

New Information Technology and Organizational Culture

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Abstract

Predictions of the effects of office automation on organizations vary widely. This article focuses on changes in individual work patterns, management control, and organizational structure that may occur as a result of implementation of office technology. The most significant change predicted is that organizations will no longer be limited by a central office work environment operating between the traditional office work hours of nine and five. Computer and communications technology will facilitate the relaxing of these physical constraints as necessitated by societal and economic pressures. Relevant research to date regarding the effects of the new technology on organizational behavior is reviewed. Management guidelines for preparing for the coming changes are included.

Keywords: Office automation, telecommunications, transportation tradeoffs, remote work, telecommuting, electronic mail, professional work station, satellite work center, remote management

ACM Categories: H.4.1, H.4.3, K.4.3

Introduction

Members of the MIS profession are well aware of the proliferation of new technologies which is expected to have a significant impact on managerial and professional productivity. Microcomputers, office automation, decision support systems, and teleconferencing are a few examples of such technological developments. Despite grandiose predictions, however, so far only a few studies have demonstrated changes in methods of work of managers or professionals as a direct result of recent technology [e.g., 1, 5, 15, 24]; to date such changes can rarely be translated directly into productivity improvements. This article examines how the use of new technology in support of managerial and professional work, particularly office automation, will affect the "organizational culture" that surrounds the actual tasks to be supported. It thus focuses on subtle changes in organizational behavior, facilitated by technology, that may affect overall organizational performance as much as individual productivity.

Predictions of the effects of office automation vary widely. Generally, it is claimed that office automation will increase office productivity [41]. The underlying assumption is that the same amount of office work can be performed with fewer people, or the same number of office workers can handle increased volumes of office work. However, predictions regarding the organization and skill requirements of the remaining office work force still vary widely.

A typical "good" scenario is that office automation will permit more effective management and control of office workers and of the business as a whole. The ability to increase managerial span of control is a tangible benefit. Office automation can also increase the number of work options for individuals and provide increased opportunities for skill acquisition and career enhancement [6].

A typical "bad" scenario of office automation can also be described [10, 16]. In this scenario, office automation technologies create lowered skill requirements for office work. The office of the future is likened to the factory of the industrial revolution [16]. Increased division of labor creates jobs that are more routine and repetitive; the potential for exploitation of office workers is increased through lower wages and decreased

benefits. There is also greater potential for increased stress on the job and other health hazards [42].

The philosophy underlying this article is that technology itself does not create organizational change; the choice of technology and the method in which it is implemented dictate the changes that will occur. The "bad" scenario is not inevitable, although it could easily occur. The "good" scenario can be accomplished if management is prepared for the coming changes and makes the appropriate decisions regarding the technology in order to bring about positive effects.

The most significant change predicted in this article is that organizations will no longer be limited by the physical constraints of a central office work environment operating between the traditional work hours of nine and five. Computer and communications technology will facilitate the relaxing of these physical constraints as necessitated by societal and economic pressures. The implications of changing definitions of organizational structures in space and time provide a major underlying theme throughout.

This article is concerned therefore with management of the future office environment and how to prepare for it. Emphasis is placed on the realities of the near term future (five to ten years) rather than futuristic speculation. Today many organizations are experimenting, formally or informally, with the use of computer and communications technology to support innovative work arrangements; examples of such experiments are discussed. Relevant research to date regarding the effects of the new technologies on organizational behavior is reviewed. Management guidelines for preparing for the coming changes, so that the positive scenario can be assured, are included.

Significant trends in technology and society

Technological developments over the next decade will provide the necessary support for new forms of work and alternative organizational structures. Technology itself will not create such changes, however; developments in the

economic and demographic structures in the United States will create a need for organizations to search for alternative means of adapting to the changes, and technology may provide some solutions. In this section, significant emerging technological and societal trends are discussed.

Technological Trends

The dramatic decreases in costs of computer and communications power have permitted increased availability of such power to large numbers of people. Once such intelligence is in the home, for instance, the addition of capabilities to perform work related functions will be relatively easy. Conversely, bringing computer technology home to support work related activities is becoming common.

Many personal electronic communications services, as well as broadcast information services, will soon become readily available and easily affordable [9, 28, 29]. Electronic mail permits individuals to communicate efficiently without requiring both parties to participate simultaneously; electronic voice store-and-forward message systems have the same capabilities without requiring the message sender to type or to have access to a terminal. Teleconferencing substitutes directly for face-to-face meetings among larger groups of people. Broadband transmission such as is now found with cable television will become commonplace, primarily with the introduction of optical fibers. "Videotex" services will provide consumers with huge libraries of public information such as airline schedules, financial services updates, and shopping guides. Electronic funds transfer may substitute as much as fifty percent of paper transactions by the year 2000 [9]. Videodiscs, which can store immense quantities of data and randomly access and display any recorded image, may replace many books and archival storage if they can be mass produced cheaply [29].

Office automation is a concept that implies a packaging of a variety of computer and communications components rather than a specific type of technology. Word processing, the production of text with the support of sophisticated electronic text handling facilities, is already well established in organizations. Future office automation systems will include electronic filing.

electronic scheduling, graphics facilities, facsimile transmission, and even slow-scan video. The most significant development in office automation in the near future will probably be its packaging. One can expect to see "professional workstations," microcomputer based systems with the capabilities listed above built in and designed for functionality, linked through internal communications networks to other workstations. Workstations can be specialized: secretarial workstations will have specialized capabilities for word processing and special links to one or several managerial workstations; programmer workstations will be designed for programming functionality, while managerial workstations may have voice store-and-forward message switching built in. Variations in workstation design may be built primarily into the software and/or keyboard design, or workstations may be specially tailored through "off the shelf" components to suit individual needs and work styles.

Telecommunications/Transportation Tradeoffs

Over the last decade, considerable research has been undertaken to predict the effect of increased communications capabilities on transportation needs [21, 26, 34]. The basic view is that if computer and communications capabilities were substituted for certain types of travel, transportation and energy needs would be reduced.

Based on extrapolations from current energy and transportation needs, one report estimates that if twenty percent of all business travel (including both air travel and business travel by auto) were eliminated through the substitution of teleconferencing, there would be energy savings of 130,000 barrels of gasoline daily (at 1974 levels). Since 25 percent of all mileage traveled and 27 percent of all gasoline consumption is spent commuting, the resulting savings from reducing commuting would be even more dramatic. The report estimates that if fifty percent of all office workers worked in or near their homes six out of every seven working days, the savings in fuel consumption from reduced commuting would be about 240,000 barrels of gasoline daily in 1985 [21, p. 1111].

