EDP ANALYZER
Editor and Publisher: RICHARD G. CANNING

EDP ANALYZER

JANUARY, 1982
VOL. 20, NO. 1

PRACTICAL OFFICE AUTOMATION

From our recent research on office automation, we get the impression that many companies have the beginnings of an office automation system—they just don't know it. What they have are numerous disjoint computerized systems. With some careful planning, creative thinking, continuous searching, and limited development work to link products, they can provide the groundwork for a future integrated office automation system. The companies that are moving along in office automation appear to be taking advantage of what they already have or can easily obtain. We found this true of some small and large organizations in the U.S. and Europe.

Zynar, Ltd. is a British distributor of local area networks for micro-computers. They also develop application software for use on these networks. As described in Reference 1, and in conversations with us, Zynar needed a better way to control their personnel and overhead costs. For their data processing to accomplish this, they chose to install a microcomputer based network called Cluster/One, from Nestar Systems Inc. of Palo Alto, California. In fact, Zynar now has *three* Cluster/One networks in their 24-employee company.

Zynar's networks consist of 28 Apple II computers, connected by 16-wire cables. They started out with four Apple IIs in mid-1980, and their system has grown right along with the company. Zynar installed a Nestar interface card in each of the Apples and added special 'server' software to some of them.

Some of the micros are user work-stations only, others are network peripheral servers only, and still others are both (although not simultaneously). Two Apple IIs are file servers; they co-ordinate use of several dual 8-inch floppy disk drives and three 14-inch Winchester disk drives, two of which hold 33 megabytes of information each and one which holds 16.5 Mbytes of information. Several others are printer/plotter servers, another is a server for an additional disk drive and a graphics tablet, and another has a modem, which allows any work-station to access common carrier lines and remote services.

ISSN 0012-7523. Multiple copy prices listed on last page. Photocopying this report for personal use is permitted, providing payment of $2.50 fee *per copy of report* is made to Copyright Clearance Center, Inc., 21 Congress Street, Salem, MA 01970; please include identifying fee code 0012-7523/82/010001-15$2.50.

As mentioned, Zynar actually has three networks, in order to minimize conflicts among shared resources—one is for software development, a second is for business applications, and a third is for technical support, such as for performing system integration testing for systems they are about to deliver. These networks are connected via 'gateway' servers, also Apple IIs. User work-stations operate locally except when they need to use one of the shared peripherals.

The network allows Zynar to update cost information on-line, rather than in batch mode as previously done. Since more current and accurate cost data is now available to more employees, quantitative decision-making is being performed at a lower level in the organization. Previously, data had to be compiled, formatted, and then reported to an upper-level manager before such decisions could be made.

Also, the network gives employees a broader organizational view, because they can obtain information when they need it, rather than when the 'information supplier' makes it available in 'batch oriented' meetings, memos, or formal reports. Since installing the system, Zynar's employees have been able to handle more work more efficiently, thus reducing both personnel and operating costs.

Although most application packages for the Apple IIs work on the Cluster/One network without requiring changes, most were designed for single user operation. Thus Zynar has worked with the authors to make changes to permit multi-user operation. For business use their network provides word processing, electronic mail, financial planning and modeling, and in-house viewdata capabilities.

The total cost of the networks is about $140,000. However, Zynar estimates that it would have cost them five times as much to install a mini-computer system to obtain the same capabilities. They believe that their micro-based networks are more cost effective until the total system grows to over 80 work-stations, at which point a mini-computer alternative would cost the same. Cluster/One allows 64 Apple IIs and IIIs on one network, and separate networks can be connected. Zynar is continually adding micro-based work-stations and more functions and peripherals as their company grows.

U.S. Army DARCOM

The U.S. Army Materiel Development and Readiness Command (DARCOM) is responsible for providing complete life cycle management support—from conceptual design of an Army weapon or logistical support system to its ultimate delivery in the field. The command employs some 106,000 people around the U.S., of which over 80% are managers, professionals, and technicians.

In our October 1978 issue we described some office automation pilot projects that DARCOM was then conducting to gain experience in this emerging field. Here we describe the office automation strategic planning approach that has emerged at DARCOM. The effort is directed by the Automated Logistics Management System Activity (ALMSA), a division of DARCOM, located in St. Louis, Missouri.

Identifying their needs. In 1977 it became quite clear that members of one very important group within of the DARCOM organization—the project managers—required additional information service support. These executives are responsible for managing major projects which require from 30 to 300 staff members and which take up to eight years to complete. The performance of these executives is important to the command. So ALMSA began by studying the work these executives were performing, in order to evaluate what types of office automation tools might best support them.

The team interviewed some 60 project managers. From this survey they uncovered 148 needs that the managers could identify *at that time.* The team was sure more needs would come to light in the future. When this list was compared with the inventory of automated support tools already available within DARCOM (such as word processing for document production, a message system, etc.), they discovered that a good number of tools were still needed.

Choosing future goals. With both the available and needed tools identified, the team created a scenario of what an automated support system for project managers might look like and how it might be used. In the scenario they included *all* of the interactions that take place in a project manager's office environment. And they speculated on which support tools could be offered to the project managers, to support the scenario, during the subsequent two years.

Filling the gaps. DARCOM decided to 'start simple,' using as much existing equipment and service as possible. The team analyzed what inhouse work would be necessary to create an initial system that they could offer to users on a turn-key basis. They decided to build the system around the Augment service from Tymshare Inc., of Cupertino, California, which their information system groups had used for several years. Augment is an office support system that provides aids for electronic text processing, computer conferencing, data management, document production, and software engineering. We will give more details on Augment below.

