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TOWARD THE ELECTRONIC OFFICE

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PREFACE

In the past two decades the application of electronics and computers has been largely directed to specialized information systems, large telecommunications networks, and automated industrial processes. Advances in microelectronic technologies have increased the productivity, efficiency, and responsiveness of banking, manufacturing, health care, and military defense. But, even though speed, convenience, and adaptability are essential to information handling in business, the office has remained in the main untouched by the microelectronics revolution. For years the only machinery office workers used to improve their productivity included the telephone, electric typewriter, and photocopier. Now the individual computer terminal, the electronic message system, the laser printer, and several other innovations in hardware and software are bringing about the "office of the future."

The concept has many components and configurations--different ones for different needs. The end result is always the same: a modernized office system that is more efficient and more productive. While productivity in the factory has increased by more than 80 percent in the last 10 years and on the farm by some 300 percent in the same period, office productivity is up by less than 3 percent in the decade. The comparatively low increase may be due, in part at least, to the relatively slow introduction of available microelectronic technologies. Moreover, the ability of current office components to operate as a system and between office systems has been impaired by a lack of compatibility and integration among the components from various suppliers. This problem appears to exist between office automation equipment and data bases that are maintained in large-scale data processing systems.

Recognizing the importance of stimulating the use and standardization of office automation to increase productivity in the federal government, the National Bureau of Standards asked the National Research Council's Board on Telecommunications-Computer Applications to organize and conduct a symposium on the prospects and problems of the electronic office.

Accordingly, the Board invited a heterogenous group of experts on office communications to speak about different aspects of the new technologies at an open forum. This took place July 23, 1980, in the

Auditorium of the National Academy of Sciences in Washington, D.C., and was attended by some 150 people. This publication consists of the papers delivered during the symposium and the public discussion that followed the presentations.

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WELCOME

Louis T. Rader
University of Virginia

Good morning. My name is Louis Rader. I want to welcome you to this symposium on behalf of the National Research Council. This is one of a series of public forums run by the Board on Telecommunications -Computer Applications of the National Research Council.

On Boards such as these, we have volunteers from industry, from academia, from non-profit organizations who work to help the federal government do a better job of applying technology.

For example, we currently have three areas in which we are working: with the Internal Revenue Service to modernize its tax processing system, and I might say parenthetically that most people in the country are not in favor of helping them but they are still our tax dollars. We are working with the Postal Service on plans for electronic mail. We are working with the Air Force to improve their worldwide computerized administrative support system.

Now, this Symposium on Integrated Computer-Based Office Systems is supported through the good offices of the National Bureau of Standards who supplied the necessary funds, although we did the planning. Jim Burroughs, who is director of the Institute for Computer Science and Technology of the National Bureau, will be with us this afternoon.

To start the Symposium this morning I would like to turn the meeting over to Dr. Licklider, a very unusual professor who is professor of electrical engineering and computer science at the Massachusetts Institute of Technology. He is also the Deputy Chairman of our Board and he is the Symposium Chairman. For those of you who worry about whether we will quit at five o'clock, Dr. Licklider is willing to take wagers at a dollar a minute, so that I think you can be quite sure that even though he is a professor, that this meeting will end on time. So, we turn it over to Dr. Licklider.

INTRODUCTION

J. C. R. Licklider
Massachusetts Institute of Technology

Thanks very much, Lou, and welcome all of you to what just could be a very important symposium because we have a technology that is improving in cost effectiveness at a rate something like double every two years. We have a country that has gotten so deeply into services that services and information account for more than half the gross national product, and the figure is still rising; and we haven't learned to be efficient in working with information or in providing services.

Our great claim to fame was to develop a real skill, a real expertise at farming the ground and manufacturing stuff out of solid metal. We got pretty efficient at that and showed the world how to run a country. Now, in my view at least, we are showing the world how difficult it is to get on top of the information business. So, part of our opportunity is to get in there and do with information some of the magic that we learned to do with things. We have a technology that is just knocking on the door saying, "Hey, I am very efficient. I am capable. I am not just for numbers. I am a general information processing technology. Why don't you get on the ball and put me to work and get going again?"

Well, that is one of the themes, in my view, of this morning. It is the theme of productivity, of cost effectiveness, of efficiency, of doing things right in the information sector.

There is another theme that is a close second and in many eyes comes before that. It is that work tends to be -- especially efficient, highly routinized work -- humdrum, unrewarding, uninteresting and machines threaten from some perspectives to reduce the amount of it available for people to do. In short, there is a whole quality of life issue in this, especially since more than half the people work in offices and the big prospect now for the next ten, fifteen years is that information technology will do something about offices. So, we ought to be thinking about - What will it do? Will there be substantial reorganization? Will the nature of jobs and human relationships inside offices change, or will this just be

another thing, like bringing the electric typewriter into the office? I surely think not the latter. I think there is a revolution to be had.

I have had this fantastic experience now, since the late '50's, of sitting at a computer console several hours a day and I know that it can be absolutely fascinating. It is, at least for me and for a lot of people I know, in fact almost everybody I know up at Cambridge who has the opportunity, finds it exciting. It changes careers. People who start off thinking they are just going to learn about the computer in order to use it in a particular task -- well, I might as well be personal about this. I was a psychologist. I was making models of the auditory systems, trying to figure out really how hearing works. And the models got a little more complicated than would fit on the back of an envelope and they certainly were not amenable to conventional mathematical expression. It was obvious to me I had to know about computers to do computer modeling. And, I have never gotten back. The computer field has just been more fascinating than the modeling of hearing. That has happened to a lot of people I know. I think it is going to happen to a lot of people in offices.

They are going to say, "Oh, I am a substantive office person and I just happen to be bright and understand what is happening here. I will just learn a little about the computer so I can put it to work in our office". I suspect that a lot of those people will be saying after five years, "Gosh, I don't know whether I am a substantive professional in the insurance business or whether I am a computer professional". I think there are going to be a lot of people who are both.

So, the second theme has got something to do with quality of life, with involvement, with how to make jobs exciting, interesting, as well as efficient and productive. And it includes the organization of the things we call offices, what they are like, what the career paths, what the skills, what the tasks are.

Now, there is a third theme which has got to do with putting the technology to work to do something about productivity and quality of life in offices. What I see is kind of a conflict between top down planning and the natural, American, market-driven, bottom-up procedure. Here is a word processor that looks promising, let us buy a few and see what happens. Ah, here is an electronic message system for sale or rent or lease, let us get into that and see what happens. Oh, yeah, we have got to have data management so we will get a data management system. Then, a couple of years later, scratching the head, gosh, I wish that when I typed this letter in the word processing system it would fit somehow into the electronic message system and when I get messages I could put them into a data management

system, but nothing works. Nothing articulates, besides which, I have equipment from four manufacturers and they obviously didn't get together. They are pure from an anti-trust point of view.

This is a third theme that just seems tremendously important to me. We are obviously doing this pretty much from the bottom up if you look at the coutry as a whole. Companies in the office automation business, insist they are providing integrated systems for office work and are planning from the top down. But, the top down planning is within corporations that are in the business of seeing the stuff. It is not nationwide, it is not government-wide. A real conflict, almost a national predilection to unplanned bubbling up from the bottom. If we are going to go blasting off into the future with goals of increased efficiency and effectiveness let us figure out what we are going to do first and then do it.

So, maybe in our discussion today, there will be some germs of planning. Who knows?

We absolutely didn't want to get into this by saying, let us invite ten corporations who manufacture stuff and come give you ten technology push talks about how great it is going to be. At first, we thought, "Let us not have any vendors. Let us just have people who are trying to use it. Let us talk about the users' problems". But that is not balanced either. We want to have a kind of balanced discussion.

We are going to have some insight from the corporations who are really trying to make available stuff that will improve offices. We are going to have some from companies and a government agency or an organization that is trying to use it.

To start off, we are going to have a university professor who has been consulting with a lot of these companies and with the government and who has been doing research. I know him well, he's in the next office to me at MIT, Mike Hammer.

THE OFFICE AS A SYSTEM

Michael Hammer
Massachusetts Institute of Technology

Dr. Licklider, in his opening remarks, has identified a large number of important topics that should be covered today. I have the advantage, being the first speaker, of getting to address all the easy ones and leaving other people to address the difficult ones.

What I want to do today is talk about an approach to office automation. Office automation is a buzz phrase, an advertising slogan, that we see in the trade press and the popular press. Office automation has also become a whole new industry and there are a variety of approaches to it. One approach is basically Tom Swift and his electronic office: the idea that you can go into an office, see somebody pounding a keyboard, and by giving them a keyboard with automatic transmission make their work better. This is a view that technological marvels somehow magically make everying better. A view that if we can replace paper with electronics, then ipso facto it must be an improvement. Well, I am doubtful.

What I want to talk about today is a rather different approach to viewing offices by approaching office automation with a more systems-oriented perspective.

The starting point for this is a set of premises. The first one is really rather bad news. Nobody wants office automation.

What I mean by that is described by the following story. A few years ago the president of a well-known handtool manufacturing company was addressing his firm's annual meeting. He got up in front of the room and said, "We had a very good year. Sales were up, growth was up and profits were up." Everybody smiled. Then he said, "I have some very bad news. Nobody wants our drills." The audience was shocked. "What do you mean the customers do not want our drills. They are buying our drills hand over foot." He said, "That is right. Nobody wants our drills. They want holes. We, unfortunately, are not selling holes. We are selling drills and that is not what people want. Drills are the means, holes are the end."

We have to keep the same thing in mind in the office environment. Nobody wants office automation. Nobody wants offices. Nobody wants information. Nobody wants the whole information sector of the organization. What people want are cookies, cars and trips to the beach. The rest is just facilitative overhead to help do a better job producing end items. If we keep putting our emphasis on means rather than ends, we will start thinking that the information sector and the office environment is an end unto itself. Then, we will end up in a very bad state.

A second premise: people talk about office automation when what they want to talk about is a general administrative office. They say, well what we want to do is focus on the office in general, the office in the abstract, not any particular kind of office, but the office.

Well, I have never seen the office in general. I have seen a lot of offices. I have seen insurance offices, sales offices, brokerage offices and government planning offices. I have never seen the office. The platonic idea of the office exists only in the abstract. In any specific instance, there are exact details which are concrete and enormously important. The specifics define that particular office and distinguish it fromn all the rest. The specifics establish what is critical and what contributes to the way the office operates.

A third premise of mine is that more and faster are not always better. In fact, they are often worse. There appears to be a general concept underlying most of the conventional approaches to office automation that if you can do more of something, or do it faster, then the result must be better. This concept suggests that if we can generate twice as much text per day then that must, by its own fact, be a better approach. Well, I have my doubts. Twice as much junk is just twice as much junk. If you merely proliferate equipment to produce output -- as measured in number of forms, measured in terms of lines of text or number of communications -- without trying to focus on what the purpose of the communications are, or what the purpose of the text is, then you are not better off. In fact, you have generated more garbage that other people have to waste their time reading.

There are numerous stories about this and they are not apocryphal. They are very concrete. I was recently in a New York City law firm. They had just installed a large number of word processing systems, yet, they had the standard ratio of secretaries to attorneys: namely, one secretary for every two attorneys. I asked the managing partner, "How did you manage before you had word processors? What did you have, 10,000 secretaries here?" He said, "Oh, no. Before word processing, briefs only had three drafts, now they have forty." So, I said, "Aha. Are forty drafts better than three?" And

he said, "I have no idea." Therefore, I suggest that given the equipment, people will polish prose until the sky falls and there is no measurable way of determining if it is really any better.

There is another delightful story, about a government agency that installed a lot of word processing equipment and was delighted to find twenty percent productivity increase by their secretaries. With that twenty percent freed up time the secretaries were giving tours of the word processing center.

On the other hand, I also know of organizations that would think anything that enabled the corporate staff to produce more memos faster was a disservice to the rest of the organization. So, merely producing more text can lead to information overload, less productivity and less efficiency, and a high cost of installed capital equipment without any real measurable benefits.

There is another effect that I call "the copying machine effect." Some twenty-five years ago, when the process of xerography first came into being, a well-known computer company did a very careful market survey of whether or not they should go into the copying business. They determined that if they captured one hundred percent of the existing dittograph and hectograph market, it would not repay the capital investment required to get into the business. So, they decided not to get into it. Unfortunately a small company named Xerox Halide did not have the money to afford a capital study and blundered into the business. The point, of course, is that many technologies are catalysts for their own use. While there certainly is a lot of benefit that has come from the use of copying equipment, it did not, at the time, necessarily respond to a felt, perceived and real business need. Having the equipment around merely gave the ability to use it and not always wisely. So, the use of the equipment and the focus on what it is for is key, not just the artifact of what it seems to accomplish.

So, let me get back to basics. There are very few offices in the business of just typing or sending messages. Offices and organizations exist to fulfill business or organizational needs and to perform business-oriented functions. I am interpreting business in a very general sense and, of course, I do not mean only the private sector. The business of an office is not to type letters, to attend meetings or to send messages. That is what my three-year old thinks when she comes to my office. She thinks that is what I am doing. I try to disabuse her of that notion. People are really in an office, presumably, to set policy, to conduct analyses and to monitor programs. They have substantive work to do. All the artifacts of the information world are merely symptoms of what is done in order to get the job done. Therefore, if we focus only on the current way we are doing our work without trying to improve or understand the process we may miss the point.

What office automation really is is using technology to do a better job, to get the office functions realized in a better way. There are real measures and we will talk about them in a minute. It is not using technology to produce more lines of text per day, or using technology to speed up business communications. Why? What is the matter with business communications today? Sometimes it may be good, sometimes it may be bad. You cannot say that that is an end in itself. If business communications is the rate-limiting step in improving the operation of your office in achieving its function, then you want to speed it up. As a goal in itself, it is pointless.

So, with these premises in mind, we can talk about office systems. There are really a number of systems to think about in the office environment.

First of all, the office itself is a system. It is comprised of many components: the people, the equipment they use, the information they have access to, the procedures they follow, and most importantly, the mission that they have. If I have a purchasing office, I can say its job is to turn purchase requisitions into purchase orders. The people in the office may change. They may get rid of the old equipment and bring in new ones. Information is up-dated. Procedures may evolve. But, it is still a purchasing office. That is what we have to focus on. We do not want to calcify existing modes of operation by bringing in equipment that instantiates, embodies a particular operation. What we want to do is keep the mission in the front of our mind and design systems to support it.

An office is also a component in a larger system; namely, the organization's information sector. The information sector is not a vertical slice of the economy in which a certain number of companies are to be found. It is a latitudinal slice through all parts of the economy. Every organization has an information sector whether it is U.S. Steel, the Department of Commerce or IBM. Every organization has an information sector that is the infrastructure that supports the substantive work that is going on. So, an office information system is the infrastructure inside an organization that supports the performance of substantive office work.

The way that an office information system is implemented may vary from case to case. It is not necessarily automated. An office information system may consist of mail carts, typewriters and filing cabinets. That is an office information system. In fact, that is the most common office information system. The automated office information system is the new thing.

My perspective on office automation is something that I call functional office automation, where we are really focusing on automated office information systems which provide support for office tasks and office procedures in the context of trying to get the office work done.

There are varying degrees of automation. There is not a single standard architecture for an office information systems, it varies from case to case. The perspective we have to take is a system perspective and a business perspective. We do not want to go into an organization and focus only on what each person is doing. We want to take a holistic view of the office. We want to say, what is this office about? How can we organize this office to take best advantage of technology and get that job done better. We want to look at it as a system. We want to focus on the application. It is really an application orientation. We are not concerned witrh individual tasks. We are not concerned even with the information processing, but we are concerned with the application that the office is trying to achieve.

As Dr. Licklider suggested: the issue is emphasizing integrating components; not putting in a lot of special purpose boxes to handle special purpose tasks, but putting together a lot of pieces, some high technology, some low technology, and organizing them and integrating them so that we can build a system that addresses the application.

We also have to have a business perspective, which means that we have to focus on the goals of the organization. What is it there for? We can't be technology driven. We cannot say, "Look, there is some new whiz-bang coming out of the labs. Let us put it into our office and see what it is good for."

There is an observable I call the Pirandello effect in office automation. Pirandello was a 20th century playwright. He wrote a play called, Six Characters in Search of an Author. Here we have six solutions in search of a problem. Everybody is tracking the new technology and they feel it is their job to put it into their company. I was talking, about two years ago, to the newly appointed director of office automation for a company in the Fortune 10 and he was not quite sure what to do with his job. He decided that his job was to see what new office systems technology was going on in the outside world and try to bring it into his company. I was a little puzzled by that. You don't start with the answer, presumably you start with the problem. You have to look around, see what the needs of your organization are, then look for appropriate technology, then look for solutions, not the other way around.

Also, you don't want to be task oriented. You don't want to say, "Aha, I see that we make equipment." You should stop to ask yourself, why are we making 91 copies when 90 of them are ending up in the circular file? So, if you focus on what the goals and functions are rather than tasks, that is where we want to go.

Furthermore, you should emphasize the uniqueness of the office. Vendors are in the business of focusing on the commonalities of offices. They are interested in large volumes, large market bases. What users need to do is say, what is special about my office, not what is common. If you reduce yourself to the lowest common denominator of all offices, you are not going to get very far. If I can take a piece of generic equipment and plug it in just as easily into a doctor's office or a lawyer's office or an accountant's office or a government office, then it is not doing very much for anybody because those four offices do not have a lot in common. If all I am doing is supporting the intersection of the functions of those four offices I am just taking the bottom base, the smallest piece of what goes on. After awhile things begin to diverge wildly.

So, what a user should do is ask what is special about me and how can I use generic equipment in a special way?

The goal is not increased efficiency in information handling. The goal is not to produce more letters per day or get messages delivered more quickly unless that is a means to achieving the real end you want, which is to improve the performance of business operations. And, there are measures for those. It might be increased volume with the same head count. It might be faster turn around with fewer errors. There is a whole list that can be developed. The point is that is what you have to focus on and really keep in mind. All too often vendors make sales presentations about how they are going to justify their office systems equipment, by saving you one-third of a secretary. I am not quite sure which third you are going to save. The cost justification arguments that are often very compelling in advance often seem to vanish in the end. You bring in the equipment and people tell you they cannot do things faster, but are doing things more carefully. That is, they are doing things more slowly. So, if you just bring in the equipment to focus on isolated tasks you are not necessarily going to be any better off.

When that happens, the vendors quickly turn around and say, well, you do not want to focus on mundane, secretarial cost reduction. You want to focus on the professional staff and improving their productivity. When I hear that I think of what Will Rogers said when told that Calvin Coolidge had died, "How can you tell?" So, when you talk about improving the productivity of professional workers I say, "How can you tell? What is your yardstick, more decisons per fortnight?" I am not sure what the effective measure is if you are going to look at what a professional office worker does.

Lord Kelvin, of course, was a 19th century physicist, rather a dinosaur in his attitudes. Among other things -- to reduce his thought to its simplistic form -- he said, "If you can't measure it, it is not there." Well, you know what? He was right. If you cannot measure the benefits it is all hot air.

So, with that perspective we are ready for the main question, how do you automate an office? The answer is, that is the wrong question. We don't automate offices. What we want to do is improve the operation of the office information system. We are talking about building an automated office information system where we understand an office information system to be a collection of components that support the realization of office functions. So, we want to talk a little bit about what it is, how you build it, and where it fits in your organization.

Well, I am going to equivocate right away. There is no such thing as an automated office information system, a general office information system. There is a particular one for every office. We are talking about office-specific systems. The pieces out of which you construct it presumably are going to be moderately generic unless you want to go into the business of designing special purpose chips for you own organization, which I doubt. However, the way that it is put together and some of the software will be specific to your organization.

Furthermore, even for a particular office, there isn't a single automated office information system. There are a whole range of possible equipments and functionality. These possibilities include everything from today's office information system of filing cabinets and typewriters to something that is marginally better, such as small expenditures for electronic typewriters with a small amount of memory or major investments such as stand alone word processors, shared logic word processors, electronic mail systems and minicomputer based systems. These are all different possible realizations of different versions of office information systems for the same organization.

The key idea to keep in mind is that we are indeed talking about systems, an integrated collection of components, integrated in a special way to better serve the specific office and the organization structure. As Dr. Licklider said, "It may be that you want to have your electronic mail system and your word processing system integrated so that you can prepare messages with one and edit it on the other and send it back with the first one." Even if the pieces do not talk to each other electronically they have to be viewed as being components of a whole.

The equipment base is what we build these systems out of. I am not going to get excited about whiz-bangs today. It is whatever makes sense. It could be word processors, minicomputers, local

networks. It is easy to talk about technology. The point is whatever makes sense with due consideration of functionality and cost. It is a trade-off.

You can build very powerful integrated office information systems today if you have three-quarters of a million dollars to spend. You can do a really good job. You buy a main frame computer and a lot of terminals. However, if your office justified that kind of expense you probably would have done it a long time ago. That is what we call data processing. The difference between data processing and office automation to me is really one of degree not one of kind.

In the office, we are talking about low transaction volumes, highly interactive work, a place where human factors are really critical. It is essentially the same concept of using computers for an application system. What is important is determining what level of functionality is appropriate for a given level of cost for the eventual pay-off that your organization will achieve.

Now, just so I am not entirely vague, some simple functions that I have seen integrated office systems support include the following. Document production is obviously the kind of thing that word processors are used for. This can be either a semi-automated or completely automated production of documents from form letters and similar projects. Information presentation is another useful function. For example, a bank that I am familiar with had a letter of credit system where the person determining if letter of credit terms have been fulfilled calls up the documents and examines them. The system presents total information and enables him to decide if the terms have been supported or not. History tracking and work flow control is another very important support function. What is going on? What is the status of an order? To know where an item is, to know what actions have taken place and to know who is responsible are essential to proper management and can be directly assisted using an integrated office system.

There is also a whole set of tools that are generally called personal augmentation tools. These include calendars, electronic message systems, automated note pads, and other similar devices which help people manage themselves and their time. Another category of functional support are the tools for the decision-maker, not tools for the so-called executive, but tools for the person who needs to access data and to use decision support capabilities in order to examine, analyze, project and display information and then make decisions based upon that data. In some cases a real sub-process exists which is amenable to automation and software can be created so the system will do the whole thing.

Well, if that is what it is, how do we do it? Again, there is no general prescription, but there are some guidelines. The key issue is understanding the office. That is really the first step. It is not a technological enterprise. The principal thing is understanding what an office is doing, understanding it well, and then seeing how the equipment can help do a better job. This requires detailed first hand observation and analysis of operations, not taking people's word or giving them a word processor.

The emphasis of the system has to be on the mission and the function. You want to identify the real problems. It is a Peter Drucker platitude that you should look at problems as opportunities and it also happens to be true. If there is a place where there is a particular bottleneck that is the opportunity to really do something good.