There are other potentially more dramatic changes that could take place if communications

were to be a widespread substitution for commuting and business travel. Telecommunications could be used to minimize public transportation requirements and reduce urban population densities, and to preserve cultural and historical benefits of the center city. There could be a return to a rural lifestyle and the formation of communities united by a common recreational or cultural purpose rather than proximity to work.

Much of this is "informed speculation" which is out of the scope of this article; the reader is referred to the comprehensive report completed by SRI, Inc. for the National Science Foundation [21]. Later in this report the specific effects of changing the locational and temporal boundaries of work, and the implications for organizational structure, will be discussed.

The Changing Nature of the Work Force

The increasing size and complexity of today's business organization is leading to increased specialization of the white collar work force. Such specialization may be viewed as increased professionalization, in the sense that more and more employees will be acquiring a specific trade or profession. The data processing profession provides an example of possible future trends; the loyalty of data processing professionals is often to the profession before the organization. Since their skills are also in great demand there is a high degree of turnover in the job, with little loyalty to a particular company established.

The composition of the work force is also expected to change. One significant trend is the number of women who have been entering, or re-entering, the workforce, particularly women with young children. A recent study showed that in 1978 over 35 percent of all American households required supplementary day care [14]. At the same time, the total number of available people for entry level positions in general is expected to decrease dramatically; the number of eighteen year olds in the U.S. will drop by twenty percent by 1985. The segment of the U.S. labor force classified as office workers will be especially hard-hit by this decrease, since the total number of office workers has been predicted to double between 1975 to 1985 (from twenty percent to forty percent of the total U.S. labor force) [41]. One particular problem facing the professional worker is the emergence of "dual

career couples." Faced with the demands of two careers and raising a family, such couples are changing their priorities. Generally, work and family are seen as a set of compromises by such families; as a result the company has less control over individual career decisions.

The trends discussed above create specific problems and opportunities for business organizations. With increasing specialization and a shrinking labor force, a major problem will be the ability to attract and retain qualified personnel in specialized areas. Because of the increasing number of families with parents working outside of the home, new demands are placed on both families and organizations to allow work and family responsibilities to be combined more easily [12]. The rising costs and shortages of available office space are forcing companies in highly developed urban areas to search for alternatives to centralized office structures. Altogether these factors combine to increase the pressure to improve productivity of present office structures. In a later section of this article, some predictions will be made about the potential for new technology to help alleviate these organizational and societal pressures.

Changing Definitions of Organizational Work

The author argues that new office automation technology will facilitate more flexible, innovative approaches to the organization of work. In this section potential changes in individual work styles and task definitions for different classes of workers as a result of the new technology are suggested. In the next section some implications for overall organizational structures and the coordination and control of work will be discussed.

Changes in individual work styles

Predictions about potential changes in the structure and content of many "office related" jobs vary widely. In this section some of these potential changes are discussed. A rather arbitrary distinction will be made between "clerical," "professional," and "managerial" jobs for the purposes of discussion.

The Clerical Worker

The clerical office worker of the future will have as a primary work tool some form of screen oriented input device and electronic intelligence. A "clerical work station" may have electronic mail, electronic filing, scheduling, and word processing readily available. The main emphasis of most promotional literature on office automation is increased productivity, based on the simple premise that the same volume of work can be handled by fewer people or, conversely, increasing volumes can be handled by the same clerical work force.

In order to accomplish this increased productivity, however, the nature of the clerical job is altered. There will be a greater administrative hierarchy, with workers providing specialized skills through a centralized or centrally controlled administrative services function. The concept of a personal secretary will only be retained at the highest levels of management.

The fact that workers provide more specialized skills has implications for training and career enhancement that could be either positive or negative. In the negative scenario, clerical jobs will become "deskilled, fragmented, routinized" [16, 42]. The administrative function will undergo division of labor in such a way that each remaining job requires minimal training, little career potential, and easy replaceability. It is possible that such jobs could become more externally paced, where the operator is required to respond quickly to external requests and has no self control over the work flow; short term, external pacing has been shown to increase stress on the job [42]. There is also, in some views, increased potential for exploitation of employees; work can be rewarded on a piece-rate basis and employees may receive differential pay and benefits, depending on the supply and demand of their particular skill.

There is of course a much more optimistic scenario as well. In this view clerical work evolves into an administrative hierarchy of "information specialists," with skill enhancement and increased career potential. Work can be organized to provide "job enrichment," where each worker performs a variety of tasks and is responsible for the support of a single work unit, or principal. In ways this scenario looks more like,

the traditional "principal secretary" relationship, except that the set of skills the information specialist acquires are more generalized and the potential for skills enhancement and career growth is greater.

The author's premise is that office automation technology does not itself determine which scenario described above ultimately results. The nature of the implementation of that technology determines whether the jobs that remain are de-skilled or enriched. The technology can be organized to support either centralized or decentralized organizational structures, both physical and authority structures. The author does not deny that office automation technology can be used to exploit clerical workers; however, it also offers excellent opportunities to enrich clerical work in terms of both the jobs themselves and their career potential. Both alternatives have the potential for increasing productivity of the clerical workforce; it is the overall management philosophy of the organization that will ultimately determine which outcome will result.

The Professional Worker

The author predicts that office automation will improve productivity of professional workers with the development and refinement of the concept of a "professional workstation." The first such example on the market today is the Xerox Star System [43]. It is probably representative of future systems in terms of general functionality, although one would expect much more specialized workstations in the future.

The Xerox Star System is organized on the basis of decentralized, communicating, intelligent workstations. Each station has capabilities for text/word processing, graphics, and filing. Electronic mail is decentralized, so that each workstation has its own private mailbox under the individual user's control. In the future, workstations for different professions might have different keyboard designs and function keys; they would be modularly designed to be easily tailored to particular needs. The workstation concept probably implies individualized work stations, which today would be quite cost prohibitive. Even with shared terminals, a well designed workplace with easy access to terminals and other reference

facilities is probably critical to the increased productivity of professional workers

One implication of the professional workstation concept is that with ready access to a terminal and the necessary data online, as well as electronic mail, a professional employee could easily work remotely. Much professional work is defined by deliverables rather than process measures; employees could work at home, for instance, in relative peace and quiet for periods of time rather than going to the office. Already some companies are taking advantage of the increased flexibility provided by electronic technology. Employees can be assigned to different projects without relocation, for instance. "Electronic briefcases" permit employees to work at home evenings and weekends rather than to work long hours away from their families. In a later section of this article, the results of a study of professional employees working remotely are presented; the implications of remote professional work for the management process and for professional development are discussed.

The Managerial Worker

With the advent of professional workstations and extensive use of electronic mail, what office automation tools will the manager use? How will office automation affect managerial productivity?