They also decided to continue to use the ARPANET electronic mail service, and to add two other ARPANET facilities—business graphics and a cost-performance reporting system for consolidating contractor information.

One of DARCOM's prime concerns was that the system must be easy to use. So they decided to create a user-friendly front-end which would include a single set of commands for use with all of the tools, as well as a help facility and prompting menus.

The team identified six additional tools needed to round out the initial system: a suspense tool for tracking items (with automatic reminders provided), a calendar tool, a 'milestone' tool for tracking project progress, a budget monitoring tool, a regulations tool with which managers could access pertinent regulations by key word searching, and a scheduling tool for organizing project schedules.

This initial office automation system was completed in 1979. It contains twelve tools and is called ELITE (Executive Level Interactive Terminal Environment).

The team also identified the need for control and charging policies, for managing the new office automation resources. They are creating such policies and putting them into place as quickly as possible, because management is concerned that without wise policies the office automation system could become unwieldy, unmanageable, and even splintered. These policies deal with: network interface protocols, responsibility for administering the policies, ownership and maintenance of shared code and data, and how the resources should be priced.

Installing the system. DARCOM devised a three-part implementation strategy designed to: first, get users to *want* to use the system; second, ensure that the system is appropriate for the requesting users; and third, provide proper training and follow-up support. All three components depend heavily on the expertise of the marketing person on the office automation team—both in his role in 'selling' the system to users and in being the users' voice on the office automation team.

The initial step involved the use of a prototype for three months by three geographically-dispersed information system departments. They experimented with the system to uncover its deficiencies. During this time, the experimenters were urged to talk about the system to others in DARCOM, and numerous presentations and demonstrations of ELITE were given.

Following this experimental use, portions of the system were re-designed, based on users' recommendations. And, by this time, a number of departments were eager to use the service.

The second phase of implementation strategy involved organizational analysis. Any department wanting to 'buy' the system must submit to an analysis of its organization, performed by the office automation team. The purpose of the analysis is to determine whether the ELITE system can be introduced successfully into the department and how it should be tailored to suit the department's needs. When a department 'buys' the service, it actually gets charged for its use of the system.

Third, the team supplies education, follow-on support, and guaranteed response within 24 hours to users' requests for assistance. One person on the team is in charge of ensuring that all calls are answered. Also, part of the training is held in a seminar setting, with some current users describing their uses.

Creating a roadmap. Eventually DARCOM expects to provide most office automation facilities in-house, and connect them via a local area network. They foresee the local network connecting a corporate database machine, a number of mainframe computers, some word processing systems, numerous micro-processor-based workstations (to replace the dumb terminals now in use), and gateway processors to other networks. So DARCOM will have a processor-to-processor network, somewhat like the ARPANET, rather than a terminal-to-computer network. Also, DARCOM has defined a number of standards to make migration to a local area network easier and to enhance software portability.

In summary, DARCOM is gradually moving into office automation. They identified an important target audience—their project managers. They identified these users' needs. And then, starting with familiar hardware and services, they filled in some of the gaps to create an initial system. In addition, they have a roadmap for getting to their longer range goals.

The practical approach to office automation

We see the practical approach to office automation meaning that you can use this approach now, for a reasonable cost, and with good, practical results appearing soon. This approach is equally applicable to small as well as large organizations.

The practical approach has five steps: (1) determine where to put your efforts, (2) identify possible needs, (3) choose future goals, (4) begin filling the gaps, and (5) create a roadmap.

Determine where to put your efforts

Normally, in order to determine where to put their efforts, office automation teams develop an opportunity list. This list identifies where office automation opportunities exist for decreasing costs, increasing productivity, and so on. Generally, this list is compiled by studying the organization and assessing various technologies.

Perhaps a more effective method of identifying office automation goals is to perform a critical success factor study of the organization—as part of an information system study.

As we described in the June 1979 issue, critical success factors (CSF) are the few key areas of a business where things *must* go right for the organization to flourish. There are generally fewer than ten such factors for the organization as a whole. Units of an organization, such as departments, can have their own CSFs.

CSFs help executives concentrate their efforts on the important aspects of their organization, and we see a CSF study doing the same for the office automation team. It would identify the business activities and the job classifications that are most important to the organization's success.

In many cases, an office automation team will select a critical success factor area intuitively. An objective study, however (of the type discussed in our June 1979 issue) would be more likely to identify the most appropriate areas.

So this initial step is meant to identify where the organization should put its efforts, providing a basis for goals for longer range office automation planning.

Identify possible needs

Once the areas of greatest importance have been identified, it is necessary to develop a list of possible information service needs that could be filled. Assume that a specific level of management is identified as a key area for office automation, based on the CSF study. These managers may have the following lengthy list of information service needs, for tracking, communication, and analysis. A number of the needs described below were brought to our attention by a user-needs study performed at Standard Oil Company of Indiana, and described in Reference 2.

Tracking needs. A major part of a manager's job usually involves monitoring work that is being performed by others—so managers could use a number of aids for monitoring. Electronic personal calendars and tickler files are two examples. Also, scheduling, 'milestone,' and status reporting tools would be useful for planning and tracking projects. All of these require storing information about the past, the present, and the projected future. In addition, there is the need to store not just data but also plans, text, and correspondence.

