and keywords by using a display station through a channel connected to a System/370. Figure 3 illustrates the prototype configuration.

With the display station, the managers or professionals can perform all functions by selecting the action desired from a list of appropriate options displayed on the initial screen (see Figure 4) or on the lower part of other screens. They can generally use the program function keys, or for some functions, key in the information to be communicated or retrieved. There are no complex commands to learn.

Figure 3 Prototype configuration



The prototype also provides secretaries with the capability of performing all of the above activities, as well as with additional "support" functions such as entering documents and messages into the system from magnetic cards for electronic storage and distribution, defining and maintaining user records, distribution and circulation lists, and calendars/schedules, and handling print and retrieval requests. These support functions can be done using a display station or a dial-up CMC/ST.

Each of the basic and supporting functions is discussed in greater detail below.

creation and entry of documents

The creation and entry of documents into the prototype is done in the following manner. First, documents, such as letters or memos, originated by principals are typed by secretaries on a CMC/ST and follow the normal procedure that results in hard-copy forms as well as having the documents recorded on magnetic cards.

Using the CMC/ST, the secretaries sign on to the prototype. In response to a set of system prompts, they enter the magnetic

Figure 4 Selection menu: (A) Initial display (B) Extended function display

```
                                INITIAL DISPLAY              OCTOBER 3, 1977
                                                             2 USERS AT 9:45
                                                             1 IN A REQUEST

DEPRESS FUNCTION KEY TO SELECT NEXT ACTION:

    KEY 1 - FILE SEARCH (RETRIEVE)
        2 - ENTER INFORMATION (MEMO)
        3 - REVIEW SCHEDULE
        4 - DISPLAY SUSPENSE FILE (HOLD QUEUE)
        5 - REVIEW INCOMING COMMUNICATIONS (MAIL QUEUE)
        6 - REVIEW DATA PROCESSING REPORT
        7 - TERMINATE SESSION (SIGN OFF)



DEPRESS ENTER TO MOVE TO NEXT FRAME FOR ADDITIONAL FUNCTIONS.
```

(A)

```
                    EXTENDED FUNCTION DISPLAY



DEPRESS FUNCTION KEY TO SELECT NEXT ACTION:

    KEY 1 -
        2 - INDEX EXTERNAL DOCUMENT (DCR)
        3 -
        4 -
        5 - RESET TO INITIAL DISPLAY
        6 -
        7 - TERMINATE SESSION (SIGN-OFF)
        8 -
        9 - DEFINE USERS, MAIL ADDRESSES, DISTRIBUTION LISTS, KEYS
       10 - UPDATE SCHEDULE
       11 - MAILROOM PROCESSING
```

(B)

cards. After the cards for each document have been read, the system prompts for confirmation of information scanned automatically from the document, such as date, subject, addressee, and those to whom copies are to be sent. The system also requests keywords and special handling instructions (e.g., confidential, receipt required). When this is done, the system prints out a document number.

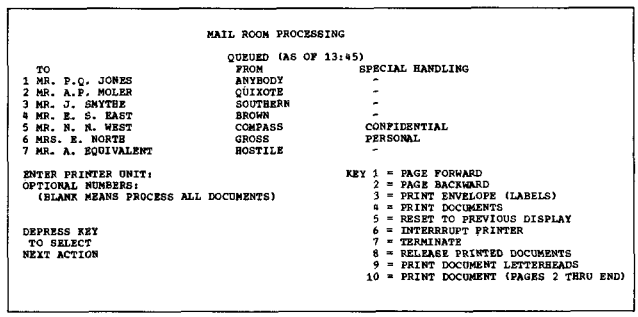
System users can also create memos on line by using the display station. The "Memo Entry" option prompts the user to enter similar descriptive information, memo content, and addressees' names.

distribution

At the completion of the memo entry process, the system automatically distributes the document to each recipient, whether individually named or on a distribution list. For recipients on the system, a descriptive entry is immediately posted in their "mail queues." This posting is the equivalent of almost immediate delivery of documents to the recipient's desk.