Although there have been a number of claims that office automation will increase managerial productivity (e.g., 5, 38), few such claims have to date been borne out by actual data. Although the benefits of electronic mail, for instance, can be analyzed in terms of increased efficiency of receipt of information (see for instance [1]), the realization of those benefits is dependent on whether managers actually adopt the particular tool. The rate of adoption may be highly dependent on management style; research to date on what managers actually do shows an overwhelming preference for face-to-face contact (e.g., 23, 30, 40).

At this point there are three types of office automation tools that seem most likely to have an impact on managerial activities.

Electronic Mail. The use of common forms of electronic mail available today is only partly limited by managers' ability to type or willingness to use a

keyboard; this limitation is removed from several electronic voice store-and-forward message systems now available. The effectiveness of electronic mail is also constrained by the number of others (especially "significant" others) who utilize the system. For instance, if a manager has even one subordinate who does not have access to the electronic mail network (whether voice or typed), it is easier to prepare a written memo and distribute it through normal channels than to send an electronic message and make a special case for the one subordinate. There is also the danger that employees who do not have access to the system will fail to receive critical information through carelessness or intent.

Electronic Scheduling. These systems are relatively simple to design and implement, but pose a number of difficulties depending on how they are used. Public scheduling systems allow groups to schedule meetings without the explicit consent of each member; managers therefore lose some control over their own scheduling and screening of appointments. Private scheduling systems are generally electronic "datebooks" and less convenient than pocket calendars unless the manager always has ready access.

Teleconferencing. This refers generally to the substitution of electronic communication for the need for face-to-face meetings. Typical teleconferencing meetings consist of two (or possibly more) groups "meeting" in specialized conference rooms that are geographically separated from each other but electronically connected. Another method sometimes classified as teleconferencing is "computer conferencing," where the subject of the conference is "discussed" asynchronously on computer terminals using specialized software that could be described as a highly sophisticated electronic mail system. Research is now being conducted on effectiveness of different forms of teleconferencing and types of meetings for which they are appropriate [24].

A study of managerial work

A recent study by Ives and Olson [23] of information systems managers provides some insights into the type of face-to-face communication in which managers engage and whether it is

appropriate for electronic mail or teleconferencing. The researchers spent three days with each of six managers, observing and recording their activities and the type of information they utilized. Since the managers were responsible for data processing, the researchers were interested in how much they utilized technology to support their managerial activities. It was assumed that managers who were familiar with the technology would be less inhibited regarding their utilization than other managers who might resist using a terminal or have a general fear of computers.

Managerial Activities and Communication

Detailed findings of the study are found in [23]. A few highlights are relevant here. Generally, the managers showed an overwhelming preference for face-to-face contact, consistent with previous studies [30, 40]. They spent, on average, 77 percent of their day in some form of oral contact; 68 percent of the day was spent in face-to-face contact. Although they spent almost half (48%) of their day in scheduled meetings, all other activities were short, averaging less than nine minutes in duration, and were interrupted frequently. They averaged sixteen unscheduled meetings per day; these were typically unexpected interruptions lasting five minutes or less. Managers had some control over this hectic, highly interactive schedule; they initiated over half of the oral contacts they made.

Purpose of Contacts. Three categories of oral contacts (telephone calls, scheduled meetings, unscheduled meetings) were classified as to the general purpose of the contact or reason for its initiation. (Within each contact, detailed data about the type of information passed between participants will also be reported.)

The general purposes of telephone calls made to or by the manager were the following:

Manager request	29%
Scheduling	18%
Give information	16%
Receive information	11%
Action request	9%
Review	6%
Other	11%

The managers averaged nine telephone calls a day. They also attempted an average five uncompleted telephone calls per day. These types of "telephone tag" or "shadow functions" [1] have been shown to be costly in terms of time. It appears that a substantial number of telephone calls could be substituted by electronic mail without loss of effectiveness, particularly the function of scheduling which is surprisingly time-consuming. The researchers also observed that manager requests, particularly requests for information, could be handled more effectively when the other party replied asynchronously, after having located the correct information, than when the other party attempted to respond "on the fly" with the most convenient data at hand. Clearly an electronic mail system would facilitate an asynchronous response to a manager request, although this could not be shown in the study because none of the managers utilized electronic mail. Only nine percent of their day was spent on the telephone, about forty minutes.

Unscheduled meetings occurred primarily for the purpose of the manager receiving information (35 percent). The degree to which this could be substituted is highly dependent on the need for timeliness of the information sought, which could not be determined from the data gathered. However, it will be seen that at least as much subjective information was passed between the manager and others as factual information.

The two primary purposes for scheduled meetings were review (36 percent) and strategy (19 percent). The average duration of a scheduled meeting was forty minutes. Nearly half of the meetings were attended by three or more people; 27 percent were attended by more than four people. If such people were geographically separated, the substitution of teleconferencing for review meetings would seem cost effective. Teleconferencing costs could be justified not by savings in travel time and costs as much as by the convenience leading to more frequent reviews; since these managers already spent so much time in meetings it is questionable whether they would perceive this to be an advantage.

Over half of the managers' scheduled meetings were with one other person only. Since the process of scheduling the meeting usually signified some formal purpose for it, they usually constituted strategy or delicate personnel matters

that would be difficult to substitute by electronic mail. Contacts with those outside of the organization would of course require a scheduled meeting; only about five percent of the managers' contacts were of this type.

Detailed Information Content. Communications between managers and others were further classified by the detailed "message units" contained in each communication. Message units fell into one of four general categories:

1. **Inform Fact.** This included reporting of all problems and background on ongoing situations as well as factual information.
2. **Inform Opinion.** This included any "soft" or subjective information communicated, including suggestions and rumors.
3. **Inform Action.** This category included actual decisions, delegation of action, and informing of future plans and intentions.
4. **Request Information.** This covered requests of all forms, including requests for facts, opinions, and intentions or plans.

Table 1 contains the frequencies of types of messages communicated by the manager and others during telephone calls, scheduled meetings, and unscheduled meetings. The table shows that most message units for both the managers and others were of a "soft" or subjective nature.

The manager communicated fewer facts than others while requesting more information. The manager also communicated action oriented messages. Thus the manager is seen as soliciting information, much of it subjective or "soft," and delegating or communicating action to others.

Table 2 shows the frequencies of message units classified by the speaker. It is clear from Table 2 that the information systems manager relies heavily on subordinates, there is no comparison data available for managers at other levels or in other functions. The information systems managers also communicated surprisingly little

Table 1. Frequency of Message Units

	Total n = 7225	Non-Manager n = 3602	Manager n = 3623
Inform Fact	29.0%	35.9%	22.2%
Inform Opinion	35.5	38.9	32.0
Inform Action	15.0	9.4	20.6
Request Information	20.5	15.8	25.2

Table 2. Frequency of Message Units to Manager by Speaker

Outside Service (Consultant, Vendor)	11%
Inside Service (Peers, other Staff Fns.)	8%
Superior	4%
User	7%
Subordinates	70%
First level	50%
Second level	16%
Third level	4%

with users. Table 3 shows the frequency of communications of each type by speaker. It shows that opinions or "soft" information are the majority of message units communicated by all groups except the manager's superior and outside services; the majority of communications from the former are requests and from the latter, facts. Subordinates are seen to be the major source of both factual and soft information.