The whole thing has to be conducted with a very great sensitivity to the human and organization agenda. Office systems, as opposed to conventional DP systems, are for use by real people, not by programmers. And they have a whole set of concerns that are not to be identified with those of the DP environment. Numerous data processing vendors have badly stubbed their toes thinking, well, gee we have got a text processing system our programmers use to prepare program texts. We will merely put a new nameplate on it and call it a word processing system and put it into an office environment. It does not work.

The precept from an office system developer's perspective, the major concept is that rationalization must precede automation. What do I mean by rationalization? I can tell you by a story.

There is a story that at the beginning of World War II the British were looking to their coastal defenses and they bought some new truck-mounted guns to replace the horse-drawn ones they had been using for target practice all about the English coast. They were supposed to get real productivity improvements, increased shell firing rates and lower crew sizes. Those improvements were not materializing. They brought in a time and motion man who watched what was going on. He took slow motion photographs. He brought out his stopwatch. He found that the time from when the muzzle was loaded until the time when the muzzle was unloaded, that whole period, two of the five-man team were standing at attention doing nothing. He asked them, "Why are you doing that?" They said, "That is what procedure says. That is what it says in the book." They did not know why they were doing it. So, he went around asking everybody why they were doing it. Nobody could figure it out until he came to an old Colonel of Artillery. He said, "Oh, yes, they are holding the horses."

So, automating a mess gives you an automated mess of questionable utility. What we are really talking about is not office automation but office design. The design of office procedures, office jobs, office structures and then using technology almost as a catalyst. I have seen cases when it was said, we are going to have an office automation effort and everybody gets very excited and starts analyzing their office and figuring out what is going on. By the time they have rationalized and redesigned their office they do not need the equipment. The equipment gives them the last twenty percent of the benefit. The first eighty percent came from the fact that they have been given the impetus to study and redesign and analyze some archaic procedures.

However, you cannot willy-nilly walk into an office and expect everybody to be rational. You have to face the fact that you are perturbing an existing system and that office systems are delicate and have evolved over time.

People may say that you cannot change anything. Hogwash, you can change everything if people are on your side. If you give people incentives that are high enough they will stand on their head and spit nickels. So, the incentives are what are key, not improvement to the organization as a whole. You cannot say, well, you are doing it for the greater glory of the Department of Commerce. That will not go over so big. But, if there are some particular advantages for the person involved, they will do almost everything.

You also have to face the fact that you cannot always get there from here. We may have an office that operates a certain way and in the abstract what we would like to do is to chuck it all out the door and start from scratch. That is not going to happen.

You also have to take into account that there are limits to rationality, that pure systems thinking does not carry all the way. You might walk into an organization and say, this doesn't make any sense. The guy in the corner there isn't doing anything. You don't need him. Well, it turns out he is the boss's brother-in-law and you really do need him.

So, in designing systems and thinking about human factors -- and I mean that in a very broad sense -- people are the most important part of the system. If you get carried away with technology and analysis you can run into a lot of trouble. Currently, there is a lot in the literature about what it is going to be like to work in an automated office. There is one point of view, put out principally by people trying to organize office workers and scare them, saying. "It is bad news. It is going to be very much like working at drill presses and lathes. It is going to be an industrial model at the office, except you are going to be sitting at a cathode ray tube all day and frying your eyeballs."

The optimists, who tend to be vendors trying to hawk their goods say, "Oh no, on the contrary, it is going to be a paradise on earth. We will have no more boring work. Everybody will sit and think all day."

Well, in fact it can be both or neither or somewhere in between. It all depends on how you approach it. It all depends on how the system is designed. There are a whole lot of concerns, one of which is human engineering of equipment, but that is only one. Namely, is it something that people can use without trying? I have seen numerous people trying to use poorly designed equipment and literally crying because the system when they did something wrong came back with the comment that said, "Slash, slash you, stack overflow, all jobs and files deleted." It did not work very well. Or, equipment where the inset and the delete functions were on the same key, one in lower case and one in upper case. This is true, not a joke.

Needless to say human engineering is very important. However, it is not the only thing. We have to talk about what are people going to do? You have somebody who is sitting there reasonably contented, doing a certain kind of job and you say, "All right, you have a new job." "Me? I didn't ask for a new job. What do you mean changing my job?" So, you have to take into account the fact that you are changing people's jobs. By designing systems you are designing jobs. You have to face the fact that you have to introduce the system. That is often a very difficult thing and you may have to overcome a certain resistance to change. The resistance is not to automation, but to change. In fact, often people like equipment. It gives them something to talk about. But, they are afraid of uncertainty and they are afraid of change that does not carry any benefits for them. There is also a key issue of skill degradation or enhancement. Are you going to turn people today who have a variety of intersting jobs into essentially an entry person staring at a key board all day typing in data that comes in from other sources, or are you going to remove the boring work and turn them more into paraprofessionals who have a chance to exercise some autonomy and responsibility?

There also is the whole question of monitoring and privacy in that context as well. Are you going to give people additional responsibility? At the same time, are you going to give them the tools to do it? Are you going to use the new systems technology to better keep track of what people are doing in a way that they feel to be intrusive on their own legitimate needs for privacy?

You have to take into account that there is a social framework in the office. There is a well-known case where a certain organization put in a highly expensive word processing center. It was a big capital investment. They decided it had to be used all day,

eight hours a day through the main shift. Well, they got little or no cooperation. The system fell apart. Why? Because the operators realised that if it was going to be done that way they could not take their lunch breaks and their coffee breaks together and they refused to cooperate.

There is a whole issue of career paths. What futures do people have? Are you condemning them to an endless life in front of the terminal, or are you saying, this is an upwards step in a variety of ways.

There is a whole issue of how do people view office work and themselves. You can get pretty philosophical here, but what is the work about? Are they becoming slaves to the machine or is the machine becoming an adjunct to them? As I said before, a key issue is really one of incentives.

We talk about an OIS, an office information system, as a system, and it therefore has a life cycle like any system. Let me just quickly identify the major points. There is the issue of getting it in the door. There is the problem of high cost. You go to management and say, "We can do a better job if you give us $2 million for our office." And management will say, "You come back with a 300 page study proving it and maybe I will believe you." High entry costs require a lot of justification which is often difficult to do in advance, because you do not really anticipate what the real advantages are going to be. So, low cost initiation and growth is much preferred to a monlithic, mammoth, all-at-once approach.

There is an issue of getting it in and getting it institutionalized, so that it is no longer an experiment, no longer an oddity, but part of the way the system really works.

Once it is in, it is going to start changing. It has got to be enhanced and expanded. You want to increase functionality. Right. We brought it in to produce our documents, now we also want to keep track of our work.

Also, you are going to grow in volume. Yesterday we had ten people working here, now we have twenty-five. Help!

Then there is maintenance. Now, maintenance in this environment is a little different because we are basically talking about software kinds of systems. Cynics, of course, describe software maintenance as replacing old bugs by new ones, but we will not say that. Wnat it does mean, of course, is maintaining things in the face of change. It does not mean that you have a lot of friction, moving parts, and you have to change the oil every 50,000 key strokes; but, rather that the technology changes. You want to bring in new equipment and there is an organization application change. You want to do new things and the old equipment has to adapt.

The implication of this is that you don't want to get caught up in focusing on the technology. You do not want to focus on the technological realization, but rather on the logical function. If there are different implementations of that over time, that is terrific.

As an implementation strategy I find that it is useful to get going quickly, get something small up fast. If it is small and not too expensive, people do not get too excited. You can often justify a small start out of some backhand pocket and you do not have to go through twenty-five levels of management to spend a lot of money. Once it is in, and you start to prove its worth, then it becomes easier to grow and expand. The low-key effort requires less initial effort and limits expectations. It also limits trauma. Not everybody gets excited. You can bring it in without ruffling too many feathers.

If you are going to bring in systems you have to face the fact that you have to have diversity and flexibility. You should not say, "Right, this is the way we are going to do things here." But, rather you have to have an environment in which people can, within tolerable limits, explore their own approaches. You need systems that are modular rather than monolithic, so they can be introduced over a period of time. In order to do this you have to have a technical warning system, a picture of where things are going.

Let me start to wrap up. Where does an automated office information system fit? I see two levels. First, there is the specific office information system that is under local autonomy and control. The whole point is that if I have a responsibility for getting a job done, it is, to put it mildly, crazy to say that I do not have the authority to acquire and manage and use the equipment I need to get my job done. I should not have to go hat in hand to somebody with the name of information resources manager or office automations czar and ask him to solve my problem for me. It is my problem, why am I asking him to solve it? Because he has this certain expertise. Well, he should rent it to me or loan it to me. But, if I am the one with the responsibility to get the job done, then it is my responsibility to have the equipment to help me do it. And, in fact, conventional approaches to centralized, large-scale, corporate systems are really an artifact of the fact that we were dealing with expensive things that had to be shared among a lot of people, which could not be cost justified on a local basis and that required a lot of resource and expertise to operate. Those factors are changing. The concept of local autonomy and control is the thing that is motivating distributed data processing and is the reason why people are putting in minicomputers to support local operation. The rationale of local control and use equally applies to local office infomation systems. So, this is not an organizational control system, it is a local system controlled by the operational manager.

However, the infrastructure, the corporate networks, the data communications and telecommunications networks, the corporate data bases, the things that transcend individual office needs, should be managed by some centralized staff. This is the second level. The shared, more expensive resources and the interconnection of communications and integration of individual systems. The systems belong to end-users, but the integration infrastructure belongs to some centralized staff.

System integration and the connection of communications are key problems that Dr. Licklider alluded to. Namely, how do you put pieces together? How do you avoid a distributed system with dispersed responsibility from decaying into anarchy? For example, I build a system and you build a system. A year down the road we say, gee, you know it would be very good if my system could send documents to your system or that your system could get data from my system. We find that they cannot talk to one another. That is not so good.

But how do you achieve interoperability without putting an iron hand on control which stifles innovation and creativity? The answer tends to be singular, by means of standards. What we want to achieve is coherence through interface standards, that this infrastructure that ties the peices together is the thing that really enables us to define standards for everything to talk without imposing internal standards on what they have to look like.

Let me conclude then just by saying some obvious platitudes and one last story. I told you at the beginning that the bad news was that nobody wants office automation. Well, I would like to conclude with some good news. I am not quite sure what it is, but there is an old story that once there was a king who heard that there was a famous wise man in his kingdom. So, he had him brought to the palace and said, "I hear you are very smart. If you are smart, I want you to teach my horse to sing." The wise man said, "Oh, that is a pretty hard job." And the king said, "I know it is hard. If you can do it, I will give you a bag of gold and if you can't, off with your head." So, the wise man said, "I need some time." And the king said, "Fine, you have a year."

So the wise man took his horse home and he told his family about the story. They started to cry and wail. He said, "Calm down, don't get so excited. A lot can happen in a year. Maybe the king will die. Maybe the horse will die. Or maybe the horse will sing."

So, there are a lot of possibilities, but you have to be optimistic.

SYSTEM TECHNOLOGY, PRESENT AND TRENDS

David Lyons
IBM Corporation

Ladies and gentlemen, I have been looking forward to the opportunity of being part of your symposium. At the outset, as Dr. Licklider was talking about the crucial need for planning the office of the future, it reminded me of a short story that Bill Moyers used to tell about a college student.

He was having some trouble in school and he didn't know whether or not he should leave college to make his fortune in the world. What he did was he went out to see a fortune teller. The fortune teller studied his hand for awhile and then she looked up at him. She said, "Young man, you will be poor and you will be unhappy until you are 30." He then asked, very quizzically, "What happens after I am 30?" After that, she said, "You will get used to it."

I think that kind of fits into our subject today. You will be hearing from others on why the area of office systems is of such critical importance. We have rising costs, decreasing productivity, and work force imbalancing problems that are placing severe strains on our economic health and our ability to compete in world markets today.

You will also hear from three leading edge organizations who have begun to install what has been generically called the "office of the future".

What I would like to discuss with you today are four topics: First, what is happening with technology and its potential to provide solutions for office systems; second, what I see as the office application and where we are today; third, the challenges we face in the future both as vendors and as organizations implementing office systems; and lastly, the potential I see for totally integrated office systems in the future.

As you can see, in Figure 1, the annual decrease in cost of computer and related technology over the past 20 years has been significant. More importantly, not only have these costs decreased, but our ability to use them has increased. For example, pocket calculators of today are more sophisticated and powerful and easier to

use than computers of twenty years ago. Watches are available today that can maintain multiple time zones concurrently. In the area of home appliances, microwave ovens today have mutilevels of programming capability on microcomputers. In fact, if other costs had gone the same way a sirloin steak today would cost nine cents a pound and a standard sized car would cost $200.

In addition to all of that, our ability to manufacuture technology has increased at an astounding rate. Within IBM, in 1970 it took us 200 man-hours to manufacture 32,000 bits of computer memory. In 1980, it takes us 20 minutes to manufacture 32,000 bits of computer memory,

However, this technology evolution and our capability to utilize it is only one side of the equation. On the other side is the applications that those technologies will be used to address.

Let me talk for a few minutes about how I think the office of the future might evolve. I have depicted this in Figure 2. It begins with secretarial productivity. Starting there to pick up the justification due to the fact that the average business letter now costs over eight dollars to prepare. Starting there, because capturing the key strokes is essential to an office system. These secretarial systems will start in departments where the paper workload is the heaviest. In fact, word processing is really what our typical customers are implementing today.

But that, as was discussed earlier, is really just a beginning. The incentive for automating text preparation is so that it can be combined with the data processing systems already installed. As an example, an insurance proposal can be prepared in a remote agency on a word processing workstation with access to actuarial information on the computer system at corporate headquarters. Our customers tell us consistently that the next step that they want to take is the integration of text with data.

The next phase of system evolution will be the storage and the retrieval of documents, or more simply put, electronic filing. Now, the prospects of running a business with all our vital records stored in magnetic form may initially appear frightening to some. However, it is reassuring to remember that in many application areas, such as airline reservations, we have really been doing that for years. You don't have to look very far to recognize that electronic filing offers massive productivity benefits.

The average secretary makes over 5,000 copies of documents per year, many of which end up in redundant files which must be maintained, updated, purged, and stored away in archives. Recent surveys have told us that secretaries spend over 10 percent of their

time filing and retrieving information and professionals seeking information spend 25 percent of their time seeking this information.

The next step will be to tie systems together into electronic mail networks. You will be able to get many of the benefits of electronic mail quickly, for our studies show that the greatest majority of written communications stay within the establishment, often within the same functional area.

The economic benefits of being able to eliminate labor-intensive manual mail systems coupled with the productivity gains -- and that is key -- of moving messages between departments and locations in seconds rather than days will make electronic mail a high priority for most organizations.

The next step will be to place terminals directly on professionals' and managers' desks. Professional terminals will be a standard fixture in the office of tomorrow as the telephone is today. They will bring to the professional, who all too often is the forgotten individual in the office, support that exceeds what any executive now receives from a dedicated secretary. Profesional productivity is the real pot of gold at the end of the office systems rainbow.

There are, in a typical company today, four professionals to every clerk or secretary. Professionals are paid two to two-and-a-half times in salary and benefits what the secretaries are paid. So, that results in a ten-to-one cost leverage by saving a small percentage of each professional's time, which is of major economic significance in most of our organizations.

We also see a comparable evolution in the workstations and the equipment used to automate these office functions. From the original mechanical typewriter came the electronic typewriter and the ability to store key strokes electronically on magnetic cards or on disks. Recent technology has implemented display based word processing systems. These primarily are stand alone-single work stations or shared logic-controllers with multiple workstations and printers attached. These are being enhanced by providing communication capability, allowing them to talk to comparable cluster controllers or to host application computer systems. Other technologies within the industry are also evolving, but they are not yet here as generally available components. These would provide the capability to store, forward, and retrieve digital facsimile information in the same manner as a document entered from a word processor. Another major thrust in the industry is the ability to store and forward captured voice information (in digital form) so that we would leave voice messages.

At our Watson Research Center we are testing an experimental, computer-controlled, voice communication system. It is based on the telephone as the most standard component of business communications,

but designed with the realization of how difficult telephone communications can be. If you are anything like me, you often don't get a party on a first try and sometimes days go by before you finally do. Now, using a standard touch-tone set and the speech system, a user can record messages, edit them, and then route them to an individual or a group based on pre-identified distribution lists. The computer maintains the equivalent of a voice "in basket". You can call it from wherever you are for your messages or it will call you twice a day if it hasn't heard from you. It calls back in a few minutes if your line is busy, and every ten minutes if it has a priority message for you.

Utilization of this system, like most new sytems, started slowly. but now it is an integral communications medium among the users. It is used for very complete messages and those messages are being relayed and responses received in hours rather than days or weeks.

Given that as an applications oriented scenario and as a view of where the products are in support of the application, where are we really today?

Well, there are over eight million electric typewriters installed today and over 350,000 display based word processors. However, of those display based word processors, over 92 percent are non-communicating.

In the application area, we are mostly seeing the implementation of word processing, but other phases are emerging. You will hear today from three organizations who have begun to tie together the various components of the integrated office and implement solutions. However, most organizations are in the planning and the piloting phase where they are preparing for rapid growth in the '81 and '84 time frame. Surveys show that a large majority of orgnizations have expanded their planning and piloting activities.

An IBM customer survey showed that from 1978 to 1979 the number of those customers planning to place automation into offices had doubled. A guide survey in 1980 showed that planning is at a high level with 64 percent of the respondents developing a top-down organization-wide plan.

However, there is more to this application area than just piloting and planning to make it become a reality. Both we as vendors, and you as customers and users, face significant challenges in the future. (Figure 3). As vendors our challenge is to take today's technology in data, text, and graphics, and the emerging technologies of digitally stored image and voice and integrate these various forms of information to provide you with a system that is capable of delivering information to the people who really need it.

Now, what does this really mean? Another way of looking at our goal of integrating the separate pieces of information found in a memo is that we want and need the ability to put all the different forms of information into a single document.

For example, in the upper left-hand side of Figure 4 is a logo, which is graphical information; data, the name and address from a host data file; the text that has been keyed in by the secretary; business graphics that are created by the system as a result of complex calculations performed by a computer program, and an image which is the individual's signature; and a voice annotation or a buck slip, because a professional needs the ability to electronically pass a document he has received to someone else with his comments annoted by voice. He would also electronically file the document with the voice message.

However, you too face a challenge in realizing the utlimate goal of improved office productivity. As new products are announced and installed, office systems will evolve, but not without top level direction and support. If we don't have that top level direction and support, fragmentation can result, making it difficult, if not impossible, to integrate the individual pieces. We talked about that earlier this morning.

Organizational placement of the office systems operation will be a key factor in the success of a function which has to cross organization lines. The total office system of the office systems operation will be a key factor in the success of a function which has to cross organization lines.

The total office system represents a long-term and an evolutionary process requiring a formal, long-range plan as depicted in Figure 5. It is a major project with significant return on investment, but it requires a substantial up-front investment and firm commitment to some agreed-to goals. It has widespread organizational implications and it requires high-level executive support, direction, and most importantly, involvement. It is a complex implementation. It is a process that requires strong professional leadership across your organizations and across what are many, usually separate, disciplines. Finally, and most importantly, it requires an understanding and a recognition of the organization and the personnel impacts of automating what is to many of us a very personal activity, that is, our office and how we run it.

In summary, then, I see our joint goal as to improve overall office production, especially in the area of the professional user, to use the technology provided by data processing to automate the manual tasks in the overall office process, and to integrate the separate forms of information that are required to run our business and agencies. This is graphically portrayed in Figure 6. While the

technologies may be complex, the overriding theme will have to be to make the office systems simple to learn, easy to use, and geared to the utlimate end-user. Therefore, if we the vendors meet our challenge of providing the individual technology, the application support products designed for end-users' ease of use, and the tools and guidance in planning to address your requirements; and you develop the plans to address those requirements and needs: then we can achieve our joint goal of improving the office environment and our productivity.

My message this morning has been a simple one, to ask you to take a view of the office beyond the paper-shuffling, beyond the faster typing and the clean-up-the-files approach; to view the office of the future in terms of the administration of our businesses. Efforts to restructure our business offices, already started by some and contemplated by most everyone, offer dramatic potential for increased productivity. There is no doubt that those organizations who are willing to commit the time and resources necessary to implement these sophisticated systems will gain a substantial edge in the efficiency and in the cost of doing business. With that perspective, I think our joint mission is clear. It is to capitalize on the technology. Apply it quickly, broadly and effectively to make the productive power of the computer as useful and accessible as possible to the secretary, the scientists and the clerk, as well as the controller.

Tomorrow the questions will be much tougher. What will it be worth to find some needed information in seconds rather than hours? What will it be worth to send messages to someone across the building or across the country in minutes rather than days? Or, to help the professionals to do their job better?

Your contributions, I believe, will be in direct proportion to your ability to get involved: to be thoughtful and creative, and, to add value to the decision-making process in your organization.

