Management in the Nineties

Office Technology and the

Knowledge Worker

by

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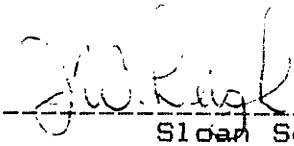
Signature of Author 
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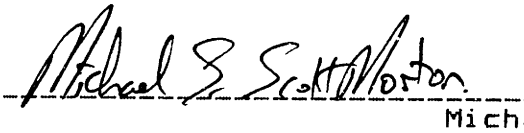
Certified by 
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ABSTRACT

This thesis is a case study of the way the introduction of electronic office technology has affected organizational structure and culture, management processes, and the roles of individuals at two very different organizations: the Xerox Corporation Office of General Counsel, and The Spunbonded Division of The Textile and Fibres Department at DuPont. One, and perhaps the only common ingredient of the two is that they both are made up, primarily, of "knowledge workers" - those whose main function is the production, handling, and distribution of information. Both have implemented, within the last two years, a form of electronic office technology.

The framework for analyzing the affects of this implementation is the model developed by Michael Scott Morton and Jack Rockart out of the work of Leavitt and Chandler.

The study begins with a literature survey of the why, what, who, and how of electronic office technology for the knowledge worker. Some possible consequences are inferred from this foundation. Interviews and a questionnaire are employed to attempt to detect the actual consequences at the two organizations, and comparisons are drawn with the expected consequences.

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CHAPTER 1

INTRODUCTION

In his "Management in the Nineties" research proposal, Michael S. Scott Morton (27) provides a clear and concise rationale for making the effort to study the impact of looking at technological change on the structure, processes, and roles of major corporations in the next decade and beyond. For reasons of completeness and consistency, that rationale is repeated here:

> To date there have been two major classes of work done in this field. One is by the Futurists who think globally, ponder and discuss "megatrends", and provide some insights into the major economic, technical, social, and political forces that are affecting business organizations. The second type of work done, most often by Organization Behaviorists, is the study of the impact of changes that have already happened. There has been a significant amount of the first type of "research", and some of the second. There has been virtually no work, to the best of our knowledge, which focuses on understanding managerial conditions, and therefore the managerial structures and processes, which are being and will be redefined by the technology.
>
> Looked at in retrospect, one significant reason for

this lack of work can be easily deduced. Computers have been utilized in a widespread manner for only two and a half decades. For almost all of this twenty-five year period, information technology has been used primarily to replace and improve clerical functions. For the major part of the first ten years of the period, computer systems were installed primarily to automate accounting functions. Payroll systems, accounts payable, and general ledger systems were installed on increasingly powerful computer systems throughout the world.

In the 1970's, we entered an era in which the emphasis changed from systems to aid the accountant to those in aid of first-line operational personnel. In this second era, manufacturing control systems and on-line order-entry systems were put in place. As with the first, most of the second wave of systems merely enabled companies to do what they had previously done with regard to paperwork processing in a faster and more accurate manner.

During the past several years, however, a "third wave" of computer applications has begun in earnest. As opposed to "accounting" or "operational" systems, this "third era" of applications can be termed the "information-communication" application era. This new wave of applications has been engendered by profound

changes in the technology (both hardware and software).

It is now our expectation that the computer-based revolution - in effect, the second industrial revolution - will have as profound an effect on the structure, processes and roles of major corporations as the first industrial revolution did almost a century ago.

That hardware technology is changing is well recognized. The rapidly decreasing cost of computer hardware and the frenzied reception of the new wave of personal (micro) computers has led many to predict that, within this decade, almost everyone handling information in a corporation will have a terminal on his/her desk. Most probably, this "terminal" will in effect be a personal computer allowing both remote access to major data bases and the ability to perform local computation with local storage of data at the particular users desk. Parallel to the computer hardware change, however, has been an equally explosive change in the technologies for data, text, and graphics and visual communication. Satellites, fiber optic systems, microwave communication, and "local area nets" are now at the point where it is agreed that the "computer function" has now been transformed to the "computer-communication function".

Computer systems are today used increasingly not only to gather, store and process data but also to communicate both numerical data and other forms of information throughout the corporation.

Equally significant, to the hardware and communications changes, is the third major change in the technology - that of the increasing availability of a new generation of software. This new software allows users at all levels in the corporation to access and use computer systems without the need of learning the rites of programming. Called "fourth generation" or "user-friendly" languages, this software today allows managers at all levels to use the computer without the one to three year wait associated with the production of systems by the company's data processing organization. Although such languages have been with us for approximately the past decade, it is only within the last two to three years that they have evolved enough to go into widespread use.

Another, less talked about but perhaps equally significant change, is that of the increasing availability of data for managers. It is common knowledge that the first two eras of accounting and operational application development have produced many internal data bases which are of use to the management

of an organization. Perhaps more important, as the hardware and software has evolved, organizations such as Dun & Bradstreet, DRI, Nielson, Best, etc. which provide external data (e.g. industry data, competitive data, economic data) have perceived an expanding market for their services and have moved aggressively to exploit this market. As a result, there are several thousand data bases containing the type of market, competitive, economic forecast, industry forecast, and other data which is perhaps even more useful to management levels above the first line supervisor than is internally generated data. This data is provided, for a fee, in machine-readable format to be easily added to a company's computer systems.

Chapters 2, 3, and 4 that follow take a look at the "why, what, who, and how" of the technology under study in this work - namely electronic office technology for the knowledge worker. Chapter five develops some logical consequences of the introduction of this technology, while chapters 6 and 7 describe the research conducted at two major corporations - Xerox and DuPont - where electronic office technology has been in use by small groups of knowledge workers for about 2 years now. Chapter 8 attempts to draw some more or less general conclusions from the research evidence in the light of the predictions

made in chapter 5.

CHAPTER 2

IMPLICATIONS OF THE INFORMATION AGE

Much has been written and said about the information age. This chapter will attempt to draw from this extensive resource that which might be relevant to the management of enterprise in the next decade. In particular, the focus will be on the need to cope with the changes brought about by the changing complexion of the office environment - changes brought about by the increasing complexity and scope of the tasks to be performed by the office in this information age.

The Growing Flood of Information

Daniel Bell (2), who was among the first to write about the phenomenon we have come to call the information age, quotes an appropriate passage from The Library of Babel in which Jean Luis Borges describes with excited anticipation the establishment of a library to hold the sum of all the world's knowledge. Hard on the heels of the joy comes deep depression with the realization that nothing can be located in such a massive collection. Chance experimentation would still be necessary in the search for information.

In a "real world" example drawn from the experience of research libraries, Bell (2) (4) describes the growth of the libraries of 10 representative U.S. colleges from 1831

(when they contained an average of 7,000 books each) to 1938. The data suggest a doubling every 16 years, a pattern of growth known as exponential growth. Specifically, the Yale University example is given. Starting in the early 18th century with around 1,000 volumes, 1.25 miles of shelving and 160 card drawers (or their 18th century equivalent), the library by 1938 contained 2,748,000 volumes, eighty miles of shelving, and ten thousand drawers of cards. The staff in 1938 numbered some 200 persons. Projecting this rate of growth to the year 2040 would apparently result in a permanent staff of some 6,000 persons merely to catalog this (by then) enormous library.

As a further example of the magnitude of the explosive growth of information, Lieberman, Selig, and Walsh (23) report that each year now in the United States more than 100 billion telephone calls are initiated, and more than 70 billion documents are created.

The quantity of information is growing at a rapid, exponential rate. It has already reached a point where new methods are likely to be required if chaos is not to ensue.

It was Galileo who pointed out that as a thing (natural or man-made) gets bigger, the materials from which it is made must change or it will fall to pieces of its own weight. It isn't hard to see that a similar structural limit might

apply to the growth of information. It is easy to understand how Naisbitt (28) comes to the conclusion that:

> We are drowning in information but starved for knowledge. Information technology brings order to the chaos of information pollution and therefore gives value to data that would otherwise be useless.

Information technology is the new material from which it may be possible to build the larger information structure so desperately needed in the face of a flood of information. The emphasis must indeed turn from supply to selection if the flood of information is to be turned from destructive to productive purposes.

So information is growing rapidly, so we need to be able to handle it better, so who cares? After all, it isn't important so long as we continue to produce "things" faster and better, right? Wrong! It is critical to keep in mind that manufactured goods are not the only "economic" entities in our society. Today, information is as economic as any manufactured good since it costs something to produce, and is worth something to firms and individuals in and of itself. In support of this concept, Charles Jonscher of MIT, in a recent Forbes article (39) cites the example of the auto industry. His point is that making cars is not the only "economic" activity the industry is involved in. By his reckoning, some 30% of the industry's value added falls into the information sector. Jonscher sites studies which reveal that half of

all U.S. economic activity is information creation and processing.

Clearly, our manufacturing industry's competitiveness, as well as our service industries success will increasingly hinge on improved productivity in this information portion of the value added chain. The challenge before American industry is to make effective and efficient use of the necessary information creation and processing steps.

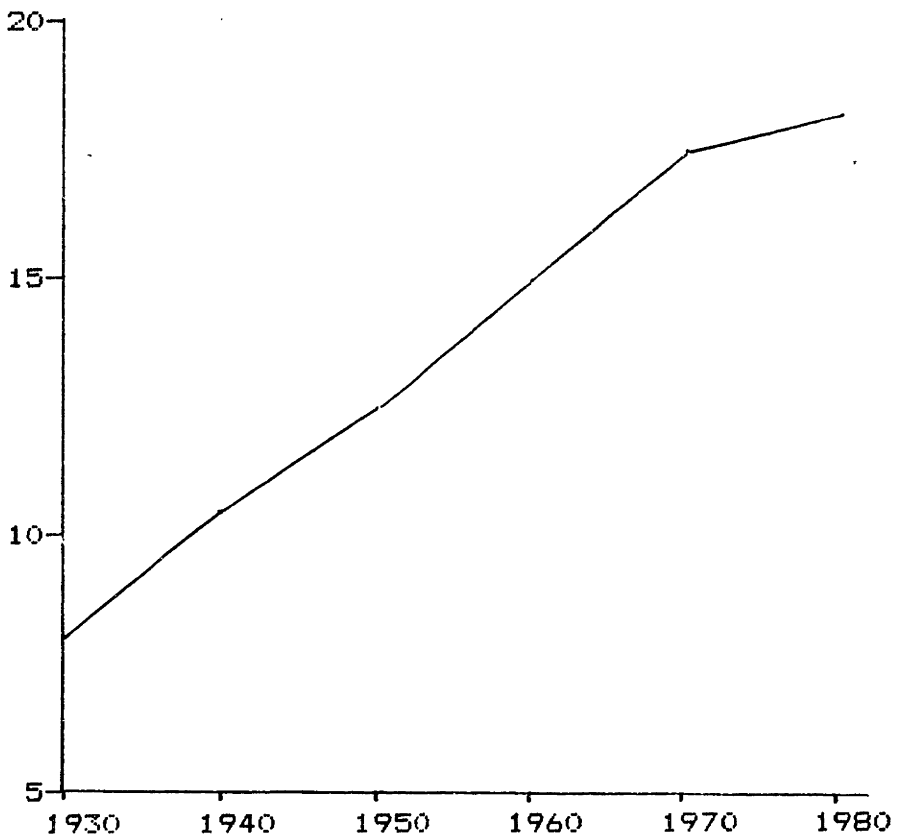
Increasing Office Employment

Farmer, laborer, clerk is the way Naisbitt (28) characterizes American society. And in fact, there has been a significant growth in the clerical labor force in the past 50 years (fig. 1). In 1979, the number one occupation in the United States numerically became clerk (28). This growth in recent years, however, appears to be directly related to that of another group which is growing even more rapidly. Bell (4) highlights the modern phenomenon of a rapidly increasing professional/technical workforce (growing in relative terms as well as absolute, whereas clerical employment is growing in absolute but not in relative terms).

The following points quoted from Lieberman, Selig, and Walsh (23) lend support to the importance of office work to the American economy:

1. 58% of the nation's office expenses are attributable

Figure 1.
The Growth of Clerical Support Work



Source: John J. Stallard, E. Ray Smith, and Donald Reese, The Electronic Office: A Guide for Managers, p. 3.

to managerial and professional salaries and fringe benefits.

2. Administrative costs are growing 10% to 15% a year.

3. White collar workers are now half the nation's total work force (up from 33% in 1950 and 18% in 1900), and growing 20% faster than the total labor force.

This growth of office employment is of particular concern since, as Katzan (18) reports, in the last 10 years, manufacturing productivity in this country has increased 80 percent while office productivity increased only 4%. While it is tempting to relate this slower productivity growth in the office to poor management techniques or to difficulty with measurement, Jonscher (39) and others have attributed this low productivity to low capital intensity relative to manufacturing. Roughly one third as much capital comes to the aid of the average white collar worker as compared to the average manufacturing worker. And the trend continues. In 1980, according to Jonscher, U.S. industry was spending only about $800 per year on technology for each information worker, only about one third of the spending on technology per production worker.

No matter how difficult they may be to measure, or how expensive to achieve, productivity gains have the potential to produce significant economic gain. According to Lieberman, Selig, and Walsh (23), a 15% gain in office

productivity could be worth 125 billion dollars per year in the U.S. by 1985.

It should be apparent from all the above that the information age is real, office work in support of the enterprise's need to handle the increasing flood of information is growing, and that the ability to handle it effectively and efficiently could result in a distinct competitive advantage.

Organizational Issues

Communications. If we accept that the office is a large and growing factor in the American economy, and if we take a look at the factors which contribute to the success of the office as an organization, the communication issue stands out as critical. This is not a new idea. Harold Guetzkow (16), for example, quotes Chester I. Barnard's 1938 work The Functions of the Executive:

> In an exhaustive theory of organization, communication would occupy a central place, because the structure, extensiveness, and scope of an organization are almost entirely determined by communication techniques.

The research of Donald (8) provides empirical evidence which implies that when organizational size grows, the formal vertical communication dimension grows, while informal horizontal channels of communication remain saturated. As intuitively comfortable as this hypothesis may be, the consequences are considerable and potentially negative: larger organizations must rely more and more on

formal, usually written , communication.

Structure. As a result of the increasingly vertical orientation of communication, organizations (and offices) take on increasingly pyramidal or hierarchical organizational structures in order to hold span of control down to a level at which the individual at the top of the hierarchy in question can respond in a reasonable fashion to the communication load thrust upon that individual. Even at that, pyramidal organizations often result in those at upper levels being flooded with communication to which they find it impossible to respond in a one-for-one fashion as appropriate.

An analogy with the passing of a rumor is perhaps appropriate to communication up the pyramid. The more layers of a pyramidal organization through which communication must pass, the more subject it is to distortion. Some of the distortion is likely to be of the random, rumor passing variety, but some of the distortion may be systematic. As Guetzkow (16) says:

> Meaning is transformed, as symbols are transmitted and filtered in the context of other symbol complexes.

The need to communicate accurately is critical to the success of any organization in this information age. However, it is apparent that the growth of office employment (with existing technology) results in a more hierarchical organization and with it the potential for miscommunication.

The Technological Imperative

Classical economics would have us believe that real incomes are tied tightly to the amount and quality of capital stock employed. A very real case based on solid evidence can be made today that technological factors rather than capital stock correlates best with the level of real wages.

The work of Robert Solow (42) looks at the period between 1909 and 1949 and reports that only one eighth of the increased productivity realized over that period could be identified with capital increase. The remainder, Solow argues, resulted from technological change.

Drawing on more recent developments, we find that the early days of centralized data processing brought predictions of huge improvements in productivity. In many individual functions, these predictions came true to one degree or another. Unfortunately, the overall savings were not realized because what most did not recognize was that the increased number of people in the data processing function compensated, in many cases, for savings elsewhere. It can be argued that the result of computerization was increased data, not reduced head counts. Centralized data processing departments and all the money devoted to data processing in the '60s and '70s to gather information has created a huge bank of more or less available data. Katzan (18) therefore identifies the

technological challenge of the '80s as the ability to achieve a "return on information."

From still another perspective, a convincing argument has been made (32) that office technology is rapidly becoming the modern equivalent of the early telephone in the office. The point is that it may be becoming a cost of doing business, of attracting and retaining top quality employees in the office. Proponents of this position point out that air conditioning and telephones were initially dubious office productivity enhancers (in the eyes of managers, at least). The analogy with the telephone is particularly apt since modern office technologies similarly rely on a growing population of "users," just as the telephone did in its early days.

From either perspective a reasonable case can be made that when a competitor employs improved office technology, others must also, or face the real possibility of becoming non-competitive. The non-competitiveness may be directly related to the effective use of available resources (return on information), or to the ability to attract and hold the best qualified individuals (office technology as an expected amenity).

CHAPTER 3

OFFICE TECHNOLOGY FOR THE KNOWLEDGE WORKER

Bruce Hasenyager, vice president for information systems at Kidder Peabody, in a recent interview in Datamation (20) said of office technology: "Something's happening now. In analyzing it, though, I think we're a bit like the blind men inspecting the elephant." The obvious point that jumps out of a review of the available literature is, as Hasenyager's interviewer, Kenneth Klee, concludes: "Even though the blind men failed to agree on the nature of the elephant, none of them disputed its existence." There is obviously a lot happening in the general area of office automation. What is less clear is what exactly is, or should be happening and what the likely consequences might be.

The purpose of this chapter is to identify the technology under study, the likely beneficiaries of the technology, and the challenges and opportunities which might result.

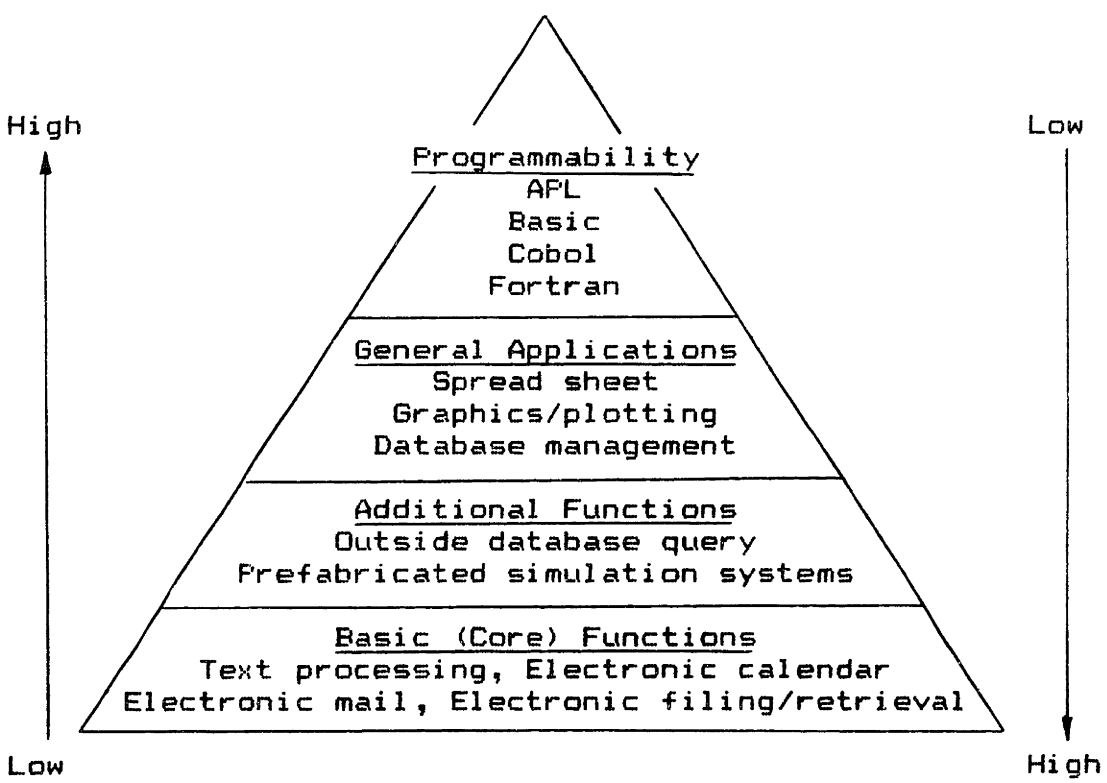
What is the Technology?

Macfarlane (25) describes a functional framework for describing an office technology system. The framework groups each element of the system as being contained in, or consisting of, elements from six categories:

1. Communications
2. Information retrieval
3. Analytical tools
4. Text preparation
5. Personal support tools
6. Special applications and programmability

Figure 2 shows another way to look at the elements of office technology. The base of the triangle shows the basic, or core functions most often considered when introducing electronic office technology today. As the system progresses up toward the apex of the triangle, the degree of user sophistication required increases; or, put another way, the user friendliness of a given element is reduced.