Table 4 shows the frequency of communications by all parties classified by medium. The table shows that the pattern of communications is basically the same across all three media.

Implications for Technological Support

The picture of managerial work that emerges, at least of information systems managers, shows heavy reliance on "soft" information of a "realtime" nature. The managers also communicate primarily with subordinates, who are those in close physical proximity.

It appears that office automation technology could improve managerial communications by expanding the manager's volume of contacts beyond the immediate hierarchical organization. Despite the emphatic managerial prescriptions for user

**Table 3. Frequency of Classes
of Message Units by Speaker**

	Inform Fact	Inform Opinion	Inform Action	Request Information
Outside (n=401)	42%	32%	10%	16%
Inside (n=285)	31	42	12	15
Superior (n=138)	15	25	28	32
User (n=255)	33	37	11	19
Subordinate (n=2523)	37	41	8	14
Manager (n=3623)	22	32	21	25

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**Table 4. Frequency of Classes
of Message Units by Medium**

	Inform Fact	Inform Opinion	Inform Action	Request Information
Telephone Call (n=819)	27%	32%	20%	21%
Scheduled Meeting (n=4436)	29	38	13	20
Unscheduled Meeting (n=2093)	31	32	17	20
Total (n=7348)	29%	36%	15%	20%

involvement in information systems activities [7, 18, 27], these managers' direct contacts with users were minimal. Electronic mail and teleconferencing remove the locational advantage of the manager's proximity to subordinates, and thus could be predicted to help reduce contacts with subordinates and increase contacts with others. This assumes, of course, that the technology is readily available throughout the organization.

Office automation will only have an effect on managers' activities, however, if the managers see it as being advantageous and fitting their own "management style." These managers dealt with a great deal of opinion or "soft" information. It is not clear how much of this type of information could be effectively communicated through electronic mail or teleconferencing and how much would require face-to-face contact. The importance of immediacy of the information received is also not readily apparent.

These managers, like others studied [30, 40], show an overwhelming preference for face-to-face contact. Furthermore, although this group should theoretically be more comfortable with technology, they showed little or no inclination to use it in their own work. Thus the lack of use of technology cannot be attributed to abnormal resistance to or fear of technology they do not comprehend. With the exception of one manager who utilized his telephone answering machine to give himself control over incoming telephone calls, these managers demonstrated few changes in work habits as a result of technology. Unless information systems managers are like the "cobbler's children," based on this study it appears likely that patterns of managerial work will be slow to change.

Changing Definitions of Organizational Structure and Culture

In this section the discussion turns from particular work styles to the overall structure of work and the organization. The basic premise is that office automation technology can facilitate alterations in the physical and temporal boundaries of work

organizations; some implications of such alterations are discussed. A case study of work under conditions where the physical and temporal boundaries of work have been altered is presented.

Altering organizational structure

Physical Structures

In traditional organizations as work places it is assumed that a critical mass of employees will occupy a central work place a set number of hours a day, typically "nine to five." Work performance and organizational procedures are critically bounded by this place and these hours. Office automation permits many office workers to be potential "telecommuters" or "remote office workers" in that their work can be performed at a remote site with the support of computer and communications technology. Many office jobs have the potential to be performed independently of a particular work location or of a standard schedule of work hours. The removal of these boundaries theoretically provides great flexibility in terms of physical organizational structures.

One type of work option is called a *satellite work center* [21]. The idea of a satellite work center is that a relatively self-contained organizational division be physically relocated. The emphasis is on locating the division within convenient commuting distance of the greatest number of employees who would utilize the site. The optimum number of employees to relocate is determined partially by the opportunity to benefit from economies of scale of equipment and services. The logic is that the critical mass of employees will also provide the necessary social interaction and a sufficiently deep hierarchical structure for adequate management on site.

One other critical issue with the organization of a satellite work center is what segment of the central work force can be relocated. In order to benefit from economies of scale it may be optimum to relocate an entire function, such as accounting or data processing. On the other hand, if the primary motivation is to reduce employees' commuting time and expense, the appropriate employees to be relocated are those who live nearest the satellite work site. Since the employees at the site would then not be

Hierarchically organized, this arrangement poses problems of remote supervision and social isolation from professional peers, issues which are addressed later in this article.

Another structural option, similar to satellite work centers only more complex to implement, is a neighborhood work center. Under this option, remote supervision of employees is assumed to be acceptable so that a critical mass of employees in one location is not necessary; however, economies of scale of equipment and certain services (such as facsimile transmission, hardcopy printing, teleconferencing facilities, etc.) are desirable. Employees from different organizations share space and equipment in the work center closest to their homes. Thus any densely populated area could have neighborhood work centers which are supported financially by all of the organizations whose employees utilize them. This option obviously relies heavily on the use of telecommunications networks for coordination and supervision. Such a concept is complex to implement on a large scale because it requires a great deal of cooperation among different organizations.

A more common general trend in the United States is recognition of the need for occasional alternative work arrangements, especially for professional and managerial employees. For instance, a company may encourage a professional to stay at home to write a critical report, away from the distractions of the office. Employees are encouraged to take portable terminals home with them at night or on weekends to accomplish critical work at "non-peak" computer hours, or so they do not have to extend their hours at the office to perform necessary overtime work. Companies may "reward" employees with their own terminals or personal computers which they can then utilize to work at home.

The extreme case of individual work options is to have employees work at home on a regular basis. This may mean from one day a week to virtually full-time, where the employee rarely makes a trip to the central office. This option is heavily dependent on remote supervision, similar to the neighborhood work center. It does not provide the social interaction that a satellite or neighborhood work center should theoretically provide. On the other hand, work at home can provide employees with extreme flexibility in

schedule and life style; theoretically they can work when and where they want in a more casual atmosphere. Child care should be accommodated more easily; for many people with primary child care responsibility work at home may be their only employment option. It also offers employment opportunities to the elderly and handicapped.

Authority Structures

Regardless of the form that physical reorganization takes, the ability to shift employees easily permits more flexible forms of authority structures and facilitates the reorganization process. One may predict that matrix organizations or project organizations are facilitated because the employees and their managers are not required to be physically in close proximity in order for supervision to be effective. Employees may be reassigned to different work groups, or to multiple work groups, without physical relocation. For example, in one organization employees are regularly promoted without being relocated; relocation expenses for the company have been significantly reduced. Importantly, the company provides the technological and psychological support for remote management to take place on a regular basis.