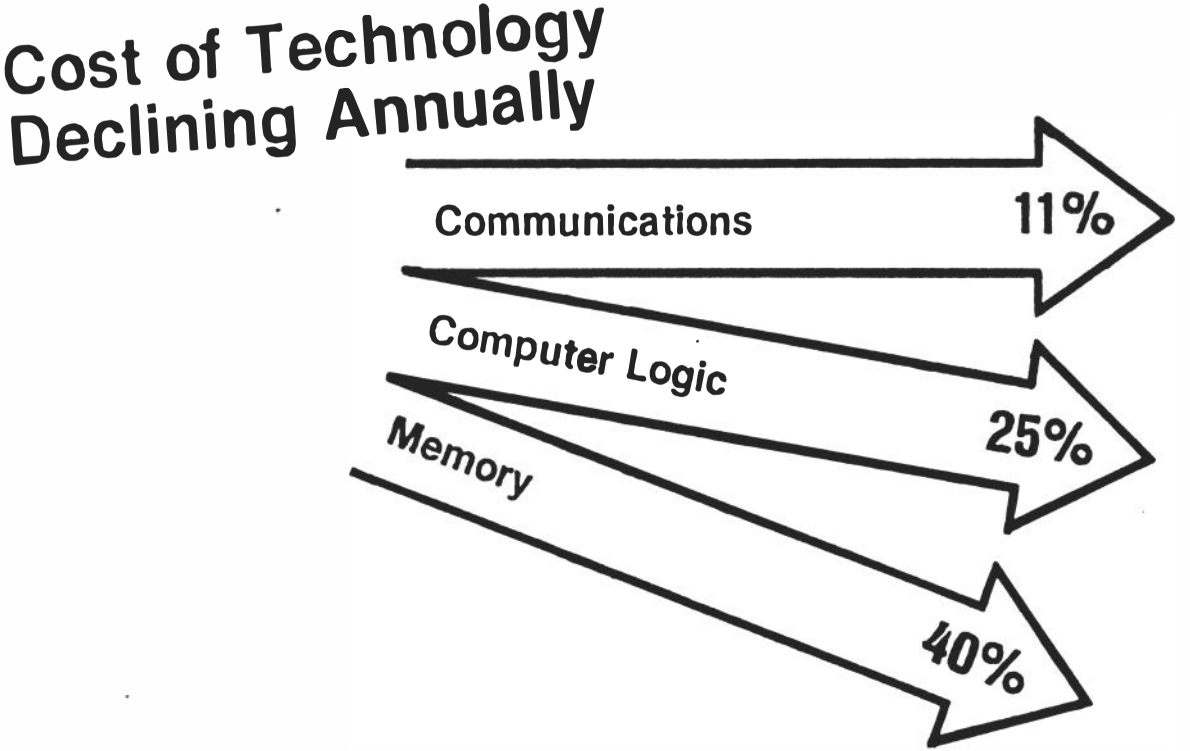

Cost of Technology
Declining Annually
Communications
11%
Computer Logic
25%
Memory
40%

FIGURE 1

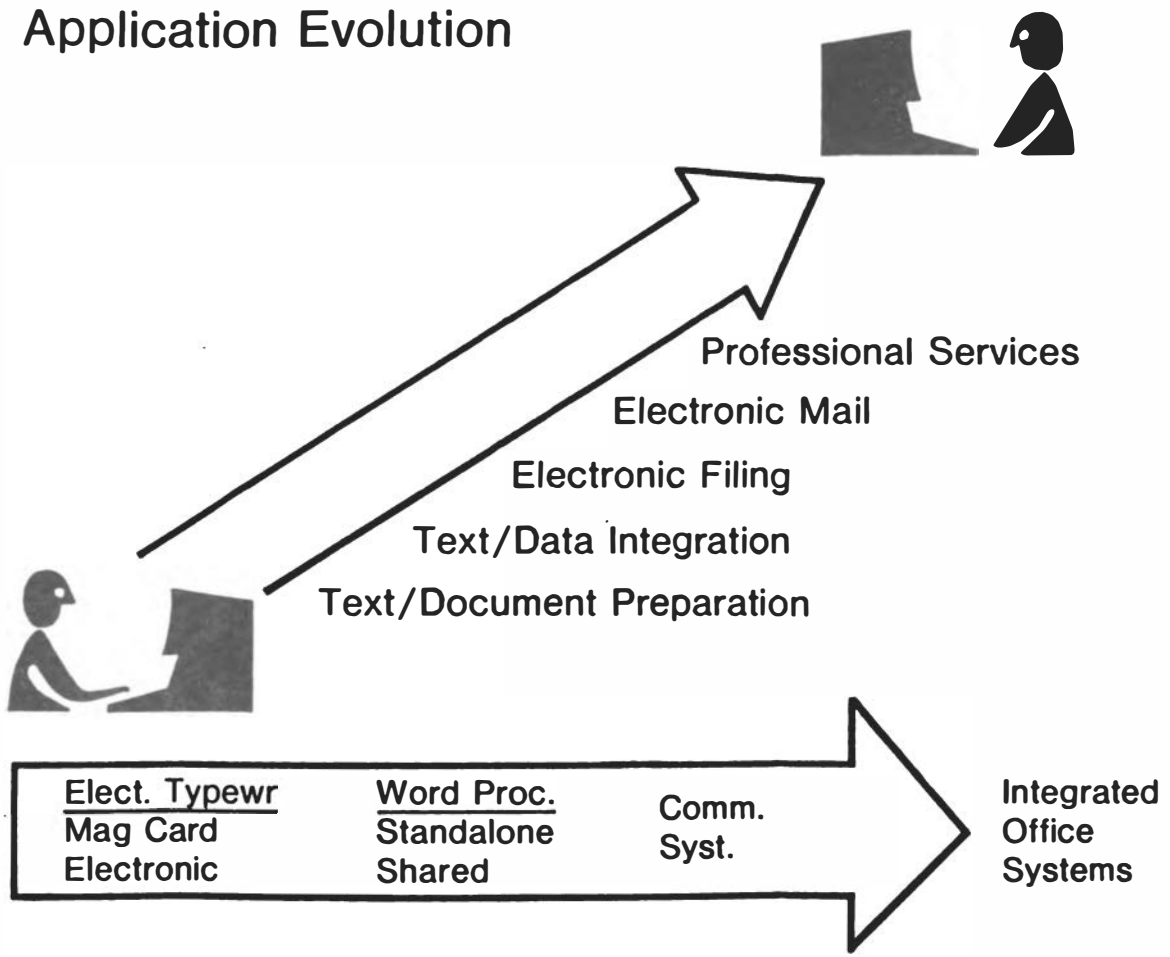


FIGURE 2

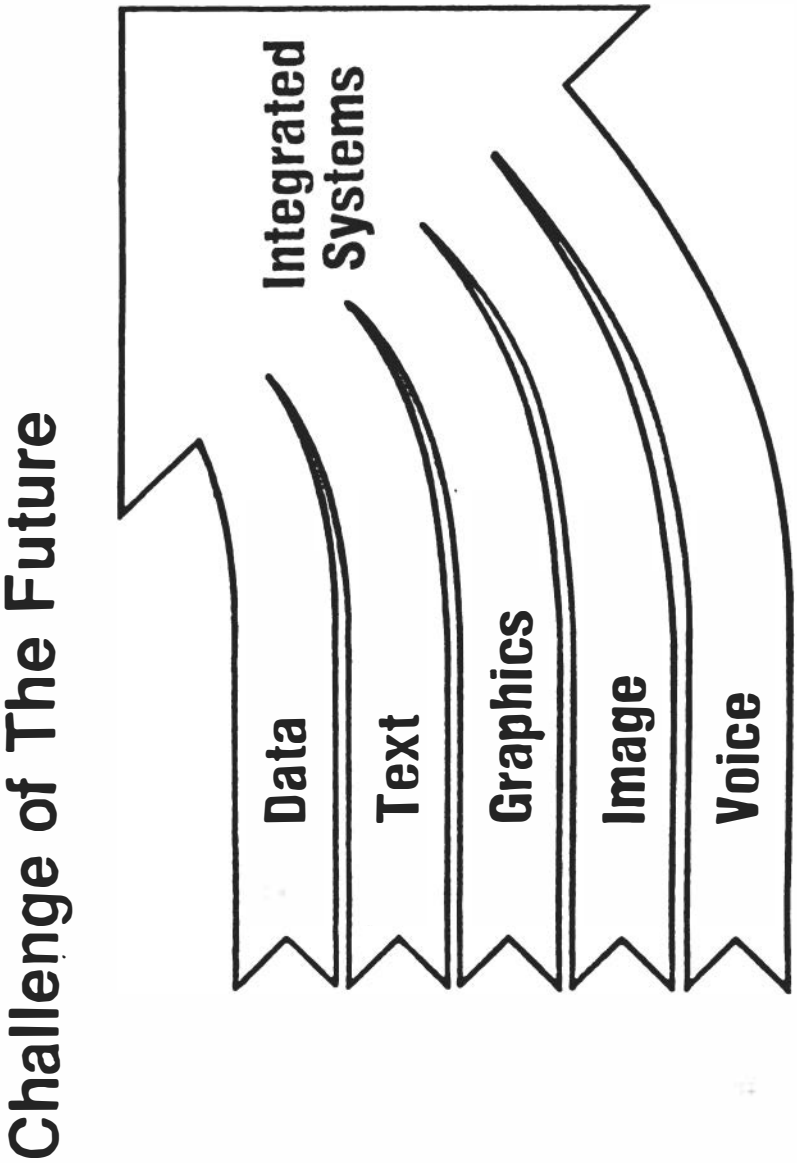


FIGURE 3

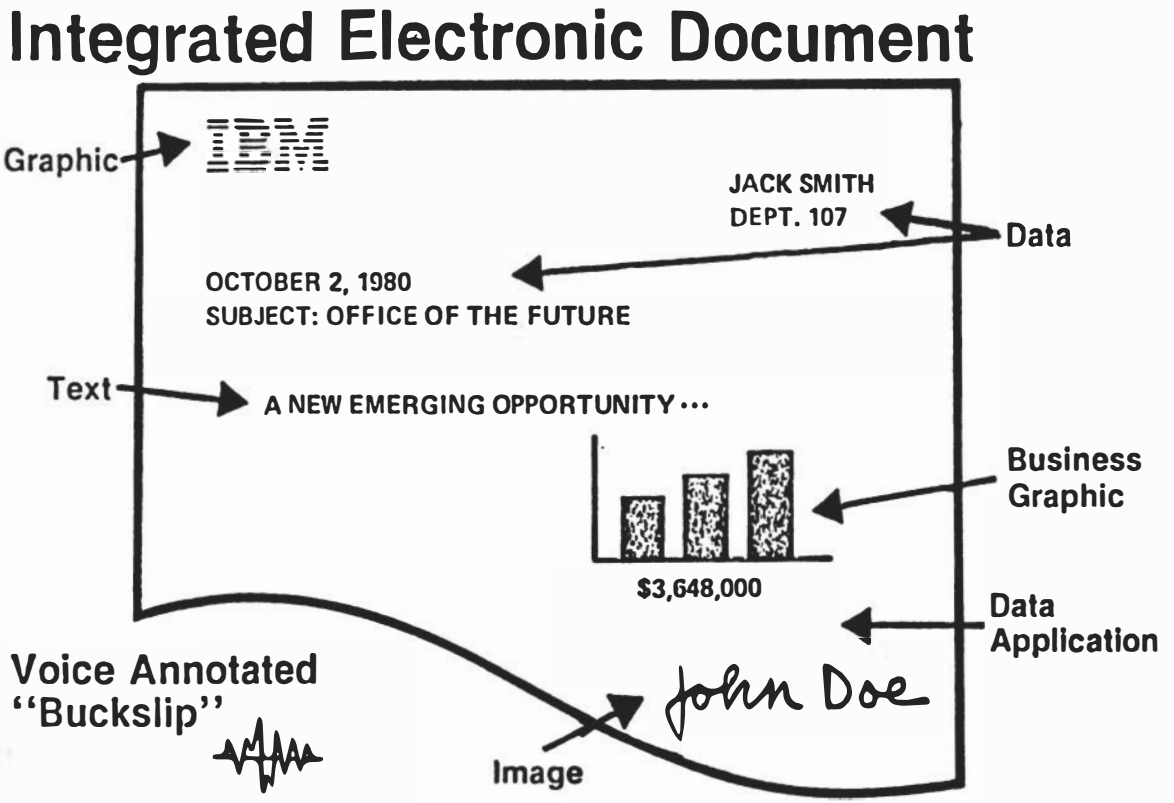


FIGURE 4

The Total Office System Requires . . .

- A Formal Long-Range Plan
- Substantial Investment and Firm Commitment to Goals
- High-Level Executive Support, Direction, Involvement
- Strong Professional Leadership

  Systems

  Computing

  Communications

  Planning

  Project Management

  Personnel

FIGURE 5

Summary

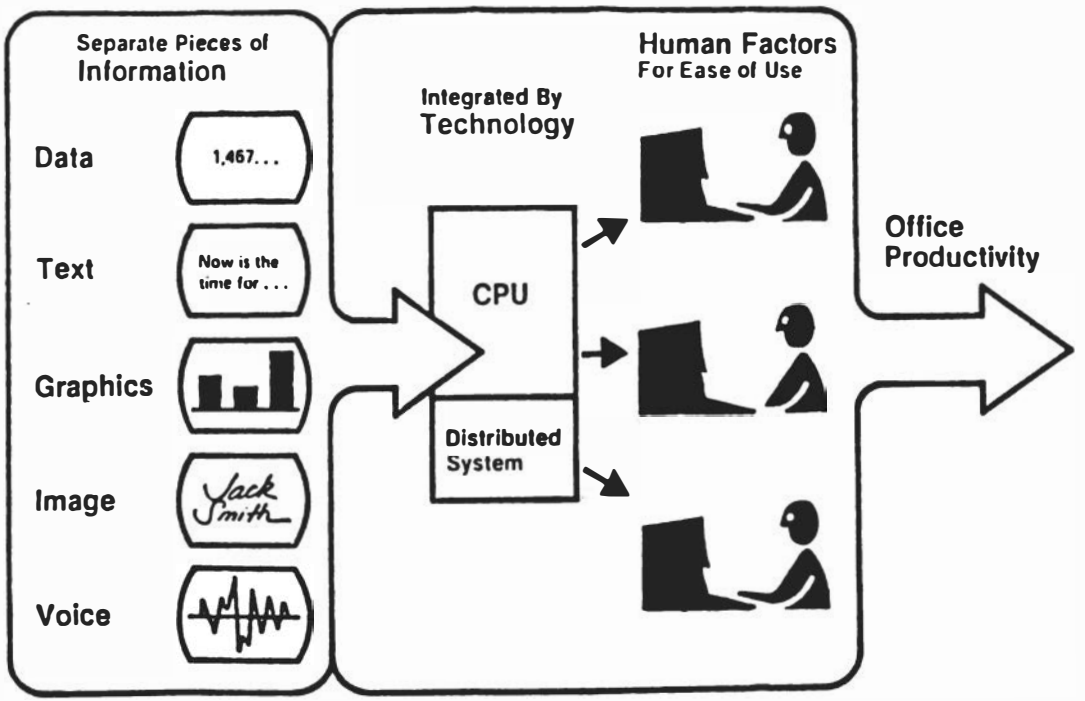


FIGURE 6

OFFICE SYSTEM PLANNING

Daniel Hosage
Datapoint Corporation

The fact of the matter is that the systems approach to the office is the name of the game. This is the kind of thing Datapoint has been doing and the kind of thing that we are going to be talking about here.

Before I get into planning, there really are a couple of things I have to cover. I think we must understand the nature of the office, at least what I believe to be some of the driving forces in this whole electronic office approach, some of the general trends, some of the converging technologies. These are the things that are really going on right now. I think we all agree on what the most important elements of the electronic office are. In my discussion I think I will have something surprising to say in that area that most people are just fluffing off at this point in time. I'll provide some examples of integration and how you can do some things today in a systems integration fashion, and then talk about the planning, how to prepare and what you can expect to get in terms of the results.

Addressing a question that was asked in the previous discussion, one of the difficulties you have in this whole area in terms of standardization -- and there is a lot of work being done that wasn't mentioned, but I will refer to it later -- is that what's happening is typical of classic, emerging market or emerging industry. In this kind of an emerging situation, diversity is the name of the game. If you don't have diversity and you don't approach this whole new industry this way, instead of fighting for standardization, we are not going to achieve the kind of creative approaches and the kind of progress that are going to make the whole office a heck of a lot more productive in the future.

An amazing thing was said earlier today. A responsible member of a large corporation made the comment that his company is a source of the information that it costs approximately eight dollars to type a letter. That is an amazing fact in and of itself. But the really amazing fact is that a commercial enterprise, in a free enterprise system, where understanding what your product costs are, understanding where your money is going, understanding what kind of a

profit you can get out of a product and proper pricing techniques and strategies are so important, we don't even know what a piece of paper costs us to produce in an office. It is considered real news when we find out, when Exxon runs a study or IBM runs a study. That is one of the most amazing missing links in our whole operation. The problem is that too much of our business as well stated earlier, is now coming from the office itself. There is so much time and effort being put into that infrastructure, that overhead, that over 50 percent of the people in the American free enterprise system today are in office support capacities. This just is absolutely unacceptable from the standpoint of productivity. What has happened as we see it, is that there have been significant advances made in productivity and capital investment in the factory areas the last ten years: something in the range of $24,000 per employee. In the office, it has been only $3,000 and what has resulted is simply that factory productivity has increased over the last ten years -- it has taken a few lumps lately, but it has increased over the last ten years -- whereas in the office it just simply hasn't.

People have been added, more and more people have been added. One of the things that also has happened, as we put all of these people in the office, is simply the whole game of information flow. If you will remember when you were young, at least I did it when I was a young IBM salesman and I used to go home to meet my future wife, I used to float checks between Baltimore and Philadelphia, Pennsylvania, because a float existed. You could cash a check and it took five days for your money to get out of the bank. There is a similar situation, an information float that exists in our society and in the office. What happens is illustrated in this example. At one major company in the United States, it took an average of two-and-a-half days to transmit one piece of mail to another member within the same department. It took almost four days for interdepartment mail maybe even on the same floor in this 40 story building in New York City. Once you went into another location it took five days to get that information to that site. That meant decisions were being made without the proper information. That meant decisions could have been made earlier and faster.

I will give you an example of what that can mean, at least, in a corporation that has concerned itself with high interest rates, its use of money, its use of inventory, the cost of carrying inventory, et cetera.

Mike Hammer also addressed that problem of trying to address all of the aspects of the office. In an office matrix that covers all of the aspects of an office, there are functional groupings, and there are office tasks and personnel descriptions that are on at least a three-dimensional level. There are kinds of things in a functional grouping that all of these operations, all these functions have to serve in any kind of an office system and have to be done to

try to handle all of those two dimensional items along with a third level on specifically oriented, custom oriented systems. It is a seemingly impossible task, so we absolutely are going to have to have a kind of generic approach to equipment.

As to the demographics that are occurring in this country, 50 percent of the work force is in the office. That is where they are. They are not producing products. That is the trend that just isn't going to be able to be withstood over the coming years. For example, if we keep increasing clerical help, we aren't going to be able to find enough secretaries to man the phones and the typewriter.

One other thing which impacts us tremendously is that a significant part of the work force today has some college education. In the future an even higher percentage of the work force will have college educations. It is not the fact that they have got a college education that is important, but what is contained in that college education.

I spoke at the University of Texas Graduate School of Business about three months ago and learned, to my very pleasant surprise, that there was not one person out of the couple thousand people in that business school that did not have hands-on, in-depth training and understanding of a computer system; a computer system built by IBM, Datapoint or Sperry Rand. They had the whole bit. They understand what they are and they know what tools they need to succeed. When these students are executives 20 years from now they won't mind an executive terminal on their desk. I do. I mean, I build and I sell the equipment, but I hate to use the damn things. But, I am an old foggy. When I graduated from college in 1954 and started selling for IBM, I was selling punchcard accounting systems to coal miners in Pennsylvania. I was just reminiscing with a gentleman here about the Social Security Administration in Baltimore. It was the most highly automated system in the world back in 1953 and 1954. In reality, it was so minimal in terms of automation that nobody quite understood what was really happening.

So, there is going to be a lot of changing in terms of the demographics and the ability of people to absorb what we are talking about in this integrated office area.

The key is integration. It really is integration: from a functional standpoint, from an application standpoint, and from an equipment standpoint. The cost of investment in the equipment that is needed to do all this work is significant and we have got to develop clever approaches, multi-functional approaches, to using the same equipment. I will talk a lot about that.

What has happened today is that any operation in an office is terribly difficult to change. You change one part of an office system and it screws up another part. You endure a much higher cost because separate systems are not integrated. The communications breakdowns are tremendous. The difficulties in getting information from one department to another; even though it is the same company, or if it is just cross a department line or if it is on another floor, are absolutely amazing. The millions of dollars that a business spends on trying to get the right information to where it is needed is really hampered by the fact that the whole communications function is really not efficient at all. There really isn't any control of the office. There is absolutely no control of an office.

A good executive today can tell you what his product costs. But, as I said, earlier, it is news if he knows what his documents cost or how much the typing pool costs or how much it costs to dictate anything. One of the key approaches and methodologies that addresses itself to this area and solves the problems of non-integration is Mike's (Hammer) systems approach. Without any question, basing tasks on the computer and the good old programming systems capability, you have the ability to provide all of the things that Lick (Licklider) indicated: ease of use and change, the flexibility to handle variety or complexity, the ability to do some generic programming while allowing specialized function through work stations.

The other thing that is happening are some significant advances in technology. The application of the computer to office tasks is really one of the major things. People talk about word processing as one of the major aspects of the automation in the office, but now if you will notice carefully, people are beginning to say computer-based word processing. There is more to it than just word processing. This is the kind of thing that is going to become more and more pervasive.

Someone used the word "digital" earlier. One of the saviors of the world in terms of current and future office automation area is simply the fact that everything, after a long hard battle, is being reduced to digital representation; wherever it is, whatever is going on. In spite of 103 years of AT&T and all the analog equipment, the digital form of transmission, the digital form of storage whether it is voice, FAX, data or whatever, is becoming the common denominator. Whether it is a PBX or a computer it is all digital. This is the kind of dynamic thing that is happening.

Electronics. The LSI chips, with their reduction in costs and improvements in efficiency are having tremendous effects on this industry. Again, 10 or 15 years ago you had computers that consumed a room maybe a half or a quarter this size and cost several million dollars. Today equally powerful computers may be only as big as this

console and sell for $10,000 or $20,000 while doing things a heck of a lot faster. All of these things are happening.

The results that we are going to achieve are going to help get business done better, not just improve the office for the sake of doing something new to offices. Automation will help get business accomplished, the actual business of the business. It will help to get products to market, perform services a heck of a lot more effectively. This technology is an absolute driving force. That is why there are gimmicks around. There is so much technology that is being developed, that technology is becoming the wrong end of the game. The tail is kind of wagging the dog. There are so many new techniques and so many capabilities, improvements in applications and increased speeds coming out that people tend to be mesmerized. They frankly can't be all used effectively.

People have a computer in a dispersed data processing work station today and that computer is idling. It is using probably 10 percent of its power if it is just doing one particular application. The key is to integrate other applications, to systematize it and put other functions on it. This will be the kind of a thing that is occurring and making systems more efficient.

The velocity of change is tremendous. There is absolutely no question about it. Good old Alvin Toffleer talked about that and told us what was going to happen ten years ago. He also said something in his last book The Third Wave, that has recently been published. He talks about the concept of demassifying. That is what really is going to happen.

I like to think to my days with the IBM Corporation and the days of the main frame as being back in the age of the dinosaur. All of the main frames, although they obviously will continue to be there, to control massive files and all those things, have diminished in importance over the decade. The capability to provide the power of a system in a small minicomputer, microcomputer based product on the other hand has grown within a processor the size of a typewriter a quarter-of-a-million, a million bits of semi-conductor storage, megabites of mass storage can exist. The same machine can provide all kinds of printing capability and the logic and the systems and the screens and all the functionality necessary to provide you with a multiplicity of functions. These powerful small processors really are coming. It is absolutely an historical imperative.

This is what is happening. The fact of the matter is that function and performance are increasing tremendously while the price and space required are coming down. That is, by the way, just as important. You cannot do a thing in an office if it is going to take up, you know, 40 square feet of space. The equipment has got to be about the size of a typewriter. There are no scientific equations

involved in it. That just happens to be the way things have evolved. It is kind of like the size of a baseball. I don't know what it is, but if you want to play baseball you have got to use a National League or an American League standard sized baseball. It's just the rule of the game.

You have seen examples of some of these things in the '70s. There are going to be a lot more in the '80s. The examples in the '70s were: data communication terminals that talk to each other in spite of the fact that there are not compatible standards in many areas. They talk to different computers. They are digital and they have RS-232C kinds of interfaces. There have been some protocols. At least there are a dozen or so protocols that everybody does. So, there are numerous communicating data processing terminals.