Communication needs. Since managers now communicate using various media (typewritten memos, telephone, meetings, etc.), the same should be permitted electronically. A computer message system could be used to send and receive short memos; a somewhat similar system could be used for sending voice messages in a store-and-forward manner. Even graphics or image communications may be needed. These systems should allow the managers to communicate with others both inside and outside the organization.

Additionally, these managers may need facilities for group communications, via a telephone conferencing system (for verbal use), or perhaps a computer conferencing system (for written interaction), or even a video conferencing system. Some of these managers may also need the ability to obtain good quality graphic output for group presentations. A link to a computer typesetter, for producing documents with a nice appearance, might also be needed. And it is likely that once created, the documents will need to be moved around electronically so that others can review them and make comments and changes. So the ability is needed to send and receive lengthy documents.

These managers might also need on-line access to reference materials, such as organization charts, union contracts, job descriptions, correspondence files, procedures manuals, and the like. In addition, they might want to use an on-line forms capability, such as for travel expense forms, telephone service orders, stationery and other office supplies request forms, audio visual equipment requests, and so on.

Analysis needs include the ability to query electronic systems conveniently, in a natural manner, and retrieve desired information. Also, the managers may want a calculator capability, a budgeting tool, an electronic spread-sheet, and a planning tool. In addition, the managers might use one or more decision support systems to help them analyze recurring decision areas. Further, these managers may also want to obtain external services, with additional analytical tools and data.

The above list of possible information service needs is really a checklist. It is probable that any one group of people who will use an office automation system (the 'target' group) will not require all of these services. But the list indicates the broad range of possible services.

Further, the list can apply to people in small companies as well as to those in larger organizations.

The prime purpose of this step is to determine the information services that will be required by the group of employees identified in the CSF study as a target group.

Uncovering areas for improvement. Once the information service needs of the target group have been identified, the next step is to determine how the activities of that group might be improved. To find these possible improvements, the studies we know about use some combination of questionnaires, activity diaries, personal interviews, and statistical samples of files and tasks.

As an example, here is one technique used in a recent office automation study performed by Booz Allen and Hamilton, a management consulting firm with headquarters in New York City (References 3 and 4a). Booz Allen chose from nine to twenty-five executives, managers, and professionals in each of fifteen large companies and asked them to record what they were doing every twenty minutes for several weeks. These people carried a beeper with them, and they circled the appropriate descriptors on a brief questionnaire whenever the beeper sounded. The questionnaire asked: the purpose of the activity they were currently involved in, its nature, tools being used, the direction of the information flow, other people involved, the location of the activity, the degree of satisfaction with the activity, and lastly, how they thought the activity might be improved.

One goal of the study was to uncover potential areas for improving productivity, so Booz Allen studied the activities that the participants felt were not too productive. The *managers* felt they spent 19% of their time on less productive activities, such as traveling on business, doing clerical chores, and performing administrative work (scheduling meetings, seeking information, and seeking people). The *professionals* were even more unhappy; they felt they spent 33% of their time on such less productive activities.

In general, the respondents felt that planned activities made good use of their time, while disruptive activities and administrative activities (planned or not) were not a good use of their time. These employees spent anywhere from 10% to 40% of their time on administrative activities—a ripe area for improvement through office automation, believes Booz Allen.

Discovering the current status. This study of information service needs and possible activity improvements is generally coupled with a survey of the in-house situation: (1) to discover what office systems have already been installed, and (2) to get a 'feel' for the current office costs associated with the prime areas for office automation.

At one insurance company, they took a survey of office systems already installed in their company. They were surprised to find 27 IBM Office System/6 word processing systems, plus several departmental computers. They took a closer look at these systems and found they were appealing because they allowed secretaries to easily pull together information from various files, to (say) compile a report and then format it and have it printed out. The desirable features of these systems influenced the office automation team's recommendations for the functions their future systems should provide.

Installed systems may also provide a starting point for office automation. Where it is feasible, adding to or linking existing systems is often more cost-effective, and causes less upheaval, than acquiring new systems.

On the subject of costs, we were told that many office automation teams feel they should somehow estimate current aggregate cost figures, in order to determine the magnitude of the office automation effort. Unfortunately, when office costs are aggregated, the numbers are so large that the office automation teams may avoid presenting them to top management, for fear that they will not be believed. Few companies aggregate office costs, so most executives do not realize the magnitude of these costs.

During the study mentioned above, Booz Allen also looked at total office costs. For instance, they calculated that, *on the average*, manufacturing companies spend 10% of their revenue dollars per year on supporting their office-based employees. Insurance companies with their own sales forces spend 15% to 20% of the premiums they receive on the office function. These figures include the office workers' total compensation plus the costs of their office space and furnishings, support people, communication and information resources used, training, and so on.

While Booz Allen feels these figures are reasonably accurate, they caution against applying them outright to an individual company, because they found wide variations among the companies they studied. For example, process manufacturing companies, such as oil companies, have fewer employees per revenue dollar than fabrication manufacturing companies, who have more sales and service employees. Thus, while office costs for process manufacturing are often about 3% of revenue dollars, these costs are about 16% for fabrication manufacturers—which shows up as a 10% average but does not really tell the individual story.

