EMMS
ELECTRONIC MAIL & MESSAGE SYSTEMS

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TURN-ON, TUNE-IN AND DISCOVER THE SOURCE

Just as the Arm and Hammer people are credited with dreaming up new uses for baking soda such as neutralizing swimming pool water, keeping drains unclogged, and creating "no-smell" in the refrigerator, a new company known as Telecomputing Corporation of America (hereafter TCA) is pushing an old service to a new market.

Timesharing has been around for quite a few years. Primarily used for business applications, although the past few years have brought more fun-oriented games, biorhythms, and graphics capabilities to the once staid chore of chatting with the computer, timesharing originally served the needs of business by providing companies with access to computer power and technology without the need to make huge capital expenditures on data processing equipment. Technical assistance was available for inexperienced users and vendors touted custom programming services which were available at extra cost to users desiring a custom program and not able to live with the "canned program" offerings.

The Unveiling: The Source offers an entirely new dimension to timesharing -- a new audience with diverse needs and wants. Early in June, coinciding with the National Computer Convention (NCC) in New York, the unveiling of The Source took place with the usual fanfare including introductions of key personnel responsible for the "innovative breakthrough", prestigious guest speakers, and a detailed rundown of the capabilities of the emerging product/service. But there was something different about this press conference. One could feel the excitement of the people involved with The Source. Their casual yet positive stance in describing the features of the information network were fully understood after the presentation had been delivered and The Source Telecomputers were busily in use by "excited" attendees.

IN THIS ISSUE:

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STRICTLY PERSONAL
SUGGESTION BOX
SYSTEM NEWS
TRAVEL
USER DIRECTOR
VOICEGRAM
WEATHER

Table 1

Evolution Of The Source: William von Meister is Chairman of Digital Broadcasting Corporation in McLean, VA, the firm which offers the system Infocast which essentially is an information distribution network transmitting through digital modulation of the subcarriers of commercial FM broadcast stations (see EMMS 5/15/78 Vol. 2, No. 10).

Robert Ryan is Chairman of Dialcom Time Sharing Corporation of Silver Springs, MD. Both gentlemen formed TCA as a joint-venture with von Meister Chairman and Ryan President.

How Expansion Will Be Possible: TCA is funding The Source by offering franchises of retail outlets to qualified investors. Initially, six stores are planned in the Washington, DC area and 22 other franchises throughout the U.S. are expected within the first twelve months of operation.

The franchised retail units will provide sales (equipment and service), demonstrations, and seminars about applications and use of The Source. In-home demonstrations are planned complete with on-line credit checks for interested consumers. Further emphasis will be placed on providing access to The Source for those who already own stand-alone computers.

It appears that The Source will be heavily aimed to the consumer and treat small business as a secondary market. Communicating through The Source on a business level could have direct impact on EMMS technologies such as CWP and facsimile. Overnight transmission of messages (utilizing the off-peak rates) with the capability of hard-copy print out could be derived for considerably less money than messages sent via other forms of EMMS. Consider the equipment cost differences alone, and then look at the connect time fees.

Tuning-In To The Source: Access to The Source database is easy to achieve. After placing the telephone handset in the coupler, one need only dial the local access number and wait for a light to illuminate on the terminal (callers outside of the Washington, DC local calling area must instruct the network how to reach the database and must enter an additional command). The user then types his ID (account #) and password and keys the return button.

The system then welcomes the user and instructs him whether or not there is mail waiting (Mail Call). If yes, he can retrieve his mail. If no, he presses return. It is at this point that the user is in the command mode and can access programs and services available through The Source network.

There are only three major commands required for instant access of The Source: return, pause, and break.

The return command must be typed after all commands. The pause command is used

two, three or four services to peacefully coexist? TCA's marketing plan is tight, and it appears that the company knows exactly what its goals are and how to get from point A to point B. Whether or not Prestel/Viewdata has missed the boat in terms of garnering the first home information system in the U.S. remains to be seen. Are there striking similarities and/or differences between The Source and Viewdata, and won't The Source completely overshadow Micro TV's Data Transmission System called INFO-TEXT (a version of BBC's CEEFAX)?

It is entirely possible that von Meister has captured the high ground with his new service, and that the explosive growth in home information systems and services during the 1980's will not, after all, be focused on the TV set. (See the related article in this issue on teletext standards).

OFFICE AUTOMATION -- ARE MAINFRAMERS MISSING THE BOAT?

The role of the old-line mainframe computer manufacturer, once considered to be pervasive in the office of the future, is ebbing, more from a lack of strategy than from competitive forces. The companies -- IBM, Burroughs, Control Data, Honeywell and Sperry Rand's Univac -- are spectators watching the market develop rather than pacing its progress with new products. Meanwhile, pressures to try to automate the office are growing, forced largely by inflation and management's perception that it is spending too much on white collar labor with too few results.

There is confusion, controversy and skepticism about the relationship between investment in particular office machinery and increases in productivity, but there is an almost myth-like belief that something can and should be done to improve it. Yet measuring the output of a white collar staff is far more difficult and much less precise than accurately computing the results of major outlays for production equipment installed on the factory floor. This difficulty is one major reason why office automation is still mostly talk. Today, the typical capital investment for the office worker is about $2,500 compared to $40,000 for the average factory worker. This capital spending in the plant produced results; factory worker productivity has increased about 90% during the past ten years compared to 4% for the office worker. If hardware improved the productivity of blue collars, supporters of advanced function office product sponsors argue, it can do it for white collars. But at a price. A basic electronic typewriter with minimal memory retails for about $1,300 and a unit with a cathode ray tube, large memory, and communications ability will cost $15,000 to $17,000.

Despite years of trying, OPD has had only small success in dictating equipment compared to entrenched Dictaphone, upstart Lanier and Norelco. Finally, OPD, which fathered and nurtured the concept of word processing, is losing its leadership to smaller companies such as Wang Laboratories, Four Phase, and two Exxon subsidiaries, Qyx and Vydec.

At IBM headquarters, there are indications that senior management is permitting, and perhaps encouraging, the company's two other main divisions, Data Products and General Systems, to encroach on Office Product turf because of its past performance. For example, the IBM System 34 has a word processing capability, and a much more impressive 34-based word-processing package will soon be announced. Just what division will lead IBM into the era of true office automation will likely be determined as much by outside forces as by internal direction. There is a brewing organization battle in user companies between the traditional office manager and the data processing supervisor about who has the final say on office automation devices since they merge both functions. Traditionally, the "sell" is quite different to the two, and IBM is, on the whole, more comfortable as well as successful dealing with the data processing manager. Given OPD's lackluster performance, it is inevitable that outsiders will look to the company's two data processing divisions for truly automated office equipment.

Meanwhile, observers who had expected a variety of new products from IBM that would take advantage of the wideband facilities of its Satellite Business Systems "bird" are (so far) disappointed. SBS, a joint venture of IBM, Comsat and Aetna Life and Casualty, will offer error-free digital communications channels capable of supporting voice, electronic mail, facsimile, and data traffic when in service in 1981. So far, however, IBM has not made major product announcements of equipment specifically designed for what is likely to be an entirely new market. New product expectations were based on the premise that with SBS, IBM would want to control the market via its own orderly introduction of equipment just as it has tried to do with mainframe computers. But it now appears the giant simply wants to win some of the handsome profits to be earned as a common carrier.

With that in mind, IBM management apparently is following a deliberately uncoordinated policy towards the emerging marriage of data and word processing via advanced function office products, allowing each division to go its own way in the market.

As the market is now configured, IBM and Burroughs are the only two mainframe producers pursuing the office of the future, and neither company is making major innovations in product spectrum. For these developments, outsiders must look to five or six smaller companies, which EMMS will examine in a future issue.

STANDARDS FOR TELETEXT SERVICES? NOT YET!

Young soldiers, it is said, tend to be fascinated by weapons, gadgetry, equipment. As they age, their interests become more focussed on tactics, chains of command, modes of leadership and planning. The grizzled general must spend much of his time on the grander issues of strategy and politics. But eventually, age takes its toll on even the bravest of soldiers, some of whom eventually become preoccupied with medals and uniforms.

So it is in the data communications field, with the place of uniforms being taken by data communications standards. Just as the doddering old soldier will talk for hours about hats, gaiters and epaulets, so will some otherwise-reasonable data communications veterans babble on about their RS232's, their CCITT Group II's and their Bisyncs. Nevertheless, just as a smart uniform is the key to a good soldier, which is the prerequisite for a winning army, so is the standardization of telecommunications protocols the ultimate key to the future development of many types of new services.

EMMS has always tried to cover developments in the equipment, tactics, planning, strategy and politics related to electronic mail and message systems, but once in a while it is worth pointing out that standards are, perhaps, quite important in the future shape of the markets for electronic mail and messages. This is a time at which standards are pivotal in the evolution of the viewdata, or teletext market.

Viewdata, Antiope and the other systems for bringing information services into the home via the TV set are now being taken very seriously by the U.S. broadcasting industry, and common carriers also are eyeing the possible impact of teletext on electronic message services. The second-largest U.S. common carrier, General Telephone and Electronics, has negotiated with Insac Data Systems (the U.S. representative of the British Post Office's Viewdata system) and GTE may be moving into the lead in the U.S. deployment of teletext technology.

Meanwhile the French are lobbying the FCC to adopt the competing Antiope system as a U.S. standard. Sofratev, the French-government-owned organization (which is jointly run by the French PTT and the Television authority) has set up a U.S. subsidiary, named AVS Inc., to handle its U.S. licensing and lobbying efforts. Microband National Systems is going to develop applications packages for Antiope,

Probably the teletext standards question is going to be thrashed out in the marketplace, with some significant impact from the priority and funding which GTE chooses to give the rapid development of the British system in the U.S. The FCC, caught in an unusually complex situation (because both the common carrier bureau and the broadcasting bureau have strong interests at stake) will probably not come down firmly for one universal standard. And as soon as one particular system has a clear lead in the market, TV set manufacturers and others will tend to gravitate towards that particular technology, which will become a de facto standard.

MYSTERY MESSAGE SWITCHING HOUSE DRAWS BACK THE VEIL -- A LITTLE!

Which company is the largest supplier of computer message switching systems? Comten? CCI? Wrong! It seems that the honor of the largest supplier of fully-programmed message switches may belong to Computer Projects Inc., a Greensboro, NC based company which has been shipping turnkey message switches for ten years. CPI's president Bill Miller, in an interview with EMMS, named a blue chip list of customers, which include Shell Oil, GTE Sylvania, Singer, Bank of America, Honeywell and Tymshare (for Tymnet's OnTyme service). Each of CPI's switches is a custom project, with prices for the entire system varying between $150,000 and $300,000. Starting off pretty much as a one-man company, CPI has expanded to the point at which it has offices in San Francisco, Denver, Chicago and Birmingham, AL.

CPI has used Honeywell hardware exclusively for its systems, and now bases its designs around the Honeywell Level 6 minicomputer. Previously, CPI systems were built around Honeywell 716's and 516's. More than seventy message switches have been shipped altogether.

Miller uses the same basic architecture for most of his systems, writing in assembly language for maximum speed and efficiency of operation. Demand for CPI message switches is so strong that Miller employs no marketing staff at all -- like some other companies in the burgeoning electronic mail business (including EMMS' parent IRD) all the business comes in "over the transom" and by word of mouth and no salesmen are needed. CPI's service and support problems are eased by the standardization on Honeywell hardware.

Miller's current development activities are focussed upon the incorporation of more word processing and electronic mail type

Western Union International (which has no corporate relationship with Western Union Telegraph Co.) has received a Department of Defense contract to provide satellite-based wideband channels from Hawaii to California.... Siecor Optical Cables, Inc., (Horseheads, NY), which is a joint venture between Corning Glass Works and Siemens AG set up to produce fiber optic cables, has announced the appointment of L. R. Dunlop as Market Manager, Telecommunications. Mr. Dunlop was previously with GTE for 20 years, most recently as Product Development Manager for Fiber Optics....The Pacific Telecommunications Conference will be held in Honolulu January 7-9 1980. Keynote speakers will be Mr. Santiago Astrain, Director General of INTELSAT and Sir Ratu Mara, Prime Minister of Fiji. For information contact Mr. Richard Barber at (808) 948-7879.... IBM's intelligent copier/printer, the 6670, will soon be available in several additional areas of the country. Marketing activities are being extended to Atlanta, Dallas, Hartford (CT), Houston, Washington D.C., San Francisco, San Jose and Sacramento (CA). IBM expresses itself pleased with the reception obtained in the New York, Chicago and Los Angeles areas where the 6670 is currently available.... Franklin Systems Corporation (Westlake Village, CA) is positioning its optical character reading equipment, TO-2000, as a means of rapid entry of Telex and TWX messages. The equipment will read messages typed on a standard IBM Selectric typewriter, using OCR-A or -B typeballs, and the operator then has an opportunity to edit the message on a CRT before transmission. Franklin also makes a small message switch for Telex and TWX users, designated the Automatic Dialing System (ADS)... Atlantic Research Corporation (Alexandria, VA) has announced a new portable V.35 interface tester, a new line of interface converters and several enhancements to its successful portable INTERSHAKE data communications monitor....

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ROLM PLUGS CBX INTO IBM WORLD

The worlds of voice and data are merging; that we all know. But so far the convergence has been between asynchronous, ASCII devices and PBXs. Then late last year came a harbinger of a more significant development -- IBM signed a deal to procure Mitel's SX-2000 PBX to link it with IBM's computer world, which predominates inside most companies needing a large PBX.

Rolm Steals The Thunder: Rolm Corp. has stolen IBM's and Mitel's thunder by announcing a gateway from its CBX (Computerized Branch Exchange) into IBM mainframes. More significantly, the gateway performs protocol conversion so low cost ASCII terminals and personal computers can look like 3270 devices. If it works as claimed, it is likely to be Rolm's most significant announcement since the CBX itself.

The gateway itself is part of the company's Distributed Digital Network of products, an optional upgrade to a voice-only CBX that allows users to intermix voice and data devices through the one switch. Already, for example, Rolm has announced an X.25 gateway permitting users to link directly to packet networks.

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ASCII terminal users are connected to a Rolm Data Terminal Interface (DTI), which is linked to the CBX. This allows terminal users to access other data resources, such as minis or mainframes, connected to the CBX. The IBM gateway looks to an IBM front end processor as a cluster controller in either the binary synchronous or SNA/SDLC environments. Typically, IBM cluster controllers have hardwired terminals attached. The Rolm gateway, however, which can handle up to 15 asynchronous terminals apiece, has open access ports seemingly equivalent to a telephone extension. Any user connected to the CBX can dial the gateway extension and grab a port, which provides the protocol conversion. When the ports are busy, the calling terminal is automatically put in a queue and its status displayed.

Network Control And The IBM PC: Along with the IBM gateway, Rolm has announced a Data Network Management and Control software package that is the functional equivalent of a voice telecommunications control system. The package provides comprehensive usage statistics and current status information, allowing managers to assess load patterns, produce department or individual billback records and determine the current status of all devices connected to the network.

Also introduced was a board for the IBM PC that allows it to be directly connected to the CBX and thus to other data resources. In effect, the board replaces the need to connect it to a Rolm DTI device and serves as an asynchronous interface.

Impact Of The Announcement: Rolm's IBM gateway is the first between the PBX and the IBM worlds, which have up to now existed as separate islands within the overall corporate environment. Its impact is likely to be twofold. First, the gateway opens up management and planners to accessing corporate databases on a demand basis from low cost terminals. This has been available before via protocol converters, but these have always required separate wiring that made random distribution throughout an office building prohibitively expensive. The Rolm gateway will give any manager with a terminal access to IBM mainframes. Even if a company has to add new programs, it will still allow management to access up-to-the-minute operating statistics for relatively little cost.

Second, it gives planners options when establishing distributed data entry centers to update information. At present, data entry is often centralized because of the astronomical cost of placing terminals throughout the company. The Rolm gateway allows IBM PCs and other ASCII terminals to access to the mainframe from anywhere.

Overall, the announcement beats IBM/Mitel to the punch and should serve as a strong card for the sale of Rolm CBXs. It's one thing to have an X.25 gateway, which has only a small value to most companies,

and quite another to have a gateway to IBM, which holds 70% of the mainframe market and is a major expense item in most companies. The IBM gateway could well be the tail that wags the dog by giving users a valid reason for investing in a voice/data PBX.

IMPLEMENTATION: OA's ACHILLES HEEL

Over the past few years, we've written thousands of words about computer-based message systems (CBMS), most of them related to vendor strategies. Moreover, during the past few months we've expanded our coverage to include user-oriented topics like cost justification. This issue explores one of the most important, but often ignored, aspects of CBMS -- implementation. In many high-tech markets, implementation of systems is one of the least exciting topics, especially in vendor-oriented publications.

The trade press is filled with boring articles about how such-and-such company saved a few zillion a year by using so-and-so's product. While they look like user articles, don't be fooled. Every one is written by a vendor's PR department for the sole purpose of selling more products. They aren't real implementation articles. The real implementation world is often quite different, and it may just cost CBMS vendors a few million dollars per year in lost sales opportunities.

Gating Factors Of CBMS Usage: There are seven gating factors controlling the use of CBMS:

-- Cost of terminals
-- Cost of service
-- Interconnection of different systems
-- Availability of user directories
-- Definition of applications
-- User training
-- Cost justification.

The first four are vendor-related; indeed, vendors can do very little about the cost of terminals or of their services because of the economic laws governing the development and marketing of products. As for interconnection, the CCITT is working on such a standard. And directories -- well, we can forget about that. In general, CBMS directories rate from one to four out of ten. One vendor, GTE Telemail, has a directory that can take 20 minutes to search through, unless it has recently fixed the problem.

The final three factors are related to how well computer mailboxes are implemented within a user organization. If companies cannot determine proper applications, train users (and overcome the natural resistance of many) and cost justify the system, they often won't invest.

The CBMS sales cycle typically begins by convincing a customer to explore messaging through a trial project with from 30 to 200 users. At this writing, such trials are now running in as many as half of the Fortune 500 companies, perhaps more. The basic sales strategy underlying the trialing concept is that companies will recognize the value of CBMS and expand the service company-wide, which will increase the number of mailboxes by at least an order of magnitude.

The simple truth is that so far the strategy has met with limited success at best. Most of the trials have not yet led to expanded systems; this can be seen clearly from the poor performance of CBMS software sales for private in-house systems. It makes sense for a company to use a public service for a trial of a few hundred users, but when the number jumps to 2,000 plus, it is less costly to buy an internal system. But this is happening slowly.

Trouble In Paradise: There are two basic problems confronting the successful sale of CBMS. The cost of the terminals is only the first; poor implementation may be equally responsible.

An examination of one of the leading CBMS vendors provides an insight into the problems of implementation (the company isn't named to protect the guilty -- and our sources). The firm has many different divisions, with the MIS department responsible for implementing internal systems and the marketing department responsible for planning and selling the company's service.

Naturally enough, the marketing department decided to use the system internally so it could serve as a living example of the power of CBMS to potential customers. It also truly believed in its product. Thus, the department prepared a request for the MIS department to install about 125 mailboxes and 70-odd terminals for every executive and project manager in the department.

The VP of MIS, however, refused the request and put a freeze on all expansion of the CBMS because he wasn't sure it was cost justified. Needless to say, the firm had quite a power struggle on its hands between the forces of light and the forces of darkness (we'll let the readers decide who was who). To this day, the struggle still goes on, with the VP of MIS keeping an iron fist on internal expansion and the marketing department continuing to push sales.

Achilles Heel Of Office Automation: This story points to the Achilles heel of office automation. Vendors are often successful in convincing one group within a company to invest heavily in systems, but that group, in turn, may not be successful in selling the system internally. It is easy to convince companies to hold low cost trials. It is difficult to run them successfully and have them expanded into company-wide systems.

From another perspective, implementation after the sale amounts to a secondary cost. Vendors' sales strategies, pricing and budgets, however, rarely consider this as a cost. The vendor sells the purchasing agent within the

company, who may get a trial authorized, but then gives him virtually no help in running the trial. In fact, this writer has never seen implementation costs reflected in any proposal given by a vendor.

But no matter how you slice it, poor implementation is reflected in the vendors' bottom line, which depends as much on the implementation skills and resources inside user companies as it does on the skill of the corporate sales forces. You can see why poor implementation can cost vendors millions.

Vendor Stake In Implementation: At this point we could launch into a nice theoretical dissertation about implementation strategies, probably of more interest when vendors realize they have a huge stake in how well office systems are implemented. The purpose of this article, however, is not to write about how to implement, but to point out that the never-ending headache of selling office automation won't go away until far more resources are devoted to helping users implement systems. Look for more on this in EMMS, for this is going to become critical during the next few years in getting those many pilot projects now in operation to expand company-wide.

TRAVELHOST GOES ONLINE ON SCHEDULE

The videotex industry, with powerful communication giants like AT&T and Knight-Ridder, must be eating its heart out. A tiny company from Dallas, TX has stolen its collective thunder in opening, on time, a network serving as the key to getting hotels to install terminals in thousands of rooms around the country (EMMS, Feb. 1).

In an opening ceremony in Chicago, Travelhost inaugurated service at the Quality Inn Midland Hotel, the first of many chains to install terminals this year. Terminal orders have come from every leading chain, including Hilton, Westin, Marriott, Sheraton, Holiday Inn, Stouffers, Preferred Hotels, Howard Johnson's, Best Western and some independents. Already 60 cities have hotels installing terminals; Travelhost expects to have 100,000 machines in place by the end of this year and 500,000 by the end of 1985.

Something For Everybody: Travelhost, publisher of in-room city guides distributed to the hotels, pulled off its marvelous feat by focusing on the business problem of installing the terminals, not on the technical problem of developing pretty graphics. It accomplished this by literally giving something to everybody involved.

The key unlocking the hotels' doors was a barter agreement. Instead of selling its terminal for cash, Travelhost trades them for $300 worth of room space and a cut of each customer transaction. In turn, Travelhost has launched a service for travel agencies, who are expected to sell Travelhost's bartered space. Instead of the normal 10% paid to a booking agent, Travelhost is giving them 17.5%, a strong incentive for the agent to book a Travelhost room whenever possible.

American Express is also involved in the act. While we don't know the exact details, its interest is related to accounting for the complex transaction. Since most of the rooms will be paid by American Express card, the financial firm will probably act as Travelhost's banker. When the hotel submits its American Express charges for collection, Amex is likely to debit the account the money owed to Travelhost from people booked in a Travelhost-bartered room. Travelhost has signed Amex subsidiary First Data Resources to provide credit authorization and billing information for the service.

The Service: The service itself is being provided by ITT Dialcom. When the user in a hotel room presses the terminal's "On" key, he is linked to Dialcom, which will take the user's ID, established in a previous session, or his credit card number. Credit information will be sent to First Data for real-time authorization. Thus, the service can be used by new users as easily as those with existing accounts.

Users will have a choice of numerous services, including the Official Airlines Guide, local restaurants, electronic shopping, a travel club with many specials, games, news, stock quotes, job opportunities and electronic mail. In fact, a user requires an ID only if he wants to use electronic mail; otherwise he can have his credit card billed each time he signs on.

It's Still Up To The User: Travelhost has broken through the installation barrier, but now the tough part begins. It must make users like the service, a task as challenging as putting the deal together in the first place. Already Travelhost is taking what could be a costly gamble by charging users a $3 minimum usage fee for each sign-on. Someone wanting just one piece of information might decide not to bother since, for example, a user having information needs totalling 20 minutes of time would be charged about $4 for a single session, but $12 if he must sign on four separate times.

At this point, however, it's too early to say much about usage. The service will have to operate for a few months for patterns to build up enough to let Travelhost make any accurate assessment. Judging from the flexibility they've shown in setting the service up, they're more than capable of dealing with usage issues as they become obvious.

The bottom line of the Travelhost network was best verbalized by one analyst at the press conference, who said that people at videotex shows normally look at graphic images "of spaghetti being rolled onto forks and quickly get bored. At the Travelhost announcement, they were seeing dollar signs."

SBS SPAWNS "MICRO-PHONE" COMPANY

You've heard about mainframes, minicomputers and microcomputers. Well, Satellite Business Systems has unveiled a new concept that will bring to life another micro -- the micro-phone company.

Ironically, however, the micro-phone company (not microphone) will threaten the sale of small telephone systems, like key systems, and will promote the sale of PBXs. It will also affect local telcos by providing alternatives for some services.

Bundled Service To Real Estate Developers: SBS' concept is simple. It has put together for real estate developers and office building owners a service that would add a complete communications capability to the building that could be resold to its tenants. The service will consist of a building-wide PBX connected not only to local trunks, but also to a dedicated satellite earth station to provide low cost long distance services.

The building's owner would install the SBS system and resell its capabilities to tenants, much as the owner now installs heating and air conditioning systems and "resells" them. At present, of course, each tenant in a large office building is responsible for his own telephone service. For most companies, this normally means installing a key system or small PBX and dealing directly with the local telephone company (and long distance firms like MCI).

Under SBS' concept, the building's owner can set up what amounts to a micro-phone company, competing with the local telcos and MCIs of the world to provide equivalent services. Ironically, the micro-phone company, which will be the tiniest of the competitors, is likely to rely on the oldest argument of any giant firm -- get all your services from a single source and don't even worry about dealing with multiple vendors. For one rental price, the building provider will provide space, environmental control and telephone service (specified number of phones, with add-ons and long distance calling extra).

New Twist But An Old Idea: Interestingly, the idea is not new. The Teleport, set up as a giant office building/computer center complex on Staten Island, NY, has been working on the concept for a few years. Recently, Western Union and Merrill Lynch announced a joint venture to set up a private phone system there, planning 17 earth stations offering tenants direct access to all domestic and some international communications satellites.

The Teleport system is set up to handle voice, high speed data, video and facsimile traffic. It also will have its own local fiber optic cable system to accommodate wideband channels from nearby metropolitan centers. This will allow direct communications from corporate headquarters to the Teleport, which will house many giant computer centers. Already the first leg of the system, a four-mile link between the World Trade Center in Manhattan and the Port Authority building at Journal Square in Jersey City, NJ, has been installed. The home link from Jersey City to the Teleport begins construction shortly.

Customers are expected to flock to the service, which its owners say will severely undercut the telcos because of the cost of local loops, which normally run from the company's computer center to the earth station. The WU/Merrill Lynch system will only require a local loop to the fiber optic network.

Great Ideas In Theory: The Teleport is a fabulous idea from a cost viewpoint, but it's certainly not so hot from the security angle. If the concept catches on, it's likely to become the central nervous system for numerous leading companies in the metropolitan region, including banks, brokerage houses, insurance companies, television and radio networks and the print media. All that capability in one spot would make an inviting target for terrorists. But this is hardly grounds for backing off the idea; in fact, it seems to be the only negative, and a very small one overall.

The SBS micro-phone company (it's our term, not theirs) is a bit more shaky than Teleport. Office building tenants are used to their own telephone systems. Many, in fact, will probably have their own phone systems and expect to move them to new office space. The office building owner, however, will have to press hard to get them to take his phone service lest he have an unused PBX on its hands. Thus, the system could create a barrier to space sale for some companies.

But even this seems like a small problem in the overall scheme of things. In all, SBS' new service seems to have great potential for small companies, who will have access to powerful services like videoconferencing and advanced PBXs, and building owners, who can probably make a nice profit by adding a small mark-up. SBS, of course, will win by capturing all of the long distance traffic coming from each earth station, which it will link into its own DDD service competing with AT&T Long Lines, MCI and other firms in the business. The biggest losers will be key system sellers and the other long distance competitors.

A Trend In The Making? Is the new SBS system likely to be the start of a trend? It's certainly possible, although it's unlikely it will spread like wildfire. Too many companies are tied to long term telephone equipment contracts to make it easy for such a concept to spread rapidly. It seems most suited for new office buildings, which can be wired from the start to support the new system, although it's also possible to retrofit existing buildings.

Still, SBS Real Estate Communications (RealCom), the name of the subsidiary to sell the service, is on to a hot idea that industry analysts will watch very closely. Already it has its first customer -- Urban Investment and Development Co., which is planning systems for new buildings in Boston, Chicago, Denver and Philadelphia.

WASHINGTON NOTES

Competition between telephone companies and cable operators for lucrative data communications business exploded during Senate consideration of Barry Goldwater's (R-AZ) cable deregulation bill as the Senate Commerce Committee approved the measure 15-2. It is now likely that Senate floor consideration of the legislation will closely examine AT&T's charge that the current language gives cable companies a tremendous advantage over local telcos in seeking data communications traffic since cable would be completely deregulated. Goldwater is also planning hearings on the issue.

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As EMMS went to press, the Postal Service filed its E-COM rate and classification case, seeking a rate of 31 cents per page that is expected to draw a lot of fire in the weeks ahead. Apparently a new methodology is being used to determine a test year for E-COM volume, a turn of events that is likely to be the centerpiece of controversy during the rate proceeding.

Noteworthy is the fact that the USPS has drastically scaled back its volume projections for the next three or four years from those it presented prior to its launch in January 1982. Also, E-COM is beginning to look more like a Postal Service lettershop, with reply envelope insertion to be a major aspect of this filing. Obviously this will lead to strong opposition from small printers and lettershops.

Meanwhile, it looks as if the Justice Department is poised to jump back into the E-COM arena with a full appeal of the system's authorization.

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The Aspen Institute has released a new book entitled "The Future of the Postal Service." The work is edited by Joel L. Fleishman, vice-chancellor at Duke University and author of much of the material. At the Capitol Hill press conference announcing the book's release, Fleishman said he believes "the only long term solution to the problems of the Postal Service is one that includes three basic elements: repeal of the private express statutes, abolition of the Postal Rate Commission, and freedom of the Postal Service to compete fully in all telecommunications services." He warned, however, that "no element can be implemented without implementing the other two."

For the most part, Fleishman draws on four- and five-year-old Congressional hearings and postal studies in reaching his conclusions, so active postal experts will find the book already outdated. Still, it will undoubtedly be extensively quoted by advocates of "privatization of the Postal Service." The book, published by Praeger, is ostensibly available at leading bookstores for $33.

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ELECTRONIC MAIL ASSOCIATION FORMED

The formation of the Electronic Mail Association was formally announced last week by the organization's initial Board of Directors. The Association, as suggested in the last issue of EMMS, will seek to promote the rapidly-growing electronic mail industry and represent it in Washington.

Stanford B. Weinstein of Graphnet will serve as chairman of the new association; other officers include Richard W. Coughenour, Citibank, as vice-chairman, Philip Walker, GTE Telenet, as secretary, and John Barry, U.S.T.&T. (ITT), as treasurer.

Other members of the EMA Board are Steven L. Geller, American Bell/AIS, Mary Anne K. Angell, IBM, Michael Levy, Lexicon, and Walter E. Ulrich, Walter E. Ulrich Consulting. EMMS' Washington correspondent Michael F. Cavanagh will serve as EMA's executive director.

EMA's initial goals include promotion of the growth and use of electronic mail in the United States and worldwide, the continuation of public policies placing maximum feasible reliance on the private sector, rather than government organizations, for the provision of electronic mail services to the public, of the development and implementation of voluntary industry technical standards, and of the relaxation of restrictions on the flow of the information across national borders.

Committees are currently being formed by Association members, and seven new Board members will be elected in November. Membership information is available from the Association's office at 715 Eighth Street, S.E., Washington, DC 20003. Telephone (202) 547-3585.

COMMUNICATIONS PROCESSOR/TELEPHONE MANAGEMENT FOR IBM PC

Intelligent Technologies (Palo Alto, CA) has unveiled an interesting communications and telephone management peripheral for the IBM PC that goes a long way towards integrating the PC and the telephone. The product itself, called the PC Express, is a board that plugs into the IBM PC and provides sophisticated software for terminal emulation, text editing (stores 10 pages of text) and telephone control (auto-answering and -dialing, a directory and other phone features). In addition, the board also has a 300 baud, built-in modem and RS-232 interface for faster modems.

Two versions of the product are available. The PC Express I has asynchronous communications and costs $895. The PC Express II has SNA/327x emulation for $1,295. Both will be available in June.

Close But No Cigar: The PC Express is probably the most powerful communications product we've seen to date in one package designed for the IBM, but it still has major limitations. The IBM PC runs under the PC DOS single-tasking operating system. For a user to take advantage of the package, especially the auto-dialing and directory of users, it must be loaded and running. Thus, the user must keep his PC on at all times, which eats up a lot of energy and affects system life (the PC does not have the power-down capability found on units like the Mitel Kontact, Displayphone or Apple).

But even if users don't mind their PC always being on -- it's not that big a deal -- they must always have the program running. If a user is working on a Wordstar program or spreadsheet and wishes to make a phone call via the directory, his current file has to be saved and the new program loaded with a few keystrokes of commands before the directory can be searched. In all, it's probably simpler to use a paper-based directory and dial it manually.

There are, however, two saving graces. First, the telephone works independently, allowing calls to be received or placed manually regardless of the program the user is working. Second, the system will work quite well with a multi-tasking system, something Intelligent Technologies is already working on. Thus it has long term expansion possibilities. Users purchasing now will be able to use the terminal/editing/dialing features immediately, use it as an intelligent phone when not operating another program, and also be able to upgrade to a multi-tasking OS in the future.

In all, the PC Express looks like a powerful first step towards integrating mainline PCs like IBM's with the telephone. But more work must be done. Besides multi-tasking, for example, the firm should also add call timing capabilities for real-time call management and the ability to hold audio conferences. As a first step, however, the PC Express looks like a good, albeit pricy, start.

ELECTRONIC JUNK MAIL, TELEPORN BECOME REALITIES

Two of the twin terrors plaguing the consciousness of electronic mail planners for the past few years -- electronic junk mail and telepornography -- have become realities. The terrible twosome have long been discussed, but they have never really been seen in action because of the tiny size of the industry. Recently, however, both surfaced on The Source, and their presence leads to some very interesting strategic questions.

Futuretrends Dave, The Mailman And Electronic Junk Mail: One of the hottest new services on The Source is Participate, a computer teleconferencing system that seems to be growing geometrically despite only modest promotion from The Source itself. Participate, or Parti, as it's called on the system, is the potential equivalent of CB radio for personal computer users.

It works by users starting conferences or making queries seen by all of the other members of the system, who can join the conferences for an extended meeting or answer the query (EMMS, May 17 and Aug. 16, 1982). Not only is the system flexible, but it's colorful. Users can give themselves any name they want or even have multiple names.

One of the leading Parti supporters is Futuretrends Dave (Dave Armistead), who runs the Futuretrends Foundation in Austin, TX, which promotes the development and study of future technologies. Wanting to help promote Parti, he decided to send direct mail promotions to Source users via the regular computer mailbox system.

After a bit of study, Dave figured out how to randomly generate Source ID numbers to which to send Parti promotion. In effect, he created an electronic junk mail generator program. After realizing what he had done, he decided to start his own service, call it the Mailman, and resell it to anyone who wished to use it.

Squelched By The Source: Dave was midway through his first mailing, about 4,000 messages along, when The Source shut him down by closing off his ID. Apparently the number of messages generated was so high it was clogging the system's operation. The Source technicians' sleuthing tracked down the cause -- Dave's Source ID (IDs consist of a combination of six alphanumeric characters, not the person's name. EMMS' editor's ID, for example, is PS0010). And so they shut him down.

No notice was given to Dave. No attempt was made to reach him. The Source just cancelled him and referred him to the legal department. Needless to say, Dave was furious and went on Parti to let everyone know about the cavalier treatment. In fact, he started a user's union conference and told the story of how The Mailman was shut down.

This opened up the issue of electronic junk mail for real, with most Source users opposing the concept in their comments on Parti. There are two reasons for being against junk mail (unsolicited messages of a commercial nature). The first is that mailboxes can become filled quite quickly, making it difficult to determine which message to read. The second, and probably more significant, is that users pay to read their mail on most mailbox systems while senders pay only to write the message (no charges accrue to sending messages to multiple users). Thus it is very expensive to read 4,000 messages but very cheap to generate them.

This makes a system like The Source a potential heaven for unsolicited messages, which today, at least, cost the sender a stiff price per piece. On systems like The Source, the cost is chicken feed for the sending. While The Source had not yet developed a policy on the sending of electronic junk mail -- at least none that appeared in print -- it quickly enough let Dave know that what he had done was wrong.

Should Big Brother Be Watching? This raises the interesting issue of the precise role of the service provider. Should it be able to cavalierly step in as The Source did to put a stop to what it thinks is a poor practice? We're not going to get into it any more than to point out that today this is barely an issue. But with millions of users on systems, it's likely that someday society will have to step in to define the ground rules, not leave it to the service providers. We wouldn't, for example, stand for AT&T monitoring the content of telephone calls and cutting service off to those saying the wrong things.

Teleporn Conferences Are Also Flops: The second practice that has reared its head is telepornography. A new series of Source conferences have been started by someone named Eros IV, who wants consenting adults of any sex to find each other for erotic conversations and perhaps to arrange a meeting in person.

So far these conferences have been total flops, having generated no responses. But they've only been on the system for about two weeks. In addition, the user base is probably 85% male and from widely dispersed geographic regions -- unlikely candidates for such a service. If the conferences do take off, with Parti becoming a major place to vent erotic literary flare (gently, he stroked the pebbled casing of his floppies) or for prostitutes to advertise their wares and fees as they did via CB, The Source will have another issue on its hands. Should it step in and stop it?

Two years ago, when we first wrote about teleporn, it was really just a thought in our twisted minds. Today, however, these issues are becoming real. At the moment, it's in the infant stage, but we wonder what will happen two years from now....

SEMINARS/CONFERENCES/EXHIBITIONS/PUBLICATIONS

TeleStrategies will present a two-day conference on Telephone Bypass Opportunities And Local Access May 18-19 in Washington, DC. Designed to provide an understanding of industry dynamics and competition, it will focus on the key areas of bypass technology economics, local access and charges, and joint venture contracts. Among the sessions will be Cellular Mobile Radio as a Bypass Alternative and Teleport Approach to Regional Networking. For more information contact TeleStrategies at 6842 Elm Street, Suite 102, McLean, VA 22101. Telephone (703) 734-7050.

A listing of communications courses scheduled through June is now available from George Washington University. Among them is Data Communications Standards: Interfaces, Protocols, and Network Architectures, offered May 31-June in Washington, DC. For more information contact Continuing Engineering Education, George Washington University, Washington, DC 20052. Telephone toll-free (800) 424-9773 (in DC 202-676-6106), or telex 64374.

IWP (which is changing its name to AISP effective June 1) is sponsoring Syntopican XI on June 13-16 in the Moscone Center of the San Francisco (CA) Hilton. Included will be technical/managerial lectures, workshops, panel discussions and an exposition of products and services (which currently has more than 90 scheduled participants). Among the sessions are What the Heck is Electronic Mail?, Computer Conferencing and Teleconferencing, State of the Art: Videoconferencing, and The Personal Computer in Context: A Link in the Office System. For more information contact the International Information/Word Processing Association, 1015 N. York Road, Willow Grove, PA 19090, or phone conference services at (215) 657-6300.

The American Institute for Professional Education is presenting the three-day seminar Local Area Networks June 15-17 in Orlando, FL, June 22-24 in Chicago. IL, and June 27-29 in Stamford, CT (locations scheduled for July are Scottsdale, AZ, New Orleans, LA, and Anaheim, CA). Designed for EDP professionals with responsibilties for planning, installing or managing a network, it will cover, among other things, the essentials of development and evaluation, specific user needs, possible applications and security, integrity and maintenance planning requirements. LAN architecture, transmission standards and network-to-network communications will be examined. For more information contact the American Institute for Professional Education, Carnegie Building, 100 Kings Road, Madison, NJ 07940. Telephone (201) 377-7400.

Ontario's Transportation Energy Management Program (TEMP) is sponsoring a two-day Canadian conference on audio, video and computer teleconferencing June 20-21 in Toronto. Teleconference '83 will include an exhibition, workshops, and general, hands-on and informal sessions. For more information contact Sue Bartlett, Teleconference '83, Box 1900, Rexdale, Ontario M9W 5L7, Canada. Telephone (416) 675-7420.

ITEMS OF INTEREST

Dean Meyer & Associates (Ridgefield, CT) has conducted the first of an innovative series of seminars on office automation held by teleconferencing. The seminar, called Teleforum, uses the Connex audio conferencing system to hold the meetings without participants leaving their offices. The featured speaker at the first conference was Dr. Tom Lodahl, leading OA consultant. According to Dean Meyer, more than 100 people from 16 companies listened in on the 2.5 hour discussion.

The largest group was from the British Civil Service, which had 40 people listening from across the Atlantic....There has been a blizzard of small, lightweight terminals and microcomputers during the last few weeks. The latest is called Postmark 300, which has a full-size keyboard, 16-character look-ahead display, 80-column thermal printer and a tiny mag tape cartridge for message storage. It is designed to function as a dumb terminal to interact with central mailbox systems or as a direct terminal-to-terminal device in a network of Postmark 300s. At $1,095 it seems to be one of the best designed units we've seen on the market. It is manufactured by Post Technologies (Menlo Park, CA)....Amtel (Sunnyvale, CA), one of the first companies to move into the low cost messaging terminal market, has also introduced a new system, consisting of three modules that communicate over local building wiring used as a LAN. The first unit is the Executive, which has only five buttons associated with messaging tasks. The second is the Master, a full keyboard unit. The third is the Printer, used for printing out messages. They range in price from $300 to $400....Diablo Systems (Hayward, CA) has struck back at the Japanese printer manufacturers threatening the long-standing leader in daisywheel printers. Diablo has introduced a complete new line of products ranging from a new line of daisywheel units (the 620 Plus) to a series of dot matrix printers, a color printer and an elegant plain paper, non-impact unit that prints six pages per minute and costs about $5,000. The $1,095 color printer, called the Series C, uses ink jet technology and is designed for personal computers, as is its line of dot matrix printers that operate at 100 cps. The non-impact printer, the Series 200, uses a raster-scan thermal print head that does not require a specially coated paper. It works by fusing black ink onto the page by energizing the print head. In all, it's an impressive array of new products and technologies....While IBM is busily setting up an electronic mail network for its personal computer dealers, two other leading vendors have announced either dealer or user networks with electronic mail conspicuously absent. Long ago we commented on the cobbler's children syndrome that sometimes afflicts high tech firms, but the latest moves almost baffle our imagination. The first company is Altos (San Jose, CA), which has set up its ASAP dealer program to distribute software for the Xenix environment. It comes complete with an 800 toll free number to place voice orders. What about using the computer with an order form program and maybe the ability to send questions, etc.? The second is Radio Shack (Fort Worth, TX), which has given its blessings to a private user's group for "members [to] exchange ideas regarding their individual and collective corporate computer applications." Their first annual conference is being held May 9-11 at the Americana Hotel in Fort Worth. What about computer conferencing for a meeting that runs from Jan. 1 to Dec. 31?...While we're not sure whether its new user group plans to use electronic mail, Radio Shack has announced the availability of Arcnet for its Model II and 12 microcomputers. Arcnet is Datapoint's local area network technology and can be used to link up to 255 systems with an interface available at Radio Shack computer stores for $399. The hub to interconnect processors, also a necessary component, is available for $995 to support 8 units. In addition, Radio Shack also sells coaxial cable at 21 cents per foot....Rolm (Santa Clara, CA) has filed a suit against Plessey Telecommunications (United Kingdom) charging the firm with misusing Rolm technology and copyrighted software. Rolm is accusing Plessey, which once was a Rolm licensee, of stealing the software for Plessey's new IDX PBX....Satellite Business Systems (McLean, VA) has filed to include Alaska and Hawaii in its satellite network beginning in 1986. In

another announcement, SBS and Geosource, Inc. have announced a new joint subsidiary Geo/Sat Comm (Houston, TX) to provide communications to the oil industry via direct links between earth stations at oil exploration/drilling sites and corporate headquarters. The company's scope will include both the continental U.S. and the Alaskan North Slope....Another competitor to the IRCs has set up shop. Worldnet Communications (Los Angeles, CA) has set up a network of IBM Series/1 minicomputers located worldwide that handles messages from ASCII, TWX and telex terminals and IBM mainframes using the 3780 protocols. Worldnet claims it can shave 40% from international telex costs. Special services for users include departmentalized billing, 90-day message archiving, "up to the minute" tracing reports and mini codes....Convergent Technologies (Santa Clara, CA) has signed an OEM agreement with Prime Computers for its high-powered workstation, already carried by firms like NCR and Burroughs....RCA Global Communications (New York, NY) has added an innovative upgrade to its store-and-forward Telextra and Databank services that allow word processors and personal computers to send international telex messages. The service allows real-time communication between a 300 bps CWP or PC and a telex machine. This really turns a PC into a telex terminal.... Tymnet (San Jose, CA) has introduced a micro-based version of its Engine packet network node to compete with concentrators from third-party companies. These devices are valuable because they allow companies to set up their own private access to a packet network, avoiding the continual problem of overcrowded public access ports. Tymnet's new concentrators are the Micro 1 and 2. The Micro 1 is set up to handle 16 asynchronous terminals and four synchronous channels, while the Micro 2 can handle 16 async terminals and 8 synchronous devices....Hughes Communications chief Clay T. Whitehead is leaving that Los Angeles, CA, company to pursue a private business in the communications and information industry. Whitehead will be replaced by Steven D. Dorfman, the company's executive vice president.... Western Union (Upper Saddle River, NJ) has permanently retired Westar I, which will eternally orbit the earth about 40 miles beyond its previous geostationary track....The FCC has licensed the First Communications Group (Coral Gables, FL) to provide enhanced data, voice, and video telecommunications services in 14 major markets. The company's FirstNet offering is to be marketed with telephone companies and cable operators and transmits in excess of 2 million bits per second....In a similar arena, Sydis Inc. (San Jose, CA) has unveiled its VoiceStation, an integrated terminal capable of handling voice, data, text, and graphics. operating over existing telephone lines, the unit is supported by a XENIX-running Sydis Information Manager, a 68000-based multiprocessor that will support from eight to 300 workstations. The company says a typical configuration will cost from $6,000 to $7,000 per user....Panasonic (Secaucus, NJ) has announced the availability of a 3-inch floppy disc drive. Called the EME-101, it is compatible with 5.25-inch disc interfaces. The company is also selling the 3-inch discs to be used with the drive; these go by the name of EBF-3....3Com Corp. (Mountain View, CA) has signed 25 retailers to distribute its EtherSeries line of products, which link IBM Personal Computers; the company claims to have sold 1,000 EtherLinks since the beginning of the year. Among the early retailers to sign up are Businessland (San Jose, CA), FuturByte (Montreal, Quebec), Morris Decision Systems (New York, NY), and independent ComputerLand stores....GTE and the Department of Justice have come to terms over the former's acquisition of Southern Pacific's communication satellite and Sprint long distance telephone businesses. At base, GTE must follow the same structural restrictions imposed upon AT&T by the Computer II inquiry.