For the many recipients not on the system, the document is sent to the mailroom queue to permit the document and a matching

Figure 5 Mailroom processing



address label to be printed by mailroom personnel, who place the document in an envelope with the matching label and deliver it in the conventional manner. See Figure 5 for the screen on mailroom processing.

filing of documents

Besides distributing documents, the prototype automatically stores a permanent record of each document. This record, which is indexed for later retrieval by the originator and recipients, becomes a reliable substitute for the traditional hard-copy files. The indexing of documents by the descriptive parameters keyed during entry provides the ability to retrieve documents by originator to produce the equivalent of an originator's chronological file, and by keywords for a "project" or "cross reference" file.

Hard-copy documents received from external sources, and documents that contain other than text (pictures, graphics, line drawings) are indexed the same as electronically created and filed documents and can be "retrieved" by the same search methods. The only difference is that the documents are filed in an ordinary file as hard copy in sequence by the document number, which is assigned by the system when the document is indexed.

receipt and review of documents

Each user of the system has a "mail queue." Distribution of documents is reflected by an entry in the mail queue of each of the system addressees or those to receive copies. This posting of the mail queue is done in real time, and therefore, the mail queue is a dynamic facility.

The primary device for mail review and other administrative activities is the display station. The principals or their secretaries "sign-on" at the display station. The system response is a menu containing a selection of actions to perform (see Figures 4A and 4B) such as "Display Incoming Communications." Selection of this action displays the mail queue.

The mail queue consists of a series of single line entries arranged in time-of-receipt sequence (see Figure 6). Each line contains the

Figure 6 Mail queue

```
A. B. ANYBODY                        MAIL QUEUE                          MAY 1, 1977

 01 JONES          68J/DPD  04/27/77 REQUEST FOR TRANSFER - J. BROWN          AP
 02 BRANDT       --PASSED--04/27/77 MESSAGE ATTACHED, ACT BY 05/10/77        A
 03 ABERCROMBIE   E134/SCD  04/28/77 MACHINE AVAILABILITY - KINGSTON CENTE
 04 HARDLINE      C071/CHQ  04/30/77 MANAGEMENT PRACTICES - APPRAISALS       C
 05 CROMWELL       61R/DPD  04/29/77 #77-16503 MONTHLY APAR REPORT           RA
 06 SNOWFLAKE      703/DPD  04/25/77 REDUNDANT CORRESPONDENCE                *R
 07 SHUTTER        701/DPD  04/30/77 RELEASE OF PHOTOGRAPHS TO MEDIA
 08 BARRISTER      68K/DPD  04/30/77 PRODUCT ANNOUNCEMENT - 3999
 09 RETRIEVAL      REQUEST  05/01/77
 10 OVERHOLDT      802/DPD  04/28/77 FE MAINTENANCE RESPONSIBILITIES
 11 QUACKER        705/DPD  04/28/77 S & A TIME STATISTICS                     C
 12 RETRIEVAL      END      05/01/77

FLAGS:                     DEPRESS KEY TO SELECT NEXT ACTION
  A=ADDRESSEE
  C=CONFIDENTIAL    KEY 1 = PAGE FORWARD            6 = SELECT DOCUMENT
  P=PERSONAL            2 = PAGE BACKWARD           7 = TERMINATE
  O=OPENED              3 = DISPLAY SCHEDULE        8 = RETRIEVE
  #=OFFLINE #           4 = DISPLAY HOLD QUEUE      9 = ENTER MEMO
  R=RECEIPT REQ'D       5 = RESET TO PREVIOUS      10 = DISPLAY REPORT FILE
 *R=RECEIVED                PROCESS              ENTER = REFRESH MAIL QUEUE
```