Another office automation executive expressed a similar point to us. He noted that some managers hold an enormous number of meetings to gather information from many sources in order to make decisions. For instance, one executive he knows spends almost three-fourths of his time in meetings. When the salaries of the people involved in these meetings are added up, the hidden costs are surprisingly high. He observed that an electronic mail system, and some new procedures for information transfer, might well reduce the amount of time employees spend in meetings. And this has happened in some organizations, where electronic mail has actually reduced the number of meetings.

It was pointed out to us that an often-overlooked (and more convincing) view of costs is cost *trends*, both past and future. Using these figures tends to put the large, aggregate figures in more believable perspective. And if the total-company figures are too frightening, cost and trend figures can be presented for a smaller component of the company. These can then be compared to aggregate figures when their credibility has been established.

Once priorities have been assigned to needs, with costs estimated, and with in-house systems counted, the next step is choosing future goals.

Choose future goals

When people in office automation think about the future, they generally think mainly of the technical issues—what will the architecture of our future information systems look like? Since the technology is changing so rapidly, these projections should not be based on today's technology. Rather, the projections should be based on meeting goals, without going too deeply into the technologies to be used. Technological decisions should really not be made for more than five years into the future, and even that is probably too long range for this new field.

The projections might best be expressed in terms of 'scenarios,' describing how each new technology could be installed in the organization. The scenarios should also include thoughts on human, organizational, and economic matters—such as, will employees work in one or a few buildings as they do now, or will there be a shift toward smaller offices which are closer to their homes? Might some even work in their homes part of the time? Will there be less travel and more tele-conferencing? And so on. Scenarios about what the company might look like in the future are necessary for evaluating the realism of the goals. Some companies are now giving serious thought to such alternative work arrangements for some of their employees, because adding office and parking space to current sites is becoming more complex and costly.

Obviously, trying to predict the future in a fast-moving field like office automation is risky. Hiltz and Turoff (Reference 5) point out that it is very difficult to predict how people will interact with future office systems. They have studied how people's communication habits change when they use computer conferencing systems. It takes about 18 months of use before users begin to see new, imaginative ways to use the system. Changes occur rapidly after that. Although pioneering users can provide clues, new tools can easily lead to new, unpredictable uses.

A simple case in point is the use of the popular VisiCalc package from Personal Software Inc. This is an electronic version of an accountant's worksheet, which allows a user to make a change in one entry and automatically see the repercusions of that change in the other entries, such as sub-totals and totals. It was not surprising that people started using this tool for budgeting, raw material estimating, making marketing projections, etc. But who would have thought that it would also be used, for instance, to engineer the drainage for a large parking lot? So future projections should look for desirable goals, without specifying the tools to be used and how they should be used.

Up to this point, then, the office automation team has identified one or more target audiences whose work performance is particularly important to the business. They have uncovered and prioritized the needs, and areas of possible improvement, for this group. And they have investigated what products are available, some of which may even be already installed in-house. Plus they have identified some future goals.

The question still remains: How do they get from the present situation to those future goals? Here is a two-part approach. First, compare future goals with the current situation and begin filling identified gaps. Second, create a plan for filling *all* the gaps—a roadmap to the integrated office system.

Begin filling gaps

The question at this point is: how many of the needed information services and the desired improvements can be satisfied soon? Typically, companies find that departments have installed a number of stand-alone and incompatible departmental computers and word processors. Perhaps some of these can be extended to fill some identified needs. Or perhaps appropriate, tested products or time-sharing services can be acquired. These are fundamental steps for practical office automation, so we will discuss them in more depth.

Extending what you already have. Many office automation applications involve one or more of the following technologies: word processing, data processing, tele-communications, and database. Companies with systems in place that use these technologies can consider linking these systems as one way to add new office automation applications, often without major changes to the original systems.

At the AFIPS 1981 Office Automation Conference, Thomas Hannagan, an independent consultant who was formerly with Continental Illinois Bank and worked on their well-known office automation program, (Reference 4b) presented examples and reasons for linking existing systems in order to automate office functions that were previously handled manually. He says the linking of existing data processing and word processing systems saves a substantial amount of design, development, implementation, and maintenance time and costs. A new application can be installed without making major changes to the existing equipment, applications, or system software, he stressed.

One of his examples was an application to automate the issuing of letters of credit by a bank. This application required good text manipulation in addition to a database. Much of the information in these letters was financial, so good computational capabilities were also important.

The bank looked at their existing word processing and data processing systems and found that the first could not handle the database, computation, or accounting needs, and the latter could not handle the text and variable requirements well. So their solution was to create a program to interface the two systems for this particular application. The customer and accounting information is stored in a database on the mainframe computer. When a letter of credit is to be created, the information is obtained by using an existing on-line inquiry capability. Then the user switches to an in-house word processing system where appropriate standard paragraphs are stored. The information from the two sources is merged and manipulated using the word processing facility. Once the letter has been completed, it is stored on the mainframe, and, if need be, is electronically mailed to others in the company for review, using an existing electronic mail system. To implement this new application, new 'linking software' was created, but the software on the mainframe system and the word processing system was left unchanged.

This approach of linking existing facilities can be used to put together an integrated office automation system, not just specific office applications. Stanford University has been preparing plans for the past few years for a campus-wide office system, and their first projects have concentrated on using existing facilities as much as possible.

Stanford University

Stanford University is a private university located in Palo Alto, California, just south of San Francisco. The university is a community of about 20,000 people with a budget in 1981 approaching $500 million. Stanford sees its main purposes as providing instruction as well as performing research.

