Interfacing people with their machines

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ABSTRACT

As computer technology proliferates, the techniques applied to the interface of people with their machines will assume great importance if the large dollar investments in equipment are to be recouped in the form of increased productivity.

This paper propounds the theory that change in any form is difficult for people to accept, especially in the office environment, and that it is essential to involve the work force in the change to automated information processing if new technology is to succeed.

The paper outlines several ways to accomplish this, including polls and individual interviews with all employees before the system is purchased and the design of a public relations effort to help employees understand the applications of automation to their personal roles. The paper also covers various ergonomic questions related to computer systems, such as noise, heat, illumination, static, terminal design, and general environmental questions.

The issue of accommodating people in an office to office automation is a complex one, requiring a concerted effort on the part of all managers involved with the implementation.
INTRODUCTION

The implementation of office automation in a company is a change far different from any that has preceded it. Unlike the opening of a new plant, the shifting of a division, the reorganization of a department, or the implementation of a specific new procedure that attempts to accomplish a single goal, automating the office changes an entire information processing scheme, altering the daily tasks and chores of individuals and rearranging not only people's lives but the physical design of an organization as well. In other words, office automation, if properly implemented, ultimately restructures the office environment, requiring a shift in management tactics as well as in management procedures.

With automation, new roles and responsibilities are created, forcing office workers to reshape the patterns of their day and to assume new, specific chores related to the computer systems they must now learn to use. The familiar tools of the typewriter and the telephone are shunted aside, and workers are told to learn to operate these terminals through short training sessions and by struggling with complex documentation. They often find themselves moved from private cubicles to an open space, where they share a terminal with other office workers. Personal relationships between secretarial workers and managers are dissipated as managers are forced to reassign the workload and in some cases are required to keyboard original documents themselves. In theory, the task is to use the finest applications of computer technology to increase productivity. In reality, when dealing with human beings, it does not often work easily.

IS CHANGE A POSITIVE OR A NEGATIVE?

Research in human behavior has clearly indicated that human beings react poorly to change, though in varying degrees. Studies have shown that humans view change with a mixture of fear, ambivalence, lack of interest, and downright unwillingness to modify their behavior. People resist change because they fear they will not be able to develop the new skills and behavior required. They resist change because it is different from the established patterns with which they have become comfortable. Some groups have even been known to engage in direct action to block the implementation of something new.

If automation is to succeed—if it is to fulfill its promise of increasing productivity and making information processing a manageable, viable facet of office operations—then management must develop a basic understanding of what it takes to keep the elements of change under control.

THE OFFICE STRUCTURE

Most offices are structured with an executive/manager at the top and several managers reporting, each in hierarchical steps, to the person above. Secretaries and clerks are assigned to managers at various intervals in the spectrum.

Sociological studies have shown that there are two levels of jobs in an office environment: primary jobs, or those that offer substantial pay, opportunities for training and advancement, considerable supervision, and a degree of job security; and secondary jobs, which offer low pay, little training or advancement, little job security, and constant supervision from someone above. Implementation of office automation will have an effect on both primary- and secondary-level jobs, since information flow in the hierarchy is accomplished step by step, with very little direct information contact between the bottom levels and the top. Messages are passed from one level to the next in an extremely cumbersome fashion, and both primary- and secondary-level employees are involved in the process.

A COMPUTER ON EVERY DESK

In the early 1950s there were approximately 1,000 computers in America and no microcomputers, microprocessors, or chips. By 1976, there were more than 220,000 computers and three-quarters of a million microcomputers in use. By 1980 Americans were using over 10 million microprocessors. It is estimated that the market for intelligent terminals will grow at a rate of 25% each year throughout this decade.

With the placement of terminals on the desks of virtually every manager and secretary in the office environment, information flow will change radically. Vocal and telephone communications, face-to-face meetings, and many written mes-
sages currently processed will disappear. In their place will be shared databases, common electronic mail/messaging systems, and common files that will open up new avenues of communication among the individuals in an organization. Each individual user will be able to supervise more closely the dissemination of his/her messages. New pathways of communication will be established. Interpersonal roles will change as well. Clerical workers will become an unknown entity as such highly routine work as filing, mail sorting, mail delivery, and voluminous copying tasks are handled electronically by computer systems that perform these tasks by the mere push of a button or the command of a voice.

Out of the labor force will come a group of paraprofessionals who will assume semi-management positions in the office, using computer technology to monitor and control a variety of processing chores currently performed manually. Managers and executives will use computer conferencing to replace time-consuming travel. They will have decision support systems to handle budget preparation, sophisticated modeling tasks, and maintenance of their calendar and to give them access to a variety of databases.

Knowing that this is ahead, workers at all levels of the office hierarchy are fearful when they hear that office automation is coming. How to implement automation with a minimum of dissent and disarray is the question that must be addressed if electronic processing in the office is to meet with success.