Technology may encourage lateral relations within the existing organizational structure, since communications across departmental boundaries are easier to establish [13]. One might predict improved interdepartmental relations [36] and increased accessibility of experts within an organization as a result of electronic communications. As discussed previously, however, the ultimate effects of the technology are highly dependent on managers' preferences for certain communications media and their willingness to alter their "management styles."

Implications for the Coordination and Control of Work

The alternative organizational structures described above all have one common assumption: coordination and control of work can be performed remotely. In other words, the employee and the supervisor are geographically separated; work groups or project teams are also geographically separated. Another significant feature of future work structures is that the

employee has at least a modicum of freedom of scheduling work.

The technological support for "remote work" and remote supervision already exists, although software to fit new work styles still lags behind hardware. At MIT, for example, prototype systems are being developed that support professional group work through interaction on terminals; computer conferencing is an early example of systems that support group interaction while group members are geographically separate [17, 22]. The desirability and nature of coordination of remote work is significantly different for clerical versus professional employees; each will be discussed separately.

Clerical Employees. The general premise for arranging clerical work to be performed remotely is that as long as an equitable and measurable piece-rate can be established for the work, remote supervision is not an issue. Furthermore, the relationship between the employee and the organization, in terms of career growth and development, is basically considered irrelevant. The jobs that are considered appropriate do not require communication with others in the organization in order to be performed and the social needs of the individuals performing the work are assumed to be non-critical to the work performed.

The motivation for organizations to consider remote work options for clerical workers is strictly economic; they can pay less for the same work. Normally the employees are hired under part-time status [8, 31], and receive no benefits. According to one company experimenting with clerical workers at home, the cost of equipment is justified by having employees work part-time at home, receiving no benefits and an hourly wage that is less than that paid for comparable work at the central site [31]. An additional benefit is that turnover and absenteeism are reduced. Since similar attitudes prevail for employees doing clerical work in a central office site (the employee is replaceable and therefore not worth investing in), these are often jobs for which absenteeism and turnover are significant problems.

Situations such as those cited above are relatively rare today, in part because of the difficulty of establishing equitable piece-rates for much clerical work and in part because much of it, such

as filing and scheduling, is not yet widely automated. However, many companies are contracting out overloads in keypunching and word processing. It has been predicted [20] that there will be a general trend toward increased contract work in the future. Such entrepreneurial arrangements could be beneficial to both the worker and the organization in the same way that software contract houses flourish today, providing qualified technical expertise to "take up the slack" in company workload on an as-needed basis. Furthermore, work could be distributed to depressed areas where jobs are scarce, to the benefit of the community.

However, there is also the potential for exploitation of remote clerical workers. In order to establish an equitable piece-rate, the work needs to be divided so as to become more repetitive; furthermore, the piece-rates can be set arbitrarily low, especially if the supply of the skill required exceeds demand. It is possible to set up such an arrangement for short turnaround, so that the employee has less flexibility working remotely rather than more. A warning can be taken from the situation of industrial home work in the U.S. and Canada, where exploitation of workers in terms of low pay, unreasonable turnaround, and poor working conditions is a severe problem [25].

Professional Employees. For professional jobs to be performed remotely, whether in satellite work centers, other offices geographically separated from management, or at home, the underlying organizational philosophy is that the employee should be rewarded with greater autonomy and flexibility [8]. The employee's long term relationship to the organization is at stake, so it needs to be reinforced even as the employee is given greater autonomy. The underlying motivation is still economic; generally the employees in question provide a scarce and important skill which is crucial for the organization to retain. The company may see some remote work arrangements such as work at home as a tradeoff to the employee for performing less desirable tasks; for instance, a company may attract people to the generally unpopular programming job of maintenance by allowing them to work at home. Although communications in typical professional jobs are required, it is assumed that technology can support most requirements for communica-

tions and the rest can be "batched" for those times when the employee is on site.

For the professional worker who is paid on salary, the task of remote supervision takes on a somewhat different aura. The supervisory process is often assumed to be one of observation, so that a manager's initial reaction to a remote work proposal is, "How can I manage someone I can't see?" Most remote supervision of professional employees is actually based on results, the quality and timeliness of completed work, rather than observation. In effect, professional work could be subcontracted out just as software consultants are paid, if the manager felt comfortable with the estimating techniques employed. To date, most companies that practice remote work arrangements with professionals do not contract their work, but treat them as exempt full-time employees receiving regular salary and benefits [8].

A study of remote work

In order to understand the phenomenon of coordination and control of remote work, the author interviewed nine employees and their managers in a major corporation that practices remote work on a regular basis. One half of the employees interviewed participated in the company's "alternate work site" (AWS) program; they worked at home three days a week and attended the central work location the other two days. The other employees interviewed were geographically separated from their managers so that little or no supervision or work group interaction was conducted face-to-face; they worked at home for the most part.

In the remainder of this section, the results of these interviews in terms of the phenomenon of remote work and its implications for the employees' relationships with their managers, their coworkers, and the organization as a whole will be discussed. The focus will be on professional workers, as all the employees interviewed were professionals. First, the attitudes of employees and their managers toward remote supervision are presented, followed by a discussion of the broader implications of the relationship of the employee to the organization

Remote Supervision

Changing Attitudes. It may appear that a manager will become comfortable with remote supervision as soon as it was recognized that regular supervision of professional work is also results oriented rather than "over the shoulder." In fact, however, remote supervision requires a significant change in attitude and discipline on the part of both the manager and the employee. The employees interviewed all felt that remote supervision was more formalized than face-to-face and relied more on rules and procedures. Most felt they had less supervision than under the traditional work arrangement, although those in the AWS program, working at home only three days a week, felt they had the same amount of supervision or more. Employees felt that there would be a greater reaction on the part of management if deadlines were not met than there would be if management could observe the everyday problems and distractions in the office that contributed to delays and missed deadlines.

The managers interviewed agreed that supervision of remote employees was more time-consuming for them because of the additional paperwork required and the greater reliance on it. Some who generally preferred a more formal style of management did not feel the increased formality to be a serious drawback; one manager who preferred a more personal style commented on the need to learn to be more expressive and sensitive on the telephone.

The manager generally agreed that a key to the success of remote supervision was selection; employees who were already highly motivated and self-disciplined were most likely to perform successfully remotely from their managers and did not pose a management problem in any case.

