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ABSTRACT
        Unpredicted ways in which the use of computers has
affected social interactions in colleges and universities are
considered. Information was gathered from a literature review and
from personal observations. One outcome of introducing computers into
an academic or administrative unit is the development of alliances
depending on prior experience with computers. Personal involvement
with computing can be characterized by feelings of frustration.
Personal communication channels can change due to the existence and
use of computers, and particularly electronic mail. Increased
efficiency resulting from computer usage has been an issue, along
with the computing skills needed by secretarial and professional
staff. Access to a computer can also reduce the need for typing and
secretarial support by the faculty member. The implementation of
computers on campuses has made training and selection of support
staff more technical and complex. Evaluation of student learning can
also be affected by computing. Managerial concerns include purchasing
of hardware and software and maintenance costs. The unit within each
campus most affected by recent trends in computing is the central
data processing or computing center. Consumer behavior theory
provides some additional insights concerning computer usage and its
effects. 17 references. (SW)

Unintended/Unexpected Outcomes of Computer Usage in Higher Education

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Unintended/Unexpected Outcomes
of Computer Usage

Introduction

The computerization of the campus has had a profound effect upon the way in which students, faculty, and administrators work and interact with each other. Colleges and universities have gradually integrated computer use into a wide variety of activities, yet surprisingly little has been written about how this process has changed the campus environment in unintended and unexpected ways.

The following is a work-in-progress which summarizes some of the unpredicted ways in which the use of computers has affected social interactions in colleges and universities. The information reported has been gathered from a review of the literature and from personal observations shared by a number of people.

Literature Review

The literature has been relatively silent concerning the sociological and social-psychological impact of computer usage in modern society. Volumes are available as to the effects of computerization on employment. A new sub-speciality of industrial engineering, called ergonomics, has evolved as a result of the need to better fit electronic data processing machinery to human physical structures. Of particular interest to ergonomics is the health consequences of long exposure to visual display terminals and oth r peripheral equipment.

One promising trend in the literature is exemplified by Linder (1985), who outlines the use of computers as impacting the organizational culture. The changes she suggests, however, are intended to be purposeful, not unplanned, for she argues for a "culture-consistent systems environment" (p. 50). Some limited attention is also being given to the individual psychological effects of prolonged computer usage (e.g. Sprandel, 1982), but the context is often quite negative, as in the case of Benson (1985), who uses the term "technological alienation-mindlessness" to describe the human reaction to long-term exposure to high technology. The intent of this paper is to move beyond the emphasis on the individual physical and psychological health, focusing more on the human interaction effects of computer use in the academic environment.

One effort similar to the kind described here is that reported by Hill, Camden, and Clair (1986). They conducted a case study on the impact of saturating a single academic department at a public, urban university with desk top terminals connected to the campus mainframe computer. Their analysis of the experiment, which draws heavily on personal interviews and communications theory, presents a number of principles which seem to be generalizable to a larger audience. This paper draws heavily on their work, while also adding points that are outside the realm of what they were studying.

Unanticipated Outcomes

One of the first problems in discussing unanticipated outcomes of computer usage is to develop a framework for the issue, a way of categorizing the outcomes. While the following themes are not comprehensive, they do provide a starting point upon which to build a more thorough taxonomy.

We/They Groups

One of the more obvious, yet seldom discussed, outcomes of introducing computers into an academic or administrative unit is the We/They syndrome. The We group consists of those with prior computer experience, i.e. the faculty or administrators who are already relatively sophisticated regarding computer usage. In most environments the We group evolves gradually as a cluster of people who gravitate towards each other out of a mutual interest in and use of computing in their unit. They usually develop other networks of relatively sophisticated users outside of their home departments or academic units as well.

The They group consists of the new computer users, infrequent users, and non-users. The new users are those who have just begun learning how to utilize existing computing resources or have recently gained access to computing for the first time (e.g. have recently purchased a personal computer). The infrequent users are those who have had access to computing for a period of time and have mastered the rudiments of what they feel they need to know (e.g. for using electronic mail or standard statistical packages), but have not really adopted computing as a central part of their professional lives. The non-users are those for whom computing has not proven sufficiently interesting or necessary to justify the expense and effort required for them to become even minimally proficient. Among the non-users are those faculty and administrators who have others, such as student assistants, computer programmers, and secretaries, performing computer-related activities for them.

The We/They group distinctions are interesting in that, within existing academic and administrative units, they evolve as groups of people who may not have otherwise been thought of as a clique or informal group. Discipline, sub-

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discipline, age, rank, and other factors that would have defined sub-groups in the past don't always continue to hold for the We/They groups. Not only research methodology, but also data, text, and general information sharing can become machine dependent relatively easily, so that those who are not using computing facilities are left out of the communication channels of those who are more oriented towards computer usage. The result is an environment where personal alliances depend more on computer usage than the more traditional boundaries of the past.