INFORMATION MANAGEMENT IS EVERYONE'S CONCERN

The first hurdle to be passed when office automation is considered is for an office to take a close look at its information processing and determine where, when, and how automation might fit into the scheme. This information management study must be undertaken with all members of an office staff participating, not just a selected few, as has been the practice in the past. To insure that the information management study is handled properly, a team of individuals should review office procedures as they relate to the following:

1. The kinds of documents typed or handwritten
2. Filing procedures and how the files are organized
3. Sorting and retrieval of documents
4. Copying chores and the numbers of copies generated
5. Mail volume, reception, and distribution
6. The volume of telephone calling and how calls are channeled
7. Final document preparation: Is it via Xerox, mimeograph, phototypesetting?
8. Budget preparation, access to budget information, manipulation of data
9. Planning and forecasting tasks
10. The allocation of time to these tasks by executives, managers, secretaries, clerks, typists, bookkeepers, etc.

The results of the study must present an overall picture of the nature of the work being done daily in the office. It must determine how technology can be used most effectively to improve productivity and bring about beneficial change.

In the information management study, each member of the office staff should be individually interviewed and asked to analyze items to be included in the review as they relate to his/her job. During the same interview, individuals should be asked for opinions about the impending change and should be encouraged to express any of the fears and anxieties about automation they may have as well as to express any helpful ideas.

For the sake of efficiency, especially in a large office, a questionnaire might be used to complement personal interviews. The questionnaire will provide more extensive feedback on each individual's role in the information processing scheme than the interviews alone will reveal. They should not, however, replace the interviews. (See Figure 1.)

Many companies have totally dispensed with an information management study, charging the computer department with the task of evaluating needs and determining equipment configurations. Generally, computer departments require that individual offices justify their requests for a system by maintaining a daily work log for each individual. The informal discussions encouraging employees to voice their feelings about automation are ignored. In their place, hostility builds among both managers and clerical workers who are being
Figure 1
Sample Questionnaire

1. Could you please analyze your work day into segments and indicate the percent of time you spend with the following activities:
   - Handwritten work
   - Typing
   - Mail sorting
   - Mail answering
   - Telephone usage
   - Copying
   - Filing activities
   - Retrieval
   - Calendar Maintenance
   - Meetings
   - Calculating
   - Reading/review
   - Original work

2. Are you in favor of office automation?
   - Yes
   - No

3. Would you personally use a computer?
   - Yes
   - No

4. Please rank in order those chores where you feel a computer would help you the most:
   - Typing
   - Filing
   - Retrieval
   - Elimination of telephone calls
   - Elimination of meetings
   - Original work
   - Budget maintenance
   - Calendar maintenance
   - Record maintenance

5. Do you produce finished (typescript) documents?
   - Yes
   - No

6. Do you feel that a computer will help you become more efficient at your job?
   - Yes
   - No

7. Can a computer terminal be placed at your current workstation?
   - Yes
   - No

8. Have you ever used a computer terminal?
   - Yes
   - No

asked to account for their time without receiving a proper explanation of why or how the information is needed. This intrusion into work operations is considered an invasion of privacy by office workers. As a result, office automation is resented before it ever has a chance to prove its worth.

There is reason to believe that change is coming. Centralized data processing departments are slowly losing clout in large organizations. No longer are companies looking to their corporate data processing managers to provide the leadership needed to bring computing power out of the back room and into the hands of all employees. Steering committees whose members come from all levels of the corporate hierarchy are assuming this role, insuring that each faction in the company is represented.

In offices where automation has previously been installed, but where a proper information management study was never completed and where employees are disgruntled and grumbling about their computers, a study should be undertaken. It is never unreasonable to review information processing practices and attempt to formulate an organized, sensible, and easier-to-use database. Although it is more difficult to convince already unhappy employees that automation has a positive aspect, the problem is not unsolvable. Involving employees in change at any step in the process is better than not including them at all.

AUTOMATION DOES NOT EQUAL JOB LOSS

Another way to avoid negative reactions to office automation is to dispel the myth that automation in and of itself will create job loss and unemployment. Automation generally has not resulted in mass layoffs in most companies. Although it is true that the elimination of personnel is one factor to cost-justify office automation, reducing the work force usually takes place through attrition rather than through wholesale firing. Initially, computers have even made it necessary to increase a work force, since massive information reorganization must occur when a database is input. Once a computer system is up and working, employees generally find that they are freed from the burdens of paper work and many routine tasks, enabling them to perform administrative work and to participate in decision making more effectively. Thus computers have not eliminated jobs but have made them more interesting, challenging, and fruitful.