Communications. The managers found that they did not communicate extensively with their remote employees. They averaged one to three telephone calls per week; only one remote employee communicated with his manager daily. Employees at alternate work sites usually saw their managers on a formal basis once a week when they attended the office. Those in distant remote locations usually came to headquarters for face-to-face meetings quarterly. Some managers made special arrangements to help the remote employee keep informed: two managers

had remote employees conference called into staff meetings while another manager taped staff meetings. There was little use of electronic mail for communication with remote subordinates, even though they all had access to an electronic mail system via an internal network and all employees had ready access to terminals. Messages, when sent, were usually limited to requests for the employee to call to discuss an issue.

Performance Evaluation. Most of the remote employees in the sample were assigned to long term projects with well defined deliverables. The employees had control over their own scheduling of work, although they were expected to be available by telephone during the core work hours of approximately 10 a.m. to 3 p.m. Managers expected to be satisfied if the remote employees met their schedules for deliverables. Most required more-or-less formal progress reports on a weekly or biweekly basis, either verbal or written. There were no cases among the nine managers of checking or attempting to check the process of work rather than the final output. For instance, no managers monitored terminal activity even though that information was readily available on the system which they were using.

Interestingly enough, although the managers were relatively positive about the abilities of their remote employees, they were generally unsure about their own ability to evaluate performance. They recognized that their intuitions were subjective and felt uncomfortable about the lack of substantive examples to support them. Several managers acknowledged that deadlines were monitored more closely than for regular employees because they were the only concrete yardstick available. It seemed clear that, although they may not have been more subjective in their evaluations than with their on site employees, the lack of ability to support their perceptions with a verbal image of the employee at work made them somewhat uncomfortable.

Productivity. Although in no case were hard measures of performance available, both the managers and the employees emphatically pronounced that remote work, particularly work at home, improved employee productivity. Managers recognized intangible benefits that enhanced overall performance: employees were

more responsible and conscientious about schedules, produced better documentation, and planned and organized their time better. Several managers also thought that technology, while not having an effect as yet, would enhance productivity of remote workers once the appropriate tools became available.

Employees perceived their own productivity to be generally higher than when they had worked full-time in an office environment. They cited increases of from 10 to 100 percent. They felt that they worked more efficiently or produced higher quality work, but some doubted whether their supervisors recognized the difference. Several of those working at home felt that their regular work environment was extremely distracting, so that the increase in productivity due to the ability to concentrate was relative to the character of the regular work environment.

Managers' Attitudes. Most of the managers interviewed felt that managing employees remotely was less than ideal but was a fact of life. Success of remote work was seen as highly contingent on selecting projects with little coordination or visibility required. Most managers felt that their own jobs could not be performed remotely. Technology was seen as an important factor in facilitating remote supervision in the future but played a minimal role at present. The success of remote work was also seen as relative to the working conditions of the regular work environment.

The basic premise of remote supervision, according to these managers, was that good managers recognize and reward good work. The managers indicated that they did feel insecure not being able to observe the employees at work, simply for their own reassurance that everything was in control. They indicated that the manager also needed special skills to provide the employee with emotional support, generally by having to be expressive and sensitive without the benefit of face-to-face contact.

The Relationship of the Employee to the Organization

The task of supervising an employee remotely is only one of several issues affecting the employee's relationship to the organization. More subtle effects are concerned in the employee's

relationship to others on a project team and other professional peers in general. Long term career paths may be affected. The feeling of commitment of the employee to the organization may be altered by the arrangement. These and other issues were explored in the interviews with employees working remotely.

Communications with Others. The methods by which employees communicate with their managers have already been discussed. Most of the employees interviewed were working on long term projects in which other people were involved, although for the most part the projects were highly structured and did not require frequent intense interaction. Communications with others on a project were limited to two to three contacts per week. The employees had a strong preference for the telephone, although they and other members of the project team had access to electronic mail and used it occasionally for brief factual messages. A "monitor mode" on the system permitted limited interaction between two people: a program, for instance, would appear on both screens and a few lines at the bottom of each screen were used to "discuss" the program.

All those interviewed indicated that their interactions were, for the most part, more factual and formal than they had been previously. There were mixed reactions to this change, while acknowledging that they were more efficient with their time, several employees missed the purely "social" interaction. Only one employee, who was working at home and remotely from not only his boss but all of his project team members, made regular weekly telephone calls to colleagues for sharing of common interests and problems. Others acknowledged a sense of isolation at times, particularly those who did not attend the office two days a week.

Only one remote worker of the nine interviewed carried on extensive communications with project team members out of his home. He coordinated a project with five to ten people actively involved at any one time. He said he averaged about ten telephone calls a day and twenty to thirty electronic messages per day. He felt that his communications with colleagues had improved with this work arrangement because he had more control over the communications and was able to

cut down on "non-essential" interactions. This example indicates how much the nature of the individual contributes to the success or failure of a remote work arrangement; this individual had a strong sense of his own social needs and the degree to which they were separate from work needs.

Logistics. There are some logistical problems with a remote work site, although not as many as one might anticipate. The employees working at home were aware of the need to have a separate work area, preferably one they could close off when not working. For those who did not attend the office on a regular basis, the biggest problem was the need for hard copy, either a printer or a copy machine or both. For those who worked at home three days a week as well as the others, another major problem was lack of necessary information or materials. Several indicated that because of this work arrangement they had learned to plan ahead and were better organized than before, so that the problem of missing materials was not as great as it had been originally and the advantage was an improved ability to organize their time.

One common problem of the remote employees was the lack of clerical support. None really felt that the clerical support they received was adequate. For those attending the office two days a week the need to batch clerical work and then have fast turnaround on the days they were in appeared to put a strain on the clerical support system that was difficult for both parties to manage. However, lack of clerical support was not seen as a major problem by most; they simply viewed it as a necessary evil and did much of the work themselves. Having access to word processing software and the ability to type, they found it easier to do their own correspondence and report preparation. When specialized clerical support was required, such as preparation of graphics materials for a presentation, there were occasionally severe problems meeting deadlines.

Promotability. One particularly difficult issue with remote work and remote supervision is their affect on employee's promotability. At issue is the degree to which visibility, as opposed to performance, affects promotions. The remote employees that were interviewed felt that their work arrangement enhanced their ability to perform good work; some felt that their performance

was recognized and rewarded, while others were more doubtful. Four out of the nine interviewed felt that promotability was not affected by their work arrangement; two felt their chances for promotion were improved because their work was recognized and rewarded. The three that felt their chances of promotion were hurt were concerned that lack of visibility would make it difficult for them to be promoted to a position with management responsibilities. At least one employee felt that his career path was limited because of his work arrangement; he said that if he had a choice between being promoted into management and remaining with his present work arrangement he would choose the latter.

