OFFICE AUTOMATION: THE ORGANIZATIONAL REDESIGN OF OFFICE WORK

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As the United States and other industrialized societies become service and knowledge-based economies, a major challenge confronting work organizations is to increase the productivity of office work. At present vendors are offering electronic equipment to mechanize office work — communicating word processors, electronic mail, teleconferencing, and combinations in a totally electronic work stations. Citing the relatively low capital investment for each office worker, equipment vendors propose mechanization as the road to productivity. Lurking just behind equipment vendors, software specialists are proposing complete automation of office tasks. However, present hardware and software strategies for office automation neglect critical facts about human behavior in organizations. The purpose of this paper is to propose a behavioral science strategy to improve the productivity of office work based on our current knowledge about organizational diagnosis, design, and change.

The paper begins with a critique of simple mechanization as a productivity strategy, then shows how a behavioral science strategy differs from both mechanization and automation. Finally the paper outlines a new organizational design for office work along with some immediate implications of behavioral science to facilitate the use of electronic office equipment.

False Promises of Office Mechanization

Three pieces of electronic equipment dominate current discussions of office work. Word processors allow text editing and high speed retyping. Electronic mail systems relay and store messages between terminals. And at the ultimate, the electronic work stations combines word processing,
electronic mail, on-line access to data bases and a variable set of other capabilities in an individual console. In current practice, most large organizations are entering the second generation of word processors — current versions have the capability (often unused) to communicate with one another; a smaller number have experimented with electronic mail; and a few are developing fully equipped work stations. A brief review of experience with each piece of equipment suggests the shortcomings of mechanization as the solution to office productivity.

In its early installations, word processing disappointed many users. In its marketing strategy, IBM specialized the typing task, centralized typists and mechanized typing with capital investment in new equipment. However, many early installations generated little cost savings, output of disappointing quality, widespread resistance from users, cancellation of leases and turnover in the newly formed word processing center, turnover at all levels from typists to supervisors and in many cases even office managers. As a consequence, IBM and its many competitors modified the initial marketing strategy to accommodate the demands of a human work organization.

The model of the office as factory mis-diagnosed both the variety and the critical functions in office work (Williams and Lodahl, 1978). To begin with, different language groups in many offices doomed a central center. Typists had trouble deciphering the secret language of lawyers at 9 a.m. and chemical engineers at 10. More importantly, word processing sought savings only from more efficient typing, focusing on the (20%) of secretarial time spent typing and neglecting the much greater potential for savings from the higher salaries of managers and professionals. And finally, implementation of word processing equipment
followed a external analysis by the vendor of needed equipment with little benefit from the input of ultimate users of the equipment.

Electronic mail threatens to repeat the early dissapointments of word processing. Bair (1978) estimated that an electronic mail can save two hours a day for every non-clerical worker in an office. Savings derive from avoiding busy signals, disturbing interruptions, transformations between media and repetitious tasks such as addressing letters, what he calls "shadow functions".

Optimistic predictions (savings of 62 billion dollars!) reflect a questionable diagnosis of managerial and professional work. First-hand observation suggests the critical functions of managers are building relationships, persuading others, and in resolving conflict (McCall, Morrison, and Hannan, 1978). The impact of electronic mail hinges on managers' capability to complete such sensitive functions by intermitent, written communication.

Problems with electronic mail have already begun to surface (Comins, 1979) but similar difficulties await the ultimate in office equipment as well. Electronic work station according to Strassman (1978) increase the ability of white collar workers at the boundary of organizations to respond flexibly and directly to the needs of clients and customers. Strassman cites the possibility of coordination among the work stations by organizational procedures imbedded in the system software. However, behavioral research on such boundary spanning jobs has highlighted the need for flexibility within the organization, the opposite of programmed coordination (Strauss 1964). Effective boundary spanners influence internal procedures and modify standing operating procedures in order to serve clients and customers. Indeed if any work organization follows all
of its routines all of the time, chaos ensues. As a labor relations tactic, it is called "working to rule."

As a further complication, managerial and professional work is increasing accomplished in groups rather than by individuals (Schein, 1978). A more promising mechanization might be group rather than individual electronic work stations.