Strong Personal Involvement

Strong personal involvement with computing is another of the themes that seems to emerge from increased computer usage. On the negative end of the spectrum are those who simply refuse, for whatever reason, to use computers in any way not absolutely required in their work. Such people, whether humanists, scientists, administrators, students, or others, see no benefits and some drawbacks to the computer invasion. As that invasion of the campus becomes more pervasive, it takes more and more energy to remain among the resistance.

New users (Theys) and more experienced users (Wes) have varying levels of involvement and different needs. The new users express frustration with the inevitable problems of learning the logic and the details of mastering the new electronic tools. Their needs are for basic assistance in getting the machine to do what they need or want it to do. Hill and her associates found that the strong feelings of frustration by new computer users were not necessarily softened by the presence of the more experienced users (Wes), since professionals seem reluctant to admit ignorance to their peers. They suggest the hiring of less threat-

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ening outside consultants in cases where new computing tools have become suddenly available to a relatively large number of people, as was the case in their department. (Hill et al , 1986, p. 26).

The more experienced We group reports more positive, but equally strong, personal feelings regarding computer usage. Both the media and popular lore are replete with stories about fabled "computer jocks" who would rather work and play on the machine than eat or sleep. Excitement at the availability of this tool, and all the wonderful things that it can do to enhance one's work, is a common phenomenon. Feelings of increased control over the machine or one's data are reported as well. Most also express increased dependency on computing and expressions of exasperation at the mere thought of not having easy access to a computer. The study by Hill and her colleagues found faculty saying that they would leave the department and the university if computing capabilities were suddenly unavailable. Job satisfaction and even institutional loyalty had become associated with computing among the faculty interviewed!

The more experienced and active users frequently report some frustrations, however. The most common types have to do with needs resulting from heavy usage, such as increased processing speed and more storage capacity. In addition, computer centers are often faulted for not doing enough in the area of software purchases and maintenance to satisfy faculty and others with highly specific, relatively esoteric computing requirements. In computing, as much or more so than in other areas of academia, resource needs always seem to outstrip resource availability.

The extent of the frustration experienced depends somewhat on the user's level of expertise, but virtually all accounts of computer usage acknowledge var-

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ious frustration levels. New users are probably more prone to the problem and are less likely to be tolerant of it. due to lack of similar experiences in the past. Advertisers have gone so far as to adopt the frustration theme by showing users destroying terminals in slow motion on television, then telling the viewer that their product will make such behavior obsolete in the future.

There is also anecdotal evidence suggesting that some people have been personally crushed by their inability to master computing. Exhibitions of lowered self-esteem can, and apparently do, appear in those instances where a person is simply unable to cope with the technology. Substantial personal stress results when one lacks a skill which was formerly unnecessary to work effectively, but which is now considered essential.

Besides feelings of frustration, another term often used in discussing personal involvement in computing is commitment. The seemingly endless complications involved in getting the computer to do what is needed require substantial commitment in order to be overcome. Patience, enough humility to seek help, and stubbornness can add up to the kind of commitment necessary to work past the frustrations in order to use the computer productively.

Changed Personal Communications

A theme related to the development of We/They groups and the strong personal involvement of faculty and administration with computing is that of changed personal communication channels due to the existence and use of computers, particularly electronic mail. As mentioned earlier, those not using the communication medium of electronic mail end up outside of the mainstream if most of one's colleagues use it. Common too is exclusion from the "electronic humor"

that goes on when colleagues use electronic mail, a subtle but not unimportant means of becoming isolated from departmental camaraderie.

Non-users and infrequent users also remain outsiders to other quasi-social activities related to electronic mail, such as the one-upsmanship games of sending the latest note at night or on weekends. A variant is seeing who can send a note from the farthest distance when traveling; there is a certain status in sending greetings to colleagues electronically from Toyko or Berlin. Home personal computers are highly recommended for such evening and weekend endeavors, while substantial travel budgets are necessary for winning the distance title.

Aside from the issue of some people being excluded from specific communication channels is the more fundamental change in the way departmental colleagues communicate with each other. Electronic mail in particular is quite convenient and time independent for the receiver, who does not have to be present in order to get the message. This convenience and accessibility can lull users into employing the medium even in cases where the more personal telephone or face-to-face contact would be more effective and appropriate.

There is some disagreement among frequent computer users as to whether electronic mail is a "cold" or a "hot" medium. On the one hand, it is somewhat formal and "cold" in that one cannot see or hear the sender. It is also "hot," however, in that the apparent brusqueness growing out of a lack of auditory and visual cues seems to lead to greater numbers of misunderstandings. This can result in "computer fights" which are similar in nature to a flurry of memos. The latter has the advantage, however, of being slower, so that people have time to cool off before sending an inflammatory paper memo. Electronic memos, being so convenient and immediate, can eliminate the cooling off period so common

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and effective in bureaucratic battles. This combination of immediacy and potential for misinterpretation causes many to consider electronic mail a "hot" medium.