Figure 7 Mail selection

```
A. B. ANYBODY                        MAIL QUEUE                          MAY 1, 1977

 01 JONES          68J/DPD  04/27/77 REQUEST FOR TRANSFER - J. BROWN          APO
 02 BRANDT       --PASSED--04/27/77 MESSAGE ATTACHED, ACT BY 05/01/77        A
 03 ABERCROMBIE   E134/SCD  04/28/77 MACHINE AVAILABILITY - KINGSTON CENTE
 04 HARDLINE      C071/CHQ  04/30/77 MANAGEMENT PRACTICES - APPRAISALS       C
 05 CROMWELL       61R/DPD  04/29/77 #77-16503 MONTHLY APAR REPORT           RA
 06 SNOWFLAKE      703/DPD  04/25/77 REDUNDANT CORRESPONDENCE                *R
 07 SHUTTER        701/DPD  04/30/77 RELEASE OF PHOTOGRAPHS TO MEDIA
 08 BARRISTER      68K/DPD  04/30/77 PRODUCT ANNOUNCEMENT - 3999
 09 RETRIEVAL      REQUEST  05/01/77
 10 OVERHOLDT      802/DPD  04/28/77 FE MAINTENANCE RESPONSIBILITIES
 11 QUACKER        705/DPD  04/28/77 S & A TIME STATISTICS                     C
 12 RETRIEVAL      END      05/01/77


 DEPRESS KEY CORRESPONDING TO DESIRED DOCUMENT.
```

name of the originator for the document or message, the originator's organization, the origination date, the subject line, and indicators showing if the user is an addressee, whether it is "personal" or "confidential," or that a "return receipt" has been requested.

By depressing a program function key, the user may initiate selection of a specific item from the queue (Figures 7, 8A, and 8B). The process is tutorial in that the actions (and corresponding keys) appropriate to the task are shown on the screen.

When the user has finished reviewing a document from the mail queue, he can select one of several options related to the disposition of the document (see Figures 8 and 9).

One option is to place the document in a suspense or "hold" status for action at a later date. If the user selects the hold queue function, a suspense date can be selected for later follow-up. The

Figure 8 (A) Mail display (B) Continuation of mail display

```
MAIL DOC. NO.    1204   WP                    RECEIVED 14:34 MAY 1, 1977
FILE KEYS - PRODUCT ANNOUNCEMENT;3999;DELAY;

Mr. A. B. Anybody          DPH61R  White Plains, NY

April 30, 1977
J. J. Barrister
Systems Management Department
68K/DPD - 1133 Westchester Avenue
White Plains, N. Y.

Product Announcement - 3999

The product announcement of the 3999 will be delayed until the required release
by the corporate legal office has been received.  We have no projected date for
receipt of the release.  Since several of your plans are dependent upon the
timely release of this device, you may wish to review your schedules and
commitments.

DEPRESS KEY              KEY 1 = PAGE FORWARD      KEY 6 = MOVE TO HOLD QUEUE
TO SELECT                      2 = PAGE BACKWARD          7 = RELEASE (FILE)
NEXT ACTION                    3 = DISPLAY SCHEDULE       8 = HARD COPY REQR'D
                               4 = DISPLAY HOLD QUEUE     9 = PASS FOR ACTION
PAGE 1 OF 1                    5 = RESET TO MAIL QUEUE   10 = CIRCULATE
```

(A)

```
If you, through your channels, learn of other impacts in relation to this
announcement, I would appreciate being advised.

                                                    J. J. Barrister

JJB/CMH
cc:  Mr. J. Q. Benefactor
     Mr. R. L. Judge

DEPRESS KEY              KEY 1 = PAGE FORWARD      KEY 6 = MOVE TO HOLD QUEUE
TO SELECT                      2 = PAGE BACKWARD          7 = RELEASE (FILE)
NEXT ACTION                    3 = DISPLAY SCHEDULE       8 = HARD COPY REQR'D
                               4 = DISPLAY HOLD QUEUE     9 = PASS FOR ACTION
PAGE 1 OF 1                    5 = RESET TO MAIL QUEUE   10 = CIRCULATE
```

(B)

document displayed is removed from the mail queue and placed in the hold queue in suspense-date (if any) sequence. This queue is similar in function, format, and content to the mail queue. Hold queue documents whose suspense date is the current or passed date are highlighted to bring attention to action that is due. The user may change the suspense date for any document as necessary.

Next, the user may "file" or "release" the document, having familiarized himself with the content and having no further reason to see the document. The document is already a part of the system "file" and will be retained by the system in current and archival storage to the limit established by the using facility.

The user is also offered the option to request a printed copy of the document displayed. Selection of this option sends a message to the secretary's mail queue requesting printout of the specific document. The secretary can then use the CMC/ST to print the document, and deliver it to the user.