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Protocol Conversion & IBM PCs; PCs, Electronic Banking & the USPS; Datapoint's ITMS; Modems; Xerox 1810 Pro Workstation; Five Rolm PBX Additions; British Fiber Optics Network; MCI/Amex/RCC Paging/E-Mail Service; Participate Computer Conferencing System; IXO Telecomputer Take-Off.

Highlights from Recent Issues:

Dec.	15, 1981:	Rent an Ethernet, ACS Attack on IBM?, Savin's Electronic Office.
Jan.	4, 1982:	'81 Electronic Mail Dev't, Airfone, MCI Going Int'l, IRC's Deregulation.
Jan.	15, 1982:	AT&T Antitrust Settlement, IBM Antitrust Suit Dropped, Two-Way Walkman.
Feb.	1, 1982:	Workstation Software for Micros, Electronic Filing, More S's of EMMS.
Feb.	15, 1982:	Secret AT&T Voice/Data Scheme, IBM's Timesharing Biz, Portable Micro.
Mar.	1, 1982:	Ethernet vs. IEEE 802, Data Entry via Facsimile, Flat Panel Displays.
Mar.	15, 1982:	AT&T's Packet Switching Svs., Electronic "Notepads", Xerox Laser Printer.
Apr.	1, 1982:	N. American Telex Service, Inside ECOM, WU Reenters Int'l Telecom.
Apr.	15, 1982:	Embattled E-COM, RCA/ITT Telex War, HP E-Mail System.
May	3, 1982:	IBM & Office Comm. Standards, Teletex & CBMS, Conflict in Xerox's OPD.
May	17, 1982:	NEC Moves Into Fax, IXO Telecomputer, Low-Cost Workstations.
June	1, 1982:	SBS's E-Mail System, AT&T in PABX & Cellular Radio, Portable Computing.
June	15, 1982:	Execunet, Int'l Telex: WU vs. IRCs, Daisywheel Printers, E-Commentary.
July	1, 1982:	Xerox & HP on Local Networks, Recession & the E-Mail Business.
July	15, 1982:	Cellular Radio Upset, American Bell's AIS/Net 1, Largest Ever Fax Order.
Aug.	2, 1982:	IBM in PABX Market, NBS Messaging Standard, Paper-Based E-Mail.
Aug.	16, 1982:	Greene OKs Antitrust Settlement, Search for E-Mail, BPSS Tariff Rejected.
Sept.	1, 1982:	BOCs New Lease, Kontact Workstations, EMCA Finishes Funding, ITT Faxpak.
Sept.	15, 1982:	MHF Standard, Isacomm Develops ANS, CNCP/Dialcom Deal Made, DowAlert.
Oct.	1, 1982:	Voice Mail: ECS and Beyond, IBM & TI LAN Chip Deal, GTE & AMA's AMNET.
Oct.	15, 1982:	Congress Views E-Mail and USPS, GTE Buys S. Pacific Comms, PCs & Comms.
Nov.	1, 1982:	Pitney Bowes In Fax, 3Com Ethernet Board, Intel LAN Products, Teleforum.
Nov.	15, 1982:	CBMS Comparisons, Cutting Costs With PCs, Bell Canada & the Gov't, Csnet.
Dec.	1, 1982:	Dialcom Leads CBMS Field, Stability for Fax Leaders, PCs: Hot Xmas Item.

EMMS back issues cost $10 apiece. However, there is a 50% reduction if you purchase all of the 1982 issues to date. Complete sets of 1978, 1979, or 1980 issues are available at $125, the 1981 volume at $170, and the 1982 volume at $210.

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USPS MAKES ITS REAL MOVE IN ELECTRONIC MAIL

The U.S. Postal Service has very quietly made the most significant move possible in its efforts to enter the electronic mail business. During its recent tariff refiling with the Postal Rate Commission, in which the price of the first E-COM page was raised from 26 to 31 cents and the second page upped from 5 to 9 cents, the USPS eliminated the requirement that users have a minimum of 200 letters per serving post office (SPO), presumably allowing anybody to receive an account. (See Washington Notes for some surprising post-filing revelations.)

If the tariff goes into effect, it opens the door to the USPS becoming a direct electronic mail service to millions of individual customers rather than being a once-removed "carrier's carrier" to large third-party E-COM resellers or to only a small number of elite major mailers.

The 200 Minimum: During its first year of operation, E-COM has had only limited success, with most of its traffic coming from users not taking advantage of the service's speed, but instead of its low price. These users have sent mailings to one SPO regardless of the letters' destinations in order to meet the 200 minimum.

IN THIS ISSUE:

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In theory, a mailer sending nationwide should have a minimum of 5,200 letters before using E-COM. The USPS, in fact, expected to have a relatively small number of large users as its primary customer base, figuring to attract firms like Sears, American Express, the oil companies and other big billers who would use E-COM for invoicing, direct mail, dunning, etc.

Electronic mail for the masses, quite frankly, wasn't something the USPS was thinking a whole lot about. Initially, it expected that small users would be served by third-party carriers that bundled traffic from many small users. In this way, the USPS would have a well-controlled accounting system and everybody would be happy.

Theory And Practice: The way it was supposed to be and the way it is turning out are two very different animals. First, E-COM has not attracted its intended audience. The Sears, Exxons and other major mailers of the world have not flocked to E-COM. From this perspective, the service has been an absolutely dismal failure. One major stumbling block has been the lack of a return envelope. In its filing with the Postal Rate Commission, the USPS plans to change this by allowing a return envelope for an additional four cents. This should enhance the service's attractiveness to large mailers.

Another problem has been the third-party carriers, who have looked at E-COM as a license to print money but apparently overestimated the price people are willing to pay. While the USPS charged 26 cents a message, the third-party carriers were adding up to $1 on top, making E-COM comparable in price to Mailgram. This takes away E-COM's major advantage over Mailgram (price), forcing the user to focus on the major disadvantage -- speed.

While third-party carriers started out with good intentions, the same cannot be said of their performance. They have been unsuccessful, so far, in capturing the imagination of small users. The man on the street certainly has no incentive to pay Western Union Electronic Mail $10 per month for its Access service so he can send E-COM's at $1.05 a pop.

That E-COM certainly hasn't reached its target market doesn't mean the service has failed. For example, it has succeeded in reaching an audience of direct mailers using E-COM as a low cost means of sending out junk mail. They skirted the 200 minimum per SPO by sending messages to one SPO regardless of the address. The direct mailers, in fact, saved E-COM's life, and the return envelope is aimed at keeping this business. But the real move in the new filing is the elimination of the 200-address minimum per SPO, which opens the door to a major new service.

No Minimum & The Masses: In theory, eliminating the minimum will allow people with personal computers -- both business and home users -- to send E-COM messages with low cost software added to the PC. The USPS could thus end up with millions of E-COM accounts, handling 40 cent letters that will be delivered within two days.

This doesn't mean that such a service is imminent; the USPS simply isn't geared up to handle the many requests for service that would ensue. Furthermore, the intention behind eliminating the minimum is to promote transmission directly to the SPO nearest the addressees. Presently, many users send all of their traffic to the closest SPO and let the USPS deliver them as first class mail regardless of their destination. This has caused much concern that the service isn't being used as intended.

Eliminating the minimum was seen by many USPS officials as a way to encourage proper usage by large mailers. Nevertheless, it also opens the door to a service for individual users as well. For example, why bother with a return envelope for a user with a home microcomputer? Instead, the USPS can give a return E-COM address and the user can send it electronically.

Long-Term Evolution & New Billing: The present E-COM system really isn't set up to handle many users, although there's nothing to prevent the USPS from adding more direct dial and packet switching ports to handle such traffic flows. The real problem the USPS has is in its billing system.

By law, the USPS cannot extend credit to customers. Thus, people must buy stamps in advance or use postage meters for regular mail. To solve this problem with E-COM, the USPS set up an elegant real-time billing network. Customers pay in advance for an account on a computer in Wilkes Barre, PA that is linked directly to every SPO. When a transaction is sent, the SPO queries the accounting computer for authorization and the customer's account is debited.

This is fine for transactions with a minimum of $52 per SPO, but it isn't at all suitable for transactions of 41 cents. In effect, the door is open to an electronic mail service for the masses, but the accounting system currently in place would have to be larger than Mastercard's to handle the potential traffic.

If the USPS plans to move to a direct electronic mail service, it will have to change its rules on collecting money in advance, probably having to make some sort of deal with Visa, Mastercard and American Express. To make such a service economical, it will probably have to consolidate its accounts and bill people monthly.

The Regulatory Scene: E-COM's critics haven't been happy with the service at all. Not only has it been labeled an under-priced electronic turkey, but the critics have also scalded the USPS for handling electronic junk mail without charging a compensatory rate. The USPS' initial intention was to capture large mailers like Sears, but these have not flocked to the service. E-COM went after local junk mailers because it was forced into this position. It would have much preferred to deal with large, nationwide mailers sending bills, dunning notices, product recalls, etc.

The present filing with the PRC will certainly meet with severe opposition from the large telecommunication firms, who want the service to at least charge rates consistent with its costs. This, of course, puts E-COM back where it started -- in a sort of regulatory limbo.

The USPS & Electronic Mail? The prospect of the USPS serving millions of users directly is an intriguing one. The Postal Service today delivers letters physically deposited in the mail stream by millions of customers. Why not let the same people send them in electronically? It certainly seems in the public interest unless one wishes to challenge the right of the USPS to have a monopoly on mail delivery in the first place.

The issue, however, is more subtle than that. E-COM is really a bundled service connecting the printing and delivery of mail. If the USPS can have a print shop located on its facilities to receive messages that bypass the physical sorting system, why can't competitors set up their own print shops and deliver bundles to the USPS for delivery within the same SPO? To do this, however, the USPS would have to break up the entire concept of a single, nationwide rate regardless of distance. In effect, competition in this field would require the USPS to unbundle its tariffs and set up a zoned system. People sending across zones would pay for the physical sorting or they could pay less by sending the letter via an electronic mail service. But would this be in the public interest, especially since it is only a matter of time before letters are sent to electronic mailboxes anyway?

In short, the USPS' not becoming involved in terminal-to-terminal traffic may be a disservice to the public if E-COM -- or a more suitable evolution -- is forever tied up by regulators. Messages are cross-elastic. Today, for example, the leading message service is the telephone. But how many people would rather put it in writing instead of making a call if the mail were fast and inexpensive? With the advent of highly-intelligent personal computers that are going to be in homes anyway, it seems to make sense to let the USPS carry terminal-to-mail traffic for the lowest cost possible. This, however, isn't the reality of E-COM. Instead, we have a troubled service embattled in the regulatory arena, and with little prospect of solution in sight.

AT&T VOICE/DATA MODEM SERVICE SURFACES IN FLORIDA

EMMS doesn't go after scoops like most of the trade press; this isn't the purpose of a non-daily publication, or at least it shouldn't be. We pride ourselves on our analysis, and our readers' comments have certainly more than justified such an approach. Nevertheless, such scoops often come our way. During the past year, you've first read about many products and services in these pages.

One of the most interesting appeared in the Feb. 15, 1982 issue, when someone in AT&T leaked to us information about a new hybrid voice/data transmission and switching technique that would allow a twisted pair of wires to carry a voice/data signal without converting the entire network to an integrated digital system. The concept is anchored on a new type of modem that allows voice and data signals to be carried simultaneously on the same wire. The phone company's central office would have a bank of modems corresponding to the voice/data modems installed on customers' premises. Voice calls would then be routed through the normal central office voice systems and data calls through packet systems.

The concept has two main benefits. First, it will give new life to old central offices, which will no longer be threatened by small computers (and long holding patterns) overloading the switches. Second, it allows local telcos to move to measured local service without putting a damper on computer communications, which now benefit from "free" local calls. The local telco, under the concept, would establish two measured services, one for voice and the other for data.

New Services Can Ride The Data Tariff: A dual tariff of this type can open the door to many new services, such as alarm monitoring, remote meter reading and other customer data collecting schemes. It can also be used for regular data communications and will serve as a bridge to the Integrated Services Digital Network (ISDN) under development on a worldwide basis by telcos.

When we broke the story a year ago, we only had some apparently internal AT&T documents to go on. The implications also weren't as clear then as they are now. For example, we weren't certain about whose packet network would carry the ensuing traffic. At this writing, however, it's all a bit clearer. Bell has filed a tariff for the new service in a trial in Florida that will charge users two cents per minute for data calls.

This is going to be acceptable, if not popular. Users will be able to connect to any packet network, so they will also have to pay the packet charges as well. But it is a small overhead in comparison to what it might cost if local telcos went to measured rates for all local calls.

Whose Packet Network? But now we get to the interesting part. When Federal Judge Harold Greene ruled that the Bell operating companies could do more than dish out basic telephone lines (EMMS, Sept. 1, 1982), we realized that the

BOCs could set up regional packet networks by going the same route AT&T has with its Basic Packet Switching Service. It would be a regulated service that would not provide any value-added services, such as packet assembly/disassembly

On the surface, this doesn't seem too exciting or threatening. Our initial reaction was that it would allow companies to get their own packet assembly/disassembly (PAD) devices and set up hybrid packet networks. Still, most firms would be just as well off by going directly to today's packet networks.

X.25, LAPX & Personal Computers: Things have happened so fast in the PC world that we're now changing our opinion. The little window that allows a basic packet switching network to operate as a regulated service can potentially turn into a gigantic cavern that threatens the concept of unregulated competition in value-added services.

This won't happen today or for the next two to three years, but by later in the 1980s, the packet switching business could be in for some very rude shocks. The X.25 interface that has been expensive to implement and is now only suitable for hosts or terminal concentrators is going to migrate downwards to terminals via the LAPX protocol under development within the CCITT.

At the moment, the CCITT has recommended two LAP standards, which determine the level II signalling between devices and a packet network. Both LAP standards (LAPA and LAPB) are used by hosts or terminal concentrators to link directly to the packet network. The LAPX protocol is designed for personal computers so that concentrators aren't needed. By the middle of the decade, the protocol could be as commonly available and inexpensive as the RS-232 interface is today.

LAPX is being viewed as a tremendous boon to the packet industry because it will popularize X.25. By the mid-1980s, however, it could turn into a nemesis of the packet industry as we know it today. The key is where the packet will be assembled and disassembled. Right now, memory is too expensive for terminals to do their own assembly/disassembly. By the mid-1980s, however, most business micros will probably be able to handle assembly/disassembly with ease. Even the home micros of that day might do so as well.

Should all three levels of the CCITT X.25 standard migrate to the terminal, then packet networks will go full circle from value-added networks to little more than pipelines for formed packets. About the only intelligence left to the packet networks will be in serving as a means for non-IBM terminals to link to IBM mainframes.

While such a migration of intelligence will not happen overnight, it will clearly have enormous implications for packet switching carriers, who will find their investment cycles shortened considerably. All of the money pouring into ultra-intelligent nodes will have to be recovered in a much shorter time. In addition, the BOCs and AT&T, which can only invest in basic packet networks, will have a strong edge. They can pour their resources into developing large,

basic switches, while the other packet vendors must still put money into value-added intelligence. It is the equivalent of timesharing companies putting money into developing online financial planning packages (see next story).

A Path Of Mixed Blessings: The dynamics in the packet switching business put carriers on a path of mixed blessings. On the one hand, packet switched traffic is heading for an explosion of growth from two directions. First, home and business personal computer users are moving into the market in droves; by the mid-1980s, they should be stampeding in that direction. Second, the sancrosanct IBM world is also opening to packet switching vendors, which holds an even greater traffic potential over the short run than home and PC users.

The key question, however, is whether the value-added carriers will benefit by this movement. On the surface, the PR departments can point to all the positive signs, but deep in market planning there has to be some people worrying about whether the value-added is going to move right out of the networks and into terminals. Clearly, of course, some value will be required. But how much?

Most users in medium and large companies will be able to do all their packet assembly/disassembly in concentrators sitting on their premises, such as is the case with the new Rolm gateway to the IBM world. Home and business personal computer users in small companies may have their packets assembled locally as well. Where does that put the packet carriers, who have invested millions in their value-added switches? Things look rosy right now, but by 1985-86, AT&T and the BOCs, with their basic packet networks, could well be the hottest players in town.

BAD NEWS FOR TIMESHARING COMPANIES?

The timesharing industry has heard how microcomputers are going to wash it away almost since the advent of the Apple. So far, however, the industry has survived quite nicely. VisiCalc and its derivatives just do not have the power to match the complex financial planning packages that have been developed by the timesharing industry.

Financial Planner By Ashton-Tate: The low power of VisiCalc & Co. has kept micros in the background; indeed, the timesharing world has been only threatened in words, and even then we've never seen any direct attacks. But Ashton-Tate (Culver City, CA) has changed this by being the first company to mount a head-on campaign against timesharing with an advertisement captioned, "If you stick with timesharing after reading this ad, you haven't read this ad."

The ad is for a package called Financial Planner that runs on either the IBM PC or CP/M machines. The $700 package claims to handle all but the most sophisticated of financial planning tasks, including conditional logic, internal rate of return, present value and simultaneous equations. It maps to Ashton-Tate's popular dBase II DBMS and has integrated editing and report writing capabilities. In addition, it allows formulas to be named, so that users can work in an English-like language. Most importantly, with an IBM PC, the user can easily have 512 Kbytes of memory. In short, Financial Planner seems like it could give the financial planning packages on timesharing systems a run for their money.

Is Timesharing Dying? The death of timesharing has been heralded for years, but it has nevertheless kept right on growing. Still, it seems inescapable that the 16-bit micros running packages like Financial Planner will take out a huge chunk of business. This isn't to say that timesharing is dying; instead, it will take on different forms. But it is safe to say that the financial planning portion of the business is now under direct attack.

Ashton-Tate placed the ad in PC magazine, which is procured by people with IBM PCs. This is selling to the converted. We wonder what will happen if it starts placing such ads in Business Week and other general purpose business publications....

WASHINGTON NOTES

In one of the most contentious Congressional hearings in recent memory, Rep. Glenn English (D-OK) dissected the Postal Service's recent E-COM filing and extracted several extraordinary revelations from Postal Service witnesses.

English's Government Operations Subcommittee held an all-day session to examine the status of the E-COM program and elicited an admission from USPS Governor Bill Sullivan that the 31 cent E-COM rate was approved in private session by the postal governing board by only a 5 to 4 vote. What's more, Sullivan told the panel that the Presidentially-appointed governors split 4 to 3 against the 31 cent rate (and for 35 cents); only with the vote of Postmaster General William Bolger and his deputy did 31 cents carry. For all practical purposes, however, this fascinating piece of information probably dooms the 31 cent rate, even before 10 months of rate proceedings commence. (The big players in the coming rate case will be the letter shops, the printing industry, and the Commission's consumer advocate vs. the Postal Service.) Knowledgeable persons predict a 40 to 45 cent E-COM first page rate from the Postal Rate Commission, which Bolger probably will not be able to overturn under the arcane postal laws.

English also forced Sullivan to admit that, despite the fact that the program was his responsibility in his role as chairman of the USPS Board's electronic mail committee, he did not realize how abysmally Intelpost had performed since

its inception. English supplied the sorry data: 6,000 messages for all of last year.

E-COM marketing chief Karen Uemoto admitted to English, under sharp questioning, that the USPS volume witness for the present E-COM case, Gregory Whiteman, had projected twice as much E-COM volume for FY 1983 less than eight months ago (at the Postal Forum) than he did in the current case. The postal witnesses also conceded that current volumes, more than six months into FY '83, are running at only about half the current scaled-down estimates. Further, English pointed out that volume has not grown since last September and October. Despite the Postal Service's proud boast of hundreds of users for E-COM, Uemoto admitted that at the present time only six firms produce 70% of E-COM volume.

Sullivan said that any growth in volume would lead to perhaps additional printers at the 25 E-COM serving post offices (SPOs) around the country, but the Postal Service would not increase the number of SPOs (and thus guarantee overnight service).

Also testifying at the hearings were Joel Weiss, representing the letter shop industry, and Herbert Jasper, of the American Council for Competitive Telecommunications.

Weiss told the subcommittee that by planning to offer inserts (reply envelopes), the Postal Service is crossing the line into the business performed by private sector letter shops. Weiss said his colleagues have no fear of the Postal Service as a competitor if the pricing is fair, but he questioned the proposed E-COM rates. Jasper also called for compensatory E-COM rates and urged legislative action to remedy the lack of accountability that allows postal managers to implement questionable projects such as E-COM.

Rep. Charlie Rose (D-NC) testified that he uses E-COM and likes it, although he wishes the print quality could be improved and a letterhead added. He appeared baffled, however, when he learned from the subcommittee of E-COM's subsidized status.

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The Computer and Business Equipment Manufacturers Association (CBEMA) recently jumped back into the E-COM controversy by writing the Postmaster General and the USPS Board of Governors to restate their opposition to USPS entrance into resale telecommunications. "We continue to believe that the Postal Service can quite properly provide hard copy delivery of nationwide mailings, but not electronic delivery," stated CBEMA President Vico E. Henriques in his letter.

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SELLING TERMINALS THROUGH COMMUNICATIONS

Remember Mohawk Data Sciences? Once one of the darlings of the dp world with some of the hottest data entry equipment in the market, a few years ago it just got totally lost in the shuffle and was almost forgotten.

Unlike key competitors Extrex, Sycor and Inforex, who are now little more than memories, MDS (Parsippany, NJ) moved away from the data entry dead-end and branched into communications by striking a deal with Wiltek (Norwalk, CT) to integrate Wiltek's electronic mail system with MDS terminals.

Low Growth, But A Strong New Tack: During the past few years, MDS has experienced slow, but steady, growth. Revenues rose from $287 million in 1980 to $333 million in 1982, while net profit held steady in the $16 million range. This doesn't make the firm a high flier, but it does at least qualify as having weathered the storm that engulfed its major competitors of the 1970s.

Moving beyond simple survival, MDS is emerging as one of the most interesting contenders in the value-added communications field. Its Worldwide Integrated Communications service (WINC) is based on a central message switch that interlinks into the telex network, to central mainframes and to other terminals on its network. The key to WINC is that it is extremely flexible, allowing users to choose among full mailbox operation, auto-delivery for incoming messages or auto-pick up and delivery of messages.

A Quick History And An Agressive Future: Wiltek is one of the true legends of the electronic mail field. While other companies were talking, Wiltek developed a store-and-forward message system designed for high end users. The system worked with a central switch that polled each terminal every 30 minutes or so to pick up and deliver messages from and to a storage buffer. Operators typed messages and sent them to the buffer or retrieved messages from the buffer when they were available. Operation was fully independent, with the operators able to print out and create messages simultaneously.

Wiltek ran into the usual problems faced by many small start-ups. It grew too big too fast and then hit a few snags. The economy got tight, a few orders were delayed and all of a sudden the balloon collapsed. The company survived, however, and struck a deal with MDS to merge the Wiltek switching concept with MDS terminals, which had once been used for distributed data processing but are now also used for distributed communications.

The aggressive future that MDS is pointing towards is the international telex market. The WINC system, while professing to be worldwide, was really a domestic system that interlinked to international record

carriers for overseas traffic. Recently, however, MDS set up its own switching center in London so it could refile telexes from the U.S. into the European network at British rates. Now the company is offering a service that can cut up to 70% off the cost of an international telex.

Selling Terminals: There's a catch, though. Unlike many of the other networks going out of their way to be a mix-and-match system for any kind of terminal on the user's premises, MDS is really aiming at selling its own terminals to companies wanting to shave a lot of communication dollars. WINC's unique polling concept and flexible autodelivery/pick-up operation is optimized to work with the MDS units, the key to economical operation. That's not to say that users must use MDS terminals; the system can work with basic asynchronous terminals like a Teletype, but only for mailbox operations.

But that's not what MDS is pushing for. It is aiming for large users looking to save on communications costs and willing to pay for a Cadillac message service with highly-integrated word processing and messaging. It is a philosophy that runs counter to today's trend but nevertheless may just succeed in a small niche.

SYDIS INTRODUCES HIGH-POWERED VOICE/DATA WORKSYSTEM

One more start-up, Sydis (San Jose, CA), has introduced what may just be the most complete and powerful management workstation system to date. Outlined in the last Items of Interest column, here's all the gory details.

For starters, the system is based on a Motorola 68000 and runs the Xenix operating system. Second, the company has dispensed with stand-alone workstations, opting instead for a shared workstation concept. Third, each workstation has an integrated telephone and allows shared voice, text and graphics files, along with the ability to simultaneously display 10 different windows on the screen. Fourth, the central processing system, called the Sydis Information Manager (SIM), is a powerhouse with a 160 Mbyte drive, multi-megabytes of memory, a 1/2 inch, 9-track tape streamer and an interface to the PBX for the voice functions.

A High-End System: Unlike the Mitel Kontact, which we've covered in detail, the Sydis system is aimed at the high end of the market. Kontact is designed as a low end single user system incorporating its power in an 8-bit micro. Users procure separate Kontacts and link them with the telephone system.

The Sydis system is typically priced in the $6,000 to $7,000 per user range. Each VoiceStation terminal is linked to the SIM via twisted pair cabling operating at 320 Kbps, with voice and data multiplexed over the same line. Since

the system runs Xenix (the company says it has enhanced it, to be precise), there should be plenty of software available, although Sydis users will have to do quite a bit of program development or have it done for them to take advantage of the ability to handle the multiple windows on the screen.

Soft Keys & No Commands: One of the interesting features of the system is its soft key operation. Sydis claims that managers will be able to handle 95% of the functions of the terminal by pressing soft keys instead of using the keyboard. This means that the terminal itself is to do more than word processing and spreadsheet calculation, aiming instead at handling virtually all of the functions performed by a manager, including making telephone calls, searching for names and addresses, handling memos and keeping a calendar. To press this point home, the terminal is raised slightly off the ground to allow the keyboard to slide underneath.

The terminal itself is one of the most beautiful we've ever seen and comes fully equipped with a professional keyboard, a telephone with a Touch-Tone pad, a monitor with soft keys at the front and sides and a mouse (mandatory on high end systems these days). The monitor is triangular (similar to the new Televideo system) and is colored black. The telephone sits at an angle on the side of the monitor and is a light tan. If nothing else, it will certainly win some award for aesthetic design.

What To Make Of It? Sydis has a winning-looking product, but it opens the door to the fascinating question of system architecture. Apple, for example, has a one man, one computer philosophy. Sydis has adopted the shared user philosophy. Both have had their day. In dp, shared users became commonplace in the data entry arena. In word processing, single user systems have dominated.

In office automation, it seems that both philosophies will gain their adherents. Already, for example, the minicomputer companies are starting to recover by pushing shared user systems that can also have stand-alone workstations attached. The Sydis system, however, is almost in a class by itself because of its intermixing of voice and data. By way of comparison, Fortune Systems' 32:16 is a shared user system, but for data only.

So what do we make of it? The company has developed a beautiful product from the hardware side, but it will have to deliver strongly in the software arena to make a dent in the market. Data General, for example, has been successful lately because it developed its integrated Comprehensive Electronic Office (CEO). Instead of focusing on award-winning hardware looks, it concentrated on software that puts together key functions for office automation. The bottom line for any firm moving into office automation is going to be software integration. Beautiful hardware will help, but it is hardly the way to succeed in the market.

If the firm can put together the software, however, we are quite possibly looking at the shape of things to come, especially the merger of the telephone with data/text functions. As we've said many times, managers spend as much time or more on telephone-message related tasks as they do on stand-alone tasks like word processing and spreadsheet calculation.

SEMINARS/CONFERENCES/EXHIBITIONS/PUBLICATIONS

A listing of Summer/Autumn '83 Networks & Systems courses is now available from Integrated Computer Systems. Among them are Computer Network Design & Protocols, Local Area Networks and Digital Communications, each offered in various cities on dates from June through November. For further information contact Integrated Computer Systems, 3304 Pico Blvd., P.O. Box 5339, Santa Monica, CA 90405. Telephone (800) 421-8166 (inside CA 800-352-8251 or 213-450-2060).

The three-day Executive Microcomputer Conference & Exposition (EMCE), designed exclusively for business and professional users, will be held June 23-25 in the Sheraton Centre (New York, NY). Included will be more than 100 special exhibits, 48 conference sessions covering such topics as hardware/software selection, implementation strategies, marketing opportunities, financial applications, new and future trends and an Executive Microcomputer Workshop for personalized instruction. For more information contact EMCE, CW Conference Management Group, 375 Cochituate Road, Box 880, Framingham, MA 01701. Telephone (800) 225-4698 (in MA 617-879-0700); ask for Louise Myerow.

The Institute for Graphic Communication's 14th annual facsimile conference The Digital Facsimile Revolution will be held June 19-21 in Andover, MA. This intensive conference will cover new directions in technology, applications, markets and the automated office connection. For further information contact the Institute for Graphic Communication, 375 Commonwealth Ave., Boston, MA 02115. Telephone (617) 475-5903.

Carnegie Press has announced the June publication of Data Communications: Terms, Concepts, Definitions, written by Daniel Farkas. It is designed for managers with a basic understanding of the field to serve as a reference to commonly used expressions, abbreviations, etc. Also included is an alphabetical glossary, cross-referenced indices and a bibliography of introductory texts. The $39.95 (plus shipping) looseleaf volume is designed for annual updates and available from Carnegie Press, 100 Kings Road, Madison, NJ 07940. Telephone (201) 822-1240.

A listing of communications technology courses scheduled for July through September is now available from George Washington University. Among them are Local Communication Networks and Digital PBXs on July 20-22, Digital Voice and Video on August 1-3 and Telecommunications Alternatives in the '80s on August 22-24. For more information contact Continuing Engineering Education, George Washington University, Washington, DC 20052. Telephone (800) 424-9773 (in DC 202-676-6106) or telex 64374.

ITEMS OF INTEREST

EMMS editor Stephen A. Caswell has moved from his home in Ottawa, Ontario to the Charleston, South Carolina area. For readers wishing to update their files, his vital statistics now are 839 O'Sullivan Drive, Mt. Pleasant, SC 29464. Telephone (803) 884-2311....Computalker (Santa Monica, CA) has introduced a telephone management board for S-100 bus microcomputers that turns the PC into an intelligent voice/data system. The board allows users to give verbal commands, leave voice messages, make automated voice calls or serve as a database inquiry system with voice output. Voice digitization can be done at rates from 9.6 to 32 Kbps....A new Codex (Mansfield, MA) modem uses the CCITT V.22 bis standard, operates at 2.4 Kbps and is full-duplex; as such it is one of the first of its kind. The voice grade network now handles 1,200 bps full-duplex communications easily, but 2,400 bps communications has been done at half-duplex. The new modem paves the way towards even faster communication from terminals for interactive communications, although the $1,195 price tag is almost as expensive as terminals themselves. Besides 2,400 bps, the modem has a step-down mode to operate as a 1,200 bps Bell 212A modem....On-Line Software International (Fort Lee, NJ) has introduced Omnilink, a software package for IBM PCs that allows them to not only emulate an IBM 3270 terminal but also to perform integrated, intelligent offline functions as well. While the IBM PC can serve as a 3270 easily enough, it looks to the mainframe like a dumb terminal. OSI claims that Omnilink allows PC users to build applications inside the micro that uses data from the mainframe far more easily than customizing applications from scratch. Omnilink is a series of software packages that allow users to create processing applications related to planning, word processing, spreadsheet calculation and graphics. It is interlinked to IBM mainframes via the firm's Omnicom electronic mail system, which serves as a software controller. The key to the system is a package that runs at the mainframe and serves as query language for the mainframe and micro simultaneously, so that a program written for the IBM PC can access data processed and stored on the mainframe. If it sounds complex, that's because it is. There's a lot of software development that is required to make IBM PCs live up to their full potential as terminals in the IBM world. Omnilink is the first of what will undoubtedly be a wave of such products. Look for EMMS to get inside the whole topic in coming issues....Digital Microsystems (Oakland, CA) is one of the first firms to move from the world of local area network hardware into the world of turnkey applications with a LAN-based manufacturing resource planning (MRP) system based on its HiNet LAN and terminals. The product provides a complete hardware/software solution for small manufacturing firms in the $5 million to $25 million range. At $39,950, the system has five workstations, a printer, a file server and the LAN, along with complete software for bill of material processing, inventory control, sales order entry, material requirements planning, purchasing, shop floor control and cost control. In addition to the MRP software, the system also has a word processing package, a spreadsheet, a spelling checking and a small DBMS. Remember the turnkey systems supplied by minicomputer companies? That same milieu is now migrating to the micro world....The Hughes Communications (Los Angeles, CA) satellite scheduled for June 1984 launch was one of 19 satellites that received approval from the FCC recently. These 19 will by 1987 more than double the present number of U.S. domestic systems....You think you've got problems managing your

telephone bills? The General Accounting Office (GAO) recently prepared a report for Rep. Jack Brooks (D-TX), the chairman of the House Government Operations Committee, on telephone costs in the federal government, and it concluded that neither itself nor anyone else has any reliable estimate of how much the government spends on telecommunications equipment and services. Taking its best shot, the GAO estimated that in FY1981 the feds spent $10 billion on equipment and services, but admitted it was only a rough guess. Needless to say, Brooks wasn't too happy. AT&T execs, on the other hand, probably aren't too sad....Tymshare (Cupertino, CA) has introduced a service for correspondent banks using OnTyme II. Called FICS (Financial Institution Communications System), it is designed to speed among banks specific messages like balance reporting, posting of prime rate changes, loan participation opportunities, large dollar return items, quotes on current investment rates and exchange of pre-formatted funds transfer instructions and acknowledgements. Like many of the applications of high technology we're seeing, this is one more example of a turnkey system built from a basic system. A few years ago, there were only a few major customized networks, like Arinc, Swift, Arpanet, etc. This year alone, there will probably be more specialized nets than in the 1960s and 1970s combined. With the decreasing cost of terminals (and word processors and PCs), along with the low cost of e-mail services like OnTyme, dozens of industries will be setting up pseudo-private networks using public services....Tymshare isn't the only firm with an electronic mail service for banks. Innerline (Rolling Meadows, IL), a venture between the Bank Administration Institute and the American Banker, has formed a service that will allow banks to shop electronically for money market funds like Fed funds, jumbo CDs, GNMAs and other issues. In addition, it is also planning to offer other services like a prime rate monitoring service and Federal reserve pricing and services data bank by district....Computer Sciences Corp. (El Segundo, CA) has received a $4.3 million contract from the U.S. Army to design an interactive videodisc system to help with training in areas of maintenance and logistics. As an example, with the system, recruits would be able to see and hear a tank or missile system in operation and then see the parts and procedures required to maintain the equipment. In addition, of course, the system would also allow them to play a rousing game of Defenders. Have you played Atari today?...Drexler Technology Corp. (Mountain View, CA) now has seven licensees for its innovative laser card system that could become the most powerful data storage medium for small systems during the coming years. Using a card about the size of a credit card, the system stores data using lasers to achieve densities of about two megabytes. Read/write discs are estimated to cost in the range of $800-$1,500 at end user prices, which makes them price competitive with micro Winchesters. But the real application may be in read-only drives, which will cost from $150 to $250. Instead of shipping software on 5.25" diskettes, it can be stored in a card you can carry in your wallet. The most immediate application is in portable computers, which can be reduced in size dramatically when packaged with a flat panel display. Drexler's licensees are Canon (Japan), Elbit Computers (Israel), Ericsson (Sweden), Fujitsu (Japan), Logitec/Kanto Denshi (Japan), NCR (Dayton, OH) and Toshiba (Japan)....Ungermann-Bass (Santa Clara, CA) has dropped the price of its interfaces to Ethernet and other LANs by announcing its first interface product, the NIU-150, based on the LAN chip set it developed about a year ago. The chip set was designed by Ungermann-Bass and manufactured by Fujitsu (EMMS, Feb.1). Rather than use the

chip set in an individual interface, however, U-B has developed a controller that supports up to six terminals. Two versions are available. The first is for Ethernet and costs $2,800 for up to six RS-232 devices ($466 per connection). The second, at the same price, is for broadband networks. In addition, the firm said that DEC-DR11-W/B, IEEE-488 and RS-449 interfaces can use the system....Ztel (Andover, MA) has announced its awaited super PBX merging traditional PBX architecture with local network technology. The company, which may be the most well funded start-up in telecommunications history, has more than 100 people working away to develop the innovative PBX. To be honest, the product is so innovative we're not sure the new company can deliver it. For those who think it can't happen, think back to the go-go days of the 1960s. There were a few super-starts, like ill-fated Viatron, that turned into super fizzles. We're not at all suggesting Ztel is headed in this direction, but we do want to point out the similarities of today's venture capital market to the go-go days. At the moment, we're holding back on a thorough review of Ztel until we get a better handle on both the product's architecture and the people behind it. The firm may be onto a product that makes them the next Rolm or Mitel. Then again, they could end up like Viatron. It's one thing to announce the best thing since sliced bread, but it's another to deliver on it....Xerox Corporation's Office Products Division (Dallas, TX) will be marketing a new facsimile terminal that can integrate fax images and information stored in computers and office automation equipment. Called the Telecopier 495-1, the machine can also receive computer information for printing or for redistribution to remote facsimile units. It is designed for high-volume applications and can send or receive a one-page letter in about 30 seconds. The Group 3 compatible machine will also be able to send and receive information to and from Xerox personal computers by year end. Single unit price is $12,995, and order taking will begin June 1....MCI (Washington, DC) has announced that its gross revenues for Fiscal Year 1983 topped the $1 billion mark for the first time, rising 112% over the previous year's $506 million. At the same time, the company named Bert C. Roberts to be president of MCI Telecommunications, the long distance arm of the MCI Communications Corp. parent.

EMMS
ELECTRONIC MAIL & MESSAGE SYSTEMS

A twice monthly newsletter covering technology, user, product and legislative trends in graphic and record communications.

AN IMPORTANT AID FOR OFFICE PRODUCTS AND DATA COMMUNICATIONS USERS, EQUIPMENT MANUFACTURERS, TECHNICIANS AND SERVICE SUPPLIERS....

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Since its first issue in 1977, EMMS has built a reputation as one of the most respected and widely-read newsletters in the electronic mail industry. Twice each month, EMMS provides its readers with the information they require to keep up-to-date in this complex market area. EMMS' insight and analysis in high-technology communications products provide meaningful and timely information regarding market figures, new opportunities, upcoming products, vendor strategies, regulatory issues, and a host of other topics.

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ELECTRONIC MAIL & MESSAGE SYSTEMS

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EMMS back issues can represent a useful and inexpensive means of reviewing recent major developments in the electronic message industry and include detailed analysis of trends, products, legislative proposals, etc. as well as news. Complete sets, which include a complete year's worth in back issues (24) and a three-ring vinyl EMMS binder, can be purchased as a package at the prices below.

Here are some topics covered by EMMS:

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Protocol Conversion & IBM PCs; PCs, Electronic Banking & the USPS; Datapoint's ITMS; Modems; Xerox 1810 Pro Workstation; Five Rolm PBX Additions; British Fiber Optics Network; MCI/Amex/RCC Paging/E-Mail Service; Participate Computer Conferencing System; IXO Telecomputer Take-Off.

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Apr.	1, 1982:	N. American Telex Service, Inside ECOM, WU Reenters Int'l Telecom.
Apr.	15, 1982:	Embattled E-COM, RCA/ITT Telex War, HP E-Mail System.
May	3, 1982:	IBM & Office Comm. Standards, Teletex & CBMS, Conflict in Xerox's OPD.
May	17, 1982:	NEC Moves Into Fax, IXO Telecomputer, Low-Cost Workstations.
June	1, 1982:	SBS's E-Mail System, AT&T in PABX & Cellular Radio, Portable Computing.
June	15, 1982:	Execunet, Int'l Telex: WU vs. IRCs, Daisywheel Printers, E-Commentary.
July	1, 1982:	Xerox & HP on Local Networks, Recession & the E-Mail Business.
July	15, 1982:	Cellular Radio Upset, American Bell's AIS/Net 1, Largest Ever Fax Order.
Aug.	2, 1982:	IBM in PABX Market, NBS Messaging Standard, Paper-Based E-Mail.
Aug.	16, 1982:	Greene OKs Antitrust Settlement, Search for E-Mail, BPSS Tariff Rejected.
Sept.	1, 1982:	BOCs New Lease, Kontact Workstations, EMCA Finishes Funding, ITT Faxpak.
Sept.	15, 1982:	MHF Standard, Isacomm Develops ANS, CNCP/Dialcom Deal Made, DowAlert.
Oct.	1, 1982:	Voice Mail: ECS and Beyond, IBM & TI LAN Chip Deal, GTE & AMA's AMNET.
Oct.	15, 1982:	Congress Views E-Mail and USPS, GTE Buys S. Pacific Comms, PCs & Comms.
Nov.	1, 1982:	Pitney Bowes In Fax, 3Com Ethernet Board, Intel LAN Products, Teleforum.
Nov.	15, 1982:	CBMS Comparisons, Cutting Costs With PCs, Bell Canada & the Gov't, Csnet.
Dec.	1, 1982:	Dialcom Leads CBMS Field, Stability for Fax Leaders, PCs: Hot Xmas Item.