Summary: Implications of Remote Work

The "alternate worksite" example illustrates that professional employees can perform remotely from their management if the work has well defined deliverables, the employee is a demonstrated high performer, and a relationship of trust has been established between the employee and manager. However, remote supervision is difficult. Improved technology may enhance a remote worker's ability to communicate, but strong preferences for traditional management techniques will be hard to change. Continuing preference for the telephone over electronic mail and the increasing formalization of communications nevertheless are signs that technology is not a perfect substitute. There is no indication at this point whether technology can or should be used for performance monitoring, at least of professional employees.

In the sample of remote workers there were two types of remote work arrangements: the alternate work site program had an employee at home three days a week and in the office two, while the other remote employees either worked at home or in an office but were geographically separated, permanently, from their work groups. With this limited data, it appears that the AWS arrangement definitely improved productivity, although it must be kept in mind that these were carefully selected individuals who had already been identified as high performers. The other remote employees had, understandably, greater problems with isolation from their professional peer group. From the management point of view, the remote work arrangement was seen as a necessary evil;

managers would have preferred to have the employees "where they could see them." Their feelings about the AWS program varied from somewhat negative to very positive; the variation depended on their own insecurities about their somewhat more subjective evaluations of these employees, and did not seem to affect the employees' evaluations of their own performance or managerial support.

Implications for the future

What is a realistic prediction of the long term implications of these technological developments for organizations and for society as a whole? Although theoretically dramatic changes in the geographic distribution of the work force could take place [21], it is likely that such changes will occur incrementally. Since the focus of this article is the near term future, the predictions are relatively conservative. Any developments are of course a result of a combination of factors including the economic situation, government policy, and the relationship between management and labor unions. These factors differ markedly depending on the country involved; in this article only the situation in the United States is assessed.

Telecommunications/Transportation Tradeoffs

Will telecommunications provide an adequate substitute for business travel? In a review of studies of attitudes of business travellers, Kraemer [26] concluded that "business travelers will continue in their present travel patterns unless compelled, by political, economic, or organizational factors, to modify their travel behavior." Furthermore, the perceived substitutability of telecommunications (including teleconferencing and electronic mail) for travel is only about twenty to thirty percent. There is some evidence [26] that availability of telecommunications increases the total demand for communications in general; in one scenario travel is actually increased as a result [21]. Limited use of teleconferencing to date has not resulted in consistent reductions in travel; it has more commonly increased the total volume of communications and the number of people communicating with each other [15].

The reduction of business travel would result in a direct cost saving to the organization. Remote work or "telecommuting," on the other hand, results in savings in commuting time and cost, which accrues directly to the individual. A recent study of employees of companies working at home showed that the primary advantage felt by the employees was the reduction in commuting [8]. Furthermore, commuting can be stressful; employees may lose as much as an hour of otherwise productive work time recovering from the stress of commuting to a major urban area such as Manhattan [35].

Of the forms of remote work that have been discussed, satellite work centers are the easiest to implement. Some companies are experimenting with such centers [3, 8]; others are decentralizing de facto as demands for office space increase and the supply in urban areas diminishes (while prices rise) [19]. Telecommunications facilitates such regional decentralization but is not currently a major contributor to the trend. Neighborhood work centers have not been experimented with in the United States, although they have been described as combining the best advantages to both the individual and the organization of all remote work options [2, 21]. Some experiments are currently being conducted in Europe [2].

Work at home is generally considered the most radical remote work option [21], although it is the best option for those with family care responsibilities, physical handicaps, or other constraints on their ability to work traditional hours in a central work place. Although estimates vary, it has been predicted that up to fifty percent of all office related jobs could be performed at or near home [21]. This estimate is based on the characteristics of the work and whether it can be performed with telecommunications support. (See [35] for a discussion of selection criteria for jobs that can be performed at home on a regular basis.) Because of other significant constraints such as social isolation of employees working at home and difficulties (perceived or otherwise) in the supervision of remote workers, the author predicts that a much smaller proportion of the office work force, perhaps five to ten percent, will be working at home within the next decade. Of these, most will represent special situations and many will be temporary arrangements.

For businesses, the primary motivation presently to investigate remote work options is the need to attract or retain qualified personnel. Thus the most active interest generated today is usually within data processing, not as much because of the technological requirements of the work as because of the critical shortage of qualified data processing professionals. Other advantages in terms of increased productivity or reduced compensation have already been discussed. Despite the recent publicity [3, 4, 11, 32, 33, 37, 39], few companies actually have full-time employees working at home on a regular basis. Furthermore, the author knows of no major business organization in the United States that currently has a standard policy to permit employees who qualify to work at home.

The author does not necessarily feel that a conservative approach to remote work, as depicted here, is ideal. However, organizational structures are slow to change. Dramatic changes will not occur until basic philosophical notions about the nature of work and control of work are altered. The author does not predict such changes will occur except incrementally, at least in the next decade.

The Structure of the Labor Force

Much of the speculation regarding the impact of technology on office work is critically dependent on the structure of the labor force and supply versus demand of certain categories of workers. Earlier in this article it was argued that shortages of critical skills provide the primary motivation for companies to consider alternative work arrangements. Will these shortages continue? What other shortages will occur?

It has been well demonstrated that the "information sector" is the fastest growing sector of the economy and has accounted for over fifty percent of jobs in the United States since 1960 [2]. The clerical and office work force, a component of the information sector, has been increasing at a rate that is predicted to be 100% in the decade ending in 1985 [41]. At these rates of growth and with an average capitalization per office worker of \$1000 (for an electric typewriter!) it is understandable that companies are turning to office work as an area for productivity improvement through technological support.

Predictions of how effective office automation will be in increasing office productivity vary widely. A summary of quantitative forecasts shows estimates of from ten percent to sixty percent reductions in clerical and administrative jobs in the next decade [2]. A separate study by Communications Studies and Planning Ltd. [2], drew somewhat more conservative forecasts regarding the labor force in Great Britain:

1. The study predicts that by 1985 roughly two percent of the present secretarial work force will be displaced by word processing technology. The maximum displacement by 1990 is predicted to be seventeen percent.
2. The study further predicts a shift in the job market from unskilled and semi-skilled clerical jobs to jobs requiring higher educational and professional qualifications [2, p. 5].

At the same time, it has been pointed out here that the number of eighteen year olds, representing new entries into the labor force, is expected to drop by twenty percent by 1985. The implication is that even significant displacement of entry level jobs should not significantly impact unemployment. The combined effects of these two phenomena are still not understood and are highly dependent on the degree of displacement in other categories of the labor force.

Nevertheless, new jobs will likely be created at higher professional levels and requiring more specialized education [2]. This could present a barrier to entry unless training and educational opportunities are provided to upgrade the skill qualifications of those who would otherwise be unemployable.