Figure 9 Pass-for-action processing—initial display

```
                        PASS FOR ACTION PROCESSING                    MAY 1, 1977


DEPRESS KEY CORRESPONDING TO DESIRED NAME
       KEY 1 = STAFF, I. M.              61RDPH WP
           2 = PLANNER, I. M.            B02SCD WP   <
           3 = CHASER, A. B.             81NDPH WP
           4 = FRIDAY, M. G.             62ADPH WP
           5 = DISTRIBUTION-A
           6 = DISTRIBUTION-B
           7 = DISTRIBUTION-ALL
           8 =
           9 =
          10 =
          11 =
          12 =

PRESS ENTER TO END NAME LIST, OR TYPE "cancel", OR A NAME AND PRESS ENTER.
```

Figure 10 Pass-for-action processing—action message development

```
                        PASS FOR ACTION PROCESSING                    MAY 1, 1977

DEPRESS KEY CORRESPONDING TO THE DESIRED MESSAGE FOR I.M. PLANNER
IF THERE IS A "DUE DATE" TYPE IT IN "(BY XX/XX/XX)" AND PRESS ENTER

       KEY 1 = FOR YOUR INFORMATION
           2 = FOR YOUR ACTION                          (BY        )
           3 = PLEASE SEE ME ON THIS ITEM
           4 = PREPARE A RESPONSE FOR MY SIGNATURE      (BY        )
           5 = GIVE ME YOUR COMMENTS                    (BY        )
           6 = I WILL ATTACH MY INSTRUCTIONS ON THIS MATTER.
                 PLEASE FOLLOW THROUGH                  (BY        )


  OR, DEPRESS KEY TO                KEY 7 = DISPLAY SCHEDULE
  SELECT NEXT ACTION                    8 = REPEAT LAST MESSAGE
```

The last option displayed is "pass for action," which gives the user the ability to pass on a document to others. When this option is selected, the user is presented with a list of names of people with whom the most frequent communications occur. The user can select any of the names listed, or can key in other names at the bottom of the screen (see Figure 9). After the selections are made, the system displays a list of pass-for-action messages for each name selected such as "for your information," "please see me on this item," "give me your comments," etc. In addition to these prestored messages, the user can key in a unique message (see Figure 10).

The user can enter an optional suspense date which will be added to the message shown such as illustrated in Figure 10: "Give me your comments (by 10/14/77)." Each pass-for-action recipient can be sent a different message, or the same message, as desired. A reminder is automatically inserted into the sender's hold queue showing to whom he passed the document, the suspense date (if any) and the message (see Figure 11).

Figure 11 Hold queue processing

```
A. B. ANYBODY                        HOLD QUEUE                          MAY 5, 1977

 01 JONES          68J/DPD  04/27/77        REQUEST FOR TRANSFER - J. BROWN
 02 BRANDT         81N/DPD  04/27/77 05/10  ACRE USAGE STATISTICS
 03 ABERCROMBIE  B134/SCD  04/28/77 05/10  MACHINE AVAILABILITY- KINGSTON CENTE
 04 HARDLINE     C071/CHQ  04/30/77 05/11  MANAGEMENT PRACTICES - APPRAISALS
 05 CROMWELL       61R/DPD  05/01/77 05/11  #77-1201 MONTHLY AFAR REPORT
 06 SNOWFLAKE  -REMINDER-  04/01/77 05/12  GIVE ME YOUR COMMENTS BY 05/12/77
 07 SHUTTER        701/DPD  05/02/77 05/12  RELEASE OF PHOTOGRAPHS TO MEDIA




SUSPENSE DATE              DEPRESS KEY TO SELECT NEXT ACTION
 SHOWN WHERE
 APPLICABLE     KEY 1 = PAGE FORWARD          KEY 6 = SELECT DOCUMENT
                  2 = PAGE BACKWARD             7 = TERMINATE
HIGH INTENSITY    3 = DISPLAY SCHEDULE          8 = RETRIEVE
 FOR SUSPENSE     4 = NOT USED                  9 = ENTER MEMO
 EXPIRED          5 = RESET TO PREVIOUS        10 = DISPLAY REPORT FILE
                      PROCESS               ENTER = REFRESH HOLD QUEUE
```