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In addition to the horizontal worksurfaces, Haworth offers an adjustable keyboard pad that attaches to any panel-mounted or freestanding worksurface. One significant ergonomic innovation in office equipment years ago was the detached keyboard that allowed operators to position themselves for maximum efficiency and comfort. Haworth extends the concept to the furniture itself.

Haworth also offers Architectural Elements—geometric glazed and fabric-covered panels, fanlights, and single and French doors—to allow office managers to play around with interior design possibilities.

ELECTRONIC MAIL

Electronic Mail is a term that covers a broad range of different message and document delivery services. Technically, Electronic Mail (or E-Mail) encompasses telex, teletex, facsimile, voice store and forward, subscriber services, and on and on. Here, however, we will limit our discussion to a key E-Mail capability — electronic messaging, both local and remote.

This aspect of E-Mail lets you type a message on your terminal and send it, at the touch of a key, to a co-worker or anyone else connected to the system, across a room, in another city, or on another continent. Most applications are local or regional. (At a telecommunications conference highlighting the advent of a global network that would permit a user to send data transparently anyplace on the globe, one businessman muttered :"I don't need to talk to Australia. I need to communicate across town!")

The clearest benefit of E-Mail is efficiency. Workers can work longer without interruption, tapping into the mail system at their convenience. With the E-Mail package integrated into the rest of your computer system, you can quickly write a message and post it without having to break away from your primary activity for very long.

Because it is so easy to send messages — and copies of messages —communication within the company inevitably opens up. E-Mail tends to bypass hierarchies and territories; information often flows according to need rather than organizational charts. And information becomes available from more sources. The largest corporations probably receive the most benefit from this last aspect of E-Mail.

Most E-Mail lets you attach other files to your message, an easy way to transfer spreadsheet files, etc., among co-workers.

The actual uses of E-Mail vary widely. One company uses a public E-Mail service to send out personalized collection notices (the service offers a surface mail delivery option) at one-third the cost of an express delivery note. The order entry department of a beverage manufacturer uses it to coordinate delivery schedules among company warehouses, independent food brokers, retail stores, and institutions.

On the downside, E-Mail can also lead to information inundation. Dozens of trivial notes can clutter your mailbox, hiding important messages. And for some, hanging out on E-Mail becomes a preoccupation, taking time away from actual work.

You also lose the capability for nuance in an E-Mail message. Misunderstandings can occur, so it's best to leave sensitive communication tasks, such as contract negotiations, to face-to-face meetings or phone calls.

To try to offset this problem, veteran E-Mailers have attempted to work out a system to express emotion. When someone writes all in caps, that person is "flaming" — they're angry. Some E-Mailers put clarifications in their text, such as <grin> after a comment that should—but might not be—taken as a joke.

Basically, you can have access to E-Mail services in two ways: through subscriber services, or through software running on your own computers.

Subscriber services

Publicly available E-Mail has been around for a few years, and grew out of the old time-sharing services. Subscribers dial into local nodes on the networked service through terminals or PCs, check their mailboxes, send messages, hook up to information sources such as Dow Jones or The Source, and so on. Because you call a local number, you are billed only for a local call—even though your message might be going across country.

Seven services currently dominate the market: AT&T Mail, GEISCO Quik-Comm, GTE Telenet TelE-Mail, ITT Dialcom, McDonnel Douglas On Tyme, MCI Mail, and Western Union Easy Link. Services such as Compuserve and the Source offer E-Mail to their members as well.

Of these, MCI has been the most aggressive in creating gateways to proprietary mail systems. For example, through an agreement between DEC and MCI, a DEC user can sit at a terminal, type a message, send it out over the DEC mail system, and have it delivered to anyone anywhere with an MCI mailbox. A similar agreement exists with 3Com, linking its network mail system with MCI. Such a gateway provides instant, transparent access to a much broader audience than ever before available.

Lotus uses MCI Mail in its Express application. Express is a package that runs in the background (it operates without interrupting what you are working on at the moment) on your PC, and regularly polls the mail service to see if any messages are waiting, or to send any messages you might have written.

Concerns to keep in mind when evaluating a subscriber service include:

- ☐ Minimum monthly usage fee
- ☐ Usage rates and service charges
- ☐ Storage charges: Services let you keep data on their computers, but charge you for the privilege.
- ☐ Hardcopy delivery option: Services will send a letter, a mailgram, or a telex to addressees who have no E-Mail account. Bulletin boards: a place for posting public notes
- ☐ Information services: Through cooperative agreements, some mail services bring you on-line access to newswires, Dow Jones, and so on.
- ☐ Attached file services
- ☐ PC software: Some have their own applications to ease communications from a PC. The on-line editors of the services are often clumsier than their PC counterparts.

Office Systems

E-Mail is a component of most office systems, including DEC's All-in-1, DG'sCEO, Wang's WangOffice, and IBM's PROFS. E-Mail functionality among the major integrated office systems is very similar; the primary difference is in the screen interface — the menu that you follow to use the software — and the integration with other applications. Some questions you should ask as you evaluate an E-Mail product are:

- ☐ Is there a master directory for all local and remote users?
- ☐ How easily can you send messages to users on another system?
- ☐ Can you attach files to a message?
- ☐ Can you use your full word processor with E-Mail?
- ☐ Are you notified immediately upon arrival of mail?
- ☐ How well does the system handle interruption to attend to mail? Can you manipulate the message without having to quit the application you currently have up on screen?
- ☐ Does the mail support different systems within the vendor's product line?
- ☐ Is there a single directory of all messages?

LAN E-Mail. PC users needn't attach to a larger computer or to a public service to have E-Mail. Such software is readily available nationwide for PC Local Area Networks as well. Concerns for evaluating these packages are similar to those listed above.

...FORMATION WORLD™
NEWS FOR THE INFORMATION COMMUNITY
WASHINGTON, D.C. AUGUST 1979

Information World 1(7): 1, 26 Aug. 1979

"information utility?" Perhaps these young
e Source Telecomputing Center in McLean,
he Telecomputing Corporation of America
e-home access to a databank of more than
n. Watching the children play a game on the
Ryan (left) and TCA inventor and Chairman

'e offers to homes

of news and sports, amounting to several thousand stories daily;

• Immediate access to the files of the nation's leading newspaper services—and the ability to demand only those stories of personal interest;

• A means to shop for and order retail products using the home terminal;

• Vast libraries of consumer information, including comparative prices, transportation schedules, and the scheduling of entertainment events; and

• Standard computing capabilities, including several programming languages and numerous applications programs.

It can do this, and more, for $2.75 an hour, TCA claimed.

No technological breakthrough

The Source is not a technological breakthrough; it is similar to other large time sharing systems. TCA contends the product is unique, however,

See TCA p. 26

Carter approves
Electronic mail begins

WASHINGTON, D.C. — The United States Postal Service (USPS) has received President Carter's approval to enter the electronic mail business.

In a decision made in the midst of his Cabinet's comings and goings late last month, the President declared his support for new postal services that will use long distance telecommunications systems to feed messages into the normal mailstream for delivery by postal carriers.

At the same time, Carter concluded that the USPS should be prohibited from offering end-to-end electronic message services.

With the President's endorsement came eight conditions, designed to ensure that all forms of electronic communications will be open to benefit from "full and fair competition." Postmaster General William F. Bolger has accepted these conditions, according to an Administrative spokesman.

• The Administration will oppose any legislative or regulatory effort to restrict competition or entry in the electronic message field. Any attempt to extend the private express statutes beyond letter mail to cover electronic transmission will be blocked.

• USPS electronic operations should not be subsidized by tax money or by revenues from other USPS services.

• The electronic service should be established as a separate entity for accounting and ratemaking purposes to ensure that it is operated in a competitive fashion and to avoid the cross-subsidization of electronic service by regular mail services.

• The USPS should make its delivery services available to all electronic carriers at the same rates it charges itself.

• A review of the USPS electronic service will take place within the next five years and before the major investment is made in the system. The evaluation will include the service's competitive impact and its potential to improve postal services.

• The Postal Service should purchase electronic transmission services from carriers rather than building a transmission network of its own.

• To ensure that all companies can link their electronic services with the mail delivery system, technical interconnection standards should be developed through a cooperative effort by the American National Standards Institute, the USPS, private communications carriers, and an impartial arbiter, if needed.

• The existing regulatory system should be used to regulate the prices of the new services. The Federal Communications Commission should regulate the pricing of the electronic transmission portion of the electronic message service, and the Postal Rate Commission should regulate the pricing of mail delivery. This regulatory system, too, should be examined in five years to determine whether Congress needs to alter it.

The result of ECOM

President Carter's decision regarding the Postal Service's venture into electronic mail stems from USPS plans for a new service called "Electronic Computer Originated Mail (ECOM)." This proposed service is aimed at large businesses.

Under ECOM, the Postal Service would solicit and accept such data

See USPS p. 26

French commit funds to develop database industry

by Edith Holmes

WASHINGTON, D.C.—The French government will soon commit funds to the development of its domestic database industry, according to M. Michel Vieillard, director general of DAFSA.

Some 50 French companies have expressed interest in their government's financial help with the risks of database construction and marketing, the French executive said in an interview here during a recent visit to the United States.

Vieillard heads an information company whose shares are owned "by practically all the large banks in France." Likened by observers in the United States to such organizations as Standard & Poor's and Moody's,

See VIEILLARD p. 17

their were new confi- iology roces- ds her ng the mpset letters elects ipoint f the ips of on the diting on to loppy whose ients, mer-

said, "and if we achieve closer contact with our members through personalized letters and up-to-date reports and telecommunications, we shall provide improved services to our members." He noted that NAM chairman of the Board, Herbert E. Markley, and his colleagues are presently studying how to revamp their approach to printing by consolidating more printing functions to become a more cost-efficient association.

Cushman, Darby and Cushman, a patent law firm in Washington, graduated from their IBM mag card machines to include an OCR scanner, two NBI Word System 3000 and hookups with two different computer terminals. Their foreign patent division is linked to a computer in Philadelphia on a time sharing basis for data on obtaining patents abroad, while the firm's accounting department uses a the shorter, more personal correspondence. Similar to the COMPSET-used by NAM, the NBI System 3000 has paste-up and editing capabilities and they both can store all information on a floppy diskette which the law firm numbers and stores.

Sentelmann said that the staff's initial reaction to the more advanced equipment was positive, and they were eager to learn the new technical skills. Instead of the technology eliminating employees, the law firm has hired two more people to work in the center. "We have a more highly trained staff that can leave the mundane office tasks to our updated machines," Santelmann said, "and I think that they find their work more challenging and satisfying now."

Larry Nixon said that their employees did not have as much trouble adapting to the more advanced WPMs since they were already accustomed to the automatic sheet-feeders, manufactured by Word Processing Associates, relieve the technician from standing by and replace the filled page with a fresh piece of paper. These devices are enclosed in acoustical covers, which greatly decrease the noise level; thus the WP center is a quieter and more pleasant atmosphere for concentrated work, she said.

USPS from p. 1

stored electronically on magnetic tapes as monthly billing information and transmit it through a common carrier around the country. The messages would be printed on paper and automatically stuffed into envelopes for manual sorting at the post offices nearest their delivery points. Postal carriers would physically distribute this mail.

"The USPS believes it can reduce substantially the handling, labor, and transportation costs that would be associated with regular letter mail" of this type, the Administration spokesman said. The Postal Service adds that it is bound to pass on those savings to the mailer. By 1985-1995, the average price of each electronic message should be nine cents or ten cents, in 1979 dollars.

A follow-on system, known as Electronic Message Service System (EMSS), would be in use by that time, according to USPS.

Intelpost tested

The Postal Service has also inaugurated an international electronic mail system with a demonstration that will lead to a field test. The test will follow the demonstration, which began in mid-July, in the middle of this month.

Called "Intelpost," this electronic mail system involves the transmission of facsimile messages via satellite between the United States and other countries.

Carter's decision follows a six-month study coordinated by Domestic Policy Advisor Stuart Eizenstat. Primary agency support came from the Commerce Department's National Telecommunications and Information Administration.

Standards Developments, Messaging in Australia Among Topics Discussed at New York City Meeting

from page 1

of their customers. Through an arrangement with McDonnell Douglas, he said, customers can see an on-line edition of the company's catalog by logging-on to McDonnell Douglas' electronic mail system, OnTyme.

Companies nationwide also are using electronic data interchange (EDI) to improve the flow of business documents between and among companies, Paul Lemme, executive director of the Transportation Data Coordinating Committee (the EDI trade association), told EMA members during the all-day meeting. EDI is the computer-to-computer exchange of formatted data, such as purchase orders. The TDCC, Lemme explained, is responsible for coordinating, maintaining and publishing the data standards and common database used by participating businesses, including retail and grocery companies, ocean carriers, couriers and public warehouses.

A panel of facsimile vendors, moderated by EMA member Steve Caswell of Caswell Consulting, continued the discussion of new developments in related technologies with an overview of the growing connection between facsimile and electronic mail. Michael Armstrong, vice president of product planning for Pitney Bowes, told EMA members that trends in facsimile use include expanded memory, the addition of CCITT error control procedures and the ability to receive ASCII files.

Peter Home of Telecom Australia

Panelists Arthur Shebar of EIT, Inc., Eric Giler of Brooktrout Technologies, and Richard Powers of Ricoh emphasized the ways in which facsimile and electronic messaging are working together. As an example, they noted how easily someone familiar with word processing can send a document from a computer to a facsimile machine using messaging technology.

In yet another panel, developers of new interactive document programs discussed their products, which allow writers to share comments and to make revisions on a common document. Panel moderator Art Kleiner, of New York University and the Whole Earth Software Review, described how such programs allow writers and editors to keep track of when and by whom revisions are made.

Panelists George Reinhart of Network Technologies International, Dan Atkins of the University of Michigan, Norman Kurland of the State University of New York, and Murray Turoff of the N.J. Institute of Technology each described how their programs (DocuForum, EXPRES, ForComment and EIES, respectively) can make writing and editing a more creative process.

Members also heard a presentation on the use of electronic mail in Australia and received an update on standards. Peter Home, manager of text services for Telecom Australia, told EMA members that some of the issues facing Australian messaging vendors and users are the interaction between public and private systems and the development of business applications.

In a review of recent developments in standards, EMA member Rich Miller of Telematica, Inc., said that the National Bureau of Standards' Open System Integration (OSI) workshop has become a center for standards work. Ted Myer, chairman of EMA's Standards Committee and director of consulting services for Telenet Communications, described some of the changes that will be proposed for the X.400 guidelines scheduled for consideration by the CCITT, the international standards body, in 1988.

Seventeen Join During Drive; Membership Now Numbers 96

Seventeen new members, including nine corporate users, joined the association during EMA's spring membership drive. Total membership in the association has grown to 96 members.

"We're very pleased to have attracted so many new members in such a brief period," Jennifer Johnson, director of member services, said. "We're especially excited about the increase in the number of our user members."

Members who have joined since March are: the American Bankers Association; Union Pacific Railroad; Consumers Software Inc.; Northrop Corporation; SRI International; G.D. Searle & Company; Text Lite Communications; Eastman Kodak; Chemical Bank of NYC; Boston Business Computing; Steve Caswell of Caswell Consulting; Aetna Life & Casualty; the American Library Association; GTE; Alisa Systems; Anheuser-Busch; and Incomnet, Inc.

EMA Newsletter

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ELECTRONIC MAIL ASSOCIATION NEWSLETTER

ELECTRONIC MAIL ASSOCIATION SUITE 300 1919 PENNSYLVANIA AVE., NW WASHINGTON, D.C. 20006

VOLUME 2, No. 2 **JULY 1987**

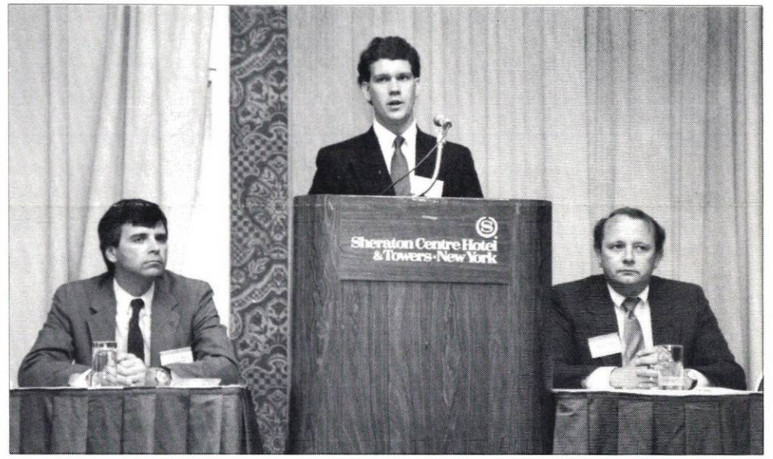
EMA Conference Set for Oct. 8-9 in San Francisco

The Electronic Mail Association will hold its fourth annual conference, "Electronic Messaging '87," on October 8-9 at the Sir Francis Drake Hotel in San Francisco. This year's program again will include top industry experts speaking on topics such as messaging over Local Area Networks (LANs), progress in interconnection, electronic data interchange and messaging, and innovations in communications software for microcomputers. This will be the first major event EMA has held on the West Coast.

Since 1984, EMA's annual conferences have featured the industry's most respected experts and opinion leaders. Three years ago, EMA conducted the first detailed public meeting to explain the recently adopted X.400 Recommendations. In 1985, the association hosted "Electronic Messaging Week '85," a five-day series of conferences, including IFIP's (International Federation for Information Processing) "Second International Symposium on Computer Message Systems." Last year's conference, which drew nearly 300 participants from across the U.S. and from around the world, focused on industry trends and developments in interconnection.

The regular registration fee for the two-day event is $395. The fee for EMA members is $295. Those registering before September 8 will receive a $50 discount. A complete conference brochure, including a roster of speakers, is available from the association.

EMA committees will meet the day before the conference.



Scott Klososky of Southwestern Stationery discusses sales force automation. On the left is Roger Walker of Dupont; on the right, Steven McMahon of Western Union.

Automating Sales With Messaging Featured at NY Quarterly Meeting

Lower costs, increased customer satisfaction and improved staff morale are just a few of the benefits gained by automating a sales force with electronic mail, a panel of users and vendors told EMA members during the June 9 membership meeting. By bringing a sales force on-line with portable computers, the panelists said, sales representatives have instant access to inventory, can spend more time with customers, and can radically decrease the turn-around time on orders.

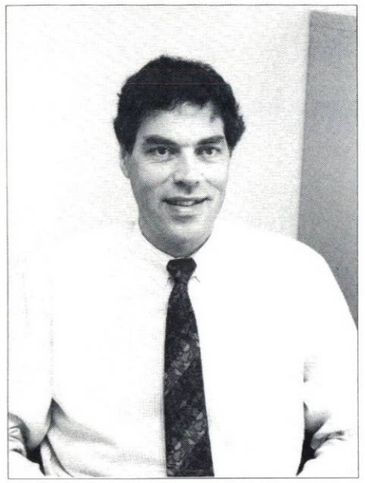
"Electronic mail is the hub that keeps us all going and communicating," Frank Trenery, regional field manager for Hewlett-Packard, told more than 75 EMA members gathered in New York City for a meeting that also included discussions of electronic data interchange, trends in facsimile technology and new research on interactive electronic documents. Trenery said that since starting with a pilot test of sales automation in February 1986, Hewlett-Packard has seen a marked change in how its sales force conducts business. The time sales representatives spend with customers is up, while their time spent traveling and in meetings is down.

"What this has done from a morale point of view is amazing," he added, saying that across-the-board the automated sales force has noticed an increase in their productivity.

Other featured speakers on the panel, including Roger Walker of DuPont, Scott Klososky of Southwestern Stationery and Steven McMahon of Western Union, emphasized the need for employee training and a commitment among the sales staff to make automation work.

Klososky, vice president for sales of Southwestern (a small Oklahoma-based office supplies dealer) described how his company had not only automated their sales force but also had brought on-line a number

See *Standards Developments*, page 4.



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European EMA Sets Goals, Holds First Membership Meeting

The European Electronic Mail Association, sister organization to EMA, held its inaugural membership meeting on March 24 in Paris. The meeting, which was hosted by the French PTT, introduced the newly formed association to Europeans interested in the electronic mail industry, EEMA chairman Ids Zandleven said during a visit in May to EMA's offices in Washington. Zandleven, communications systems department manager for Philips International in Eindhoven, The Netherlands, said the meeting included an overview of industry developments as well as discussion of the association's long- and short-term goals.

The European EMA, which was organized last year with the cooperation and support of EMA, now has about two dozen members, including British Telecom, IBM, Digital Equipment Corporation, Philips International, and the Dutch and Swedish PTTs. The association has set as its objectives the establishment of a common platform for the exchange of information and ideas about electronic mail and messaging, promotion of the industry in Europe, and increased public awareness of the applications and benefits of electronic mail and messaging. EEMA also intends to play a role in determining policy issues related to the implementation of an integrated European electronic mail and message handling service.

Association Launches Campaign to Promote Messaging Industry

Press Kit, X.400 Tutorial Are Part of Information Package

The Electronic Mail Asssociation has compiled an information kit containing charts, articles and figures that outline the state of the electronic mail industry. The kit, which was mailed in late May to about 250 reporters, editors and producers nationwide, provides the association's first comprehensive look at the growth and development of electronic messaging. In addition to the latest industry statistics and description of products, the kit also includes the 1987 EMA membership directory and copies of the association's two most recent newsletters.

This month, the association also will release a short X.400 tutorial brochure that is designed to serve as a beginner's guide to the interconnection standard. The brochure, which was drafted by EMA member and ProtoComm Corporation president Dan Heist, will be available free-of-charge.

In other promotional activities, the association is working to place electronic mail industry spokespersons on panels and as speakers at events, such as national conferences, of organizations not directly related to telecommunications. A group of electronic mail vendors will speak to the American Society of Association Executives in late August and additional panels are planned. Such panels, says EMA Executive Director Mike Cavanagh, help spread the word about the many uses of electronic mail.

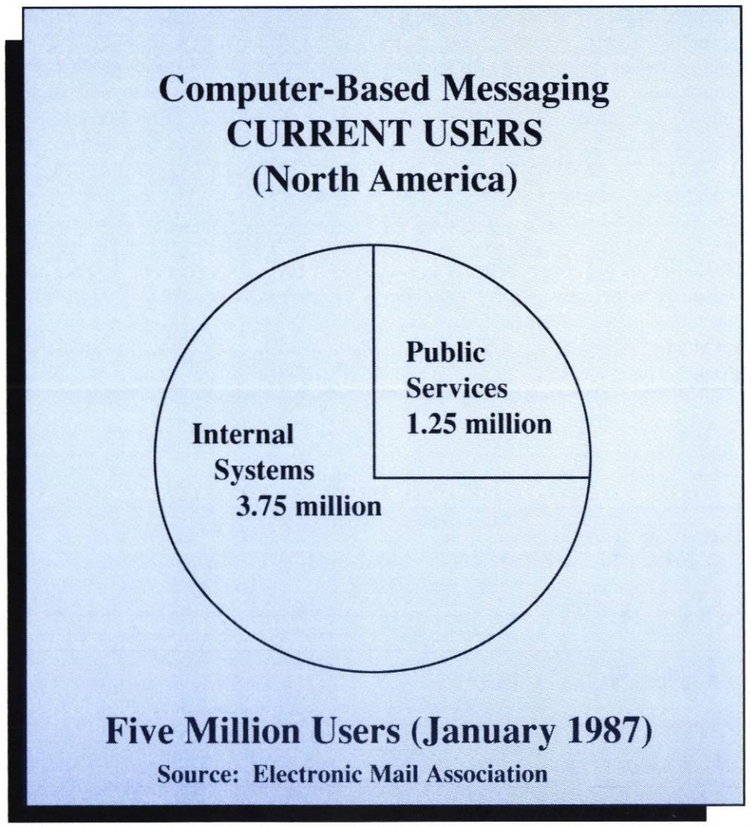

Chart from EMA press kit mailed in May to 250 reporters, editors and producers.

EDI Working Group Holds First Meeting in NYC; Committees Discuss Software, Junk Mail Solutions

EMA committees and working groups, meeting June 8 in New York City, covered a range of industry issues including electronic data interchange and developments in communications software for personal computers.

Lynne Edwards and Paul Olson, both of McDonnell Douglas ACS, led members in a discussion of electronic data interchange during the inaugural meeting of the EDI Working Group. Edwards and Olson noted that EDI is defined as the computer-to-computer exchange of inter-company business documents in a public standard format. In an EDI transaction, Olson said, one party will send a formatted document to another party via a third-party computer. Although the transaction is very similar to what occurs when transmitting electronic mail, he said, EDI in its strictest definition refers only to the transfer of encoded business documents. Members agreed that given the close relationship between EDI and electronic mail, EMA should work closely with related organizations, including the Transportation Data Coordinating Committee and the EDI Council of Canada.

The PC Software Working Group hosted a two-hour seminar featuring a vendor and a user panel. The vendor panel, headed by PC Working Group Chairman Eileen Rudden of Lotus Development, made presentations on the many uses of new communications software. Panelists John Morey of Microsoft, Fred Krefetz of Transend and Rich Pekelney of Kensington Microware said that by using communications software designed for personal computers, users can reduce the cost of sending messages, enhance text editors and transfer binary files. The user panel, made up of Lou Galterio of Bankers Trust, Jim Burridge of Procter & Gamble and Steve Chase of American Home Products, rated the importance of various software features.

Eileen Rudden takes questions during PC Software Working Group seminar. Looking on, from left, are panelists John Morey, Rich Pekelney and Fred Krevetz.

The Interconnection Committee discussed the role EMA should play in resolving issues related to interconnection. Members proposed that the committee continue to collect information on the growing number of interconnected electronic mail systems.

Junk mail and how to prevent it from flourishing on corporate electronic mail systems was the main topic during the meeting of the Privacy Committee. Several members who are in the process of expanding their companies' electronic mail systems told the committee that they are searching for ways to curtail the frequency with which unnecessary messages or junk mail are being sent on their systems. A number of members who have implemented large corporate systems told the group that the problem seems to disappear once the novelty of the system wears off. However, members noted that there are guidelines a company can follow that will discourage junk mail and agreed to publish a brochure that will offer advice on using electronic mail in the workplace.

Members of the Market Awareness Committee received an update from acting chairman Mike Cavanagh on EMA promotional activities. The committee decided that it will produce materials detailing the successful applications of electronic mail technology based on descriptions of applications submitted by members.

EMA Hosts Series of Press Forums

Sessions Designed to Bring Reporters Up-To-Date on Messaging Technology

New developments in X.400 were featured when EMA recently held its first press conference for Washington-area reporters. The event drew reporters from trade and business publications, including *Business Week* and *Communications Week*.

EMA members Ted Myer and Jim White of Telenet Communications and Stuart Davidson of MCI Communications discussed the proposed CCITT enhancements to the 1984 X.400 guidelines and the effect such enhancements will have on the use of electronic mail.

The April event was the first in what EMA Executive Director Mike Cavanagh said will be a series of such meetings with the press. Events such as press conferences, he said, provide a forum for EMA members to discuss innovations and developments with reporters who cover telecommunications issues.

EMA will hold its next press conferences this summer in Washington and in San Francisco, the site of "Electronic Messaging '87."

EMA

The Association for Electronic Messaging & Information Exchange

Electronic Mail Association APPLICATIONS NEWSLETTER

VOLUME 1, NUMBER 1 MARCH 1988

IN THIS ISSUE...

From the Executive Director

March 1, 1988

With this first issue, we are very pleased to introduce a new quarterly publication, the *Electronic Mail Association Applications Newsletter*. It is the product of some months of discussion and development work within the association, and we hope you will find it to be informative and useful.

The newsletter is primarily designed to meet the needs of journalists covering the electronic mail industry, or new technology trends in general, but undoubtedly it also will be of value to financial and business strategy analysts, researchers, managers, and others interested in the growing use of messaging technology. The format provides for short descriptions of how electronic mail is being used today in a range of diverse industries. A press contact is then listed with a telephone number. If a topic proves to be of interest, please don't hesitate to call the press relations person for more details, needless to say.

More than six million Americans are using electronic mail today, according to a recent EMA estimate, and even those of us in the industry are sometimes amazed at the wide array of uses that individuals and companies have found to benefit from the technology. This newsletter is designed to share some of those stories with you.

EMA is now five years old, and has grown from eight companies in April 1983 to more than 130 organizations today. We're very proud of the many leading-edge issues and developments that we've been able to impact and/or bring to the public's attention over the past half-decade. We hope that this new publication will prove to be of value to observers of the industry. Please let us know what you think, and please give us a call if you have any questions about the industry in general or the specific information contained in this publication.

Sincerely,

Mike

Michael F. Cavanagh
Executive Director

Sales Force Automation

Eaton Company's Truck Components Marketing Group in Galesburg, MI, uses low-cost Tandy PCs and Telenet's Telemail electronic mail service to inform its sales force of potential causes of product failure. The system eliminates paperwork and improves communications at low cost. Before automation, it took between three and six months for reports on product failures to reach Eaton's database. Now a sales representative can fill out a standard report form on his portable PC and upload it from any telephone via the Telemail service to a regional office, where it is edited and re-routed again via Telemail to the product division and entered into the database. The whole process now takes only four days. In addition, Telemail is used to exchange messages between headquarters and the field. (CONTACT: Robin Carlson, Telenet Communications, 703-689-5664.)

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A company providing advertising, publishing and database services to the insurance industry is using AT&T Mail to automate its sales force. With AT&T Mail, the company's 15 offices around the country can communicate more quickly and efficiently with each other. General company information, including details on special promotions, sales strategies, etc., is sent from headquarters. Each of the field offices exchanges expense and call reports with the home office as well. (CONTACT: Don Dewar, Product marketing Mgr., 201-658-6437.)

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The management of a major beer distributor uses the Text Lite PX1000F (portable terminal) with the Text Lite C-Mail (company mail) software running on a PC to replace an old, obsolete order entry system. The portable terminals carried by all sales representatives allow them to enter orders directly from the customer site to receive delivery information and "specials of the day" sales information. Other uses are product distribution management, sales forecasts and electronic mail to and from the sales force. Sales and order information gathered from the PC allow for faster order delivery, faster invoice preparation, better control of inventory and more timely reports than the previous system. (CONTACT: Pete Bachman, Text Lite Communications, 703-549-0352.)

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A major chemical manufacturer and a number of multi-national financial institutions are using DESK EXECUTIVE, Boston Business Computing's office automation software that emulates DEC's All-In-1, to increase the productivity of their sales force. These companies will equip their sales people, familiar with All-In-1, with DESK EXECUTIVE and laptop computers, thus allowing them to function in an All-In-1 environment outside of the office. Sales personnel can edit files and read and create mail from their car, airplane, or hotel room without being connected to a VAX. Sales and personnel only need connect with the VAX to upload and download mail. (CONTACT: Edward J. Gaudet, Boston Business Computing, Ltd., 617-683-7920.)

Pricing and Purchasing

A large office supply firm has given OnTyme Plus order entry and electronic mail communications capabilities directly to their high-volume customers, providing their customers with 24-hour order entry convenience. Customers get on-demand, error-free order entry with immediate confirmation (against inventory availability) and order status inquiry. By making just-in-time product delivery possible, OnTyme Plus has also reduced the space, risk, and cost associated with excess inventory. Customers can also communicate directly via electronic mail, getting special pricing and promotional information. The company providing the OnTyme Plus product enjoys quick, economical, error-free order transmission and has gained long-term customer loyalty. They view their system as "leading edge," and believe that it has allowed them to compete on improved quality of service. (CONTACT: Diane Doran, McDonnell Douglas, 408-922-7047.)

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A Washington, D.C.-based wholesale gasoline and oil distributor uses a Redi List (Stored Address List) available on EasyLink service together with Western Union's Instant Mail Manager accessory package Instant Forms Plus to send daily price changes from an IBM PC for gasoline and oil sales to 150 EasyLink mailboxes on its customer network. This application is very time sensitive--in the oil and gas business there are many price fluctuations which must be reported immediately. The benefits to this company include savings in notification time (the company estimates a 50% reduction) and, therefore, increased profits for the company. The previous method of notification was by phone. Now it is via EasyLink primarily to PCs, but also including EasyLink's recent dial-out capability to facsimile terminals. Other applications for EasyLink service include sending financial reports and spreadsheets to headquarters. (CONTACT: Joan Prescott Wray, Western Union, EasyLink 62791434 or phone 201-825-5277.)

Dealership Relations

Chrysler Motors has interconnected its internal corporate electronic mail system (an implementation of IBM's Professional Office System or "PROFS") with GE Information Services' QUIK-COMM System global electronic mailbox service. The two-way, electronic mailbox system links 6,500 Chrysler dealers n the U.S. and Canada with more than 650 field personnel as well as 25 U.S. field offices and five Canadian regional offices. The system allows Chrysler to communicate rapidly with its dealers and was particularly valuable in helping to quickly integrate the 1,500 newly acquired Jeep/Eagle dealers. It includes a customized forms package which enables Chrysler to automatically process the collection of data from its dealers via its mainframe. The system is also used by Chrysler for information exchange with international locations. (CONTACT: Steve Haracznak, GE Information Services, 301-340-4494.)

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A major auto manufacturer uses MCI Mail for timely and efficient communications with its dealers. Prior to implementing the application, one of the company's plants was experiencing problems due to the time and manpower requirements of processing dealer inquiries. These inquiries, frequently involving the plant's engineers, consisted of special request orders, clarification on existing orders and modification to design specifications. By combining a customized and automated PC front-end package with its electronic forms capability, MCI Mail provided the company with a total solution. The plant was able to save manpower resources and increase its responsiveness to dealer needs. The company, in turn, was able to strengthen its relationship with its dealers and differentiate itself from its competitors. (CONTACT: Jane Levene, MCI Communications, 914-934-6480.)

IRS Filings

April 15th is a dreaded day formany taxpayers. They can remove the pain--and get their refunds sooner--by turning to a professional tax preparer who also uses ELF software and Telenet's Telemail electronic mail service to file with the Internal Revenue Service. Tax preparers can use a wide variety of tax-preparation programs and a variety of PCs with ELF and Telemail. The innovative ELF package, developed by ELF, Inc. of Belmont, Calif., transfers information directly from the electronically prepared tax form into a format for electronic transmission to the Internal Revenue Service. It eliminates re-keying of data and thus eliminates the possibility of errors caused by re-keying. Filing electronically saves time over paper mail. The best part for taxpayers is that, with an electronically filed tax form, they can receive a refund in only 18 days. About one million tax returns are expected to be filed by April, 1988, the IRS says. The IRS anticipates that within two years, 30 million returns will be filed electronically. (CONTACT: Robin Carlson, Telenet Communications, 703-689-5664.)

Environmentalist Information

Greenpeace, the international environmentalist group, has been a user of the MaxCom International messaging service for several years. Greenpeace turned to MaxCom primarily because of the logistical difficulties of their international communications. Different time zones, language barriers, equipment compatibility, and the near impossibility of obtaining cost effective and easy-to-use gateway connections to networks in many countries made MaxCom an instant success with the Greenpeace staffers. Greenpeace found that MaxCom International could solve these problems. The service can be accessed with a local phone call from over 600 gateway cities worldwide. The MaxCom system also allows users to set their language to Italian, French, German, and Spanish, thus alleviating the resistance to using a "foreign" communication service. Many Greenpeace staffers travel continually, and access the MaxCom service from many different locations. With telex and fax built into the service, the Greenpeace users have placed great value on being able to communicate with almost any type of correspondent from their PCs and portable laptops. (CONTACT: Marilyn A. Murphy, MaxCom Corp., 617-890-8822.)

Union Information

Pan American Airlines Pilots' Association uses the Networking and World Information Inc. (NWI) PARTICIPATE system that it licenses from NETI Eventures Limited. The pilots use laptop computers at home and in hotel rooms to share news relating to safety, accidents, training, contract negotiations, and other union business. As one association official has said, "A union is a people organization first and foremost. It's impossible to keep secrets, and it's undesirable because of the political necessity of keeping members apprised of what's going on." As one example of this system in use, a private aircraft crashed into a runway and damaged a taxiing Pan Am airliner. Union investigators arrived on the scene with their laptops and got information through PARTICIPATE to pilot members and the association's executive council within three hours. The union reduces the cost of committee meetings by conducting business over the network (CONTACT: Harry Stevens, NETI Eventures Ltd., 313-994-4030.)

Financial Printing

The Corporate Printing Company (CPC) is using ExpressNet to deliver typeset proofs of financial documents to clients who are located outside of New York City. The initial word processing document is transmitted from the client through the ExpressNet System and arrives at CPC in ASCII format as an exact duplicate of the original. Typesetting codes are inserted by the Datalogics Typesetting System and the proof copy is transmitted to the client and other parties to the deal. The proofs are printed at the client's site on a Postscript based laser printer and appear as camera-ready typeset copy. (CONTACT: George Chingery, 212-620-5606.)

College Courses

The American Open University of New York Institute of Technology conducts electronic classes via PARTICIPATE, an integrated electronic mail, bulletin board, conferencing, electronic organization system, which is licensed from Eventures Limited, under contract to Network Technologies International, Inc. (NETI). More than 300 students use PARTICIPATE to take courses for one of three degrees, all offered totally in the distance learning mode. AOU/NYIT also uses PARTICIPATE extensively for counseling of students and administration of the program.
(CONTACT: Don McNeil, Eventures Education Marketing Manager, 301-320-6060.)

Published by the Electronic Mail Association, 1919 Pennsylvania Ave., NW, Suite 300, Washington, D.C. 20006. For more information about EMA or electronic messaging in general, please contact the association at 202-293-7808.

Other Areas Addressed by X.400

It does not make sense to talk about groups of MTA's scattered all over the world if provisions have not been made for the organizations that must install and manage these MTA's. Two types of organizations are defined in X.400: Private and Administrative. Each organization has a domain of specific MTA's and associated UA's. Thus we have private management domain, PRMD, and administrative management domain, ADMD. The management domains are given rules of operational responsibility over their MTA's and UA's. A PRMD might be a corporate E-mail system or a commercial electronic mail service while ADMD's are either government-operated carriers or private internationally recognized carriers. This distinction is carried through to the different areas of responsibility for the PRMD's and ADMD's.

X.400 also accommodates existing Telematic services. X.430 specifies an interface to Teletex and provisions are made for an interface to Telex. Today, many electronic mail services have provided gateway connections to the Telex network as a stepping stone to the worldwide connectivity that will be provided through the use of X.400.

Finally, there is considerable work taking place today related to the directory services needed to make a widely interconnected system more useful. Users need to be able to "look up" a recipient just like they need to look up a telephone number or telex answerback. More importantly, the system itself needs to know the communications characteristics of each user registered. This directory service standards work is in progress at this time.

Summary

X.400 provides a set of standards for the specification of facilities and services which can be hooked together to provide a store and forward messaging network. This network is used to provide electronic mail services and the messages transferred by this network can contain any type of electronic data. Vendors developing new products can conform to these standards to allow their products to be interconnected with other vendors. Vendors currently providing electronic mail services and equipment can modify or enhance their products to bring them into conformance with X.400. Any vendor is free to provide services and features over and above those standardized.

Today, interconnection of existing electronic mail systems is in its infancy. The capability to send a message from a user on one electronic mail system to a user on another system is a rarity. However, in the near future, any system that is not able to interconnect via the X.400 standards will be the exception.

So, how are messages transferred between users and the MTA? A facility is provided that acts **on behalf of each user** for the exchange of messages between the users and MTA's. This facility can be thought of as an agent for the user. There must be one of these User Agents (UA's) for every user of the system. A UA can be a stand-alone PC or can be a software program and set of UA tables within a mainframe. The UA has a dual personality. On the MTA side, it must conform precisely to the X.400 rules and services. On the user side, it can be programmed to provide services in any number of ways.

The Message Transfer System provides the UA's with a means of transferring messages. A set of services that must be provided by each MTA within the MTS are described in X.400. These services allow the UA's to send messages back and forth. As mentioned, a UA can be co-located within the same CPU as the MTA or can be remotely located in a separate CPU. In the latter case, the protocol for submission and delivery of messages between a UA and MTA in support of the MTS services is called the P3 protocol. This protocol is described in X.411 and the concept of a remote operation is described in X.410.

There is a UA for every user and each UA is given a name. Since a UA can be either an Originator or Recipient of a message, the name of a UA is referred to as an O/R Name. Routing is done using O/R Name and there are two forms and several variants for the form of O/R Names. Since everyone wants to use X.400 with their own routing scheme, standards activity dealing with O/R Name conventions has a tendency to be controversial.

X.400 As An Electronic Mail Service

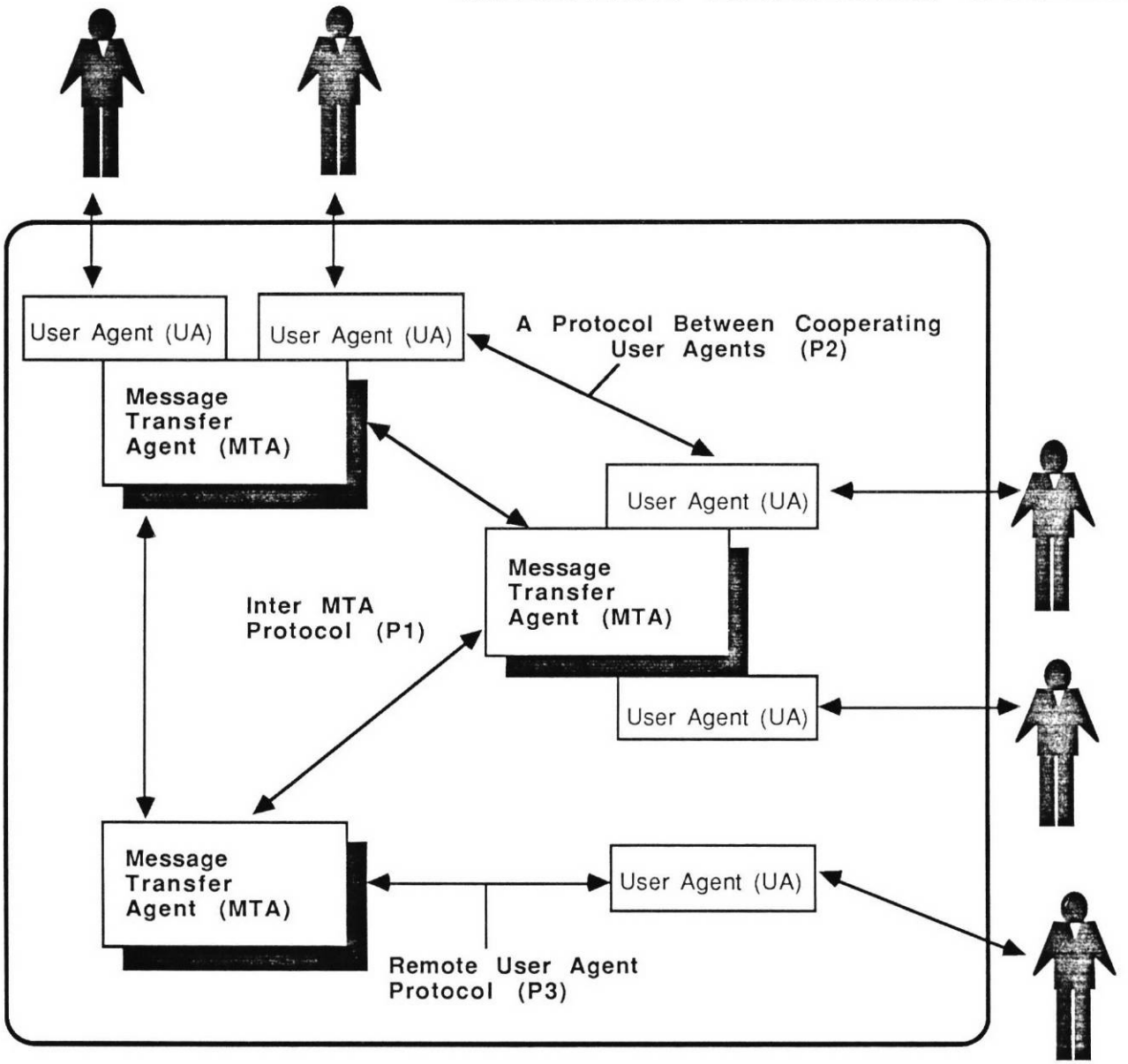
So now we have dual personality UA's for every user, hooked up to some store and forward boxes called MTA's which talk to each other using a set of interface rules. A message can be submitted, transferred and stored for subsequent delivery. So where is electronic mail and all the features that come with it? To answer this, we have to back up just a bit. All the MTA's act together to route and transfer messages. As mentioned, store and forward systems provide a variety of services. For instance, they can tell you if your message was delivered or they can make multiple copies of your message and send them to multiple recipients. One of these services, conversion of message encoding, is described in X.408. The rest of these basic services are listed in X.400 and X.401. The UA's have access to these basic services and can use them to provide features to the user.