Digital telephones. A digital telephone was a dirty word ten years ago. You couldn't say that in an AT&T dominated communications environment. But, today it is happening, they are available and they will become increasingly available. They will be treated just like a data terminal. They are one and will be the same as we go on.

Communication word processors. Ninety percent of the word processors that exist in the world, the 350,000 of them, aren't communicating. But, that is, and has been gradually coming. The electronic PBX, the ones that are worth anything, are all digital. They are processing analog voice from telephones on a digital basis and have the capability of doing the store and forward voice, store and forward data, and store and forward facs as the future evolves.

Computerized telephone management systems. The kinds of products that we have offered at Datapoint have addressed themselves to an area of the business, an area of the office, that too many of us just pass by because it has been old and plain and black and sitting in the corner and doing nothing but ringing every once in a while. That is called the telephone. It is called voice communications. There are too many people in this whole office automation enterprise that have either come from the data processing side -- where most of the automation has occurred -- or from the word processing office administration side where some of the automation is occurring. Very few people have concerned themselves with the most common means of communicating and exchanging information, the whole telecommunications area and voice communication. That is something that we have tried to consistently do for over five years in our company.

One of the things I want to do is give you an example of how we have integrated our product line. It will take me a few minutes to do it.

We started as a corporation eleven years ago and we produced a dumb terminal. It was a CRT replacement for a Western Union terminal, a teletype. We developed about seven years ago what we called distributed or dispersed data processing. Datapoint, along with Four Phase, and a couple of other companies, were the early people who got into the concept of putting the power of the computer out where the action was. We developed our own minicomputer, our own software languages and our own operating systems. Today, our Corporation and quite a number of other corporations offer truly powerful distributed data processing systems that have a quarter-of-a-million, half-a-million bites of semi-conductor storage and millions of bites of mass storage. They are supported by a good operating system, a disk oriented operating system. They are supported by COBOL and FORTRAN, and proprietary languages. These are the products that have been the leading edge in applying the computer to office tasks which are data processing application oriented.

As Mike (Hammer) indicated earlier, that is the first area to address, the natural flow of computer power to a given office application. This is what has been happening. These systems have been applied to accounts payable, small payrolls, personnel jobs, general ledger, the wide gamut of office tasks; but each system is located in the office where the task is performed.

The next thing we did, about five years ago, was to develop a line of equipment that controlled voice communications. Now, it is interesting to see that people are considering voice as part of the office environment. They are beginning to see that it needs to be controlled and it needs to be integrated with data, particularly in a storage and a transmission mode. And, voice needs to be used as an annotation device for documents or forms. We started meeting that need with a whole line of equipment called communications management products. We have about 900 or 950 of these systems installed in American industry today. The voice management systems do the job of helping people manage this whole voice communication area, as one of the basic functions in the office.

The next thing we did was develop a systems architecture three years ago. We called it ARC, Attached Resource Computing. It is a systems architecture that employs a high speed coaxial cable and software which allows all processors in a system to be attached to one another. The speed at which information flows is 2.5 million bites per second. It is, as you can tell, high speed. It operates in an architectural structure such that common files are shared by different application processors. All application processors, or multi-function work stations -- call them what you will - can be addressing other functions and other files and other application processors. It is a coaxial cable approach to this local communications problem in an integrated office. It is the basic method of integrating all of these features and functions. In the

last year or so Xerox announced something called Ethernet and in the last few months a consortium of companies, Xerox, Intel and DEC (a pretty powerful combination), have formed an agreement. They are going to create an interprocessor standard, in the Ethernet fashion, and provide the world with a common interoffice, local network communications capability. Maybe this is the kind of thing that some of the earlier questions were addressed to. I hope that the three companies can do it, because when they do it and they decide what all those protocols are, we will make our ARC system compatible with it and we will have the powerful ability to communicate with one another inter-system.

Once we established the ARC network, the local architectural approach to an interprocessor, office-oriented, multi-function work station capability, we integrated not only the data processing capability, but also voice communications, word processing and electronic messaging. Those capabilities are integrated from a functional standpoint and most of them reside in the smart computer-based processor. So, it is a beginning. I certainly don't make the claim that it is nearly as sophisticated as what we will see over the coming years. But, it is the beginning of truly integrated, multi-function work stations where the system not only does data processing, but also does word processing; and the word processing and the data processing are integrated. You can access the files and have combined operations. The word processing serves, if you will, as a mailbox for an electronic message system. Through the interprocessor bus you can communiate with all the other processors on the line and obviously outside of our office building over the common carrier networks. Our approach is a global approach, a strategic approach towards the intergrated electronic office.

What is going to be happening is more and more functions are going to be addressed into a loosely woven, in my judgement, minicomputer-based series of processors. These processor or controllers taken together will form, in the aggregate an office supercontroller. The beauty is that the supercontroller will be able to be built step by step, application by application starting where the business needs to get the best bang for the buck.

If the biggest problem is getting invoices out and typewritten information out, maybe the word processing approach is the first one and that is what a company should start with. If it is data processing, then maybe that is what they can start with. If it is an electronic message system and the company needs to improve their services, maybe that is the way to do it. But you have the opportunity to pick any one of those areas, start with it, know that it is compatible and know you can grow from that as your needs grow in the future.

I think that this is the kind of thing you have got to look for in thinking about your planning for constructing the electronic office. You need the kind of expandable modular systems that will permit you to be able to grow and be flexible. The systems must be compatible without any question.

Believe it or not, there are single, major corporations in this country who are offering several different versions of the electronic office, depending on which division you buy it from. I would never mention the name of that company.

There has got to be some sound strategy on the basis of the vendor that really has to be well thought through. It has got to be articulated. It has to be open. You should know where the vendor is going and by his actions and experience in the past, you should know what he has done in the past. Look at it and examine it. There are a lot of things that are said today. There are a lot of good intentions that are being stated today, but the question of whether or not they are all going to occur is another matter.

The elements of the intergrated electronic office. I am not going to go through these in any great detail. We all know what they are: word or text processing, the whole idea of electronic typing; electronic message systems, as such, switching if you want to call it, but the ability to get information to another location much faster electronically than we have in the past through taking it and transcribing it onto paper and then mailing it, et cetera; data processing, we all know what that is. Most of us come from that kind of an environment, however, I will make the qualification that the data processing I am talking about is distributive data processing, dispersed data processing. That is going to be key. That is the most automated part of the office and that is going to form the most effective base for expansion and extension under economic and viable kinds of restraints.

Voice communications. The long forgotten part of the business because for 103 years it was a monopoly and it has only been opened up to young, new, creative approaches in the last seven or eight years effectively, although the FCC rules have been out for about eleven years. The fact of the matter is you are going to see significant kinds of things being done in this area and companies like ourselves and others have already made some equipment and addressed these areas to make it a great deal more efficient.

Facsimile. We talk about electronic mail and we talk about the typed and printed word. Actually, I know a lot of companies that think of electronic mail as FAX and as pictures and, by golly, that is the way it is. That is the way their business runs and that is their version of electronic mail. So, our whole integrated electronic office must admit the existence of that and play it as a part of the system.

Video image, video conferencing, the game of teleconferencing. IBM Satellite Business Systems studies say that 20 percent of meetings that are held in American industry today are well-structured, include people who know one another, involve knowledge which is quite common, and they could be replaced by video conferencing techniques as opposed to getting on airplanes and flying around. I believe that. I find that true in our business. I think you might also find that to be true.

The whole data communications area. The standard volume data communications will always be there.

Here's an example of how these things might be integrated in a given application area. One of the favorite subjects of a company like mine is the whole invoicing, cash collection end of our business. Typically in this kind of an environment a bill is prepared and an accounts receivable file is established at that time. At that time also a file is set up, the entry is made into the data processing file and we have accomplished the first step in our process. But, as things happen, there has been a problem and you receive a partial payment from the customer. In this case, if you did have that data processing terminal, did have a word processing capability; you could use it to type a letter to the customer, make a correction in the file, get their correct bill out while only entering the changes that are necessary. To do this, interaction to the data processing files is key. We tie in the word processing in that fashion.

But, the fact of the matter is that the people who really collect the money are out in the branch office. This is not atypical. The guy who knows his customer, is located close to the customer and collection is done in the branch office. He needs to have a copy of the invoice in the branch because the customer's handwriting is on it. So, he sends it. The notes are needed. We therefore facsimile a copy of both along with the file.

In the branch office they call the customer for the collection. The phone call is controlled by a computerized telephone system to make sure that it is least-cost routed, to make sure it may be merged with all that other traffic that is going back and forth; that, if you will, it is at least interleaved. If it isn't packet switched it is at least interleaved between data and facsimile. We get that done on a least-cost basis and all of that communications cost is tracked and accounted for. So, at this point we have controlled the voice and we have brought that in as an element.

Now the branch office collects the money. They format another message that says, "We have it all resolved," by word processing. Using the electronic message capability of the system, they mail electronically, the same day, all of this information back

to the home office. All the files are updated. The customer is in the meantime sending in the money that is necessary. We therefore may have reduced the time involved in that transaction from a couple of weeks to a day or so. Therein lies the value of the system. A transaction is done a great deal more efficiently. There have not been a lot of retransmissions and repetitious clerical efforts. That is fine, but the key is the business is run better. The customer is served better. His difficulties are resolved. The cash is acquired much more quickly and this is the major result of business.

On a weekly basis all of this information can be transmitted out to the data communications terminals on a volume basis. Perhaps on a monthly basis, instead of everyone flying to meet each other we could have a video conference.

If you try to take away the piece of equipment they have today the clerks will damn near kill you. They love it so much and the people have done such a good job in using it. There are other people who fight new systems and don't like them in general. They are terrible. They have been imposed from above. They don't understand automating for the greater good of the department. Their reactions are understandable. They have to understand why it is going to help them do their job better, eliminate the drudgery, whatever it might be. Those kinds of systems that help workers are available today. The systems can be made to be friendly, easy and perform in English language. It doesn't have to be a nasty system that is going to harp on the operator.

What can you do? As I said earlier, you have got to understand what it is we are talking about. These kinds of conferences help everyone to learn about what is available in the industry, to learn the concepts, the basics. Please be aware of some of the new things that are involved, like voice. Work to establish a commitment in yourself and your company that system integration is really beneficial and can be done. Show the willingness to invest, frankly in a policy effort. It has got to be done that way. That is the only way you can really get the bugs out of any aspect of a system where there is going to be any kind of a major element that is going to be involved.

Obviously planning at the top for the financial and the managements leads, hiring and developing the people is important. You have got to look at something that is practical something that you can get done now, but the reality is you have to look over the long-haul. Sooner or later you are going to get it all done.

Thank you very much.

THE PRODUCTIVITY ASPECTS OF OFFICE SYSTEMS

John D. Hogan
American Productivity Center
(now with The Variable Annuity Life Insurance Company)

INTRODUCTORY REMARKS

I would like to be able to lay out for you a number of research studies on the productivity of office systems, summarize the strengths and weaknesses of each, and interpret the resulting knowledge in terms of good practices you should follow to obtain specific productivity results. There is, however, no such bounty of research. There are case studies of apparent good practices and successful outcomes, but few careful research studies that associate given office systems with measured productivity effects.

The leading edge in office systems is technology -- the automated office, office of the future, and integrated office systems that compete for our attention in journals such as Datamation, Info Systems and Computer Design. There is little question that the existence of the technology compels us to consider its use, leads us to imagine various configurations in our organizations. The more exotic the technology, the more resolutely should we remind ourselves that systems are designed to serve needs, but even the most urgent needs cannot be accommodated at every price. Cost justification, careful design and preparation, and sensitive implementation are the keys to successful employment of office systems technology.

This presentation is, therefore, a consciousness-raising effort to share views about the white collar productivity problem, the potential in office systems technology to improve productivity and some of the promising appraches to realize that potential.

The office problem or white collar productivity problem comes to us in various guises but the principal manifestation is rising costs. Relative to production workers, white collar workers are an increasing burden in most organizations; the proportion of white collar workers exceeds fifty percent of employed workers and accounts for more than sixty percent of compensation costs.

The costs of the "office" are better appreciated as information handling and processing costs and include personnel, equipment

and software. These costs have increased dramatically. In 1946, for every dollar of information expense $3.26 of goods and services were produced; by 1974 only $2.78 were produced. The likelihood is that the trend has continued in recent years.

Estimates are that the productivity of office workers over the 1968-78, period increased 2.3 percent, while productivity of factory workers increased 18.5 percent. The tendency is to attribute low productivity in the office to low levels of capital investment per employee. Estimates of the investment per office worker indicate it is only one-tenth of the investment per factory worker and one-twentieth of the investment per farm worker.

While the numbers surrounding the office technology problem are dramatic, the management of office workers, especially skilled information workers, is widely perceived to be a serious problem. Morale is low among these workers due to threats to their status resulting from pay compression and such job-related issues as overspecialization, uneven flow of work, and inadequate information and decision support systems. The management challenge is to control the rising burden of costs and simultaneously cope with morale and work-related issues. Competitive pressures in the national and international markets are forcing attention to the office problem.

One part of the solution is undoubtedly office systems technology. However, a strictly technological approach to improvement of office productivity is doomed to failure. The nature of information work and information workers, office practices and perquisites that have become institutionalized, and the role of the office as an information handling and processing system force attention to organizational behavior as the critical variable in the office situation.

Information workers. The characteristics of information workers that set them apart include the following:

- Substantially more costly than all other kinds of labor;
- Tasks almost all information oriented;
- Not yet influenced much by information technology beyond automating traditional paper flows and clerical routines;
- Resistant to change in ways of handling own information and communicating with others;
- Not oriented to thinking in explicit cost-benefit (productivity) terms of his own activities because of lack of knowledge, disinclination, or not being requested to do so;

- Work is unstructured -- difficult to describe and define.

The challenge, therefore, is to (1) accept the characteristics of information workers, (2) use the power of the existing information technology to assist them in their tasks, (3) find the most cost-effective personnel and technology combinations, and (4) to develop a method of measuring these most productive combinations.

Why have we made so little progress in this effort to date? Some of the reasons are:

- Lack of knowledge on how to create the most cost-effective combinations of personnel and information technologies.

- Resistance to change by information workers.

- Poor measurement and accounting systems.

- Inadequate systems to bring technology to the service of information workers.

- Organizational inflexibility

- Unavailability of commercial systems to integrate needed technologies.

THE IMPRINT PROJECT

IMPRINT is an acronym for IMprovement of PRoductivity with INformation Technology. The project is a cooperative effort by the Center and sponsoring organizations to conduct research on the questions that surround white collar productivity.

The project concentrates attention on (1) analysis of present work; (2) analysis and design of change; (3) creation and application of productivity metrics to the present work system; (4) changing work systems through tecnnology and other interventions; and, (5) analyzing and interpreting results.

An office systems laboratory has been contributed to the Center and will be operational in the third quarter, 1980. When completed, the laboratory will have one of the most comprehensive office systems in existence for research purposes. Supplementing this facility will be office systems in sponsoring organizations which will also serve as test sites.

Among the major research outputs sought in this project are the following:

- Techniques and instruments for organizational intervention and assessment;
- Productivity measurement and accounting systems design for information work;
- Guidelines for managing office systems technology pilot projects;
- Case studies of cost-benefit resulting from office systems technology projects;
- Guidelines for technology evaluation and integration; and design of man-machine systems for information work.

SUMMARY

The state of knowledge in productivity research as it relates to white collar workers can only be called backward. Very little is known about productivity and organization variables such as high or low morale, job satisfaction, or degree of participation in organization decision-making. The parts of skilled information work that can be delegated to office system technology are also shrouded in doubt. Measurement of information work in terms of either output or productivity is in a primitive state. Research projects that can fill these voids in knowledge are sorely needed. Project IMPRINT and other office systems research projects in operation are expected to enhance considerably our understanding of information worker productivity.

UNITED STATES AIR FORCE PROJECT IMPACT

John Zaner
Air Force Systems Command

I would like to begin by giving you a little of the background of Project IMPACT. The primary motivation behind Project IMPACT was a study conducted by the Air Force in the 1975-76 time frame. This study pointed out that although the Air Force work load was going to be increasing, particularly in terms of information gathering and dissemination, the workforce to support that collection and dissemination process would decrease or at best remain constant. Faced with that situation, Air Force Systems Command established Project IMPACT in 1978 to investigate the possibilities of using office automation to improve productivity in the information use area. Its objective was to modernize systems management and systems acquisition operations in Air Force Systems Command, but with an understanding that the cost of the implemented tools had to be offset with gains and productivity of the clerical and professional workforce.

In initiating Project IMPACT, our past experience indicated that many of the successes or claimed successes in office automation had not really reached the potential that was forecast for them. In fact, failures were numerous and expensive. This was true, not only in industry, but in the government as well. One of the biggest problems appeared to be a lack of acceptance by the user. This was both from the standpoint of people not wanting to change the way they did things and from the standpoint of having systems that were not oriented to the user. There was a perception that office automation was difficult to use and therefore not acceptable. Further, the cost of what we proposed to do was not really defined. Therefore, we found it was very difficult to measure increased productivity when we did not really know what we had in our current manual system.

So, our general conclusion a couple of years ago was that we should move very cautiously in this area and attempt to have a lot of people involved in it, especially users and implementers.

We established Project IMPACT consistent with our overall program management philosophy. We set up a program office to manage the program. We hired a prime contractor, Booz-Allen & Hamilton, to support the program office and, we are conducting it as a multi-phased project. The first phase is to evaluate what is going on in government and industry in terms of office automation. The second phase is to conduct extensive interviews and select candidate systems for prototype testing and candidate hardware for implementation. The third phase is to design a prototype for implementation. Phase four, is to implement and test that prototype. This is the phase that we are in now. The fifth phase is to document the results of the prototypes and measure them against savings that we projected in Phases one and two.

One of the interesting aspects of IMPACT is that we chose to use a product orientation rather than a functional one. Within our field organizations there are a number of products that are produced over and over again. For example, if we are going to acquire a weapon system we need a request for a proposal, we need a statement of work, and we produce any number of technical documents in support of that weapon systems acquisition. So, we chose to look at each product and follow it through the flow of the organization, identifying those which were labor-intensive and those where there was a high pay-off in using automation.

We collected information concerning the products by conducting extensive interviews from the commander right on down to the working level. Based on the interviews and some measurements, we established the amount of time that went into the creation of each of the various products in terms of the tasks supporting the product and the functions that were performed in support of producing the products.

We got some very interesting results. First of all, and it didn't surprise a lot of people, the number one product in the Air Force Systems Command is briefing charts. It is the way we run our organization. The Air Force Systems Command management style is based on briefings all the way up the chain of command. Based on the results of the inteviews, and using a computer system to help us reduce and analyze the data, we prepared a product oriented list which shows the greatest consumer of man-hours down to the lowest consumer of man-hours. When we originally did the study we came up with some 220 products. We couldn't fully analyze that large number of products so we conducted another series of interviews to identify those that were really the most critical.

Chart 1 represents some results of our examination of one of our major organizational elements, what we call a product division. We have six product divisions in Air Force Systems Command: Ballistic Missile Division, Space Division, Electronic Systems Division, Armament Division, and the Aeronautical Systems Division. The results of our analysis produced figures which were fairly constant across all product divisions. This particular set turned out to be most interesting. The first column (Ct) represents the percentage of total hours of clerical people doing clerical things. The second column (Pr) represents a professional person's total work activities. The third column (PCt) represents a percentage of the value (Pr) which a professional person spent doing clerical things.

Some of the products on Chart 1 may not be familiar to everybody. The briefing is, in fact, a briefing much like the one I am giving today. In terms of briefings, this product division produced 17,020 a year. The total number of hours that went into the preparation of briefings represented 120,000 man hours a year. The second line is the time to prepare and process a contract through the procurement shop. The third item is for travel orders. We found that it costs about $90 a shot to prepare a travel order and yet they serve only a minimal useful purpose. We spend a phenomenal amount of money preparing travel orders and everybody agrees that we should get rid of them. Consistent with this type of finding if there is no use for a document, we intend to get rid of it.

The next two high interest items on the Chart are the preparation of specifications for a contract, and the development of integrated logistics support plans.

While reviewing our findings, we have found that some other interesting conclusions can be derived from the numbers. For example, if we look at the current labor utilization in this particular product division, half of the time that went into products is professional time. The other half is clerical time. Even where it is a professional doing the clerical work, the mix of work between professional and clerical is 50-50. If you look at our current mix of people, we have four professional people to every clerical person. So, there may be something wrong with the figures, or maybe our estimates in the past of how many people a clerical person can support are erroneous. We are implementing a prototype system to prove whether or not such hypotheses are correct and whether it is possible through office automation and local management information system (MIS) kinds of techniques to recover 47 percent of the clerical time spent by clerical people and 18 percent of the time spent by professionals doing clerical work. We believe these figures to be conservative. We have enough evidence to back us up

that we can make those kinds of projections and feel very comfortable with them. Of course, we will know a lot more by December or January when we start getting some of the actual results of the prototype implementation.

However, some of the recommended improvements are so obvious that we are not waiting for the prototype. For example, the preparation of briefing charts: it is obvious we can increase productivity through some sort of a graphics processing system. So, we have planned, and are now involved in implementing, a centralized graphics processing system in our products divisions that can eventually be integrated with the office automation function. The elimination of travels orders is another obvious recommendation.

What will the prototype look like in a product division? In each product division, we have the commander, his various deputies, who are like vice presidents, and then under the deputies a number of special project offices. The latter are special offices to acquire a major weapons system, such as the B-1, or the F-16. Each is a self-contained team, set up for that particular acquisition. The program manager, who heads the team, has the management and functional people necessary to support the acquisition of the particular system. What we will provide the program manager is a distributed capability implemented within his program office for text editing, electronic filing, some very simple management tools, like managing a schedule, some local information retrieval and very limited data processing. In fact, that kind of capability that can be implemented on a fairly complex word processing system. At the deputy level, we will centralize some more sophisticated MIS capabilities and some product functions. Each system will augment the user. For example, if you want to prepare a contract, a tutorial system would lead you through the preparation of a contract. The procurement specialist sits down at the terminal and says, "I want to prepare a fixed price contract." And, the system goes through all the various clauses that are candidate for that contract. He can strike out information that he doesn't need. He can supplement it at any point. That part of the prototype has been implemented and it has been very well received.

The particular installation looks something like the simplified portrayal on Chart 2. The implementation at the deputy level is on a large minicomputer, the one we are using in the prototype is a Prime 550.

One of the most significant aspects of the prototype implementation is that we are making maximum use of the vendor supplied data base management system rather than develop our own unique software.

Within the program offices we have several word processing systems. One of the side issues involved in the prototype implementation is to evaluate word processing systems that are available on the federal supply schedule. To do this we have seven different kinds of hardware and 30 software systems installed. We have evaluated at least one of each of all the word processing systems that are currently available on the GSA schedule and are collecting information on user reaction, environmental considerations, and other related items.