Neglected Factors in Mechanization

Three themes run through the shortcomings -- both past and projected — of office mechanization. First, in the rush to install new hardware, vendors and users have neglected a careful diagnosis of office work. The critical functions in offices are performed by managers and professionals, not just in potential cost savings but in contributions to the missions of the organization. Behavioral studies of high level office workers, although infrequent, highlight functions not well encompassed by current equipment proposals. Second, mechanization in the office neglects the human side of the enterprise. Little attention has been paid to the need for a social redesign of the office to facilitate the utilization of new office equipment. And third, current mechanization programs neglect much behavioral science wisdom accumulated painfully about the process of organization change.

Examples of behaviorally-sensitive innovations in office work, although few and far between, reinforce the importance of these neglected factors. The redesign of jobs between manager and secretary in conjunction with the introduction of word processing has resulted in many cases in both increased cost savings and enhanced performance. (Lodahl and Williams, 1978) One successful approach begins with a diagnosis of
the work in an office — managers, professionals as well as secretaries and clerks. Then all office workers and an outside facilitator participate in a job analysis and redistribution of tasks from manager to secretary. More routine tasks are delegated to secretaries and clerks. While managerial tasks enhance the level of discretion in lower level jobs in the organization, managers gain time to engage in more planning.

Decision support systems provide a second example of effective organizational diagnosis. In a few successful examples, data processing and new office equipment have combined to enhance the performance of managers and professionals. One striking example in banks allows portfolio analysts to prepare documentary presentations for potential customer on very short notice. Generated by communicating word processors, the presentations incorporate extensive analysis from data processing.

The distinguishing characteristic of both examples are attention to the diagnosis of office work, a willingness to redesign the social system in an office to utilize new equipment and a participatory approach to organizational change. These three components comprise a significant conceptual advance in the automation of office work.

Three Generations in Office Automation

Zisman (1978) has argued pursuasively that significant increases in office productivity will only occur after the initial phase of office mechanization gives way to true office automation. The distinguishing characteristic of office automation is the incorporation of significant control operations in the systems software. In Gibson and Nolan's (1974) formulation such automation procedures ultimately diffuse throughout the
economy. However, as Table 1 describes, a third stage of an organizational diagnosis differs qualitatively from office automation and holds the potential for significant contributions to office productivity beyond the gains from automating routine office tasks.

Most organizations today are pursuing office mechanization. Driven by hardware vendors, office and administrative managers are investing significant resources in new hardware to mechanize the routine operational tasks and decisions in the office environment. Organizations today seek to increase their efficiency, that is, accomplishing the same performance with fewer resources, and are willing to endure the increased alienation on the part of individual office workers psychologists would predict as a consequence (Hackman and Lawler, 1971). While Zissman is no doubt correct that in a subsequent stage, software vendors and systems analysis within user organizations will design computer languages to encompass more complicated decisions, the advantages are still in efficiency. The organization will do what is does now only with the expenditures of fewer resources. Such organizational advantages will hopefully offset the individual costs of displaced workers resulting from such automation.

Automation that saves costs, however, does not imply effectiveness (Anthony, 1970) that is, coming closer to organizational objectives. Increased effectiveness of an organization requires a careful diagnosis of the organizational goals and its environment to determine whether the tasks performed at the present time ought to be performed at all, much less mechanized or automated (Beckhard and Harris, 1977). Such analysis is referred to here as organizational redesign. In this third stage, managers within the user organization will begin change in office work
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with a diagnosis of the goals in an organizational unit and then select the essential tasks to be supported by organizational redesign and office automation. A pleasant societal offshoot of this three-stage approach is its potential for humanization of office work for individual workers. The difficulties with this stage lie in its long gestation period and the difficulty of obtaining the top management attention necessary for successful organizational diagnosis.

**Organizational Redesign of Office Work**

Offices are the last vestige of 19th century Prussian bureaucracy (Gerth and Mills, 1946) with its hierarchy of specialized tasks, reliance on formal authority and written communication. Office managers have yet to adopt widely the innovative work structures popularized by behavioral scientists for other levels in work organizations. When managers work with other managers, they rely increasingly on matrix organizations, temporary tasks groups, and project teams (Galbraith, 1973); when blue collar workers in new manufacturing plants assume higher levels of responsibility in autonomous work groups they enjoy a flexibility denied to most office workers (Hackman, 1977). Office work most typically reflects what Likert (1967) describes as an exploitative-authoritative organization. In contrast other components in work organizations are experimenting with the more open and flexible participative group approaches described by Likert. Although it is not clear that these innovative designs always lead to increased productivity, increasing evidence suggests such results for knowledge-based workers in complex information environments (Lawrence and Lorsch, 1969).