Figure 12 Retrieval processing—initial display

```
                                RETRIEVAL PROCESSING

SPECIFIC REQUEST
  DOCUMENT NO.:                                        <== NUMBER OR YY-NUMBER LOC.

INDEXED SEARCH
  DATE RANGE:       04/01/77;05/01/77                  <== ONE DATE, OR DATE;DATE
  ORIGINATOR:                                          <== LASTNAME AND INITIALS
    ORGANIZATION:                                      <== OPTIONAL
  ADDRESSEE:                                           <== LASTNAME AND INITIALS
  FILE KEYS (0-8)  :                    :
                   :                    :
                   :                    :
                   :                    :

ENTER DOCUMENT NUMBER FOR A SPECIFIC REQUEST, OR
ENTER PARAMETERS FOR AN INDEXED SEARCH.  THIS WILL RETRIEVE THE AUTHORIZED OR
PUBLIC DOCUMENTS IN THE DATE RANGE WHEN THE ORIGINATOR MATCHES AND THE ADDRESSEE
MATCHES AND ANY FILE KEY MATCHES.  DOCUMENTS ARE NOT TESTED FOR A PARAMETER IF
IT IS BLANK.  TAB PAST FIELDS THAT DO NOT HAVE TO BE ENTERED.


PRESS ENTER TO BEGIN RETRIEVAL, OR
  DEPRESS KEY TO
  SELECT NEXT ACTION                KEY 5 = RESET TO PREVIOUS PROCESS
                                        7 = TERMINATE
```

Figure 13 Retrieval processing—intermediate results

```
                                RETRIEVAL PROCESSING

YOUR RETRIEVAL REQUEST HAS RESULTED IN 4 DOCUMENTS FLAGGED FOR
    RETRIEVAL.


This retrieval was for authorized or public documents in the date range JUNE 28,
1977 through JULY 6, 1977 and written to J. J. BROWN and having one of these
file keys:  3705 EP; 3705 NCU.


DEPRESS KEY TO SELECT  KEY 1 = CANCEL, REPEAT      KEY 5 = CANCEL,RESET TO
  NEXT ACTION                  PARAMETER ENTRY            PREVIOUS PROCESS

                         2 = CANCEL, BEGIN           7 = TERMINATE
                             PARAMETER ENTRY

                        10 = RETRIEVE THESE DOCUMENTS TO THE MAIL QUEUE
```

retrieval of filed documents

Filed documents can be retrieved in two ways: (1) by document number, if known, and (2) by search parameters. "Parametric search" is a search for documents based on parameters such as

date, originator's name, organization, addressee, and "file keys" or keywords (see Figure 12). The user can key in whatever parameters are known, e.g., "I would like to see all documents originated between June 28, 1977 and July 6, 1977, addressed to Mr. J. J. Brown about 3705 EP, 3705 NCU." The system scans all indexes, selects those authorized or public documents that match the parameters, and displays the number of documents found and a description of the request on the next screen (see Figure 13).

If the number of documents found is not satisfactory, the user can return to the retrieval screen and either modify the parameters or enter new ones, and reinitiate the search as often as necessary.

When the results are satisfactory, the user can retrieve the documents. The retrieval request and a one-line description of each document is then entered into the mail queue. The user can select and look at each document, save the required information, then file or remove the rest of the retrieval results by filing the "Retrieval Request" line.

Since keywords can be very helpful in a retrieval, provision is made to add keywords to a document and to equate keywords (synonyms) to be able to relate documents to many different projects, subjects, etc. (Keywords defined by the originator are displayed with the document; added keywords or synonyms are not.)

Because the prototype is not available at every location, "dial-up" support is provided for the CMC/ST. This support enables users visiting a remote location to "dial-up" their own offices and use the facilities of the CMC/ST to communicate with the prototype.

This CMC/ST support does not provide the full "browse" capability of a display screen device; however, sufficient function is available at the remote site that most day-to-day operations can be performed. For example, documents from the mail queue can be printed on the CMC/ST. The contents of the mail queue may be listed. Retrieval functions may be entered with the results printed on the CMC/ST and selected items printed back in hard-copy form. The characteristics of the device limit the volume of material that can be produced in this manner; however, use of the facility for specific "hot" items is practical.

privacy protection—data integrity

The philosophy of the prototype system is that only users who originate a document or are on the addressee or copy list for a document are entitled to access the document. Simply stated, a user sees only a subset of the total document data base. Each user of the system is uniquely identified to the system. The sign-on

procedures perform this unique identification. This process provides a logical linkage between users and the documents they are entitled to see.