IMPACT is looking at office automation, anything that can improve productivity in an office, from word processing to executive telephones to electric letter openers if that will improve productivity. We also have another program, the Command Management Information System (CMIS), which views IMPACT as a source data automation mechanism for collecting management information, rather than have people in the office environment use a word processing system for preparation of correspondence, electronic mail, and then turn around and feed some other kind of terminal into a management information system. Some of these people currently have four or five different terminals in their office, one for each different kind of MIS that they need to feed. We want to start integrating them and tap the information out of the word processing systems at the source. That, and the integration of information up through the chain of command to the commander, are the major emphases of the CMIS program. In that program we currently have an initial operating capability where our commander, General Slay, has direct access to some decision support capabilities that are coming in from the program offices.

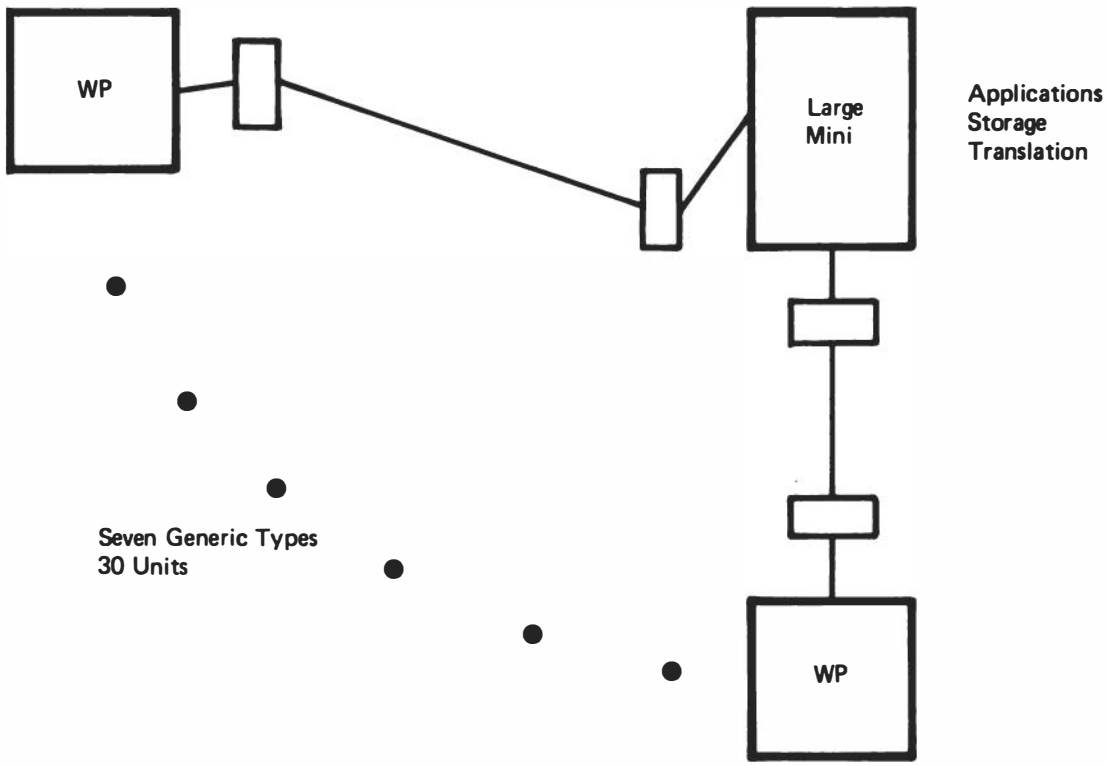
In the future, we see a combination of the Command Management Information System and IMPACT. Each has their separate place in the world and we are currently treating them separately during the study phase of IMPACT. However, CMIS will provide the implementation vehicle for IMPACT probably next year.

I thank you.

CHART 1 Quantitative Results

Pro	No. Yr.	T_T Hrs/ Prod.	Total Hrs/ Prod.	Percentage C_T/T_T	P_T/T_T	PC_T/P_T
Briefing	1,720	70	120,000	.34	.66	.45
Contracts	85	945	80,000	.31	.69	.06
Travel Orders	16,000	4.2	67,000	.76	.24	.33
Specifications	55	1,126	62,000	.40	.60	.06
ILSP	50	1,240	62,000	.19	.81	.18

CHART 2 Project Impact Test Configuration



AVON'S OFFICE SYSTEM

John Walsh
Avon Products Incorporated

Avon is a large company. It is 14th in the Fortune 500. You probably know us for our fragrance sales, but we are also involved in marketing cosmetics, clothing, and jewelry and we have been very profitable for a number of years. We have approximately 35,000 employees; one-third of those we classify as clerical/professional employees.

We have 1.2 million sales representatives worldwide, and about 400,000 in the United States. These people don't work directly for Avon, they are independent contractors.

The major corporate objectives that I am faced with are to improve profit margins, enhance product line appeal, and provide service support to those marketing representatives.

One of the first things I would like to do is talk to you about the organization within Avon products because this is a key issue for a lot of corporations and government organizations right now. What is the optimized manner in which office automation, telecommunications, administration, and data processing should be organized? Within Avon products we have consolidated it on a worldwide basis. The whole group of directors, five of us, report to a single vice president. Our decisions impact the entire data processing, telecommunications and office automation aspects of our business worldwide.

We meet on a regular basis, about every two weeks. We meet and talk about our project activities. The managers who work in each of the respective areas present their projects to the group. We look to see if there is commonality or conflict and we decide about different optimized approaches.

One of the things that we have done is we have consolidated both telecommunications and office automation under a single person. It is getting harder and harder for me to differentiate between the telecommunications role and the office systems role. In fact,

sometimes when I talk to the office system people I tend to switch into some telecommunications discussions and they pick it up very easily. Two years ago it wasn't like that, but today it is.

When we study a specific need within our company, we follow a standardized systems development methodology. Whether it is the people who work for me or the people who work for those development areas, if we are going to go in and study the needs of Product Cost or Purchasing functions, or a manufacturing area, we all follow the same methodology in analyzing the particular needs of that area.

Generally, the user will request our services. Sometimes the user is not sure whose services to request: my services or the services of the development people. Because the development people in most Fortune 500 companies are backed up about 18 months in terms of addressing significant projects, more and more users have been coming to us looking for a backdoor solution.

The check and balance on that is that we do follow a systems development methodology. We will get into an initial survey and if at that point it becomes obvious that ADRS-2, or CMS, or something like that is the obvious solution for the user, we will hand that project over to our development people. If it is not so obvious, if perhaps a distributed office system approach that type of thing becomes apparent versus ADRS-2, we will proceed along and get involved with a feasibility study. We might even get into an in-depth study phase and then decide that there are five or six alternatives. Then, we sit down as a group and collectively decide what is the best approach.

Sometimes the best approach is not the approach that we take because we have constraints on our staff, on our resources. We have capacity requirements that we have to address in terms of our resources; or the development staff is limited because they are working on a set of other projects.

But this methodology has worked well, because we do not have to go back and re-invent the wheel once we get into the feasibility phase and it is obvious it should be a development project, we can essentially take the completed review work and it is transparent to that area.

To give you an idea of the complexity of the environment that we work in, on a worldwide basis we have approximately 100 different computer systems. We consider our 370's really to be obsolete in terms of our capacity needs. They are all migrating to 4331s or 41s. From a standards point of view we have to address systems solutions on a standard perspective because we just don't have the resources to go out and install seven different word processors, for instance. What we try to do is we try to optimize the selection of equipment on a worldwide basis. It is not always so easy, because I am faced with

import problems in Brazil or something similar in Germany, but generally we optimize the use of our resources by a standards approach.

Further, to illustrate the complexity of the environment, most of these computers are communicating with each other on a peer-to-peer basis in terms of the transmission of production allocation or inventory or sales estimating information. This is just a small portion of our network reflecting the European situation. Over and above this there are message switching systems, that are switched out of London, Hong Kong, and McLean, Virginia. At a different level, there are voice networks. We are transmitting digital data in the form of facsimile over this network. So, there is a lot going on in terms of the telecommunications resources.

In 1976, when I was assigned the responsibility of implementing office automation at Avon Products, the thing that was missing was a conceptual overview as to what was office automation. We had a perspective that office automation was word processing, at that time. Obviously it was more than that, but we could not quite get our arms around the concept. We certainly did not have a frame of reference as to quantifying the concept as to what office automation was about. John (Hogan) referenced that and the need for that.

One of the things we did in New York City was to ask the vendors who else was involved with office automation. They told us that companies like Union Carbide, RCA, and Exxon were involved, that the Department of the Army was involved, the academic community, MIT and Wharton were involved. So, we started calling on different people and saying. What are you doing? What is your concept? What are you looking at and what is your migratory path? What are your organizational thoughts?

In 1977 we put together a group of 12 of these organizations and we called it the Office Automation Round Table. It is not a formal organization, it is informal; although we do have by-laws.

The idea was to have a small, limited membership, corporate, government and the educational community and to meet on a regular basis and to share practical experiences and ideas, and to have that membership evolve because we felt that it would be a dynamic environment and it should change, but it should always be manageable in terms of the size of the group. Our objectives were to influence office automation hardware, software development, standards; identify common problems and not reinvent the wheel five times; influence management direction as to what this was all about; and broaden the understanding of management and the people involved in this regarding office automation and also the users; and to establish guidelines and standards for achieving an evolutionary path in office automation.

Bob Dickinson, from Exxon, came forth with the concept of the business communication system. His concept was that there is very little difference between the way John Hogan works and the way Jack Walsh works. Essentially, we create through thought something we capture, whether we write or we dictate it or someone keybords it. It is stored, retrieved, and disposed of. Dickinson said, "Those steps can be quantified and measured." He said, "The difficulty is in how to do it." But, he said, "If we are going to seek office automation in the corporate environment, we had better be able to quantify it and qualify it so that our managements will make the resource commitments in terms of organization and capital."

We wrestled for a long time with a definition as to how to quantify and qualify those steps. Essentially we said that office automation involves the functional integration of a host of technologies that can be overlayed on each of these steps. It is centered around communications and the key to it to us, in terms of the pay-offs, are decision support systems: providing automation tools to those people who are making major decisions for the corporation; not looking at secretarial productivity where perhaps you will net five or six percent as far as total secretarial cost opportunity and you might net that one-eighth of a secretary. That is really not a hard dollar savings. It is better to look at those pay-outs where you can go to the treasurer's department and find someone who is investing $50 million and offer that person access to information so that he or she can make a better investment decision. Perhaps that translates to a 10 percent opportunity, that is $5 million per annum.

We also felt that there were things that were extremely important, other than the technology, including organizational factors, formalization of policies and procedures, environmental, human factors, and also, internal and external business factors. Of course, whatever we developed would have to tie to our business plan. Economics were a major consideration because of the major capital investment required.

IBM shortly afterwards said essentially the same thing. This confirmed in my mind the integrated synergistic nature of the technology, the users and the functional needs.

At that time, we were very confused by the proliferation of vendors who claimed to be in the office automation marketplace. We subscribed at the time to Datapro and Auerbach, and as we started to read through those thick manuals we became somewhat befuddled by the type of system I was looking for. So, we prepared a general RFI that we mailed to each of the vendors listed in those books. We said, "We are not sure what we are looking for, but we are looking for an information based system to meet our general requirements for both management, secretarial, clerical and professional staffs. It should

be software based, it should offer flexible communications, it should fit in in a transparent manner with our data processing environment, and it should offer vertical and horizontal modularity to meet our changing and flexible needs."

We structured this RFI objectively. We defined our criteria as equipment, service support, economics, contractual terms, and financial stability, We had a predisposition towards dealing with vendors like IBM and Xerox because of their ability to service our organization, but we were somewhat surprised when Wang Laboratories emerged as the company best able to meet those total requirements. They met those requirements on the basis of a number of considera-tions: the friendliness of their system; the marketing response; strong vendor interest in our needs, not only short term but long term; a willingness to divulge their planning scenario, which was important to us in the longer term. We weren't looking for short terms solutions, we were most interested in the longer term scenario. We were more interested in an information based system than a word processor. We recognized at the time the need for a communications, information-based, modular system.

We looked very hard at Wang and selected them as our standard for office automation text/informaton processing systems.

As John (Hogan) referenced, one of the most difficult things was to gather hard facts about our organization. When we went to our management and spoke about our plans for office automation, they said, "We really don't understand what goes on as far as the administrative side of the business. Let's find out about it." So we talked a little bit about some of our concerns Essentially, they are the same as most large organizations: rapidly rising administration costs, increasing personnel requirements, inefficient distribution systems, paper proliferation, inaccessible information, increasing reporting requirements both internally and externally, and, of course, the sorting and retrieval of paper, which in our case was becoming increasingly expensive; more and more information requirements, more and more cost, more and more personnel and flat white collar productivity.

In our company the thing that gets management excited is increasing corporate profitability opportunities. So, we presented our scenario with that as the lead item. We also had the intention of orientating our management on what office automation is and what is the potential for it. We wanted to also talk to departmental management. We wanted to build a technology profile, just like I mentioned, in terms of our RFI. We wanted to have feedback with our corporate steering committee on an ongoing basis so that we could communicate to the president and senior management, establish this group as a very dynamic organization in terms of maintaining state-of-the-art expertise and knowledge.

We wanted it to be a fluid and flexible group and yet, at the same time, have an orderly path towards the future in terms of the integration of communications, data processing and office automation.

So, with that as a framework, we decided to do an in-depth study of the administrative operations within Avon Products. We wanted to learn about the requirements of users, both professional, technical, clerical and secretarial. We wanted to learn about procedures within the organization, both formal and informal. We wanted to know about the interrelationships between users in different departments. We wanted to address administrative work solutions and needs of both professionals and secretarials, as I said, with information on their current information requirements, information requirements that are needed that have not yet been identified, and information requirements that are not needed, as well as future information requirements. We wanted to know about information processing: manual information processing; distributed information processing; text processing.

So, we did an in-depth analysis of a 2,000 person population in our headquarters in New York City. We wanted to look not only at classifications of workers, but we wanted to look functionally at classifications of workers. We wanted to study R&D workers. We wanted to study administrative workers. We wanted to study marketing workers. We felt then, these would be different by category. We wanted to look at the support staffs of each of those functional areas because we felt their needs would also vary.

The tools we used -- and I am simplifying this -- were questionnaires, interviews, logs and file sampling. The procedures were to key off questionnaires for specific areas of interest, and then go back and talk to those individuals who indicated a strong interest in a particular type of system or a strong need for something that was not evident to us.

We were concerned about privacy, and the proper involvement of people, because we felt that if we got into a study like this and there were a lot of complaints to our senior management about our probing, we would be finished before we started. So, in all cases, we communicated to people about the intent of the study, which was to provide them with solutions, better tools, better techniques, for doing their jobs. We stressed very strongly we were not there to develop a case to eliminate jobs.

It was interesting. We also looked at single sources of information. We found that many items could not be identified unless you went to some old hand who had been with the company 30 years and really understood the interrelationships between different departments.

I am not going to go into data collection, but you see we used pretty decent sampling techniques, received good returns with the exception of a communications questionnaire which was addressed to many levels of management with emphasis on the senior level and which took about an hour-and-a-half to complete. Our 38 responses were not exactly what we wanted, but it served our purposes to conceptualize on future needs.

We also looked at 22,000 file drawers. I was amazed to find that we have ten drawers for each person in our headquarters organization.

We wanted to see how Avon stacked up against other companies. There wasn't a lot of information around for measurements like this, but we did find that similar studies or partial studies had been done at a bank, at an insurance company, and at a manufacturing company. We obtained that information so that we could correlate our results against their results. We found that we were not that much different than other organizations. We thought we had a tremendous amount of typing. In reality it was significantly less than the others reviewed, although those organizations, two of them, are very transaction-oriented.

We did the same thing for our managers. Again, we found nothing earth-shattering or significant in the correlation analysis other than a lot of time spent at meetings.

I am only going to touch on a few of the statistics uncovered, but I think you will find them very revealing. We found employee statisfaction in the company was very high. Study participants thought it was a fine company. Good longevity with the company, as you see. A very good program, internally, to move people. You will see that people were with us a number of years, yet in their current position for a very short time, indicating a good internal personnel program. Secretarial training is high. We found they were extremely bright, high-level, and really had excellent skills. This indicated to us that in our conceptualization on terminals usage that the secretaries could cope with that quite easily.

Some of our secretarial findings: all secretaries, very traditional in terms of the relationships of secretaries to principals. They spent 29 percent of their time typing. Our study indicated that is about 16 words a minute, which when we netted the whole thing out, is pretty good. We found opportunities to delegate about 10 percent of the manager's time to this group. On communi-
cation channels, we found we had good relationships between the managers and the secretarial staff.

Paper flow. The average document is handled four to six time from creation to destination. We found a dramatic need for improved distribution systems. Of the entire study, document distribution emerged as the most important need in the entire study.

Lets touch on information storage and retrieval. We looked at 22,000 file drawers. We tagged them and did a pretty thorough sampling. What emerged was a need for a formal records management program in the broadest sense. We have decent records management programs in our securities area, in our tax department, in those areas where formalization is required, but on a general basis, we found a strong need for a general corporate program for records management.

One of the most interesting set of statistics that emerged was that only 56 percent of the file drawers are actually utilized, and of that, about half are utilized for business materials. The average document in there is 39 months old. So, when you think about electronic storage and retrieval you are really talking about something that is quite manageable and justifiable.

Dan (Hosage) mentioned this morning, electronic mail. The need in our business is for fast, accurate distribution. Sixty-three percent of our mail was found, on the basis of tagging 10,000 documents, to be required within 24 hours. In actuality, it was found to take two and-a-half days within the same department, three and-a-half days between departments and 4.7 days between U.S. locations. Because of that, 16 percent of the mail was found to be hand carried and 23 percent of the documents that were analyzed were considered to be late.

Data processing. Everyone indicated a need for increased data processing support. Within Avon we have over 2,000 data processing terminals, a lot of online inquiry and access to various data bases, all different types of systems. The users indicated an extensive need to re-format the output from those systems. Generally we would find somebody would be outputting a voluminous report and it would be retyped, and sent to someone where it was further reconsolidated into a final report. We found, as someone mentioned earlier this morning, a high awareness of data processing on the part of the people we interviewed. Twenty-eight percent of the users told us that they had been exposed to various types of systems and many of them could program in basic.

Thirty-one percent of the time of the professionals was found to be spent in meetings, which translates to $12 million in salaries. If you think about just introducing good agendas and good meeting techniques, it is possible to impact that by 10 percent, you can see the potential significance. This alone translates to two cents a share in our case and meetings are an area that not many people talk about. But, just from the practical instruction

perspective, it did not seem to be that difficult to attain improvements in this area. It is just something very worthwhile to think about.

The study also indicated additional requirements were needed for copying and duplication needs; manuals were found that were not used, that were out-of-date, and people were commonly calling specific individuals to ask a question because they hadn't maintained their manuals. We found an obvious need for an internal education program for file maintenance, how to conduct meetings and document distribution. Distribution lists are prevalent in my company. They just expand and expand and expand, despite the fact that on a quarterly basis we ask people to look at those; in reality it is rare that someone takes an individual's name off them.

We found that reports had increased dramatically. One of the most dramatic things we did was to take the computer output for a single month from one department and stack the reports up end-on-end. It turned out to be two nine-foot piles of paper. In some cases, 100 reports were being distributed to users. I was mentioning at lunch today that there is a feeling that if you have got something like a 3800 printer you had better use it eight hours a day or it is not justified. That type of ranking has resulted in a tremendous proliferation of paper.

We found a need for graphics and photocomposition. One of the by- products of this study, when we got into source information analysis, was energy management. I think that was mentioned just a moment ago. As we analyzed our costs, we started to ask questions about monitoring procedures of electrical and steam and oil usage. Then we reviewed the technologies that were available and found that there were a number of mini-and micro-processors available that could control peak demand, reduce consumption, and impact in general the energy consumption area. We began by installing microprocessors (8080A) that were provided by Intel, and we migrated subsequently to IBM Series 1s. In each case we got a payback on these systems, which ranged between $20,000 and $30,000 in cost, in less than a year; in some cases, six months. So, that proved to be what I describe as a golden opportunity. It brought senior management awareness to the function that we were performing. The cost for this entire macro-administrative review, which involved nine man-years, were recaptured on that single project.

At the conclusion of the study, we applied as best we could -- and you have to remember this was 1977 -- what we thought would be the available technologies against how people spent their time. Our conclusion was that there was an opportunity to impact about 19 percent of the professional's time and about 31 percent of a secretary's time. I think the Booz-Allen study came up with a similar conclusions.

We did a lot of thinking about this and we looked at all the available technologies very, very hard.

We presented these findings to our management and informed them that the requirements to move ahead included a strategic plan and an organizational plan. We wanted a commitment to address office automation over an extended period of time.

We talked about a strategic focus for administrative planning. We discussed this as being a coherent focus and stressed it as a very flexible, fluid thing in terms of an ongoing awareness and a commitment to the program.

The strategic plan stated that we would develop guidelines and procedures to monitor and control the general administrative processes within the company. We needed a master plan that looked at internal resources and project benefits on an ongoing basis. We expressed a need to establish controls to make sure that on a regular basis we could review what we were doing against the established plan. And, we needed to define resources that would insure that we would be able to carry out the projects that we identified as worthwhile.

One of the problems is that most of us have a static set of resources and an exponential development curve in terms of projects over time. The delta between available development resources and maintenance resource expenditures becomes larger and larger, and essentially you start to push valid users away and the group starts to look like a traditional data processing development staff unable to touch projects for 12 or more months.

From an organizational point of view, we stated a need for a corporate guidance consultant responsibility for strategy and planning. We stated that this group should be fairly sophisticated and should not be administrative types. They were identified as a combination of administrative, data processing, and communication types. We stated that the group should be involved with research, and development work, in the sense of software, and implementation and post-assessment analysis. The entire process should be planned, orderly, and phased over time.

That is all great, but what has gone on? Over the period '77 to '79 we classified the projects into two categories, stand-alone projects and integrated projects. We developed a very, very large text processing capability using Wang Laboratories systems. Since that time we installed the Wang system and we interfaced it to our mainframe (S/370-N5). We now use our 3800s, for instance, to output from that center. The Wang equipment in the center is interfaced via communications to an IBM 6670. The center has changed over time. It has grown significantly. It has become much more sophisticated. We

have installed approximately 30 different word processing systems, different in the sense of users. The majority are Wang Laboratories WP or OIS systems. We also installed a DEC system (WS202) and have some Vydec equipment which we had purchased five years ago.

The key here on text processing for us was user transparency, flexibility, programmability, the ability to provide a basic compiler to a user who has that need, and the ability to have 2780 communications protocol or 2741 communications protocol, again, depending on that user's need.

We put together a corporate records management task force on the basis of the findings regarding our files and our problems in that area. We have addressed that through micrographics or computer output microfilm.