The failure of offices to explore innovative organizational designs
may well be due to the fact that managers themselves work in offices. A simple political view of organizational life would predict that reduced differentials in the distribution of desireable working conditions would come last in those areas closest to organizational authorities (Gamson, 1968).

Whatever the reasons for the limitations on innovation in office design, it is possible to sketch out the basic building blocks of a new approach to office work. Such a design may ultimately emerge from the third stage of office automation.

For the last two decades, behavioral scientist studying work organizations in the United States have identified fundamentally different approaches to organizational design. While the labels used to describe these approaches vary among scholars, it is clear that managers in large organizations can create different work environments. While Likert (1967) contrasts "authoritative" and "participative" organizations, others contrast "mechanistic" with "organic" or "closed" vs "open" systems (Buins and Stalher, 1961; Katz and Kahn, 1978). Despite different language, the several studies found differences on fundamental dimensions: decision making, communications, jobs, leadership, and human resource development. According to Argyris (1957) the participative-organic-open organization not only motivates its members more effectively but also excels in the performance of organizational goals. For knowledge-based organizations coping with complex and changing technologies and markets, most behavioral scientists would expect the participative organization design to be the more productive.

Unfortunately, few offices incorporate behavioral innovations into
the design of a productive work organization. The next section highlights several dimensions of a more participative organizational design for the long-term and also suggests the immediate application of behavioral research to the implementation of new electronic technology to the office.

**Decision-Making**

Although managers and professionals spend a very small proportion of their time actually making decisions, decision making is their critical function and much of their time is given to the creation, direction, and maintainence of decision making systems.

From the perspective of organizational design, two key dimensions in decision making are the pattern of participation and the basis of influence in the process of deciding. Vroom and Yetton (1973) summarize five patterns of participation ranging from individual initiative to delegation of authority to subordinates. Kotter (1977) on the other hand, distinguish between influence in decision making based on formal organizational position, political connections, and expertise, among other possible bases of organizational influence.

A new organizational design would emphasize increased levels of participation in decision making and the recognition of influence based on task expertise rather than formal job descriptions.

The most useful immediate insight to the implementation of office automation and a new office derives from this behavioral analysis of organizational decision making. As a general rule, the most effective means to reduce resistance to change in the implementation of new technology is to allow the ultimate users to participate in the selection...
and implementation of new office systems. The optimal basis for selecting participants is not their level of formal authority or organizational position, but their familiarity with the tasks and functions to be automated. Such expertise is typically dispersed across several organizational levels and among several different departments. To move an office towards a new organizational design, new office technology ought to be assessed and implemented by a user group representing a broad slice of the organization.

Job Design

Closely related to the issue of decision making is the packaging of specific decisions and tasks into jobs for individual workers. Although researchers have described jobs on many dimensions, (see Hackman and Lawler, 1971; McCormick and Tiffin, 1974) the fundamental distinction among jobs is the extent of discretion allowed to the individual (Jacques, 1961).

A new organizational design combines tasks to provide more workers with substantial discretion or responsibility for decision making in their job. Such job enrichment contradicts the emphasis on task specialization in classical organization theory. Although there are some qualifications (Katz, forthcoming; Hackman & Oldham, 1976) the bulk of empirical research has demonstrated that discretionary or enriched jobs are more effective motivators of individual productivity than specialized tasks.

As noted in an earlier example, combining a systematic job redesign along with the introduction of new office equipment can greatly enhance the effectiveness of managers and professionals in the office. Such job
redesign bundles a mix of discretionary and routine tasks in order to avoid the problems of alienation and turnover among secretarial and clerical workers. Managers and professionals are free to concentrate on the most discretionary aspects of their job.