The prototype assumes that the originator or any formal addressee or person receiving a copy of a document can pass the document to others. A record of this action is kept by the system, however, so that eventual distribution of documents within the system is trackable. As an example of this process, consider the "pass-for-action" facility previously described. A manager has "sent" a particular memo to a staff member for action. The original record contains an addressee list and a list of those to get copies. A third list is appended to the document in internal storage. This list is an extension of the copy list and contains the identification of the individual who passed the copy along to this new recipient. The third list also has a provision for the informal practice of making "blind" copies for internal distribution.

The prototype also operates on the philosophy that formal documents are a matter of permanent record; therefore, no facility to delete documents is provided. If a memo is transmitted in error, the memo is recreated correctly by the originator, and then reentered in the system as a new document.

Any information entered into and acknowledged by the system will be retained by the system. Power failure or other service disruptions simply cause the system to restart without data loss. In the event of catastrophic error where data is physically destroyed, sufficient facilities exist within the system to permit recovery of the data destroyed. A system of redundancy ensures protection against data loss, without significant overcommitment or auxiliary storage. Restart of the system is not affected by power loss, nor does it require manual positioning of archive volumes, etc.

return receipt requested

Not uncommon in normal office environments is a requirement to receive confirmation that the addressee (or recipient of a copy) has received the document. The prototype provides a facility by which the sender can request this action. A reminder is put in the sender's hold queue for each receipt request. The item is flagged in the addressee's mail queue, indicating that a return receipt has been requested. When the addressee selects and displays the document, the prototype will automatically post an acknowledgment on the sender's mail queue. The acknowledgment returned to the originator carries the date/time of delivery, and is posted to the permanent record pertaining to this document.

schedule and appointment calendar

The schedule is carried in system storage in a queue similar to that used for mail. Each entry in the queue corresponds to a day, with appropriate identification in the queue entry. To examine the

schedule, the principal selects a day by depressing a key. The schedule for that day is displayed, and may be paged forward or backward by key depression just as documents being viewed can be paged. The format of the day's schedule is simple, containing the hours committed, the individuals involved, and a brief statement of the purpose of the meeting or appointment. Remaining "open periods" are also indicated. Since the "statement or purpose" portion of the schedule is free text, notations to remind the principal of departure and travel time, airline bookings, reservations, etc., may be included. No limitations on the span of days that may be carried by the system are imposed. Similarly, the "work day" may be defined to the system for the individual, permitting identification of "open" slots in the schedule that match the work habits of the individual.

Entries into the schedule are made interactively, with the system soliciting the required information, and the user responding with minimal key stroke action.

The schedule may be scanned by the system and a display of only the "open" slots presented. This display may be limited to a finite period or may extend indefinitely into the future.

In any office environment, appointments are canceled, and conflicts in making them will occur, necessitating the rescheduling of affected appointments. To assist in this process, the prototype will accept new appointments for already "booked" periods. The conflict is called to the user's attention, and provision is made to reschedule the original appointments to other open time periods without reentry of the original information.

Also, to assist in setting up meetings or appointments with multiple individuals, the prototype provides a "group" scheduling capability. This process will match the open time available for each person selected, present the best time when all will be available, and indicate the persons causing a conflict. Finally, the daily schedule allows the user to enter "reminders" of nonscheduled events or actions. These are entered in essentially free-text form. Each appears as an individual item on the display of the day's schedule. Since the schedule is modified in real time, the user's display can remain current.

Conclusions

major findings

The findings of the prototype provided an excellent basis for requirements evaluation. Some very critical answers were obtained, especially in the human interface area. The population that used the system gave insight into the acceptability of the prototype functions at the level of director, manager, professional, and secretary.

Table 5 Most frequently used prototype functions by occupational group*

Managers	*Professionals*	*Secretaries*
Mail queue	Mail queue	Mail queue
Schedule calendar	Schedule calendar	Define
Retrieval	Hold queue	Hold queue
Hold queue	Retrieval	Schedule calendar
Calendar update	Calendar update	Retrieval
84†	93†	87†

*Functions are listed in descending order of use.
†Percent of total system time used by these functions.