We have done many studies of administrative needs. I think it used to be called work simplification. We actually do a lot of that in terms of reviewing user administrative needs. Maybe it is elimination of forms or maybe it is reallocation of staff. Perhaps it is designing an ADRS-2 for a user. Or, maybe a Wang OIS. The point is, we look at many different system alternatives for many different users.

A fascinating system we installed was the PARS system, the Passenger Airline Reservation System. When we looked at travel, we found it was not controlled very well and we needed a system that would provide an audit and at the same time online access so that we could ticket and schedule, not only airline, but hotel and car reservations. Using TWA's resources, we installed an on-line facility for our transportation department.

We migrated from analog, six-minute machines, to digital as well as faster analog machines using Rapidfax equipment and linking them to our alternate voice data net-works around the world. We use the CCITT standards worldwide.

Message switching. We had a lot of old ASR 33s and 35s. We upgraded all of them using intelligent terminals, so that we could do editing and front-end manipulation of text and data before sending it over our worldwide networks.

We tried tele-conferencing. The initial thrust was a one-year pilot using RCA's slow scan system. It eliminated a lot of travel, but it really turned people off. It was not interactive enough.

We installed a Compuscan OCR as a front-end to our message-switching system. Every secretary in our environment types on a pre-programed form either in 10 or 12 pitch depending on whether it is ASCII or Baudat code. The front end to the message-switching system reads the form and sends it to either the domestic ASCII or international (Baudat) system.

In the centralized text processing center we initially installed a Wang-30. We had a need to communicate to our mainframe, so we added 2780 communications capability. The Wang system looks like an Remote Job Entry (RJE) terminal to the mainframe.. We dramatically increased the output. We have done some other similar things which I will discuss in a second.

We installed a number of digital telephone systems. These devices have security monitoring and are connected to various doors for office control. More recently, we decided to install a Northern Telecom SL-1 that can handle both voice and data simultaneously and this portends all sorts of things in terms of the distribution of information, including digitized voice as well as other digitized information of all sorts.

Information utilities. We have and use access to over 300 external data bases. Our research people are involved in toxicological, medical, chemical, physical and immunological studies. Our marketing people are curious about what is going to happen with the 1980 census in terms of the way we do our business, our legal research people are always looking at legislative information. We look at the Department of Commerce data bases in terms of our limitations in doing business in places like Brazil or Spain. I can go on, and on. We have an information scientist who runs that system. She has an assistant with a Masters degree in Library Science who manipulates it. It has paid for itself literally dozens of times over.

Current project activities. More administrative reviews are now underway. More people and departments are coming to us for help as we become more well known and accepted. This has resulted in more complex administrative reviews in order to assist departments that have various systems, or that have combinations of systems. Because we now have to address different solutions, our task is starting to get more and more complex.

Distributive text processing. I can't say the word "text processing" means anything in our environment. I think information processing is really what I am talking about. Almost every system we have has some sort of communications either on a peer-to-peer basis or on a distributed-to-CPU basis. We are looking for switching capability in terms of being able to send a broadcast message or a multiple address message between different systems, as well as on a

terminal-to-terminal basis. That whole area is changing dramatically. More and more people are coming to us and saying they need software support so that they can do different things at the local level. They want to control their data and manipulate it locally. That presents us with some problems in terms of formalized procedures on software development.

Expanded micrographics. We are pushing very hard in the area of micrographics to eliminate paper. It is a slow battle. We are having a very difficult time selling the concept of records management. It is like motherhood, baseball, and apple pie. I hate to say that but that is really a tough one to sell, despite the obvious advantages. Yet, at the same time, when I look at the synergism between all these technologies and paper and people it is obvious that a very good records managment program is going to be as important as communications are in pulling the whole thing together.

As for integrated project activities: in New York we are installing a very large digital telephone system, a Northern Telecom SL-1/XL. It is justified on the basis of a competitive analysis of Bell equipment, (the Dimension system), but really in the back of my mind an additional important factor is that it can handle simultaneous voice and data. It will enable us to add terminals for various users. It is an internal Ethernet, in a sense. People can send and receive messages through that switch. Simultaneously with use of the telephone, someone will be able to address my administrative terminal, and be able to send me a message. So, our intention is to migrate with that system from the voice environment into the hybrid voice and data document distribution enviroment. The one piece that is missing is a really good communications based, yet, user transparent terminal for both the secretarial as well as the professional environment. We have tried systems like Qwix and Olivetti and a host of others, but they really don't meet our requirements for the secretarial area. In the management areas we have used TIs and a number of others. They do not fit our universal requirements either.

One of the most interesting projects we are working on right now is an improved method to prepare our brochures. Anyone who has been involved with the emergence over the past year of photocomposition, photo-typesetting, interactive graphics and color graphics, realizes that this is probably the most dynamic portion of the whole information processing revolution. We are working with people like Raytheon, Compugraphic and Harris and a host of others, companies who are looking at how to build a total integrated printing system. We want a unique system, with very sophisticated color graphics, with user transparent terminals at the front-end; that copy-writers and art directors feel comfortable with; with communications to various data bases that reside on DEC equipment or IBM equipment at the front end. We want to integrate our printing

capability into the total system and be able to flow information through and produce excellent copy and graphics.

Teleconferencing. We can't push that enough either. We have had a lot of people who could use teleconferencing. However I think there is a reluctance on their part to leave their offices to go somewhere to use a public facility. We have a feeling that if we could bring teleconferencing capabilities directly into the user enviroment it would work from an operational sense, but not from a justification perspective in terms of eliminating travel. Working in a marketing organization there is a strong need for individuals to get out to the field locations and rub shoulders, and find out what is going on. But, as an operational tool we think teleconferencing has considerable viability, assuming that it can fit in with our other networks. We think if we can justify teleconferencing on the basis of modest cost increment, it will be fine. However, we don't think we will be able to justify it alone.

I am going to cite just a few of the difficulties of working in the current operational enviroment. We had a Wang system working; highly operational, very satisfactory. Despite that, we were still spending a decent amount of money on the outside, especially in personalized letter-writing preparation. We wanted to eliminate that. We wanted to eliminate intensive keyboarding and maintain a high level of personalization in terms of marketing base letter-writing. To do this, we installed an IBM 6670 to work in conjuction with a Wang system and we saw a dramatic increase in output, from a million lines a month to four million lines, which brings me into the next point.

People working in the area of integrating a variety of vendor systems have a lot of problems. To do this project we had to go through all sorts of finger-pointing, we had to face the complexities of communications and the lack of vendor support. It is very a complex task, and as we move toward integration I think we are going to experience more and more difficulty in getting the levels of marketing support that we want from the vendors, particularly as equipment costs come down and vendors cannot justify such support.

As to the future let me just briefly say, we are looking at a lot of activities. We are looking at worldwide network development. We are looking at interactive cable TV. We are participating in the German and United Kingdom Vudata experiment. We are intrigued by the fact that 21 percent of the population in the United States now has cable television. We are very interested by the Warner Cube system. Video-disk has great potential as a learning tool for us. Voice response -- Dan (Hosage) mentioned it this morning -- We are intrigued by it. I think it is going to be as revolutionary as the word processing enviroment was four years ago. I think the key summary point is the need for the proper organization to manage all this on an ongoing basis.

Conclusions

Senior management must be committed to do all this. It must be integrated. The largest pay-off will be in management decision support systems. There is an absolute need for standards in terms of system compatibility. There is a great difficulty of getting good staff. We need to maintain technological awareness. And, of course, there is an overall need for an overall, flexible, fluid, evolving strategy.

OFFICE SYSTEMS INNOVATIONS IN THE BANK

Louis Mertes
Continential Illinois National Bank

Over the past two and-a-half years the Continental Illinois National Bank has converted about 25 percent of its employees to using electronic mail and information retrieval. What I will cover today is what our view is on some of the problems and issues that we have encountered, how we see our progress, what we are trying to accomplish, and also some of the specific things that we have implemented.

First, to give you a general overview, I will remark on what has been happening in the world of automation over the last few years. During the '60s our view was that almost all automation efforts were pointed towards the production areas. Nothing was oriented toward the computer people in terms of making their job more efficient or administrative and professional areas. If you do not believe that, see how effective they were in installing systems during those years.

The following ten years we again continued to move toward the production areas, did a little more in the development areas in terms of up-grading the quality of programming languages and trying to improve our own operating environment. We also did some things in word processing, dictation and a few managerial type of reports.

Our view of the future, the 80's, is that professional productivity will be our main area of involvement. Activity is going to be in the administrative and professional areas and the real productivity gains are going to be there. The reason we have gone ahead in this automation area, properly termed as office automation, is to improve professional productivity and keep the focus on that; not on making the office more efficient in terms of word processing or getting the secretary more effective, even though as a by-product those things do happen as well.

About two and one-half years ago when we started implementing some of the electronic mail and information retrieval systems, three members of my staff and I analyzed how we would feel operating in an environment that we were going to suggest and impose, or help guide,

our entire organization to move toward. At that time, I threw the desk out of my office, after deciding that handwriting and similar archaic things should no longer be done.

Within the first 90 days, I concluded I had lost my mind and was wondering how I was going to back off. What occurred over those 90 days made me and several of my managers feel the magnitude of the change we were going to impose on ourselves and that we were going to suggest as the organizational response to office automation. In fact, I think one of the more important things about this area of automation is this is the first time, at least in our organization, where the decision-makers are making decisions to automate themselves. If you look back, when someone was automating a payroll, the people who were making the decisions were saying, let us automate the clerical people and then they complained they had no choice but to continue on because once the payroll system was converted they could not go back to the manual perspective.

However, now we are asking people to make a decision to change entirely the way they behave and also provide them the option of not using the system after they started using it. So, we had a whole different arena, at least from our perspective, in terms of behavioral ramifications and also on retrenching staffing use once the conversion has taken effect.

Our managerial belief right now is that professionals can save time if equipped with effective tools. I believe I personally save at least two hours a day in doing the same kinds of activities I used to do manually. For example, I have a dial-up terminal set into a coffee table. It pops up electronically, so it goes away and you can not see it when I don't need it, I have a picture phone on the desk to do teleconferencing with my staff. I do dictation through a telephone to a remote dictation center. The center then transmits it through a word processing unit to our CPUs. I retrieve it and look at a draft copy before I release it on the terminal at my desk or at home, or anywhere I can get to a terminal. I have an answering device on my phone to pick up my messages so that I can deal with verbal mail and also pick up messages from remote locations.

The whole orientation in our organization in moving towards office automation is location independence. How can I operate in a fully functional fashion being anywhere I choose to be? This is a very interesting question. It opens up a whole new opportunity of suggesting where should you be to do your job. Today, we are so tied to our physical location because that is where our phone messages stack up; that is where our mail is mailed to. We haven't really thought through where we could more effectively operate if we could have full support wherever we are.

So, it really opens up the question of, what is an office and why an office? It directs our focus on location independence and also on testing and trying pilots that find out how people feel about not coming down to work a couple of days a week, or doing word processing in the home by dictating to a remote word processing terminal in someone else's home.

So, what we said was, before we go ahead and charge on with all these crazy ideas, what exactly are we trying to accomplish? We geared them down to four potential areas of activity in our office which are obvious once you address them.

First of all, all of us do reading and writing. We said we were going to address the reading and writing function of how you create the text, how do you process it, how do you retrieve it when you want to look at it again, where do you file it, and also how you get it approved. So, we were going to address the reading and writing function, but stay away from anything specific that people do in their reading and writing process. All we were going to do was address the function.

The next area we were going to address was talking and listening. The issue here is that in the talking and listening arena we get involved in something called a telephone tag. The issue is I will call you and then you will call me back and then I will call you and you will call me back. We call this process telephone tag in our organization. A lot of studies show that it takes three or four phone calls to make one complete phone call. The focus was, how can we eliminate that nonsense or that stack of messages all of you are going to get when you go back to your desk today or tomorrow.

The other one was traveling to and from meetings, even in large buildings. Everyone in our organization used to believe that you had to be going to Europe or New York before you wanted to consider teleconferencing. However, I have a group that is about three miles away from me and the travel time is an hour round-trip, portal to portal. The issue was, how can you provide some teleconferencing capabilities or some kind of ways to eliminate those one-hour trips during the day, which is wasted time. We may believe we are studying as we are walking down the street, or thinking, but it really ends up not being very productive activity.

The fourth area concerns something that we know government does not do. What we tried to do was reorient what was office automation. What we were really saying was let us address the work patterns of the professionals, people engaged in reading and writing, talking and listening, et cetera. It is not about gadgets, even though a lot of things we tend to talk about concern what kind of word processing gear do we want, what kind of manager's work stations?

Our view of a manager's work station is cheap is good. If you can build something for $400 or $500, that's great. Every time I talk to a supplier, they say, are you willing to spend $10,000 or $15,000. I say, you are absurd. Think $500 to $1,000 and maybe we can get some progress made. Our objective is to get a device that can handle the communication of all the information on everyone's desk. That means you don't want a financial study every time someone is hired on whether they merit the opportunity of having a $20,000 to $30,000 work station. What you want is something inexpensive, like the phone, to be put in place.

So, we next addressed two things on how. First, how technically were we going to deal with the situation. Many of you may deal with suppliers on a regular basis. They are a very interesting group to deal with. Some people think that anyway. But, what we were looking at in 1977 and 1978 was some guidance on what suppliers were talking about in terms of office automation and how to pull together all the technology. They had their own idea and most of them communicated only those directions that they themselves were supporting. As a result, what we said was we need to get our own technical philosophy straight so the next neatest vendor idea that hits the street does not redirect our direction or impede our progress towards an end. We needed to really focus on the function we are trying to provide to the professional and put the technology and the computer in the background. So, what we said were two things. We want to focus technologically towards a central library, everything stored in one logical room, where you have categorized all the things that could be accessed from one location not much different than a library in your home. Therefore, if you wanted a math book you look in the math index. If you wanted a physiology book, you go to the physiology index, but you do not have to worry about where you have to go. It is all contained in one central library.

Second was a notion of a universal terminal. I think someone mentioned that just earlier. One terminal with a dial-up capability, that could access any information in the central library at any time through any telephone.

So, those were the two technical concepts we incorporated in our overall approach. We have allowed any supplier, who can help us in this direction, support our activities since then.

The next question we addressed was how to package the capability. As the gentleman from Avon highlighted, we all have backlogged computer projects. If I brought this overall project two years ago to my management staff and said, I would like to spend $5 or $10 million to study office automation and make the offices more efficient, they would say very clearly, go back and do the work you are behind on, quit fooling around with the future stuff. No one knows if there are any true productivity gains inherent in this process anyway.

So, what we did -- and we concluded that that was the kind of response we would receive -- we used the old military game of scrounge; cheap is good, don't assign a lot of people because that just means you up the cost of the process. We assigned two people initially to the process. We said, find out what you can find out there. Subdivide it into mini-projects not an overall whole, as long as you are aware of how you want the puzzle to be put together. That is the exact approach taken.

We moved ahead on information retrieval, audio mail, electronic mail, graphics, and analysis. But, we did them separately, without saying, here is our overall strategy on how to improve professional productivity. As we moved ahead with quick pilots, we then got in the process of having people justify them from our user perspective in terms of putting the pieces in place. Other things we did just expanded in the organization as long as there was a request to get involved even though they could not justify some parts.

The last step was, how to implement and where? We approached it not too much differently than most marketing firms approach introducing new products. Get to the early adapters, people who would be receptive to change and would profit from it. Do not try the new technologies or ask people to change totally who reject change in the first place. We recognized we were going to have enough complaints from the people that wanted to try it, that you had to stay away from those who had no interest in the first place. Not only did we want the early adapters, we wanted those early adapters that we would view as supportive of what we were trying to accomplish, because it is so easy to toss the whole thing down the drain and find it not worthwhile to do.

We also subdivided different pieces of the pie among the early adapters. So, if someone went sour and did not like one piece of the action, we could move to another area and test it elsewhere, and really just separated the whole project into a lot of small pieces and moved ahead.

The first item that we started to install was audio mail. This is a very simple thing to get on with. It was one of those things where three of us were sitting and chatting about the problem of telephone tag and said, how do you get at this? What we did was install answering devices which each and every one of you has run into sometime in your life and hated. After the beep, please leave your name and number. We said, let us take this thing that has been around for 15 years and change the way we look at it.

What we said was, view it as your option to talk to the secretary or a receptionist who might take your name or number, or let the phone ring for ten times. The last option was you have an answering device on which you could dictate a full message. Now, the

devices we installed hold up to 30 minutes. This even allowed for some of our more verbal people. We also had fast forward so we could eliminate listening to overly long messages. Look at that process and, rather than being irritated by having to talk to a machine, view it as an opportunity to dictate a message because you could not talk directly. Quickly we put in 12, then we put in 38. Within my own management structure we went right from myself and covered the first 12 guys reporting to me and then went down 38 to include 38 people. We found the following things. One is, 65 percent of the messages were being picked up on the answering device. It scared us a little bit initially but we checked with some consulting firms and found that a manager or a professional is away from his desk or on the phone something like 25 or 30 percent of the time anyway. Sixty-five percent going into the machine was still maintaining the behavior that we had expected. That was, they continued to answer the phone no differently than they would have before, not get people sensitized that they are not going to answer the telephone anymore.

Secondly, we put it on the second ring so that no secretary or receptionist intervened, ever. A caller could count on leaving a message.

Of the messages called in on the device: in excess of 50 percent were either one-way or two-way complete messages. What I mean by one-way complete messages is, you called me and left a full message and there was no need for me to return the call -- it was just information, one-directional -- and there was no need to call back and I knew exactly what you wanted to communicate.

For example, my data center manager, after a bad evening, preferred talking to the machine than to me.

The remaining complete messages were two-way messages where you would call me and leave all of the questions you had on your mind. Again, think you are dictating a verbal memo. I would call back and you also were not at your desk -- which is a very high likelihood -- and I was able to answer all of the questions.

What we found was that over 50 percent of the messages that were picked up by the machine were handled that way, and that that percentage grew as people got more comfortable in the process.

The thing we did find, though, was that people went through a learning period and people that installed the answering devices had to almost be crusaders in a certain way. The first time an individual called and ran into the machine -- he would say, how can anyone in a bank have an answering device on their machine and hang up.

We also had some choice words left on the machine because of previous experiences.

What was more important was that if you walked them through and said, last time you left only your name and number, however, here is what we are trying to accomplish; the next time they would really try. What they would do is leave their name, number, and usually, the subject, but never give you a full dictated memo. You would have to be the crusader for the next step and say, here is what you forgot to say. It works. It really does. I have no more friends, but it does work.

So, what we have done is expanded this. It really works well and it eliminates the stack of messages that you inherit by not being at your desk. It allows location independence, because now from here or from wherever I am, I can pick up my messages. I have now left town and behave as if I was still in the bank. I pick up my messages, people view me as still being at the office because there was no face-to-face contact required. It does work. I think some of the suppliers are coming up with some interesting things to further enhance the shortcomings of just an answering device. They are simple to install and you can move quickly without a major study. The devices cost somewhere in the range of $350 to $400, so they are not a major expenditure and progress can be made quite well.

Another important thing was grouping and installation. It turned out that if you spot the devices around an organization they do not work very well. What you need to do is go down the managerial chain because it represents the calling patterns you are concerned about. If people calling you call infrequently enough you do not really learn the process or walk them through the three-phase approach of getting to the point where they leave full messages. Another point is you learn to prepare to give a full message when you make the phone call, especially if you know they have an answering device. Now, when the answering device is turned off or the person answers the phone you really feel frustrated at times because you are not able to execute the full communication without interruption.

Other areas that we worked on were dictation and word processing. We think that moving people into both of these directions is critical to getting everything electronically captured. We, at the bank, have had dictation going fairly aggressively and in general we have been moving towards remote dictation using the telephone to dictate to a remote word processing center.

What we have done in the last two years is hook up several of the word processing centers within the organization with communicating devices to our data center so individuals can electronically move the data to an end-point terminal rather than being required to pick up some paper at a specific locations.

We have had two pilots that we have been working on in addition to many word processing centers located around the bank. One is a pilot with two people in their home. We feel there is an excellent potential of using qualified people that are tied to their homes or choose to be there. We have made the underlying assumption that equipment will be cheap enough that you become indifferent to whether it is being used eight hours a day or six hours a day. The important thing is the quality of people that you can hire to perform the task not where they are located.

So, we have installed several devices in people's homes. I can pick up a phone, dictate to a word processing remote dictation center. The person in the home can pick it up, key the information, transmit it to our CPU and move the information. So, what you really have is you and even your support location are independent. I can dictate from here in Washington to someone in a suburb of Chicago and she in turn can retransmit, or make available that information in my mail system where I, again, can read it, edit it and resend it and ask for further development of the process. You end up being totally independent of where she or the other people are located in performing their tasks.

The other pilot is where we said, if the central center equipment is going to be expensive, you want to put it in a satellite away from your main source area. We located a word processing center in a suburb of Chicago. What you do is dictate to that remote area. We work the machines multiple shifts a day. Both pilots are going along well. We are finding some things that need to be improved in terms of the hardware to make it a little more smooth. But, the process is working very well and it is really making some behavioral changes with the groups around the organization.

The other area that we tried was electronic mail. When we installed our terminals, I ended up frustrated because I could not key at all. If you read the Wall Street Journal, we also have a manager in our bank that thinks keying is bad. The conclusion when I eliminated my desk was, how am I going to now handle these things? I handled them in two ways. One is I dictate remote, but on the other hand, I also bought myself a teach-yourself-how-to-type book. It takes about ten person-hours to get yourself to type faster than you can write. I don't mean with all the capitals and indentations and punctuation, but to replace handwriting, because that is the objective.

Another interesting by-product is I am now able to read the things I created yesterday.

So, when we went to electronic mail we did the same thing as with audio mail. We took another group, installed it down the management chain, and said let us start putting up documents electronically. It is starting to replace telex in our organization.

Our European heads love it because as they are moving from country-to-country, traveling, people can reach them and send them information no matter where they are located because any time they stop at one of our European branches they can get on a terminal and pick up their mail as if they were back at their head office.

One of the problems we are running into in the European relationship -- and some of you may be aware of it -- is the transborder data flow issues that are happening between the countries. People are raising questions on can you really transmit information in and out of different countries. Restriction of transborder data flow, from our perspective, would be a disaster and hopefully people here or someone in government is taking a very aggressive stand to help us in this area.

The mail system can be entered in three ways: remote dictation or key it yourself; or dictate it or handwrite it and hand it to a secretary or some other clerical person to enter the information. It moves electronically so distribution is instantaneous. We file it or separate it. It is not very different than what you do with a paper-based system. We sort it into different categories no different than your in-box may be sorted today. We are now doing approvals on the mail system so if I want something approved through four levels of the chain of command someone would enter the four people that it has to be routed to. It is automatically routed to the first person on the list. The second person gets it as soon as the first person approves it. We are testing how people will operate within the work environment without seeing a physical signature. It seems to be working within a small group right now. We expect to expand it to several thousand by this year-end with no trouble at all.