Communications

The study of communications in formal organizations covers a wide area: communications networks, content, etc. Perhaps the simplest insight of behavioral sciences distinguishes informal and formal communications. Formal communication is required and tends to be written and hierarchical. It reflects the organization's need to accomplish its missions. Informal communication, on the other hand, is ad hoc, and tends to be verbal and lateral. It satisfies the individual's need to derive social satisfaction in the work setting.

New organizational designs encourage informal communications as a systematic supplement to formal channels. In complex and changing organizational environments, communications has to be rapid, spontaneous, and capable of cutting across formal organizational boundaries (Burns & Stalker, 1961). Therefore, innovative organizations have nurtured informal communications and deemphasized the formal.

Informal communications can provide an important incentive to experimentation with some new electronic systems. In every successful installation of electronic mail which I have visited so far, the users have developed informal distribution lists to notify each other of social events and gossip (concerts, parties, etc.). While these informal channels have developed among groups experimenting with electronic mail, the formal introduction of the mail system has often encountered massive
reluctance to make use of the equipment. From a behavioral perspective, organizations seeking to encourage the use of electronic mail might cultivate its informal use for organizationally "irrelevant" topics, much as every white collar worker uses his or her telephone for social contacts. Since the mail system would serve their individual needs, users could develop familiarity with the equipment in the course of enjoyable, informal communications rather than face the electronics as a barrier to the accomplishment of formal organizational tasks.

Leadership

Managers and professionals provide leadership for work organizations, that is, they help move the organization towards its goals. After a long and frustrating history of research, behavioral scientists no longer attempt to identify natural-born leaders nor the traits of successful leaders. Rather leadership is most frequently described as any action by any member of a group or organization to help the organization progress towards its goals.

At least four leadership functions can be specified: technical, administrative, social, and institutional. Unfortunately, most practicing managers conceive of leadership as a technical and administrative function and neglect the social and institutional aspects of the role. Therefore, it is not surprising that attempts to support managers in their office settings emphasize the former two roles and inadvertently jeopardize social and institutional contributions.

New organizational designs, by contrast, emphasize precisely the social and institutional functions. Behavioral-science research beginning with the famous Hawthorne experiments has shown that human
organizations must provide social support to maintain the commitment of their members. At the same time, organizations also require institutional direction in establishing goals for the organization.

In office work, for example, social leadership involves meeting the needs of individual workers for a close personal involvement in the work group. In several successful word processing installations I have studied, face-to-face personal contact between users of the system and the typists or equipment operator has helped overcome the frustration resulting from the physical and social distance between the initiator of word processing input and the system operator.

Electronic mail opens up whole new possibilities in the social area. Many organizations currently administer attitude surveys on a regular basis to monitor the feelings and satisfactions of organizational members. Electronic mail systems provide a means of conducting such surveys in very short time periods, for example in response to organizational crises. In like manner, a confidential complaint service might easily been incorporated into an electronic mail system.

Electronic technology entering the office increases the need for such social leadership. Increased unionization of the white collar workforce in America is a likely development in the 1980's as women become increasing job and career-oriented (Kochan, 1978). A central question for labor-relations specialists forecasting the level of unionization in that decade is whether increased office automation will be a force contributing to the increase in unionization or whether its careful introduction becomes a means for managers to maintain their current non union status.

Institutional leadership is difficult to provide in very large
organizations. As a consequence many firms are turning to planning exercises where their top managers meet in face-to-face groups with people representing a diagonal slice of their organizations, that is, people drawn from different hierarchial levels and from a variety of organizations units (Beckhard and Harris, 1978).

The communications capability of an electronic office makes it much easier to get the input of lower-level workers to the planning process and subsequently communicate institutional decisions throughout the workforce. A new organizational design ought to incorporate electronic technology not simply in the technical and administrative components of managerial and professional work but also to fill the social and institutional requirements of a productive organization.

**Group Development**

One specific leadership task deserves particular attention in the new organization design. Within the social functions of leadership, new organizational designs pay particular attention to the development of effective working groups. Sophisticated managers realize that new groups don't work together well; the comparative advantage of groups over individual contributions only emerges as groups mature. Therefore groups must be allowed a period of time early in their history when little is expected from them in the way of performance. Managers who are most dissatisfied with groups (task forces, committees and the like) typically call a group of people together, assign them a task to work on immediately, and are then surprised when the group fails to accomplish its objectives on time.