A PUBLIC RELATIONS PLAN

Companies that have most successfully brought automation to the office environment while maintaining harmony and good will among the office workers in the initial stages have embarked on an active public relations program to market this concept to their employees. All companies that are automating can benefit from a plan of action incorporating all the media of communication (including words, visuals, and other tools) to keep open channels of communication and to create acceptance of office automation as a beneficial tool. This mammoth effort to launch and maintain an aggressive public
relations campaign will pay off in positive employee attitudes and in the increase in productivity that is being sought through computing power.

The public relations plan should include several facets. Most companies have working communication media, such as house organs and weekly newsletters, that can feature explanatory general articles about the applications of office automation tools. In addition to established publications, companies might want to issue an office automation bulletin or newsletter, biweekly or monthly, with articles of specific interest—for example, news about new software packages and contributions from employees about new applications for their computer terminals.

Another tool that could be used is bulletin boards, which offer a good place to corroborate information with brief messages, appropriate posters, and drawings. A dynamic bulletin board, effectively designed, with imaginative posters, cartoon drawings, and well-displayed notices on office automation, can be a considerable asset in propounding the idea that automation is a concern of all members of the organization.

Information racks (installed in many companies primarily for morale and employee education) can provide easy access to written materials describing office automation tools. These racks should be placed in lunchrooms and corridors so that everyone has access to them.

A common device in large corporations, which has received favorable reception, is the use of telephone newslines to link managers with various employees in the hierarchy. Establishment of a newsl ine update on office automation is another way of keeping employees informed.

Displays of equipment, set up before a computer system is installed, may make employees feel more familiar with terminals. Even the use of closed-circuit television in large organizations where it is often difficult to reach everyone is a helpful feature in communicating the need for and the importance of office automation.

Most essential in the public relations effort is the establishment of regular departmental meetings involving all the employees in open discussion about the changes and the uses of computer systems. This is the most important element in the attempt to assuage ruffled feelings and emotions and remove a sense of alienation among employees, who often feel that they are not consulted about major changes in the office where they spend the largest part of their day.

ERGONOMICS

Ergonomics is the science that studies the relationship between people and machines. It focuses on the design of computer terminals and the ease with which the user is able to adapt to computers, including a concern for structural and physical design elements. All the public relations strategies and attention to information management before a computer system starts operating will be fruitless if installed systems do not solve the interface problems that have hampered the industry in the past. Some of the problems that have to be addressed are discussed in the following sections.

Noise

The increasing acquisition of computer equipment, along with new office design encouraging an open landscape, has resulted in an environment that is not conducive to concentrated work. The noise generated by clacking printers and the ringing of telecommunications devices is an irritant to workers whose enclosures have been removed in many offices, as well as to workers who are in close to a printer. The use of acoustic panels to absorb distracting sounds and the installation of plush carpeting have provided partial solutions to the problem. Improvements in printer technology are slow in coming; but there will be a gradual change, which should alleviate the problem.

Static

Computers generate static electricity that can make an office an uncomfortable place to work. Antistatic mats and sprays are a partial solution to this irritant. Vendors are working to eliminate some of the static at its source.

Illumination

The placement of a computer terminal near adequate lighting seems to be another problem. The installation of lights in panels and other pieces of furniture designed for the automated work station promises to help in that situation.

Heat

Computer terminals also emit heat and must be placed in an atmosphere that is neither too hot nor too cold. Adequate air conditioning must be planned for and provided.

Design

The general design of the office, and especially the chair and table used by the terminal operator, is extremely important for comfort. A recent trend in vendors of smaller systems has been to provide terminals that are set on tables and contain the disk drives so that all users buy their furnishings with the system.

As computer technology proliferates in the office, the ergonomics of a system will be yet another determinant in its acceptance by the workforce. The ability of an individual user to adapt easily to the equipment and to accept it as a productive tool depends on ease of use. Attention to the elements of noise, static, illumination, heat, and design is essential to an appropriate interface.

CONCLUSIONS

Acceptance; use; and, most important, the establishment of a new pattern for information processing in the office will be
realized only if new technology is implemented with concern for the human reaction to change. Even if all the creativity and imaginative selling technique that a company puts into the promotion of a new product is directed to the selling of computer power to their employees, the system will not succeed unless employees are directly involved in bringing about the changes that will come with office automation.

The most sophisticated management studies in human behavior have revealed that the greatest productivity booster is the willingness of employees to give 8 hours of work for 8 hours of pay. By accepting as a given that employees will not welcome change with open arms, but need to be introduced to it tactfully and gradually; by accepting as a given that management must include the employees in the decision-making process; by accepting as a given that a thorough understanding of information management is an essential first step toward the implementation of computer power; by accepting as a given that an aggressive campaign to influence, to educate, and to inform all employees about office automation is important to its adoption—organizations can fulfill the promise of electronics.

BIBLIOGRAPHY