If UA's choose to cooperate on their own, they can provide even more services than those supplied by the MTA's. An originating UA could find out if the recipient UA has enough room to hold a particular message. The recipient UA could determine if a receiving user had actually taken delivery of a message and inform the sender of this fact.

X.400 allows UA's to cooperate in this fashion. Furthermore, X.400 provides a set of rules for cooperating UA's that go a long way toward facilitating electronic mail services. These rules are called the P2 protocol and they relate to cooperating UA's. They are described in X.420.

The MTA's tied together via the P1 protocol provide a message transfer service for cooperating UA's. This service can be thought of as a basic message transfer service where UA's place messages in envelopes transferred by the service. The MTA's never look inside the envelope. Likewise, the UA's do not care how the MTA's deliver the messages, just as long as they get there. (Just as the recipient of a conventional postal message has no idea which mail processing centers handled the letter during delivery.) The total set of services provided by UA's and MTA's are defined in X.400 and summarized in X.401. These services can be used to facilitate the development and interconnection of standardized electronic mail systems.

BASIC COMPONENTS OF AN X.400 MESSAGE HANDLING SYSTEM



There is a User Agent (User Interface Facility) for every user of the system.

Each Message Transfer Agent (Store and Forward System) acts as an agent in support of a basic message transfer service.

User Agents are allowed to cooperate in order to provide services over and above the basic services.

X.400 Technology

An electronic messaging service provides for the electronic transmission of messages containing text, data, image, and even digitized voice. The key elements of such a service are the speed of electronic message transmission and the message storage on behalf of the users. In the direct transmission of a message over a telephone connection via modems, the message goes in and comes out virtually immediately. Both ends must be set up in advance. With electronic messaging, however, the sender and receiver put messages in and take messages out of their interface to the electronic mail system whenever they want. Furthermore, the equipment, speeds, character sets, etc. do not have to be the same.

A network that stores messages for later delivery is called a store and forward network, and an electronic messaging service makes use of one or more store and forward systems hooked up as a network via communication lines.

The technical issues addressed by X.400 relate to an internationally accepted specification for the interconnection of store and forward systems. Prior to X.400, as anyone who has ever written a technical specification for a store and forward system knows, there were numerous details to write down. All of the rules for putting a message into the system (human to machine), rules for the formatting and storage of messages, and rules for delivery of a message (machine to human), were quite complex. Since most store and forward systems service a limited set of users, the approach usually taken is to write down as much detail as possible and then let a group of programmers deal with the users in making all the final detailed decisions. Ever find yourself talking to a programmer about why he or she has chosen to insert a carriage return and line feed into your beautifully constructed letter?

In order to have a worldwide store and forward network, it is necessary to specify all of the interface details of each store and forward system involved. What X.400 does is to provide a standard for the specification of store and forward systems and their interfaces. It does this in enough technical detail to satisfy the needs of all of the programmers. Not surprisingly the language used to write down all of the rules had to be very precise. The language used (described in recommendation X.409) is by any standard quite complex. This fact, plus the level of technical complexity associated with the OSI seven layer stack (of which X.400 is in the seventh layer), presents a formidable barrier to the person who just wants some understanding of how a message is sent across town.

Let's take a different tack. First, a set of interconnected store and forward systems is called a message handling system. The message is the thing stored and then sent forward. The message can contain any type of electronic data. The chart on page 3 shows the basic components of a message handling system adhering to the X.400 standard. Several users are shown. The system allows you to send a message to be stored and picked up later. Each message is stored, passed on to be stored again, and so forth, until it reaches and is sent to the recipient. Since each store and forward system could be provided by a different participant, it is important that the interface between each store and forward system be well defined. Whenever we talk about an interface, we are talking about the rules for exchange of data, i.e. protocols. The protocol between store and forward systems in X.400 is labeled the P1 protocol and it is rigorously defined in X.411 for all the programmers of the world. The store and forward systems function together to provide a Message Transfer System (MTS). Each store and forward system is a participating agent in that system for the transfer of messages. Thus, each store and forward system is called a Message Transfer Agent (MTA).

The P1 protocol defines the rules for sending messages from one MTA to another. The next issue is the transfer of messages between an MTA and the user who wants to send and receive messages. Since the man-machine interface for the user is highly sensitive to the type of equipment and functionality being provided and since it is unlikely that any two parties could agree on a generic interface for end users, X.400 does a very smart thing for this interface--it says nothing.

Introduction

In any discussion regarding electronic mail, the issue of X.400 invariably comes up. It is legitimate to ask, what does X.400 have to do with electronic mail and what is X.400 anyway? As a starting point in answering these questions, this tutorial takes a brief look at the history of the X.400 standardization work and the forces driving this effort. Next, information on X.400 terms and concepts is provided. Hopefully, the tutorial provides an intuitive treatment of the technical aspects of X.400. The discussion shows that in addition to providing standardization for electronic messaging systems, X.400 provides a standard for the exchange of any type of electronic data including computer files, image and even digitized voice.

Fundamental to all of this discussion is the concept of store and forward digital communications. Regardless of whether we are talking about the nature of the communicating services provided or the details of the underlying technology, the fact that a collection of digital information (a message) is stored on behalf of a user and then sent forward for delivery at a later time is what sets X.400 apart from other standardized data communications.

The Background of X.400

The history of X.400 dates back to the late 1970s when work began within IFIP Working Group 6.5. (IFIP stands for the International Federation for Information Processing, a United Nations affiliated organization which includes technical societies from around the world. Working Group 6.5 has responsibility for computer-based messaging systems.) At that time, low cost digital communications was becoming available to a wide range of users. There was an obvious need to standardize the electronic exchange of messages, for instance a document such as this with text and graphics data, between a variety of end user equipment and services. IFIP brought together top international technical experts to examine issues relating to store and forward messaging including naming, addressing principles and interchange formats. In 1980, the internationally sanctioned standards setting organization, the International Telegraph and Telephone Consultative Committee (CCITT), building on IFIP's efforts, initiated the formal work on what quickly became X.400. CCITT set up a working group, which it refers to as a "special rapporteur" group on Message Handling Systems (MHS).The group, under the leadership of Ian Cunningham of Bell Northern Research, met regularly beginning in the spring of 1980. Sessions were held in Rennes (France), Melbourne, Washington, D.C., Paris,Tokyo,Geneva and Brighton (England). Eight volumes of recommendations were drafted, and formally adopted in 1984 at the CCITT plenary meeting in Malaga. Thus, X.400 became "official" international telecommunications standards.

The author of this tutorial is H. Daniel Heist, president of ProtoComm Corp. (Bala Cynwyd, PA). Heist is a member of the Electronic Mail Association's Market Awareness Committee.

ELECTRONIC MAIL AND X.400: A Tutorial

Published by:

Electronic Mail Association
1919 Pennsylvania Avenue, N.W.
Suite 300
Washington, D.C. 20006
(202) 293-7808

September 1987

Who Should Attend?

- Managers responsible for purchasing, invoices, distribution, and/or administration
- Communications Planners
- Corporate Telecommunications Executives
- System & Software Designers and Managers
- Office System & Software Vendors
- Personal Computer Hardware & Software Communications Vendors
- Telecommunications Suppliers and Consultants
- Government Communications Managers
- Executives responsible for EDI and/or computer-based messaging implementation

About the Electronic Mail Association

The Electronic Mail Association is a Washington, D.C.-based trade association representing more than 115 companies involved in all aspects of the electronic messaging industry. Members include system operators, equipment manufacturers, software developers, corporate users, and industry consultants. EMA offers its members a range of services and activities. In addition to organizing educational seminars, the association sponsors regular membership meetings, monitors industry issues, and serves as a liaison with international industry leaders.

The association also produces a variety of publications, including a quarterly newsletter and a membership directory, and serves as a clearinghouse for information about the electronic messaging industry.

In October, EMA will hold its fifth annual industry conference, *Electronic Messaging '88*, in Boston. Last year's event, held in San Francisco, drew a record crowd of industry analysts, product vendors, journalists and messaging users.

Association members, whose first-year dues range from $250 to $4,000, receive significant discounts for EMA events as well as the opportunity to discuss industry trends and developments with other messaging users and vendors. For information about joining EMA, please contact the association.

Upcoming EMA Events:

March 4	Membership Meeting, Hollywood, Fla. (Members Only)
June 14-15	Membership Meeting, Palo Alto, Calif. (Members Only)
October 24-25	*Electronic Messaging '88*, Boston, Mass.

EMA—The Association for Electronic Messaging and Information Exchange

The Electronic Mail Association Presents
A One-Day Seminar:

Electronic Data Interchange (EDI) & the X.400 Messaging Standards

Both electronic data interchange (EDI) and electronic mail are gaining wide acceptance by businesses across the country and around the world. While these two related technologies have evolved independently, the CCITT X.400 messaging standards, which have quickly garnered broad international support, now provide an excellent prospective vehicle for the distribution of EDI documents. The Electronic Mail Association is pleased to sponsor this important and timely seminar on the interrelationship between EDI and X.400.

Hollywood Beach Hilton Hotel—March 3, 1988—Hollywood, Fla.

Seminar Program

Thursday, March 3

Morning

Introduction

Michael F. Cavanagh
Executive Director
Electronic Mail Association

EDI & X.400: Opportunities for Today & Tomorrow

Theodore H. Myer
Director of Consulting Services
Telenet Communications Corp.

The EDI Community's Perspective

Paul Lemme
Executive Director
TDCC —
Electronic Data Interchange Assn.

Marshall Spence
President
EDI Council of Canada

EDI & X.400: The European View

Guy Genilloud
Engineer
Swiss Institute of Technology

EDI & X.400: Is There a Marriage?

Lynne Edwards, *Moderator*
OnTyme Product Manager
McDonnell Douglas ACS

Stephen J. Kirchoff
Corporate Mgr., Elec. Mail
Digital Equipment Corp.

Donald M. Audsley
Dir., Business Development
Telecom Canada

Victor S. Wheatman
Senior Consultant
INPUT

Martin A. Weiss
Product Mgr., EDI Services
Western Union

David L. Bezaire
Mgr., Elec. Communications
CompuServe

Gary Dalton
Data Services Appl. Planner
AT&T

Roundtable Discussion

Theodore H. Myer
Director of Consulting Services
Telenet Communications Corp.

Paul Lemme
Executive Director
TDCC —
Electronic Data Interchange Assn.

Marshall Spence
President
EDI Council of Canada

Stephen J. Kirchoff
Corporate Mgr., Elec. Mail
Digital Equipment Corp.

Guy Genilloud
Engineer
Swiss Institute of Technology

Donald M. Audsley
Dir., Business Development
Telecom Canada

Afternoon

Third-Party Networks: Do They Fit?

Eric Arnum, *Moderator*
Editor, *EMMS* Newsletter

Stephen P. Korn
EDI Marketing Mgr.
GE Information Services

John Reat
EDI Product Manager
McDonnell Douglas ACS

The program will run from 9 a.m. to 4:30 p.m., and will include question and answer periods.

Registration Information

Seminar Fee

Regular Registration Fee.....$175
Special EMA Member Fee.....$25

The seminar fee will include a luncheon as well as coffee breaks. **Pre-registration is required.**

Hotel Accommodations

The seminar will be held at the Hollywood Beach Hilton Hotel in Hollywood, Fla. Rooms are available at the special rate of $99 (single or double) per night. To make reservations, please contact the hotel directly at (305) 458-1900. The telex number is 522330. Note you are with the Electronic Mail Association block. **To receive the special EMA discounted room rate, all reservations must be made by January 29.** (All reservations must be secured by credit card or check for one night's stay.)

Airline

Continental/Eastern is the official airline for the seminar. To receive a discount of up to 50% on your flight to Florida, please contact (or have your travel agent call) the Continental/Eastern convention desk at 1-800-468-7022 and ask for the EZ3BP27 group fare.

For More Information:

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Registration Form

☐ Please register me for *Electronic Data Interchange and the X.400 Messaging Standards* at the regular registration fee of $175.

☐ Payment enclosed.

☐ Please register me for *Electronic Data Interchange and the X.400 Messaging Standards* at the special EMA member registration fee of $25.

☐ Invoice me.

Name _____

Job Title _____

Company Name _____

Address _____

_____

Country _____ Telephone _____

Mail to: Electronic Mail Association, 1919 Pennsylvania Ave., NW, Suite 300, Washington, D.C. 20006

Philip F. Whalen Jr. of PCC Systems addresses conference as part of LAN messaging panel. At left are AT&T's Dale DeJager and EMA's Mike Cavanagh.

X.400, Interconnection Discussed at Electronic Messaging '87

from page 1

Interconnection allows users of different messaging systems to send electronic mail to each other. For example, through interconnection a user of DEC's All-in-One system within a company could send a message to a colleague using Data General's CEO system or a Western Union EasyLink user could send a message to a user of IBM's PROFS system. Interconnections are occurring with increasing frequency between public services and private systems, like the PROFS to EasyLink transaction described above, as a way to link "islands of communication" within major corporations with users not linked to a company's internal system.

X.400 is an internationally approved standard for communication between dissimilar computer-based messaging systems. In addition to providing a standard for the delivery of text messages, X.400 provides a standard for the exchange of computer files, image (such as graphics) and digitized voice.

Messaging over local area networks also is an important new trend, conference speakers said. Hank Vigil, Microsoft's product manager for electronic mail, said that he sees a "tremendous opportunity" to integrate electronic mail with desktop applications already being used on LANs. Ease-of-use is a key factor in LAN messaging, Philip F. Whalen Jr., vice president of sales and marketing for PCC Systems, told conference attendees. Whalen said that messaging should mirror as closely as possible the "feel" of paper mail, using familiar terms such as inbox, bulletin board and file folder, to make users more comfortable with messaging technology.

The "synergy" between electronic mail and electronic data interchange was the main theme of speakers on the EDI and Messaging panel. Victor Wheatman, senior consultant for INPUT, described how EDI and X.400 are merging, as X.400 develops into a viable standard for transport of EDI documents.

Users of electronic mail offered tips on how to choose and maintain a corporate electronic messaging system. Keith Addison, manager of computing services for G.D. Searle, emphasized that support, reliability, accessibility, and versatility are essential components of a well run messaging system.

As a California-based sales representative for a commercial printer in Oregon, Jim Taylor described how he uses electronic mail to communicate with his staff and customers. Taylor said that while he finds electronic mail to be a helpful tool, he eagerly awaits the day when system reach will be universal.

Conference attendees also heard from Walter Ulrich of Coopers and Lybrand, who predicted that the electronic mail industry will experience dramatic growth over the next five years. The conference also included a session on sales force automation and an update on CCITT X.400 standards.

New EMA Slogan Reflects Diverse, Growing Industry

The Electronic Mail Association has adopted a slogan to define more fully the range of services used and offered by EMA members. The phrase "EMA—The Association for Electronic Messaging and Information Exchange," which will appear on the association's letterhead and publications, was developed and approved by EMA's Board of Directors during a long-range planning meeting held in August in Washington, D.C. The chief crafters of the new slogan were board members Walter Ulrich of Coopers and Lybrand and Richard Miller of Telematica, Inc.

EMA Executive Director Michael F. Cavanagh said he thinks the new slogan more accurately expresses the many areas of on-line communication in which association members are involved.

"The term 'electronic mail' in some people's minds is synonymous with just the sending and receiving of short text messages," Cavanagh said. "With the industry expanding to include a range of new applications, we thought it was a good time to adopt the slogan."

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ELECTRONIC MAIL ASSOCIATION

NEWSLETTER

ELECTRONIC MAIL ASSOCIATION SUITE 300 1919 PENNSYLVANIA AVE., NW WASHINGTON, D.C. 20006

Volume 2, No. 3 *EMA—The Association for Electronic Messaging and Information Exchange* **November 1987**

Lauri Hirvonen of Nokia (Helsinki, Finland) poses a question to panelists during EMA's annual conference held October 8-9 in San Francisco.

Electronic Messaging '87 Attracts Capacity Crowd

"Electronic Messaging '87," EMA's fourth annual industry conference held last month in San Francisco, drew a record crowd of nearly 300, as service providers, industry analysts and electronic mail users gathered to discuss developments and trends in the electronic messaging industry. The two-day event featured several X.400 product announcements as well as panels on topics ranging from messaging over local area networks to innovations in PC communications software.

Speaking before the audience in the packed ballroom of the Sir Francis Drake Hotel, EMA Chairman Philip M. Walker in his introduction heralded the explosive growth of the messaging industry.

"Electronic mail is taking its place as an indispensible tool in the office and increasingly in factories and on the road as a way to increase productivity, to improve communication and to gain an edge over competitors," he said.

Speakers throughout the conference cited numerous examples of how electronic mail can enhance communication regardless of the type of business or size of group.

Today's companies see information systems as "strategic weapons," said panelist Peter Westwood, a vice president of Sydney Development, Ltd. Westwood noted that many companies that rely on electronic mail have increased their communications reach through interconnection and predicted that X.400 will encourage more firms to interconnect their messaging systems.

See **X.400,** *page 4*

Quarterly Event to Feature ONA, X.500 Updates

EMA will hold its final quarterly membership meeting of the year on December 8, in Washington, D.C. The Tuesday meeting will include a two-hour overview of the FCC's Open Network Architecture proposal and what it will mean to the electronic mail community. Philip M. Walker of Telenet Communications Corp. will chair the ONA panel, which will feature speakers from Bell operating companies, enhanced service providers, and companies using electronic mail.

The meeting also will include a discussion of developments in the X.500 standard for directories and an update on projects of the Office of Technology Assessment. EMA's Market Awareness, Privacy & Security, Interconnection, Standards, and Government Relations committees will meet the day before the general membership meeting.

EMA's first quarterly membership meeting for 1988 is set for March 3-4, in Hollywood, Fla. In addition to featuring two days of industry discussion, the March membership meeting also will include a celebration of the association's fifth anniversary. EMA will host a poolside reception for members and guests on the evening of March 3.

Following the March meeting, EMA's next quarterly membership meeting is scheduled for early June in Silicon Valley.

EMA's quarterly membership meetings, which have evolved into mini-conferences featuring industry experts, are open only to employees of companies who are members of the association.

EMA Leads Fight Against FCC Proposal

Newly Formed Government Relations Committee Advises Association on Access-Charge Issue

The Electronic Mail Association has taken a leading role in the fight against the FCC proposal to impose access charges on enhanced service providers—charges that could more than double the fees paid to access electronic mail and on-line services such as CompuServe, the Source, Telenet and Tymnet. EMA has joined a broad spectrum of service providers and users in a campaign to derail the proposal.

"It is ironic that the FCC is proposing this now, given all of the efforts being made to make more and more information available to the American public," Philip M. Walker, EMA chairman and regulatory counsel for Telenet Communications Corp, said recently. "If adopted, the FCC proposal would stifle the growth of many telecommunications services, such as electronic messaging, that are just beginning to be widely used by U.S. businesses and consumers, and that doesn't benefit anyone."

In a statement released shortly after the proposal was announced in mid-July, EMA Executive Director Michael F. Cavanagh also criticized the proposal for not taking into consideration the effect an increase in charges would have on non-profit and community-service organizations that rely on relatively inexpensive on-line services to communicate with members and to conduct research.

George Minot

"We just don't believe that the FCC has thought through the implications of who gets hurt by this plan," Cavanagh said.

Stephen R. Bell, a partner with the Washington, D.C. branch of the law firm Squire, Sanders and Dempsey and a recognized expert on telecommunications regulatory issues, drafted the formal EMA filing with the FCC. The commission has received more than 5,000 letters and filings in opposition to the proposal, on which it is expected to issue a ruling before the end of the year.

Partly in response to the FCC's proposal, the association in July launched a Government Relations Committee, which will serve as a clearinghouse on government-relations issues for EMA and will advise members on policy issues the association should address. George Minot was elected chairman of the group. He is a senior consultant to CompuServe and president of Applied Information Technologies Research Center, a Columbus, Ohio-based research and development consortium. Ron Patterson, director of government relations planning for Pacific Telesis, will serve as vice chairman.

Minot, who has been a leader in the development of EMA's strategy against the FCC proposal, said that the committee will foster the policy goals established by the association by focusing on ways to enhance EMA's liaison with policy makers at the FCC, on Capitol Hill and within the administration.

Since its founding in 1983, EMA has been an active participant in legislative and policy issues related to the growth of the electronic messaging industry. Most recently, EMA was instrumental in the passage of the Electronic Communications Privacy Act of 1986, landmark legislation that provides privacy protection for electronic mail users.

The committee will hold its next meeting from 9:30 a.m. to 12:30 p.m. on December 7, the day before EMA's membership meeting, to discuss long-range policy issues.

Association Membership Jumps to 115

Biggest Growth in Corporate Users, West Coast Companies

EMA membership has nearly doubled since the beginning of the year, raising the total number of members to 115. Corporate users now account for 30 percent of EMA's membership, up from less than 15 percent in January.

"We're very pleased that our efforts to attract major corporate users to the association have been so successful," said Heather Dreyer, EMA's new coordinator of membership services. Dreyer joined the staff of the association in July.

"We're also excited about the many innovative West Coast companies that have joined EMA recently," she said.

Companies that have been added to the EMA roster since the last newsletter was published in July are: CIS Corporation; CMA Inc.; Communications Solutions Inc.; Conetic Systems Inc.; DA Systems, Inc.; Engelhard Corporation; Genentech, Inc.; GeoNet Mailbox Systems, Inc.; ICL Inc.; Indesys, Inc.; Kensington Communications; Lincoln National Information Services; Manufacturers Hanover Trust Corp.; Mutual Life Insurance Company of New York; On-Site Information Systems; PCC Systems, Inc.; Pennzoil; Retix; Sci.com Research U.S., Inc.; Trendcom, Inc.; UNISON Telecommunications Service; WANG Laboratories, Inc.; Westinghouse Electric Corporation; and, The Wollongong Group.

Conference speaker Andy Huffman of AT&T discusses software innovations.

PROCEEDINGS AVAILABLE

Copies of the proceedings for Electronic Messaging '87 are available from EMA on a first-come, first-served basis. The proceedings include materials from the presentations of 17 of the conference speakers. The price per copy is $15 for members, $45 for non-members.

EMA Broadens Its Market Awareness Campaign

Trade and Professional Associations Host Panels, Feature Articles Promoting Use of Electronic Mail

EMA's Market Awareness Committee has targeted trade and professional associations as part of an on-going campaign to increase awareness of how electronic mail can improve communications within any business or organization.

"Trade and professional associations, through their constant contact with their members from across the country, are able to bring innovative products such as electronic mail to the attention of a broad range of decision-makers in business, industry and the professions," said Michael F. Cavanagh, EMA executive director and acting chairman of the Market Awareness Committee. "Association conferences and publications provide an ideal forum for explaining the many benefits of installing and using an electronic messaging system."

So far this year, Cavanagh said, EMA has placed speakers at several association events. In August, a panel drawn from EMA member companies spoke at the national conference of the American Society of Association Executives in New York City. More recently, Cavanagh spoke in October at the Direct Marketing Association's conference in New Orleans. His talk focused on business-to-business electronic marketing.

In addition to placing speakers at conferences, EMA also has been working to have articles on the industry featured in association publications. For example, the September issue of *Association Management*, a magazine for association executives, included a nine-page package on how to select and use an electronic mail system. The piece also included a list of public-service providers who are EMA members.

European EMA Selects Group's First Director

Telecommunications expert Philip Kelly, formerly of British Telecom, will staff association's activities

The European Electronic Mail Association, sister organization to EMA, has named Philip Kelly as its executive director, EEMA Chairman Ids Zandleven announced in a statement released last month. Kelly has been active in telecommunications for more than 40 years, most recently as director of the national network division of British Telecom. He left British Telecom in 1983 to become an independent telecommunications networks and services consultant.

Zandleven also announced the appointment of Jan Mul to the position of secretary. Mul is head of office computing services for the Rotterdam School of Management.

Kelly was introduced to the European electronic mail community during an EEMA reception held in conjunction with last month's Telecom '87. The October 22 event also featured discussions of EEMA strategy and activity plans for 1988 as well as an overview of conformance testing services by EMA officer Richard Miller, president of Telematica, Inc.

EEMA has taken steps in recent months to consolidate its advisory groups and is working to increase its membership. In order to build awareness of the association and the electronic messaging industry throughout Europe, EEMA launched a journal last month.

And, according to Guenther Leue, one of EEMA's founding members, the European organization is looking forward to continued collaboration with EMA. Speaking at the start of EMA's annual conference last month, Leue thanked the association for its support in EEMA's creation and said his group plans to further its ties with EMA.

For more information about the European EMA, please contact Jan Mul at the Rotterdam School of Management, P.O. Box 1738, 3000 DR Rotterdam, The Netherlands.

ELECTRONIC MAIL

Throughout the world, mail delivery services are experiencing serious troubles, and methods to improve the situation are being considered along with alternate modes of information delivery, primarily electronic mail.

Before looking at the future opportunities in the realm of electronic mail, a brief review of the mail delivery situation and problem areas is in order, since problem elimination can result in market opportunities.

Mail Delivery: USPS's Problems

Exhibit 9-5 shows an overview of the postal situation for a number of postal administrations in selected developed countries, including the United States Postal Service (USPS). USPS is notable for several reasons. For example, letters handled per employee well exceed that of the other countries, and the total volume of mail is almost an order of magnitude greater than that for the other countries. USPS operates within a large geographical area with widely dispersed population. Notable also is that all of the postal organizations are losing money.

Some of the known problems with USPS operation are:

- labor costs, since 85% of total costs are for manpower;
- operating costs are accelerating due to higher energy costs and inflation;
- the techniques of moving, sorting, and processing physical items are mature and no significant automation breakthroughs are anticipated;
- the delivery point/volume ratio is changing unfavorably, and costs are, to a large extent, directly related to the number of delivery points and the frequency of delivery;

EXHIBIT 9-5

POSTAL OPERATING OVERVIEW OF SELECTED COUNTRIES

	United States	Canada	United Kingdom	Belgium	France	Germany	Italy	Netherlands	Australia
Volume of first-class mail (millions)	88,573	4,999	11,008	2,542	11,342	9,858	6,628	3,351	2,590
Number of postal employees	701,051	114,678	200,954	52,627	235,781	286,099	168,822	41,487	29,348
Letters per employee	126,343	42,489	54,780	48,250	48,030	34,420	39,420	80,740	87,960
Losses (millions)	$2365	$ 181	$ 145	$ 122	$ 174	$ 445	$ 527	$ 36	$ 137
Losses per employee	$3373	$1586	$ 750	$2000	$ 739	$1672	$3116	$880	$4654
Loss on each letter	2.1 ¢	3.8 ¢	1.4 ¢	4.8 ¢	1.5 ¢	5.2 ¢	8 ¢	1 ¢	5.3 ¢
Cost of first-class mail	13 ¢	10 ¢	17.9 ¢	16.2 ¢	18.1 ¢	19.3 ¢	15 ¢	18.9 ¢	26 ¢

- too many and too little-used post offices -- according to a GSA study., 13,000 of the 31,000 post offices could be closed without a loss in efficiency.

USPS's major strength is its monopoly for the handling of first-class (sealed) mail.

Since 1971, when the quasi-independent corporation, USPS, took over from the Post Office Department, USPS has had financial problems, although most recently there has been some respite. In a speech before the Economic Club of Detroit in March 1976, Postmaster General Bailor stated, "Unless drastic changes are made in the way Americans send and receive their mail, we are heading for potential disaster". From a peak of 90 billion pieces of mail in 1974, the volume dropped 1% in 1975 and is expected to drop to 84 billion pieces by 1980. In addition to the oncoming effects of EFT, some mass volume mailers (newspapers, magazines, etc.) are cutting costs by using private carriers. USPS 1976 fiscal budget was $14.2 billion, and was expected to post a deficit of about $1.4 billion. However, latest figures show that at least for one quarter, USPS was operating in the black.

A number of telecommunication developments and techniques can affect the position of USPS as well as provide the potential for improved services. Significant changes in the telecommunication network (and operations), i.e., the continual shift toward digital plant and transmission, will affect USPS's first-class mail business. Either USPS will become more involved with the electronic transmission of messages, or it will continue to lose a growing percentage of the first-class business mail market.

USPS, for a number of years, has been studying the potential of electronic message systems (EMS), but no procedural plan has been adopted. USPS's estimates were that it would lose a minimum of 30% of all first-class mail to various privately operated EMS organizations by 1985, if it does adopt its own EMS system.

The use of digital data networks for intraplant and interplant business messages is growing and will accelerate with the expansion of digital networks, the value-added carriers, and EFT. There is no doubt that EMS will penetrate the business mail market. The question remains, however, as to whether USPS will engage in EMS or decide to continue its physical delivery system on a reduced level.

USPS Strategies

Under the shelter of the Private Express Statutes and the ramifications of other regulatory and legal sanctions, USPS strategy decisions become quite complex. USPS could continue as it is and concentrate on physical delivery systems as well as respond to quasi-electronic services, such as MAILGRAM delivery. If this strategy is adopted by design or default, USPS could consider -- with the proper governmental sanctions -- different modifications to its operations, such as the following:

- change in delivery schedules and rates so that mail is delivered one to three times a week with added charges for daily delivery;
- additional funding (subsidies) from general or special taxes in an attempt to provide the best hard-copy delivery system possible;
- contracting out more of its operations to private organizations, with USPS acting in a supervisory role to assure performance;
- an excise tax on messages not carried by USPS.

USPS could decide to join in the EMS competetive arena and possibly adopt the following alternatives:

- participate in joint ventures with additional (other than WU) digital data carriers, such as USTS (ITT), SBS (IBM) in 1980, or AT&T; or
- participate in an individual or joint development

program to offer EMS terminals to business organizations on an optional basis.

If USPS opts for the joint operations approach, electronics would be used for long distance transmission (not local mail) and either input (pick-up) or output (delivery), but probably not both, since then there may be a conflict with the telecommunication industry. In this role, USPS would accept messages for electronic transmissions by the current physical pick-up method, using special forms or other means to identify EMS-type items. Also, messages would be accepted from public electronic access stations, common-carrier digital data networks, and perhaps from terminals leased by USPS or others to businesses and individuals. USPS would make physical delivery of output copy to recipients who do not have terminals, and would switch messages it originates to the digital carrier networks for those that do.

Technology Options

The Research and Development Department of USPS has been conducting and reviewing research into the technology required for EMS. The EMS currently envisioned by USPS is a network of message handling facilities that would accept messages in a variety of forms and, as necessary, convert them to digital format. This digital stream would be transmitted via landline, microwave radio, optical lines or communication satellite to the receiving end. There the messages would be decoded and printed on hard paper copy; alternately, tapes would be generated for delivery to single or multiple customers. The network would consist of 125 large nodes spread over the U.S. and Puerto Rico and supplemented by about 15,000 small nodes located 15-30 miles away from the large nodes. Another network considered would consist of around 25,000 nodes, with varying capacities distributed as needed.

Preliminary USPS system definition studies indicate that an economical EMS system will utilize communication satellite links that require coverage of large areas with minimum interference. By 1985, the state-of-the-art spacecraft technology will include:

- improved active body stabilization,
- use of new lightweight materials,
- higher solar electrical energy conversion efficiency,
- more efficient energy storage for satellite operations during eclipses,
- improved satellite positioning and station-keeping,
- large deployable multi-beam spacecraft antennas, and
- anti-jamming techniques.

Some of the communication spacecraft now being utilized have the above capabilities and USPS's needs could be met by its integration and adaptation to an EMS system.

The communication technology that would be utilized for the communication satellite link would include the following:

- frequencies above 10 GHz,
- precision pointing of inexpensive narrow-beam antennas,
- orthogonally polarized antennas,
- high-power, high-efficiency X-band and K-band TWTs,
- on-board satellite switching and SDMA,
- coding for error control,
- more efficient source encoding,
- more sophisticated modulation methods, and
- small, low-cost, low-noise receivers.

Of particular importance to the network development is the optimized utilization of the higher-cost short-haul land links that tie together the EMS network.

USPS has recognized the necessity for utilizing electronic technology for its message-handling requirements in the 1985-plus time frame. By 1985, most of the subsystem equipment

will have been developed. USPS will then select and integrate this equipment into a workable EMS system. USPS recognizes that substantial development work will be required in the high-speed paper handling, scanning, printing, data compression, and networking areas.

MAILGRAM: EMS Proves In

MAILGRAM service was introduced jointly by USPS and Western Union (WU) on an experimental basis in 1970. Since then, this service has grown appreciably every year. During the experimental service phase, MAILGRAM was available to WU's Telex and InfoCom customers in 12 cities. InfoCom is a private network in which subscribers' teleprinter terminals access each other through a WU computer system. By the end of 1971, all Telex customers were permitted access to the service, and acceptance of messages by telephone was also instituted successfully. In 1972, USPS agreed that MAILGRAM service had proven itself and the service was tariffed. In 1974, a computer link was established with Canadian telecom carriers which permitted the exchange of MAILGRAM messages between the U.S. and Canada by means of automatic computer routing. Currently, all subscribers to WU's Telex or TWX networks, and those who are equipped with an InfoCom terminal can send MAILGRAM messages directly into the InfoMaster computer.

The InfoMaster computer automatically routes each MAILGRAM message by ZIP code to one of 119 Serving Post Offices (SPOs). One-fourth of these SPOs are equipped with PDP-11 computers operating as controllers for two Data Products 2310 line printers, each of which can process about 800 MAILGRAM messages an hour. The other SPOs are linked to InfoMaster by dedicated lines and the messages are printed on 100 words-per-minute receive-only teleprinters. MAILGRAM service has proven its effectiveness as the harbinger of new EMS systems.

A good combination of concept, implementation, and cost has resulted in a useful electronic mail service.

Canadian Electronic Mail Systems

The Trans-Canada Telephone System and Canadian National/Canadian Pacific Telecommunications have initiated cross-country digital networks, Dataroute and INFODAT, respectively. These services, particularly with the augmentation of packet switching, could provide the major network backbone without requiring Canada Post to undertake the construction of dedicated facilities.

In the Canada Post proposed system, mail would be collected by various means at a "mail station". The source documents would be converted to digital form by an optical character reader (OCR) and facsimile equipment. The digital electronic message would be delivered by the appropriate carrier via terrestrial and/or satellite facilities to its destination where it would be converted back to hard copy and sealed in an envelope. The letter would then be delivered by regular postal carrier service to its recipient.

Canada Post estimates that this system could be almost in full operation by 1985 on an intercity (post office to post office) basis. By 1990, service to and from individuals, on an intracity basis, might be provided.

A trial EMS system (Pilot EMS or PEMS) linking the three cities of Ottawa, Montreal, and Toronto is expected to be operational in 1977. This system would handle an estimated daily mail volume of about 22,000 pieces. System characteristics and performance comparison data will be obtained through the use of mail test pieces that will be handled by PEMS along with regular mail.

system operational requirements. A generalized communication requirements evaluation for the three network types is shown in Exhibit 7-9. Hierarchical networks generally have higher communications costs than satellite systems of equal capabilities. As sites become increasingly independent, the frequency of communications is reduced.

Electronic Mail

In a broad sense, telegraph, Telex, and MAILGRAM may be considered early forms of electronic message systems. Facsimile systems and word-processor based systems represent newer technology and promise to gain wide acceptance and to be formidable competition to the U.S. Postal Service (USPS) first-class business mail. EFT also constitutes a competitive threat to first-class mail, in that bills and payments represent a significant portion of business and private first-class mail volume.

MAILGRAM

The first comprehensive test of mass mail delivery using an electronic medium for at least part of the transmission path was initiated jointly by Western Union and the U.S. Postal Service in 1970 and is called MAILGRAM. The communication process consists of a message initiated via telephone, Telex, or desk facsimile to a Western Union message center. Messages may also be turned in at any Western Union office. The message is graphically reproduced on a CRT display by means of a keyboard-operated character generator. After read-back to the sender and any required editing, the message is instantaneously transmitted to a computer message-switching center for dispatch to its destination. A teletypewriter at a post office near the recipient's address produces a message copy which is then entered in the

EXHIBIT 7-9

NETWORK COMMUNICATIONS REQUIREMENTS

Requirement	NETWORK		
	Hierarchical	Satellite	Distributed Processing
Staff	Many (Central Site)	Few	Few
Operating System Overhead	High	Low	Low
Line Costs	High	Low	Low-Moderate
Line Type	Various (Mainly Dedicated)	Switched (Generally)	Various (Generally Switched)
Number of Lines	Many	Few	Few

local mail delivery system and delivered by the regular carrier. The service assures a 98% certainty of next-business-day delivery of the message. Early service was offered on an experimental basis to a few business firms, and in April 1971 it was made available to the general public in the New York City area. In March 1972, the Postal Service entered into a long-term open-ended contract with Western Union, and MAILGRAM became a permanent service and is available nationwide. First year growth in message volume was 97.7%, from 3.2 million mailgrams in 1971 to 6.3 million in 1972.

A substantial percentage of the current MAILGRAM volume consists of bulk messages sent to many recipients by large companies. In such cases, Western Union is provided with a magnetic computer tape containing both the message and the address list. This "batch" service is provided at a reduced rate which varies with volume. Bulk mailing of this sort is extensively used in marketing campaigns. It is probable that this business-oriented use of MAILGRAM service will dominate message volume over the next 5-10 years, but individual message service will increase in popularity as a substitute for telegrams, important airmail, and telephone calls where a delayed response is permissible.

Facsimile Mail

A joint industry-government symposium in 1970 visualized future mail delivery in terms of a broadband cable communication system in each city with inter-city connection via domestic satellite. An "electronic mailbox" was proposed for street, apartment, or business locations. This mailbox would contain a facsimile transmitter to scan an inserted letter and relay the information, via coaxial cable, to a central switching computer. A coded address would allow the message to be routed to the recipient's home facsimile receiver. The "hard" copy output from the receiver would be folded and sealed to ensure the privacy of both parties.

The technology for such a system is available now, but the wired-city concept necessary for intra-city delivery is at least 20 years in the future, partly because of logistics and finance, but also in part because of consumer reluctance to pay extra for services that may not have personal premium value.

Facsimile transmission of mail between post offices, however, is feasible now. Letters or legal documents that require signature reproduction cannot be sent by MAILGRAM, but a facsimile copy delivered in the same manner would be satisfactory. Such service is now available from the Postal Service between New York and Washington, D.C., at a charge of approximately $5.00 per page. Similar service is offered between major cities by private facsimile services.

New Activity

Because of shifting mail patterns, anticipated changes in mail volume, and the expanding utilization of electronic technology by the business community, the U.S. Postal Service has awarded a $2.2 million contract to RCA's Government Communications System Division for a two-year feasibility study to determine the technical and economic aspects of an electronic message service system.

The study will consider alternative systems employing communication satellites, terrestrial networks, facsimile devices, optical character readers, and word-processing equipment. The results are expected to enable postal management to determine which system, if any, will provide the service with a single reliable and economical means of electronically transmitting mail in accordance with customer service requirements.

In concept, the system would accept a message in paper copy form, convert the material into a digital form, transport the message electronically to its destination, and

convert the material back to paper copy form for delivery by a letter carrier. Material initially received in digital form could be sent directly to the addressee by an electronic delivery system or be converted to hard copy and delivered by conventional means.

Wiltek Electronic Mail System

An electronic mail system using word-processing technology to link corporate executives, management centers, branch offices, and computer facilities at a cost competitive with the U.S. Mail, while achieving control, efficiency and flexibility, has been developed by Wiltek, Inc. of Norwalk, Connecticut.

The Wiltek system is designed to provide:

- correspondence preparation,
- automatic, dependable, and fast distribution of correspondence,
- control of present and future communication costs,
- communication with corporate computers for data entry and computer-generated reports,
- direct access to public-message networks such as TWX and Telex,
- access to international communications.

Initial drafts can be typed on a terminal and stored in electronic memory for later recall and revision. Once correspondence has been typed in final form, it is released for automatic pick-up and delivery by WILCOM, Wiltek's Communications Computer System. Correspondence is received and typed at 450 words per minute on continuous-form letterhead, standard stationery, or computer paper of up to 132 columns.

Operating the mail station is similar to operating a standard typewriter. When typing correspondence, the secretary simply presses a button marked "Keyboard" which

activates the typewriter. When the secretary is finished, the "Print" button is depressed. This allows the station to print out correspondence addressed to it by another station.

Internally, the electronic mail system is more secure because fewer people have access to the correspondence. Mail clerks and teletype operators no longer need to handle confidential information. Only the sender, the recipient, and the secretary see correspondence that is sent through the electronic mail system. Key personnel will have an "electronic signature" which authenticates their messages. The recipient can be required to enter his own electronic signature before obtaining confidential information.

In a Wiltek electronic mail system, automatic pick-up and distribution of correspondence is handled by WILCOM. A WILCOM computer picks up mail by sequentially placing telephone calls to each individual mail terminal. When called, a terminal automatically answers and sends to the computer all completed correspondence. The computer then delivers to the terminal correspondence which it has collected from other locations. This process continues throughout the day with WILCOM collecting, sorting, and distributing correspondence throughout the corporation.

Three levels of correspondence delivery are provided:

- regular,
- express, and
- overnight.

The schedule for calls to each station is elected by the user and may vary by location.

Regular -- The frequency of regular mail pickup and delivery usually is set at 30 minutes.

Express -- Using the express mode of the mail station, urgent correspondence can be sent immediately to its destination. Following preparation of the message, the originating terminal automatically dials the destination terminal and delivers the message.

Overnight -- Voluminous correspondence which is not urgent can be marked for overnight delivery. Overnight correspondence is stored at WILCOM until the evening hours when it is delivered at lower cost.

WILCOM utilizes WATS -- Wide Area Telephone Service -- lines to link the electronic mail stations. Separate lines are dedicated to each Wiltek customer, and cost of the lines is billed directly to the user by the telephone company. The combination of WATS lines and high-speed transmission reduces communication costs to a minimum. The cost of the system is almost independent of volume. Thus, cost per message drops rapidly as the volume of messages increases.

The Wiltek electronic mail service can deliver computer reports directly to the user on a timely basis. Computer reports are picked up from the data-processing center and distributed through the system just like other correspondence. The electronic-mail typewriter can handle up to six copies of formatted paper with widths up to 132 columns. If needed, a variety of low, medium and high-speed printers to supplement the electronic-mail typewriter can be supplied.