Figure 2.
The Elements of Office Technology



Goldberg (14) suggests three criteria to use in selecting an element that goes beyond the basic functions:

1. It should be used at least once daily.
2. It should be an automated replacement for a manual application.
3. It should have accessibility to a wide user group.

In applying any of the conceptual frameworks for electronic office technology, it's important to keep in mind the contrast, highlighted in a recent Businessweek article, between office technology and factory automation:

> With a traditional machine tool, for instance, workers cannot learn much beyond machine's basic job functions. But with computers, the capacity of both the machine and the worker can grow the more it is used. Thus, the person sitting in front of a computer terminal not only learns new ways of doing a specific job more efficiently but also often starts demanding new and more efficient functions from the computer, adding new information that was not previously programmed into it.

The important point then in selecting a system for use in the office would seem to be flexibility and adaptability coupled with an ability to grow with the user.

Macfarlane (25) describes some 18 currently available office systems that he considers most integrated. It is apparent that the choice of system is to be made in the midst of a bewildering maze of software and hardware. The framework and flexibility approaches described here may give some hope to the potential implementor of office technology in the search for the right system for a given office environment.

The hardware selection often follows from the software selection. A word needs to be said, therefore, about the key consideration in selection of the right hardware. That word is responsiveness. There are usually two parts of system responsiveness. One is the availability of the core processor (micro or mainframe), and the other is the adequacy of the communication network. The literature is full of examples of office technology introductions which either came up on the shoals of, or were rescued with great difficulty from, a lack of responsiveness. Digital Equipment Corporation, a major participant in the office technology field, reporting (7) on the implementation of its own ambitious in-house electronic mail system reports that network design proved to be a critical component. In their words, "The popularity of the new tool almost became its downfall!" Slow response brought on by overloaded telephone circuits brought considerable dissatisfaction among the users of the system. The lesson is clear: communications traffic engineering must play a hand in the selection and implementation of any system which includes an electronic mail system. In fact, a study by Smith and Benjamin (41) finds that the advent of electronic mail and document distribution systems with their associated non-voice communication circuit requirements will result in a doubling of existing telephone circuit capacity requirements over that of the traditional office environment.

In discussing the content of office technology, it is important to bear a few key points in mind: First, the systems are office technology, not automation. The distinction is drawn to clarify the point that the technology supports, it doesn't truly automate the knowledge worker's function. As Katzan (18) tells us "it is becoming increasingly clear that most office work will never be truly automated." The key benefit according to him is when the office technology (hardware and software) allow office people to "work smarter".

Finally, Simon makes a telling point: "Automation is not the only way to reduce the cost of a process - a more effective way is to eliminate it." The manager who would provide technology to support a function would do well to ask the question first - does the function contribute anything to the success of the organization? - before charging head-long into implementing technology to enhance the function in question.

In summary, the technology, often called office automation or electronic office technology, is to be found in a wide selection of available hardware and software. There are certain base or core functions which should require little user sophistication, but the system must be capable of growth through additional functions, general applications, and ultimately personal customization through programming as the user's capabilities grow. And finally, the system

selected must be responsive and appropriate if it is to enhance office productivity.

Who are the Candidates?

The candidate beneficiary of the benefits of the kind of office technology described above is the person who has been termed the "knowledge worker". A Booz, Allen & Hamilton, Inc. study cited in a recent issue of Computerworld (33) defined knowledge workers as management and nonmanagement professionals.

Lieberman, Selig, and Walsh (23) are somewhat more specific in their description:

MANAGEMENT	PROF'L/TECH'L
Chief executive officer	Financial analyst
Vice president	System analyst
Upper mgt. (gm's & directors)	Market researcher
Middle mgt. (managers)	Engineer
First-line mgt. (supervisors)	Programmer

The candidates are therefore those who are relatively high in the pecking order of the typical organization. Given the more usual secretarial/clerical orientation of office automation efforts, this might come as a bit of a surprise, but Simon (40) warns us not to assume that the high status positions will be immune from first-hand exposure to office technology. Lieberman (23) points out that the function of the executive may well be modified

significantly by the introduction of what he calls an executive work station. This work station would provide, as a minimum, the following:

1. The use of keyboards and displays to replace pads and pencils in the process of crystallizing ideas into summaries and conclusions.

2. The use of graphics composition tools, displays, and analytical computing aids to model, compare alternatives, understand relationships, and develop presentation materials.

3. The use of electronic media to store, cross-index, retrieve, and dispose of reference materials.

4. The use of electronic communications to share ideas and information and to conduct meetings without the physical presence of the participants.

Table 1 is Lieberman et al's comparison of the traditional office executive's environment and function with conditions after the introduction of office technology in the form of the executive work station.

In the area of electronic filing, Poppel (35) reports that a significant amount of a traditional executive's time is spent in what might be considered clerical work - that is in trying to locate information they have either generated or received on some prior occasion. The real crime, according to Poppel, is that the search depends on the executive or the clerk knowing what they are looking for in some detail. The ability to search by key words is a feature which can be put to good use in eliminating this unproductive waste of time in an office with an electronic filing/retrieval system.

Table 1. The Impact of Executive Work Stations

TRADITIONAL OFFICE	WITH EXECUTIVE WORK STATIONS
1. Major concerns are communication (telephone, pencil, typewriter).	1. Communications remain a major concern. However, messages will be keyed in by the executive for transmission through a networking system to other terminals or for electronic mail and oral messages for voice output.
2. Manual methods are used to create and process information.	2. The creation and processing of information will be accomplished through automated technology, and manual methods will be minimized.
3. Information is decentralized and housed in files in various offices.	3. Centralized files of information throughout the organization will be accessible to each of the executive work stations.
4. Many times decisions are based on incomplete information because of the decentralization of files.	4. Centralized files will provide the executive with all pertinent, up-to-date information from all units within the organization for decision making purposes. In addition, the executive can develop what-if scenarios, forecasting, and modeling and receive graphic displays of the result or impact of various decisions.
5. The executive/secretary organizational arrangement makes the executive dependent upon the secretary for numerous support activities.	5. The executive/secretary organizational arrangement would be eliminated, minimized, or become an executive/administrative assistant arrangement. The result would be fewer transfers of control over work, the elimination of labor, and the elimination of a procedure or steps in a procedure.
6. The productivity of the executive/secretary organizational arrangement has changed little over the past.	6. Productivity could be increased through a better utilization of human resources, improved organizational communications, an increase in the quality of decisions, and an enhancement of the quality of work.
7. Excess time is spent retrieving needed information.	7. A minimal amount of time would be spent on filing, searching, and retrieving of information needed for decision making purposes.
8. As the volume of information increases, more support personnel are hired to handle this growth.	8. An increased growth in the volume of information could be handled with increased memory capacity of the automated equipment ratherr than additional support personnel.

Source: J.J. Stallard, E.R. Smith, and D. Reese, The Electronic Office: A Guide for Managers, pp. 139-141.

Ironically, with this concern over the excessive amount of time spent by the average executive on clerical tasks, electronic office technology in the form of text processing (an apparently clerical task) may well be an important executive productivity enhancement tool. In that connection, Macfarlane (25) opines that:

> Perhaps the greatest benefits come from authors using the system themselves to close the gap between thought and the printed text. Many managers are unenthusiastic at first, but once the barrier of unfamiliarity is passed, virtually every direct user of a text preparation facility will be convinced of its advantages.

Crawford (7), in his study of the implementation of office technology at the Digital Equipment Corporation reports a significant reduction in the cost of document preparation when the principal does the typing rather than the secretary. Table 2 is drawn from Crawford's research.

The candidate then is the knowledge worker. This category as defined here includes management and non-management professionals who therefore occupy a relatively high status place in the typical organization. By describing some of the ways that this high cost, presumably high value, segment of the payroll could benefit from the introduction of office technology, this section has attempted to show the importance of proper implementation of appropriate office technology to the success of the organization.

TABLE 2
COMPARATIVE COMMUNICATION COSTS

	INTEROFFICE MEMO	PHONE CALL	EMS MEMO ORIG:MGR	EMS MEMO ORIG:INTERM
ORIGINATOR (LABOR)	2.88	1.80	2.16	2.88
SECY/OPERATOR (LABOR)	3.42	--	--	1.08
NON-PRODUCTIVE	0.25	1.23	--	--
MATERIALS/MAIL	0.61	--	--	--
COMMUNICATION	--	0.82	0.27	0.27
SYSTEM	--	--	0.83	0.83
PERIPHERAL EQUIPMENT	0.44	0.46	0.14	0.14
COMMUNICATION	--	--	0.83	0.83
ACCESS FACTOR (FRACTION)			0.90	0.90
TOTAL UNIT COST	7.60	4.31	4.70	6.70
COST/ADDITIONAL COPY	1.56	4.31	1.24	1.24

SOURCE: A.B. CRAWFORD, JR., "CORPORATE ELECTRONIC MAIL - A COMMUNICATION INTENSIVE APPLICATION OF INFORMATION TECHNOLOGY," MIS QUARTERLY, SEPTEMBER 1982, PG. 11.

The Opportunities and Challenges

That there are both opportunities and challenges associated with the introduction of office technology for the knowledge worker, there can be no doubt. The optimists would have us believe that challenges are opportunities. Whether that is so or not, it is a good idea to be aware of the sensitive issues in approaching this complex subject. The following section will highlight some of the issues identified in the literature.

The challenges (opportunities?) appear to be in three general areas: communications, data availability, and document creation/handling.

Communications. Leavitt (21) discusses laboratory condition research into the appropriateness of communications network structure in complex organizations. The salient point to be drawn from that research for our purposes is that for ill-structured tasks, more wide-open communication nets with larger numbers of channels and less differentiation among members seem to work more effectively. The electronic mail concept, with its relatively open and easy communication channels, would seem to be particularly appropriate to the working environment of the knowledge worker as defined here.

Windt (47) points out another positive feature of electronic messaging systems. With its spontaneity, one is able to send messages with the ease of a phone call, without worrying about the availability of the recipient - "in the heat of inspiration" - and forget about them until the reply comes. However, along with this optimistic evaluation of electronic mail comes the following caution:

> "People react to electronic messages in different ways. In the absence of body language cues, some people wonder whether to be formal or informal."

The ease of use of a messaging system can also lead to other forms of abuse. Keep in mind the old Russian joke "What is Stalin, if not Genghis Khan with a telephone?" Some would say that electronic mail has some of the same potential for destructive use.

Driscoll (9) says that the critical functions of a manager are building relationships, persuading others, and resolving conflicts. He says that the success of a technology such as electronic mail hinges on the manager's ability to complete such sensitive functions by intermittent written communications.

Simon (40), however, takes a more positive view. He feels that the relief brought by office technology from mundane, repetitive, and time-consuming chores will free up the manager and allow more non-business communication than otherwise possible. According to Simon, this communication is likely to be more valuable than

communication under the strain of the authority role normally implicit in business communications, even those of a face-to-face nature.

Driscoll (9) concedes that electronic mail systems offer a very real potential in the administration of employee attitude surveys and suggestion programs.

Data Availability. By now it is obvious that programs like Visicorp's VisiCalc and Lotus' Lotus 1-2-3 have helped clear a space for the micro on the manager's desk. However, according to Walton (45): "As good as Visicalc is, it has exposed a new need for the real data." What Walton is referring to, of course, is the problem facing many organizations today as a result of the recent proliferation of microcomputers. The problem is summarized by Keen (19) when he says that too often in the past, distributed processing power (Keen was discussing decision support systems) has tended "to focus on models without data and data processing departments on data without models."

According to Keen, the real payoff for the executive comes when the data in the central computer becomes truly available in an integrated way for use with the smart terminal on the desk. Healey (17) writes:

> What is needed - and eventually recognition of the need will produce the product - is a general purpose mainframe package, with a defined protocol any micro manufacturer can support, which will give access to any database software.... Eventually all interactive

processing will migrate to the workstation, leaving the batch and database management to the mainframe."

From the above, it would seem that centralized data, decentralized processing is to be the way of the future. The conclusion seems to be that centralized corporate data base access is an idea whose time is yet to come, even if there is a lot of work going on in the area.

Document creation/handling. Stallard, Smith, and Reese (43) remind us of the fact that "90% of managerial information is words, not numbers, while most automation to date has been in the collection of 'data' in the form of numbers." The consequence of this lack of focus on the electronic handling of this key resource of management is that filing systems are still on paper and in filing cabinets. With the advent of electronic mail and electronic document transmission systems, electronic filing becomes a real possibility. Some assume that such systems will come about more or less automatically. In fact, electronic filing has all the difficulties of centralized data base maintenance and control with one giant roadblock that numerical data bases don't face: the files don't yet exist in an electronic form. Again, there is work going on in this area, but there is a long way to go yet.

Eliot (11) points out one further disturbing aspect of office technology implementation is that it may require some individuals in high status jobs to take instruction

from relatively lower status individuals or to acquire by some means skills normally associated with lower status jobs. A prime example is that many executives consider it beneath themselves to type (particularly the women, it seems). And yet, personal text processing (i.e. without an intermediary) is a demonstrably productivity enhancing activity for the knowledge worker, even one with limited typing skills.

CHAPTER 4

THE CRITICAL NATURE OF CHANGE MANAGEMENT

In the last chapter, we looked at what makes up office technology, who is likely to benefit, and some of the challenges/opportunities associated with its use. In this chapter, we'll take a look at what may be the biggest single challenge to the implementation of office technology for the knowledge worker - successful management of the introduction of the system. In any society or organization, change brings strain. The following material will focus on some of the points of resistance to office technology, and some relevant theory concerning implementation methods.

A Perspective on Change

It has become fashionable recently to talk of the "accelerating pace of change" and "future shock", but Bell (4) takes some of the wind out of the futurist's sails when he quotes Mervin Jones:

> A man born in 1800 and dying in 1860 would have seen the coming of the railway, the steamship, the telegraph, gas lighting, factory-made clothing and furniture. A man born in 1860 and dying in 1920 would have seen the telephone, electric light, the car and the lorry, the aeroplane, radio and the cinema.

Seen in this light, it is difficult to say that our modern predicament represents more rapid change than that seen in the last two hundred years, at least. Are computers and television fundamentally more unsettling than these

earlier changes when seen from the perspective of the contemporary citizen?

Bell also reminds us that in many ways, the introduction of electronic technology to the office environment is similar to the change wrought by Guttenberg's invention of movable type. It put the artisans (specialists) out of work, but its impact on employment was to increase it as more people demanded the now more available product. A further analogy to the printing press: The invention of movable type started an avalanche of further technological advances - from the linotype to improvements in paper manufacturing technology - which had a bigger impact on the information distribution business than did the original technology itself.

Having said that change shouldn't be as much to worry about as some would have us believe, there is still to be faced the fact that organizations and the individuals in them will resist change - sometimes pathologically.

Points of Resistance

The Luddites, who were around over 100 years ago, are frequently cited as an example of organized change resistance. Their concern, of course, was that machine weaving would result in permanent overproduction and underemployment. Their theories have been widely discredited by now, but the fear which led to them still

lurks beneath the surface of every organization - even the most progressive, whether the fear is valid or not.

Simon (40) sees automation of any sort as an extension of the industrial revolution of which he says:

> Most analysts who studied this history agreed that the industrial revolution had, in the long run, increased the real income of most segments of the population. Yet optimism has not been the universal tone of commentary on the industrial revolution. At any given moment in history, most observers grant its past benefits, without necessarily being willing to project these benefits into the future.

It would appear that office technology, and the change it brings with it, suffers from the same (mis)perceptions as many earlier changes in the working environment. However, office technology enthusiasts may be able take heart from Nauges (29) who says: "When people search long and hard for reasons not to do something, it's a fairly good indication that they ought to be doing it."

Still another reason for resistance might be considered more reasonable. Most of the office technology systems available do not yet live up to their advance billing. Alvin Toffler in a recent Computerworld OA interview (37) said:

> Despite all the beautiful design, systems today are still very primitive, and the cost of learning them is still very high. As a result, a natural resistance exists on the part of executives who regard their time as extremely valuable.

Even if all the benefits of the technology ultimately come true, the productivity cost associated with learning the system in the first place may be just too big a hurdle to

cross for many.

One can't ignore the part that perceived roles and self-esteem play in the resistance to office technology for the knowledge worker.

Traditionally, the executive originated a business document (memo, letter, report) with ideas expressed by means of longhand draft or dictation, the secretary captured the ideas (typed or word processed them). The argument has been that this system is an efficient use of the high priced executive's time. With the rising cost of office clerical support and the falling cost of the electronic technology which provides a potentially more efficient idea capture method (the executive work station) the old method is no longer so efficient. However, the attitude prevails.

Nauges (29) provides a most lucid argument in favor of the concept of unaided (no intermediary) document capture by the knowledge worker:

> If a manager is sitting at a terminal, drafting and editing her own report, some people will say the company is paying manager's fees for secretarial work. They forget that most of the time, typing is a job that consists of preparing, for the second time, a document which has already been created by a manager. Getting a manager on a terminal is simply a way to avoid doing the same job twice.

The "efficient use of time" argument, or the traditional "secretary will fix it approach" doesn't appear to be the appropriate one for today's office environment.

The fact remains, however, that for one reason or another, most executives have not concerned themselves with the process of information handling, so not surprisingly, information management has not been viewed from the top down as a system. Until it is, self-imposed change will be slow, and resisted.

A more subtle, but no less important, point of resistance stems from the potential for changes in the power distribution within the organization which change might bring. Many have postulated that information is power, and that therefore office technology which, almost by definition, leads to some redistribution of information will result in some change in the distribution of power. As Eliot (11) points out:

> The power distribution inherent in the information system is unlikely to be precisely the same as that within the organization to begin with; hence, in the course of implementation people are likely to use the system in ways that will distribute power more to their liking.

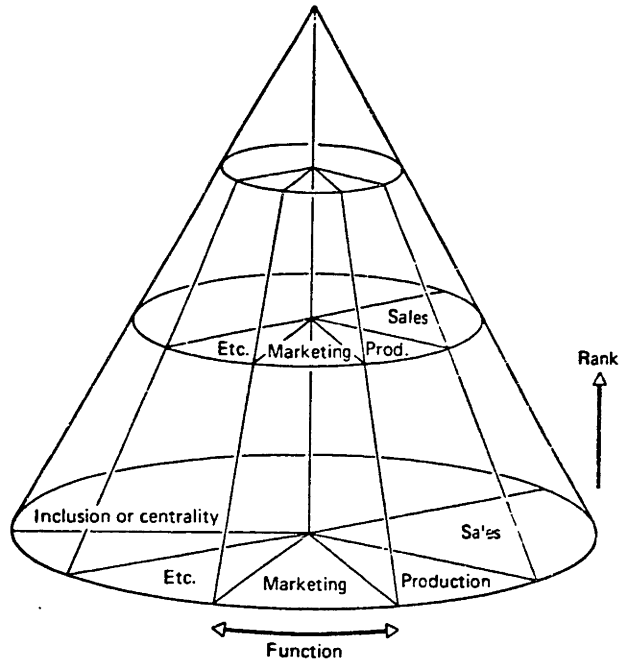
Given that someone must face change, or, alternatively, change the system (through passive or active resistance), it isn't too hard to understand this facet of the resistance to office technology.

According to Schein (38), even if office technology does not appear to impact power distribution, it may redistribute something he calls centrality (Figure 3), and so may radically alter the actual distribution of power

Loss of centrality may go some way to explain why older, more established employees at all levels of the organization have more difficulty accepting new tools in the office environment.

Figure 3.

A Three Dimensional Model of an Organization



Source: Edgar H. Schein, Organizational Psychology, p. 18.

A feature of the redistribution of power which accompanies the introduction of electronic office technology which has not (as yet) brought much active resistance, is apathy toward the use of the new technology among certain classes of American society. The tendency for interest in computers to be a male province for example, or the

absence of blacks among either the makers or the users of the new technology argues that the "levelling" of the organization seen by some office technology enthusiasts may not come to pass quite so quickly, if at all.

Implementation Issues

M.I.T. information economist Charles Jonscher, when asked by Sherrid (39) why, if it took 100 years to automate the factory, would it be feasible to take only 10 to 15 years to do the office? The answer, it appears, lies in the homogeneity of office functions (or more to the point, the flexibility of the tools relative to the function).