Interest in remote work opportunities as discussed in this article are based on a company's economic motivation to attract or retain qualified personnel. There is little indication that the percentage of professional and administrative jobs will be significantly affected by technology within the next decade [2]; it is therefore difficult to predict whether companies will be motivated by shortages to provide alter-

native work options. The Communication Studies and Planning report concludes that flexible work hours, part-time work, and work at home or in neighborhood work centers all have a low priority in terms of management planning. The author also concludes that unless critical labor shortages exist, companies will not be compelled to consider such risky alternatives. In other words, in the near future there will be little motivation for companies to change their basic underlying philosophy of control of work through temporal and spatial boundaries.

Implications for Policy

Changes in government policy could have a significant influence over the potential for technological impacts on business and society as a whole. The issue of telecommunications/ transportation tradeoffs is highly dependent on whether government takes an active approach to policies encouraging telecommunications and/or curbing growth in transportation facilities. Kraemer [26] provides a thorough summary of arguments for and against pro-active government policy in this regard.

The author has argued that part of the shift in employment caused by technology will be away from unskilled and semi-skilled jobs to jobs requiring specialized skills and/or higher educational qualifications. It is essential, therefore, that educational opportunities be readily available to those in more disadvantaged situations, so that the gap between the employable and unemployable does not widen.

The author has also discussed in this article scenarios where office workers, particularly clerical workers, are exploited through low wages based on piece-rates and job de-skilling [16]. Furthermore, the option to work at home has the potential for increased exploitation as with industrial home work [25]. Office work at home can be seen as an opportunity or a threat and is generally resisted by labor unions [4]. One solution to preventing the potential abuses of home work is to provide adequate government controls to prevent exploitative practices, although enforcement is difficult [25].

Guidelines: Preparing for the Coming Changes

Although the author has suggested that, in the short run at least, the potential impacts of technology on organizational structure and culture will occur slowly and will not be dramatic, nevertheless the management process will be affected. At the very least, managers will have to learn to cope with new technology and its diffusion within the organization. The more subtle adjustments in management style and supervision and in the criteria for a "good manager" will be more difficult to determine. This article concludes with some general guidelines for managers to prepare for the coming changes.

The process of management

The author has discussed some characteristics of "management style," based on the nature of manager's daily activities. Office automation technology provides the opportunity or threat to alter management styles. It also may require or make available different criteria for supervising and evaluating employees.

Management Style

Managers in the future, given the availability of office automation technology, will need to rely less on face-to-face communication than they do today. We have seen that remote supervision may tend to increase the formalization of the relationship between employee and manager. Thus in the long run, performance evaluation may become more "rational," based more on formal rules and procedures than intuition. Other implications of remote management relate to physical appearance: there may be less dependence on physical attractiveness as a factor in promotion or acquisition of power; one may also argue that there is less potential for discrimination against minority groups, women, or the handicapped if communication is not face-to-face [22].

The managers studied by Ives and Olson [23] apparently had little control over events in their work domain. Their days were characterized by many varied, short activities, a relentless pace, and frequent interruptions. If managers are provided with tools that permit them to gain more

control over these interactions and activities, they may become more "productive." Will managers have more time to make decisions? This is unlikely since in fact many decisions are made during the interaction process [30], although they may be implemented in some more formal or structured way. Two more conservative results of better control over the process of interaction may be predicted. One is that technology replaces the "gateway" that is currently provided by a personal secretary; if a restructuring of the office work force has taken place, this eventuality is very likely. Thus, relatively inexpensive technology may replace at least one of the functions of a relatively expensive human resource. Another possible direct result of technology is that through better time management the manager's span of control may be increased, also translating into direct cost savings for the organization.

Remote Supervision

If employees are to be supervised less through face-to-face contact, the process of supervision of many employees will be altered. We may learn from supervision of sales forces and management at the corporate level (e.g., of regional divisions); employees are managed on the basis of results and the value of those results is clearly understood and appreciated by both parties. The supervisory process may become more formalized, with a greater reliance on procedures and measurable outputs than intuition for a greater number of employees.

The manager who operates under this new form of management must learn to rely on deliverables; therefore, the manager must learn to be a good estimator. More managers in a broader range of functions in the organization must learn to set clear performance goals, establish clear guidelines for performance, and establish appropriate feedback mechanisms. Moreover, much remote work will also be group work; the manager's role in coordinating group projects and facilitating interaction and information flow among group workers will be critical.

The author has argued that philosophically remote work represents a change in the definition of work in space and time. It can be argued that providing these options for employees will increase their

overall productivity; under these conditions, how is productivity defined? A relatively ineffective method of evaluating performance is to measure the number of hours worked without defining an expected deliverable for that time. However, if employees are given more flexibility in work hours and well defined deliverables, what work hours should be expected? Employees attribute greater productivity at home, for instance, to their ability to concentrate away from the distractions of the office. If it takes an employee half the time to do the same amount of work at home, should the employee be expected to produce twice as much or be permitted to work a twenty hour week? This example illustrates the need for managers to develop indicators of performance that take into account the overall effectiveness of the employee rather than to narrowly focus on short term measures such as hours worked or piece-rates.

Career paths

With remote management, the long term career paths of employees are affected in organizations where visibility remains key to promotability. If remote work is a standard, then the relationship between work quality and rewards must be clear. At this point one can only speculate, but there are signs that remote work encourages individual autonomy rather than loyalty to the organization. Management philosophy can go in two different directions. On the one hand, remote work arrangements may be viewed as a privilege and an indication of trust in an employee; coupled with a commitment to develop the employee's career path, remote work may actually encourage commitment to the company and improve the likelihood of long term employment. On the other hand, companies may view remote work options as a step toward contractual arrangements for work that has fluctuating demand; such arrangements may benefit both the company and the employee if the rates for work performed are established equitably.

Improving the quality of work life

Although this article has concentrated on organizational structure and the management proc-

ess, it reflects an underlying concern for the potential of technology to either negatively or positively affect the quality of work life overall. The general premise is that the technology is neutral; its implementation in the organization determines its effects on employee productivity and job satisfaction. Two alternative strategies by which organizations may utilize technology to improve productivity are summarized. In the first strategy, improved quality of work life is sacrificed to increased efficiency. Technology is organized to increase the division of labor, reduce skill requirements for remaining jobs, and set exploitative piece rates; the "office of the future" becomes the "factory of the past" [16]. In the second strategy, office automation technology is organized to facilitate job enrichment, to provide a greater set of employment options and greater flexibility to accommodate varying employee needs outside of their work lives, and to demonstrate trust in the employee's ability, sense of responsibility, and willingness to produce a quality product.

The challenge for management in the future, beginning today, is to utilize the vast potential of computer and communications technology to achieve the end of increasing organizational productivity while at the same time improving the quality of work life for all employees. The author is optimistic that with good management planning this end can be achieved.

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