Traffic is separated by primary recipients; in other words things directed directly to you, and things you are copied on. We have bulletins so I can broadcast to the 800 people that work for me in the organization with just one memo and one command, "my staff;" and it goes out to the 800 people instantaneously. So, all of a sudden I can almost beat the rumor mill.

We just break it down into a lot of categories. You ask for display and see what you have got in your in-box. The other thing is that you can browse or read memos. You can comment. In other words, like a paper buck slip, you can just comment by typing in a sentence or two and re-route it, routing to multiple people. We allow for the use of nicknames, so you can create your own nicknames of people and don't have to spell out full last names. I understand some of the nicknames used are quite interesting in terms of other people.

You can staple the document electronically right away, so that when you comment you can just staple it and that document goes with it, no different than what you would do in a copying

environment. Using "CBS" command, you can comment, send it back to the person that sent it to you and staple a document. So, just with the simple three letters, you can readdress the memo to the person that sent it to you and it is sent back instantaneously.

The "send" is straightforward. We have the approval process, which I mentioned. We also have "registered" mail. I can send anything to any group of people and it will tell me when they have looked at it. All it does is keep a master listing of all the people I have sent it to if I send it "registered." It is no different than registered mail. When you have looked at it, it will give the time and date so that you can keep track of what is happening on important documents or where they are. It turns out to be an important process to the approval process, because as you are routing things through the chain of command or around an organization you always know where it is, who has read it and approved it last, and whose desk "it is sitting on," without having to run around or spend all kinds of clerical and staff time trying to find out where the document is that you are trying to get signed off.

We are also expanding this notion on mail. One of the important things we have found in the mail system is you have to go down multiple levels of the chain of command. Initially, we started with the head of our international banking department and took only the people reporting to him and did not go down two or three levels. We found out if you do not go approximately three levels down the chain of command and sometimes four you do not have the worker. When you only go down one level, no one in that level is creating anything, so nothing is being transmitted. So, the important thing in the installation of mail is to go deep enough in the organization so that those who create documents are doing it electronically. Then you can keep mail electronically rather than having people read documents that are on paper. We are also expanding this. We are linking word processing to our computer systems and we are coming up with computer-generated mail. The question is, why should all the mail be created by other people? Now, rather than creating exception computer reports that are specifically formatted, let the mail system be your in-box and when the computer is programmed with limits or guidelines on report suspenses let it cut a memo and send it to people saying, "Hey, you have an expense statement that is overdue, you have this overdue." We are looking into starting to expand that notion. We expect that the area of computer generated mail will probably be a larger function over time because there is a lot of exception and control reporting that is desired.

Another point on the mail system we debated was what ought to be in a mail system. We concluded that we could debate forever on how each of us handles our in-box and really, who cares. Finally, we said, let us get something done. A young lady raised her hand and said, "I will get up a pilot mail system in six weeks." I said,

sold. And, she did it. Six weeks later we started with about 60 people. That system now has been scrapped. We only got up to 1200 people before we scrapped it. But, we scrapped it and enhanced the follow on system since then. But, we did get up to 1200 people using an electronic mail system that was thrown up very quickly. We found that it is more important to get people using electronic mail that are willing to use it and that give you meaningful feedback on how it should be improved, rather than theoreticians sitting back telling you how you should do your mail and nothing happening because you are not learning anything directly.

IRIS: another area that we investigated was information retrieval and the big desire to have information at our fingertips. The underlying product in IRIS is IBM Stairs-Virtual Storage (VS) which is a text retrieval package. We contacted IBM, some people flew in from New York and we chatted with them. They said, by the way, we have this product that is clearly an overkill. You won't want it. Right away we started paying attention. When IBM says I won't want something I figure I want it.

They said it is a heavy text retrieval system. If you are familiar with the product, it is like a library search system. If you ask for how many "these" are in the file it will come back and tell you how many word "these", and on what documents they are located. We decided to try the product and look at the data stored in the computer center and view it as text. For example we looked at the payroll file with transactions, the master file and salary information as text, rather than as the quantifiable data we thought of in the past. What we did and IBM supported us well on this was in eight weeks put up the IRIS software, loaded a couple of data bases and did some searching. The product is capable of retrieving on any word in the file that you can think of and pull up the documents. You also can do some "anding" and "oring" so you can get combinations of words. What we did was convert information through use of IRIS so that it was retrievable at a terminal. You do not have to have a lot of knowledge like an account number or some special numbering scheme to be able to get at the information. The objective was to make information available to people so that they were location independent and really did not have to receive any reports. The notion is that if I put up every master file in my computer center -- that would be all the loans, the savings accounts, the name and address files, the transactions for the last quarter, and all of the transaction files and data files -- I no longer needed to print anything. Now, I would like to suggest we have accomplished that. But, the point is we have put up something like the information, master file, transaction files, and history files of every application and formatted it as text so that people who want to respond to individual inquiries can look at information, take some summaries of data, and they can do it from a terminal. An interesting by-product point in putting the information on a terminal, is we no longer have to decide how many copies of a report need to be generated

-- that is our objective, we are not at that point yet -- because if you have to save it once, you have got it for everyone. You have also got the benefit of not only do you have it for everyone, but you have it for the daily user who uses it and really needs it. You also have it for the periodic user who wants to look at it once a month, once a quarter, or only when someone has called him and asked him what is happening.

It has turned out to be a good customer service tool because you also have the information available for customers calling in for information.

For example, one of the data bases that we orignally didn't even think about putting on was 40 days of checks processed through our bank, something like 30 million items. We decided to put that in an on-line mode to answer customer inquiries. A check which once took 30 to 45 minutes to find, can now be handled in 20 to 30 seconds. It has also eliminated some problems, such as if you called in and called your commercial officer and he called an operating area -- and we have got to remember we are playing telephone tag in trying to accomplish these things -- and then they called back and said, yes, it has; by the time you have an answer, hours have passed. Since we stored it in the area that deals with the checks, the commercial officer can access the information himself. We are now routing notices with 25 firms saying, do not call us at all, why not dial in and look yourself. So, the whole notion is once you have the information available from and for the source that needs it in the first place, you can now start moving that information, as long as you have proper security in place, to the people that need it or who were interested in the first place.

So, we have been converting files of all types. I have my data center performance project information, anything that we need to manage our area we put up under IRIS. We are moving towards -- and I don't want to lead you to believe that we have eliminated paper in the organization -- we are moving towards people thinking hard about current generations of systems that we are upgrading right now; they are talking about reducing or eliminating a lot of the paper they use to get. To make the full transition of cutting out all paper is very difficult. But, where electronic information really is helpful is where there is a need for distribution of information around the country especially in Europe. These people are responding more quickly because in the past they never got the paper reports until weeks later anyway, and all of a sudden they can have it the same day.

So, we are moving more and more toward the information source and retrieval back to the source and having customers actually tap into their own files where they find it appropriate.

For people who are familiar with IBM disk, we have converted data so that we now consume something like 90 to 100 IBM 3350 disk drives. What we did do in terms of cost is we installed each application, like the accounts payable system and our other computer systems, in such a way that they would justify the cost of the disk and the incremental cost.

The education process and the terminals. We are using Lear Siegler terminals primarily because cheap is good. They cost $700. They are less costly than a typewriter and there are fewer questions regarding the significance of having those on a desk rather than spending $3, $4, or $5,000 on some terminal types.

The education process we underestimated significantly. We do have marketeers. We give them territories within our organization. Their objective is to convert more people and convince more people to use electronic media more. We have divided up the bank organization, no differently than IBM and other suppliers divide up their territories, in order to market our product.

Our whole goal here is we have a lot of pieces of the puzzle and we are marketing the pieces, not the whole. The whole intention, obviously, is to merge it into a total piece. All of a sudden the manager and professionals will see that they have all of these pieces once they have their terminal installed and are using the information.

The area that we now are focusing on and trying to address is, given you have people with location independence and you can retrieve anything you would want about your firm, off the files via a terminal, now you can start offering different communications tools. We all recognize, and I think it was Marshall McLuhan who said, "The medium is the message." We might have some new mediums in which to communicate. We all recognize face-to-face is preferred. We also realize the written message is still useful, and there are times too, when you want to write and when the reader wants to read a personalized letter. The telephone has been around and tends to be used as an interruptive tool. Our focus right now is let us replace the written message where we can by electronic mail and audio mail. We believe that electronic media does it more cheaply and more effectively and provides you more function than you have ever had before.

The other area we are starting to test in two ways is teleconferencing. Now, if you have a terminal where you can view all of the information you want to, you might now consider voice conferencing and picture conferencing. In the voice conferencing end, we are now using some picture phones. If you have the terminal dialed up, I can share information with you directly. You can be reading the document no differently than if you were in my office. If you can also see me, what other things will make you comfortable or

uncomfortable with the process of saving travel time? We are experimenting with picture phones. The only office the telephone company has in Chicago, is starting to work towards saving some people travel time. We are just trying to find out how people feel. We only have about ten of those installed. Our view is that the real key is the communcations alternatives and starting to think about the time wasted in traveling to and from.

In line with some of the notions we are talking about it really opens up some scenarios of work at home. We feel the technology is dropping in cost and all other things are rising very rapidly. It opens up pilots of people working at home, in neighborhood work centers, and just working in your sales territory or wherever you might be most efficient.

We have got a lot of feelings on some of those scenarios we plan to test, but that is pretty much where we are today.

HUMAN FACTORS

Eleanor Wynn
Xerox Corporation

I work in what I consider to be a rather ideal situation in terms of the interface of technology and what needs to be done and the community of people that I work with. But since I was asked to talk about generalities of human factors, I have included in my talk the work and environment of others in order to describe a range of possibilities and situations. I will also try to include a critical perspective on office automation as well as what I consider to be the ideal kind of perspective.

I considered this to be quite a prestigious place to give a talk and I am very pleased to have been invited to talk here. At the same time, I have an image of talking to the establishment. I noticed in preparing my talk the fact that I don't have an interactive television set yet: a style in which I might have addressed some of my remarks to you. However, the comments that I had to make to you the decision-makers, may as a result of watching various 60 minutes specials, be in that style.

In fact, a specific television program that influenced me a couple of weeks ago was the McNeil Lehrer Report that included the former speaker from Avon and Karen Nussbaum of the Working Women Organization. What I came away with from watching that program, was that one side kept saying office automation was good; and the other kept saying office automation was bad and we should stop and look at it before we go any further with it. The point is that the state of technology that we have now presents us with the opportunity to really choose what we want to do with office automation, not just in terms of productivity, but also in terms of the kind of environment we want to work in. We are not really driven by a particular kind of technology. We have a very, very versatile sophisticated technology and we have an opportunity to design basically the kind of office environment we want at all the levels.

So, my first exhortation is with regard to choice. Rosy Mrozinski, when he suggest I speak today, asked me to talk about the future. He suggested I talk about predictions and generalities. What I came up regarding the future, is that the future is still to be decided and it is to be decided by among other people the people in this room. The technology is not some kind of massive monolithic entity that is going to proceed according to a certain pattern inexorably. In fact, it is very versatile, it is diverse and it offers all kinds of opportunities that we have to choose amongst, and we have to consider lots of different things.

So, really the choice is yours. The choice is that of the buyers and the choice is, to some extent, that of the designers and vendors of equipment. In making that choice, I would like to point out there are many kinds of hard-to-measure qualities that really need to be included beyond just productivity statistics. These more human factor qualities will become explicit after choices have been made. I have all kinds of analogies that come to mind.

For instance, the bottom line for me in thinking about the kind of job that I want would include a salary range that I would expect. That would be an explicit item of my choice. But I have lots of other implicit dimensions and implicit values that I also believe to be significant. Included, among my implicit values are the kinds of relationships I want to have with the people around me, the kind of hierarchy structure I want to be in, the kind of tools that I will have, the kinds of tasks that I will do, and whether I will have a choice over those items or not.

So, these are essentially implicit things that bear very heavily on my choice of work, where I work and whether I am satisfied in my working environment. Office automation is going to have a tremendous impact on the quality of the work and the working environment. In fact, I think it is revolutionary in its impact.

Another extremly significant factor will be the change in turn around response to correspondence. I am terrible about answering mail. In fact, if you send me a letter, I am likely not to answer it unless it is something very important like a communication from Dr. Brezezinki. Although, I am not much of a letter answerer at all, I answer my messages, the ones I am going to answer, I answer instantaneously. Further, the moment at which I read something is the moment at which I am most likely to be interested in responding to it. When you have a medium that makes available to you the thing to read and also provides a simple means of replying, it catches the critical moment at which you are most likely to make the response.

I don't know of any statistical studies which truly explore the impact of instant response, but I think it is a really interesting feature: a feature which will signifcantly change the way business is done.

Assuming this is but one factor of office automation that will change the office, its work, its enviroment and its structure, there is much more to creating an automated office than a few simple choices. Choices, correct or incorrect, bear significant responsiblity. Office automation is an enormous industry. It is going to keep growing. Whether it is applied well or applied poorly, there is no stopping it. I would just like to exhort everybody to be responsible about its application: to not have a narrow focus of interest, but to look as much as possible at the broader impact of it.

Overall, I favor augmentation, not total automation, because that continues skill in jobs. In fact, it adds power, it adds skills, so there are more kinds of quality jobs and fewer routine jobs. I also think that people will work better in an augmented environment.

By the same token, I go for multi-functionality and not segmentation. Quality hardware and software answers the kind of human factor questions that people have about whether your workers are going to get headaches and backaches and shoulder aches and eyestrain and everything else. I don't think that is a problem if you give them good equipment.

Augmentation also provides a coherent backup for equipment outages. What if the power fails? Do you want to have a lot of workers around that all they know how to do is key things in or do you want to have people who can get the job done without the system? That is a strong argument for keeping the level of skills up.

We need to think now about retraining people. Vendors have programs for training people. I think automation has to become a feature that is taught in our schools, our high schools, junior colleges and so forth. More programming courses, more technological courses, so that people are actually able to manipulate the equipment and not just do single functions on it. We expecially need more technical skills for women. In the past men have had the technical skills and, therefore, they have gotten all of the technical jobs which are high paid and more fun.

I would also exhort people to include the high dimension values even though it hurts and even though it means taking a chance and even though it may momentarily effect your bottom line. I think in the long run including quality of choice and quality of working life is going to pay off over all for everybody more than a narrow focus that only looks at the dollar bottom line.

Ultimately, you are going to have to live with the automated office and that is a strong argument about being responsible about it.

GENERAL DISCUSSION

James Burrows
National Bureau of Standards

Dr.Licklider: Jim Burrows is going to moderate the general discussion session and he will be the first discusser also. Jim is head of the Institute for Computer Science and Technology at the National Bureau of Standards, so I won't blame him a bit if standards creep into the discussion.

Mr. Burrows: Thank you very much, Lick.

I think one of the problems that I have in being a speaker for Technology and Standards is that I am continually being asked to solve managerial, organizational and personnel problems with technology and I don't know how to do any of those things with technology. Somenow, that is a skill we haven't been able to automate yet.

We, at the Institute, do have programs for standards in local area networks and computer based office systems, mostly having to do with extending the options you have in terms of being able to interconnect equipment and exchange media. We are not in the area of doing human factors experiments at the moment, although we hope we will get to that level sometime. Right now, we are mostly in hardware and in how to look at the use of office automation, but not actually doing experiments.

One of the questions I would like to ask the speakers here is, would any standards have helped you do the jobs you have done thus far?

Mr. Walsh: One of the requirements we recognized very early on working in an IBM main frame environment, was that we wanted to communicate initially in a largely job entry type format, but eventually we wanted to move to an on-line environment. It was key for our selection that we have a vendor who could offer us total transparent support in the communications mode. Our initial thrust was with DEC. In trying to put the communications together, their equipment didn't interface very well with our IBM environment. Wang did.

Also, in trying to communicate between our Vydex and our Wangs, we had total failure. A standard communications protocol, a bi-synchronous protocol, would have helped us considerably. I think it would have also afforded us an opportunity to deal with a number of other vendors. There are situations where, for instance, we might not have good Wang support, but we might have excellent Data Point support or excellent Vydex or Xerox support. If a standard had existed, I would be more inclined to look at a number of vendors.

Mr. Burrows: Thank you, John (Walsh).

Does anyone else believe that standards might have helped you, or were you able to make your own standards? Most of the users appear reluctant to standardize across other vendors lines. You get hold of the manufacturers and ask them: "Why don't you standardize?" The answer is: "We don't want to sell interchangeability. We sell everything we manufacture. Our production lines are flooding. Everything we put out the door, we can sell. Why should we change? We sell features that differentiate us, not make us the same. It is up to you to worry about whether you want standards and if you want standards, why don't you just buy mine all the time." That is the argument you get from them.

So, the only people who are interested in standards are the users. Many manufacturers are not interested, at least not at this time. Further, most of us have a very tough time finding a place where we can get standards. The fastest way to get something done is like John (Walsh) said. He selected DEC and he asked DEC to do something for him. There is some nice leverage there, some of "I give a little and you give a little" that makes things happen.

When you get in the environment of asking all of the manufacturers to do something standard, they don't know who you are going to buy from. They don't have any individual incentive. So the standards process is very slow. I don't expect to see universal standards unless the users need them and find some way to gather together and ask for them.

Mr. Burrows: Could we now have general questions from the audience?

Question: I am from the Department of Justice. In looking at the figures which divided up what people were doing in terms of tasks and how that was affected by office automation and how the amount of time people spent doing their work was affected, two things struck me. One is that you didn't include time for "goofing off" such as coffee break time or anything like that. You only had work time. I have found that omission is a big problem. If you don't include the amount of time that is lost during the day, the figures aren't really meaningful and as a result you don't know what you are comparing when you look at end results.

The second problem is that all of the workers, professional and clerical, as soon as they see you counting anything and conducting a study which quantifies their work, they resist the fact that you are just simply taking a hard look at changing the office system, the office structure or the way things are done, even if you make things easier. There is usually an hour, or two a day that is not accountable that the worker can alter to change his productive image.

I wonder how do you approach that situation and after approaching it, what kind of results do you have, because you didn't show anything in the numbers.

Mr. Walsh: Okay. There is another time factor that I think John Hogan would agree with that is probably five or six percent of a workers total time. I agree that any time you try to quantify what people do, they are going to respond and fill those hours up with work rather than say they are not working full time.

When you do a sample, as we did, in a population of 2,000 and you do a fairly high sampling, let's say 10 percent of the managerial work force, and you do it across different functional groups, the chances are that your statistics are going to produce something that is fairly close to a semblance of how people work. In our case, I think that the sampling that we used was so large -- that is a very large sample -- that I think the results translated into accurate numbers.

I was concerned when I did it that it would correlate and I didn't have a lot to go on other than those three studies. But they did correlate pretty closely. Then three years later, I saw some of the Booz-Allen results that talked about a 19 percent opportunity regarding management. I know that the Department of the Army did similar work and I think they said the value was between 16 and 22 percent. Therefore, you know, the real opportunity value is in there somewhere. So, I feel pretty comfortable with those numbers. John (Hogan) might want to add something.

Mr. Hogan: One of the observations I might make is I think the numbers are not wildly wrong. I think there is a difference between accounting for the way people spend their time in a real sense and just calculating numbers in terms of mental arithmetic or the association of ideas and the persuasion of other people, things of that kind.

As we move into the white collar area, the information worker's area, the perquisites that apply are so many more than in the other production areas where we have experience. Wherever we put MTM systems in, they have built in overhead to account for an amount of personal time. Everybody lives with those.

But your employees or mine, professional level, some afternoon their car is supposed to be ready at the lunch hour. They had the brakes fixed and, alas, the car was not ready at noon, but it is going to be ready at 2 o'clock. Almost anyone in an office could be gone for a half an hour, go get the car and bring it back.

That is a very different kind of a phenomenon than is presumed in the accounting for work and the way people spend their time. I think the standards are altogether different. I think standards have to apply to different kinds of products and their quality. To a degree the standards should originate from the people themselves, as they probably won't live with anything else. It is a complicated matter, but I think I know the ways in which to solve it.

Mr. Walsh: I think one of the problems is a matter of definition. John (Hogan) talked about us working in a communications mode 60 to 70 percent of the time. That is probably true. It is a matter of definition whether you include telephone usage as part of the communications, or other shadow functions such as meeting in the elevator or talking informally. Is that a formal meeting or informal meeting. A whole lot of it is definition. I think if we had some definitions three years ago to work from, we would have been better off. I think John is now bringing a more professional, defined approach to these different tasks than we had as a frame of reference in 1976. At the time there really were no standards.

Mr. Burrows: I would like to ask Mr. Mertes how seriously do you take the possiblity of an electric power failure, particularly in Chicago and what should you do about it, if anything?

Mr. Mertes: We take a power failure very seriously, particularly in Chicago. We happen to be fortunate enough that we haven't had a failure yet. We don't even have power backup on our computer center. We are currently tied into two generating plants.

Mr. Burrows: Oh, you have two sets feeding your bank.

Mr. Mertes: Yes. Correct. We do take seriously what will happen when the electronic mail system goes down. It is a new phenomenon when everyone in the bank could be angry at you simultaneously. Power loss is a very serious consideration and that is why we went to the two generating stations and are looking now at what kind of computer power backup we should provide on an ongoing basis. It becomes more serious as you get into the office function and are really interacting with people all day, every day.

Question: I have two questions that bridge all four of you: however, I will address them to Mr. Walsh and Mr. Mertes. First, I was wondering what efforts you make to protect your corporate

records. Second, I am troubled because you both appear to be looking at the office as it is currently structured and not re-examining job functions as Mr. Hammer suggested this morning.

Mr. Walsh: I think the first question is an excellent question. We have for years been concerned about the protection of data in the main frame environment and we have very formalized procedures. We have shredders. We have very defined standards as to the maintenance of security in our environment.

As we proliferate systems into the distributive environment, we are dealing more and more with users who are not familiar with the security and confidentiality factors, even when we give them procedures to archive and set up audit trails and do the right things. We are finding that even after we go back to a user with our security concerns four and five times, data is still left on the system that is accessible to many people through numerous terminals.

Users will archive sometimes, but still leave open data on the system. I was shocked one Saturday when we went to test a new program -- I happened to be on a Wang OIS system -- to go through the index and see that all the salary information, all the bonus information, everyone of the directors and officers of the company.

I am going to tell you the practicality of the real world. We went to that user and attempted to instruct him that this shouldn't be the case. We pointed out all of the deficiencies. We gave him a set of procedures. I am oriented towards formalization: giving procedures and then working with them from that. It is sort of a CYA, too. They really didn't listen to us. In fact, they were very aggressive about us looking into their data.

Our internal auditing department looked at this same user a year later and found the same situation. It emerged as an issue on the president of the company's desk, much to my chagrin. But that is one small example of the problem that I am having with this. As we progress into a telecommunications mode with a lot of these systems, the question of encryption is becoming an issue. We are in a multi-national environment and a lot of people would like to know our marketing plans. So, the whole issue is very serious and very important.