Whether rapid change is feasible or not, Driscoll (9) makes a strong case for slow-paced strategic change in the form of demonstration projects and pilot programs. He feels such a slow pace of introduction is necessary because of the nature of the change ultimately desired (a basic change in the nature of office work.) "Commitment and local innovation require a slow-paced transition, not specific directions from the top."

Birchall (5) makes the point that "People may need the reassurance of private play as well as careful training in order to encourage them to take 'ownership' of a major new tool." He feels that through the familiarity so developed, managers, specialists, and staff will more readily identify new applications for the equipment.

Driscoll (9) also points out the importance of informal communications to the acceptance of electronic mail:

> In every successful installation of EM I have visited so far, the users have developed informal distribution lists to notify each other of social events and gossip...

Both the above authors make a telling point: Acceptance and innovation that improves the system may come at some apparent cost to the traditional, rigid controls over computer use that exist in many organizations.

According to Leavitt (21), there are three fundamentally different ways to introduce change into an organization. Two of these are the technological and the power equalization (PE) approaches.

The technological approach to organizational change clings to the belief that there are "better" solutions to any problem. And that a Darwinian survival of the fittest ethic requires the organization to adopt a change when it is clearly "better". No matter how emotionally unsatisfying, "the steam drill must inevitably defeat John Henry."

The classic model of information systems development grows out of a technological approach. This method for introducing change has great rational appeal but is rarely in tune with reality, according to Brown (6), who makes the point that:

> The successful use of an information system changes the user, sometimes profoundly. The information

system must be capable of change accommodating an evolving user or find itself relegated to the junkyard."

The PE approach, on the other hand, believes that internal harmony, growing out of what has come to be called participative management, is critical to the success of any change strategy.

Among other things, the proponents of the PE model of an organization believe:

- two-way communication is better than one-way, and that change can take place more readily in two-way communication situations.
- the more channels of communication the better, and that effective change comes easier in organizations with many channels of communication.
- the more valid (unconstrained) communication in an organization the better, and valid change comes easier where there is valid communication.

Leavitt, in his evaluative summary of these two change strategies, holds that in task areas where the important criteria are creativity, flexibility, and capacity to deal with novel, unprogrammed problems the PE approach to change is a feasible (he stops short of saying desirable) alternative. In more programmed environments, he feels, the PE model is inappropriate.

The executive work station is, in many ways, the embodiment of the PE model. Its flexibility and interactive capabilities can result in innovative uses generated from within the organization. And the improvement in communication which accompanies office technology can provide the multiple, two-way,

unconstrained communications required to make use of the PE approach, again if properly handled. This apparent fit, however, should not lull the reader into a feeling that ease of communication and flexibility inherent in the technology will bring with it ease of implementation of office technology for the knowledge worker. The fit may serve to blunt some points of resistance, but it is unlikely to remove any of them altogether.

CHAPTER 5

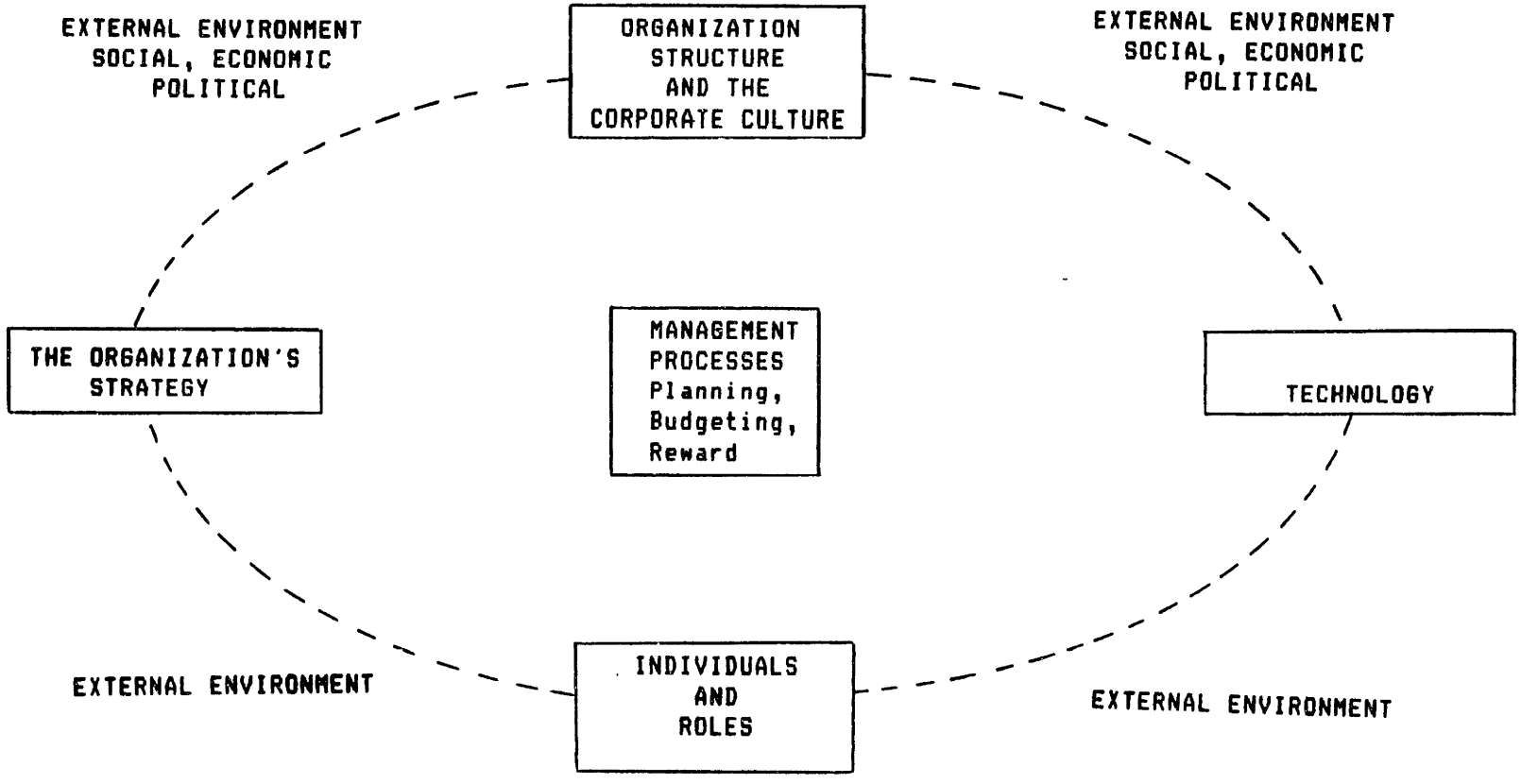
SOME POSSIBLE CONSEQUENCES

The chapters leading up to this point have attempted to identify the why, what, who, and how of office technology for the knowledge worker. This chapter will lay out a number of possible consequences the technology may have for the organizations and the people in them.

Several authors including Klee (20) and Bell (3) have pointed out that office technology might permit organizations to be more of whatever it is that they want to be. They can be more centralized/decentralized, more insightful/obtuse, and so on. In one way, the technology may simply be viewed as an amplifier of existing characteristics of the organization. However, most who have written on the subject of office technology have recognized that there will be more subtle, but not less dramatic ways in which an organization and the people in it may be expected to change with the introduction of the new technology.

One particularly useful model of the interrelationship of technology with the organizational structure and/or culture, management processes, individuals' roles within the organization, and ultimately the organization's strategy is the one developed by Michael Scott Morton and Jack Rockart out of the work of Leavitt and Chandler (Figure 3).

Figure 3. Strategy, Structure, and Technology



That which follows focuses primarily on the structure, processes, and roles boxes. More specifically, if one considers each of the boxes as having a third dimension to permit viewing each box of the model as a set of layers piled loosely on one another, we will be concentrating on the layer containing the knowledge workers. Viewed in this way, it is evident that changes in this one layer affect not only the characteristics of that layer throughout the interconnected boxes but other segments of the enterprise as well, to one degree or another.

This chapter will list many of the changes that have been suggested in the literature as a basis for comparison with the research to follow. The reader will note the positive bias of the propositions. This methodology is no less objective, since findings, both positive and negative as measured against the propositions, will be subsequently reported.

Management Processes will be More Direct

Empire Building will be More Difficult. There is built-in skip level interviewing enabled by the electronic messaging capability. At the same time, more channels of communication will be made available without the imposition which an "open door" policy often brings to a manager.

Communications will be Different. Electronic mail

combines the best of both telephone and memo communication. Like the memo, it is asynchronous and it leaves a written record. However, it is as speedy as the telephone (perhaps more so if you consider the problems of telephone tag).

The asynchronous communication capability will permit seven day, twenty-four hour access to key individuals in both directions. The key point here is that communication is discretionary in both directions.

The problem of time zone discontinuities (narrow windows) is minimized.

Written communications will be more spontaneous, and for that reason, less formal, and more concise.

Fewer Staff Groups. Simon (40) refers to "Gresham's Law of Planning," which states that programmed activities will drive out non-programmed activities. This inevitably leads to the creation of staff groups to pick up the necessary programmed activities in order to free up the executive for non-programmed environmental scanning activities.

The problem with the profusion of staff groups, as Allison (1) says, is that: "Those who decide which information their boss shall see rarely see their bosses' problem." In other words, if you want it done right do it yourself - if you have the time.

Presumably, the office technology that enhances the

executive's ability to handle programmed functions should allow the manager to handle some staff functions directly without a commensurate reduction in the time available for planning activities.

Meetings will be Different. According to Katzan (18):

> The average knowledge worker spends approximately 50 percent of the time in meetings... Many transactions require face-to-face contact, but a high percentage of everyday business activities within the communication domain can take place in the asynchronous mode, which is more efficient and more convenient.

Crawford's study (7) does provide some indication that fewer meetings will be required in the organization which makes extensive use of electronic office technology.

Paoni (34), in a review of the significant business software available for the knowledge worker, reports that one important package may be the one that takes columnar information and turns it into meaningful business graphics. He feels that with the appropriate software, the time and cost obstacles to the use of color graphics media are eliminated. Paoni goes on to cite a recent Wharton Business School study outlining the reasons that business graphics are used by more top executives:

- The average time for a meeting is reduced by 28%.
- The presenter is perceived as more professional.
- Complex and detailed information is understood more easily.
- The persuasive power of the presenter is increased twofold.

Man is after all a visual animal, he says. Approximately 87% of all information taken in is stored visually, i.e. graphically.

From the above, it becomes apparent that with the right technology, meetings would be more effective and efficient.

At the very least, the kind of meetings are likely to be different. Routine meetings for informational purposes will be probably fewer. On the other hand, the kick-off meetings may have to be more detailed in order to keep people from charging off in the wrong direction with technologically enhanced speed.

Better Decisions will be Made

Simon (40) equates decision making with managing. He makes the point that decision making isn't simply the final act of choice among alternatives, but the whole process of finding the occasion (INTELLIGENCE), analyzing potential courses of action (DESIGN), and choosing from among the courses (CHOICE). He says that these processes comprise most of what an executive does. At the same time, as Paoni says: "the decision-making process is not binary; it is iterative in nature."

There is therefore an apparent fit between function and task that the personal computer brings to the knowledge worker's desk.

With the right kind of electronic filing system and access to the corporate data bases, the chances are good that information will be more readily available. And with the

direct (not through staff) approach to the information, the chances are improved that the knowledge worker will have the right materials available the first time.

Organizations will get "Flatter"

Wider Span of Control. According to Simon (40):

> An organization will tend to assume hierarchical form whenever the task environment is complex relative to the problem-solving and communicating powers of the organization members and their tools. Hierarchy is the adaptive form for finite intelligence to assume in the face of complexity.

What this implies is that as the tools become more sophisticated relative to the task (the introduction of office technology for example), organizations will tend to become less hierarchical, or that the tasks attempted will become more complex and rewarding to match the enhanced capability. Undoubtedly, some of each will actually occur, but the net effect on the organization is that it is likely to be less hierarchical, or "flatter."

Not only is it likely that, with time, the formal organizational structure will change, but, as the British organization National Computing Center (NCC) reports in its study of the impact of electronic mail systems: "The system breaks down the demarcation lines within the hierarchy."

More Direct, Hands-on Management. Edwards (10), reports on a survey of reactions to an office technology system at the Stanford Research Institute. Among the findings of

that report; there appeared to be:

1. Reduced dependence of professional staff on Secretaries.
2. Reduced need for middle managers since there are fewer layers of subordinates.
3. Less "line of sight" management. The effect of distance on the degree of communication between individuals is minimized.

The implications of these impacts of office technology may be far-reaching for the executive secretary and support staff.

Fewer Menial Tasks in the Office. In most cases, secretaries will no longer be typists, that function having been absorbed largely by the executive in his document origination role.

The importance and even the existence of people like the copy machine operator and the mail delivery person in the office environment is called into question.

The next two chapters will take a look at two very different organizations within two different companies in an effort to see whether there can be found in common some of the consequences described.

CHAPTER 6

FIELD RESEARCH AT XEROX

The Xerox legal department, in common with those of many other major corporations, is attempting to bring rising legal costs under control (15)(22). To do so, more legal functions are being brought in-house. Tighter control and a more pragmatic approach to what is and is not necessary in the way of legal research is being forced upon those outside counsels still retained. This new attention to detail, and the do-it-yourself attitude in corporate legal departments brings with it, of course, more work for corporate legal departments. The unique thing about Xerox is that this additional work is placed on a legal department which is actually smaller today than it was 5 years ago. As you might expect, productivity is high on the list of priorities for Xerox's General Counsel.

The implementation of an office technology system in the Xerox legal departments' offices in Stamford, Connecticut and Rochester, New York stems from the convictions of the Vice President and General Counsel of Xerox, Bob Banks. Fundamentally, Mr. Banks expects that the automated office will have a profound impact on office professionals in the very near future. Knowing the reluctance usually displayed by skilled professionals (in this case, attorneys) when confronted with unfamiliar tools, Mr. Banks believes that most would postpone change if

possible. He reasons further that if, as he believes, electronic office technology in support of the professional role brings with it an economic benefit to the organization, slow acceptance is likely to be expensive in terms of opportunity costs, at least. Furthermore, the longer the inevitable change is postponed, the bigger and faster the change is likely to be when it is eventually forced upon the professional by recognized economic necessity. And, the bigger the change, he reasons, the more difficult it becomes to implement without major rents in the fabric of the organization.

Given this chain of logic, and a personal bent to electronic office applications (Mr. Banks started out with his own microcomputer at home), a logical approach to the introduction of OA was to introduce it early, and heavily promote (not to say force) its use among all concerned. That's precisely what happened about two years ago in the Office of the General Counsel at Xerox Corporation.

Xerox's legal function is highly centralized considering how widely dispersed the company's operations are. The majority of Xerox's attorneys are divided roughly equally between two locations: Stamford, Connecticut (where Mr. Banks has his office), and Rochester, New York. The two offices together number approximately 50 attorneys plus their legal assistants and other support staff. Other

attorneys are officed in locations throughout the United States and in many foreign countries.

The Stamford office, since the General Counsel maintains his office there, is considered the legal department's head office. The first level of the organization reporting to the General Counsel is also officed in Stamford for the most part.

Rochester, on the other hand, considers itself a more line-oriented organization in support of the operating parts of the company. In addition, most of Xerox's patent attorneys are located in Rochester.

Appendix 1 gives the overall organizational structure for Xerox's legal department world-wide.

The equipment in use at both locations is, not surprisingly, Xerox-made. There are basically two classes of equipment: the Alto, which is a non-commercial precursor of the Xerox "Star" line of work stations (complete with icons and mouse - similar to, and most would say the pioneer of the concept in use on Apple Computer's Lisa/Macintosh line of personal computers), and the more modest Xerox 822 personal computer. All of the equipment in Stamford, and most of the units in Rochester are modem-connected to Xerox's main-frame computer in Rochester. A few of the units in Rochester are on a local area network (Ethernet). The Alto's use hard disk storage

and special software designed to make use of the mouse and icon operating system. CPM software (Wordstar and dBase II to name two in general use), as well as Xerox's own office automation software can be employed on both the Alto and 822 equipment. The electronic mail component of the system in use at Xerox is called ASCOM.

All of the attorneys and paralegals at both locations (but interestingly, few of the secretaries) are equipped with either one or the other of the above computers - right on their desks - along with a dedicated letter quality printer. There are only a hand full of the Alto's, so most have the 822 microcomputer with dual, eight inch, floppie disk drives.

Methodology

The research process I employed at Xerox consists of a total of 17 interviews conducted at the two primary locations, Stamford and Rochester. The following sections summarize, without identification, the comments made in those interviews. No attempt was made to find hard supporting evidence. The aim of this work was to fathom perception in support of the thesis that effective change must be from the bottom up in this type of organization if it is to be successfully implemented. The two locations are reported separately since there are enough differences in the two locations' composition and purpose to justify that treatment.

Xerox Stamford

The benefits of asynchronous communication. One important benefit of the new technology cited frequently in the interviews was that time zone created communications delays are minimized. With offices in California and Europe, the typical communications window is very small for conventional telephone communication. For example, in communicating with London, the office hours of the Stamford location coincide with only two to three working hours in London. Telex and fax have filled this gap for many organizations, but lack the spontaneity of telephone communication or its near neighbor, electronic mail. Also, in theory at least, terminals in the home would remove the delays entirely.

In fact, a most graphic illustration of the benefit of having the system extended to the home was provided by the fact that on the day of my visit to Stamford, Mr. Banks was home ill. His subordinates pointed out that where they might have hesitated to telephone him, and force him to get out of bed perhaps, they felt comfortable communicating by way of the electronic mail system. The difference was that Mr. Banks could handle the incoming communications at his discretion, if at all, and that fact was recognized by those who wanted to "talk" with him.

The ability to do things outside of normal working hours came up many times. The ability to schedule meetings with

those who travel frequently, particularly meetings early in the week after the individual has been out of town was seen as a considerable benefit.

I was able to detect a dark side of the terminals at home issue, however. There were some who felt rather strongly that the systems, which are made available to a limited number of employees, are distributed on the basis of rank, not need. The accusation was that some never used the equipment made available to them while others who might use it couldn't get it.

According to those interviewed, perhaps the greatest benefit of asynchronous communication as provided by electronic mail at Xerox is the virtual elimination of "telephone tag". No more "out of the office" or "in a meeting" responses to a telephone call. The danger of missed messages or no response to a call is minimized by use of the system. The importance of this feature is evident when you recognize the importance of all available input to any decision making process.

Several of those interviewed made the point that they seldom use the telephone any more, finding electronic mail a suitable substitute. My limited exposure to the Stamford office would tend to support a finding of reduced telephone use. Admittedly, I have no experimental control, but it certainly seemed that the telephone rang less frequently than might have been expected.

Some of those interviewed made the statement that it was their experience that fewer meetings were required to conduct their business. This reduction apparently grows out of the ability to communicate in a many to many fashion electronically - at least for routine informational meetings.

Briefer, less formal communications. This comment was also made regularly, but it is something of a mixed bag. Most of those interviewed commented that there is less concern for spelling errors, and less small talk associated with electronic mail communication. In looking into why this should be so, some commented that the editing features of the system in use were practically non-existent. This, they felt, explained why the "quick and dirty" approach was used in many cases. Some also felt that the brevity could result in some loss of detail - an understandable concern, perhaps, for a profession (legal) that concerns itself so much with the meaning and context of words.

Some of those interviewed had made the effort to learn and use the available word processing package (Wordstar) in order to gain better editing capabilities. An interesting subject for further research might be whether the briefer, less formal communication attributed to the ASCOM electronic mail system survives the additional editing capability.

Secretarial/clerical implications. The following comments are grouped together in recognition of the fact that the professional in any office is faced with a certain amount of what amount to clerical duties. The changes in this area will impact both the secretary and the professional, according to many of those interviewed in Stamford.

Most agreed that typing skills and the ability to compose at the keyboard were rapidly becoming a necessary skill in the use of the system. In recognition of this increasing documentation capture skill on the part of the professional, secretarial numbers were expected to decline. In fact, the number of secretaries in the Stamford office is down, with most attorneys sharing a secretary. Many of those interviewed went so far as to say that they make little, if any use of their secretary for typing. A by-product of this increasing use of word processing is that many feel they are able to compose more effectively than by either handwriting or dictation. In speed too, one individual who made extensive use of the word processing feature estimated that, although he was a "two-finger" hunt and peck typist, he could type at least a third faster than he could write long hand.