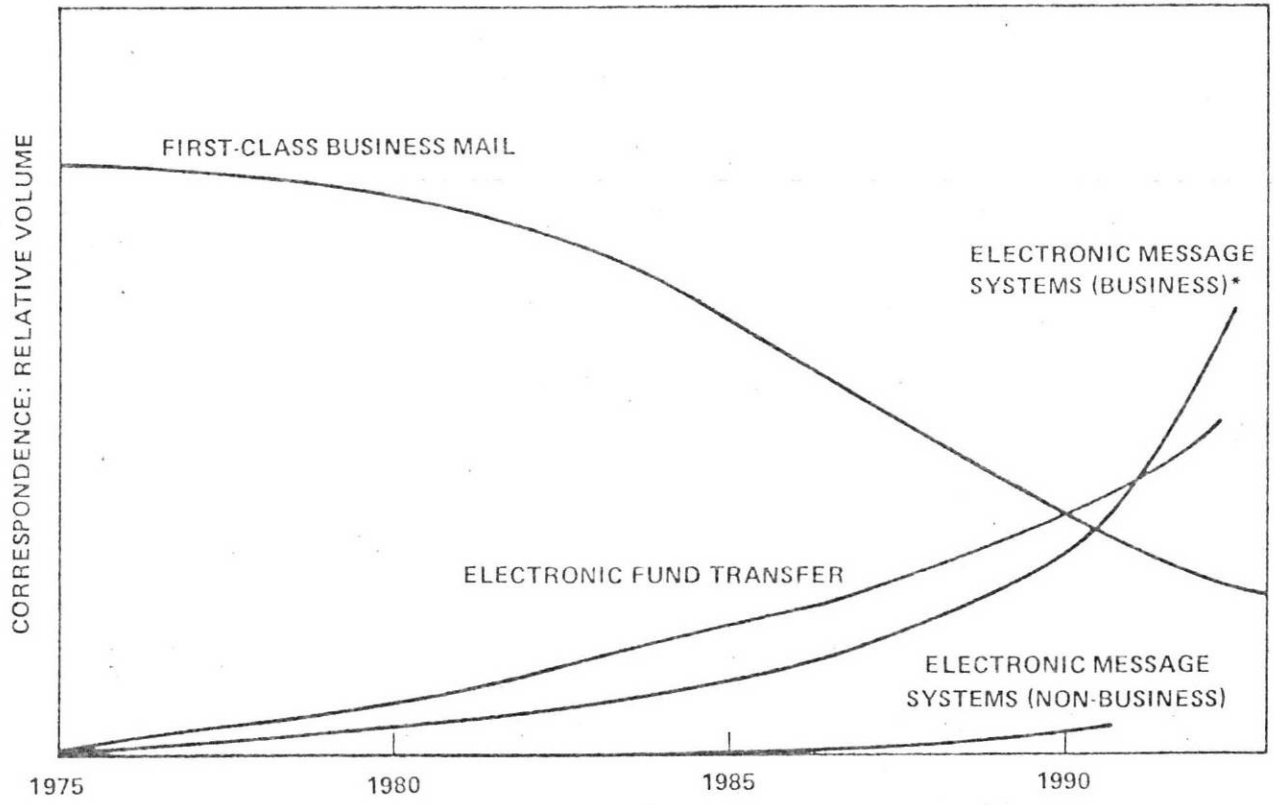
USPS Options

As EFT and business and non-business Electronic Message Systems (EMS) come on line, the U.S. Postal Service (USPS) will continue to lose its first-class mail delivery service, as illustrated in Exhibit 7-10. The USPS has numerous strategies to consider in its attempt to maintain its position and to serve the needs of the populace.

In 1975, the USPS requested that the National Research Council (NRC) undertake a study of electronic message distribution systems. The NRC, in turn, requested the Committee on Telecommunications, Assembly of Engineering to assist USPS. A USPS support panel was organized to conduct a study

EXHIBIT 7-10

FIRST-CLASS CORRESPONDENCE DELIVERY TRENDS



*INCLUDES FACSIMILE

of EMS and how it could support the mission of the USPS. The panel developed/defined three conceptual EMS configurations, as follows:

- Generation I -- an extension of the present first-class mail stream, with all of the mail handled physically except for selected links between postal installations. On these selected links, electronic transmission would replace the physical transport of mail.
- Generation II -- calls for electronic input and transmission of information. Hard copy is produced at a postal installation near the recipient and then delivered by a USPS carrier in the conventional manner. MAILGRAM is an example of the Generation II concept.
- Generation III -- a completely electronic system, in which a hard copy may or may not be produced, depending on requirements and the information flows from originator to recipient only in electronic form. Carriers would not deliver mail with this scheme.

  For Generation III to operate widely, two main elements are required. One, the development of an economical, reliable and compact terminal for the individual user; and two, the utilization of existing telecommunications network, or the development of a new distribution network.

The USPS panel concluded that:

- EMS offer the potential of replacing as much as one-third of all of today's letter mail (about 50% of the first-class mail) for business and government;
- it is not necessary and may not be desirable for the USPS to own and operate a complete message system, but the entire system will need to be

managed by the USPS to be most effective; and

- third, the USPS planning and implementation of EMS services may benefit from experiences gained from existing electronic message distribution systems.

The USPS has recognized the necessity for utilizing electronic distribution networks for its message-handling requirements in the 1985-plus time frame, if it is to maintain its first-class mail delivery position. Preliminary USPS system definition studies indicate that an economical EMS system will use communication satellite links, as illustrated in Exhibit 7-11. The USPS also recognizes that if a satellite network is implemented, considerable development work will be required in the high-speed paper handling, scanning, printing, and networking areas.

It is unclear to what extent USPS will commit to EMS within the coming decade. What is clear is that improvements in message delivery systems are needed, technically feasible, and economically increasingly more attractive. USPS derives some $1.5 billion in revenues from first-class business mail. There undoubtedly exists cross elasticity between the existing postal service and new EMS systems that will manifest itself in a shift of revenues from the conventional mail delivery systems to EMS, with or without USPS participation. It is very difficult to assess these cross elasticities until EMS systems find wider acceptance and their price structures become established. In any case, electronic means of communications, particularly various forms of digital networks -- private and common carrier -- will be the beneficiaries of these trends.

PACKET SWITCHING

Unlike the conventional telephone network which requires the use of modems to adapt the data signal to the analog

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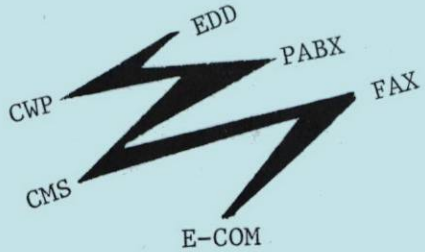

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ist for the privacy of EFT information, and discusses the threats EFT systems present.

Humble, Jane. *Overcoming obstacles to EFTS.* INFO AGE 6:111-7, APR 84.
Discusses the development benefits, and weaknesses of the electronic funds transfer system (EFTS) as well as consumer resistance to it. 21 references.

—Highlight—

Khabbaz, Nicholas G. *Bank can cut costs by adding other services to EFT networks.* DATA COMM 13:107-14, SEP 84.
Shows that, because of advances both in data communications and in data base design and management, financial institutions can now integrate electronic funds transfer with videotex, point-of-sale terminals, credit checks, and interbank networks.

Moore, James B. *Smaller banks face competition by expanding ATM services.* BANK SYS 21:83-4A, MAR 84.
Shows how the explosive development of shared networks has provided a vehicle through which smaller institutions can offer competitive automated teller machine services without incurring the prohibitive cost of installing their own base of proprietary terminals.

Perkins, James H. *How to evaluate risks in EFT systems.* BANK ADMIN 60:56+, FEB 84.
Outlines 15 steps to an ideal, risk-free funds transfer, in order to evaluate the extent of internal and external fraud risks a bank is assuming with a funds transfer.

Ritzer, Julie R. *Micro-based EFT system beefs up security, cuts staff 50%.* BANK SYS 21:85-7, AUG 84.
Tells how the Arizona Bank has enhanced its security, saved time and money, and cut staff since it became a beta test site for a microcomputer-based electronic funds transfer system.

Stuparich, Mark E. *The automated clearing house and EFT applications.* INTERPRETER 43:26-7, APR 84.
Discusses the automated clearing house, a flexible electronic funds transfer (EFT) payment mechanism, as an EFT application being used by insurance companies.

Vacca, John. *Money on the move: Electronic funds transfer.* COMPWRLD ON COMM 18:83-7, MAY 2, 84.
Looks at electronic funds transfer, which encompasses a broad range of possible payment systems and services directed toward substituting an electronic transfer of value for a paper transfer of value, either wholly or in part.

ELECTRONIC MAIL

See also: *Applications - Postal Service.*

Books & Reports

DIRECTORY OF PLANS, EXECUTIVES, POLICIES FOR PCS, OFFICE AUTOMATION, DATACOM, AND ELECTRONIC MAIL. International Resource Development, 1985. $595.00.
A directory giving names, addresses, and purchasing responsibilities of 3500 executives from 1,000 major U.S. corporations with activities in electronic mail, data communications, office automation, and facsimile.

Townsend, Carl. *ELECTRONIC MAIL AND BEYOND: A USER'S HANDBOOK OF PERSONAL COMPUTER COMMUNICATIONS.* Wadsworth, Inc., 1984. 323 pp. $14.95.
Provides a nontechnical introduction to electronic mail and covers telecommunications, information utilities, and electronic information systems.

Periodicals

A message service for corporate communications. TELECOMM 12:78+, FEB 84.
Looks at an around-the-clock electronic message communications capability called TELEMAIL, which is a computerized communications systems that handles a wide range of needs from internal company memos to field sales requests.

Adams, Russ. *Cashing in on electronic mail systems.* BUS SOFT 2:24-8, JUN 84.
Discusses the growth of intercorporate electronic mail networks and contends that a number of industry-specific networks will develop in areas as such trucking, airline and hotel reservations, and banking.

Ambrosio, Johanna. *Electronic mail seen delivering voice, video.* INFO SYS NEWS p.48, FEB 20, 84.
Examines voice mail and electronic mail as they rapidly converge into one technology following overall integration trends in the office marketplace.

Beagley, Karen. *The demise of 'telephone tag'.* INFOSYS 31:130-1, NOV 84.
Discusses the growing use of electronic mail and the advantages of the more sophisticated systems now in use.

Bird, Mike. *MicroMail!?!* INFO MGMT 18:22+, NOV 84.
Discusses how MicroMail works as an alternative to mailing and distributing paper information overseas.

Cameron, Janet. *Electronic mail gallops into the future.* COMPWRLD ON COMM 1:71-4, NOV 84.
Discusses various electronic mail systems and offers comparisons between some of them in chart form.

Chabrow, Eric R. *E-mail links bank offices worldwide.* INFO SYS NEWS p.1+, OCT 1, 84.
Describes how Chase Manhattan Bank employees worldwide can electronically exchange mail, letters, and documents with fellow workers.

Christodoulakis, Stavros and Faloutsos, Chris. *Design considerations for a message file server.* SOFT ENG SE-10:201-9, MAR 84.
Describes a message server facility for handling large organizational archives of messages in an office information system environment. 21 references.

Columbus discovers electronic mail. COMPWRLD ON COMM 18:21-2, SEP 5, 84.
Takes an inside look at the electronic mail system developed for one of the nation's most advanced municipal data processing systems, and studies how it has radically changed the way the city communicates among its own forces and with its citizens.

Connolly, James. *Speakers address emerging trends in electronic mail.* COMPWRLD 18:28, JUL 23, 84.
Reviews the latest developments in electronic mail technology, including alternative delivery methods, new applications, integration of text with voice and images, and the use of personal computers to exchange messages.

Cunningham, Ian. *Electronic mail standards to get rubber-stamped and go worldwide.* DATA COMM 13:159-60+, MAY 84.
Argues that CCITT message handling standards will make sending mail with graphics, voice, and data as easy as calling the corner grocer.

Dairy group milks system for wide array of benefits. COMPWRLD 18:41, OCT 29, 84.
Tells about a company's use of an electronic mail system to solve their communications problems.

Desmond, John. *Role of computerized mail brewing concern in Congress.* COMPWRLD 18:14, JUN 4, 84.
Probes the issue of computerized correspondence management as it relates to the United States Congress and its constituents.

E-COM's under fire. INDUS WEEK 220:82, MAR 5, 84.
Discusses Electronic Computer Originated Mail (E-COM), a system in which electronic messages are delivered as inexpensively as first-class mail.

Electronic mail allows Heinz to catch up. SOFT NEWS 4:45, OCT 84.
Tells how electronic mail has helped ease some of Heinz's complex communications problems.

Electronic Mail and Micro Systems. International Resource Development, Inc., 1977-. $315.00/yr. U.S. and Canada; $360.00 foreign.
A twice-monthly newsletter covering technology, user, product, and legislative trends in graphic and record communications.

Ferris, Dave. *The emergency of E-mail on the PC.* SOFT NEWS 4:19-20, JAN 84.
Comments on an interesting match of technologies—E-mail and the personal computer—and notes that users of microcomputers are beginning to use E-mail for communications, resulting in a significant improvement over customary dumb-terminal-based systems.

Firm adds electronic mail without additional hardware. COMPWRLD 18:45, SEP 24, 84.
Tells how a manufacturer of heating and cooling systems installed an electronic mail system to give its sales and service organizations access to each other and to headquarters.

Frank, Ronald A. *Electronic mail technology is ready, but human behavior patterns must adjust.* TELECOMMPROD 2:11-2, DEC 84.
States that the technology for both in-house and public subscription electronic mail now exists, but observes that staff participation can make or break the successful implementation of an electronic mail system.

Frank, Ronald A. *Electronic message systems hold great promise.* TELECOMMPROD 2:1+, MAR 84.
Urges telecommunication staffs to take the lead to ensure that the full potential of electronic voice and mail message systems are enjoyed by playing a role in developing a positive attitude.

Greenstein, Irwin. *Major firms to adopt electronic mail standards.* MIS WEEK 5:22+,

JUL 18, 84.
Examines the introduction of the "X 400" international standard for a computer-based message system expected to be adopted by two major electronic mail vendors.

Interface extends boundaries of insurer's electronic mail. COMPWRLD 18:39+, NOV 19, 84.
Talks about an insurance company's electronic mail users who are now able to send messages outside of the company using an interface that is modeled after a developing standard.

Kay, Susan S. *How to choose electronic mail.* INFOSYS 31:98+, JUN 84.
Suggests that the benefits of electronic mail can be realized if care is taken in assessing both needs and products.

Kovach, Jeffrey L. *Zap! It's mailed.* INDUS WEEK 222:73-4, SEP 3, 84.
Notes that Federal Express Corp., banking on market recognition and a facsimile transmission system that no one else is using, has aggressively entered the troubled electronic-mail arena.

Leaf, R Benton. *Electronic mail, automated microfilm retrieval speed recovery of truncated checks for Baltimore banks.* JIIM 17:45-7, DEC 84.
Explains how paper requests have been all but eliminated by one bank's electronic mail system, and an on-line microfilm retrieval system allows the library to turn the request around in a maximum of 24 hours.

Louis, Arthur M. *The great electronic mail shootout.* FORTUNE 110:167-8+, AUG 20, 84.
Reports that MCI, the long-distance telephone company, and Federal Express, the dominant force in overnight shipping, are moving into electronic mail in a big way.

Mansfield, Ron. *Presenting MCI Mail's log-on procedure.* BUS SOFT 2:50-7, JUN 84.
Presents the MCI log-on procedure as an example of how to simplify data communications by creating a new communications set for Smartcom II.

Mansfield, Ron. *SmartCom II's link to the new post office.* BUS SOFT 2:60, APR 84.
Describes the MCI Mail Service, a new entrant to the electronic mail field that is advertised as the nation's new postal system.

Monk, J Thomas and Landis, Kenneth M. *E-COM: Delivering on its promise.* BUS COMP SYS 3:27+, MAY 84.
Explains how one company corresponds with 500 customers each month with electronic mail services.

Moore, D J. *Teletex—A worldwide link among office systems for electronic document exchange.* DATABASE JRNL 13:No.4:2-14, 1983.
Traces the development of Teletex, describes its characteristics, and looks at how this service may be extended in the future. 26 references.

Murphy, Neil. *EMS has significant benefits for managers.* GOVT COMP NEWS 3:42, SEP 84.
Discusses the microcomputer to mainframe connection, highlighting electronic mail systems (EMS) and the microcomputer to mainframe connections they allow.

Myer, Theodore H. *Standards for global messaging: A progress report.* J TELECOM NET 2:413-33, Winter 83.
Reviews the functional model that supports the International Telegraph and Telephone Consultative Committee Recommendations on Message Handling Systems. 12 references.

Nabisco cuts messaging costs with electronic mail. COMPWRLD 18:37, AUG 13, 84.
Claims that after Nabisco Brands, Inc. switched from a punched-paper tape messaging system to electronic mail, it saved 20% on its messaging operation costs.

Panko, Raymond R. *Electronic mail.* DATAMATION 30:118-20+, OCT 1, 84.
Discusses the two sets of standards for electronic mail which are expected to remain acceptable—one from IBM, the other from the International Consultative Committee on Telephone and Telegraph.

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Porter, Peggy. *"Dear PP05" Interpersonal communication and the computer: Entering a brave new world.* LIB HI TECH 2:No.1:23-7, 1984.
Presents suggestions for rules of conduct when using electronic mail systems to assure that electronic mail enhances, as well as facilitates, interpersonal communication.

Ramellini, Joseph A. *Electronic mail key to QA systems integration.* INFO SYS NEWS p.50, FEB 20, 84.
Notes that the key vehicle supporting information interaction in the office is electronic mail (EM), and adds that the productive office automation system should logically support this technology.

Rifkin, Glenn. *Electronic mail.* COMPWRLD 18:35-6+, AUG 15, 84.
Compares electronic mail to the telephone—a seemingly good idea at its introduction, but not much use if you have only one—and predicts that in time, electronic mail will have as bright a future as the phone.

Roman, David. *Electronic mail: Faster than a speeding bulletin.* COMP DEC 16:146-8+, JUL 84.
Discusses why electronic mail hasn't grown as rapidly as vendors and market researchers anticipated and suggests that the reason may lie in the use of networks.

Rothwell, Peter. *The potential of EMS for improving certain office communications.* INFO MGMT 18:18+, APR 84.
Explains how business managers have much to gain from utilizing electronic mail and other electronic messaging systems discriminately.

Schatz, Willie. *It's in the mail.* DATAMATION 30:62+, JUL 15, 84.
Studies standards as they relate to electronic mail, and reports that a small but potentially decisive standards battle is brewing in this technology.

Schiappa, Barbara. *Electronic mail services that really work.* BUS COMP SYS 3:46-8+, NOV 84.
Suggests that electronic mail has finally taken its place as a useful business tool now that the leading third-party services deliver fast, cost-effective communications.

Schindler, Paul E Jr. *Clorox IS voice mail system cuts frustration, phone costs.* INFO SYS NEWS p.1+, AUG 6, 84.
Describes how an electronic mail system installed by one large corporation paid for itself in savings the first year—five times over.

Siegman, Jean H. *Getting the message electronically.* SOFT NEWS 4:43-4, OCT 84.
Characterizes electronic mail systems as based on teletypewriter technology, operating on a store-and-forward basis, delivering messages to a logical address, and providing services beyond individual message delivery.

Sommerville, I and Smith, D J. *An electronic secretary.* SOFTWARE 14:817-25, SEP 84.
Describes an electronic mail system which has been implemented to provide facilities for the receiver as well as the sender of electronic mail. 6 references.

Survey finds many firms planning E-mail use. INFO SYS NEWS p.36-8, AUG 6, 84.
Analyzes the electronic mail market, examining a report completed recently by The Eastern Management Group, a telecommunications market research and consulting firm.

Tsichritzis, D. *Message addressing schemes.* ACM TRANS OIS 2:58-77, JAN 84.
Defines and investigates different addressing schemes that can be used to route messages in mail systems. 20 references.

Uhlig, Ronald P. *International computer message services.* J TELECOM NET 2:399-411, Winter 83.
Discusses progress in work to allow interconnection of heterogeneous computer message systems. 2 references.

Warner, Edward. *Electronic mail lets insurer cut internal paper use, costs.* COMPWRLD 18:26, JUL 30, 84.
Describes the savings attained by a major auto insurer who adopted an office automation system that replaced paper copies with electronic mail, bypassing the need to increase clerical staff.

Warner, Edward. *Electronic mail net lets micro managers share data.* COMPWRLD 18:65+, APR 2, 84.
Explains the Executive Communication Network (ECN), an electronic mail system that will allow members to share information about microcomputers.

Will electronic mail deliver for Western Union? BUS WEEK p.64-5, MAR 19, 84.
Examines a change in Western Union's policies and its new offensive position in the telecommunications market, and adds that in 1984 the company plans to put $115 million into its EasyLink electronic mail service.

Worldwide E-Mail program helps Ford share resources. COMPWRLD 18:SR 19-20, FEB 27, 84.
Reviews the Ford Motor Company's three-phase program based on electronic mail, and adds that the purpose of the program is to eliminate communications bottlenecks.

Electronic Message Boom in 1980s to Include Some Specialty Niches

According to a new report from International Resource Development, by the end of the 1980s, users will be spending more than $4 billion per year on electronic mail services and equipment. Although the field will probably be dominated by firms such as AT&T, IBM and GTE, at least 50 other suppliers are expected to be active in more than a dozen specialty niches, says the report, "Electronic Mail in the 1980s."

The study predicts that the US Postal Service will participate in the future electronic mail market through new and ambitious service offerings. However, IRD believes that the USPS will end up with only about one quarter of the market.

The expected emergence of several new types of devices for sending and receiving electronic mail are discussed, including high-speed printers to be used in conjunction with the Satellite Business Systems wideband satellite communications service. The most important elements in future electronic mail networks will be intelligent communicating versions of the familiar office copier, telephone and typewriter, says IRD. It points to the availability already of intelligent copiers from IBM, Wang and Sharp, and of electronic communicating typewriters for Exxon's Qyx Division. Enhanced-function telephones with scanners and perhaps small calculator-type printers will soon appear on the US market, the report suggests.

The report adds that the emergence of these new communicating devices will spur the use of electronic mail, but to some extent this will be at the expense of the market for facsimile transceivers or telecopiers.

Analyzing the new network service offerings, IRD predicts that by the mid-1980s most of the networks will include message-switching nodes which will have the capability of handling intermixed facsimile-type and CWP type traffic, together with digitized voice traffic.

If all current types of electronic message services are considered, the current spending by users on electronic mail is about $1 billion, says the report, which projects a 1989 market in excess of $4 billion.

For more information on the report, including a free table of contents and description, contact *International Resource Development, 30 High Street, Norwalk, Connecticut 06851.*

Electronic Mail in the 1980s

Revenues/Shipments in $ Million

	1979	1981	1984	1989
Business/Commercial User Services	$575	$655	$930	$2,100
Electronic Mail into the Home	--	10	35	120
Communicating Word Processors	165	430	1000	1,250
Other EM Hardware and Software	264	577	565	1,200
Total	$1,004	$1,672	$2,530	$4,670

Source: International Resource Development

AML Tech Seminar Planned for March

Hughes Aircraft Company's microwave communications products has scheduled a technical seminar on its AML local distribution microwave equipment for the first week in March.

The seminars are held by Hughes

On Digital Signatures and Public-Key Cryptosystems

Massachusetts Inst of Tech Cambridge Lab for Computer Science (409648)

Technical memo. Jan-Apr 77
AUTHOR: Rivest, Ronald L.; Shamir, Adi; Adleman, Len
D2435B3 Fld: 17B, 9D, 45G, 45C, 45D GRAI7714
Apr 77 13p
Rept No: MIT/LCS/TM-82
Contract: N00014-67-A-0204-0063
Grant: NSF-MCS-76-14294
Monitor: 18

Abstract: It is shown that the single operation of raising a number to a fixed power modulo a composite modulus is sufficient to implement digital signatures: a way of creating for a (digitized) document a recognizable, unforgeable, document-dependent digitized signature whose authenticity the signer can not later deny. An electronic funds transfer system or electronic mail system clearly could use such a scheme, since the messages must be digitized in order to be transmitted.

Descriptors: *Cryptography, *Signatures, *Coding, *Secure communications, Digital systems, Mail, Message processing, Data links

Identifiers: Electronic mail, Public keys, Digital signatures, Privacy, Authentication, Factorization, NTISDODXA

AD-A039 036/9ST NTIS Prices: PC A02/MF A01

Electronic Message Systems for the U.S. Postal Service

National Research Council, Washington, D.C. Committee on Telecommunications.**Postal Service, Washington, D.C.

Final rept. 30 Jun 75-31 Dec 76.
D1505B1 Fld: 17B, 45D GRAI7707
Dec 76 60p
Rept No: NRC/TELECOM-76/5
Monitor: 18
Prepared in cooperation with Postal Service, Washington, D.C.

Abstract: The U.S. Postal Service (USPS) Support Panel believes that the Postal Service must become committed to an electronic message system (EMS) service, i.e. 'electronic mail', if it is to be a viable organization in the future. The Panel suggests that Postal Service involvement in EMS might be carried out on an evolutionary basis, with a strong management commitment to allocating adequate resources for this major innovation on a sustained basis. The Postal Service could lease or own segments of the electronic message system, but the overall system needs to be managed by the USPS for maximum effectiveness. EMS has the potential of replacing as much as one third of today's letter mail, with most of the messages being originated by business or government. Electronic messages originated by private individuals will probably make up less than 10% of the total. Accordingly, the requirement for local letter carrier distribution will not decrease significantly in the near future. Early congressional consideration of a national policy on EMS is needed because a fully electronic message distribution system would blur the distinction between the mail and the service rendered by the electronic communications common carriers.

Descriptors: *Mail, Telecommunication, Electric devices, Management analysis

Identifiers: *Electronic message systems, Electronic mail handling, Electronic funds transfer systems, *Postal service, NTISNASNRC, NTISUSPS

PB-262 892/3ST NTIS Prices: PC A04/MF A01

Paper and Paper Substitutes for Electronic Message Systems

Little (Arthur D.), Inc., Cambridge, Mass.*Postal Service, Rockville, Md. Office of Advanced Mail Systems Development. (208 850)

Final rept.
AUTHOR: Lovering, David W.
D1323L1 Fld: 17B, 11L, 45D GRAI7706
Jul 76 19p
Contract: DSPS-104230-76-Z-0335
Project: ADL-C-78543
Task: D
Monitor: 18

Abstract: The technical opportunities for the synthesis of low cost substitutes for paper suitable for use in an electronic message system are examined and the conclusion reached that plastic papers or papers based upon synthetic pulps are not viable alternatives for hard copy output primarily because of their cost. Conventional papers are examined, characterized and cost estimates made for an electronic message system.

Descriptors: *Mail, Papers, Substitutes, Output

Identifiers: *Electronic mail handling, *Electronic message system, NTISUSPS

PB-260 779/4ST NTIS Prices: PC A02/MF A01

"Making it" involves keeping bank debt flat with a growth in sales, while reducing inventory and receivables. While R&D expenditures have been cut back temporarily, Grisanti expects these to be increased to a former level of about seven percent of sales starting next year.

Grisanti took over the top slot last May when the GA board of directors decided the company was in trouble. Grisanti will presumably leave this post in favor of a new chief executive officer when the turnaround is achieved. He is a member of the Los Angeles consulting firm, Grisanti & Galef, Inc., which has reportedly helped out a total of 200 financially ailing companies over the past 15 years.

"We did not start out the turnaround with the idea of a short-term postured growth, but rather considering long-term goals. That's why the turnaround process is taking so long," Grisanti said. While he declined to speculate whether GA would ultimately be taken over by a larger firm he left the distinct impression that his one personal preference would be to see the company remain an independent, even after his job is finished and a new president takes over.

—NDK

Mini Market

Show hits: Pascal, data base, auxiliary memory

The Mini/Micro Show in Anaheim late in September was a decent affair for equipment suppliers not anxious to see overly crowded aisles of people, but rather qualified individuals likely to be influential in equipment purchases. About 10,000 visitors attended.

In the technical program, three (out of 24) sessions were jammed and repeated later in the day. These were: "Pascal On Minis and Micros," "Data Base Management Systems For Minis," and, "The Winchester Disk and Backup For Winchester Disks." In addition to "Pascal" and "Data Base" other software sessions pulled well. Some opinion held that both OEMs and end users were focusing on software.

General Automation's Winsor Brown, who chaired the Pascal presentation, admitted he was somewhat overwhelmed by the interest shown. But: "Given that you're going to use a high-level language, Pascal in its data and control structures provides the greatest flexibility and potential for subsequently writing applications programs. It's a general-purpose language usable for business and scientific applications as well as for systems programming and general-purpose utility programming."

Dennis Frailey of Texas Instruments, who helped organize the technical program and also chaired a software session, speculated that the success of the Database and Winchester presentations were related. "With a minicomputer, you enter data via terminal and the man-machine interface tends to be interactive. With this form of 'text editing' you often store data on disk. You must have a sophisticated way of handling this information, leading to a great interest in data base management. A main consideration about data base management relates to the fact that it is handled by disk, and Winchester technology tends to be less expensive with the mechanism itself smaller. So interest exists about Winchester disks usable on very small computers."

—NDK

INFOSYSTEMS honors John Diebold

John Diebold, chairman, The Diebold Group Inc., receives the second Distinquished Service Award from INFOSYSTEMS during ceremonies in New York City last month. Making the presentation is Arnold Keller, the magazine's editorial director and a Hitchcock Publishing vice president. The first award was given earlier this year to William S. Anderson, chairman, NCR Corp.

Electronic Office

Automated office: a painful evolutionary process

Even the most sophisticated office today, despite the computers and word processors and electronic mail, the buttons and blinking lights, is merely a group of mechanized work stations much akin to the factory of decades ago. What's more, true automation of the business office to the point of management of information resources is a long way off and will come by way of long, painful *evolution* rather than the "revolutionary office of the future" chronicled by most media. Thus concluded Michael Zisman, assistant professor, management science, Sloan School of Management, MIT. Zisman, who specializes in the study of office automation, spoke at a two-day tutorial on the subject in Dallas.

The technology is here today for the so-called "office of the future," says Zisman. The trouble is the very nature of the business office itself. The work carried on in most offices is no more than the execution of routine or almost routine office procedures. But most office procedures are unstructured and there has been no real unit cost volume incentive to automate the decision-making process. The emphasis has been directed toward making the clerk's job easier, in such areas as accounting, purchasing and word processing, but ignoring the manager.

Traditionally, companies spend very little on the office employee—an average of $2,000 to $6,000 per office worker, compared with an average $25,000 spent for each factory worker. But office labor costs, rising at 6 percent a year while communications costs decline at 11 percent a year, computer logic dropping at 25 percent and computer memory dropping at 40 percent a year, make automation in the office more attractive.

Will people pay what it takes to automate? Yes, says Zisman. "Ask Federal Express what people will pay to have a piece of paper delivered in

. . . continued on page 30

another city the next day," he says. "And that's what the electronic desk is all about—rapid communication. The question is not how much it costs but how much it saves." —SS

Systems

Honeywell installs first CP-6 system in US

Four years ago when Xerox decided to get out of the mainframe computer business and sold the remnants of its Xerox Data Systems (XDS), a dark cloud formed over the dedicated Sigma computer users. They liked their Sigmas and, in most cases, had a good-size investment in the systems, but they were worried about future expansion plans.

Xerox solved the problems of future expansion for them by selling XDS to Honeywell, which was well-established in the mainframe business. Science Dynamics Corp. (SDC), Torrance, CA, was one of those Sigma users that had to do a considerable amount of "soul searching." Sandy Pansarella, the company's president, said, "when Xerox announced its intention of withdrawing from the computer business at the end of 1975, we were concerned with the growth limitation that action would have on our business." SDC provides remote computing services to 300 medical schools and clinics throughout the country.

Honeywell kept Sigma users in business with its support of the Xerox CP-V operating system. In the meantime, Honeywell went to work developing a new computer and operating system that would provide these users with an opportunity to upgrade along a compatible path.

The Honeywell answer has come in the form of a large-scale computer package which is a standard level 66/DPS computer modified especially for an entirely new operating system, the CP-6. The first US installation of this unique package is at SDC. It was installed alongside the Sigmas the company has been using for 10 years. Pansarella told INFOSYSTEMS that SDC plans to phase out the Sigmas and go to a powerful, multiprocessing version of Honeywell's CP-6. —JML

Micrographics

Micrographics: 'selling' its advantages

Speakers at a recent Government Micrographics Conference in Washington, DC, examined the opportunities—and challenges—of the 1980s. Arnold E. Keller, editorial director, INFOSYSTEMS, said the major challenge of the coming decade is determining the role micrographics will play, and "selling" its advantages to those who could most benefit.

Information resources management represents both uncharted ground and "good possibilities" for micrographics, according to Keller. But he said many computer practitioners view it as a "closet operation"—and those with an interest must "get it out of the closet.

"Don't try to ram micrographics down the throats of users." Instead, he urged sticking to a systems approach geared to determining users' needs; examining available alternatives to meeting them, and helping to implement micrographics as a means of solving problems.

One specific problem facing private firms in their use of micrographics, according to another conference speaker, is differences in policies of federal agencies regarding the use of microfilmed records in proceedings. Michael Newton, of the Chicago law firm of Chadwell, Kayser, Ruggles, McGee & Hastings, said a lack of uniform policy causes problems for many companies. —VB

Software

Data dictionary/directory key to DBMS future

In a keynote address entitled "Architectures for DD/DS-Driven Database Systems," Bernard Plagman, executive vice president, DBD Systems Inc., Rockville Centre, NY, said that data dictionary/directory systems (DD/DS) "are central to the underlying concept of data base environment." Plagman addressed about 630 Cullinane User Week attendees at a recent meeting in Boca Raton, FL.

Plagman defined data dictionary as the method of organizing "logical aspects of the data base."

Plagman said that he would like to see the CODASYL committee, whose final report is due the second quarter of 1980, incorporate the DD/DS concept into its list of requirements for the standard. "The future of the data resource tool," Plagman said, "lies in DD/DS. . . . The DD/DS concept will have a definite impact on the way you design data base." —CRS

Privacy

Privacy policies must precede security systems

Organizations need to set very extensive policies on privacy before trying to implement a security system, according to the vice chairman of the MA Council on Security & Privacy. "Too many organizations approach security without having in mind what policies they are trying to implement," Jeffrey A. Meldman said. "They act as if making something secure in its own right will solve the privacy problem."

Privacy, to an every-increasing extent, is guided by law, emphasized Meldman, who is an associate professor at the Sloan School, MIT. There is a distinct difference between security and privacy, he pointed out. "Privacy concerns itself with the flow and content of information. It is a matter of policy," he explained. "Security is a question of implementation."

Meldman warned the Society for Management Information Systems' Boston chapter to get ready to be inundated by a lot of laws governing privacy and its abuses in the private sector. The 1974 Privacy Act covers federal agencies and firms that contract with them; it does not extend to abuses by the private sector, he said. —WLR

company," Cunningham commented. "The company with the best network will be the one to make the money."

The firm has signed an agreement making Nissho-Iwai exclusive distributor of Gandalf products in Japan. The agreement, for a two-year period, is worth between $1 and $2 million. That signing, which took close to a year to bring to fruition, follows closely an announcement by Gandalf's England affiliate that it had signed a contract with the London Stock Exchange to set up a 2,000-terminal network. The network, which will be using Modcomp computers, will be accessing public data bases and will be worth about $400 million to Gandalf, Cunningham said. —WLR

Electronic Office

Despite its numbers, ITT finds 'fax' little known

ITT Domestic Transmission Systems Inc. (ITT-DTS) is finding that it requires a "missionary sale" to get users of the more than 200,000 facsimile machines installed in the US to try its new FAXPAK service. In fact, after starting out with a sophisticated marketing program aimed at the telecommunications manager touting cost savings of up to 55 percent over existing services, ITT has resorted to offering the service free of charge for up to 90 days to encourage subscribers to try the service.

FAXPAX enables users to communicate between a variety of previously incompatible facsimile machines. "Today, in excess of 70 percent of all the machines in the US can be talked to by us," asserts Michael K. Hickey, ITT-DTS director of marketing.

William Wheatley, executive vice president and general manager, ITT-DTS, said he believes FAXPAK is ITT's first delivery on the promise of electronic mail. "We've inaugurated this as our first service because the equipment is inexpensive, widespread and there were major compatibility problems between manufacturers' equipment," he explains. "At ITT, we came to the drawing board with a difference. We didn't take sides between manufacturers."

ITT's research revealed that a lot of people didn't even recognize the term "fax." Instead, they were oriented toward "telecopier." This confusion in terms only compounded ITT's problems when it began talking about electronic mail. "There is a lot of talk about electronic mail," Wheatley says. "So much so that the issue is somewhat confused." Hickey chimes in that "electronic mail means different things to different people." —WLR

Wang enhances electronic mail package for WP line

Nearly a year ago, Wang Laboratories, Lowell, MA, released an advanced level of an electronic mail system, called "Mailway." Late last month, the company released what are to become the entry and intermediate level versions of the software package.

Mailway is a package that allows a user to initiate the distribution of documents to a number of recipients, regardless of their locations, from a Wang work station terminal. All three levels of Mailway are available on Wang's word processing systems, office information systems (OIS), VS computer systems and MDC50, a newly released distribution controller for users not requiring data processing capabilities.

According to John F. Cunningham, Wang's executive vice president for field operations, the new products are "in keeping with the Wang objective to provide compatible, flexible systems-oriented product lines." He pointed out that Mailway "provides a linkage between existing information processing systems."

The company pointed out that the new entry version of Mailway is also applicable to larger users who wish to make a slow, carefully planned move to what traditionally has been "an expensive, complex function—electronic mail." -JML

Telenet's mailbox heralds initial thrust into offices

GTE Telenet plans to launch a nationwide electronic mail service this summer, which it anticipates will represent 25 percent of the firm's public revenues within five years. John Peters, vice president of advanced network services at Telenet, made the projection in announcing the data communications common carrier's first expansion of its services into the office automation marketplace.

Dubbed "Telemail," the new service is targeted at the more than 1.5 million interactive data terminals and

... continued on page 32

Rapid growth expected for datacomm industry

"The US data communications industry can expect vast and rapid growth during the 1980s because it offers potential solutions to three of the nation's critical needs," said Theodore F. Brophy, chairman and CEO, General Telephone and Electronics Corp., at the recent Interface 80 conference in Miami. He went on to explain that the three needs are "automation to improve office productivity, conservation of energy and the handling of massive amounts of information being generated in an increasingly complex society." He spoke before a packed audience which was indicative of the attendance at the four-day conference and exposition. A number of vendors used the data communications show to release new products: Racal-Milgo released its 4270 Series Clustered Terminal System; Avanti, its micro-based medium distance modem; Digitech Data Industries, its data line monitor; Gandalf Data, an intelligent multiplexer; and Tymnet introduced an electronic mail service.

communicating word processors in use today that are compatible with the nationwide Telenet network. Peters said the new service will provide instantaneous delivery of messages anywhere in the US on a 24-hour basis.

Possibly the most intriguing aspect of the new service is Telenet's decision to offer subscribers "virtually unlimited storage" of the messages they generate and receive through Telemail. The decision to do so was based on studies which have shown the "average" length of letters and memos is somewhere in the 1,000-character range and that only 25 percent of memos are relevant and would probably be saved, Peters said.

—WLR

Conferences

NASIS annual meeting will focus on management

The 12th annual meeting of the National Association for State Information Systems to be held in Dearborn, MI, August 11-13, will focus on management considerations.

According to Carl Vorlander, executive director, three leading members of the information systems fraternity will review the coming decade as it relates to NASIS responsibilities. The management presentations will feature Isaac Auerbach, president of Auerbach Publications, discussing new applications of technology; Carl Hammer, director of computer sciences for Sperry Univac, will prognosticate about the technology itself; and Arnie Keller, associate publisher and editorial director of INFOSYSTEMS will discuss the people side of the equation.

The meeting will be held at the Hyatt Regency in Dearborn. For more information write in number six on the Reader Information card.

International DP forum set for Switzerland

An international forum to promote the technological evolution of modern data information transfer is set for next month in Geneva, Switzerland. Known as the IMMM/Datacomm 80 exposition, it will be held at the Palais des Expositions, June 17-19.

Minicomputers, microcomputers, microprocessors and data communications will be the subjects of various seminar sessions. In addition, there will be management sessions on these same subjects, as well as two technical teaching courses in special microcomputer applications and data communications.

In 1979 nearly 6,000 visitors were attracted to the show which includes an exhibition of data processing vendors from throughout the world.

Additional information about the exposition can be obtained from Industrial and Scientific Conference Management Inc., 222 West Adams Street, Chicago, IL 60606; or by telephoning (312) 263-4866.

Software

The 'new' Intel division upgrades its software

"With the lower cost of memory, the problem of overhead is no longer a problem," explained Stephen G. Maysonave, director of sales for Intel's Commercial Systems Division, Austin, TX. With that statement Maysonave set the stage for a raft of new software products that were released by his company.

During a swing across the country to announce the releases, Maysonave stopped in the Chicago area and gave the INFOSYSTEMS staff advance word about this major marketing event for the Intel division. Included are a major enhancement to the company's data base management system, a fully integrated data dictionary, distributed data base facilities and data communications options.

Interestingly, there are also some hardware releases as part of the total package. The hardware releases take advantage of the semiconductor prowess of the parent company. They include a semiconductor disk that offers up to 72 million bytes of storage, a data base processor option to it and add-on memory for IBM's 370 and 3000 computers. All the releases are intended to support the new concepts of Information Resource Management.

The major enhancements are to the System 2000. This was the mainstay product of MRI Systems Inc., which was purchased by Intel and is now known as the Commercial Systems Division. Integrated with the new System 2000/80 is the Integrated Data Dictionary (IDD).

System 2000/80 includes three special languages for use by application developers, programmers and users. Maysonave said the system supports on-line transaction processing, as well as large volume batch. All the software packages are scheduled for release this year, with the hardware scheduled for the first quarter of 1981.

Maysonave pointed out that the company would continue to support its System 2000 users and will offer them a full upgrade to the new data base system.

As a final word, Maysonave said Intel expects to "exit 1980 as the clear leader in DBMS." — JML

Marketing

TermiNet 'alive and well' and using its own name

General Electric Co.'s TermiNet printer line is "alive and well' and GE had apparently decided to slap its own label on a couple of new products to prove it. Before the recent introduction of the TermiNet 2000 impact matrix printer family, GE essentially relied on OEM distribution channels for its products.

GE, which rates itself fourth among printer manufacturers, according to Ken Anderson, general manager, Data Communication Product Business Department, Waynesboro, VA, believes it has too low of a profile in the industry despite such numbers. To rectify that fact and to capitalize on a brand new technology in dot matrix printheads developed by its corporate research and development center in Schenectady, NY, GE is actively recruiting third-party distributors to market GE labeled printers to the end user. —WLR

DP App : WP

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).

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

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.

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."