Indeed, predictable crises emerge in the history of a group (Schein,
1969). Phrased in terms of questions a group member might ask, they are: "Who's in charge here?" "What's in it for me?" and "What do people expect of me in this group?" Sorting through these issues takes time, but once they are resolved, groups can make rapid progress on tasks.

An obvious implication from the logic of group development concerns electronic teleconferencing. Ideally a geographically dispersed project group can function without the need for extensive travel to coordinate their efforts. Teleconferencing - either video or electronic mail - could substitute for face-to-face meetings. However, installation of the electronic system without attention to the social problems in group development would doom such a system.

On the other hand, a manager could convene a long (multiple-day), face-to-face session early in the project group's history and devote the session to an exploration of the difficult social issues discussed above. Then, a teleconferencing facility could allow the "hot-house" grown project group to save substantial travel time during the life of the project. In concrete terms, an organization hoping to reduce meeting time by purchasing the electronic equipment for teleconferencing ought at the same time build a conference center for extended start-up meetings.

**Human Resource Development**

At the core of the new organizational design are multiple systems for human resource development: how are people picked, placed, rewarded, and dropped if they do not fit into an organization. Although each human resource subsystem, e.g., performance appraisal, recruitment, management development, etc., has been analyzed in detail (Pigoris & Meyers, 1977), two global concepts highlight the problems with most offices. In the
first place, labor economists have distinguished between primary labor market jobs and secondary labor market jobs. In the vernacular, the primary labor market provides are "good" jobs. They combine high pay, opportunities for training and advancement, considerate supervision, job security, and protection from arbitrary discipline (Doeringer & Piore, 1970). By contrast, a substantial portion of office jobs currently fall in the secondary labor market. They combine low pay, little training or advancement, little job security, authoritarian supervision, and arbitrary discipline.

As a prerequisite for a new organizational design, employers must attempt to move more office jobs into the primary labor market. The individual commitment to the organization engendered by such positive human-resource practices would then allow the use of participative decision and communications practices as well as easing the implementation of new equipment.

A second key concept in human resource development is the psychological contract (Schein, 1978). Individual workers in the office are motivated both to stay with the organization and perform effectively when they feel there is a good fit between their individual needs and opportunities provided by the organization. Although office workers have been studied by psychologists much less frequently than managers and professionals (an academic verification of the distinction between primary and secondary labor-market jobs), we do know that individual secretaries and clerks differ substantially in personal preferences. Some seek advancement to higher organizational levels, others want an opportunity to cultivate and use particular technical skills, and still others need only a secure job and source of income among congenial coworkers.
A organizational design would incorporate formal systems to identify the needs of individual workers and match them with organizational opportunities. Counseling sessions, posting job opportunities and allowing open job bidding are human-resource practices reflecting this orientation. In addition, the new organizational design would incorporate clear career paths, some for progression upward through office jobs, but also a variety of other career paths to satisfy the different individuals who come to work in the office.

Summary

A "new" organizational design for office work can be described easily. Behavioral scientists have examined each dimension of the design in detail and have publicized the productivity impact from each manipulation. The behavioral-science knowledge and the specific applied technology to undertake such redesign can be found among the human-resource professionals in most large work organizations. The office needs a marriage between known social and electronic technologies. The question is not whether such a new organizational design will evolve but who will control the evolution? Managers can act now to implement these changes or be forced to accept them by legislation or unionization.

Managing the Transition

In order to implement a new organizational design, users of new office technology need not only develop a design but also a plan of action to accomplish it. A plan for transition involves two phases: organizational diagnosis and change. Table 1 highlights the diagnostic process.
Effective diagnosis is undertaken by the user organization with a line and human-resource perspective. It focuses on strategic questions with respect to a set of offices: what are the critical functions of each office? And what varieties of offices exist? The discipline for applied this diagnosis is the applied behavioral science of planned change (Beckhard and Harris, 1977). Before any organization invests in new electronic equipment, such diagnosis is essential.

The organizational design dimensions highlighted in the last section raise additional questions for the diagnostic review: decision making, job design, communications, leadership, group development, and human resource development. Assessing each office on these dimensions should suggest changes to increase productivity quite separate from the introduction of electronic technology. A number of attitude and interview survey instruments exist to facilitate the assessment of the organization on these dimensions (Likert, 1967). I would postulate as a general rule that more than fifty percent of the savings accomplished by any new office equipment can be achieved by a systematic organizational diagnosis.