There seemed to be something of a pattern in the use of the system's features. The higher ranking individuals interviewed in Stamford made limited use of the word processing feature and extensive use of electronic mail,

while some of the younger attorneys say they've not really gained from electronic mail, but have made extensive use of word processing. On reflection, this isn't too surprising, given the importance of communication to the higher level management of the enterprise, and the functional orientation of those lower in the organization.

The point was made by several of those interviewed that a significant benefit of electronic mail was the ability to make mass distribution of information. No concern for "junk" electronic mail is apparent as yet, they report.

It was virtually unanimous in Stamford that electronic mail could be handled more rapidly and more effectively than conventional mail. The ability to screen mail electronically was seen as a big plus in terms of prioritizing and responding appropriately.

The ability to hold mail in electronic storage meant that temporary filing in desk-top-stacks was made less necessary. One concern expressed in this area was that with the relative ease of disposing of electronically stored documents, coupled with the pressures brought on by the somewhat limited storage capacity of the central computer, there might be the danger of finding out at a later date that some important documentation tracks are missing. At the time of my interviews, there were efforts under way to develop a more extensive electronic filing

system.

Other features. There are a number of legal data base systems available to the Xerox attorneys including Lexis, Weslaw, and Dialog. Xerox in Stamford was, in fact, the first organization to make use of Lexis in Connecticut. A recently negotiated agreement will allow access to Lexis through the Xerox microcomputers rather than through the Lexis supplied hardware - a move that makes the information available to each attorney at his/her desk. Several of those interviewed, including the law librarian, expressed the belief that systems like Lexis or Weslaw may almost (but not quite?) eliminate the law library. Some, however expressed the belief that research using Lexis is relatively awkward as compared to using conventional hard copy because the paging interruptions are disconcerting. It would seem that some additional work is necessary before the CRT screen holds enough information to fully occupy the human scope of comprehension.

Although not a part of the main office automation system, a system has been installed which makes use of a free standing microcomputer with hard disk storage which enables Xerox to maintain and track records of outside legal fees. Given the desire to control and minimize outside legal fees expressed by Mr. Banks (22), such a system is considered a vital tool.

Problems and concerns. A significant number of those

interviewed in Stamford were of the opinion that the system in use was relatively primitive, with a need for better hardware and software. In particular, the previously mentioned lack of adequate editing features in the electronic mail system, limited electronic filing capability, and slow transmission speed (300 baud requires almost 2 minutes to send a single page document) were limitations noted. In addition, a capacity constraint brought on by lack of "ports" for the dial-up system into the central computer meant that in busy times the availability of the system was severely limited.

Some surprise and concern was expressed at the strength of the reaction from some (particular the female attorneys) against the introduction of the system. It would appear that the problem is primarily one of self-perception. Having worked hard to gain a professional position, some apparently feel that the keyboard brings with it unwelcome secretarial duties. The problem would appear to be one of self-perception.

Xerox Rochester

Although in many respects, the Rochester office's attitude toward the new electronic office technology was similar to that of the Stamford office, in some ways, it was distinctly different. One difference is that since Rochester is the center of Xerox's patent activities, and since many patent Attorneys are technically trained, there

is, as might be expected, less resistance to the technology in most cases. Even so, some I interviewed admitted to wondering initially what use the new system would be to them in their work. Those same individuals say that they find the system indispensable today.

Most of those interviewed didn't feel that their job had changed as a result of the new technology at their fingertips - only the tools were different. Some did feel that they were doing more though.

One possible explanation for individuals feeling like they are doing more might be that in 1977 there were 85 patent attorneys at Xerox, in 1980 there were 45, and now the number is down to 26. Although a large part of this reduction in staffing is attributed to reduced activity, higher productivity played a part. The patent attorneys are, however, faced with a large backlog and the impact of increased productivity is felt through working down that backlog. There is no apparent danger of overproduction and underemployment in this area at least.

One particularly attractive feature of the new technology expressed by several of those interviewed in Rochester is that it allows a better, more comprehensive job to be done. Many things that should have been done but weren't (under time pressures) are now getting done.

The benefits of asynchronous communication. In common

with their cousins in Stamford, the Rochester people agree that communicating across time zones is a plus for the electronic mail system. The virtual elimination of "telephone tag" and the ability to make wide distribution of any information are similarly seen as positive features.

The effortless nature of communication using the electronic mail system is seen to have improved communication quality and quantity.

In particular it was pointed out to me that for an attorney, briefing, coordinating, and consistency checking is vital. Electronic mail aids the process considerably, apparently.

An interesting aspect of electronic mail that one attorney in Rochester identified was that with the asynchronous nature of electronic mail, individuals are able to think through a topic in depth before "saying" anything, unlike the tendency to either temporize or say something during a telephone conversation that they would later regret

Briefer, less formal communications. Here again, as in Stamford, the opinion was that, in general, electronic memos were shorter. Some felt that the shorter memo may be the result of non-typists being pressed into a typing role. The same concerns were found for the possibility that important details may be left out as a result, or

that the clumsy editing features of the system were the primary factor limiting the length of communications.

Secretarial/clerical implications. Once again it was evident that secretaries were not being used as much (if at all) for typing. There was one instance I came across where an innovative approach to the use of the secretary as typist was being used with success. This attorney would dictate his correspondence or report, his secretary would type it and transmit it back to him using equipment compatible with his own (one of the few secretaries with compatible equipment in either office) for him to edit and/or modify. As a matter of fact, several of those interviewed bemoaned the lack of compatibility with their own secretaries' equipment.

In the area of document capture methods, the question whether dictating wins out over word processing for the professional (long hand writing was acknowledged to be out of the running) was felt to depend on the complexity of the document. The more complex, it was felt, the less likely it would be that dictation could be enough faster than personal text processing to justify using the secretary for typing.

Several attorneys reported that they were using their computers for direct docket searching on the company's own data base and that in doing so, the time and effort of two other individuals - a secretary and a clerk - were

minimized at no significant expenditure of their own time.

On the negative side, one disadvantage of the electronic mail system as implemented at Xerox was pointed out by one highly placed attorney. It seems that it has been ordered that secretaries should not be allowed access to an attorney's mail. The reasons given range from security considerations to "it's the only way we could get the attorneys to learn the system". In any event, the price to be paid, according to this one individual was that his secretary was unable to screen his mail in his absence. This was felt to be a real productivity problem - especially after a prolonged business trip or even vacation.

Other features. As you might expect, with their technical training, the attorneys in Rochester are making much more extensive use of the available software for their microcomputers beyond just the electronic mail and word processing systems.

For example, one attorney has built an extensive data base in his area of patent responsibility in order to search for "right to use" problems and opportunities. He also makes use of the Lockheed Dialog and the Lexis Lexpat data bases to search on a key word basis for closest prior art in order to set the scope of claims and patentability for any new patent applications. This same attorney uses the

spread sheet program Supercalc for his monthly time report, and for other miscellaneous statistical data manipulation.

Several of those interviewed mentioned the ease of completing their Monthly reports using the system with its ability to modify and manipulate text and data.

The commercially available software package dBase II was used extensively by a number of those interviewed. In one case, individualized data bases were being maintained in order to facilitate document searches in connection with the litigation process.

Similarly, Wordstar was being used in a number of innovative ways ranging from employing it to prepare and make use of standard, but personalized documents to using it as a form of "working file" management system.

The outside data base systems like Lexis came in for more discussion in Rochester than they had in Stamford. For the most part, Lexis was seen as a time saver which had reduced the amount of money spent on going to outside services for legal research. In addition, the law librarian in Rochester was able to identify two trends for me:

1. Lexis research can cover some things that couldn't be done practically without it.
2. Some books have been made unnecessary as a result of

outside data bases like Lexis.

On the other hand, she didn't feel that the typical law library would change really significantly until the loose leaf services were included in Lexis, and maybe not even then. She did predict, however, that outside data base availability would give large corporate legal departments a significant competitive edge since the small firms can't really afford the overhead of a Lexis system.

Problems and concerns. Although the technology got a generally better reception in Rochester and is perhaps being put to more and better use, many of the same complaints about the adequacy of the system surfaced in Rochester as in Stamford. Among the complaints: The current software is too slow and there is a crying need for more capacity on the system.

Most of those interviewed are looking for enhanced hardware and software. Several expressed a desire for additional applications integration.

Once again, the complaint came up that the editing features of the electronic mail system were clumsy to say the least.

At least one attorney was sure that electronic mail was a useful feature, but expressed concern about the lack of ability to track a document, or even to prove it had been sent. The concern seemed to be that some might take

advantage of the system in a novel "your check is in the mail" way. This same attorney was certain that typing was counter productive when compared with dictation for the type of correspondence he produced.

The problems with making use of a Xerox microcomputer for Lexis browsing were again brought up. This time, it would appear that the problem is that the standard Lexis terminal has all kinds of user-friendly function keys not available on the microcomputer, offsetting the convenience of having the terminal on the desk in the office.

Although most of those interviewed in Rochester wouldn't give up their microcomputers readily, and in fact found them to be indispensable in many cases, at least one rather highly placed attorney felt that it wouldn't be too much of a wrench to have to give up the microcomputer. He was of the opinion that the system was only there because of one Mr. Bob Banks.

CHAPTER 7

FIELD RESEARCH AT DUPONT

DuPont's approach to automating the staff office environment has been very different from the Xerox approach. DuPont's Information Systems Department (ISD) produced a "white paper" three years ago on the subject of end user computing. Among the findings of the paper: computers on the desk are an important resource to management, and effective use of the new technology through managed change could have major competitive significance. This study (and the pressures of a population explosion in microcomputers) resulted in the formation of a new group in Information Systems: the End User Computing Section. The mandate of the new section was to investigate, and recommend rationalization and implementation methods in the face of the rapid proliferation of microcomputers and office automation technology in the office environment at DuPont.

In 1982, the End User Computing Section initiated a pilot program with the cooperation of the Spunbonded Division of Textile Fibres in an effort to assess the impact of electronic office technology on a typical DuPont business unit. The pilot group started out numbering 28 exempt and 10 non-exempt employees. The organizational structure showing the exempt reporting arrangement at the outset of the pilot is shown in appendix 2.

The equipment used in the Spunbonded pilot was selected after an in-depth survey of the available systems conducted by ISD in 1981. The Digital Equipment Corporation (DEC) "Charlotte" package - later to be named "All-in-One" - was selected. Reasons for the selection included: the relative maturity of the system, the fact that the system provided adequate core functionality (software), and the fact that DEC was one of the three ISD "guidelined" computer hardware vendors. The DEC system employed was a "dumb" terminal system centered around a single VAX mini-computer. Initially, the software available included only the "core" functions of electronic mail, word processing, electronic filing/retrieval, and an electronic bulletin board. Late in the pilot, some general applications packages (IFPS, DECalc) were added.

About half of the Spunbonded personnel involved in the pilot were located in downtown Wilmington, Delaware, while the rest were in an office some 10 miles away in Newcastle County. Late in the pilot, some of the remote field offices were incorporated into the system in a limited way.

An attempt to carefully measure the impact of the new technology was made by starting off with a pre-introduction job evaluation survey conducted by an outside consultant. For internal planning and budgeting reasons, the ISD group was requested to evaluate the

impact of the program after only 9 months (a time that most felt was too early to discern any real benefits), and a report was written which remains "For DuPont Use Only" to this day. The findings and conclusions relating to this portion of the thesis are based exclusively on personal interviews with ISD personnel and questionnaire results from the parties involved in the pilot at Spunbonded.

Methodology

At DuPont, we were unable to arrange to speak directly with the individuals in Spunbonded who were actual participants in the office technology program. The unidentified comments summarized below are drawn from interviews with the ISD personnel involved. To follow up on these initial interviews, a questionnaire was distributed to most of those actually using the system. The results from that questionnaire are compiled in Appendix 4 and discussed in the second part of this chapter.

ISD Interviews

To set the stage, a couple of observations neatly summarize the climate surrounding the use of computerized office services as supplied by ISD at DuPont:

In the early days of data processing at DuPont as elsewhere, computers ran the user. Now it is clearly the

other way around.

The ratio of end users to programmers used to be around 3:1 at DuPont. It is now estimated to be more like 20:1.

Clearly, computer users are becoming a common breed and they are doing more for themselves on machines designed to allow just that.

Many of those interviewed called attention to the unfortunate fact that the currently available hardware and software has outstripped the ability of most corporations to design systems which permit access to corporate data bases while at the same time ensuring their reliability and security. The problem is well recognized, but it is a huge problem and most did not feel that it is getting the attention it deserves.

To get more attention focused on the problem, it was felt that top management support would be vital. However, most felt that this support will probably only come when it can be demonstrated that the systems are useful, and how can they be useful without adequate support? The whole problem is sort of a "catch 22" when viewed from the ISD perspective. Somehow, database organization and content must improve quickly and user friendly (perhaps even artificial intelligence query) database management software must be made available in order to catch the eye of top management - a tall order indeed.

If ISD fails to meet this order, they feel, DuPont's management is liable to find itself in the position expressed so well by one of those interviewed: "Often where the management is, the information isn't."

In the area of electronic office technology (EOT), ISD recognizes that for the systems to be cost-effective they need to be widespread. Controlled but widespread implementation would seem to be called for. And, in fact, a pilot program for another DuPont division is in final development and approval stages at ISD as this is written.

With the advent of EOT, some of those interviewed felt that the importance of secretaries would grow, and a whole cadre of middle managers would disappear. The Spunbonded group did, in fact eliminate a layer of middle managers from their marketing organization after the EOT implementation, but no one interviewed could positively link this reduction to the system's impact on the organization.

Still another faction predicted that the traditional secretarial role would undergo radical change to a more administrative assistant role.

If either of the above concepts has any validity, it is evident that a flatter organization would result - that is one with fewer levels in the hierarchy and perhaps fewer

menial jobs.

Another positive aspect of EOT as implemented at DuPont was expressed by one of those interviewed when she observed that where one used to think twice before spending the time to look up something of unknown (but perhaps critical) value, the ease of doing so with the terminal on the desk would prompt one to do so more often. An analogy was drawn to the Xerox copy revolution. When it was difficult to make additional copies (carbon paper used to be the only way, if you will recall), document distribution was severely limited. Now that it is easy to make copies, no such limit exists.

In the implementation area, a couple of, by now, familiar concerns were expressed.

There is a problem with management's persistence in looking for hard savings from the implementation of EOT. While such persistence may be laudable in most business circumstances, the same kind of attitude in an earlier time would have stood in the way of many of the "amenities" considered essential to today's office environment like telephones, air conditioning, and adequate lighting.

Another ploy commonly used by managers in opposition to EOT is the position-elimination tactic. In other words, the dollar cost of the system must by supported by a

commensurate reduction in the payroll. The Luddites would, of course, have had a good case against this kind of manager.

DuPont's ISD survey of the pilot program at Spunbonded aimed to measure "impact", not savings, and they readily admit that the dollar value of the impact amounts to "soft" savings. The impact as measured at the nine month point was estimated to be at an annual soft savings rate of $165,000. An overall increase in organizational efficiency and effectiveness was reported to be in the range of 4% - a number which was not felt to be statistically significant. This at a stage when little or no application software had been made available outside the core functions provided by the ALL-IN-ONE package.

Two other road blocks to successful implementation were mentioned by those interviewed: fear and self-perception. The fear is of the unknown - in this case, the unfamiliar hardware and software or its unknown impact on the job of the individual faced with the use of the new system. The self-perception issue arises out of the similarity of the user interface to a typewriter keyboard. Typing is considered by some to be beneath their station in the organization. This view is particularly prevalent, apparently, among female participants in the program although not their sole province as it turns out.

In measuring the impact of the introduction of EOT within the pilot group at Spunbonded, the job evaluation team encountered one particularly surprising result. In their measurement of job motivation and satisfaction, they found that the exempt people in the group were generally more satisfied with, and motivated in, their jobs after introduction of EOT. The non-exempt individuals (secretaries) were not. In fact, pre-pilot measurement had identified the highest motivation of all those surveyed in two of the non-exempt people (secretaries to managers). In an attempt to explain this radical shift, the survey team hypothesized that the non-exempt individuals were effectively cut out of the communication chain by the new system with its electronic mail and document capture features. They had their feeling of importance diminished as a result.

The ISD people were quick to point out that there were a couple of things in the environment that may have affected the validity of the measurement study. There was a four month salary freeze in the nine month period involved, and the economy started picking up toward the end of the period.

When interviewed at the nine month evaluation point in the Spunbonded pilot program, the Division Director listed the following impacts of EOT as the primary benefits to his organization:

More people in the organization were able to participate in decisions than had been the case without the system's communications capabilities.

The division's marketing people were better able to fine tune bids on business. This was felt to be of critical importance in the recessionary period of 1982/83.

The seven day a week availability of the Division Director and his immediate staff through terminals in the home enabled the organization to do things at a faster pace.

Marketing was better focused coming out of the recession than it otherwise might have been.

Spunbonded Questionnaire

In an attempt to get first hand information on the impact of EOT at Spunbonded, a total of 41 questionnaires were distributed to those who had participated in the program. Of that number, 28 were returned (68%). Each questionnaire contained 22 multiple choice questions, each requesting that an opinion be expressed through the mechanism of circling a number from 1 to 9 to indicate a feeling about two generally polar opposite points of view. In addition, a 23rd question requested any other comments about the system, its features, or any other aspect of office automation and its impact. Ten of the 28 responding took the time to provide some sort of written comment in addition to answering the 22 base questions.

The questionnaire results are compiled in graphical form in Appendix 4 along with a tabulation of the written comment responses to question 23. In addition, the

answers to the base 22 questions are tabulated at the end of Appendix 4 by questionnaire (in the order that they were received) in case some future analyst should want to look for some correlation between responses.

Most of the clearest responses (unimodal) came in the investigation of the impact of electronic mail.

Of those responding, it was virtually unanimous that communication with electronic mail is more spontaneous, less formal than written. A large majority felt that electronic mail improved communication within the organization by opening up channels of communication without at the same time bogging them down.

Although less than certain that electronic mail was a real substitute for telephone communication, there was a strong feeling that it did effectively eliminate telephone tag. Interestingly, one individual did comment that something he termed computer tag amounted to the same thing though.

The clarity of response in some other areas was only slightly lower. For example:

There was a strong consensus that EOT, as implemented in Spunbonded, would create a climate for improved decision making as a result of additional input.

The ability to type and the ability to compose at the keyboard were both considered vitally important skills for

the professional or managerial person in an office with EOT.

Other areas did not spark nearly as much reaction with most responses indicating a continuation of the status quo.

No consensus developed, for instance, in support of the hypothesis that managers would adopt a more hands on approach to management or that organizations would become flatter as a result of the implementation of EOT. Support was there, but not nearly as clear cut as in the issues described above.

The majority of those responding did see that EOT would reduce somewhat any tendency toward "empire building" by middle managers. A significant minority didn't see that EOT would have much impact on the amount of empire building in the organization.

There was some slight indication that fewer meetings might be required with the introduction of EOT.

The bimodal distribution of the responses to a number of the questions might bear watching. In particular, the disparate response to the question about whether the changeover to office automation would be revolutionary or evolutionary might be symptomatic of either current problems or those yet to come. Also, the large number of people who would attribute to office automation a

reduction in the number of people required on the job could indicate a troublesome latent job insecurity.

Other bimodal response patterns include the answers to whether the job would change fundamentally (the majority believing it would not), whether EOT-enabled fine tuning of the work product is justified (almost evenly split), and the questions having to do with the role of the secretary and the manager in the document capture area (where the responses were also split).

Questions about the role of the secretary and the middle manager elicited clearly bimodal response patterns, highlighting an apparent uncertainty about the effects, if any, of EOT on their respective roles.

Perhaps the most interesting bimodal response came, as might be expected, to the question about the seven day a week availability brought by terminals in the home. The majority found it to be a desirable feature, while a significant minority were hard over at the other extreme.

The comments in response to the open-ended question 23 were particularly interesting. They ranged from wildly enthusiastic to extremely negative over the prospects for EOT. Prominent among the comments were several complaining about the primitive state of the art and the lack of responsiveness of the system. With few exceptions, however, the tone of the comments is positive

and constructively critical. As Brown (6) tells us "...user requests for improvements and changes to the system often are not signs of dissatisfaction, but rather of acceptance and reliance." Certainly, when the system came down while I was in the ISD contact person's office, the reliance was made evident from the number of desperate phone calls received from people in Spunbonded.

CHAPTER 8

CONCLUSIONS

For all the material that has been written on the subject, and for all the expectations raised, the fact of office technology for the knowledge worker is that it is still relatively primitive. It would seem to have limited capability, and limited impact so far.