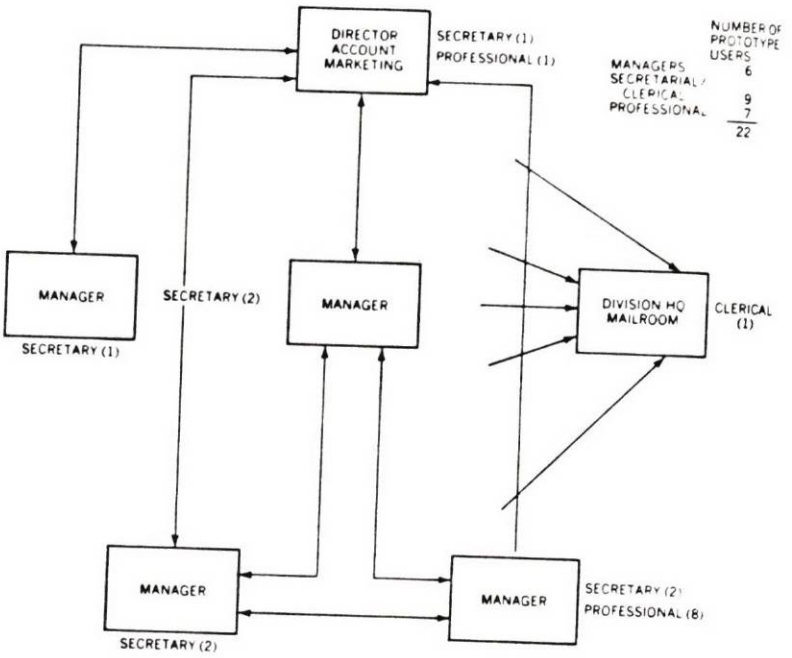
Both at IBM and at the customer many of the activities of the principals were similar. Use of the telephone, attendance at scheduled meetings, and travel, which ranked highest for upper management at the customer, also were the highest-ranked activities among Account Marketing management. Other activities 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-

n configuration

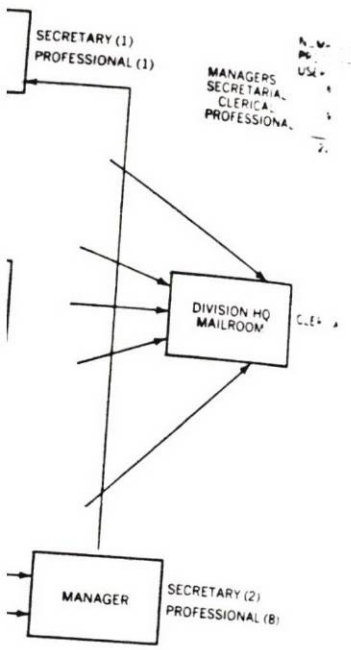


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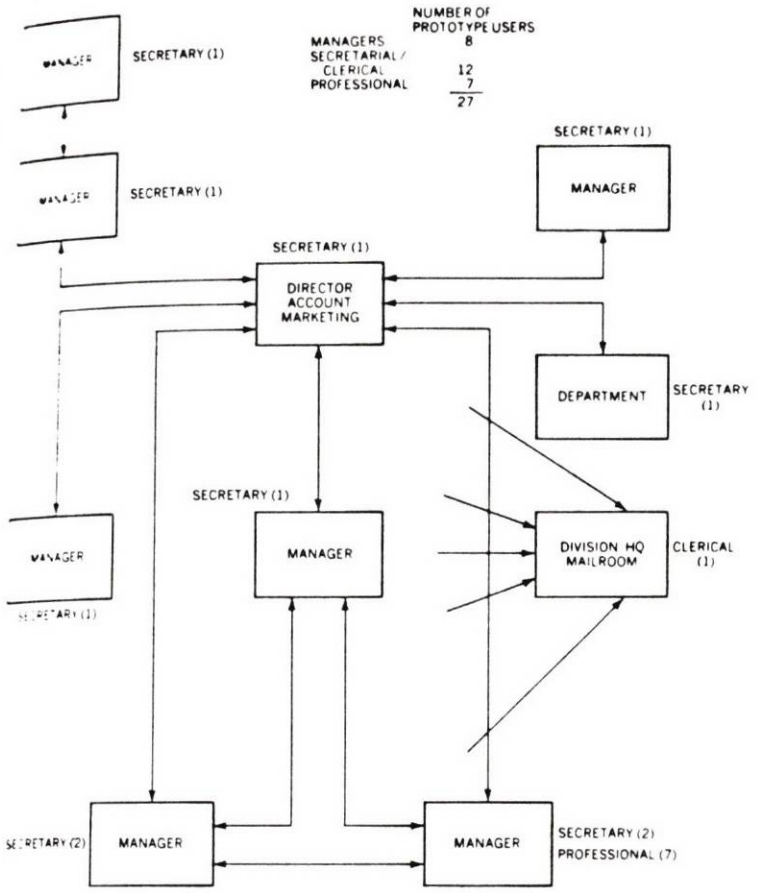
Figure 2 Final Account Marketing installation configuration



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

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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.

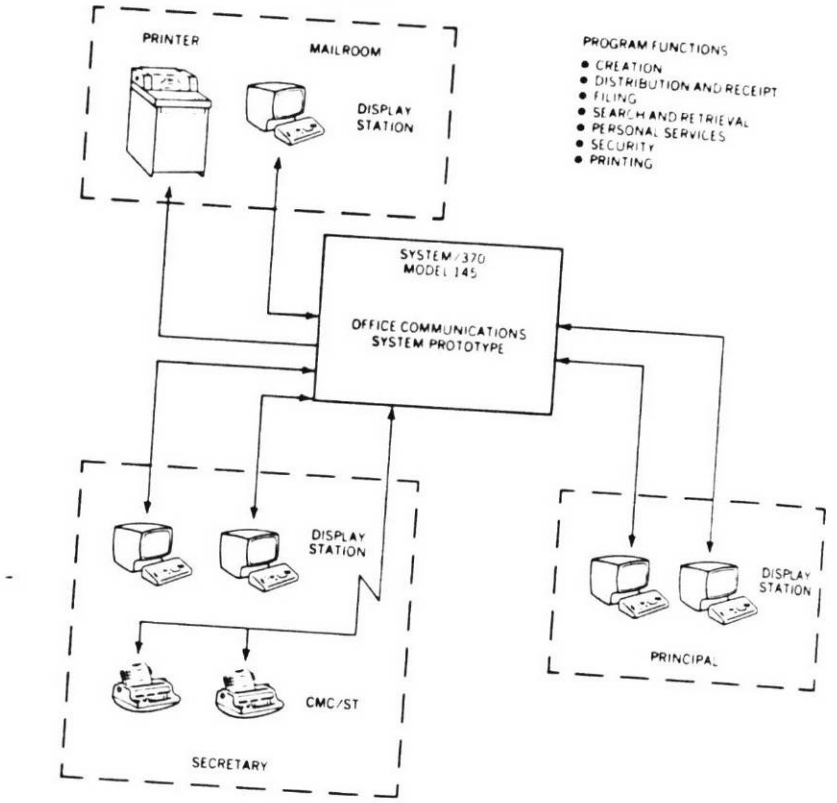
Because we were operating as a prototype installation and had a minimal operations staff, the above operational requirements became evident very quickly. Also at question was the organizational position of an office system operation. For example, in our divisional headquarters, the logical position might 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

PROGRAM FUNCTIONS
- CREATION
- DISTRIBUTION AND RECEIPT
- FILING
- SEARCH AND RETRIEVAL
- PERSONAL SERVICES
- SECURITY
- PRINTING

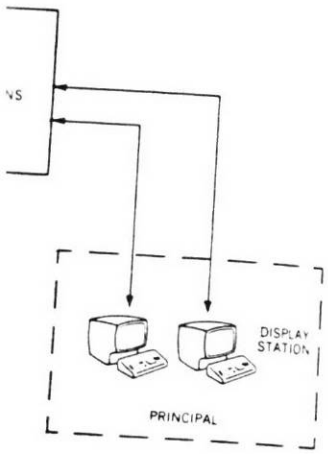


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Figure 4 Selection menu: (A) Initial display (B) Extended function display

```
                              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.

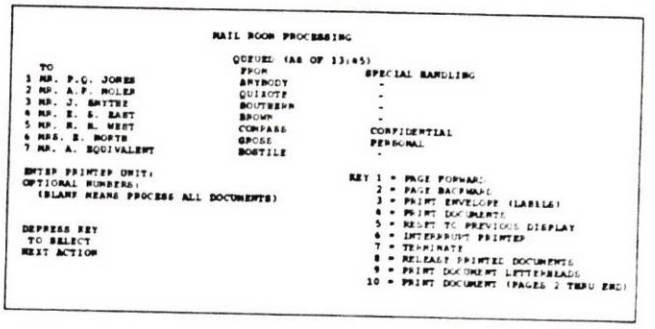
System users can also create memos on line by using the display station. The "Memo Entry" option prompts the user to enter similar descriptive information, memo content, and addressees' names.

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    B134/BCD  04/28/77 MACHINE AVAILABILITY - KINGSTON CENTE
 04 HARDLINE       C071/CHQ  04/30/77 MANAGEMENT PRACTICES - APPRAISALS       C
 05 CROMWELL       61R/DPD   04/29/77 877-16503 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      68R/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    B134/SCD  04/28/77 MACHINE AVAILABILITY - KINGSTON CENTE
 04 BARDLINE       C071/CBQ  04/30/77 MANAGEMENT PRACTICES - APPRAISALS       C
 05 CROMWELL       61R/DPD   04/29/77 877-16503 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      68R/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.
```

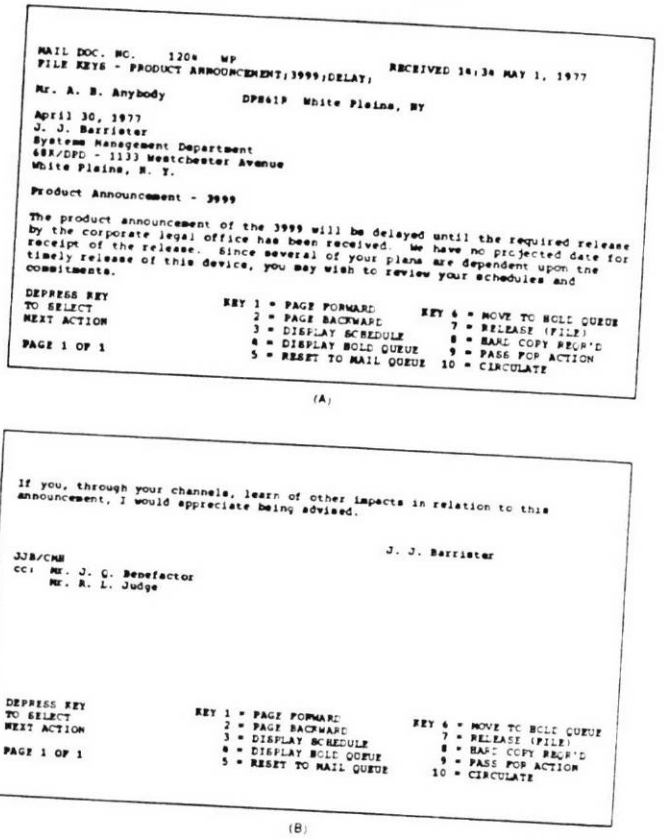
name of the originator for the document or message, the originator's organization, the origination date, the subject line, and indicators showing if the user is an addressee, whether it is "personal" or "confidential," or that a "return receipt" has been requested.

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.    120*   WP                          RECEIVED 14:34 MAY 1, 1977
FILE KEYS - PRODUCT ANNOUNCEMENT;3999;DELAY;

Mr. A. B. Anybody              DP861P  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 REQ'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. G. 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 REQ'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.              61RDPN WP
            2 = PLANNER, I. M.            B02MCD WP   <
            3 = CHASER, A. B.             81WDPN WP
            4 = FRIDAY, M. G.             62ADPN 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    877-1201 MONTHLY APAR 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

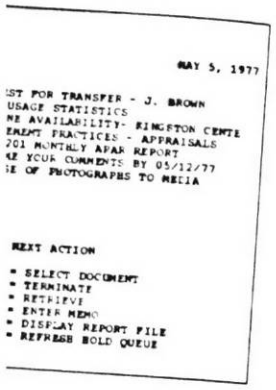
```
                              RETRIEVAL PROCESSING

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
```

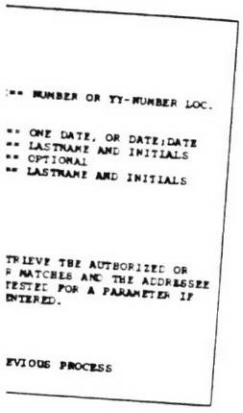
Figure 13 Retrieval processing—intermediate results