As described by Sandelin (Reference 6) and in discussions with us, Stanford is both rich and poor in the availability of computer tools to help people read, write, revise, file, retrieve, print, and distribute information. Some very powerful tools have been developed at the university by some academic groups for their own use. These tools, however, are available only to a small fraction of Stanford's population—those supported by the specific government research projects. The productivity of the professionals using these systems has risen, and they need fewer support people. These benefits prompted others on campus to become interested in office automation, so in 1978 a small volunteer committee, called COST (Committee on Office Systems and Technology), was formed to evaluate and investigate whether available tools might be extended and used by a greater portion of the university population. The committee members came from a variety of departments.

Identifying their needs. The committee decided upon four requirements for an institution-wide system: (1) the need for full-screen editors, (2) computer terminals and personal computer work-stations that are almost as accessible to users as telephones, (3) integration of application software such as message systems, spelling checkers, and filing systems, together with the integration of hardware (including printers, plotters, and photo-typesetters), and (4) the need for a critical mass of users, which includes people who contact each other frequently.

In addition, the committee established several premises under which the project would be conducted. They believe that it is more important for their system to eventually have widespread use rather than for individual work-stations to have a great deal of power. Also, the price of becoming a user must be low. Costs of the system should be recaptured in no more than five to six years, which would permit replacement at that time with newer technology. And finally, the most important uses of the system would be computer-assisted writing, communicating, and shared access to information.

With these requirements and premises established, the team took a survey of existing computer systems and people interested in the subject. They identified three key audiences on campus—students, professors, and administration staff. Needs for each audience were identified and categorized as near-term or future requirements. For example, faculty members often write a great deal, and they frequently choose to work at home. Some of them require special character sets for foreign languages or mathematical notation. There is not much turnover within this group, and they are good self-teachers. Administrators, on the other hand, have different requirements. They communicate a great deal through short messages. They work mainly in their offices, and they rarely require special symbols. Also, administrative staffs can have higher turnover and require better help and training aids than the other two groups. So different approaches are clearly needed for these groups, Sandelin points out.

The requirements uncovered were written down and circulated widely throughout the university. The results of the various reviews was a document entitled "Specification of a computer-based text system," (Reference 7). (This document may be useful to others who are studying their own needs.) The document is very thorough and detailed. It was sent to numerous office automation vendors to see if any of them had a system that would satisfy many of Stanford's needs. But none were found to be suitable. However, through this survey, Stanford gathered valuable information about existing and future products, and they established contacts with many office system vendors.

The Center for Information Technology (CIT), formed during this period, drew upon the COST work and became the focal point for office automation guidance at the university.

Filling the gaps. To reach their desired goals of a campus-wide system to serve their three audiences, the CIT began with three projects, linking as much existing hardware and software as possible.

The first project, known as the commercial word processor support project, has sought to guide future acquisitions of word processors toward products that can communicate with the campus computing center and its IBM 3033 computer. CIT created a list of recommended functions and systems. Departments that buy compatible systems can use them for more than stand-alone word processing. They can, for example, communicate with others via the computer message system available through the campus computing center.

The second project, called terminals for managers, is a one-year experiment where senior officers and their staffs use a message system. Participants in the project, including the president of the University, have been enthusiastic. The project took only a few weeks to initiate because it was based on existing resources—the campus IBM 3033, the Wylbur text processing and message system, and the SPIRES information retrieval system.

The third project, called Context and with a focus on scholarly writing, is the most ambitious project so far—but it, too, depends heavily on linking existing facilities. It has taken longer to implement because it required acquiring a new computer—a DEC System 20—and linking several software sub-systems. The purpose of this system is to support the writing projects of professors and their staffs. The system currently contains nine sub-systems. The main one supplies full-screen editing capabilities, and provides a character set with over 500 entries, including symbols for technical text, special alphabets, and accent punctuation symbols for various languages. Another sub-system helps authors prepare documents according to a standard format for publishing purposes; in addition, it can generate a table of contents. Another sub-system facilitates searching for key words. Still another is a spelling checker; it contains 100,000 words and can be augmented with a special vocabulary. Also, documents can be 'mailed' to other users on the system via a message system. Special printers are available for creating hard copy in foreign languages or using special symbols.

The communication links for these three projects are leased voice-grade circuits connected to a Gandalf message switch. This switch allows terminals operating at up to 9600 bps to access the DEC 20, the IBM 3033, or the Telenet network. Looking to the future, Stanford has projects exploring both baseband and broadband technologies for a local area network.

Through central guidance provided by CIT, Stanford University is developing a campus-wide network to serve its several audiences and their varied needs. And they have started by linking their existing hardware and software as much as possible.

Office services via a network

With the growing marketplace, it is increasingly likely that you can find products to fill some information service gaps. These may be time-sharing services or software packages you can install on in-house systems.

For example, one of the most advanced office support systems, and one that is available in the U.S. and Canada through the Tymnet time-sharing service, is Augment. Augment was originally developed at SRI International in the 1960s under the leadership of Dr. Douglas Engelbart; it was then called NLS. In 1978 it was acquired by Tymshare Inc., of Cupertino, California, then further developed and re-named Augment.

Augment consists of a number of sub-systems, all of which use a common command language. Users interact with the system through a printing terminal or a display terminal. The display terminal includes a control (a 'mouse') for directing the cursor and entering simple commands.