Even so, the systems that are available are being put to productive use in the organizations studied here. Reactions to the systems in these organizations have been, on the whole, positive and constructive. This despite their recognized negative features of slow response and lack of user friendly software.

The most popular feature of both systems studied was, without a doubt, electronic mail. Asynchronous, documented communication with the speed and convenience of the telephone was applauded almost unanimously. The ability to communicate outside working hours is controversial, but seen by a majority to be a positive feature of electronic mail.

Unaided document capture by the knowledge worker using word processing software is not so enthusiastically received, but it is widely used. Those who have achieved a level of proficiency with it apparently find it indispensable in their work. The role of the secretary as

typist and administrative assistant is in for a dramatic change as this trend continues.

Less widely used, but welcomed by those in the organizations studied who made use of it was the ability to electronically file and retrieve information. This feature of office technology is in an embryonic stage, and faces some of the same problems as numerical data bases in this era of distributed processing - those of consistency, reliability, and security.

Outside data base query systems were used a great deal in the Xerox legal department. The hardware (Xerox microcomputer), and software (electronic paging interruptions), associated with one widely used data base (Lexis) as implemented at Xerox came in for some criticism. Most felt that the law library that some feel Lexis will replace is here to stay in substantially its present form.

General application software in the form of spread sheet and data base management packages had only just begun to be used at Xerox by some of the organization's more pioneering individuals. From all reports, however, the DuPont pilot group was making extensive use of the available packages despite their relatively late introduction to the program.

Neither organization studied made any use of the

programmability features of their systems, and it is unlikely to be an important feature in the future for the knowledge worker outside the systems development area.

The rest of this chapter will summarize the organizational, role, and process changes within the framework described in Chapter 5 to the extent that the thread can be picked up in the field research.

Management Processes will be more Direct

In this area, we predicted that electronic office technology would have an effect on the organization in at least four distinct ways:

1. Empire building will be more difficult.
2. Communications will be different.
3. Fewer staff groups.
4. Meetings will be different.

Under the heading of empire building, the research confirmed that those using the technology believe that the electronic mail feature opens up additional channels of communication within their organizations. A significant number of the questionnaire responses from DuPont, although not a clear majority, were of the opinion that there would be a significant reduction in the extent to which middle managers could build empires within the organization by controlling the information their superiors could see.

Communications are definitely different, and apparently for the better. Electronic mail is believed by almost all of those interviewed and questionnaired to be a positive feature of the systems they are using. Communications were reported as being more spontaneous, less formal; the infamous telephone tag is all but eliminated; and better responses to requests for information result from the asynchronous nature of the process. The asynchronicity also came in for praise for permitting communications outside of normal business hours and across time zones. Responses to the DuPont questionnaire would indicate that full seven day a week availability is likely to be a two-edged sword, however, with some individuals very concerned with the invasion of their off-hours time that it brings.

There was only limited evidence in support of the contention that there might be fewer staff groups. The secretarial role can be viewed, of course, as one special variety of staff in support of the knowledge worker. In this one area, there is plenty of evidence of change as a result of the new technology. With managers and professionals doing their own document capture work with word processing software, the role of the secretary has changed noticeably in both of the organizations studied. What that role is likely to be is less clear. Two views were expressed. At Xerox, the majority opinion was that there would be far fewer secretaries and that they would

serve primarily as administrative aids to the knowledge workers in that organization. At DuPont, on the other hand, although conceding that there might be fewer secretaries per knowledge worker, a significant number of those responding indicated that middle management might be the real "victims" of improved knowledge worker productivity. A majority of the DuPont questionnaire responses indicated that some sort of amalgamation of the middle manager and secretarial positions might result.

Practically everyone in both of the organizations studied believes that the ability to type and the ability to compose documents at the keyboard are going to be vital skills for the knowledge worker in the office employing electronic office technology. Interestingly, however, a slight majority of those responding to the DuPont questionnaire felt it unlikely that the professionals and managers would actually compose and type their own work. Apparently old habits die hard.

The only other evidence that there might be fewer staff groups comes from the Xerox organization. The availability of docket searching software for the individual attorneys' use at their desk has served to reduce the need for the assistance of the docket clerk. Whether this more direct access results in better results over all remains to be seen. No direct quantifiable evidence was available one way or the other at this early

stage.

In suggesting that meetings would be different, the proposition was that fewer of them would be required, and those that were would be of a different nature. There was some non-quantified evidence from both the Xerox and DuPont research that fewer meetings were required. Little evidence was gathered, however, on the change, if any, in the nature of the meetings that were held. Only one respondent from the DuPont organization made any reference to the use of computer graphics for presentation purposes - a facility that the literature suggests would profoundly impact the nature of meetings in a positive way. It would appear that, as yet, not many in either of the organizations under study have found their way up to the third level (general applications software) of the "Elements of Office Technology" pyramid described in Chapter 3.

As a final comment in this area, one of the questions posed in the DuPont questionnaire asked if the respondent believed that office automation would result in more direct top management control or more indirect (through staff) control. The majority of those responding were of the opinion that there would be no change in this area. However, almost as many felt that top management control would be more direct, or hands on, following the implementation of electronic office technology the top

managers use.

Better Decisions will be Made

Here, it was suggested in Chapter 5 that decisions would be of a higher quality for three main reasons:

1. The intelligence, design, and choice model of management decision making proposed by Simon (40) is considerably enhanced by having a smart terminal on the managers desk.
2. The decision making process is iterative, not binary.
3. Direct access to files and data bases should reduce retrieval accuracy and reliability.

Most of those interviewed at Xerox and most who responded to the questionnaire at DuPont agreed that better decisions result in the office with the new technology. Reasons given were that additional input would be available (through electronic mail and data bases) and that the asynchronous nature of electronic mail would permit more reasoned responses to requests for information needed to make a decision.

Both of the organizations under study have just begun to make use of the iterative nature of current micro/minicomputer software (spread sheets and data base management) to enhance their decision making ability. As the systems and its users become more sophisticated, this aspect of electronic office technology is likely to find

more use in both organizations.

As previously mentioned, what evidence there is that direct access to files and data is inconclusive in terms of its effectiveness in improving the knowledge worker's decision making ability.

Organizations will get "Flatter"

There is little hard evidence in the research at either organization under study that electronic office technology would, in fact, result in a flattening of organizations. Several of those interviewed at both Xerox and DuPont expressed the opinion that they believed that the net result of the new technology over time would be to reduce the number of levels in the hierarchy.

There was the one report from DuPont that one level of middle managers in the Spunbonded group had been eliminated after implementation of the pilot program, but no one seemed clear whether this was consequence or coincidence.

The questionnaire results from DuPont on this subject brought the response that most believed that there would be some flattening, but the spread was very wide on the amount of flattening predicted. Part of the problem may be technical in nature since the wording of the question, in this case, may not have provided an adequate framework for expressing a meaningful opinion.

Implementation

In view of the radically different implementation approach at the two organizations under study, it might be useful to compare and contrast the visible consequences of the two methods of implementation. Such a comparison is beyond the scope of this work, but a couple of comments seem worth making.

Both organizations have their wild-eyed enthusiasts and both have some nay sayers amongst the people using the systems. One can't help getting the impression that the DuPont pilot program has created more of a ground swell of user excitement than has the Xerox implementation. Despite some rather negative comments about responsiveness and sophistication of their system, when asked about whether the introduction of electronic office technology would be evolutionary/welcomed or the reverse, the overwhelming majority of those responding were of the opinion that it would be welcomed.

One can't help getting the impression after 17 interviews at Xerox that if it weren't for Mr. Banks, the system wouldn't get near as much use as it does.

We must be careful in relying too much on this sort of comparison, however, in view of the very different nature of the individuals and their roles in the two organizations. One would ordinarily expect attorneys to

be more conservative about computers and electronic office technology than most other kinds of knowledge workers, and that may be one reason for the relatively lukewarm reception afforded the new technology at Xerox. And even here, apparently, productive use is being made of the system by most of those interviewed.