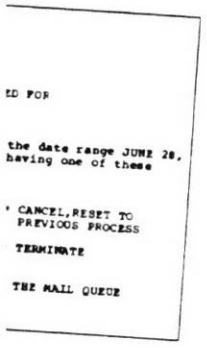
```
                              RETRIEVAL PROCESSING

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 MCU.

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







ys: (1) by document
ieters. "Parametric
parameters such as

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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

y occupational group*

	Secretaries
Mail queue	
Define	
Hold queue	
Schedule calendar	
Retrieval	
	87†

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rsonnel involved, the hu-
, and value.

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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

Secretaries	
Completely satisfied (percent)	*Needs change* (percent)
86	14
29	71
57	43
14	86
0	100
29	71

spend their time.
hat addresses these ac-

tions of the system and

by using the system.

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pal.

it time is of value and
a company. The man-
count Marketing were
pent their time. These
were compared with
cted by IBM.

t of the prototype on
estimates were made
eting study, the users
were asked to make
sionals and 43 percent
imates. In their opin-
cations system proto-
ould save: (a) 5 to 25
5 percent of a secre-

savings is to place a
pproach would be to
alue of the potential
ary 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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The augmented knowledge workshop

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CONCEPT OF THE KNOWLEDGE WORKSHOP

This paper discusses the theme of augmenting a knowledge workshop. The first part of the paper describes the concept and framework of the knowledge workshop. The second part describes aspects of a prototype knowledge workshop being developed within this framework.

The importance and implications of the idea of knowledge work have been described by Drucker.[3,4] Considering knowledge to be the systematic organization of information and concepts, he defines the knowledge worker as the person who creates and applies knowledge to productive ends, in contrast to an "intellectual" for whom information and concepts may only have importance because they interest him, or to the manual worker who applies manual skills or brawn. In those two books Drucker brings out many significant facts and considerations highly relevant to the theme here, one among them (paraphrased below) being the accelerating rate at which knowledge and knowledge work are coming to dominate the working activity of our society:

> In 1900 the majority and largest single group of Americans obtained their livelihood from the farm. By 1940 the largest single group was industrial workers, especially semiskilled machine operators. By 1960, the largest single group was professional, managerial, and technical—that is, knowledge workers. By 1975-80 this group will embrace the majority of Americans. The productivity of knowledge has already become the key to national productivity, competitive strength, and economic achievement, according to Drucker. It is knowledge, not land, raw materials, or capital, that has become the central factor in production.

In his provocative discussions, Drucker makes extensive use of such terms as "knowledge organizations," "knowledge technologies," and "knowledge societies." It seemed a highly appropriate extension for us to coin "knowledge workshop" for re-naming the area of our special interest: the place in which knowledge workers do their work. Knowledge workshops have existed for centuries, but our special concern is their systematic improvement, toward increased effectiveness of this new breed of craftsmen.

Workshop improvement involves systematic change not only in the tools that help handle and transform the materials, but in the customs, conventions, skills, procedures, working methods, organizational roles, training, etc., by which the workers and their organizations harness their tools, their skills, and their knowledge.

Over the past ten years, the explicit focus in the Augmentation Research Center (ARC) has been upon the effects and possibilities of new knowledge workshop tools based on the technology of computer timesharing and modern communications.[18-41] Since we consider automating many human operations, what we are after could perhaps be termed "workshop automation." But the very great importance of aspects other than the new tools (i.e., conventions, methods, roles) makes us prefer the "augmentation" term that hopefully can remain "wholescope." We want to keep tools in proper perspective within the total system that augments native human capacities toward effective action.[1-3,10,16,18,24]

Development of more effective knowledge workshop technology will require talents and experience from many backgrounds: computer hardware and software, psychology, management science, information science, and operations research, to name a few. These must come together within the framework of a new discipline, focused on the systematic study of knowledge work and its workshop environments.

TWO WAYS IN WHICH AUGMENTED KNOWLEDGE WORKSHOPS ARE EVOLVING

Introduction

First, one can see a definite evolution of new workshop architecture in the trends of computer application systems. An "augmented workshop domain" will probably emerge because many special-purpose application systems are evolving by adding useful features outside their immediate special application area. As a result, many will tend to overlap in their general knowledge work supporting features.

Second, research and development is being directed toward augmenting a "Core" Knowledge Workshop domain. This application system development is aimed expressly at supporting basic functions of knowledge

(3) Languages and other control conventions inconsistent or based on different principles from one system to another, creating unnecessary learning barriers or other discouragements to cross usage.

In summary, the two trends in the evolution of knowledge workshops described above are each valuable and are complementary. Experience and specific tools and techniques can and will be transferred between them.

There is a very extensive range of "core" workshop functions, common to a wide variety of knowledge work, and they factor into many levels and dimensions. In the sections to follow, we describe our developments, activities, and commitments from the expectation that there soon will be increased activity in this core knowledge workshop domain, and that it will be evolving "outward" to meet the other application systems "heading inward."

BASIC ASSUMPTIONS ABOUT AUGMENTED KNOWLEDGE WORKSHOPS EMBEDDED IN A COMPUTER NETWORK

The computer-based "tools" of a knowledge workshop will be provided in the environment of a computer network such as the ARPANET.[7,8,14] For instance, the core functions will consist of a network of cooperating processors performing special functions such as editing, publishing, communication of documents and messages, data management, and so forth. Less commonly used but important functions might exist on a single machine. The total computer assisted workshop will be based on many geographically separate systems.

Once there is a "digital-packet transportation system," it becomes possible for the individual user to reach out through his interfacing processor(s) to access other people and other services scattered throughout a "community," and the "labor marketplace" where he transacts his knowledge work literally will not have to be affected by geographical location.[27]

Specialty application systems will exist in the way that specialty shops and services now do—and for the same reasons. When it is easy to transport the material and negotiate the service transactions, one group of people will find that specilization can improve their cost/effectiveness, and that there is a large enough market within reach to support them. And in the network-coupled computer-resource marketplace, the specialty shops will grow—e.g., application systems specially tailored for particular types of analyses, or for checking through text for spelling errors, or for doing the text-graphic document typography in a special area of technical portrayal, and so on. There will be brokers, wholesalers, middle men, and retailers.

Coordinated set of user interface principles

There will be a common set of principles, over the many application areas, shaping user interface features such as the language, control conventions, and methods for obtaining help and computer-aided training.

This characteristic has two main implications. One, it means that while each domain within the core workshop area or within a specialized application system may have a vocabulary unique to its area, this vocabulary will be used within language and control structures common throughout the workshop system. A user will learn to use additional functions by increasing vocabulary, not by having to learn separate "foreign" languages. Two, when in trouble, he will invoke help or tutorial functions in a standard way.

Grades of user proficiency

Even a once-in-a-while user with a minimum of learning will want to be able to get at least a few straightforward things done. In fact, even an expert user in one domain will be a novice in others that he uses infrequently. Attention to novice-oriented features is required.

But users also want and deserve the reward of increased proficiency and capability from improvements in their skills and knowledge, and in their conceptual orientation to the problem domain and to their workshop's system of tools, methods, conventions, etc. "Advanced vocabularies" in every special domain will be important and unavoidable.

A corollary feature is that workers in the rapidly evolving augmented workshops should continuously be involved with testing and training in order that their skills and knowledge may harness available tools and methodology most effectively.

Ease of communication between, and addition of, workshop domains

One cannot predict ahead of time which domains or application systems within the workshop will want to communicate in various sequences with which others, or what operations will be needed in the future. Thus, results must be easily communicated from one set of operations to another, and it should be easy to add or interface new domains to the workshop.

User programming capability

There will never be enough professional programmers and system developers to develop or interface all the tools that users may need for their work. Therefore, it must be possible, with various levels of ease, for users to add or interface new tools, and extend the language to meet their needs. They should be able to do this in a variety of programming languages with which they may have training, or in the basic user-level language of the workshop itself.

Availability of people support services

An augmented workshop will have more support services available than those provided by computer tools.

There will be many people support services as well: besides clerical support, there will be extensive and highly specialized professional services, e.g., document design and typography, data base design and administration, training, cataloging, retrieval formulation, etc. In fact, the marketplace for human services will become much more diverse and active.[27]

Cost decreasing, capabilities increasing

The power and range of available capabilities will increase and costs will decrease. Modular software designs, where only the software tools needed at any given moment are linked into a person's run-time computer space, will cut system overhead for parts of the system not in use. Modularity in hardware will provide local configurations of terminals and miniprocessors tailored for economically fitting needs. It is obvious that cost of raw hardware components is plummeting; and the assumed large market for knowledge workshop support systems implies further help in bringing prices down.

The argument given earlier for the steady expansion of vital application systems to other domains remains valid for explaining why the capabilities of the workshop will increase. Further, increasing experience with the workshop will lead to improvements, as will the general trend in technology evolution.

Range of workstations and symbol representations

The range of workstations available to the user will increase in scope and capability. These workstations will support text with large, open-ended character sets, pictures, voice, mathematical notation, tables, numbers and other forms of knowledge representation. Even small portable hand-held consoles will be available.[13]

Careful development of methodology

As much care and attention will be given to the development, analysis, and evaluation of procedures and methodology for use of computer and people support services as to the development of the technological support services.

Changed roles and organizational structure

The widespread availability of workshop services will create the need for new organizational structures and roles.

SELECTED DESCRIPTION OF AUGMENTED WORKSHOP CAPABILITIES

Introduction

Within the framework described above, ARC is developing a prototype workshop system. Our system does not meet all the requirements outlined previously, but it does have a powerful set of core capabilities and experience that leads us to believe that such goals can be achieved.

Within ARC we do as much work as possible using the range of online capabilities offered. We serve not only as researchers, but also as the subjects for the analysis and evaluation of the augmentation system that we have been developing.

Consequently, an important aspect of the augmentation work done within ARC is that the techniques being explored are implemented, studied, and evaluated with the advantage of intensive everyday usage. We call this research and development strategy "bootstrapping."

In our experience, complex man-machine systems can evolve only in a pragmatic mode, within real-work environments where there is an appropriate commitment to conscious, controlled, exploratory evolution within the general framework outlined earlier. The plans and commitments described later are a consistent extension of this pragmatic bootstrapping strategy.

To give the reader more of a flavor of some of the many dimensions and levels of the ARC workshop, four example areas are discussed below in more detail, following a quick description of our physical environment.

The first area consists of mechanisms for studying and browsing through NLS files as an example of one functional dimension that has been explored in some depth.

The second area consists of mechanisms for collaboration support—a subsystem domain important to many application areas.

The third and fourth areas, support for software engineers and the ARPANET Network Information Center (NIC), show example application domains based on functions in our workshop.

General physical environment

Our computer-based tools run on a Digital Equipment Corporation PDP-10 computer, operating with the Bolt, Beranek, and Newman TENEX timesharing system.[9] The computer is connected via an Interface Message Processor (IMP) to the ARPANET.[7,8] There is a good deal of interaction with Network researchers, and with Network technology, since we operate the ARPA Network Information Center (see below).[39]

There is a range of terminals: twelve old, but serviceable, display consoles of our own design,[26] an IMLAC display, a dozen or so 30 ch/sec portable upper/lower case typewriter terminals, five magnetic tape-cassette storage units that can be used either online or offline, and a 96-character line printer. There are 125 million characters of online disk storage.

The display consoles are equipped with a typewriter-like keyboard, a five-finger keyset for one-handed character input, and a "mouse"—a device for controlling the position of a cursor (or pointer) on the display screen and for input of certain control commands. Test results on the mouse as a screen-

selection device have been reported in Reference 25, and good photographs and descriptions of the physical systems have appeared in References 20 and 21.

The core workshop software system and language, called NLS, provides many basic tools, of which a number will be mentioned below. It is our "core-workshop application system."

During the initial years of workshop development, application and analysis, the basic knowledge-work functions have centered around the composition, modification, and study of structured textual material.[26] Some of the capabilities in this area are described in detail in Reference 26, and are graphically shown in a movie available on loan[41]—

The structured-text manipulation has been developed extensively because of its high payoff in the area of applications-system development to which we have applied our augmented workshop. We have delayed addition of graphic-manipulation capabilities because there were important areas associated with the text domain needing exploration and because of limitations in the display system and hardcopy printout.

To build the picture of what our Core Knowledge Workshop is like, we first give several in-depth examples, and then list in the section on workshop utility service some "workshop subsystems" that we consider to be of considerable importance to general knowledge work.

STUDYING ONLINE DOCUMENTS

Introduction

The functions to be described form a set of controls for easily moving one around in an information space and allowing one to adjust the scope, format, and content of the information seen.[26,41]

Given the addition of graphical, numerical, and vocal information, which are planned for addition to the workshop, one can visualize many additions to the concepts below. Even for strictly textual material there are yet many useful ideas to be explored.

View specifications

One may want an overview of a document in a table-of-contents like form on the screen. To facilitate this and other needs, NLS text files are hierarchically structured in a tree form with subordinate material at lower levels in the hierarchy.[26]

The basic conceptual unit in NLS, at each node of the hierarchical file, is called a "statement" and is usually a paragraph, sentence, equation, or other unit that one wants to manipulate as a whole.

A statement can contain many characters—presently, up to 2000. Therefore, a statement can contain many lines of text. Two of the "view-specification" parameters—depth in the hierarchy, and lines per statement—can be controlled during study of a document to give various overviews of it. View specifications are given with highly abbreviated control codes, because they are used very frequently and their quick specification and execution make a great deal of difference in the facility with which one studies the material and keeps track of where he is.

Examples of other view specifications are those that control spacing between statements, and indentation for levels in the hierarchy, and determine whether the identifications associated with statements are to be displayed, which branch(es) in the tree are to be displayed, whether special filters are to be invoked to show only statements meeting specified content requirements or whether statements are to be transformed according to special rules programmed by the user.

Moving in information space

A related viewing problem is designating the particular location (node in a file hierarchy) to be at the top of the screen. The computer then creates a display of the information from that point according to the view specifications currently in effect.

The system contains a variety of appropriate commands to do this; they are called jump commands because they have the effect of "jumping" or moving one from place to place in the network of files available as a user's information space.[26,33-39]

One can point at a particular statement on the screen and command the system to move on to various positions relative to the selected one, such as up or down in the hierarchical structure, to the next or preceding statement at the same hierarchical level, to the first or last statement at a given level, etc.

One can tell the system to move to a specifically named point or go to the next occurrence of a statement with a specific content.

Each time a jump or move is made, the option is offered of including any of the abbreviated view specifications—a very general, single operation is "jump to that location and display with this view."

As one moves about in a file one may want to quickly and easily return to a previous view of the path as one traverses through the file and the specific view at each point, and then allowing return movement to the most recent points saved.

Another important feature in studying or browsing in a document is being able to quickly move to other documents cited.

There is a convention (called a "link") for citing documents that allows the user to specify a particular file, statement within the file and view specification for initial display when arriving in the cited file.

A single, quickly executed command (Jump to Link) allows one to point at such a citation, or anywhere in the statement preceding the citation, and the system will go to the specific file and statement cited and show the associated material with the specified view parameters. This allows systems of interlinked documents and highly specific citations to be created.

A piece of the path through the chain of documents is saved so that one can return easily a limited distance back along his "trail," to previously referenced documents. Such a concept was originally suggested by Bush[1] in a fertile paper that has influenced our thinking in many ways.

Multiple windows

Another very useful feature is the ability to "split" the viewing screen horizontally and/or vertically in up to eight rectangular display windows of arbitrary size. Generally two to four windows are all that are used. Each window can contain a different view of the same or different locations, within the same or different files.[39]

COLLABORATIVE DIALOGUE AND TELECONFERENCING

Introduction

The approach to collaboration support taken at ARC to date has two main thrusts:

(1) Support for real-time dialogue (teleconferencing) for two or more people at two terminals who want to see and work on a common set of material. The collaborating parties may be further augmented with a voice telephone connection as well.
(2) Support for written, recorded dialogue, distributed over time.

These two thrusts give a range of capabilities for support of dialogue distributed over time and space.

Teleconferencing support

Consider two people or groups of people who are geographically separated and who want to collaborate on a document, study a computer program, learn to use a new aspect of a system, or perform planning tasks, etc.

The workshop supports this type of collaboration by allowing them to link their terminals so that each sees the same information and either can control the system. This function is available for both display and typewriter terminal users over the ARPANET.

The technique is particularly effective between displays because of the high speed of information output and the flexibility of being able to split the screen into several windows, allowing more than one document or view of a document to be displayed for discussion.

When a telephone link is also established for voice communication between the participants, the technique comes as close as any we know to eliminating the need for collaborating persons or small groups to be physically together for sophisticated interaction.

A number of other healthy approaches to teleconferencing are being explored elsewhere.[11,12,16,17] It would be interesting to interface to such systems to gain experience in their use within workshops such as described here.

RECORDED DIALOGUE SUPPORT

Introduction

As ARC has become more and more involved in the augmentation of teams, serious consideration has been given to improving intra- and inter-team communication with whatever mixture of tools, conventions, and procedures will help.[27,36,39]

If a team is solving a problem that extends over a considerable time, the members will begin to need help in remembering some of the important communications—i.e., some recording and recalling processes must be invoked, and these processes become candidates for augmentation.

If the complexity of the team's problem relative to human working capacity requires partitioning of the problem into many parts—where each part is independently attacked, but where there is considerable interdependence among the parts—the communication between various people may well be too complex for their own accurate recall and coordination without special aids.

Collaborating teams at ARC have been augmented by development of a "Dialogue Support System (DSS)," containing current and thoroughly used working records of the group's plans, designs, notes, etc. The central feature of this system is the ARC Journal, a specially managed and serviced repository for files and messages.

The DSS involves a number of techniques for use by distributed parties to collaborate effectively both using general functions in the workshop and special functions briefly described below and more fully in Reference 39. Further aspects are described in the section on Workshop Utility Service.

Document or message submission

The user can submit an NLS file, a part of a file, a file prepared on another system in the ARPANET (document), or text typed at submission time (message)

to the Journal system. When submitted, a copy of the document or message is transferred to a read-only file whose permanent safekeeping is guaranteed by the Journal system. It is assigned a unique catalog number, and automatically cataloged. Later, catalog indices based on number, author, and "titleword out of context" are created by another computer process.

Nonrecorded dialogue for quick messages or material not likely to be referenced in the future is also permitted.

One can obtain catalog numbers ahead of time to interlink document citations for related documents that are being prepared simultaneously. Issuing and controlling of catalog numbers is performed by a Number System (an automatic, crash-protected computer process).

At the time of submission, the user can contribute such information as: title, distribution list, comments, keywords, catalog numbers of documents this new one supersedes (updates), and other information.

The distribution is specified as a list of unique identification terms (abbreviated) for individuals or groups. The latter option allows users to establish dialogue groups. The system automatically "expands" the group identification to generate the distribution list of the individuals and groups that are its members. Special indices of items belonging to subcollections (dialogue groups) can be prepared to aid their members in keeping track of their dialogue. An extension of the mechanisms available for group distribution could give a capability similar to one described by Turoff.[17]

Entry of identification information initially into the system, group expansion, querying to find a person's or group's identification, and other functions are performed by an Identification System.

Document distribution

Documents are distributed to a person in one, two, or all of three of the following ways depending on information kept by the Identification System.

(1) In hardcopy through the U.S. or corporation mail to those not having online access or to those desiring this mode,
(2) Online as citations (for documents) or actual text (for messages) in a special file assigned to each user.
(3) Through the ARPANET for printing or online delivery at remote sites. This delivery is performed using a standard Network wide protocol.

Document distribution is automated, with online delivery performed by a background computer process that runs automatically at specified times. Printing and mailing are performed by operator and clerical support. With each such printed document, an address cover sheet is automatically printed, so that the associated printout pages only need to be folded in half, stapled, and stamped before being dropped in the mail.

Document access

An effort has been made to make convenient both online and offline access to Journal documents. The master catalog number is the key to accessing documents. Several strategically placed hardcopy master and access collections (libraries) are maintained, containing all Journal documents.

Automatic catalog-generation processes generate author, number, and titleword indices, both online and in hardcopy.[38] The online versions of the indices can be searched conveniently with standard NLS retrieval capabilities.[37,39,41]

Online access to the full text of a document is accomplished by using the catalog number as a file name and loading the file or moving to it by pointing at a citation and asking the system to "jump" there as described earlier.

SOFTWARE ENGINEERING AUGMENTATION SYSTEM

Introduction

One of the important application areas in ARC's work is software engineering. The economics of large computer systems, such as NLS, indicate that software development and maintenance costs exceed hardware costs, and that software costs are rising while hardware costs are rapidly decreasing. The expected lifetime of most large software systems exceeds that of any piece of computer hardware. Large software systems are becoming increasingly complex, difficult to continue evolving and maintain. Costs of additional enhancements made after initial implementation generally exceed the initial cost over the lifetime of the system. It is for these reasons that it is important to develop a powerful application area to aid software engineering. Areas of software engineering in which the ARC workshop offers aids are described below.

Design and review collaboration

During design and review, the document creation, editing, and studying capabilities are used as well as the collaboration, described above.

Use of higher level system programming languages

Programming of NLS is performed in a higher level ALGOL-like system programming language called L-10 developed at ARC. The L-10 language compiler takes its input directly from standard NLS structured files. The PDP-10 assembler also can obtain input from NLS files.

It is planned to extend this capability to other languages, for example, by providing an interface to the BASIC system available in our machine for knowledge workers wishing to perform more complex numerical tasks.

We are involved with developing a modular runtime-linkable programming system (MPS), and with planning a redesign of NLS to utilize MPS capabilities, both in cooperation with the Xerox Palo Alto Research Center. MPS will:

(1) Allow a workshop system organization that will make it easier for many people to work on and develop parts of the same complex system semi-independently.
(2) Make it easier to allow pieces of the system to exist on several processors.
(3) Allow individual users or groups of users to tailor versions of the system to their special needs.
(4) Make it easier to move NLS to other computers since MPS is written in itself.
(5) Speed system development because of MPS's improved system building language facilities, integrated source-level debugging, measurement facilities, the ability to construct new modules by combining old ones, and to easily modify the system by changing module interconnection.

System documentation and source-code creation

Source-code creation uses the standard NLS hierarchical file structures and allows documentation and other programming conventions to be established that simplify studying of source-code files.

Debugging

A form of source-level debugging is allowed through development of several tools, of which the following are key examples:

(1) A user program compilation and link loading facility that allows new or replacement programs to be linked into the running system to create revised versions for testing or other purposes.
(2) NLS-DDT, a DDT like debugging facility with a command language more consistent with the rest of NLS, and simplifies display of system variables and data structures, and allows replacement of system procedures by user supplied procedures.
(3) Use of several display windows so as to allow source code in some windows and control of DDT in others for the setting of breakpoints and display of variables and data structures.

Measurement and analysis

A range of measurement tools has been developed for analyzing system operation. These include the following:

(1) Capabilities for gathering and reporting statistics on many operating system parameters such as utilization of system components in various modes, queue lengths, memory utilization, etc.
(2) The ability to sample the program counter for intervals of a selectable area of the operating system or any particular user subsystem to measure time spent in the sampled areas;
(3) Trace and timing facilities to follow all procedure calls during execution of a specified function.
(4) The ability to study page-faulting characteristics of a subsystem to check on its memory use characteristics.
(5) The ability to gather NLS command usage and timing information.
(6) The ability to study user interaction on a task basis from the point of view of the operating-system scheduler.
(7) The ability to collect sample user sessions for later playback to the system for simulated load, or for analysis.

Maintenance

Maintenance programmers use the various functions mentioned above. The Journal is used for reporting bugs; NLS structured source code files simplify the study of problem areas and the debugging tools permit easy modification and testing of the modifications.

THE ARPA NETWORK INFORMATION CENTER (NIC)

Introduction

The NIC is presently a project embedded within ARC.[39] Workshop support for the NIC is based on the capabilities within the total ARC workshop system.

As useful as is the bootstrapping strategy mentioned earlier, there are limits to the type of feedback it can yield with only ARC as the user population. The NIC is the first of what we expect will be many activities set up to offer services to outside users. The goal is to provide a useful service and to obtain feedback on the needs of a wider class of knowledge workers. Exercised within the NIC are also prototypes of information services expected to be normal parts of the workshop.

The NIC is more than a classical information center, as that term has come to be used, in that it provides a wider range of services than just bibliographic and "library" type services.

The NIC is an experiment in setting up and running a general purpose information service for the ARPANET community with both online and offline services. The services offered and under development by the NIC have as their initial basic objectives:

(1) To help people with problems find the resources (people, systems, and information) available within the network community that meet their needs.

(2) To help members of geographically distributed groups collaborate with each other.

Following are the NIC services now provided to meet the above goals in serving the present clientele:

Current online services

(1) Access to the typewriter version (TNLS) and display version (DNLS) of the Augmentation Research Center's Online System (NLS) for communique creation, access, and linking between users, and for experimental use for any other information storage and manipulation purpose suitable for NLS and useful to Network participants.
(2) Access to Journal, Number, and Identification Systems to allow messages and documents to be transmitted between network participants.
(3) Access to a number of online information bases through a special Locator file using NLS link mechanisms and through a novice-oriented query system.

Current offline services

(1) A Network Information Center Station set up at each network site.
(2) Techniques for gathering, producing and maintaining data bases such as bibliographic catalogs, directories of network participants, resource information, and user guides.
(3) Support of Network dialogue existing in hardcopy through duplication, distribution, and cataloging.
(4) General Network referral and handling of document requests.
(5) Building of a collection of documents potentially valuable to the Network Community. Initial concentration has been on obtaining documents of possible value to the Network builders.
(6) As yet primitive selective document distribution to Station Collections.
(7) Training in use of NIC services and facilities.

Conclusion

The Network Information Center is an example prototype of a new type of information service that has significant future potential. Even though it is presently in an experimental and developmental phase, it is providing useful online and offline services to the ARPANET community.

PLANS FOR A WORKSHOP UTILITY SERVICE

Motivation

It is now time for a next stage of application to be established. We want to involve a wider group of people so that we can begin to transfer the fruits of our past work to them and with their assistance, to others, and so that we can obtain feedback needed for further evolution from wider application than is possible in our project alone.[28] We want to find and support selected groups who are willing to take extra trouble to be exploratory, but who:

(1) Are not necessarily oriented to being core-workshop developers (they have their own work to do).
(2) Can see enough benefit from the system to be tried and from the experience of trying it so that they can justify the extra risk and expense of being "early birds."
(3) Can accept assurance that system reliability and stability, and technical/application help will be available to meet their conditions for risk and cost.

ARC is establishing a Workshop Utility Service, and promoting the type of workshop service described above as part of its long-term commitment to pursue the continued development of augmented knowledge workshops in a pragmatic, evolutionary manner.

It is important to note that the last few years of work have concentrated on the means for delivering support to a distributed community, for providing teleconferencing and other basic processes of collaborative dialogue, etc. ARC has aimed consciously toward developing experience and capabilities especially applicable to support remote and distributed groups of exploratory users for this next stage of wider-application bootstrapping.

One aspect of the service is that it will be an experiment in harnessing the new environment of a modern computer network to increase the feasibility of a wider community of participants cooperating in the evolution of an application system.

Characteristics of the planned service

The planned service offered will include:

(1) Availability of Workshop Utility computer service to the user community from a PDP-10 TENEX system operated by a commercial supplier.
(2) Providing training as appropriate in the use of Display NLS (DNLS), Typewriter NLS (TNLS), and Deferred Execution (DEX) software subsystems.
(3) Providing technical assistance to a user organization "workshop architect" in the formulation, development, and implementation of augmented knowledge work procedures within selected offices at the user organization.[6]

This assistance will include help in the development of NLS use strategies suitable to the user environments, procedures within the user organization for implementing these strategies, and possible special-application NLS extensions (or

simplifications) to handle the mechanics of particular user needs and methodologies.

(4) Providing "workshop architect" assistance to help set up and assist selected geographically distributed user groups who share a special discipline or mission orientation to utilize the workshop utility services and to develop procedures, documentation, and methodology for their purposes.

GENERAL DESCRIPTION OF SOME WORKSHOP UTILITY SUBSYSTEMS

Introduction

Within a particular professional task area (mission- or discipline-oriented) there are often groups who could be benefited by using special workshop subsystems. These subsystems may be specialized for their specific application or research domain or for support of their more general knowledge work. Our goal is to offer a workshop utility service that contains a range of subsystems and associated methodology particularly aimed at aiding general knowledge work, and that also supports in a coordinated way special application subsystems either by interfacing to subsystems already existing, or by developing new subsystems in selected areas.

In the descriptions to follow are a number of workshop subsystem domains that are fundamental to a wide range of knowledge work in which ARC already has extensive developments or is committed to work. For each subsystem we include some general comments as well as a brief statement of current ARC capabilities in the area.

Document development, production, and control

Here a system is considered involving authors, editors, supervisors, typists, distribution-control personnel, and technical specialists. Their job is to develop documents, through successive drafts, reviews, and revisions. Control is needed along the way of bibliography, who has checked what point, etc. Final drafts need checkoff, then production. Finally distribution needs some sort of control. If it is what we call a "functional document" such as a user guide, then it needs to be kept up to date.[39] There is a further responsibility to keep track of who needs the documents, who has what version, etc.

Within the ARC workshop, documents ranging from initial drafts to final high-quality printed publications can be quickly produced with a rich set of creation and editing functions. All of ARC's proposals, reports, designs, letters, thinkpieces, user documentation, and other such information are composed and produced using the workshop.

Documents in a proof or finished form can be produced with a limited character set and control on a line printer or typewriter, or publication-quality documents can be produced on a photocomposer microfilm unit.

Presently there are on the order of two hundred special directives that can be inserted in text to control printing. These directives control such features as typefont, pagination, margins, headers, footers, statement spacing, typefont size and spacing, indenting, numbering of various hierarchical levels, and many other parameters useful for publication quality work. Methodology to perform the creation, production, and controlling functions described above has been developed, although much work at this level is still needed.

In terms of future goals, one would like to have display terminals with a capability for the range of fonts available on the photocomposer so that one could study page layout and design interactively, showing the font to be used, margins, justification, columnization, etc. on the screen rather than having to rely on hardcopy proofsheets.

To prepare for such a capability, plans are being made to move toward an integrated portrayal mechanism for both online and hardcopy viewing.

Collaborative dialogue and teleconferencing

Effective capabilities have already been developed and are in application, as discussed above. There is much yet to do. The Dialogue Support System will grow to provide the following additional general online aids:

Link-setup automation; back-link annunciators and jumping; aids for the formation, manipulation, and study of sets of arbitrary passages from among the dialogue entries; and integration of cross-reference information into hardcopy printouts. Interfaces will probably be made to other teleconferencing capabilities that come into existence on the ARPANET.

It also will include people-system developments: conventions and working procedures for using these aids effectively in conducting collaborative dialogue among various kinds of people, at various kinds of terminals, and under various conditions; working methodology for teams doing planning, design, implementation coordination; and so on.

Meetings and conferences

Assemblies of people are not likely for a long time, if ever, to be supplanted in total by technological aids. Online conferences are held at ARC for local group meetings and for meetings where some of the participants are located across the country.

Use is made of a large-screen projection TV system to provide a display image that many people in a conference room can easily see. This is controlled locally or remotely by participants in the meeting, giving access to the entire recorded dialogue data base as needed during the meeting and also providing the capability of recording real-time

meeting notes and other data. The technique also allows mixing of other video signals.

Management and organization

The capabilities offered in the workshop described in this paper are used in project management and administration.[39] Numerical calculations can also be performed for budget and other purposes, obtaining operands and returning results to NLS files for further manipulation.

Where an organization has conventional project management operations, their workshop can include computer aids for techniques such as PERT and CPM. We want to support the interfacing that our Core Workshop can provide to special application systems for management processes.

We are especially interested at this stage, in management of project teams—particularly, of application-systems development teams.

Handbook development

Capabilities described above are being extended toward the coordinated handling of a very large and complex body of documentation and its associated external references. The goal is that a project or discipline of ever-increasing size and complexity can be provided with a service that enables the users to keep a single, coordinated "superdocument" in their computer; that keeps up to date and records the state of their affairs; and provides a description of the state of the art in their special area.

Example contents would be glossaries, basic concept structure, special analytic techniques, design principles, actual design, and implementation records of all developments.

Research intelligence

The provisions within the Dialogue Support System for cataloging and indexing internally generated items also support the management for externally generated items, bibliographies, contact reports, clippings, notes, etc. Here the goal is to give a human organization (distributed or local) an ever greater capability for integrating the many input data concerning its external environment; processing (filtering, transforming, integrating, etc.) the data so that it can be handled on a par with internally generated information in the organization's establishing of plans and goals; and adapting to external opportunities or dangers.[38]

Computer-based instruction

This is an important area to facilitate increasing the skills of knowledge workers. ARC has as yet performed little direct work in this area. We hope in the future to work closely with those in the computer-based instruction area to apply their techniques and systems in the workshop domain.

In training new and developing users in the use of the system, we have begun using the system itself as a teaching environment. This is done locally and with remote users over the ARPANET.

Software engineering augmentation

A major special application area described above, that has had considerable effort devoted to it, is support of software engineers. The software-based tools of the workshop are designed and built using the tools previously constructed. It has long been felt[24,29] that the greatest "bootstrapping" leverage would be obtained by intensively developing the augmented workshop for software engineers, and we hope to stimulate and support more activity in this area.

Knowledge workshop analysis

Systematic analysis has begun of the workshop environment at internal system levels, at user usage levels, and at information-handling procedure and methodology levels. The development of new analytic methodology and tools is a part of this process. The analysis of application systems, and especially of core-workshop systems, is a very important capability to be developed. To provide a special workshop subsystem that augments this sort of analytic work is a natural strategic goal.

CONCLUSION—THE NEED FOR LONG-TERM COMMITMENT

As work progresses day-to-day toward the long-term goal of helping to make the truly augmented knowledge workshop, and as communities of workshop users become a reality, we at ARC frequently reflect on the magnitude of the endeavor and its long-term nature.[22]

> Progress is made in steps, with hundreds of short-term tasks directed to strategically selected subgoals, together forming a vector toward our higher-level goals.

To continue on the vector has required a strong commitment to the longer-range goals by the staff of ARC.

In addition, we see that many of the people and organizations we hope to enlist in cooperative efforts will need a similar commitment if they are to effectively aid the process.

> One of ARC's tasks is to make the long-term objectives of the workshop's evolutionary development, the potential value of such a system, and the strategy for realizing that value clear enough to the collaborators we seek, so that they will have a strong commitment to invest resources with understanding and patience.

One key for meeting this need will be to involve them in serious use of the workshop as it develops. The plans for the Workshop Utility are partly motivated by this objective.

Although the present ARC workshop is far from complete, it does have core capabilities that we feel will greatly aid the next communities of users in their perception of the value of the improved workshops of the future.

ACKNOWLEDGMENTS

During the 10 year life of ARC many people have contributed to the development of the workshop described here. There are presently some 35 people—clerical, hardware, software, information specialists, operations researchers, writers, and others—all contributing significantly toward the goals described here.

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Palo Alto Research Center

Computer Science and Office Information Systems

By Clarence A. Ellis and Gary J. Nutt

XEROX

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ABSTRACT

Automated office systems are emerging as an interdisciplinary research area with a strong computer science component. In this paper we define office information systems as entities which perform document storage, retrieval, manipulation and control within a distributed environment. Some state of the art implementations are described. We relate the research to different areas of computer science and provide several detailed examples.

KEY WORDS AND PHRASES

Office automation, distributed systems, office information systems, office modeling.

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INTRODUCTION

The automated office of the future is quickly becoming the topic of much significant computer science research. The office machine industry, lead by Burroughs, Eastman Kodak, Exxon, IBM, 3M, and Xerox, is actively working on automating the information processing that takes place in an office [Creative Strategies, 1978]; most of these corporations are also investing significant sums of money into research programs for the office of the future. Active programs incorporating computer science also exist in universities, e.g. at M.I.T. in L.C.S [Hewitt, 1979] and the Sloan School [Hammer and Zisman, 1979], University of Pennsylvania's Wharton School [Ness, 1976-78; Morgan, 1976, 1979; Zisman, 1977], the University of Toronto [Tsichritzis, 1979] and the Harvard Business School [Buchanan, 1979]. The focus of most of this attention is not traditional business data processing, nor is it management information systems, but rather systems and facilities to aid the office worker in the more basic aspects of his/her job. Word processors address the problem of document preparation, but the worker must also organize, file, copy, transform, analyze and transmit that information effectively. The automated office should mechanize all these functions as well, thus allowing the worker to accomplish less routine work.

The need for the automated office creates a new area for applying results, techniques and methodologies of classic computer science research. However, solutions to a large number of difficult problems must be obtained before such systems can become a reality. Many such problems are a result of three more general problems: the complexities of distributed systems that implement the automated office, the necessity for simple, yet complete human interfaces, and the need for knowledge-based systems to aid the user.

We recognize that it is difficult to address the entire audience of computer science researchers at a level which will excite each investigator into an active interest in automated office research. We have chosen, instead, to mention as many of the appropriate topics as possible, while providing a more complete discussion of only a few of them. These detailed discussions tend to reflect the areas of research with which we are most comfortable; one should not necessarily draw the conclusion that these are "the most important" areas of research in office automation. For more breadth into related topics of management science, see other Computing Surveys articles [Aron, 1969; Taggart and Tharp, 1977]. We encourage other computer science specialists to provide more complete discussions of those topics which we have not treated in detail.

The paper deals with three major topics: some example implementations of office information systems, a discussion of some problems from the standpoint of traditional computer science, and

future trends in research. The organization has been designed to allow the reader to obtain an overview from the introduction of each major section. Additional insight is provided in each subsection introduction, and finally, several subsections are refined to contain detailed discussions.

WHAT IS AN OFFICE INFORMATION SYSTEM

The *office* is that part of a business that handles the information dealing with operation, accounting, payroll, billing, etc. In particular, office work consists of activities such as document preparation, filing, performing simple computations, checking information, intraoffice communication and external communication. Such processing within the office is usually stimulated by the arrival of a request for service such as an order, a bill, a complaint, a message to order more materials, or the date changing to Friday. The office, then, can be viewed as a mechanism that maintains the state of the business, by means of a series of activities that cause change in state.

The computer scientist can use a number of different models to describe office activity, such as:

- A set of activities resulting from requests for service, each with a specific precedence. Each activity requires a supporting file system.
- A set of people "executing their procedures" ("carrying out tasks"), communicating with and referencing a supporting file system.
- A set of communication media with their corresponding communications, such as a filled-in form, a phone call, a copy of an order, or a file system query for organizing and processing information.
- A gigantic database with users accessing and manipulating data.

An *automated office information system (OIS)* attempts to perform the functions of the ordinary office by means of a computer system. Automation in the office particularly aids the office worker in document preparation, information management and decision making. Such systems may be as modest as a group of independent word processors, or as complex as a distributed set of large, communicating computers. Within in this spectrum is a central computer with several interactive terminals, or a set of small interconnected computers. In either system the office worker would use a *work station* to perform his work, and that work station would be capable of electronically communicating with other work stations.

In this paper we distinguish office information systems from data processing systems both by the autonomy of the system's parts, and by function. A data processing system is used to implement alogorithms with a single locus of control in which there are ordinarily not collections of

autonomous parts; the algorithm ordinarily procedes without the need for human interaction. Typical data processing systems compute payrolls, implement accounting systems, manage inventories, etc. An OIS is made up of a collection of highly interactive autonomous tasks that execute in parallel; the OIS tasks include document preparation, document management, communication, and aids in decision making.

The terms "office of the future", "automated office", "office information system" and "integrated office system" have been frequently applied even to small business computer or timesharing systems. So in order to describe our view of an OIS more exactly we will present two examples of what we consider to be state-of-the-art office information systems.

Officetalk-Zero: A Prototype OIS

Officetalk-Zero is a prototype "first generation" office information system, designed and implemented by William Newman, Tim Mott and others from the Office Research Group at Xerox PARC, [Newman, 1977]. The Officetalk-Zero effort began in late 1976 as a study of languages for expressing office procedures, and subsequently evolved into an OIS emphasizing the user interface. The prototype--operational by June, 1977--was introduced into a naive user environment within the following year.

Goals of Officetalk-Zero

Officetalk-Zero, or Officetalk for short, is implemented in an environment of a network of minicomputers interconnected by a high speed communication network [Metcalfe and Boggs, 1976]. Each minicomputer, a Xerox Alto, is a 128K (16 bit) word minicomputer with a 2.5 megabyte disk and a sophisticated CRT display [Alto, 1978]. Areas on the screen are pointed to by a cursor under the control of an x-y coordinate input device called a *mouse*. The mouse is operated by a button which is depressed, held down, then released; software can determine the state of the button as well as the x-y coordinate addressed by the mouse. Even though the PARC environment encourages the network approach, it is clear that many future automated office systems will be designed around a similar physical environment [Creative Strategies, 1978].

The Officetalk designers took the position that the new OIS should be based on the data objects of single page forms and files of forms; intercommunication is accomplished by electronically passing forms among the work stations. The user's model of the system is that Officetalk is merely an electronic aid for carrying out his normal tasks. A primary difference in the user's model (as opposed to his pre-OIS model) is the lack of real paper at the user's work station. (After all, one

goal of office automation is to reduce the use of paper.) Each work station provides a graphical window onto a worker's desk, allowing the worker to manipulate electronic forms by employing the pointing device.

Officetalk is not a decision support tool nor is it a management information system; it is intended to be used by office workers to aid in document management, preparation and communication. Part of the reason for restricting interest to clerical work was the desire to investigate office procedure specification and interpretation; the designers recognized that the procedural specification of "routine clerical work" was an unsolved problem, and that a solution to that problem would be a step toward the solution of the more general problem.

Many of the individual facilities needed to implement the OIS described above already exist as separate programs on several computer systems. The user must have a text editor, a graphics package, electronic mail, a filing facility and a forms data entry capability. However, an OIS must offer all of these facilities to the user via a *simple, uniform interface.* Officetalk combines all of these facilities, plus a few others, into a single, integrated system which is currently being used by clerical workers.

Capabilities and functions

Officetalk is a distributed program that executes on at least one minicomputer in conjunction with the communication network and a central file server. Ordinarily there will be several minicomputers, each acting as a work station for an individual user of Officetalk. The central file server maintains a database describing all pending electronic transactions, e.g., electronic mail, information about each authenticated user of the system, or a set of tailored blank forms to be used in the particular application. Officetalk is designed to save the majority of the user's information state in the central server and as little as possible in the local minicomputer.

To implement Officetalk, a set of blank forms for the application must be designed and entered into the database. Officetalk provides a forms editor which allows one to design the artwork of a form and to specify the style of each field on the form. The forms editor requires that the newly designed forms satisfy certain rules, such as no overlapping fields; it also permits certain fields to be designated as signature fields. (Legal signature field entries can only be filled in with the image of the current user's signature.)

Upon logging into Officetalk, the user is shown an image of a desktop containing parts of forms. The user employs the mouse to manipulate the forms on the desktop. Each form is displayed in a

rectangular *window* on the CRT device. The form may be larger than the window; hence, the user is allowed to enlarge (shrink) the window or to scroll the form within the window by pointing the mouse to appropriate parts of the window frame. The user can also move the window around on the display screen by "picking up" the window with the mouse and then moving the mouse. If the new window position overlaps another window already on the screen, Officetalk treats the two windows as pieces of paper. The last window that is "laid down" is wholly visible, while intersecting windows are at least partially "covered up". Each window includes a menu of Officetalk commands which can be applied to the form that is visible in the window. The particular menu that is used is a function of the type of the form showing in the window. The mouse is used to point at commands in order to invoke them.

A newly-initialized Officetalk desktop contains four forms called *file indexes*:

- The *in-basket*, an index of incoming mail.
- The *out-basket*, an index of mail to be sent and mail that has been recently sent.
- The *file index*, forms that the user has saved.
- The *blank stock index*, the set of available forms.

Each file index entry contains several fields: One field names the file, an *action field* specifies a command which can be applied to that file entry, while other fields list other information about the file. A file index form is special in the sense that it contains a field on the form itself which allows command invocation; ordinary forms do not contain an action field. (Instead, all commands are invoked by the window menu.)

When the user wishes to generate a document, he selects a blank form from the blank stock index by pointing at the action field of the appropriate entry; the form is drawn in a new, fully visible window. The user may then enter information into the form by pointing at a field and typing a character string (or causing a signature to be entered). The editor restricts the data types to match the form's field definitions, e.g., a signature field can contain only a signature. Officetalk also allows the user to draw freehand on a form; the mouse is used as a "brush" which can take on several different styles. Freehand illustrations can later be removed without harming the form's layout or previously typed information. This capability is particularly useful to those who have an aversion to typing. Once a document has been prepared, it can be filed in the user's personal file, in which case it will have an entry in the personal file index mentioned above. Or perhaps it may

be copied, and the original filed and the copy placed in the out-basket for mailing. The contents of the out-basket are actually mailed (placed on the central file server) when the user points to a *transmit* selection in the menu of the out-basket.

The user can work on an existing document by retrieving a previously-filed form from any file index, including the in-basket. Electronic mail is routed from the sender to a mailbox on the central file server; the mail is moved to the local in-basket by pointing to a menu selection. Forms that have been mailed can be traced by the user. When the trace option is chosen, Officetalk opens a window on the electronic desk and then describes the current location of the form and an audit trail describing its route to that location.

Some Implementation Issues in Officetalk

Officetalk integrates a number of facilities that exist in many different systems into a single interface. The interface takes full advantage of the interactive graphics capability of the Alto. For example, the user can shuffle paper, read mail, or read previously filed documents without touching the keyboard. There are several other interesting aspects to the Officetalk design which are not discussed here: the memory management among the central file server, a work station's local disk, and the work station's primary memory is complex; the primary memory can be used more effectively if parts of a form are "demand paged" in from the local disk. Similarly, in form storage there are tradeoffs of network traffic versus local disk space utilization. The network communication mechanism has been the subject of careful study: for example, the tradeoff between reliability and program size in choice of protocol level. The production of hardcopy documents from graphical images requires more than brute force algorithms. (Several of these parts of the Officetalk implementation were adapted from OIS-independent packages that already existed at PARC.)

The basic software under the graphics package implements some portions of the Level 4 of the Core System developed by the ACM SIGGRAPH Graphics Standard Committee, [ACM Computing Surveys, 1978]. The Alto environment provides low level implementation of the *pick*, *locator* and *keyboard* input devices. The *viewing transformation* is defined by a bitmap for a 606 x 808 point screen; in order to place an image on the screen, it is necessary only to set the appropriate bits in the bitmap. Officetalk designers implemented the two-dimensional notions of *windows* and *view ports*, so that clipping, scrolling and moving windows could be handled efficiently. The techniques used in the display maintenance are described in Newman and Sproull's second edition [1979].

Each window in the user's domain has a descriptor indicating the current size and location of that window, as well as other information about the window's content. Windows are placed in a list in the order in which they should appear on the screen. Thus, window movement amounts to placing the window on the front of the window list and then updating the bitmap by first clearing the area in which the top window appears, then placing window content in the bitmap, and, then drawing (with clipping) next window descriptor in the list. When the mouse points to a window, the program searches the list for the first window to contain the x-y coordinate input. The menu selection is determined by both the identity of the window and the location within the window. (The location within the window specifies the function to be performed.)

Intelligent forms editing requires some thought. There are the usual low level interface problems: for example, how to select and replace text. Additionally, field types must be checked for proper values. While some fields may be unalterable after they have once been written into (e.g., the "amount" field of a pay voucher), other forms are copies and thus cannot be written upon. (One important problem that arose here was how to visually identify a copy from the original! The approach taken was to provide a different set of capabilities for manipulating a copy rather than manipulating an original; the menus for the two types of forms differ.)

Limitations

Officetalk is a prototype office information system that integrates a set of common facilities into a single system with a simple user interface. It does not include any decision support facility, a desirable feature of a production OIS. Decision support can perhaps best be incorporated by providing a means for defining procedural specifications of office activities. Although this was a goal of the Officetalk-Zero study, the user interface turned out to be a hard enough problem to absorb the full energies of its designers. In order to increase the reliability of a distributed OIS, production systems are likely to incorporate more sophisticated database systems than that used in Officetalk. The designers chose to use an existing facility which does not allow a distributed database, which supports no query system, and which uses overly simplistic forms of locks for data consistency.

Even with these limitations, Officetalk-Zero is a unique prototype that illustrates the power and utility of the integration of a set of information manipulation facilities into a single office information system.

SCOOP: Another Prototype OIS

While Officetalk-zero emphasized the user interface, Michael Zisman's SCOOP (System for Computerization of Office Processing) emphasized the specification, representation and automation of office procedures [Zisman, 1977]. Zisman developed a system based upon Petri nets augmented by production rules for modeling offices as asynchronous concurrent processes. This model, called the *Internal Representation*, was a conceptualization of how the machine represented the problem to itself. In addition, an *External Representation* described office procedures as activities and documents in a non-procedural programming language for the office analyst. A prototype system for computerization of office procedures was implemented at the University of Pennsylvania's Wharton School. The system, driven by an internal representation as input, tracks instances of procedures and automatically executes portions of them. Throughout his thesis, Zisman focussed on automating office procedures rather than simply automating devices in the office.

The Approach

The augmented Petri nets Zisman used to describe office procedures can also be used to represent asynchronous processes in general. The notation specifies a process representation as a Petri net [Peterson, 1977] and a knowledge representation as sets of productions [Newell and Simon, 1972] associated with the Petri net transitions. For any given situation it is necessary to consider only those productions associated with the Petri net transitions that are enabled at the time. Thus, the model partitions the total knowledge set into useful, not necessarily disjoint, subsets. We will next consider a model of an order entry process in an office as an example of the model.

For the purposes of this paper, the office which performs the *order processing* function consists of a receptionist who records the arrival of each customer request for goods in a log book, types the required information onto an order form, and then sends it to the order administrator. Upon receipt of the order form, the order administrator processes the order using the customer file. He or she next uses information from the billing file to validate that this customer is not delinquent in previous payments. Then a decision is made about whether the goods should be shipped C.O.D. or the customer should simply be billed for later payment. In the case of C.O.D., a single form, f3, is filled out, but in the bill later case, two forms, f1 and f2, are filled out. This fragment of an office

procedure , although simplified, will serve as a pedagogical aid for explaining various ideas throughout this paper.

One Petri net must be constructed for each *agent*, who is frequently but not always human. Thus, the *receptionist agent* is described by the Petri net of Figure 1a, and the *order administrator agent* is described by the Petri net of Figure 1b. The semantics of the actions that occur at the nodes of the net are presented as sets of productions in Tables 1a and 1b, respectively.

Let us consider within the model what happens when a customer's request for a product arrives. Customer request arrivals are modeled by a token arriving on the place P1 of the Petri net presented in Figure 1a. Note that P1 is the initial place specified for this net. This token appearing on place P1 enables transition a1. Some unspecified time after this enabling, the action specified by transition a1 will actually occur; that is, the transaction will fire. Note that we do not know exactly when this activity will take place, because the receptionist may be busy doing something else or may not even be working at the time of arrival. This nondeterministic timing notion is captured nicely within the Petri net formalism, because Petri net transitions are defined to fire at some finite but indefinite time after the transition is enabled. One variation from the standard Petri net definition that occurs in this model is that transition firing is not instantaneous. This instantaneity could be accomplished by associating transitions with the termination of transactions, but there are advantages to associating times with transactions in order to separate execution time from wait time and to perform analysis. Because a Petri net is an uninterpreted model, to find out what is really happening within any transition, we must look at the associated productions. Table 1a implies that transition a1 results in the writing of an entry into the log book. This action enables the next step in the Petri net (transition a2): the keying of a customer request into the system. Transition a2 also has the side effect of enabling an instance of the order administrator agent to begin by placing a token on the initial place P5 of the Petri net in Figure 1b.

Methods for modeling decision making (location P10) and parallel processing (transition a10') are illustrated in Figure 1b. Note that a single token on place P10 can cause either transition a10 or transition a10' to fire and remove the token from place P10, but both transitions cannot fire since removal of the token by one transition disables the other. Firing of a transition also depends upon the production rules associated with the transition. If the condition portion of all associated

productions is 'true', then the transition can fire (cf. Patil's [1970] coordination sets). In this case it depends upon the value of the variable "shipping-mode", which was set by the previous transition a7. When transition a10' fires, it places tokens onto both P6 and P9, thus enabling transitions a6 and a9. Again these enabled transitions cannot fire until their associated production predicates are true. In this case as in many cases of parallel asynchronous processing, productions associated with different independent transitions are in the *active production rule set.* In the SCOOP system implementation, each production consists of a list of predicates followed by a list of actions to be performed if all predicates are true. In Table 1b, after transition a7 has fired, if "shipping-mode" equals "C.O.D.", then a10 can fire; if "shipping-mode" equals "pay later", then a10' can fire. The dashed lines to and from the new transition a6' in Figure 1b have been added to illustrate the mechanism for modeling timeouts on a transition such as a6 in this example. If the activity a6 is not completed within the time limit specified, then (and not before then) transition a6' will fire and cause some reminder to be generated. The enabled a6' predicate performs this triggering function (Table 1b).

The rule associated with transaction a6' states that if this transaction has been enabled for five or more days, then a document entitled "reminder" should be sent to the order administrator. Then the timer is reset and transitions a6 and a6' are re-enabled. One generalization of the augmented Petri net formalism that is not present in this example is the ability for one net to cause a variable number of initiations of another net. This notion of spawning a variable number of child processes is useful.

The SCOOP Implementation

SCOOP stands for System for Computerization of Office Processes. The system implementation contains an execution monitor which is driven by the internal representation of a set of augmented Petri nets; as a transition T fires, the execution monitor removes the productions associated with T from the active productions rule set and enters productions of any transitions which are enabled by the firing of T. The execution monitor starts up some processes which can be implemented as automatic procedures and other processes which are interactive cooperative ventures between man and machine. At a lower level, special purpose hardware and software systems exist to carry out various office tasks which receive messages from SCOOP. The special purpose systems which are

used by SCOOP are document generators; electronic mail senders and receivers; file services, and media schedulers.

Although the complexity and number of the special purpose systems may grow large as the office automation area grows, the monitor (or office operating system supervisor) can remain relatively constant. Zisman provides guidelines and frameworks for a high level non-procedural specifications language, and that contains a document definition section for declaring all documents needed, an activity initiation section for describing when each activity can be performed and an activity detail section. The activity detail section describes the detail tasks to be done when the activity is initiated by a few basic operations, well-known to an office analyst. Procedure descriptions in this language could then be translated into an augmented Petri net and run using the execution monitor, SCOOP. By considering the specification language, the internal representation, and the design of a prototype system using one unified model, Zisman has been able to study the office as a system rather than simply as a collection of isolated tasks and pieces of equipment. Although Zisman suggests the language and the model need refinement, his basic notions will probably have great impact on the office of the future.

TECHNICAL OIS RESEARCH PROBLEMS