Interviews were conducted during the test period and were used to determine the requirements of the personnel involved, the human factors acceptability of the system, and value.

While the prototype was being run, statistics were collected regarding its use. Use of every function by every participant was recorded. This data was accumulated in a data base for further analysis to determine how an office system is used.

The often-asked question, "Will the principal use an electronic work station which involves a keyboard?" was addressed. We found the answer to be affirmative if individual benefits are perceived by the principal.

Table 5 shows which functions were most heavily used by principals (managers and professionals) and secretaries during the prototype test. The top five functions represent better than 80 percent of the total system usage by these three occupational groups.

In the case of the principals, their most frequently used functions were all individual in nature in that they helped them organize and control their work more efficiently.

Can and will the principals use soft copy on displays and not demand hard copy of all their memos and letters? The prototype empirically demonstrated that soft copy, in the vast majority of cases, would satisfy not only the informational needs of most persons but also their personal security feelings.

Of note for future planning were requests for additional functions that were not included in the prototype. Among them was the request to allow access to data electronically. Budget, personnel, customer files, and personal computing were among several items

requested. Such requests indicate that the introduction of the work station in the principal's office will create a greater demand for interactive information and have far-reaching impacts on system architecture at the host, distributed node, and work station.

Ease of interfacing to the system for the user is critical. We used the function keyboard and a heavily prompted full-screen processing technique which was essentially self-instructing. As easy as we thought it was, it could have been more complete. Greater consistency of command, a help function, and phased learning that requires the user to know only what he wants to use are techniques that should be used in systems of this kind.

The interviews revealed a concern about the training received. Some felt it was adequate; others thought it should have been spread over time and reinforced periodically.

Human factors, which was another key objective of the prototype, was held to be as important as the system functions.

We found that principals are willing to use an office system terminal and that they favor the office system concept. The idea of offloading tasks to secretaries and/or systems is acceptable to the principals, who viewed it as a positive way to gain productivity in the office.

Secretaries readily accepted the prototype. They saw its potential for easing their workload and providing them with an extended career path. They also saw the prototype as promoting closer team work between the principals and their secretaries.

Although the mail-processing function (which allowed the mail clerk to print and distribute all nonsystem-user mail) provided a mechanism for installing and allowing growth of the office system in the headquarters location, there was a limit to what it could handle. In the mailroom, 40 percent of the volume comes from the payroll department in the form of checks, verification of changes in deduction, tax, and withholding forms, etc. These items will be difficult to include in electronic form until there is widespread availability of image scanners, displays, and printers and total use of an electronic office by all employees.

When asked to rate their satisfaction with the prototype on an overall basis in certain categories, principals and secretaries responded as shown in Table 6.

quantifying potential benefits

Quantifying the benefits of an office system for principals was one of the key objectives of the prototype. The methodology used to quantify those benefits was:

Table 6 Rating of prototype

Prototype category	*Principals*		*Secretaries*	
	Completely satisfied (percent)	*Needs change* (percent)	*Completely satisfied* (percent)	*Needs change* (percent)
Responsiveness	100	0	86	14
Availability	45	55	29	71
Human factors	55	45	57	43
Community of interest	9	91	14	86
Document file size	18	82	0	100
Training	18	82	29	71

1. Determine in what activities principals spend their time.
2. Provide a system for principals to use that addresses these activities.
3. Determine if the principal uses the functions of the system and how frequently they are used.
4. Calculate the time saved per principal by using the system.

If it is assumed that a principal will only use a function repeatedly over a period of time if some benefit is perceived, then the prototype has quantified the benefits to a principal.

The key to this analysis is the premise that time is of value and time savings represent potential benefits to a company. The managers, professionals, and secretaries in Account Marketing were asked to estimate the way in which they spent their time. These profiles of information-handling activities were compared with self-estimates made at other studies conducted by IBM.