Mr. Mertes: First of all, to put availability in some perspective, we are centralized in operation. I run Europe and all of our branches out of our Chicago main data center. We have looked carefully at availability and continuity of operations because that is a big concern to us. We have backup files and have arrangements with multiple firms to support parts of our actions should we have a failure.

The thing that we are most disturbed with now and the one thing which will most likely cause us to move towards a second data center is the growing on-line environment. Just like electrical power outage, you really need two data centers running at about 70 percent capacity or more. We are laying plans to move in that direction. We aren't there yet. The thing that we found that isn't readily available -- at least to my knowledge -- is if you have an all on-line environment with everyone hooked up, is ease of switchability to the second environment and ability to just continue running. That is something we are trying to pursue further with AT&T and Bell labs.

Now, a brief response to your other comment about studying not how people are operating today, but how they should operate. Our view is we believe that if we put in tools that will permit or provide the ability to work quicker, those personnel who are quality workers or the better managers will use those tools to enhance their productivity and change the way they do business and those that aren't willing to change will eventually fall further behind and a wider gap will exist between them and those that are willing to change.

As for privacy, we have at least the same level, in fact, better privacy now with the on-line environment than we used to have. We have passwords which we control ourselves. We don't encrypt yet. One of the things that is more private now is the payroll file, which is a big concern. In the past we have had listings laying on people's desks. Now, the manager who has the people working for him is the only one with the password. He can look at his people and it doesn't go through the secretary's hands and all kinds of other handling that it used to do. So, what we are ending up with is that there is less likelihood of things lying around as they used to. We still have to tighten up the privacy, but I would view it as tighter now that it was previously.

Mr. Walsh: Can I just make one more comment on your first issue? We recently went back and looked at all of the documentation that was considered to be confidential and, really, about 15 percent of the total should be confidential and the other 85 percent should not be, so there is the reverse issue as well. We also looked at what resource we spent shredding confidential material and it turned out to be two full time people. So, that is another critical issue.

Mr. Hogan: There is a second aspect to that. I think it would be hard to find someone who would come out in favor of automating just what is there today. What I was describing in terms of task analysis and taking social temperature form only part of the diagnostics as we then move toward equipment specifications. The identification of tasks within processes, with the emphasis on improving the processes and fulfillment or contribution to mission, I think, is the name of the game.

I think work simplification and delegation and combinations, all the things that once upon a time were housed under methods and procedures are relevant here and I certainly subscribe to what Mike (Hammer) said. Eleanor (Wynn) also had some things to say about augmentation in human efforts that bear on this issue as well.

Ms. Wynn: I did come up with an approach. I was kind of stumped for a minute. I think my approach is an artifact of my being an anthropologist. I am actually not a sociologist or social psychologist and I spend a lot of time doing conversation analysis. That has given me an orientation of looking at both the surface impact, what people recognize about what they do; and the other levels, what they are doing, without realizing that that is what they are doing. So, when I look at the way people do jobs now, my purpose isn't to say this is what you want to automate, but I am saying that in producing the results that are produced in offices, there are two kinds of input. One is the explicit, procedural, kind of articulable model that you have and the other is the way things really happen in the unacknowledged processes.

So, before you go to the kind of revamping that Mike (Hammer) is talking about, you may want to look at all of the goals that are already being met by the way things are done. Some of those may not be well understood or the processes may not be well understood.

I also have something to say about privacy. I think there is an issue coming up in electronic mail with regard to privacy. The thing about electronic mail is that it is very conversational. It lends itself to spontaneous expression. There is a word coined already for that spontaneous expression when it gets really expressive. It is called "flaming". The difference between spontaneous electronic mail and spontaneous live expression is that with electronic mail you leave a record. That is a record that somebody else can make many copies of and distribute. I have questions about that. Conventions will probably develop to handle some of my concerns, but, there really is a privacy medium, broadcasting, communications kind of issue in how you are going to treat informal spontaneous communications that leave records.

Mr. Allen: I am Frank Allen from Air Force. We have heard a lot today about the interfacing of office automation hardware and communications. Several speakers have alluded to the changing work habits of individuals. I guess, one of the closest ones who came up with this was Mr. Mertes in an offhand conversation as to the scheduling of workers time and the attitudes of people in their working environment. Possibly, even getting away from the nine to five type of atmosphere.

In the few brief seconds that we have left, could someone address office automation along the lines of the psychological standpoint of possible changing work habits of people?

Mr. Mertes: I will comment. We have done a lot of talking about changing work habits tremendously. We have staggered hours where people can start at any hour they wanted, but where they adhere to the same hours all the time. However, the issue that we spent a lot of time discussing, especially considering location independence, is how about running a pilot with a commercial officer working out of his home in Denver, never coming into the bank other than to sales meetings. We have some documents assembled on that. Also how about a pilot on working out of your home: a mode of operation which is clearly demonstrated in a lot of sales or consultant organizations.

The issues that we have discussed at length come around to how would your wife or husband like you at home all day. This is a real issue because it changes the style in which you are living on a day to day basis.

Another one, that has come up in discussions with our young single people, is where are they going to meet all of those neat people if they stay at home? That seems to be a real issue, but only one of transition. When everyone in the singles complex is at home, there is no problem. In fact, then, when are they going to work?

Another issue, that has had extensive discussion in our group, is if people start working in their home or in their own location have they picked the neighborhood in which to live based on spending their time with the people that are their neighbors or for other reasons.

We have kicked around these issues and are going to run some pilots to investigate them over the next 18 months to two years. I think there are some real interesting opportunitites, real difficult transition issues and some significant cost savings. So, I think the discussion has to continue.

The other one is how do you know if the worker has two jobs or not. We really have found out how poorly we measure our staff. Seeing their bodies sitting at a desk makes us feel that they are working eight hours a day. Not seeing them and not measuring their attendance suggests that maybe they could be working for four firms at the same time, doing very little. Managers feel very bad about that. So, I have recommended that I be the first one to start working at home and that didn't fly, so we are going to start some other things.

But those are the issues that we are confronted with.

Ms. Wynn: I think the idea of working at home is an interesting one, but I don't think it will ever take the place of going to the office completely. The work that I have done has been sort of a microscopic examination of the kind of cognitive and information processes people apply to the work they are doing as they

are doing it. I am talking about what you may consider to be very low level jobs and there are an enormous amount of them. People constantly teach each other how to do their jobs. This is true for people who process orders and it is especially true for people who do more complex intellectual activities. So, that is one level, just remembering what your job is and continuing to learn about it and how to do it. This is something you get as a benefit of going to work every day.

Another one is remembering what is important about your job. You know, my job is really created every day. If I go away for a vacation somewhere, then the world becomes the place where I have gone to and my work can sort of vanish as a reality. We don't realize this; because, in fact, we do go to work every day and we are there all the time, getting reinforced in the importance of the goals that our organization has and the value of our work to other people, the value of our performance and all of this kind of thing.

But, in fact, I think that the socialization that takes place at the office -- first of all learning and, second of all, maintaining the motivation of the job -- is something that you can't replace by having people work at home on-line.

I think that working at home is a good option for part of the time. The other thing is, of course, that the work place is the main organizational contact that people have outside of the home. Americans today don't have that much participation in social groups outside of their homes. Some of them do participate in voluntary organizations, but nothing to the extent of their participation with other people at work. I don't think that should be dropped out.

A result, from an experiment of people working at home on-line, was that the participants had to be called into the office at periodic intervals because the electronic communications did not have much conversational range -- all the features of conversation were not there. All you have is the words. Conversation has all kinds of contextualization and interpreting mechanisms going on to keep people geared to the fact that this is what this means and this is what that means and this is what I meant by what I just said. When you drop that out, the interpretations of what is going on can really start getting skewed. So, people who communicate exclusively electronically can actually start getting a little bit weird about what is going on, and they have to be called in and reminded of the good will of people that they have been communicating with at the office.

So, for all of those reasons, although I would love to be able to work at home part time, I wouldn't like to work at home all of the time. But, it is great for the people who have to be at home all of the time anyway. That expands their association enormously.

Mr. Burrows: I have had the experience of working with an on-line message system twice. I mean, for production, not experimental purposes. It gets to be very frustrating when you want to clarify something with the human being you have been messaging with for the last 15 minutes only to discover that your phone is hooked up to the coupler and you cannot place a phone call. Now, what do you do. You must log out.

Mr. Mertes: Not true. You need AT&T to get you a two button phone. I agree with that problem. In fact, they put one in my house so that I could make phone calls and operate my terminal simultaneously.

Mr. Burrows: Was there one more question?

Mr. Perry: Chris Perry from MITRE Corporation. Do you find that people get weird when they use just electronic communications?

Mr. Mertes: How can I answer that? I guess in response to the comment, I don't think that is true because what happens -- in fact, what we are finding with a lot of people using the electronic communication -- is that they are freeing up time and having more personal interactions during a given work day because the mundane activities are getting handled through audio mail and electronic mail. It is not like a programmer sitting behind a terminal. It is like handling the mundane transactions that disappear and now what you have are more interpersonal meetings, talking about longer term kind of items. That was a by-product we did not expect, but it is turning out to be the case.

Mr. Perry: I just want to comment. I really do think they get weird. We have experimented with three systems. For example, we are up on Hermes and we have been using the mail capability of the Source with different people up on these systems. One of the problems I have is when I initially started these projects, I intended to use them to give direction to people. These were a group of people who worked with me, 12 people, in one particular group.

What I found actually was that they had me. They bombarded me with requests. It was just the reverse of what I thought. I am a sociologist. It is interesting that the people who are involving themselves with this integrative function in terms of bringing these things together in terms of large corporations, many of them are social scientists, not engineers or data processing or communications people. But I had a perception of one fellow who -- I was on the terminal at 1 o'clock on a Saturday morning sending messages, now, that makes me weird -- broke in between my sending messages and started communicating directly with me. That made me think that he was very weird and I haven't been able to get that out of my mind as to my perception of that individual.

So, it really has brought about a whole set of strange situations, based on the changing availability of time and the definition of the work day. It has just been very interesting, if that makes sense.

Dr. Licklider: I am afraid I am going to have to do it. I conceded my summary time to this discussion because the discussion was lots better, but there is this matter of the bets and 5 o'clock and I have to protect my bank account.

On the subject of working at home at the computer, my wife tells me, "I married you for better or worse, but not for lunch." So, I travel 30 minutes to get to my 18,000 bits-per-second connection with the computer instead of the measly 1,200 I have at home.

Okay, on behalf of the audience, I want to thank you all and the other speakers who aren't here. I think you were superb. You did just exactly what we wanted done and I am very happy with your performance.

On behalf of the speakers, I want to thank you, the participants out there, who were just spectacular. You came on time. You had your coffee at the right time.

This was very stimulating and very interesting. Now, on behalf of all of us I want to thank R.V. Mrozinski for putting this thing together. Rosy, you did a spectacular job and we appreciate it.

Now, I want to give the meeting back to Lou Rader just before 5 o'clock.

Dr. Rader: The meeting is now adjourned.

TOWARD THE ELECTRONIC OFFICE

July 23, 1980

ATTENDANCE

Thomas Aguilar
Washington, D.C.

Truett E. Airhart, Jr.
Zytron Company, Inc.

Frank A. Allen
Headquarters
U.S. Air Force

Frank L. Allen
Arthur D. Little, Inc.

William H. Allen
Washington, DC

Michael S. Alpert
Comsat General Corporation

Don M. Ammerman
Dialcom Incorporated

J.P. Ancona
Franklin Lakes, New York

Robert G. Anderson III
Office of Personnel Management

Thomas C. Bagg
National Bureau of Standards

R.C. Bainbridge
National Bureau of Standards

Harold E. Bamford, Jr.
National Science Foundation

Raymond E. Barber
Executive Office of the President

S. J. Barbera
American Telephone and
Telegraph Company

Pickard F Bargh
U.S. Postal Service

Clarence S. Bennett
Office Of Personnel Management

James F. Bennett
American Telephone and
Telegraph Company

Peter H. Bennett
Electronic Industries Association

Robert P. Blanc
National Bureau of Standards

Herman Blasbalg
IBM-SCD; C84/060

Robert S. Braudy
American Express Company

Gene F. Brown
National Archives & Record Service

Edwin E. Brown
Central Intelligence Agency

James H. Burrows
National Bureau of Standards

Jennifer C. Bush
Federal Communications Commission

William R. Butterick
Washington, D.C.

Marshall L. Cain
National Communications System

John F. Carey Jr., Lt. Col.
Headquarters
U.S. Air Force

Ehret C. Carlson
General Telephone and Electronics
Service Corporation

Edith C. Carper
Institute of Electrical and
Electronics Engineers

Frank J. Carr
General Service Administration

Anna L. Case
Washington, D.C.

William W. Chandler
Micronet, Inc.

Arthur H. Choate
Central Intelligence Agency

Cecil G. Christian
National Archives & Record Service

Ralph L. Clark
Institute of Electrical and
Electronics Engineers

Ruthann L. Clark
Federal Communications Commission

Richard A. Cloughley
Product Strategy & Requirements

Stanley I. Cohn
U.S. Department of Commerce

Jessica Cole
Consultant, Washington, DC

Thomas W. Cooper
U.S. Department of Housing and
Urban Development

Daniel Costello
Administrative Assistant to
Representative James Hanley
U.S. House of Representatives

Loren D. Creede
Washington, D.C.

Kent K. Curtis
National Science Foundation

Marc D'Alleyrand
Columbia Broadcasting System

George D. Darnell
Central Intelligence Angency

Lee L. Davenport
Genral Telephone and
Electronics Corporation

Daniel B. Davis
National Telecommunication and
Information Administration

Louis E. De Noya
U.S. Government Printing Office

Theodore E. Deming, Commander
U.S. Coast Guard

Kenneth S. Dewire
Washington, D.C.

Wilson P. Dizard
U.S. International Communication
Agency

Kenneth T. Duff
U.S. Office of Personnel Management

Linda L. Dunleavy
Personnel & Security
Washington Headquarter Services

Connie M. Eaton
Personnel & Security
Washington Headquarter Services

David W. Eaton
Danbury, Connecticut

Richard W. Eckert
Social Security Administration

Richard E. Eichhorn
CPT Corporation

James H. Ellison
Social Security Administration

Ben Erdman
National Library of Medicine

Frankie S. Estep
Headquarters USAF

Alan F. Fairaiz
Siecor Optical Cables Inc.

Thomas G. Finn
Center for Advance Planning and Analysis

Quinn Finta
U.S. Department of the Interior

Glen E. Flanagan
National Archives & Records Service

Robert H. Fleming
National Telecommunications and Information Administration

Samuel W. Fordyce
Headquarters
National Aironatics and Space Administration

Brian E. Frasco
COMSAT General Corporation

Joseph Freitab
SBS

Kenneth M. Friedman
U.S. Department of Energy

Kate Frye
American Federation of Information Societies, Inc.

James T. Gallager
Hartford, Connecticut

Donald W. Gangi
Arlington, Va.

Joseph E. Gangi
Social Security Administration

George W. Garber
National Telecommunications and Information Administration

Denos C. Gazis
International Business Machines Corporation

Robert B. Gibbons
Federal Home Loan Bank Board

John C. Gilbert
U.S. Army

Deborah C. Gilman
Systems Technology Services

Jack Gilmore
Digital Equipment Corporation

John M. Ginci
Federal Communications Commission

John Gioia, Colonel
Headquarters
U.S. Air Force

Carolyn M. Gisgino
General Service Administraton

Janet Godula
Computer Products Group

John C. Gonda, Jr.
Washington, DC

William Grieger, Colonel
Headquarters
U.S. Air Force

Rodney C. Guliford
National Archives & Records Service

Charles W. Haas
American Telephone and Telegraph Company

William F. Hanrahan
Computer and Business Equipment Manufacturers Association

Donald K. Hansen
National Archives & Records Service

Lisa L. Hatcher
U.S. Department of Transportation

William Hatfield
Consultant, Washington, DC

Betty Hauswirth
Product Research Center

Vico E. Henriques
Computer and Business Equipment Manufacturers Association

Paul Hower
Interactive Telecommunications Program
New York University

John R. Hughes
Harris Corporation

Norman J. Hunt, Jr.
Electronic Data Systems, Inc

William Jackson
Office of Personnel Management

Vernon C. Jobson, Jr.
Harris Corporation

William L. Jones
Central Intelligence Agency

Eric L. Jorgensen, Jr.
Naval Ship Research and Development Center

J. P. Justusson
U.S. Air Force

M. Azher Kahn
Public Technology, Inc

Ira Katz
The Chase Manhattan Bank, N.A.

Adam G. Kegel
U.S. Postal Service Laboratory

D. A. Keller
Bell Laboratories

K. Granger Kelley
Defense Communications Engineering Center

Jula F. Kesner
Headquarters
U.S. Air Force

Arthur R. Kneer
National Oceanic & Atmospheric Administration

Rudolf J. Konig
Informetics Inc.

S.A. Kovy
Smithsonian Institution

Judith L. Krongold
Social Security Administration

John R. Kutzman
Social Security Administration

Michael H. Ladd
General Telephone and Electronics Service Corporation

Robert M. Landau
Kensington, MD 20795

Walter E. Landis
Engineering Research Associates

Dianne Lapinsky
U.S. Air Force

Charles J. Lawson
Washington HQ Services
Office of the Secretary of Defense

Nancy B. LeFebvre
American Federation of Information Processing Societies

Karen B. Levitan
National Science Foundation

Stephen J. Lukasik
Federal Communications Commission

Louis N. Lushina
National Aeronautics and Space Administration

Anthony J. Mallia
Wang Laboratories, Inc

Alan O. Mann
Community Services Administration

Michael J. Marcus
Federal Communications Commission

Stephen T. Martin
Academy for Educational Development

John Marus
The Diebold Group, Inc.

Harry J. Mason, Jr.
U.S. General Accounting Office

Frank M. McClenland
National Communications System

Francis A. McDonough
U.S. Treasury Department

Scottie McGehee
U.S. Department of Housing and Urban Development

John E. McPhee
U.S. Department of Commerce

Reynold C. Meneeley
Postal Service laboratory

Claire V. Messier
Digital Equipment Corporation

Joseph Milano
Port Authority of New York and New Jersey

Mark A. Miller
General Service Administration

Herbert S. Millstein
General Accounting Office

John Moundalexis
Internal Revenue Service

Joseph H. Myers
U.S. General Accounting Office

Jules N. Nelson
Rockville, Md.

Paul G. Nelson
Consultant
Silver Spring, Maryland

Patrick H. Nettles
Microwave Associates Communications

Linda A. Newell
S. Ross and Company

Ronald J. Nicholson
Central Intelligence Agency

Michael Nolan
Computer Association

Ken Norris
Dialcom Inc.

Ron Novak
Federal Communications Commission

T.J. O'Leary
American Telephone and Telegraph Company

Michael J. Olsavsky
U.S. International Trade Commission

William Ozanne
U.S. Customs Service

Todd Palmer
Hewlett Packard Company

Patricia A. Park
General Services Administration

Harvey L. Pastan
Arthur D. Little, Inc.

Louis-Francois Pau
French Scientific Mission

J. Chris Perry
The MITRE Corporation

James H. Peterson
U.S.Department of Housing and Urban Development

David Y. Peyton
National Telecommunications and Information Administration

Charles A. Phillips
Consultant, Washington, D.C

Peggy A. Pinkerton
Harris Corporation

Russell L. Platt
Digital Equipment Company

Charles Popper
American Express Company

Robert S. Powers
Washington, D.C.

Anthony M. Protani
Social Security Administration

Thomas N. Pyke, Jr.
National Bureau of Standards

Shirley M. Radack
National Bureau of Standards

Charles R. Ramsdale
U.S. International Trade Commission

Robert G. Rentner
Central Intelligence Agency

Sarah N. Rhodes
National Science Foundation

James V. Rinaldi
U.S. General Accounting Office

Paul C. Ringgold
General Telephone and Electronics Service Corporation

Lee E. Rosen
International Business Machines Corporation

Alexander D. Roth, Esq.
Processing Societies, Inc.

Joseph E. Rowe
Harris Corporation

Arthur M. Ruder
U.S. Postal Service

William C. Ruotola
Agency for International Development

E. P. Rush
Radio Corporation of America

Anita P. Russell
U.S. Treasury Department

Georgianna Ryan
Central Intelligence Agency

Norman F. Samuelson, Major
U.S. Air Force

Kevin W. Sanders
Digital Equipment Corporation

Robert A. Schaerfl
U.S. Department of Labor

Elias Schutzman
National Science Foundation

Leanard C. Senia
National Archives & Records Service

Patricia A. Serino
General Services Administration

W. A. Serwat
U.S. Postal Service

Jeffery Seymour
National Bureau of Standards

James C. Sheeran
National Archives (NRSD)

Celia M. Sherbeck
ECON, Incorporated

Herbert Sherman
Harvard School of Public Health

Steve K. Siech
LINK Resources

James H. Skidmore
U.S. Department of Health and Human Services

Constance H. Slawecki
Xerox Corporation

Franklin D. Smith
Department of Defense

Jane Smith
American Federation of Information Processing Societies

Harlan J. Smolin
National Bureau of Standards

Sheila M. Smythe
Blue Cross & Blue Shield

Earl D. Spraker
Arlington, Va.

Bruce G. Steinthal
Public Technology, Inc

Tim K. Stevens
Federal Communications Commission

Judy Stevens
Digital Equipment Corportation

Anita M. Stohz
National Science Foundation

Victor D. Stone
U.S. Department of Justice

Dale H. Stouder
General Service Administration

William J. Sullivan
U.S. Department of Commerce

Duncan B. Sutherland
Wang Laboratories, Inc.

Rowena W. Swanson
Office of Personnel Management

Stillman K. Taylor
Federal Home Loan Bank Board

Ed Thomas
Digital Equipment Corporation

Nelson Thompson
Central Intelligence Agency

Cheryl S. Veit
U.S. Department of Transportation

David J. Walrath
Washington, D.C.

Kenneth J. Walsky
U.S. Department of Housing
and Urban Development

Donald M. Weinstein
Central Intelligence Agency

Marshall D. Weiss
U.S. Postal Service

Ann C. Werner
Arlington, Virginia

Gerry Whiting
Washington, D.C.

Richard H. Wilcox
United States Arms Control
and Disarmament Agency

Roxanne R. Williams
U.S. Department of Agriculture

Jeffrey T. Wood
Computer and Business Equipment
Manufacutrers Association

Murrell Worth
General Telephone and Electronics
Products Corporation

Marlene L. Wright
National Science Foundation

Allan R. Wylie
U.S. Air Force

C. A. Yeh
Washington, D.C.

Kim L. Young
Philip Morris Inc.

Leo Young
Institute of Electrical and
Electronics Engineers

Barbara A. Young
U.S. Office of Personnel
Management

Norman S. Zimbel
Arthur D. Little, Inc.

Edward K. Zimmerman
National Telecommunications
and Information Administration