The second phase in transition to office automation is organizational change. But important choices exist among the many strategies for organizational change (Beer & Driscoll, 1977).

Given the inertia of the traditional organization of office work, a two-pronged strategy of organizational change may be required. The first step in any transition is creating the felt need for change. Top levels in the organization can make managers and professionals feel some pressure to change. Top management must visibly support the human-resource-development components of the new organizational design as
a means to eliminate any second-class citizenship in the office.

In the absence of internal pressure, external threats, although painful, will ultimately lend credibility to the pressure for change. For example, equal-employment-opportunity litigation is increasingly directed at the office. A number of suits will almost certainly be expected to challenge the job evaluation schemes which currently relegate female secretaries and clerks to low salary grades. The Equal Employment Opportunity Commission has already commissioned a major study to investigate job evaluation schemes. Initial indications suggest a major threat to current patterns of sex segregation in the office. Also, female white collar workers in the currently non-union sector of our economy are more likely to favor a labor union than their male counterparts. A recent report for the Department of Labor described female white collar workers as "ripe for unionization in the 1980's" (Kochan, 1978). However, even if the pressure from the top and outside the organization makes managers and professionals feel the need to change in the direction a new organizational design, there is still the need for a change strategy to make the transition.

For the second stage, a facilitative strategy of implying slow change is required. Innovations should be allowed to move in the marketplace of ideas within the organization. For example, employers can allow local demonstration projects to diagnose particular office situations and then experiment with new social designs in conjunction with the pieces of new technology coming on stream. Evaluation of these local initiatives encourage the slow diffusion of the ideas through the organization.

Such a slow-paced strategic effort is required in the second stage
of change because of the nature of the change ultimately desired. Within an organization of any size, wide variations in office work can be expected. In most work organizations, the it will be impossible to impose a single design from the top of an organization flexible enough to accommodate all local idiosyncrasies. Moreover, employers ultimately want their office workers to internalize the values underlying the new organizational design as well as the electronic technology. Superficial commitment to the new organizational design will not suffice if traditional human-resource systems remain in place. Managers do not want the equipment purchased and then not used. The object of the exercise is to increase productivity through a fundamental change in the nature of office work. Commitment and local innovation require a slow-paced facilitative change strategy, not specific directions from the top.

The transition from old to new organizational designs for the office requires careful management (Beckhard & Harris, 1977). The logical management vehicle for such a transition is a high-level, interdepartmental task force combining the various disciplines within the organization affected by new office technology. Most innovative users in the United States have already formed such as taskforce to encompass data processing, telecommunications, and administrative services. The mix combines expertise in hardware, software, tele-communications, and methods analysis. However such task forces seem systematically designed to overlook the third stage in the evolution of automation as described here, namely, organizational redesign.

Professionals from the department of human resources or personnel rarely sit on such task forces even though they can bring a number of skills relevant to the change process described here. Implementing the
new organizational design involves the modification of job descriptions, job evaluations, supervisory style, management training and development, selection and placement, to list only a few issues relevant to the human-resource support staff groups. The taskforce also requires an applied behavioral scientist familiar with the process and problems of planned change in organizations. A major challenge confronting user organizations is to establish the link between the office automation/office of the future taskforce and the human-resource disciplines within their own organizations.

Conclusion

The first two stages in the evolution of office automation seem destined to emphasize the technologies of computer hardware and software. Such innovation, driven largely by vendors, portends very little improvement in the productivity of office workers.

A three stage approach would considers the social demands of office work as well as the technical and administrative problems. Based on the empirical literature on the behavioral impact of new office technology as well as long standing tradition of behavioral science research, a new organization design is necessary to take maximum advantage of the automation of the office. Such a design will coordinate the social organization and the tasks of office workers in a more participative and informal organizational climate. Such a design can reasonably be expected to develop a more motivated, committed and productive office workforce.

Offices in large organizations represent the last vestige of nineteenth century Prussian bureaucracy. Their productivity will only
increase if employers rethink the design of offices as organizations rather than simply focusing on the cost justification of particular pieces of machinery.
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