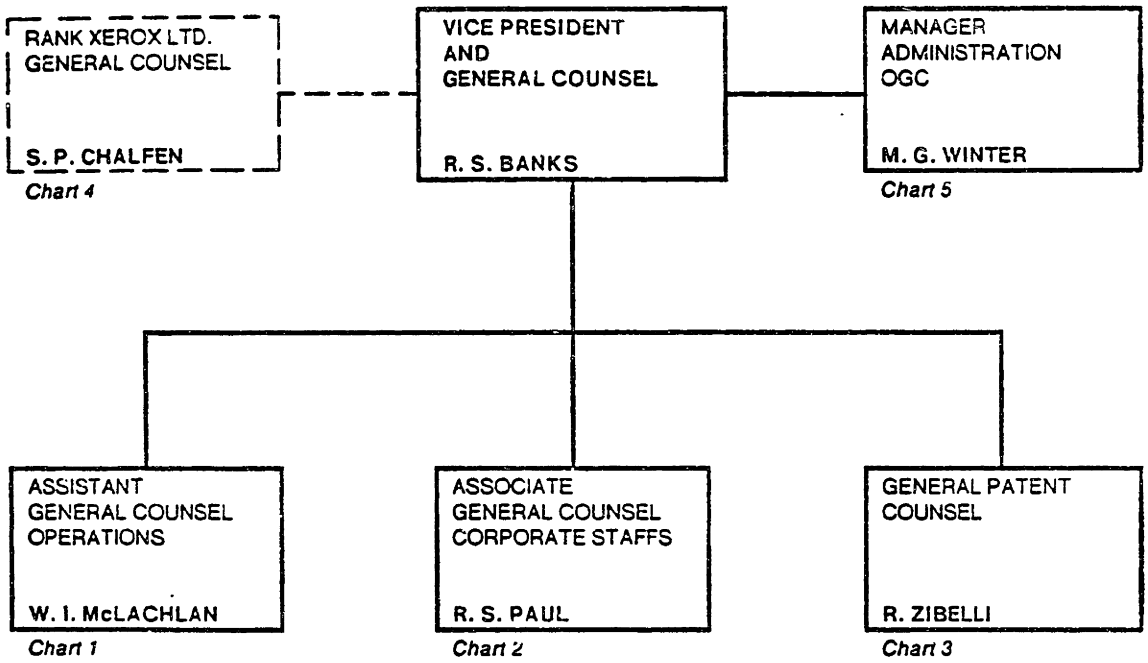
APPENDIX 1

ORGANIZATION CHARTS - XEROX CORPORATION

OFFICE OF GENERAL COUNSEL

September 1983

XEROX CORPORATION
OFFICE OF GENERAL COUNSEL



dd.oc0.sil

September 1983

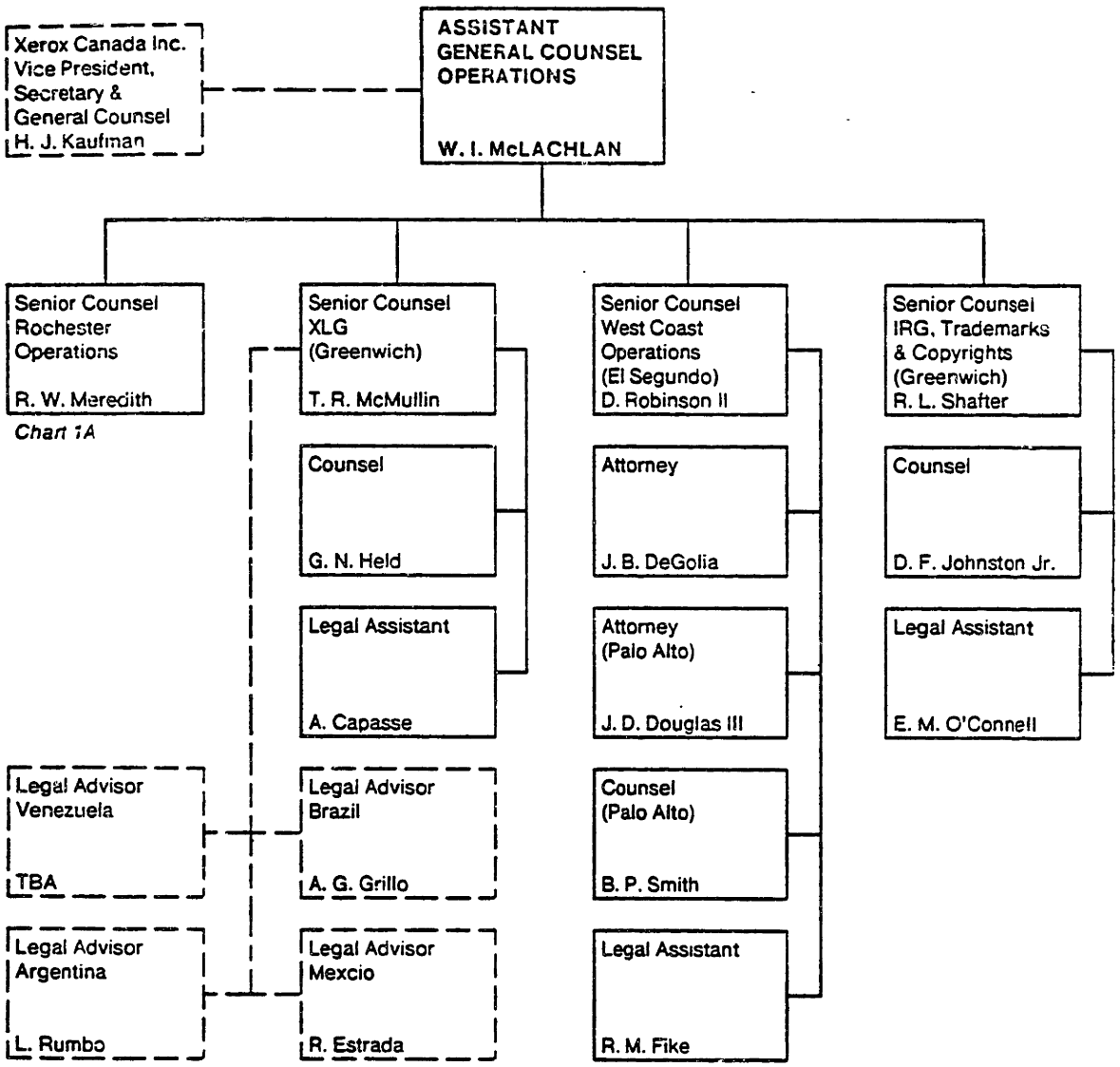


Chart 1

dd.oc1.sil

September 1983

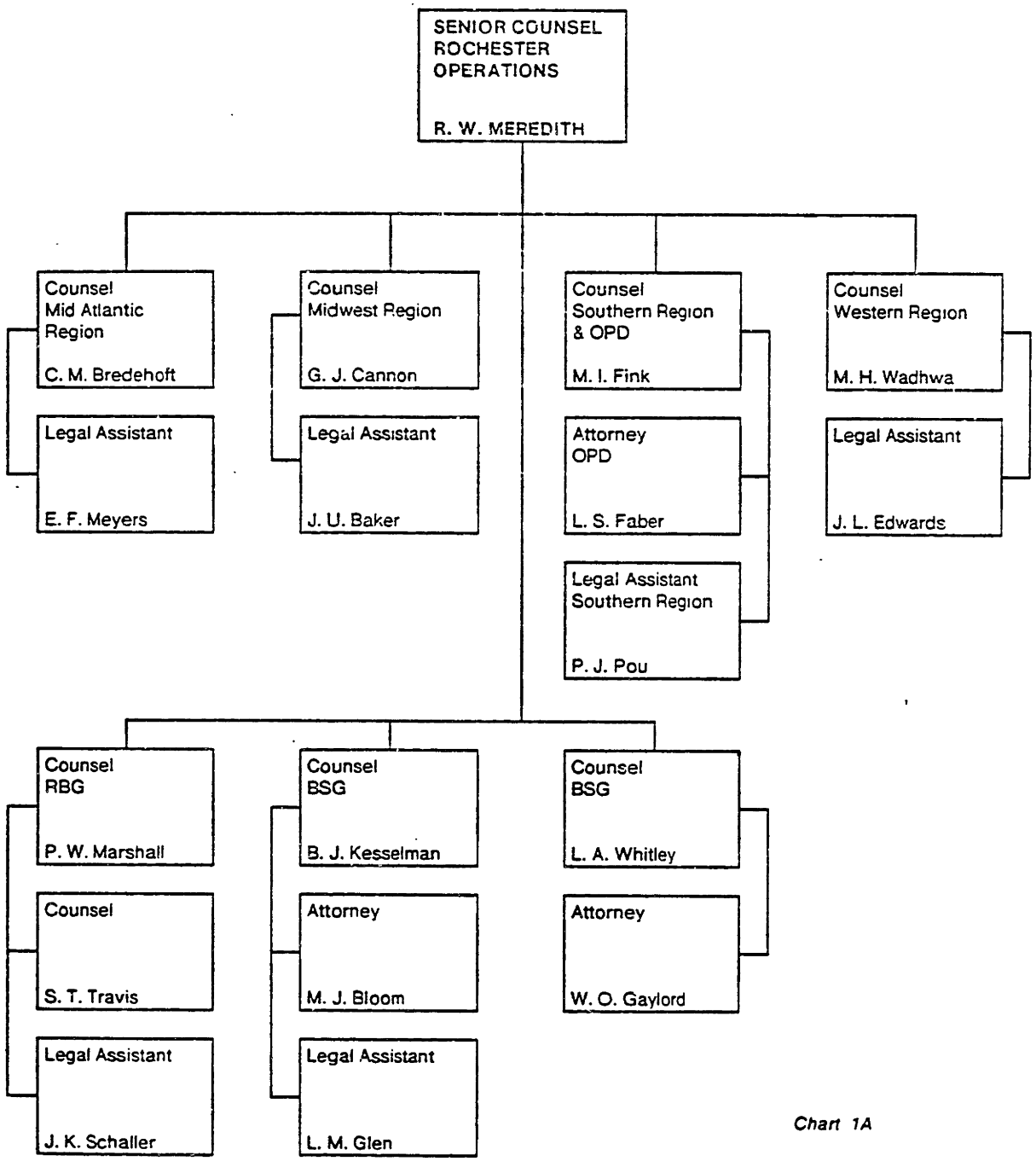


Chart 1A

dd.oc1A.si

September 1983

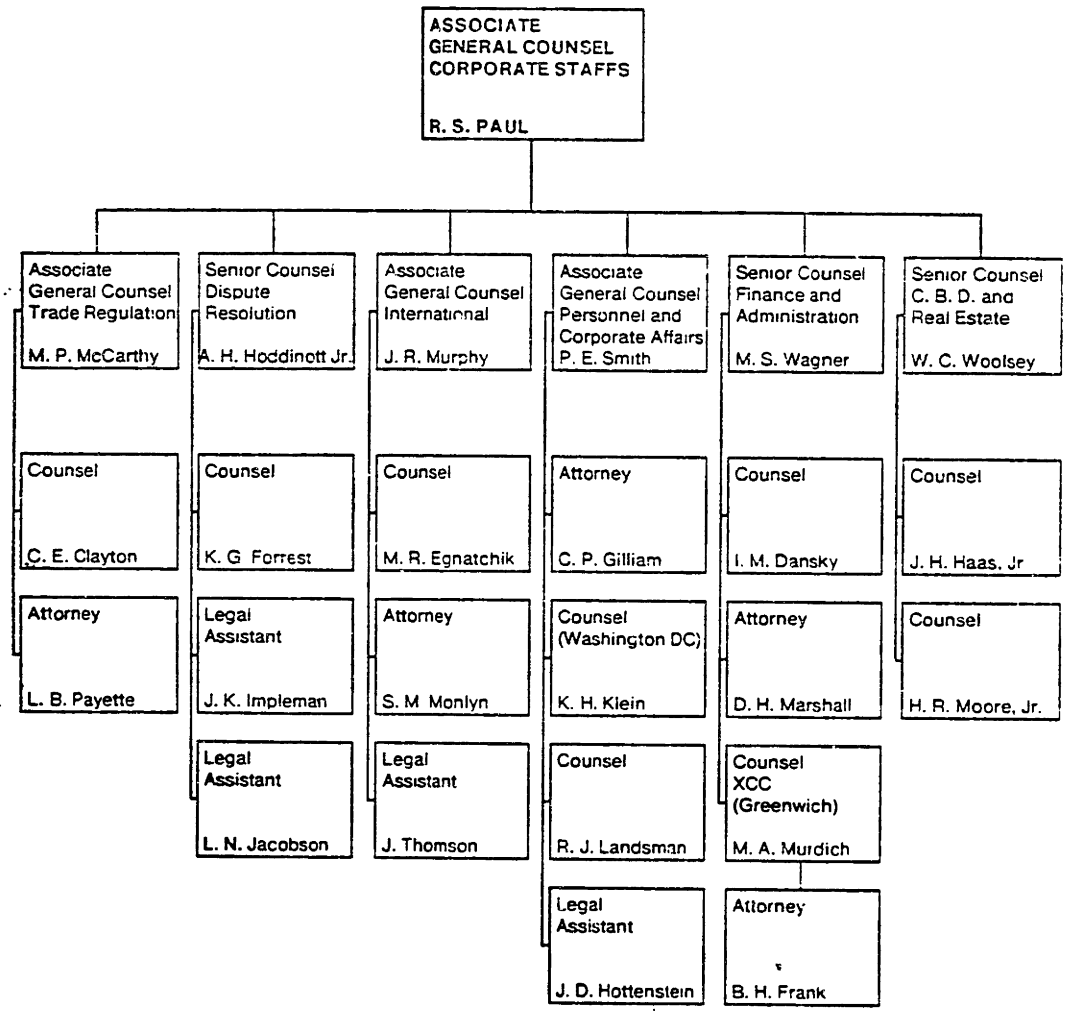


Chart 2

dd.oc2.sil

September 1983

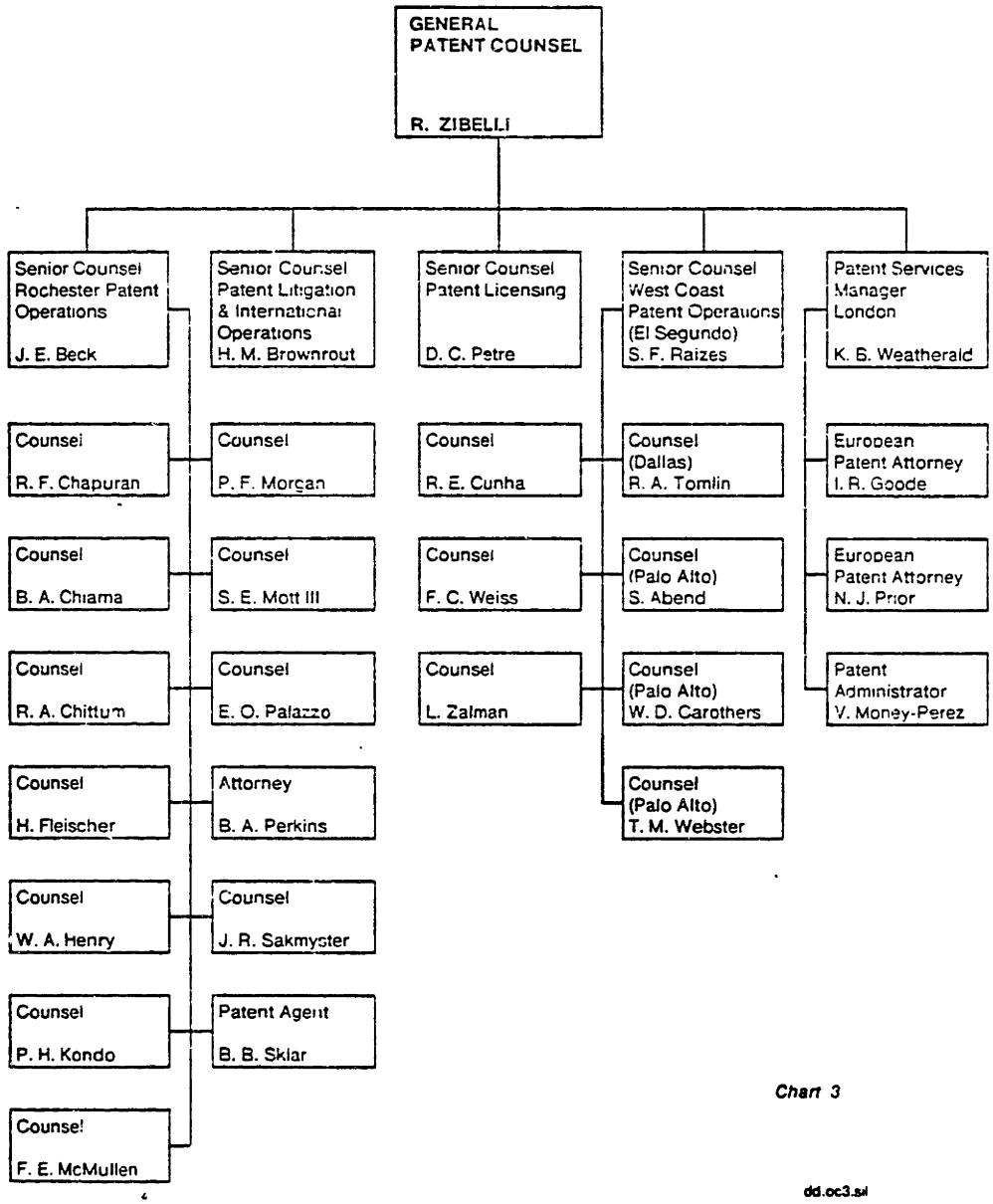


Chart 3

dd.oc3.sl

September 1983

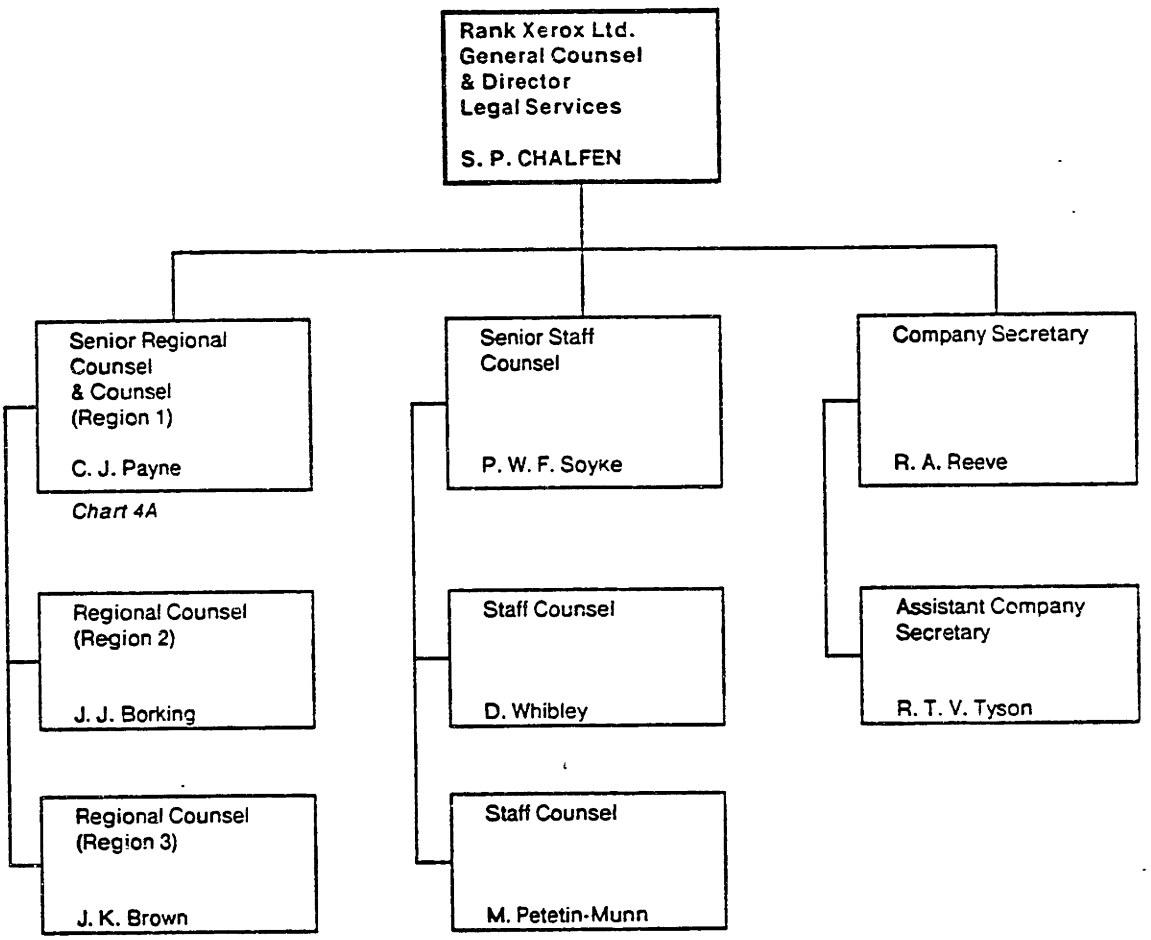
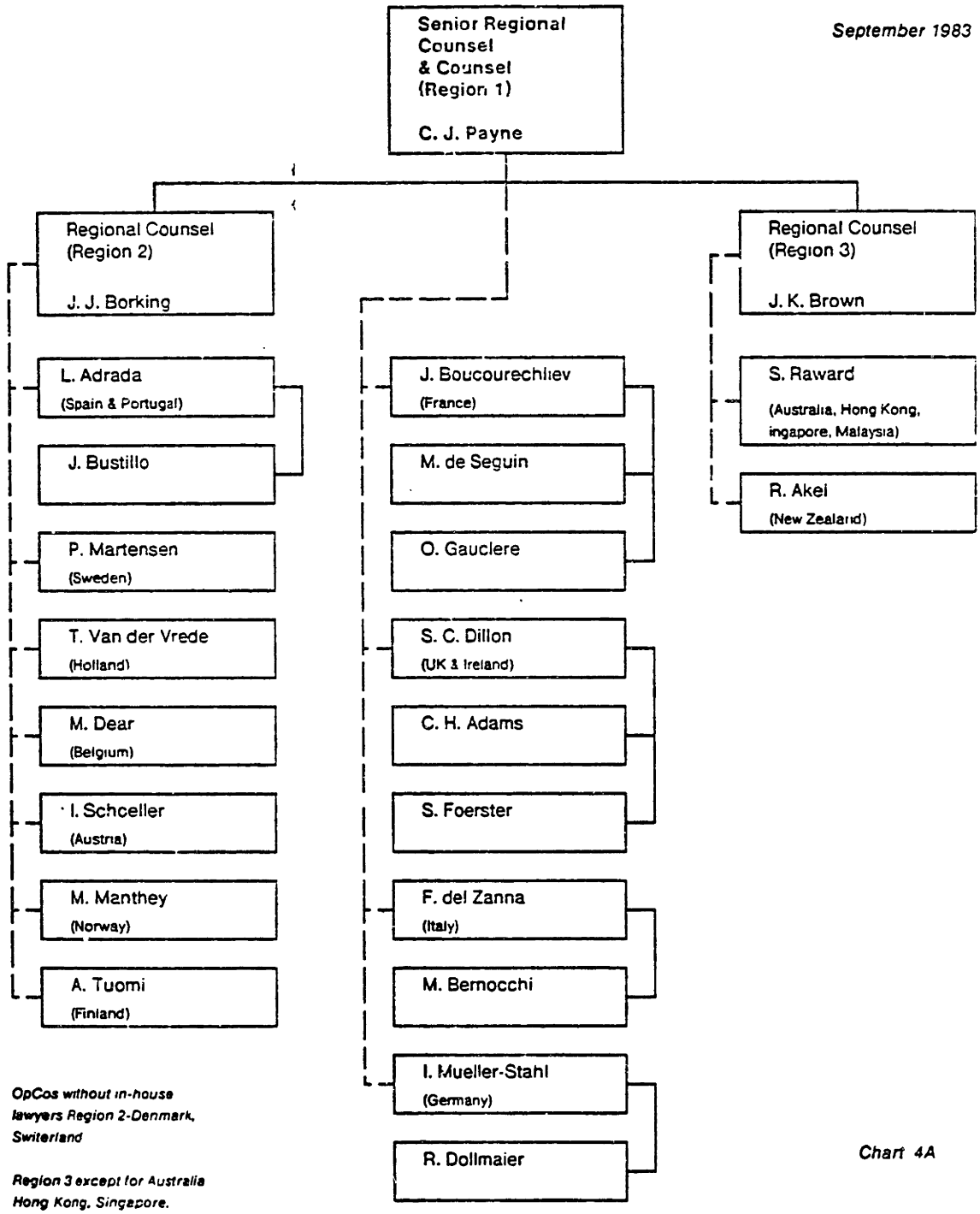


Chart 4

dd.oc4.sil

September 1983



OpCos without in-house lawyers Region 2-Denmark, Switerland

Region 3 except for Australia Hong Kong, Singapore. Malaysia & New Zealand

Chart 4A

dd.oc4A.sil

September 1983

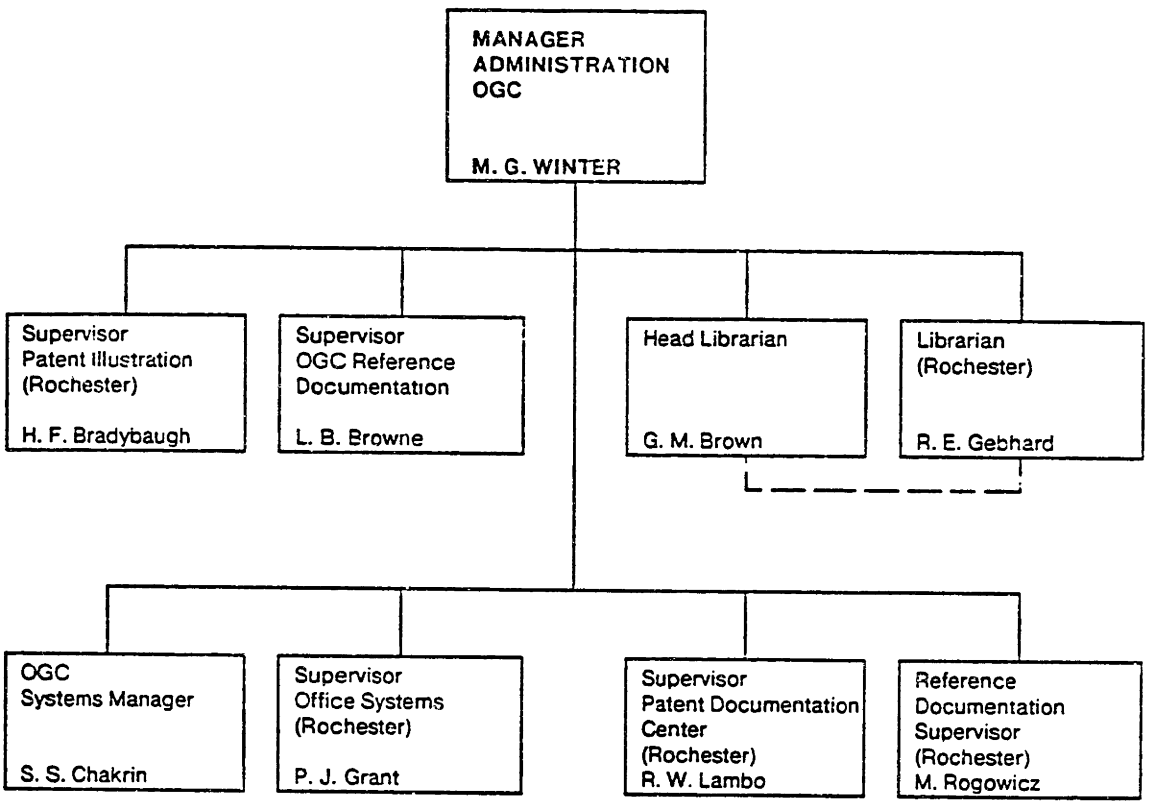


Chart 5

dd.oc5.sil

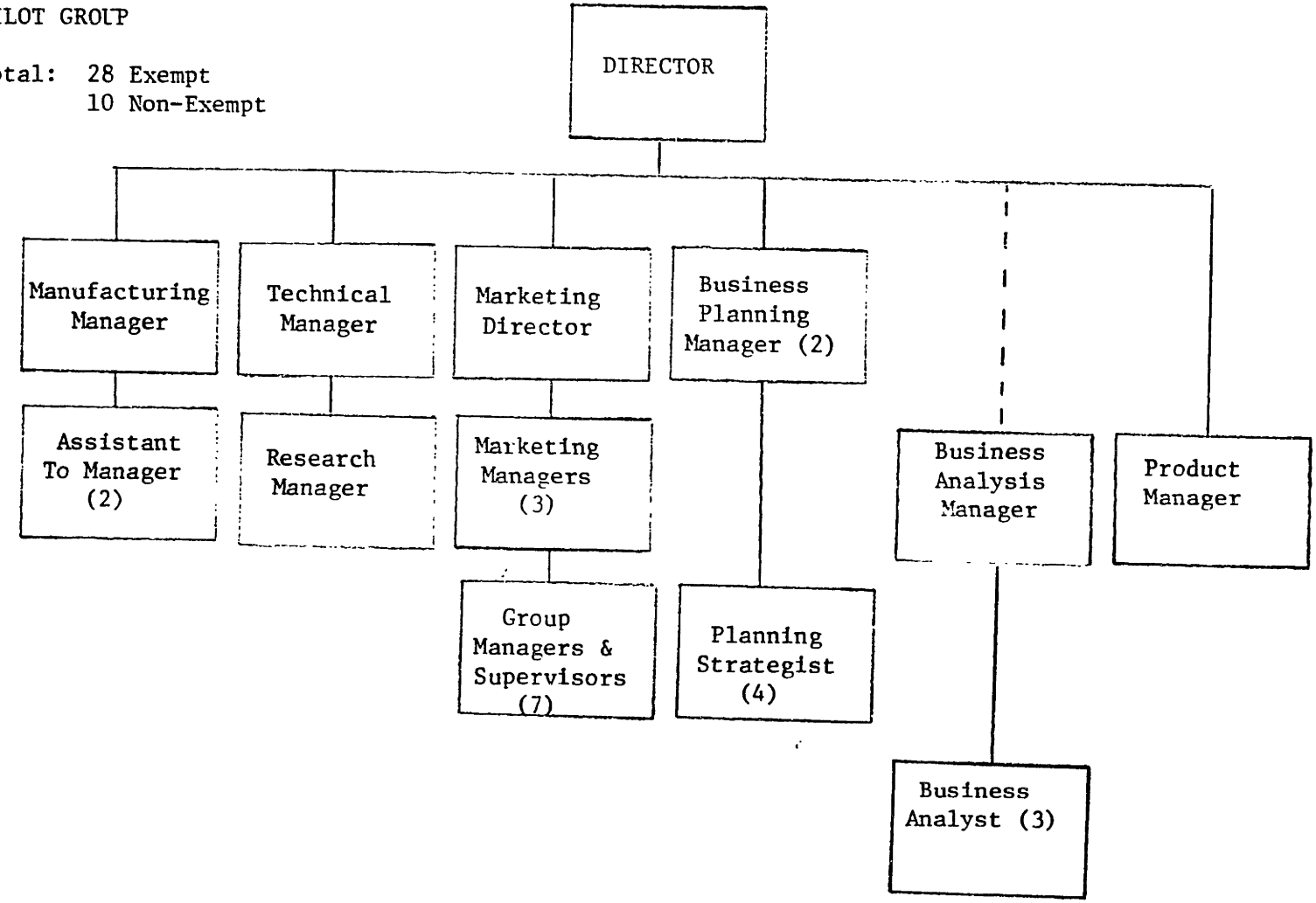
APPENDIX 2

ORGANIZATION CHARTS - DUPONT

SPUNBONDED PILOT GROUP

PILOT GROUP

Total: 28 Exempt
10 Non-Exempt



APPENDIX 3

OFFICE AUTOMATION QUESTIONNAIRE

OFFICE AUTOMATION QUESTIONNAIRE

This questionnaire is designed to discern your views about the likely impact of office automation on the way your organization is structured, how it operates, how it is managed, and how office automation has been received. For our purposes, we will define office automation as one or more of the following services in the hands of the professional or technical individual: electronic messaging, word processing, electronic filing and retrieval, and auxiliary stand-alone applications (such as access to information data bases, "Visicalc" type packages, etc.)

Even though many of the questions solicit your opinions about the future, please draw your answers from your own observations if possible, not from your view of what "ought to be".

The questionnaire will be treated in strict confidence, and the data will be compiled in such a way that no one will be able to identify the source.

Just fill in the questionnaire and return it in the enclosed envelope. It shouldn't take more than 15 minutes to complete.

Your input will be a partial basis for a Master's thesis at the Sloan School of Management at MIT under the umbrella of a project called "Management in the '90s". Because of the timing of the thesis work, your response before March 23rd is vital.