In this section we describe a number of problems in the field of computer science that relate directly to OIS research, in some cases discussing a particular topic in detail, in order to give the reader a better understanding of the nature of that problem. A special attempt has been made to emphasize two kinds of problems: Those which might reveal new and/or interesting facets due to the context of OIS research; and those which may yield to specialized techniques within a subdiscipline. The exposition of this section procedes from languages and systems through architecture, communications, artificial intelligence to some important sociological issues in office information systems.

Programming Languages

Because of the potential need for very high level programming languages that can be used by the ordinary clerical worker, research in programming languages is an important area of OIS research. The implementation of OISs on distributed systems will also affect programming languages, since a large OIS will likely require the ability to recompile parts of the system dynamically while other parts are running. Design of programming languages will be influenced both by the need to support the naive user and by the need for handling parallelism. After mentioning a variety of such problems, this section presents a more lengthy discussion of IBM's Business Definition Language developed for naive users to implement data processing algorithms.

Because of the dynamic nature of office procedures, the clerk will likely find it necessary to write and modify programs that execute at his work station but that may be applied globally. In the past, the end user of a batch system could be given an English description of the input to a program and some instructions about interpreting the output. The user model of the system became more complex when he or she was expected to use an interactive terminal, although that too could be explained by a more complicated set of instructions describing the effects of different keystrokes, the "state of the computer" when it prompted, etc. However, because of the new need to create and alter procedures, the description of the OIS that is presented to the naive programmer/user will have to depart significantly from the machine models to which he or she has grown accustomed. The average clerical worker will not be willing to learn very sophisticated notations to understand the operation of the OIS; neither will he be willing to learn drastically different approaches to the solutions of his own problems.

In order to use a programming language, the user must understand the notions of compile time, load time and run time. A simpler metaphor is used to describe an interpreter: encode an algorithm into symbolic form, then "run" the program. The question is whether this is the proper way for the clerical worker to think of programming an OIS work station, or whether the worker should be given a skeletal program which can be filled in with appropriate parameters (as in various query by example systems [Zloof, 1975]) or perhaps only be allowed to write syntactically correct programs by parsing the program as it is entered into the work station. Various other aspects of the user model may profit from new abstract machines; e.g., should the user be unconcerned with I/O devices other than, perhaps, a mailbox, keyboard, and display? (The clerk could ignore the existence of hierarchical file systems if file access messages could be sent to a file server.) A natural question that arises from this area relates to the computational completeness of OIS programming languages. Is it necessary to be able to encode any algorithm into the user's language? If the language is restricted, can one (more easily) test for certain consistency features such as decidability of a program, correctness, deadlock, etc? What should be the nature of such "restrictions" to the language; should there be unorthodox control structures (e.g., no explicit loops), or very limited data structures?

So we see that future OIS languages may reduce the amount of information needed to program the system. It may also be necessary to expand the abstract machine model over conventional languages. A model of a distributed OIS might not disguise the network aspect of the system, but rather emphasize it. For example, the model may be that of a communication network with server nodes; each work station's view of the system being that there will be requests for service, and that services can be requested from other nodes in the network by sending a request to the appropriate server. Work on such a communal system is accomplished by cooperation among a set of servers in the network. An extension to this idea is that of sending procedures to other work stations rather than sending messages, (allowing procedures to run in different physical domains). Other features that are not ordinarily in a programming language model may have to be added in order to simplify the human interface. How can a distributed OIS be updated by multiple clerical workers in a systematic manner? Can any work station dynamically recompile its own procedures (or those passed into it from another work station) without some global form of communication? Should there be a central compiler/consistency-checker which each work station must use if it wishes to recompile a procedure? Since it has been shown that there is a significant amount of parallelism in an office, [Ellis, 1979], should OIS procedural specifications explicitly denote parallelism or should it be detected by a compiler?

BDL: A Very High Level Business Language

BDL, a Business Definition Language developed at IBM's Thomas J. Watson Research Center, is a very high level programming language constructed for the naive user. Although the specific application area of the BDL work is business data processing, the work corresponds closely to that of programming language development for naive OIS users. BDL has been designed to simplify the translation of concepts and algorithms of business data processing into instructions which implement those ideas on a computer. Quite generally, the approach has been

> ". . .to apply the design philosophy of structured programming and very high level languages to a particular application area, namely business data processing" [Hammer, et al, 1977, 833].

There has been no claim that BDL is a general purpose language; the tradeoff between generality and simplicity of use has purposely been biased toward simplicity. This does not mean that BDL is simply a parameterized program, nor is it even built on an existing programming language foundation. BDL is a new approach that incorporates a number of assumptions from business data processing such as the kinds of problems that will be encountered and the common methods for solving those problems. The language is intended to be sufficiently expressive that it can also serve as formal documentation of the application. One result of the bias toward simplicity in BDL has been the decision to build as much structure as possible into the language. The result is that the language does not provide alternative ways to accomplish a given function; instead, only one method per function is provided. BDL syntactic program segments have a common style and structure; each program is constructed from the common schema.

The extensive use of structured programming concepts in the BDL design becomes apparent in the expression of control flow and information transformation. BDL recognizes *documents*, *steps*, *paths* and *files* as objects for describing a business data processing algorithm. A *document*, the fundamental data item in BDL, can be thought of as an organized set of primitive values. Each *step* can read documents, perform some computations and then produce a new document. *Composite* steps can be hierarchically decomposed into more primitive steps. *Irreducible* steps define the derivation of output documents from input documents; they can be defined only in terms of a program segment. A *path* connects steps together, indicating the flow of documents in the program; it defines an output document for one step and an input document for another step. (Several paths may enter and exit any step.) Documents can be saved for distinct program activations by placing them in *files* in one activiation, then retrieving them in the later activation.

A BDL program is defined by three distinct components: A *Form Definition Component* (FDC) defines the forms which will contain documents. The *Document Flow Component* (DFC) represents graphically steps, paths and files. The *Document Translation Component* (DTC) specifies the procedural interpretation of the irreducible steps.

A BDL form, a template for documents, is comparable to the notion of an Officetalk blank form in that the form definition includes a physical graphic image specification similar to a traditional paper form as well as other information. The electronic form tends to be more "intelligent" than paper since it can be made to respond to varying conditions; for example, fields in BDL forms can align themselves depending on the content of the document. The FDC is implemented at an interactive graphics terminal which allows the forms specialist to define the form by drawing rectangles and filling in sample field contents. The physical layout of the form is first described by specifying its size, its preprinted information, fields, field headings, etc. Detailed form information is also defined by using the FDC to specify field names, data types, data formats, names for groups of fields, key fields for sorting groups of fields, as well as explicit instructions for handling certain errors.

The Document Flow Component describes the data flow by means of a directed graph; the components of the graph are steps and files (nodes) interconnected by path segments (edges). The DFC is similar to a number of other methods for specifying the hierarchical design of computer programs and systems; the reader of BDL literature will recognize ideas and constructs similar to those used in the TELL system [Hebalkar and Zilles, 1979], LOGOS [Rose, 1972], the ICNs discussed in a later section of the paper, and many others.

The node set in a DFC graph is made up of rectangles representing steps and of circles representing files. The edge set is made up of solid directed edges interconnecting steps and of dashed directed edges interconnecting steps and files. Each edge is labelled to define the document type that flows over the corresponding path (a file is assumed to contain only one kind of document). A document is said to be an *output* (*input*) *document* of step α if the path from (to) step α is labelled with the document's name.

A DFC graph is derived as a set of hierarchical graphs in which each intermediate level in the hierarchy is made up of one or more composite nodes. A BDL program is stepwise defined by first specifying a graph made up of composite steps, paths and files, all of which illustrate the organizational units of the business and the flow of documents among those units. Topdown

refinements are made by decomposing steps into more constituent steps until each step is irreducible. Once a computer step has been refined into an irreducible step, then the function of the step can be defined by the DTC. If the irreducible step is complex unit of computation, its interpretation reflects that complexity. An executable BDL program is defined by a DFC graph over a set of irreducible steps and a set of functional definitions for each step.

At run time a step in a BDL program can be executed whenever there is a document on each input path of the step. The step is assumed to execute instantaneously, destroying each input document and creating new output documents on each output path (cf. Petri net tokens [Peterson, 1977]). For information to be passed from an input document to an output document, the step definition must explicitly copy that information from the input document(s) to that output document(s) (cf. E-net tokens [Nutt, 1972]). The BDL run time support system provides an implicit queue of documents on each edge of the DFC graph. BDL also allows a step definition to process a group of documents from the input path set and to create a group of documents for the output set (cf. parallel program schemata [Karp and Miller, 1969]).

The Document Transformation Component could, in principle, be any arbitrary programming language. Each DTC procedure is invoked when the DFC execution enables a step with input documents. The DFC run time system could merely provide a mechanism for calling the corresponding step procedure and for passing it the arguments that exist as input documents in the DFC graph. In BDL, DTC is a very high level language directed toward business data processing of aggregates of data. The DTC language contains a common algorithmic framework built into each step. The DTC programmer uses this framework to define the particular transformations of information from the input document onto the output document. (Although the innate algorithm framework handles single input-single output steps, multiple inputs/outputs are handled by using the document grouping feature of the DFC.) The step interpretation must specify an expression for each value field on the output document. The expressions are made up of ordinary arithmetic operators, conditional expressions over logical and relational operators, and aggregate operators to handle groups of data.

BDL Capabilities and Limitations

This discussion of the Business Definition Language and the previous discussions of the Officetalk-Zero and SCOOP systems have introduced the notion of expressing information flow in the business application by casting information into modules -- documents and forms. The need for

sophisticated mechanisms for creating templates for the data structures is apparent from the effort spent in developing forms editors; all of these efforts appear to be leading to the intelligent form. The notions of a trace facility in Officetalk and form error handling mechanism in BDL can both be thought of as procedures to be executed in the context of the form rather than the context of a work station or DTC procedure. Although there are many similarities between Officetalk and BDL, the emphasis in the Officetalk-Zero work is on the graphical interface to system facilities, while the BDL effort is aimed at creating a programming environment for the naive user.

One facet of the BDL approach is that it does not explicitly differentiate between control flow and data flow. The whole question of conditions under which a model should represent control and/or data flow, and to what extent they should be separated is still open; the data flow representation in the business data processing environment may be exactly right. Only experience with BDL and other data flow languages can resolve this debate.

However the distibuted office system environment is different from the data processing environment of BDL. BDL models explicitly orient the description around the flow of documents through various steps which might be executed on arbitrary processors, ignoring the assignment of steps to processors. For example, the document flow through five steps implemented at two different locations could require as little as one and as many as four communications over a network, depending on the assignment of steps to processors; a document-oriented model may not distinguish between these two cases. One alternative representation is to orient the model around processors, i.e., work stations and people. In this case, network internode communication may be apparent, but the path of the document may be difficult to discern. Document oriented descriptions of information processing tend to be useful for ascertaining information about the data flow, e.g., the temporal ordering of processing that takes place on the information. Processor oriented models of the computation often tend to be easier to use for analyzing resources in the system.

One criticism that can be leveled at the BDL's application as an OIS programming language is the stance of the designers on the problem of informal communication. Although some applications do not make use of forms for communication, BDL assumes that communications are accomplished only by forms: "For example, it is possible to represent a telephone call as a stylized document carrying certain information." [Hammer et al, 1977, page 833]. As will be discussed in a later part of this paper, capturing the information content of informal conversation is neither trivial nor well-understood.

The DTC language is intentionally constraining when compared with general purpose programming languages or other structured programming systems; however, it is definitely a programming language and not a parameterization of a previously written program. The BDL effort is one of the few published works that adequately addresses the problem of programming languages for naive business users. But it is only through these and similar efforts that programming languages will be made available that can be utilized by the clerical worker in the automated office.

Software Engineering

In this section we discuss various topics of software engineering, and also present an office modeling scheme (Information Control Nets) that has been used both to describe offices to managers and to analyze the office for consistency and performance. The scheme can also be extended into a simulation model or a requirements specification for the OIS design.

At the heart of many software engineering methodologies lies a model of the design, e.g., see DREAM [Riddle et al, 1978], SADT [Ross, 1977], SARA [Campos and Estrin, 1978], and TELL [Hebalkar and Zilles, 1979]. The goals of these methodologies are usually as general as possible within the scope of software development. The methodologies are intended to specify requirements before implementation, to check the correctness of a design, and/or to be used as a design system. The model itself is molded to reflect the particular part of the methodology that is important to that system.

In considering the development of office information systems there are compelling arguments in favor of analytic modeling: (1) the technology of the systems is still in the formative stage; (2) these systems are quite dynamic (changes to office procedures, office personnel or office requirements are frequent) and, (3), there is no comprehensive theory of office information systems. Indeed, there is strong reason to believe that the office of the future will need to lean heavily on modeling and theoretical analysis. And since the office can be viewed as a network of highly interactive parallel processes, models and analyses used in studies of computer systems are highly applicable.

Information Control Nets

We next present one particular model developed over the past few years by researchers in the Analysis Research Group and the Office Research Group at Xerox PARC to describe and analyze information flow within offices. A model with similar goals has been developed at the University of Toronto [Tsichritzis, 1979]. This model, called an *Information Control Net*, has been used within existing and hypothetical automated offices to yield a comprehensive description of activities, to test the underlying office description for certain flaws and inconsistencies, to quantify certain aspects of office information flow, and to suggest possible office restructuring permutations. Examples of office analyses that can be performed via this model include detection of deadlock, analysis of data

synchronization, and detection of communication bottlenecks. Restructuring permutations that can be performed via this model include parallelism transformations, streamlining and automation. Thus, one requirement for the model is mathematical tractability; another is simplicity so that naive office workers can comprehend and manipulate the model. A third requirement is extensibility so that one model is equally applicable to theoretical analysis, simulation and implementation.

The Information Control Net model [Ellis, 1979] defines an *office* as a set of related procedures. Each *procedure* consists of a set of *activities* connected by temporal orderings called *precedence constraints.* In order for an activity to be accomplished it may need information from *repositories,* such as files and forms. An information control net (or ICN) captures the above notions of procedures, activities, precedence and repositories in graphical form. ICN diagrams in their simplest form use circles to denote activities and squares to denote repositories as in Figure 2. A solid line from activity A to another activity, B, is a precedence arc and denotes that activity A must be completed before activity B can begin. Dashed lines to and from repositories denote respectively the storing of information into and the reading of information out of repositories.

An ICN describes the activities or tasks which make up an office procedure. This section presents a formal definition of a basic ICN as a set of activities, a set of repositories and various functional mappings between these elements. One set of mappings, δ, describes precedence constraints among activities, and another, γ, describes repository input-output requirements of activities. A great deal of information can be attached to a basic ICN: information concerning, for example, (1) concerning the particular data items transferred to or from repositories, (2) who performs the activity, (3) the amount of time the activity takes, and (4) the amount of data transferred by an activity.

Definition: A basic ICN is a 4-tuple $\Gamma = (\delta,\gamma,I,O)$ over a set A of activities and a set R of repositories, where

(1) I is a finite set of initial input repositories, assumed to be loaded with information by some external process before execution of the ICN

(2) O is a finite set of final output repositories, perhaps containing information used by some external process after execution of the ICN

(3) $\delta = \delta_i \cup \delta_o$

where

δ_o: $A \rightarrow P(A)$ is a multivalued mapping of an activity to its sets of (immediate) successors,

δ_i: $A \rightarrow P(A)$ is a multivalued mapping of an activity to its sets of (immediate) predecessors.

(For any given set S, $P(S)$ denotes the power set of S)

(4) $\gamma = \gamma_i \cup \gamma_o$

where

γ_o: $A \rightarrow P(R)$ is a single valued mapping (function) of an activity to its set of output repositories,

γ_i: $A \rightarrow P(R)$ is a single valued mapping (function) of an activity to its set of input repositories.

In mapping ICN diagrams into formal definitions, solid lines into an activity node correspond to the δ_i function, and solid lines out of a node correspond to δ_o. Similarly, dashed lines into an activity node correspond to the γ_i function, and dashed lines out correspond to γ_o.
As an example, the formal definition corresponding to Figure 2 is shown in Table 2. Given a formal definition, the execution of an ICN can be interpreted as follows. Pick any activity α, in general:

$$\delta_o(\alpha) = \{\{\beta_{11},\beta_{12},\ldots,\beta_{1,m(1)}\},\{\beta_{21},\beta_{22},\ldots,\beta_{2,m(2)}\},\ldots,\{\beta_{n1},\beta_{n2},\ldots,\beta_{n,m(n)}\}\}$$

means that after completion of activity α a transition occurs which simultaneously initiates all of the activities β_{i1} through $\beta_{i,m(i)}$. Only one value of i ($1 \leq i \leq n$) is selected as the result of a decision made within activity α. (Note that if $n=1$, then no decision is needed and α is not a decision node.) In general, if $m(i)=1$ for all i, then no parallel processing is initiated by completion of α. One complication to the above discussion is that $\delta_i(\alpha)$ must also be taken into account for each α because synchronization is frequently needed within offices.

For example, if α or β will execute, and one or the other must finish before η can begin, then one way to model this is by utilizing a hollow dot with two arcs coming into it from α and β and one arc going out of the hollow dot to η. If α and β execute in parallel, and both must finish, then the black dot with two incoming arcs can be used. Our formalism using δ_i and δ_o handles the description of all of these cases unambiguously.

The execution of an ICN commences by a single λ transition. We always assume without loss of generality that there is a single starting node:

$$\exists!\ \alpha_1 \in A\ \ni\ \{\{\lambda\}\} \in \delta_i(\alpha_1).$$

At the commencement, it is assumed that all repositories in the set $I \subseteq R$ have been initialized with data by the external system. The execution is terminated by any one λ output transition. The single input node assumption allows any complex procedure to be viewed as a single node. If there are many λ output nodes, the procedure shrunk to a single node is a decision activity. If this decision-making at a detailed modeling level is superfluous at a higher modeling level, then a hollow dot can be used to join output arcs to a single terminal node within this procedure. This implies that data arcs show information repositories that *may* be used rather than those that *must* be

used. The set of output repositories are data holders that may be used after termination by the external system.

An ICN Example

Figure 2 shows the order processing example, introduced earlier in the paper, in terms of the ICN diagram. For clarity, triangles are used instead of rectangles to denote those repositories which are temporary (analogous to local variables within procedural programming languages). At the top of the figure attached to the arc into a1 is a comment "customer request arrival." The initial incoming arc is labeled by a comment to specify startup semantics. Order processing then proceeds by logging the customers request into the log book (activity a1), typing the order and sending the order (activities a2 and a3), and then receiving the order (activity a4). Decision nodes, or choice nodes (drawn as small, hollow circles), are activities with multiple immediate successors. When a decision node terminates, one of the successors is selected to be activated next. The decision node a7 is labeled first by information indicating the semantics of the decision, i.e., a decision is made to send the goods via C.O.D. or to bill later. In the case of a bill later decision our diagram shows by dashed lines that two forms, f1 and f2, are filled out in the activities a8 and a9, respectively. In the case of C.O.D., only one form, f3, is filled out. The arcs emanating from a7 are labeled by numbers to indicate the probability that any given transaction will next be processed by a8 or a9. In the example, 90% of the transactions result in C.O.D billing. This important branching probability implies that a mapping should be added to our basic definition. Unlabeled branches in this mapping would have a probability of 1 associated with them. Another mapping which could be added to our basic information is a mapping from each activity to a person (or people) who perform that activity (cf. Zisman's agents).

Each activity in a diagram such as Figure 2 can be a macro activity described by an ICN diagram. Similarly it is possible to envision that the order processing procedure specified in Figure 2 may be one node in a diagram at a higher level. For example, one could have a diagram showing order processing node followed by credit department processing node followed by accounting node followed by billing and shipping in parallel. Figure 3 shows this same order processing example after some standard automated ICN transformations for office restructuring have been applied to it. In Figure 3 the activities *send order* and *receive order* do not appear because in an automated system the typing-in activity would automatically cause the information to appear on the screen or be available to all of the people involved in the process. Activity a1, logging, and activity a2, typing,

can be freely switched, and so are termed *abelian* activities; such activities form the basis for a number of parallelism transformations [Barth, 1978]. In Figure 3 we notice that the typing activity precedes the logging activity. Once the typing activity is done, and the information is available to all the workers involved in this process, then it is possible to do activities in parallel. Thus, after activity a2 is completed, both the logging activity (a1) and the order processing activity (a5) can begin. This is shown in the ICN diagram by small, filled-in dots with lines pointing to the activities a1 and a5. The omission of a3 and a4 is an automation transformation; the performance of activies in a different order or in parallel is a reorganization transformation.

In this example there is a streamlining of procedure in that activity a7 no longer requires access customer file C; instead this information is available locally in temporary repository U. This is an example of a transformation called *data roll-back* in which case data is accessed at an earlier time in the process, thereby rendering other future accesses unnecessary. *Data roll-forward* is exemplified in Figure 3 as well: note how activity a6, which accesses the billing file, has now been "rolled forward" so that it is done after activity a7. Thus, access to the billing file is limited to those cases in which it is really necessary (when customer will be billed later). Also in this case parallelism is now obtained between the order processing activity a6 and the forms fill out activity a9 although it is not possible for the activity a8 to be done before activity a6 has completed. Notice that in general these transformations involve what can be described as probabilistic parallelism and are predicated upon branching probabilities associated with decision nodes. If all the activities in this procedure have reasonably similar execution times, then these transformations will speed up the average processing time by approximately fifty percent.

Operating Systems and Databases

A common definition of the office information system is "a distributed operating system with a highly refined user interface and database facility." As such, there is a number of issues regarding operating systems that present challenging problems: distribution versus centralization, functionality, reliability, distribution of operating systems kernel, security, parallelism and consistency, to name a few. For example, one of the areas of high concern to office managers is security of sensitive data (data which may now be displayed on CRT screens at multiple locations within an office). Similarly, they are very concerned about reliability and the ability to continue processing transactions in the face of component failures.

Other problems are involved in the servicing, organization and management of an office. In the typical office there exists a conglomeration of unstructured tasks [Ellis,et.al.,1978]. How to group, couple and uncouple these tasks is a very important question. Dynamic links, such as those incorporated into the DEMOS Operating System [Baskett, 1977] are a possible solution to this problem; the concept of the intelligent form, a process that may travel from one work station process to another in order to fulfill its goals, is another possible solution.

Distributed synchronization in the form of efficient distributed implementations of network synchronization primitives is yet another problem in the design of an OIS. Possible solutions might include distributed implementation of eventcounts or some other type of distributed monitor system [Reed and Kanodia, 1977], and primitive serializers [Hewitt, 1979].

These problems and their solutions are relevant even if the OIS is viewed as a database system. The design and implementation of effective office information systems requires solution of a number of additional research problems on the database, involving personal filing systems, office database schema organization, specialized languages for office databases, duplicate database update algorithms, distributed query processing and other issues regarding organization of distributed databases.

In the office, information is highly diffuse and dispersed; there are strong implications that the redundant storage of data at multiple sites is desirable. If at each site, its frequently accessed data is local, then reading that data requires no overhead from network transmission. A yet unsolved OIS research problem is the minimization of the cost of updating this information at all nodes that possess it. If users at several sites attempt to update simultaneously, the result could be inconsistent copies, and so yet more research has been centered around efficient maintenance of multiple copy databases. Possible solutions might include a centralized controller scheme [Garcia, 1979] in which all nodes must ask permission from the primary controller, although this scheme generally tends to create performance bottlenecks at the primary site. A variant of this scheme employs one or more centralized controllers for various segments of the database with distributed crash recovery [Menasce, *et al.*,1979]. Algorithms allowing totally distributed control include a ring structured scheme [Ellis, 1977] in which messages circulate around all relevant nodes in a prescribed order and return to the sender afterwards as permission to update; this latter technique, however, tends to be

slow because of low utilization of parallelism. It is also possible to implement a "primary update token" that moves around the network and symbolizes control. A node that holds the token, can freely update the database. A less cumbersome scheme employing distributed control is the voting algorithm [Thomas, 1976]; if a node wants to update, it can do so by asking its neighbors to perform local consistency checks and to vote "yes" or "no" to the update. These neighbors in turn ask their neighbors to vote, etc. After getting a positive vote from a majority of the nodes, the node may update. In fact, the update may be performed even before voting is complete if transaction restart or rollback is available. This scheme allows the system to continue gracefully even if a minority of the nodes are not functioning. The complexity of this algorithm and others indicate the strong need for formal proofs that they work correctly [Ellis, 1977]. Also, experience is yet needed with implementations; at the Computer Corporation of America, an ambitious project is being considered that will implement a duplicated database facility for the Arpanet community that utilizes different update protocols for different classes of update transactions [Bernstein,et al, 1977].

Some of the objectives of all these schemes include efficiency, consistency, robustness in the face of partial failures, and formal correctness. Some additional techniques that might be used include: *timestamps*, which are attached to transactions so that such problems as out-of-order updates can be avoided; n*ode IDs* and *transaction IDs*, which break deadlocks in an unbiased fashion; l*ocking* of records or pages of a database, which can ensure that several users will not access the same data at the same time; *two phase commit protocol*, which locks multiple resources in a safe (i.e., robust) manner; and *timeouts*, which detect transmission problems and malfunctioning nodes. These techniques are all directly relevant to the design and implementation of office information systems.

Office Systems Consistency

Suppose that in the previously explained order processing example (Figure 2), a count must be maintained of the number of customers per week, but that a count at activity a10 yields 90 customers (the number leaving the system), whereas a count at a2 yields 100 customers (number entering). This type of inconsistency can be detected automatically using formal models such as ICNs. Such automatic detection can alert the office administrator of an error (that, in this case, he forgot to count those customers who exit via path a6). In a typical large office with many paths of communication such inconsistencies can readily be detected and corrected by the OIS. Consistency

takes on an even more important role within the automated office. Naive users' interaction with the automated system, the frequency of change within the office, and highly complex communications and control all necessitate rigorous verification of consistency.

Within this paper we define consistency broadly to mean that "a collection of specifications or rules are not contradictory." Internal consistency is distinguished from external consistency in that internal consistency is defined as the impossibility of generating contradictory theorems, given a set of axioms and inference rules, whereas external consistency is defined as the absence of discrepancies between two sets of specifications of a system, between a system and assertions about that system, or between two "equivalent" systems.

Some classes of consistency, if breeched, leave the system in an illegal or undesirable state. This occurs in the four classes of consistency listed next.

1. *Security violation.* For example sensitive private information displayed on a CRT in a public area.

2. *Improper responsibility delegation.* Although it may be feasible and nice for an automated system to take over assigned mundane tasks at a work station while that clerk is out of the room or on vacation, some person or process should have responsibility for each transaction which enters the system. So, if too few (or too many) parties have responsibility, this may be detectable as an undesirable state.

3. *Contradictory Information State.* If an order form indicates that one hundred widgets were ordered today, but the log book says no orders were placed today, then we have another example of inconsistency. This type of inconsistency frequently occurs with respect to monetary figures. In some cases if the discrepancy is small, then the office may ignore it; if the discrepancy is large then it becomes a undesirable state.

4. *Contradictory Database State.* For example, if an office manager, after finishing business for the day and finishing the processing of all transactions for the day, discovers that two copies of the primary database (which are automatically maintained by the OIS) have different values, then this is a case of inconsistency, as exhibited by a bad database state.

Violation of the following classes of consistency, however, cannot always be so readily detected:

5. *Message transmission semantics.* Inconsistencies could occur when: A sends, B never receives; or A sends form F, B does not understand F; or A sends to a nonexistent receiver; or B waits on a receive, but A never sends.

6. *Data semantics.* Consistency can be demanded in terms of field types (no letters of the alphabet in a salary field please, field value for the number of customers during this month should not be a negative value, etc).

7. *Procedure semantics.* (correctness of programs). If specifications or assertions are provided in addition to the system documentation, then correctness of implementation with respect to the specifications can be checked. One would like to have version consistency over dynamic recalculation, i.e., although the system is constantly changing and it is not possible to stop the system in the sense of restarting all transactions, it is nevertheless desired to maintain consistency with respect to which version of each subsystem everybody is using.

8. *Synchronization.* Deadlock, starvation, and time erratic service are examples of violation of inter-process consistency. These problems occur because multiple processes need to synchronize.

Having previously given a definition of ICNs, it is possible to build upon this mathematical framework to formally carry out external consistency analyses. For this purpose, it is useful to distinguish between ICNs, (Table 2), and ICN diagrams, (Figure 2). Completeness and consistency of ICNs can then be defined with respect to ICN diagrams. Intuitively, these answer the following two questions:

- Completeness. Does the mathematical notation suffice to describe all office procedures? The working meaning of office procedure would be any office procedure describable by an ICN diagram. To insure completeness, we insist that any two black dots (AND nodes) in a diagram be separated by at least one activity node.

- Consistency. Given one of our mathematical descriptions, does it always describe an office procedure? The working meaning of this is that the mathematical description has some ICN diagram that corresponds to it. If the mathematical description says that activity α is a predecessor of activity β but β is not a successor of α, then the consistency constraint is violated. Thus, we impose the following criterion.

  $\forall\alpha\in A,\ \forall\{\beta_1,\beta_2,\ldots,\beta_n\}\in\delta_k(\alpha),\ \exists\Upsilon\ni\ \alpha\in\Upsilon\in\ \cap\ \delta_{k'}(\beta_i)$

  where k can take on the value i or o implying respectively that k'= o or i. This criterion states that if $\{\beta_1,\beta_2,\ldots,\beta_n\}$ is one of my possible successor set of α, then all β_i must agree that α is in a common predecessor set of theirs.

Questions of uniqueness of the above correspondence can be rigorously investigated by defining structural and functional equivalence among models (see the paper "On The Equivalence of Office Models" [Nutt and Ellis, 1979]). These notions of equivalence imply that any reorganization transformations performed on a model ought to yield an alternative office structure that meets certain consistency constraints with respect to the original structure.

Consistency within the ICN Model

To illustrate internal consistency analysis, suppose that in the order processing example, activity a1 outputs information to a new repository, R, and a5 inputs information from R. After reorganizing the office (Figure 3), these two activities are asynchronous, so it is impossible to know whether a1 or a5 occurs first. If a5 occurs before a1, then a5 will obtain obsolete and possible inconsistent data. Several activities thus accessing the same repository can lead to inconsistencies; it is even possible that several activities operating concurrently could result in some wild mixture of operations in the repository. For ICNs containing no loops or branches, the following definitions and theorems describe undesirable conditions and relevant properties (see [Ellis, 1979; Karp and Miller, 1969] for extension of these definitions and theorems to nets with loops and branches):

DEFINITION: If a directed path in the precedence graph from node α to node β exists, then we say that α is *less than* β and β is *greater than* α. This can be described mathematically as:

$\alpha<\beta$ iff $\exists(n_1,n_2,...,n_k)\ \ni\ n_j\in U_j\in\delta_i(n_{j+1}),\ 1\leq j<k,\ n_1=\alpha,\ n_k=\beta.$

Thus, our graph specifies the order in which operators can execute because operator instances α and β satisfying α less than β imply that activity α must complete prior to the beginning of activity β. If α and β are unordered, that is, neither α less than β nor β less than α, then they may operate concurrently or in either order.

DEFINITION: Two distinct activities α and β are *in conflict* at repository r if

1) α is not less than β and
2) β is not less than α and
3) either r is an input repository of one of the operators and an output repository of the other or r is an output repository of both. Mathematically this condition is defined as:

$\alpha\otimes\beta$ iff $\neg(\alpha<\beta)\ \wedge\ \neg(\alpha>\beta)\ \wedge\ r\in\ (\gamma_i(\alpha)\cap\gamma_0(\beta))\cup(\gamma_0(\alpha)\cap\gamma_i(\beta))\cup(\gamma_0(\alpha)\cap\gamma_0(\beta))$

An ICN is *conflict free* if no two distinct activities are in conflict at any repository.

DEFINITION: An ICN is *functional* if the final values in the output repositories are functions (only) of the initial values in the input repositories.

THEOREM: Every conflict free ICN is functional.

JUSTIFICATION: It can be intuitively argued that since there are no conflicts the net can be directly mapped to one or more sequential execution sequences which all produce the correct values in output repositories. Since these output values are independent of the exact sequence of operations, they can be expressed as functions of the initial values in input repositories. Incidentally the converse of this is false since a net may contain conflicts which do not affect the output repositories.

DEFINITION: An ICN is *determinate* if the sequence of loadings of each repository is a function (only) of the initial values of the repositories.

THEOREM: Every determinate ICN is functional.

JUSTIFICATION: Determinacy requires that given an arbitrary repository r, the sequence of values stored into r during the execution of the net must be a function of the initial values. In particular the last value stored into r must be a function of initial values. Since this property must hold for all repositories r, it must hold for all output repositories. Thus, determinacy is a stronger condition than functionality. The converse of this theorem is false since the sequence of loadings of a repository may be altered by time dependencies while the final value loaded can be independent of the temporal ordering of conflicting activities.

THEOREM: Every conflict free ICN is determinate.

JUSTIFICATION: The proof of this theorem is based upon the observation that if a net is not determinate, some repository can be found whose sequence of loadings depends upon the order in which asynchronous activities are executed. This state of affairs can in turn be shown to imply that the net has a conflict; thus we may prove the theorem by contradiction. If a system has indivisible activities which cannot be mixed by simultaneous operation, then it is possible for these activities to have conflict but to lead to a determinate net. Within a computer memory, for example, one and only one of a set of competing asynchronous processes can write into a memory cell at a time. If the processes are all trying to store the same function value into memory, then the underlying net may have conflict but be determinate (also cf "determinacy" in [Coffman and Denning, 1973]).

Computer Architecture

Hardware technology has developed much further than software technology; software system designers, painfully aware of the problem, have increasingly relied on computer architects to incorporate more traditional software functionality into specialized hardware designs. Computer architecture and integrated circuit design have made the concept of the intelligent work station a reality through the development of such devices as word processors, small business computers and intelligent terminals. Recent work in computer architecture has included novel designs for office systems as well as more well known architectures for integration of software functions into firmware or hardware, [ACM Conference on Nonnumeric Processing, 1979].

Fixed instruction set and bit slice microprocessors have both contributed to the current trend towards preference for local networks of small computers. Intelligent terminals and communicating word processors frequently employ byte-oriented microprocessors as small computational units that can execute complex programs in reasonable times. The declining costs of such machines have made them especially suitable as work station in an OIS network. Bit slice microprocessors are chip sets which can be composed to form machines of extended word width. They have been used in small microprogrammed machines for wider word sizes; such machines are inexpensive enough to serve as common nodes in a network.

The increasing density of integrated circuit design is also drastically influencing computer architecture. The most obvious impact has come from the chip connection restrictions which are pushing designers into bit serial designs, resulting in new ways of thinking about machines. One trend has been toward data flow machines with many processors, [Schaffner, 1978; Dennis, 1974; Wilner, 1978]. An example is Wilner's Recursive Machine [Wilner, 1978], which rejects the basic notions of the von Neumann machine in favor of an architecture composed of logically regular elements each of which can store, process and transmit information. The basic idea behind such a design is that such a collection of regular elements can take on the same interface specifications as the individual elements; the design is perfect for VLSI technology. The elements can be logically structured to represent a recursively-defined hierarchy of variable-length cells, allowing the prepresentation of hierarchical data structures. As a result of this generality of logical interconnection, and of the ability of the architecture to mold itself to represent the logical interconnection, Wilner argues that his machine is especially well adapted to handling ". . .a growing, adaptive set of flexible structures. . ."; in particular, he claims that "Office procedures are a growing, adaptive set of loosely interconnected, event-driven activities. . ." for which the Recursive Machine is especially well-suited.

Measurement and Evaluation

Computer system measurement and evaluation might easily be included under a different topic heading such as software engineering or operating systems. It appears as a separate topic primarily because the measurement and evaluation subjects include human users as well as computer systems. Performance tools, such as queueing models, operational analysis models, simulation models and performance monitors, all are used to test an OIS, measure its performance, or predict its performance from specifications. Many of these same tools can be used to measure the *user* of the system as well as the system itself. After briefly surveying the area, a more complete discussion is included of a facility that was used to test Officetalk during its final stages of development.

Many of the more pragmatic motivations for so measuring and/or predicting the performance of an OIS are the same as those in any computer system: the need to choose between alternative systems or approaches, to project performance in order to evaluate the power of a system or configuration, or to make better use of existing facilities through tuning [Lucas, 1971]. Because of the complexity of interactive loads placed on an OIS, it has also become important to better characterize the user of such systems. It is also useful to measure the user in order to design better user interfaces. Such user performance measures may be based either on the time a user takes to respond to a command, or the time a user takes to correct a line of text.

Tuning studies in the OIS include traditional matters such as locating files in some part of the system such that access time is proportional to the amount of traffic between the file and the user. Tuning a work station for a particular user requires more flexibility, since each user will wish to tailor his station to his own needs on any given day. For example, the user may wish to configure his station such that it always presents a standard login display; or he may wish to have the login display be the same one that existed when he last logged off of the system.

OIS Simulation

Simulation in the study of an office information system helps both to predict the performance and to test the operation of the OIS. Simulation is also useful in OIS testing in that it can establish a controlled environment in which a segment of a distributed system can be exercised. Simulation in the network environment of the office system also naturally leads to notions of distributed simulation, particularly when a detailed simulator needs to execute at real time as in the controlled environment case.

Testing a distributed OIS requires that one simulate the various possible interactions that may take place in a network of work stations. Ordinarily, these nodes have relative autonomy, and are not directly controlled by their neighbors. Whenever a system is subjected to testing it is important to establish causal relationships between the observed performance of the system and the stimulus (in this case, work load) that is applied to the system, in order that one might determine the events causing unusual behavior. In traditional computer systems, much is known about controlling the workload during periods of observation. A benchmark program is used to drive a system with a well-known, fixed amount of work; the synthetic program is useful for establishing a benchmark that can be systematically increased [Ferrari, 1972]. Similarly in timesharing systems, scripts have been used to provide a well-defined fixed load on a system (see [Holdsworth *et al*, 1973]). For the OIS, however, it is more difficult to apply a well-understood workload, since requests for service that are directed to a work station may be interactive. For example, clerk A may request that clerk B prepare a bill from a shipping list, but if the shipping list is incomplete, B will return it to A, requesting more information or clarification.

The *Backtalk* facility was designed to provide just such a controlled environment for testing Officetalk-Zero [Nutt and Ellis, 1979]. Establishing this controlled environment for the system makes it possible to:

- Repeat a sequence of events in an experiment so that system errors can be studied more carefully,
- Determine a standard, or canonical, load for a distributed system so that relative performances of two versions of the system can be compared, and
- Increase the load on the distributed system in a controlled manner so that system bottlenecks can be observed.

Within this controlled environment a subset of the nodes can also be used as a personnel training tool; each work station in the subset interacts with a model of the complementary subset of nodes rather than the remaining real nodes. Even a single work station can be used within this environment to measure the performance of the individual human user.

Each instance of Officetalk executes at a node in a local network; other nodes of the network implement other Officetalk instances, as well as a filing system. Several diverse facilities can be used by making appropriate requests at the network interface; if results are to be returned, they will arrive at the network interface. Thus, the system environment of any single node corresponds to

the information sent and received at the network interface. Hence, in order to provide a controlled environment for one node, it is necessary to model the network and all other nodes attached to the network by generating the information input to the node and by acting upon the information exiting the node. The format of the information passed into the work station must be consistent with that work station's facilities; e.g., if the station is expecting a complex description of a CRT image of a form with certain fields filled in, then the environment must provide information in exactly that format. In simulating an interactive conversation, the environment becomes even more complex. As information is received from the subject node, the environment model must absorb that information and respond accordingly. More complex interactions can be modeled by constructing procedural definitions of the facilities provided to the subject node. The controlled environment facility then simply replaces the network and all other nodes. Thus, a controlled environment for the single node can be derived by using procedures to model the activity of all other work stations and servers. The accuracy of the model of the environment is determined by its ability to simulate the interacting work stations by procedural definitions.

A simulation of the environment in a distributed system will always be dependent upon the particular function of that system; i.e., the algorithmic description of the tasks performed at a work station is unique to that organization and work station type. Therefore, a specific facility to model users and their function is necessary. The primitive operations provided by this facility should correspond to the set of functions made available to the user of the work station. For example, if a user has the ability to create a new report, fill in certain fields, and send the report to another user/work station, then the simulation facility ought to incorporate these capabilities as primitive operators. Hence, the user interface portion of Officetalk is replaced by Backtalk, which appears as a series of procedures to the user of Backtalk/Officetalk and appears as a user to the remainder of Officetalk. It is still necessary to implement a model of the human user himself; if procedures have not been defined to automate the user's functions, then appropriate models of those functions must be constructed to interact with Officetalk through Backtalk.

The Backtalk facility allows implementation of real time models of work stations at various nodes by using Officetalk facilities driven by models of the human user. In this manner, one can specify a sporadic load on some work stations by modeling the corresponding interacting work stations with Backtalk. The level of detail in the Backtalk models is determined for the purpose of controlling the network environment of a particular (set of) Officetalk work station(s). This facility allows the designers of Officetalk to set the load on experimental versions systematically in order to compare different versions, increase the load to determine location of bottlenecks, and repeat any tests if

necessary.

Distributed Simulation

Simulation models have frequently been used to investigate concurrent systems. Building models that are exercised on a single processor is relatively straightforward, since the distributed aspects of the system are modeled rather than implemented; for example, a simulation of a network of machines can cause the machines to execute in quasi-parallel while the entire internode communication is simulated. A more interesting problem arises if the simulation is actually to execute in real time, which would be required if it were necessary to simulate some of the nodes in a network, but not all of them (e.g., train employees on a new OIS). It is clear that for certain high level (low detail) models, a single node in the network could simulate the input/output behavior of several nodes. However, as the required detail increases, the real time constraints on the simulator become more difficult to meet, and at some point it would become necessary to distribute the simulator itself over two or more nodes of the network.

An individual work station could be used to model the activity of different work stations simultaneously. The limiting factors to the implementation of *virtual work stations* on a single work station are: real time response of human users, complexity of the model of their activity, and computational power of the work station. Carefully designed models of virtual work stations will not be dependent upon the mapping of virtual work stations to real work stations. Instead, a single module of the model will completely implement the mapping, obscuring it from all other parts of the model. Whenever a simulation model of multiple virtual work stations is implemented on more than one real work station, then the model is termed a *distributed simulator.* Although other forms of distributed simulations have been used (see McRoss [Thomas and Henderson, 1972]), this form of distributed simulation provides a new area of research for the computer scientist. Distinguishing between virtual and real work stations, in particular those driven by Backtalk, makes it possible to distribute the controlled environment model. Logically, the system may contain N distinct work stations, whereas physically the configuration may contain one real work station per user, and some undetermined number of virtual Backtalk work stations per real work station. If the number of virtual Backtalk work stations is the same as the number of real Backtalk work stations, then control is implemented by the operating system for the distributed system itself. If the number of virtual Backtalk work stations exceeds the number of real Backtalk work stations, then the distributed simulation must perform the mapping into real machines. A better modularization of the simulation model might be realized by simulating N different work stations on M different nodes, where M varies from experiment to experiment (or perhaps even from moment to moment). In

order to implement such a simulator, it is necessary to construct a careful mapping of virtual work stations to real work stations and to build some good synchronization mechanisms into the simulator itself.

Distributed systems force the designer to deal with added complexity in the implementation and testing of his system; therefore, the user may face more complex training in order to use the system. Each node in the distributed system takes on the complexity of a traditional computer system, yet the designer must still cope with interactions among the set of nodes. The techniques implemented and described above are some initial attempts at providing a set of tools to aid the distributed system designer by controlling the environment in which individual components of the overall system are tested. A properly designed controlled environment subsystem should be flexible enough to allow one to model various kinds of user loads, yet specific enough to make those loads applicable to a particular situation. The Backtalk approach is to incorporate basic commands of the office information system into the basic subsystem so that specific modeling procedures can be constructed from these facilities.

Communications

The area of communications encompasses many diverse technical topics of both direct and indirect interest to the office researcher/computer scientist. This spectrum covers such topics as optical communication, telecommunication, packet radio techniques, satellite communications, digital signal processing, etc. In addition, there is an entire discipline concerned with regulation of communication facilities (e.g., see Lewin, 1979). The aspect of communication that has traditionally been studied most heavily by the computer science community is computer communication networks [Kimbleton and Schneider, 1975]. There has been a recent emphasis on the same area with respect to local computer networks (see the annotated bibliography by Shoch, [1979]). Much of this work has been directed at improving the performance, reliability and flexibility of communication over a data network. In the process of investigating ways to accomplish these improvements, researchers have concentrated on network structures and network protocols. For example, researchers have considered structures ranging from fully interconnected nodes as might be found in a multiprocessor system, to central switching facilities which rely on a switching center to pass information among the nodes. In between these extremes are partially connected systems, star organizations, ring organizations, etc. In the area of transmission protocols, investigators have concentrated on mechanisms to increase reliability (e.g., "store-and-forward protocols"), communication unit sizes (i.e., bits, bytes, packets, or messages), and protocols offered to the end-user of the communication facility (i.e., whether the user sends/receives byte streams,

messages or packets). Designs for communication networks has led to the idea of value-added networks which may incorporate various useful features into the mechanism which implements the basic protocol; for example, the network may provide teleconferencing, electronic mail, node management, or accounting as basic utilities. For office information systems, it is clear that many communications issues are important, but the availability of inexpensive, reliable electronic mail is paramount.

Although the idea of electronic mail is now well established in network environments, further developments are likely to take place with respect to designs. For example, the Arpanet mail service uses a scheme by which anyone can establish a mailbox at an IMP, allowing any other user of the net to deposit mail into that mailbox. It is easy to construct facilities which then effectively broadcast information as well as direct a copy to a given mailbox. Some variations on this scheme, especially for local networks, might provide "intelligent mail boxes" which filter incoming mail, prepare stock answers, maintain a calendar, systematically query information repositories, etc.

We can see that the area of network communications, in all of its technical and political breadth, is critical to the development of the OIS discipline. With limited communication facilities the otherwise well designed distributed system is likely doomed to failure.

Artificial Intelligence

Designers of the automated office can profit from many solutions to pending AI problems. In particular, the research areas of natural language understanding, speech understanding, knowledge representation and description, and knowledge-based systems can all provide useful results to the OIS researchers. Natural language understanding is a powerful aid to clerical workers and managers in directing their machines to perform work. This area begins to overlap the study of programming languages for naive users, although the philosophical underpinnings of the two groups are different. Speech understanding, even isolated utterance recognition, can drastically improve the acceptance of automated equipment in the office. Managers have traditionally avoided keyboards, and they may also tend to avoid other mechanical input devices such as a joystick or mouse. If an OIS can recognize even a limited form of speech, the probability of its acceptance in the traditional office will increase. Knowledge representation and knowledge-based systems can be used in a number of ways to aid the office worker. An intelligent "Help" system can greatly aid the user during the initial stages of use of the OIS; it can also be useful after the system has been used for a while if the worker uses certain facilities infrequently. Forms manipulation can be improved by applying learning techniques, e.g., by having a blank form

"learn" that the originator field of a blank form, filled out at a given clerk's work station, should always be filled in with the clerk's name. Knowledge engineering has been successfully applied to a number of other application areas such as chemistry [Buchanan, 1969] and geology [Duda et al., 1978]. Although it seems clear that one cannot immediately derive similar systems for an entire office, portions of the office may be amenable to such techniques.

Sociological Issues

Sociological issues of the introduction of automation into the office are complex. In the office of the future, it is likely that the office worker's physical and logical environment will change drastically. New equipment may be marketed that which will allow an office with a fixed load to operate with a relatively small number of people. Although this feature may be attractive to managers of an office, it is less likely to be so to the workers themselves. Automated offices will also change the rate at which certain facets of transaction processing take place. A consequence of this feature is that the office will perform more efficiently, if it is reorganized, and this consequence produces both a training problem and a problem of overcoming the existing inertia of the office. Since technology is producing more and more compact work stations, the physical organization of the office may soon decentralize to the point that workers will perform some of their duties in their own homes. The possible impact of such a radical strategy is yet unknown, but such disturbance of the logical and physical organization of the office will likely have a great effect on office procedures owing to the absence of informal communication. We will now treat this problem in more detail.

Informal Communications in the Office

An office is an information processing and transforming mechanism. Within the office people communicate through gestures and informal communications, as well as through more formal channels. The formal communications are usually well formulated and can often be algorithmically specified; the informal communication are ordinarily not well enough understood to specify their effect by an algorithm. As a consequence, automation of an office is likely to upset the informal communication mechanisms, causing the office information system to fail [Ouchi, 1978].

It is well known that many offices function in an informal atmosphere in which the office workers exchange banter and often couch their business in light-hearted talk. The first observation that might be made about such office environments is that they merely reflect the personalities of the workers or their managers. One might also assume that it is necessary to allow such an informal

atmosphere to exist in order to keep the morale of the workers at a level at which the workers will be productive. Studies have shown that informal communication is much more important than any of these theories might suggest. Browner *et al* point out that the office is full of structural dependencies in which groups of people depend on one another in order to accomplish their own work [Browner *et al*, 1978]. For example, salesmen need to maintain a good relationship with the accountant in order to be promptly reimbursed for expenses; conversely, the accountant needs to have complete information from the salesmen in order to keep accurate books. As a result, each makes some effort to create a friendly atmosphere through informal communication, thus optimizing his own situation.

Wynn has made an extensive study of the nature of informal communication in offices in an effort to aid the computer scientist in confronting some human factors of office system designs [Wynn, 1979]. She has concluded that not only is the conversation useful in maintaining a cooperative atmosphere among co-workers, but such conversation is *necessary* in order to implement the normal distributed problem-solving that takes place in the day-to-day activity of many offices. Typically, the normal function of the office is defined by an informal, intuitive specification of the tasks rather than by a formal document that specifies the exact procedures to be followed in the office. As a result, the actual office procedures frequently do not exist in a manual or in any one person's knowledge; they are distributed over the set of people that work in the office. A simple example of these interactive conversations might be the explanations of the experienced worker to the novice. Typically, the capable experienced worker corrects and guides the novice in the guise of informal conversation, frequently casting the information in the form of a joke or parenthetical remark of social comment. Workers of the same experience level will also make use of informal conversations to cooperatively solve a problem in the office. For example, two customer service workers may enter into informal negotiations in order to decide which of the two has more of the information required to handle a customer's particular problem; such negotiations are frequently not explicit but are embedded in social conversation. One result of this communal approach to problem solving is that the group of workers maintains approach a constant conversational framework for interpreting remarks and transmitting and transforming information. It is this complex social environment that provides a medium for exchange of information that would be absent in a formal, rigorous specification of processing. The environment is conducive to carrying out distributed work, implementing error handling and implementing the constant education of the office workers.

The problem of maintaining social contact of office workers is yet unsolved; the trend toward

automation works against the goal of retaining a social structure. If the communication medium is implemented completely as electronic documents, there is the danger that the informal conversation will be destroyed. A reasonable solution might be to encourage the use of a mail system for informal as well as formal communication, as is the case in the Arpanet mail system. An appropriate physical design of the office can also help prevent isolation of workers.

With the possible exception of some word processing centers, most current automated office facilities have not developed to a point that they have endangered channels of social conversation. However the next steps in such automation will likely require more effort in maintaining informal communication channels.

FUTURE TRENDS IN OIS RESEARCH

A number of research topics in computer science have been introduced in the new interdisciplinary field of office information systems. We have in this paper articulated several problems that must be solved in order for office information systems to be successful in the modern business world. In some cases we have also speculated on solutions to these problems, while in others we have simply described the problem. We believe that the research areas which we have described, even those for which we discussed some approaches, are open for research.

The ideas behind the state-of-the-art in office information systems seems to roughly correspond to the union of ideas of Officetalk Zero, BDL and Zisman's system, (although there are probably unpublished, advanced systems being developed within the various corporations). Each of these approaches to OIS work has addressed a subset of the problems mentioned in this article, yet none of them have provided a universal OIS: Officetalk emphasizes the user interface, BDL emphasizes the structured programming environment for the naive user and Zisman concentrates on the automation of office procedures.

Future research in the area of computer science and office automation will probably fall into two distinct subfields. The first subfield includes the set of familiar technical problems, concentrated in this article, that computer scientists can immediately begin to work on; the latter subfield includes problems that are less familiar and more dependent on future research. For the sake of the solution of such problems, we advocate modeling and analysis.

One second-domain problem is the need for integration to take place on at least three fronts: functional integration, system integration, and interdisciplinary integration. Functional integration refers to the need for the user's model of a system to be complete and consistent; the clerical user must be able to work in an environment that provides all of the facilities he or she will need in order to perform his or her work without having to learn several different command languages or subsystem models. System integration refers to the need for operating systems, programming languages, architecture, databases and artificial intelligence systems that converge into a single, uniform environment; for example, researchers at PARC have experimented with the Smalltalk environment as an integration of operating system, programming language, debugger and text editor [Kay, 1977]. Interdisciplinary integration refers to the need for researchers in computer science to interact with workers in management science, political science, psychology, sociology and perhaps law; Wynn's work [1979] is a good example of such interdisciplinary integration.

Although we have directed much of our discussion toward office information systems for clerical workers, future OIS work must also address the problem of designing systems for management [Rulifson, 1978]. For example, an OIS might support succeedingly higher levels of management by offering:

1. The office manager the ability to change the structure of individual clerks' tasks,

2. The administrative vice president the ability to change the structure of the entire system,

3. The chief executive officer the ability to control and audit corporate resources.

Such systems will need to have the ability to control and audit corporate information rather than manipulate characters. Interdisciplinary work between computer scientists and management scientists is especially evident in the design of management systems.

As a result of particular constraints on OIS application, we will likely see several new and radical system designs emerge. For example, local networks of minicomputers provide a physical medium for the design of exotic systems of work stations that share compilers, consistency-checkers and databases, while autonomously performing other tasks with private facilities. The notion of the intelligent form, as mentioned in the Officetalk and BDL discussions, could be extended to allow a forms process to guide itself through various work stations and measure its own progress, utilizing the facilities of particular work stations within their own domains.

Research on office information systems intersects with research in many other disciplines, particularly in computer science. Many unsolved problems of OIS research can be addressed wholly within computer science; many others invite the computer scientist to extend himself into other disciplines. We encourage our computer science colleagues to look further into this promising research area.

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RECEPTIONIST AGENT

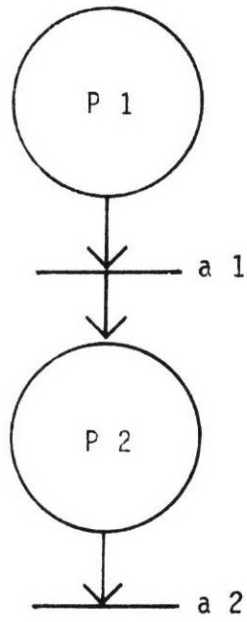

Figure 1a

ORDER ADMINISTRATOR AGENT

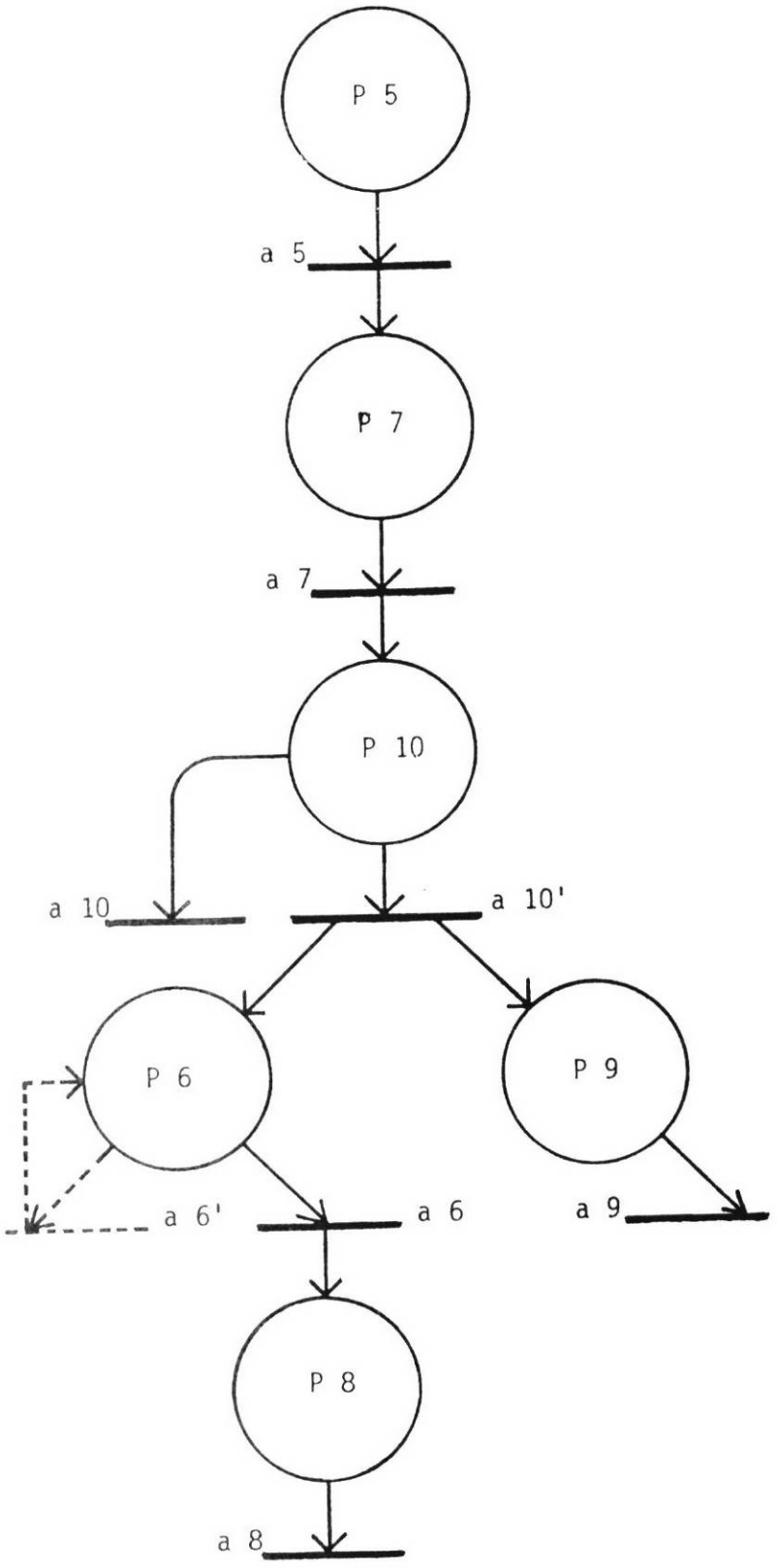

Figure 1b

ORDER PROCESSING

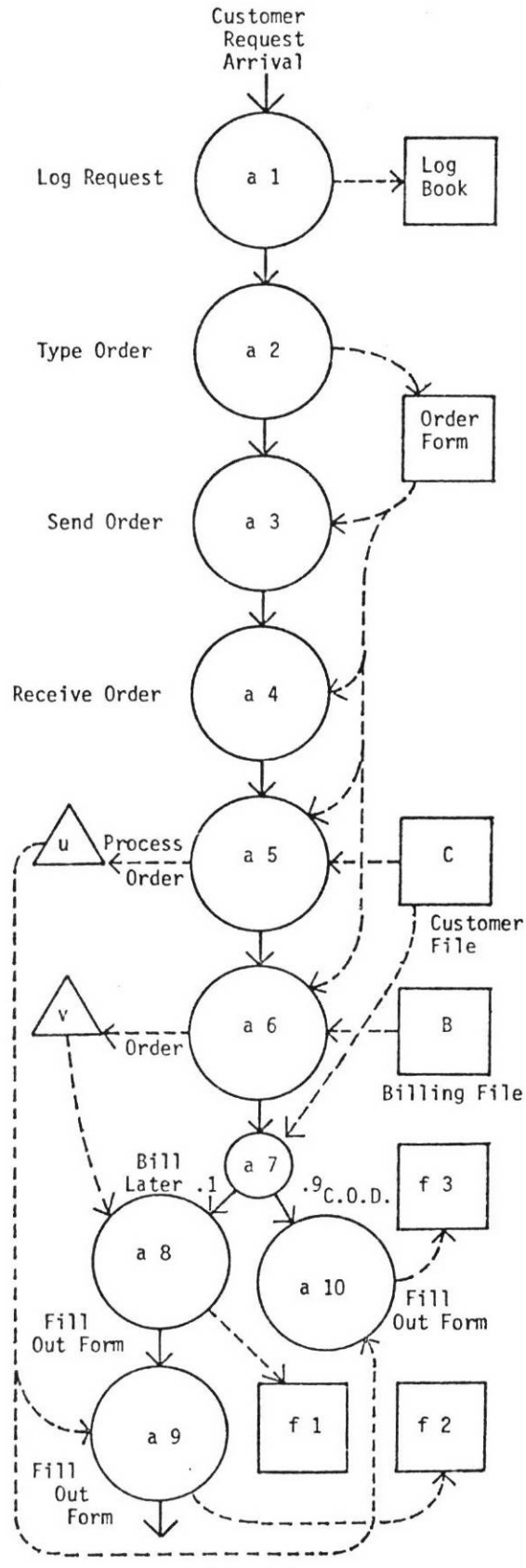

Figure 2

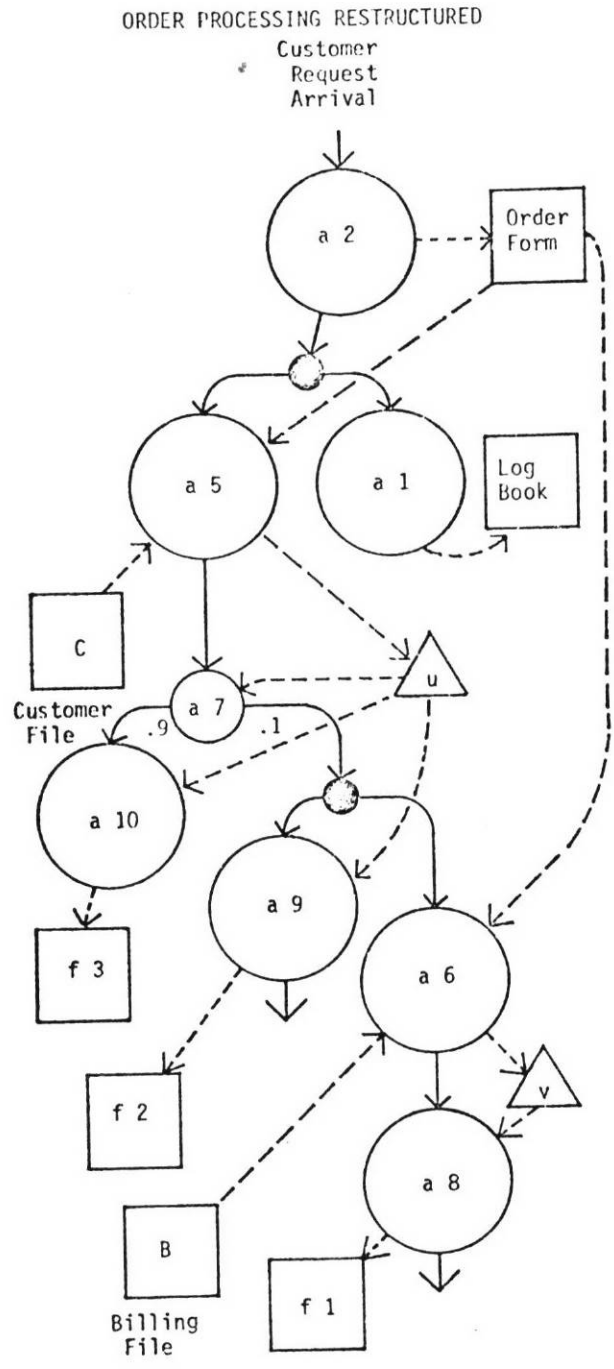
ORDER PROCESSING RESTRUCTURED
Customer
Request
Arrival
a 2
Order
Form
a 5
a 1
Log
Book
C
u
Customer
File
a 7
.9
.1
a 10
a 9
a 6
f 3
f 2
v
a 8
B
f 1
Billing
File

Figure 3

PRODUCTIONS FOR ORDER ADMINISTRATOR AGENT

INITIAL MARKING: (P5)

TRANSITION a5-
Conditions:
[exists customer-file]
Actions:
[filem read customer-file this-order]
[assign u activity-output]

TRANSITION a6-
Conditions:
[exists billing-file]
Actions:
[filem read billing-file this-order]
[assign v activity-output]

TRANSITION a6'-
Conditions:
[enabledsince 6' 5]
Actions:
[doc reminder order-administrator]

TRANSITION a7-
Conditions:
[exists customer-file]
Actions:
[assign shipping-mode cust-type]

TRANSITION a8-
Conditions:
Actions:
[assign f1 v]

TRANSITION a9-
Conditions:
Actions:
[assign f2 u]

TRANSITION a10-
Conditions:
[compeq shipping-mode cod]
Actions:
[assign f3 u]

TRANSITION a10'-
Conditions:
[compeq shipping-mode bill-later]
Actions:

Table 1b

PRODUCTIONS FOR RECEPTIONIST AGENT

INITIAL MARKING: (P1)

TRANSITION a1-
Conditions:
[exists log-book]
Actions:
[filem write log-entry this-order]

TRANSITION a2-
Conditions:
Actions:
[filem write sys-scratch this-order]
[instantiate order-administrator this-order]

Table 1a