The next step was to determine the impact of the prototype on these profiles. In other studies, the impact estimates were made by the study teams. In the Account Marketing study, the users included in the post-installation interviews were asked to make the estimates. Twenty percent of the professionals and 43 percent of the secretaries were willing to make estimates. In their opinions, a system such as the office communications system prototype enhanced to meet their requirements could save: (a) 5 to 25 percent of a principal's time and (b) 15 to 35 percent of a secretary's time.

Another way of stating the potential time savings is to place a dollar value on the time. A conservative approach would be to use salary plus fringe benefits as a dollar value of the potential benefits due to time savings. Assume the salary of the principal to

be $25,000 and the secretary's salary to be $10,000. In both cases, assume a fringe benefit amount of 35 percent of salary. The total cost per employee would be $33,750 per year or $2813 per month for the principal and $13,500 per year or $1125 per month for the secretary.

Applying the potential savings estimates yields these results: For the principal, a five percent savings would equal $141 per month and a 25 percent savings would equal $703 per month. For the secretary, a 15 percent savings would equal $169 per month and a 35 percent savings would equal $394 per month.

It is management's decision, quite likely at the executive level, as to the way in which these potential benefits are to be realized. Among the choices are the following methods:

1. Expanding mode: This method operates either by increasing the labor input, but at a rate less than the growth of output, or by holding the labor input constant, but increasing the output.
2. Steady-state mode: This method consists of either holding the labor input constant, but increasing the quality of the output, or reducing the labor input and holding the output constant.
3. Contracting mode: This method operates by reducing the labor input at a rate greater than the cutback in output.

Account Marketing environment

The Account Marketing principals work in an environment having many interruptions. Much of their time is spent on the phone and in meetings, both scheduled and unscheduled. They also spend considerable time away from their offices—either elsewhere in the building, at other IBM locations, or at customer offices.

Because of the nature of their jobs (creating and supporting new marketing programs), work is often done at home or while in transit to remote locations. These individuals handle information for themselves and for others.

Conversely, secretaries in Account Marketing spend most of their time at their desks. When they are absent, their work is generally covered by other secretaries. They handle information primarily for others, do not travel, and are not expected to work at home. They do, however, still operate in the same interrupt-prone environment, where they must answer phones for many principals while still attempting to complete their other tasks.

Several ideas were expressed during the interviews with Account Marketing principals that related to "deliverables" (market support aids). Currently, Account Marketing is measured according to field personnel's estimates of the impact these deliverables have on IBM marketing programs. The ideas expressed to mem-

bers of the study team related to improving those measurement ratings. Among those expressed were:

1. Use the time saved to be with field personnel helping them implement/understand the deliverables.
2. Get the deliverables out sooner.
3. Improve the quality of the deliverables.

Although qualitatively these alternatives appear to be worthwhile pursuits, they are not expressed in quantitative terms, nor were those interviewed able to assign a value. The findings in Account Marketing validated what the study team had learned in previous studies; that is, the requirements of the office, the selection of a benefits alternative, and the value of the alternative have to be decided by management, possibly at an executive level.

The other alternative for management is to allow an office system to change the way it does business. A suggestion came from the interviewing process in support of this alternative; e.g., use the electronic office system not only to create the deliverables, but also to distribute them directly to IBM field personnel. Some benefits of this alternative would be to:

1. Eliminate the reproduction of the deliverables package, which would (a) reduce production costs and (b) shorten the delivery schedule.
2. Reduce the distribution time required to get a deliverable to all end users.
3. Have the deliverable stored in the system for subsequent use after the initial presentation. Eliminate the possibility of a deliverable being out of stock or in a deteriorated form at the end-user location. Again, the value of this benefit was not quantified and could only be done by management at the appropriate level.

Regardless of the benefit analysis approach selected, the management of a company must transform the potential benefits into reality while taking into account the state of the economy, industry trends, corporate objectives, and managerial styles.

ACKNOWLEDGMENT

Our prototype was the product of many efforts, beginning with the customer joint study in 1975 and concluding with the prototype test in 1978. The authors would like, however, to acknowledge a special debt to Dan Daetwyler, manager of the IBM Federal Systems Division department that designed and wrote the program upon which our prototype was based, and then worked with us to produce the enhanced office communications system internal prototype based on a subset of the requirements defined during the customer joint study.

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Reprint Order No. G321-5102.