Augment provides electronic office aids in five areas: individual support, computer messaging and conferencing, document production and control, data management, and software engineering. We will describe these as an example of what is currently on the marketplace.

Individual support tools help employees electronically deal with their day-to-day working information. They can handle reminder lists, agendas, calendars, notes, things-to-do lists, name and address lists, financial records, and so on.

Information is stored in files (called 'idea nodes' in Augment), which can be linked for quick access from one to another. The user can view the cited material by using an appropriate command. Through the linking of many files, users can create 'networks of working information,' which can become very complex. These networks may include files created by others, if access is authorized.

Computer messaging and conferencing. Augment provides facilities for co-operative work among individuals and groups. Both non-simultaneous and simultaneous communications are supported.

Non-simultaneous electronic communication is where the two parties are not in direct connection with each other, which is the most common mode of use for both computer messaging and computer conferencing. Augment is suitable for working with short messages as well as long documents. Again, files can be shared among users by means of linking. For such shared arrangements, the system either automatically establishes—or requests users to specify—access control levels for each file and a table of contents for searching and retrieval purposes.

For computer conferencing, a single file is created which participants can access. For a continuing dialog on a particular subject, the participants may want to maintain a journal of the dialog, with a catalog of all entries. Augment supports this and allows searching catalogs by author name, segment number, title word, or text string. This capability is commonly used for coordinating proposals, contracts, and plans among geographically dispersed groups.

Simultaneous communication is where the sending and receiving parties are on the system at the same time (as in a telephone conversation). In the simultaneous mode, an entry on one terminal is also displayed on one or more other terminals. Tymshare reports that this mode is often used in conjunction with telephone conversations. Augment has a split screen feature (allowing up to eight 'windows' per screen) and a wide screen mode so that, for example, the users can compare data from two files while discussing their observations.

Document production and control. Many Augment users have interfaced the service to their in-house word processors, storage devices, and computers, so they can access and then manipulate information. Information extracted from these systems can be embedded in documents, and the system can keep track of the different versions of documents. This is particularly useful for large documents with numerous sections, and perhaps several authors.

Augment also has facilities for more complex document production. It can be used to compare versions of text and then list the differences, check spelling, estimate the reading grade level of the text, create and manipulate line drawings, perform word counts, automatically generate tables of contents, and format text. Augment has also been interfaced with computer output microfilming and photo-typesetting equipment.

Data management functions. The above discussion of Augment has described facilities for working with textual information; however, data structures with inter-related data records require different facilities. Augment is aimed at handling small to medium amounts of information in such databases. Augment could be used as a front-end data management system, to prepare queries to be sent to an in-house DBMS and then to manipulate the retrieved data. In addition, users can create sequences of Augment commands along with necessary parameters, store these 'programs' under names, and run them by entering the names.

Software engineering. Augment has been used in a programming work-station manner by Tymshare and others for developing complex software systems, as well as for developing software engineering tools. It has several special facilities for this type of work—for supporting a programmer's library, compiling and loading very large programs, and interactive debugging within a network of computers. For more information on Augment, see Reference 8.

Returning to the activities of the office automation team, we have discussed identifying a target group and its needs, setting goals, and making use of existing equipment and systems to provide some needed information services. But in deciding how to best make use of existing resources, the team really needs to develop a longer-range plan (a 'roadmap'), so that the steps taken all lead toward an eventual integrated office system.

Create a roadmap

Numerous times over the years we have recommended using 'the progressive approach' for installing advanced systems—such as on-line systems, database systems, and distributed systems. Once again we feel this approach will provide the surest road to success for the new office systems.

As we described in the June 1973 issue, in the progressive approach, progress is made through a series of short steps, under the overall direction of a long range plan (extending for about five years into the future). In addition, each project (of no more than six to nine months duration, and preferably much shorter) must be cost-justified by itself. Only tested technology is used, and there is no major in-house pioneering of the technology. The approach also makes extensive use of installation standards. And the new applications are designed to make only small changes in operating procedures. After the new system is running smoothly, additional features can be gradually introduced. Finally, when an advanced system is being installed for the first time, it is installed only in the department(s) where operating management gives full support and co-operation to the project.

The reason for these numerous restrictions is to provide very high chances of success for each project. The organization will be further ahead at the end of five years and will have accomplished more interesting things than if a big project is undertaken—and flounders.

So the recommended five-year plan would seek to accomplish the main goals for an integrated office automation system. It would consist of a series of short, high-chance-of-success projects.

Since office automation systems will become even more intricately inter-woven into the company's workings than today's computer systems, the five-year plan should not deal solely with the technical matters. There should be similarly detailed considerations for human and organizational aspects. For example, how will training be performed over time? Training one small group at a time on how to use a few office automation tools does not require a lot of planning. But coordinating the education and training of an entire company or division, with offices in many states or countries, on a system that has grown to include many user-written applications and tools, is another matter entirely. The question is not only who will provide the training, but also who will create the documentation, verify the documentation standards, answer users' questions, and provide enhancements? As one office automation executive said, "Support will overtake you if you do not plan for its eventual ramifications."

The computer field has become wiser through experiences with large data processing projects. So it is not surprising to see companies being very cautious about office automation. More often than not, the companies doing interesting work are following the progressive approach, and receiving practical results, one step at a time.