Thank you for your help!

Jim Leigh
Sloan Fellow, 1984
Massachusetts Institute of Technology

Please express your opinion by circling the appropriate number from 1 to 9 under each question/statement below:

1. Some say that as a result of electronic mail, communications become more spontaneous, less formal as compared to written communications in the absence of electronic mail. What's your opinion?

1	2	3	4	5	6	7	8	9
more spontaneous less formal								less spontaneous more formal

2. Is electronic mail primarily a substitute for written or for phone communications?

1	2	3	4	5	6	7	8	9
replaces telephone								replaces written

3. Do you believe that electronic mail effectively eliminates "telephone-tag"?

1	2	3	4	5	6	7	8	9
totally eliminates telephone tag								no effect on telephone tag

4. Do you believe that typing skills (speed and accuracy) will be important tools for the professional or managerial individual in order to make full use of office automation?

1	2	3	4	5	6	7	8	9
typing skills vitally important								typing skills unimportant

5. It has been said that the ability to compose (i.e. to write) at the key board will be an important skill if the professional or managerial individual is to make effective use of word processing and electric mail. What is your opinion?

1	2	3	4	5	6	7	8	9
ability to compose vitally important								ability to compose unimportant

6. As a result of office automation, top management control of an organization will become more or less direct.

1	2	3	4	5	6	7	8	9
top mgmt more direct/hands on								top mgmt more indirect (thru staff)

7. Does electronic mail generally improve communication?

1	2	3	4	5	6	7	8	9
electronic mail bogs down communication								it opens up channels of communication

8. If you accept that office automation is the way of the future, will the change be revolutionary or evolutionary? In other words, will the change come over "dead bodies", or will it be welcomed?

1	2	3	4	5	6	7	8	9
revolutionary widely resisted								evolutionary welcome change

9. What impact will office automation have on employment in the office 10 years out in the future? Will fewer people be required to do the job, or will more get done better?

1	2	3	4	5	6	7	8	9
fewer people to do the job								more done better with same people

10. Will electronic mail cut down on, or increase the number of meetings required to conduct business?

1	2	3	4	5	6	7	8	9

fewer meetings required — more meetings required

11. Will the job change fundamentally, or is it just a change of the tools of the trade when office automation is introduced?

1	2	3	4	5	6	7	8	9

fundamental change in job — same job with different tools

12. Office automation will almost certainly result in more fine tuning of the work product (the same document or report being revised many times for minor deficiencies before it is distributed, for example). Some question whether the resulting fine-tuned product has enough added value to justify the time spent.

1	2	3	4	5	6	7	8	9

fine tuned product is justified — fine tuned product not justified

13. Some say that the secretary will no longer be a typist and all professionals and managers will use word processing software to compose and type their own work instead of doing it long hand or by dictation. To what extent do you subscribe to this statement?

1	2	3	4	5	6	7	8	9

very likely — very unlikely

14. Another suggestion is that dictation is more efficient than word processing for a first draft of any document. To what extent do you believe dictation is faster than word processing for other than routine communication?

1	2	3	4	5	6	7	8	9

dictation faster than word processing — word processing faster than dictation

15. Please give an estimate of your typing speed.

```
          1   2   3   4   5   6   7   8   9
          ---------------------------------
5 words                                 45 words
per minute                              per minute
```

16. It has been said that the secretary is removed from the communication channel by electronic mail. If so, one disadvantage to electronic mail may be the loss of a way to have your mail screened, especially during or after prolonged absence for vacation or travel. Do you see this loss as a productivity drag associated with electronic mail?

```
          1   2   3   4   5   6   7   8   9
          ---------------------------------
serious loss                        no real loss
of productivity                     of productivity
```

17. It has been suggested that electronic mail allows a better response to a request for information in that the respondent has more time to think about the answer before volunteering it (compared to a telephone or personal contact). Is this a positive feature of electronic mail?

```
          1   2   3   4   5   6   7   8   9
          ---------------------------------
positive                                negative
feature                                 feature
```

18. One view of the impact of office automation is that the secretarial and clerical positions will be amalgamated with middle level management positions effectively removing a layer of the organization. What is your opinion?

```
          1   2   3   4   5   6   7   8   9
          ---------------------------------
secretaries, mid                    no amalgamation
managers amalgamated                of positions
```

19. Seven day a week access to individuals in the organization (assuming terminals in the home as well as the office) is seen as a likely feature of the automated office. Is this a desirable feature in your opinion?

1	2	3	4	5	6	7	8	9
desirable feature								undesirable feature

20. It has been said that office automation will result in better decisions because of additional input to the process. To what extent do you subscribe to this proposition?

1	2	3	4	5	6	7	8	9
improved decisions								no real improvement

21. It has been said that office automation will result in a "flatter" organization, that is one with fewer levels in the hierarchy. To what extent do you agree with this view?

1	2	3	4	5	6	7	8	9
flatter organization								no change in hierarchy

22. Some say that wide spread use of electronic mail in an organization will minimize the formation of "empires" by limiting the extent that middle managers can screen information requested by top management. What is your opinion?

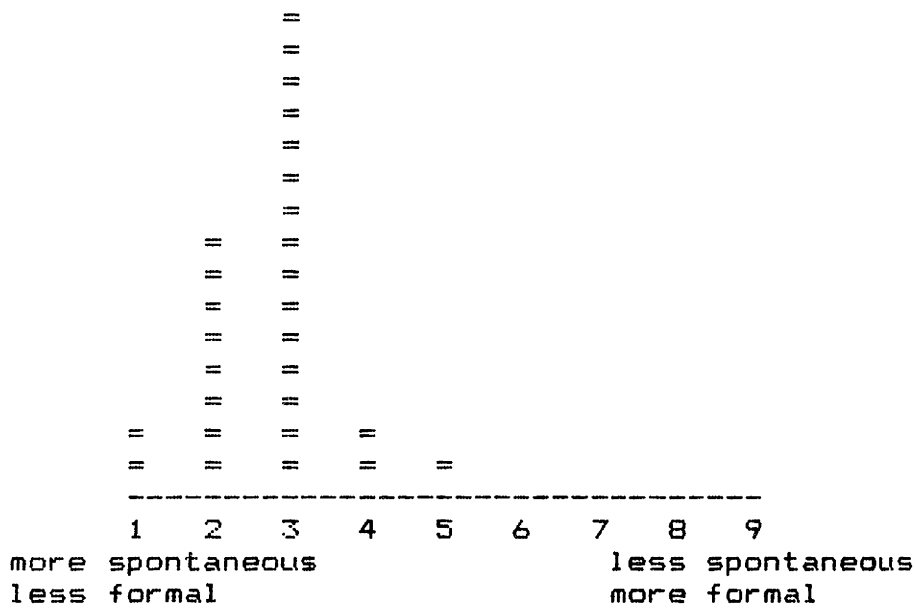
1	2	3	4	5	6	7	8	9
will eliminate empire building								won't change empire building

23. Please feel free to comment on any other aspect of office automation that you feel is worth noting. In particular, I would be interested in your views about the way that your organization might be different as a result of office automation. In particular, I would be interested in the types of "stand alone" applications available to you and and the extent of your use of these packages.

APPENDIX 4

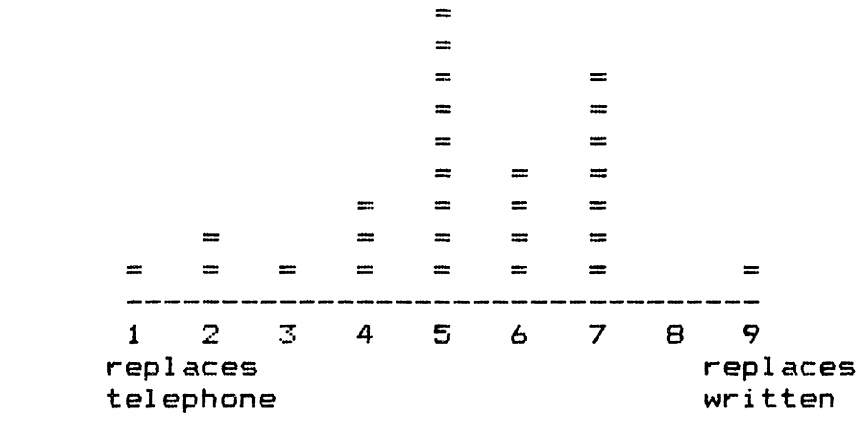
QUESTIONNAIRE RESULTS

1. Some say that as a result of electronic mail, communications become more spontaneous, less formal as compared to written communications in the absence of electronic mail. What's your opinion?



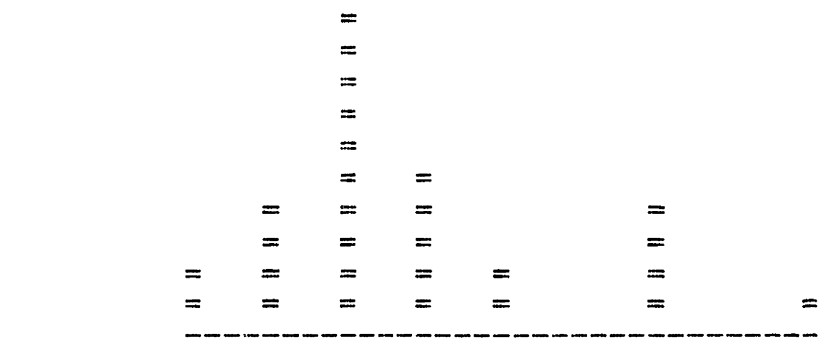
Mean 2.71, Mode 3, Standard Deviation 0.85

2. Is electronic mail primarily a substitute for written or for phone communications?



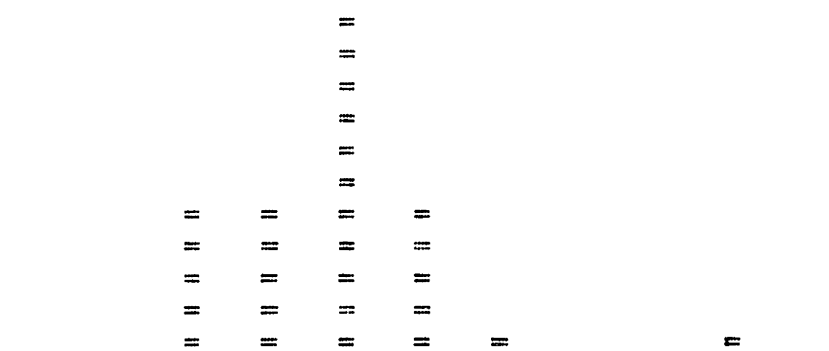
Mean 5.25, Mode 5/7, Standard Deviation 1.8

3. Do you believe that electronic mail effectively eliminates "telephone-tag"?



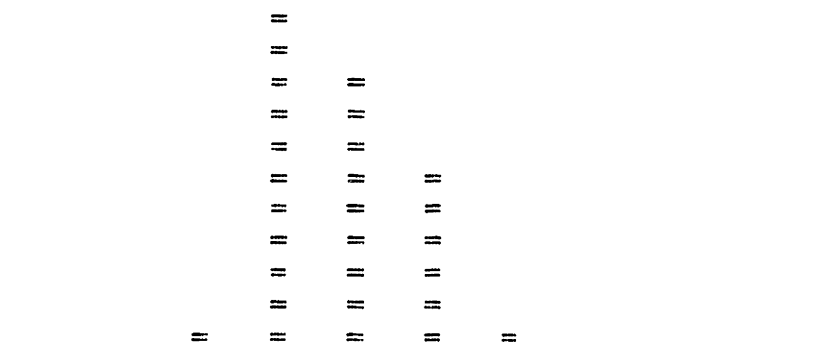
Mean 3.82, Mode 3/7, Standard Deviation 1.98

4. Do you believe that typing skills (speed and accuracy) will be important tools for the professional or managerial individual in order to make full use of office automation?



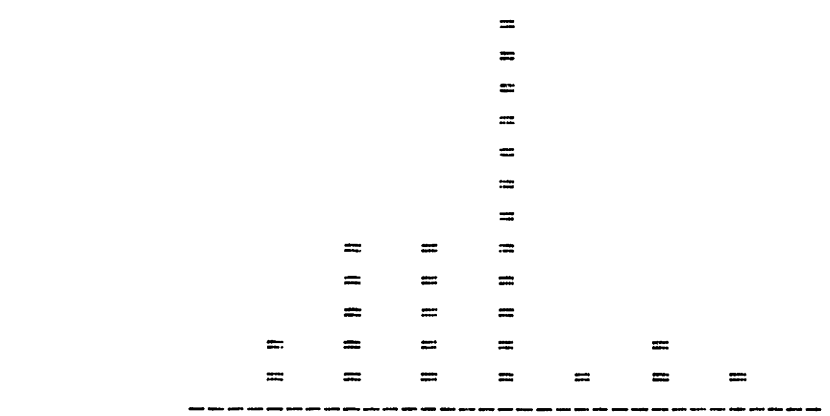
Mean 2.89, Mode 3, Standard Deviation 1.47

5. It has been said that the ability to compose (i.e. to write) at the key board will be an important skill if the professional or managerial individual is to make effective use of word processing and electric mail. What is your opinion?



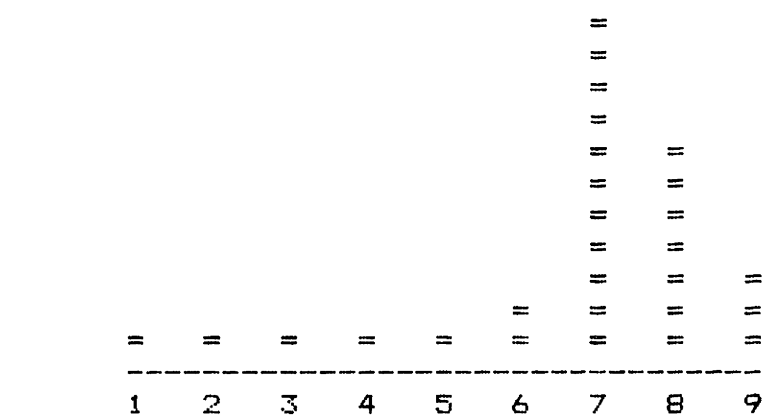
Mean 2.82, Mode 2, Standard Deviation 0.94

6. As a result of office automation, top management control of an organization will become more or less direct.



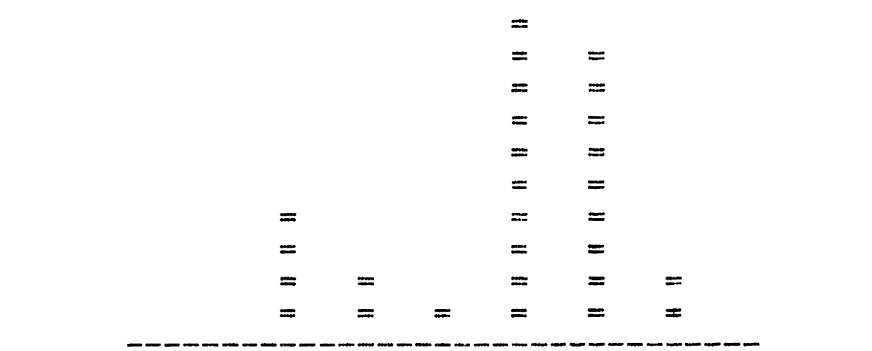
Mean 4.54, Mode 5, Standard Deviation 1.43

7. Does electronic mail generally improve communication?



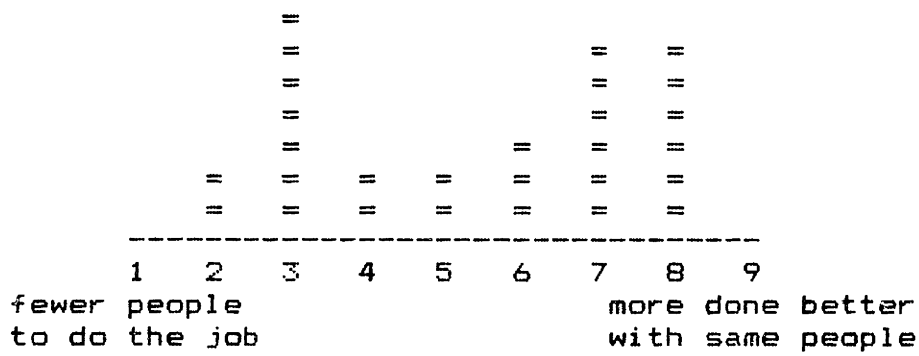
Mean 6.68, Mode 7, Standard Deviation 2.00

8. If you accept that office automation is the way of the future, will the change be revolutionary or evolutionary? In other words, will the change come over "dead bodies", or will it be welcomed?



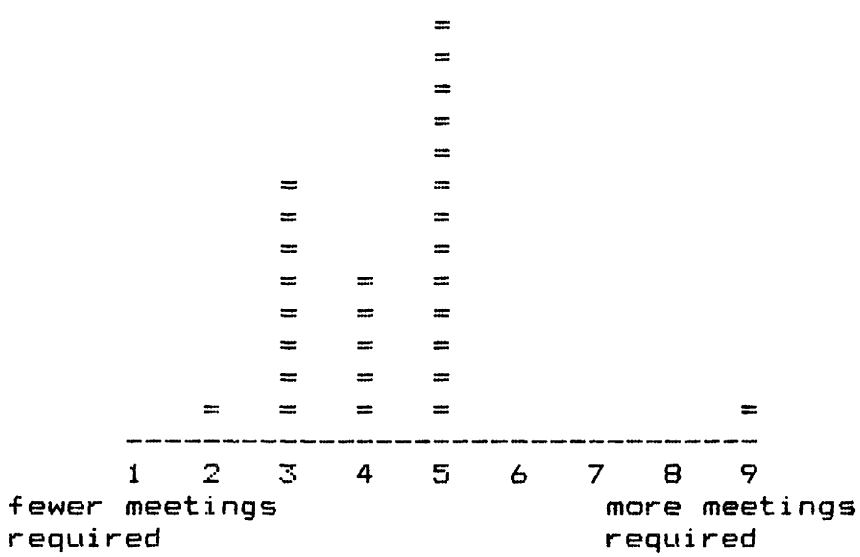
Mean 5.86, Mode 6/3, Standard Deviation 1.51

9. What impact will office automation have on employment in the office 10 years out in the future? Will fewer people be required to do the job, or will more get done better?



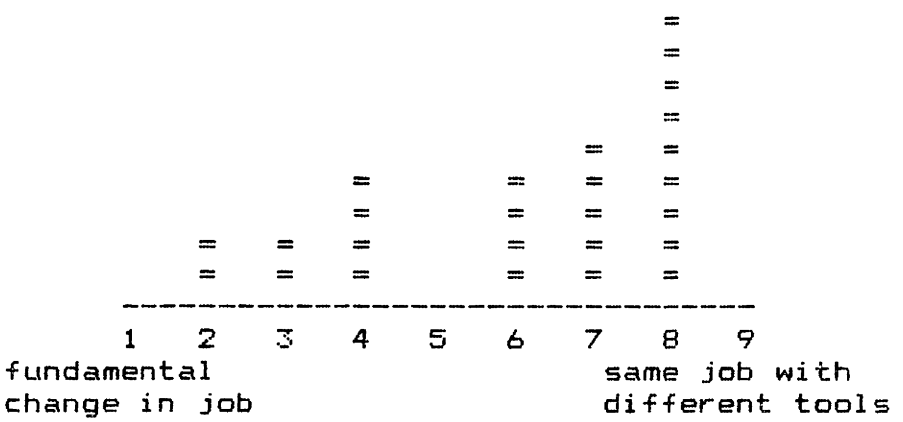
Mean 5.39, Mode 3/7.5, Standard Deviation 2.15

10. Will electronic mail cut down on, or increase the number of meetings required to conduct business?



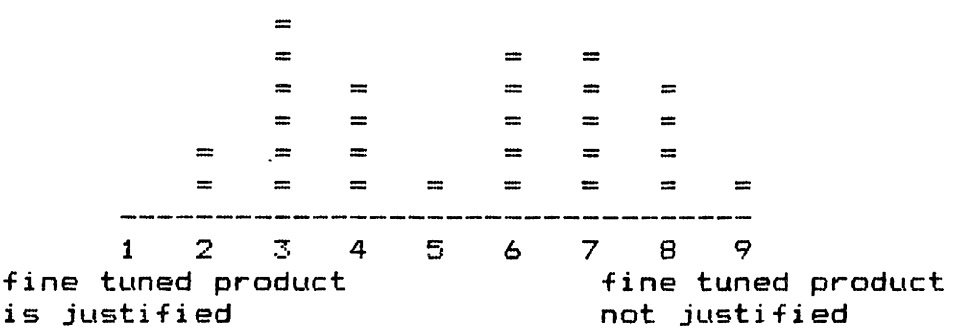
Mean 4.29, Mode 5/3, Standard Deviation 1.33

11. Will the job change fundamentally, or is it just a change of the tools of the trade when office automation is introduced?