REFERENCES

1. "Tomorrow's office, today's technology," *Mini-Micro Systems*, Cahners Publishing Company (221 Columbus Ave., Boston, Massachusetts 02116), June 1981, pp. 155-158; price $3.00.
2. *Office technology systems: Conceptual functional requirements from a user's perspective*, AMOCO, July, 1980. This 62-page workbook is available free from: Mr. Richard Rosenbaum, Office Technology, Mail Code 3608, Standard Oil Company of Indiana, 200 East Randolph Drive, Chicago, Illinois 60601.
3. Booz Allen and Hamilton has prepared an executive overview of their office automation study. For a free copy, write them at 245 Park Avenue, New York, New York 10167.
4. AFIPS Office Automation '81 Conference, held in March, 1981. Contents of the sessions can be obtained by: (1) ordering the *Conference Digest* from AFIPS Press (1615 North Lynn St., Suite 800, Arlington, Virginia 22209), price is $15 prepaid; or (2) ordering an audio cassette of the session from On-the-Spot Duplicators (7224 Valjean Ave., Van Nuys, California 91406), price is $8 per cassette.
   a. Poppel, Harvey, "Knowledge worker performance: The missing link," Session No. 62; a four-page paper is in the *Digest*;
   b. Hannagan, Thomas, "Implementing WP/DP integration", Session No. 34; no paper appears in the *Digest*.
5. Hiltz, Star Roxanne and Murray Turoff, *The Network Nation*, Addison-Wesley Publishing Co. (Reading, Massachusetts), 1978; price $18.25.
6. Sandelin, Jon, "Planning electronic office systems in a university setting," in *Emerging Office Systems*, edited by R. Landau, J. Bair, and J. Siegman, Ablex Publications Corp., (355 Chestnut Street, Norwood, New Jersey 07648), 1981; price $22.50.
7. "Specification of a computer-based text system for Stanford" *SIGOA Newsletter*, Association for Computing Machinery (1133 Avenue of the Americas, New York, New York 10036), May 1980, price: $5.
8. For more information about Augment, contact the Office Automation Division, Tymshare, Inc., 20705 Valley Green Drive, Cupertino, California 95014.

Prepared by:
Barbara C. McNurlin
Associate Editor

In the following Commentary, we mention a number of new hardware and software products that were exhibited at Comdex '81. If you would like a free copy of the names and addresses of the suppliers of those products, just write us.

COMMENTARY

EXCITING PROGRESS IN MICRO-COMPUTERS

We attended the Comdex 81 conference and exhibition in mid-November, and we must say, it presented a lot of excitement in the small computer arena. The message of Comdex 81 is important to data processing management world-wide, we believe, and to organizations of all sizes. Small computers will play a big role in practical office systems.

Comdex is aimed at 'independent sales organizations;' ISOs are manufacturers' representatives, turnkey system suppliers, computer stores, original equipment manufacturers, and such. Comdex 81 had over 640 exhibitors, the larget number of exhibitors of any computer conference.

As might be expected, essentially all of the action centered around micro- and mini-computers. The mainframe manufacturers market their wares mainly through their own sales staff, and use ISOs only secondarily. IBM, for instance, featured their Series 1 system which they sell to turnkey suppliers and other ISOs.

We could have spent a week going through the exhibits, instead of just the better part of three days—there was that much that was new (to us) and exciting. Here are some of the high points.

Personal computers. Many of the hardware and software exhibits dealt with the single-user personal computers, for both data processing and office functions. IBM's new Personal Computer was talked about a lot; Xerox's 820 was featured in a number of exhibits.

Some new offerings were hard to classify as personal computers. Artelonics (a subsidiary of Shell Canada Limited) offers a work-station computer that uses a 16-bit micro, as does IBM's personal computer. But the Artelonics model can serve two slave terminals was well. Convergent Technologies offers a series of work-stations, each of which can have memories measured in the hundreds of thousands of bytes and which can have built-in floppy disks and/or Winchester hard disks. These work-stations can be inter-connected to provide a network of powerful work-stations.

Local networks of personal computers. Corvus has supplied the largest number of local networks for personal computers, we understand. Their networks use twisted pairs of wires, rather than coaxial cable, for economy. At the conference, they announced interfaces for the IBM and Xerox personal computers. TeleVideo offers several models of personal computers (all running under the CP/M operating system) and a local network for connecting them—as does Intertec.

Mini-computers. Well-known names in the mini-computer field had exhibits—such as IBM (Series 1), Hewlett-Packard, Wang, DEC, Data General, Univac, Honeywell, and Microdata.

The new System 8000 from Zilog (an Exxon subsidiary) is harder to classify as a mini or micro. It is based on Zilog's 16-bit Z8001 micro-processor, but it has power to equal most of the better-known mini-computers and can serve up to 24 terminals. It uses Zilog's version of the UNIX operating system, thus making available all of the nice features of UNIX, including a number of office system functions such as text and word processing and electronic mail.

'Standard' operating systems. The operating system most widely used in the single-user personal computers is CP/M (which we discussed last month). It clearly has assumed a dominant (almost standard) position in the field for this size computer.

For multi-user, multi-tasking on the new 16-bit micro-processors, the technical sessions we attended all stressed UNIX as the 'standard' operating system of the future. But among the exhibitors, the OASIS operating system, from Phase One Systems, was the one most widely used; it can operate on the 8-bit as well as the 16-bit machines. (UNIX requires more memory than an 8-bit machine can provide.)

Disk storage. The small (5 1/4 and 8 inch) Winchester disks were seen in abundance, either incorporated in products or available as add-ons. One of the problems associated with these fixed disks is off-loading files for back-up and security purposes. A solution offered by several suppliers was the use of a video cassette recorder; just add a card to their computers and VCRs can be used for this purpose.

Many of the small computers being offered today still use single side, single density recording for floppy disks. But the AVL Eagle small computer offers double density, double side, and twice as many tracks, with the result that a single mini-floppy disk can hold about one-half megabytes of data.

The 'ultimate' in floppy disk recording at Comdex 81 was the Iomega floppy disk system. An eight inch floppy disk is enclosed in a rigid case—and can store *ten megabytes* (bytes, not bits) of data. Iomega sees it as competitive with the small Winchester disk systems, at about the same price, but with the advantage of removable media.

Printers. While daisy-wheel printers for small computers were common at the exhibits, the most excitment was in the dot matrix printers. By using larger arrays of dots (say, 9x9 instead of 5x7), better quality characters are formed. Some of them have a print quality that almost (but not quite) equals that of the daisy-wheel printers. Perhaps even more interesting was Integral Data Systems' printer that prints in four basic colors; by over-printing, it can give numerous other colors and can print graphics. And Facit has both two-color and four-color high speed dot matrix printers with graphics capability.

There is more we could say, but the message at Comdex 81 was clear. Pay attention to micros—because they are coming to your organization.

SUBJECTS COVERED BY EDP ANALYZER IN PRIOR YEARS

1979 (Volume 17)

Number	*Coverage*
1. The Analysis of User Needs	H
2. The Production of Better Software	H
3. Program Design Techniques	H
4. How to Prepare for the Coming Changes	K
5. Computer Support for Managers	C,A,D
6. What Information Do Managers Need?	C,H
7. The Security of Managers' Information	L,C,A
8. Tools for Building an EIS	C
9. How to Use Advanced Technology	K,B,D
10. Programming Work-Stations	H,B
11. Stand-alone Programming Work-Stations	H,B
12. Progress Toward System Integrity	L,H

1980 (Volume 18)

Number	*Coverage*
1. Managing the Computer Workload	I
2. How Companies are Preparing for Change	K
3. Introducing Advanced Technology	K
4. Risk Assessment for Distributed Systems	L,E,A
5. An Update on Corporate EFT	M
6. In Your Future:Local Computer Networks	F,B
7. Quantitative Methods for Capacity Planning	I
8. Finding Qualified EDP Personnel	J
9. Various Paths to Electronic Mail	D,M
10. Tools for Building Distributed Systems	E,B,F
11. Educating Executives on New Technology	K
12. Get Ready for Managerial Work-Stations	C,A,B

1981 (Volume 19)

Number	*Coverage*
1. The Coming Impact of New Technology	K,A,B
2. Energy Management Systems	M
3. DBMS for Mini-Computers	G,B
4. The Challenge of "Increased Productivity"	J,K,A
5. "Programming" by End Users	C,H,B,G
6. Supporting End User Programming	C,H,B,K
7. A New View of Data Dictionaries	G,B
8. Easing the Software Maintenance Burden	H,B,G
9. Developing Systems by Prototyping	H,B,G
10. Application System Design Aids	H
11. A New Approach to Local Networks	F,K
12. Portable Software for Small Machines	B,H

1982 (Volume 20)

Number	*Coverage*
1. Practical Office Automation	A,B,C,K

Coverage code:

A Office automation
B Using minis & micros
C Managerial uses of computers
D Computer message systems
E Distributed systems
F Data communications
G Data management and database
H Analysis, design, programming
I Computer operations
J Personnel
K Introducing new technology
L Security, privacy, integrity
M New application areas

(List of subjects prior to 1978 sent upon request)

Prices: For a one-year subscription, the U.S. price is $60. For Canada and Mexico, the price is $60 *in U.S. dollars,* for surface delivery, and $67 for air mail delivery. For all other countries, the price is $72, including AIR MAIL delivery.

Back issue prices: $7 per copy for the U.S., Canada, and Mexico; $8 per copy for all other countries. Back issues are sent via AIR MAIL. Because of the continuing demand, most back issues are available.

Reduced prices are in effect for multiple copy subscriptions, multiple year subscriptions, and for larger quantities of a back issue. Write for details.

Please include payment with order. For U.S. subscribers, you can use your Visa or MasterCard charge card; include your card name, number, and card expiration date on your order.

For payments from outside the U.S., in order to obtain the above prices, take your choice of three options: (1) use an international money order, (2) pay in U.S. dollars with a check drawn on a bank in the U.S., or (3) use any of the following charge cards: Visa, MasterCard, Eurocard, Access Card, Standard Bank/Kaart, Union Card International, or Diamond Card International. Please be sure to include your card name, number, and card expiration date on your order.

Editorial: Richard G. Canning, Editor and Publisher; Barbara McNurlin, Associate Editor. While the contents of this report are based on the best information available to us, we cannot guarantee them.

Missing Issues: Please report the non-receipt of an issue within one month of normal receiving date; missing issues requested after this time will be supplied at the regular back-issue price.

Address: Canning Publications, Inc., 925 Anza Avenue, Vista, California 92083. Phone: (714) 724-3233, 724-5900.

Microfilm: EDP Analyzer is available in microform, from University Microfilms International, Dept. P.R., (1) 300 North Zeeb Road, Ann Arbor, Mich. 48106, or (2) 30-32 Mortimer Street, London WIN 7RA, U.K.