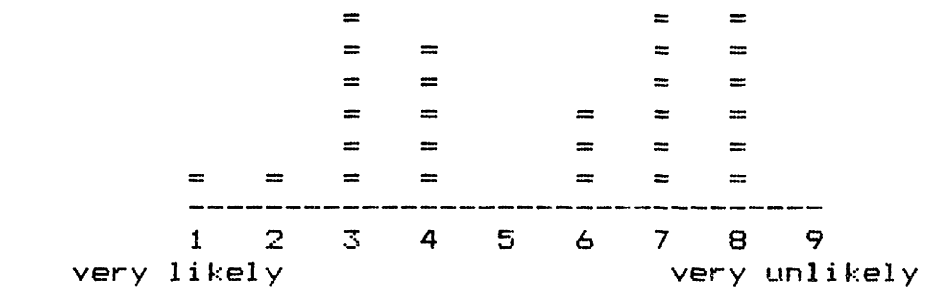
Mean 6.25, Mode 8/4, Standard Deviation 2.14

12. Office automation will almost certainly result in more fine tuning of the work product (the same document or report being revised many times for minor deficiencies before it is distributed, for example). Some question whether the resulting fine-tuned product has enough added value to justify the time spent.



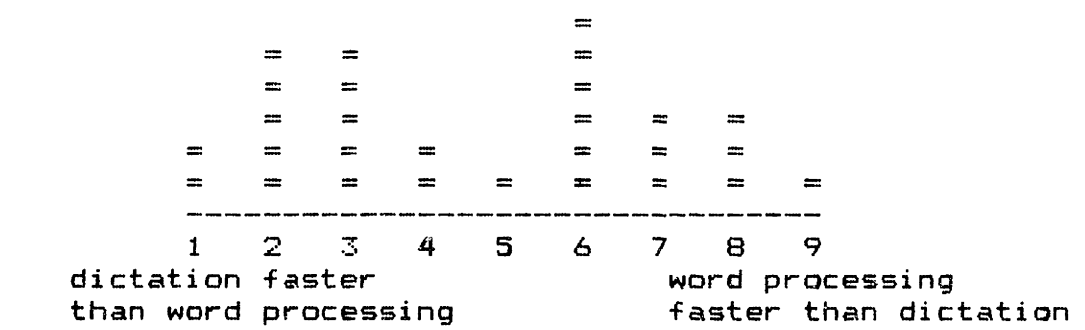
Mean 5.32, Mode 3/6.5, Standard Deviation 2.11

13. Some say that the secretary will no longer be a typist and all professionals and managers will use word processing software to compose and type their own work instead of doing it long hand or by dictation. To what extent do you subscribe to this statement?



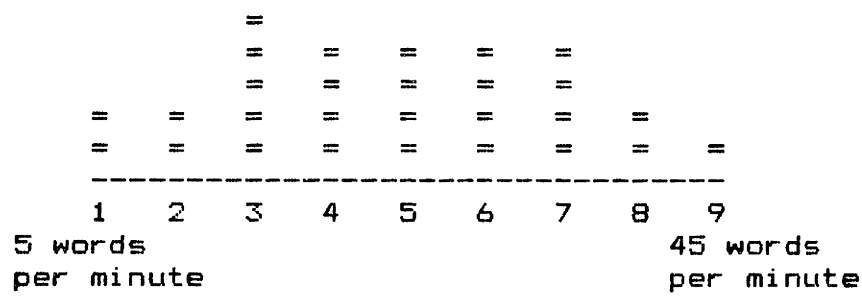
Mean 5.32, Mode 7.5/3, Standard Deviation 2.21

14. Another suggestion is that dictation is more efficient than word processing for a first draft of any document. To what extent do you believe dictation is faster than word processing for other than routine communication?



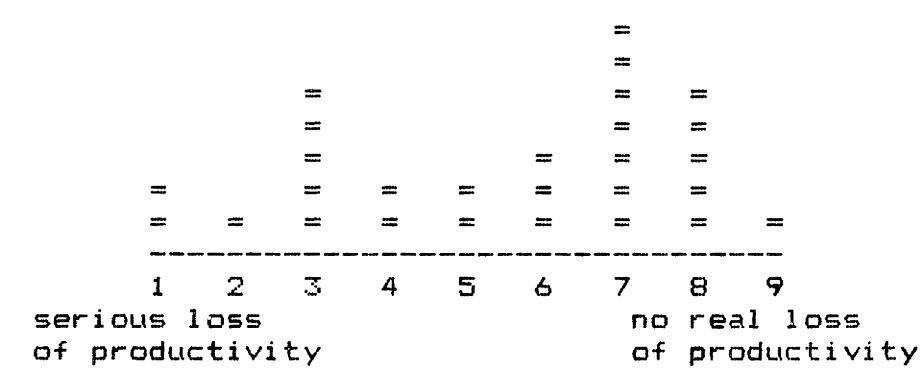
Mean 4.64, Mode 6/2.5, Standard Deviation 2.41

15. Please give an estimate of your typing speed.



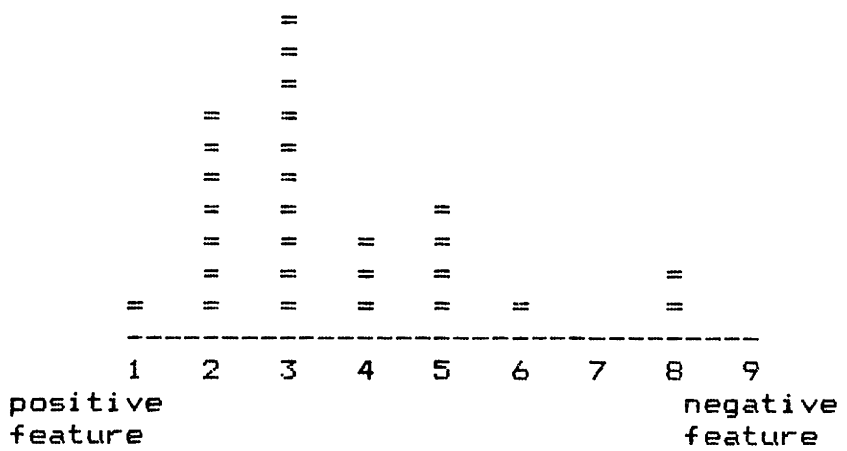
Mean 4.79, Mode 3, Standard Deviation 2.17

16. It has been said that the secretary is removed from the communication channel by electronic mail. If so, one disadvantage to electronic mail may be the loss of a way to have your mail screened, especially during or after prolonged absence for vacation or travel. Do you see this loss as a productivity drag associated with electronic mail?



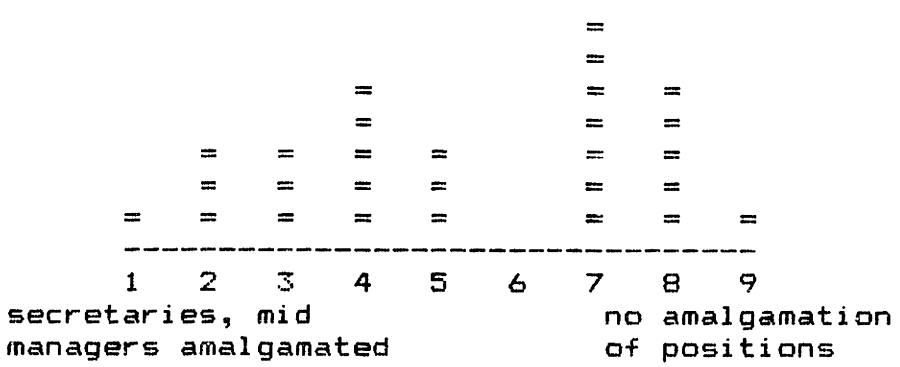
Mean 5.46, Mode 7/3, Standard Deviation 2.35

17. It has been suggested that electronic mail allows a better response to a request for information in that the respondent has more time to think about the answer before volunteering it (compared to a telephone or personal contact). Is this a positive feature of electronic mail?



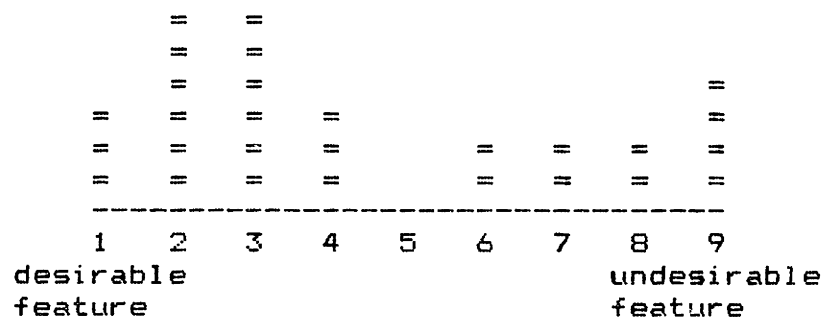
Mean 3.54, Mode 3/8, Standard Deviation 1.73

18. One view of the impact of office automation is that the secretarial and clerical positions will be amalgamated with middle level management positions effectively removing a layer of the organization. What is your opinion?



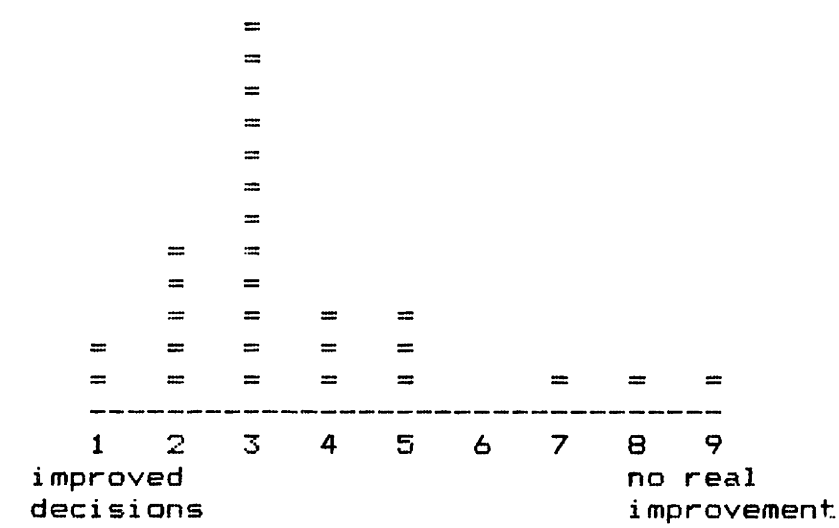
Mean 5.32, Mode 7/4, Standard Deviation 2.33

19. Seven day a week access to individuals in the organization (assuming terminals in the home as well as the office) is seen as a likely feature of the automated office. Is this a desirable feature in your opinion?



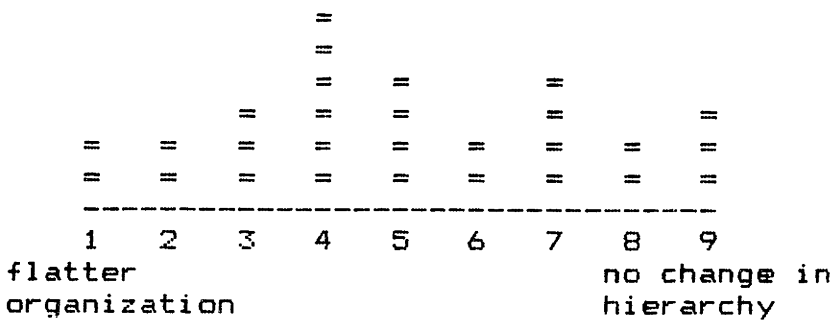
Mean 4.39, Mode 2.5/9, Standard Deviation 2.79

20. It has been said that office automation will result in better decisions because of additional input to the process. To what extent do you subscribe to this proposition?



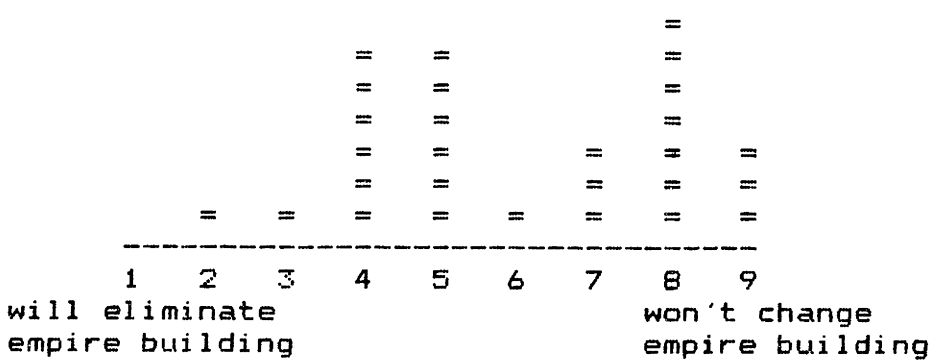
Mean 3.54, Mode 3, Standard Deviation 1.9

21. It has been said that office automation will result in a "flatter" organization, that is one with fewer levels in the hierarchy. To what extent do you agree with this view?



Mean 5.07, Mode 4/7, Standard Deviation 2.37

22. Some say that wide spread use of electronic mail in an organization will minimize the formation of "empires" by limiting the extent that middle managers can screen information requested by top management. What is your opinion?



Mean 6.04, Mode 8/4.5, Standard Deviation 2.05

23. Please feel free to comment on any other aspect of office automation that you feel is worth noting. In particular, I would be interested in your views about the way that your organization might be different as a result of office automation. In particular, I would be interested in the types of "stand alone" applications available to you and and the extent of your use of these packages.

Dial-up access for some (and hard-wired for others) and residential terminals for some (and not others) creates "second class citizens" i.e. a caste system in which some are much more productive than others - a MAJOR negative with the current system.

Major difference is wider access to information, much lower attendance at meetings, much, much, less telephone time. System makes me 20% to 30% more productive as a front line supervisor.

Currently used to communicate.

Data filing/retrieval will be used more in future.

Portable terminals for salesmen linked to office computers will improve efficiency.

Constant disruption (phones, people) make it difficult to concentrate on OA.

Have access to spread sheets, data bases, financial planning packages, graphics all of which are used extensively. Tendency has been to do more and more things that have not been done in the past due to the increased capabilities vs freeing up time.

The systems must be improved by 1 to 3 orders of magnitude in response time and at least 2 times in ease of use before productivity increases will become a significant factor. Our current system which is state of the art is useful but not great. It does give you a taste of where we can be in a few years.

Office automation offers the best and fastest way to forward filed data to other persons. Office automation offers one a superior filing and retrieval system.

We had a customer sales/price/end-use data retrieval

program that was an excellent analytical tool for sales management people. I used the program constantly but it was finally discontinued because it was not used enough and taking up too much memory space. Basic problem was that the program took time to learn so our people did not bother with it.

This system must be used as an analytical tool as well as a word processor to be fully viable for management levels.

Office automation is at this point "tool" rather than "catalyst". It is cumbersome in many ways and inelegant at best. An order-or-magnitude improvement in command response time for ALL-IN-ONE is necessary, and probably greater redundancy in the CPU to avoid agonizingly slow processing in times of heavy system use.

Encoding capability is necessary for private files - not broadly available.

Office automation has one disbenefit which I have experienced. By partially replacing the telephone, there is a tendency to lose the interactive process which happens when two people speak with each other. The electronic mail cultivates interpersonal distance between people which can become a problem if not recognized.

One of the benefits of office automation is the use of analytical tools such as IFPS, VisiCalc, etc. to perform "what if" scenarios on business alternatives. I find these tools indispensable in my work.

OA now, and in the near future, is an Atari game. Fun for those who "like" it but a real cost and burden to others. There is nothing personal about OA and in the final analysis - personal - is the name of the game. The rush to ORGANIZE everyone to a specific way of doing things is de-motivating and will lead - very surely - to non-personal and non-creative approaches to problems. There is no pizzaz to OA and without humanizing it it simply will be a COST not an efficiency promoter. It is similar to most "robots" - fine if you want to mass produce mediocrity.

Many stand-alone systems available but ALL very static and complicated to manipulate. The machine doesn't work like a brain.

In early of the stages of the evolution, I wonder if the time spent learning and using DECalc is worthwhile. It seems that a "secretary of the future" would be best to have to set up models needed then she/he or I could input actual data.

OA system requires thorough training and frequent use to gain proficiency. This is especially difficult for people who travel.

DUPONT QUESTIONAIRE
RESPONSE TABULATION

QUESTION NUMBERS 1 TO 11

QUSTNAIRE NUMBER	1	2	3	4	5	6	7	8	9	10	11
1	4	3	2	1	3	4	7	7	7	2	8
2	2	7	4	4	3	4	7	6	3	4	6
3	3	4	5	3	4	5	8	7	7	5	3
4	3	4	5	3	4	4	7	6	6	5	4
5	3	7	3	3	2	2	5	8	8	5	7
6	3	6	2	3	4	5	7	6	6	5	4
7	1	5	3	1	2	5	7	6	8	5	2
8	2	5	3	2	2	5	7	6	3	3	3
9	1	9	2	4	3	3	8	6	3	5	2
10	2	7	3	3	3	7	7	7	8	4	8
11	3	2	2	4	4	3	8	6	6	5	6
12	2	5	1	3	3	5	8	5	3	4	9
13	3	6	7	2	2	3	7	7	2	3	8
14	2	5	3	3	2	5	7	7	3	4	8
15	3	5	3	3	4	5	7	6	7	5	8
16	3	5	3	3	3	3	8	6	5	3	8
17	3	6	3	4	4	4	8	7	4	3	6
18	4	7	3	1	2	2	6	6	4	5	7
19	3	4	3	2	2	6	4	4	7	5	4
20	3	7	4	2	2	5	9	7	3	3	4
21	5	1	7	1	1	5	1	3	5	9	9
22	3	7	4	3	2	7	6	7	7	4	6
23	3	5	4	5	2	5	9	4	8	3	7
24	3	2	1	4	3	4	8	3	8	5	8
25	2	6	7	8	5	5	9	8	2	5	8
26	2	5	4	2	2	5	7	7	3	3	7
27	2	5	9	1	3	3	3	3	8	3	8
28	3	7	7	3	3	8	2	3	7	5	7

DUPONT QUESTIONAIRE
RESPONSE TABULATION

QUESTION NUMBERS 12 TO 22

QUSTNAIRE NUMBER	12	13	14	15	16	17	18	19	20	21	22
1	8	8	2	8	4	2	7	1	4	4	3
2	4	3	6	3	7	3	4	3	3	7	4
3	6	7	6	4	3	2	4	3	3	6	6
4	6	3	4	6	3	6	4	4	4	4	4
5	7	7	3	1	6	3	7	1	4	8	8
6	7	3	7	9	8	3	3	3	3	5	5
7	8	8	8	3	7	2	2	4	5	5	5
8	5	3	7	8	5	5	7	7	5	4	7
9	7	1	9	6	9	1	1	1	1	1	9
10	6	6	3	6	3	3	4	2	3	3	4
11	3	6	6	6	7	3	3	9	2	6	4
12	3	7	3	5	7	2	8	2	2	9	8
13	4	7	2	4	5	3	8	6	8	7	8
14	2	4	7	7	8	3	8	2	2	4	4
15	2	4	2	3	6	5	7	3	3	7	7
16	6	8	6	7	4	2	9	9	3	9	8
17	4	4	5	4	7	2	2	2	2	2	5
18	3	4	1	3	8	3	3	6	5	4	4
19	3	4	2	3	3	5	7	7	3	7	7
20	6	3	8	7	6	4	5	2	3	3	8
21	7	8	1	7	2	8	4	9	9	2	9
22	4	7	4	5	3	4	5	4	3	5	5
23	7	7	3	1	7	2	2	2	1	1	2
24	9	2	8	4	1	4	8	8	2	8	8
25	3	3	6	5	8	3	7	3	3	4	8
26	3	6	6	5	7	3	5	8	3	3	5
27	8	8	3	2	8	8	8	3	3	9	9
28	8	8	2	2	1	5	7	9	7	5	5

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