Not all of the social impacts of electronic mail are negative however. Wilson (1983) points out that in some cases, for the same reasons noted above as drawbacks, electronic communications may actually enhance cooperation between individuals who might otherwise be unable to function productively on a face-to-face basis (p. 19). Where personality conflicts are present, the parties involved can be more objective and think out what they communicate to each other when the personal distractions are not present. The fact that electronic mail cuts out many of the stimuli present in face-to-face situations is a help rather than a hindrance, permitting the individuals involved to focus attention on the message rather than the medium.

Electronic mail aids in dealing with two other types of personalities, the interrupter and the interrupt-driven person, in manners different from those available in using other media. The interrupter is one who constantly interrupts, whether in person or over the telephone, and is often a disturbing influence. With electronic mail, however, this behavior is not so aggravating, since the person receiving the message controls the time of reception. At the other end of the spectrum is the interrupt-driven individual who requires a "forcing factor," such as the ring of the phone, in order to get his or her attention. Electronic mail lacks a strong forcing factor, such as requiring an immediate response, and for this reason may be avoided or not used effectively by such persons. On the other hand, some people treat electronic messages with more respect than they do

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phone or written ones, possibly because they tend to require either storage or response when received (Hill et al , 1986, p. 24).

Sophistication in the use of electronic mail has helped revive an old distinction among academics: that of the cosmopolitan versus the local. The cosmopolitan faculty member is one who is more outward looking, in frequent contact with colleagues elsewhere in the institution and at other institutions. The local is more focused on the academic unit and college or university providing immediate employment and is less knowledgeable about activities going on elsewhere, even within the same academic discipline. Evans (1982), who uses the terms adopters or innovators and laggards to describe the two groups, notes that those on the extremes of each have lower social status and respect than the moderate adopter, "Who falls near the center of the adopter-laggard scale at a point slightly favoring innovations" (p. 94).

The development of electronic mail and international networks such as BITNET, NETNORTH, EARN, JANET, ARPANET, CSNET, etc. has made it just as easy and as inexpensive to correspond with a colleague in another part of the world as with one in the office next door. Once a faculty member or administrator gets into the habit of sending notes to colleagues within the same department and institution, it seems natural to do the same with colleagues off-campus, sometimes to include those far away geographically. Consequently the We group moves more towards the cosmopolitan end of the scale, while the They group is forced more to the local end, especially if the cosmopolitans elsewhere expect others to use the electronic mail networks. The We/They distinction is thus extended beyond the department and campus to the broader professional world where one gets the reputation as being accessible or inaccessible electronically.

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Psychological distance becomes more important professionally than geographic distance. The We/They distinction may well become further sharpened as the electronic exchange of data and manuscripts by academics becomes more common. The editors and publishers of scholarly journals can also be expected to move into the electronic age as the cost and effort benefits of electronic publishing become more obvious, creating more difficulty for the Theys of the computing world.

One other concern that has recently become more obvious regarding electronic mail is that of security. In the past computer security issues have generally focused on unauthorized user access to financial or personal data, sometimes resulting in fraud, misappropriation of funds, or vandalism. Particularly since the Iran-Contra affair, however, security concerns have shifted to electronic mail. The fact that the discovery of a central message backup changed the course of an investigation of the White House, as it was reported to have done during the Tower Commission investigation of the Iran-Contra affair, points up how electronic mail can be less secure than other types of communication. This suggests that academics should exercise appropriate caution in their own electronic communications, particularly where maintenance of personal privacy is a legal and/or ethical concern. Such discretion fails to slow down another growing problem, however, that of electronic junk mail.

Efficiency and Control

The issue of increased efficiency is one of the earliest and most persuasive driving forces of the computer invasion of the academic and non-academic working environments. Administration has been streamlined by the use of com-

puters to do routine processing of schedules, billings, payrolls, and the like. Word processing and other office software has enabled the computer terminal to become a substitute typewriter, filing cabinet, copying machine, and calendar, as well as a partial replacement for the telephone and the mail. Support staff such as secretaries can thus produce more work than before with no increase in effort, while faculty and administrators themselves can utilize computers to increase their own efficiency in teaching, research, administration, and public service. Some junior faculty go so far as to consider access to computing, particularly ownership of a personal computer, as a "resource equalizer" (Gilbert & Green, p. 45).

The increased use of computing raises some important issues for staff training. In the past, secretaries would learn to type on standard manual or electric typewriters, then gain employment using very similar equipment. Now such people are trained on the same equipment as in the past, or on one or two computing systems using one or two types of word processing software, but are just as likely to end up using a type of computer and/or word processing software that was previous unknown to them. Other expectations, such as the use of financial spreadsheets, graphics packages, scheduling, and electronic mail programs might also be assumed.

Consequently the secretary of today has to be flexible and easily retrained to meet the changing needs of the employing unit in addition to being technically competent to type, file, and answer the telephone. Learning how to learn is an increasingly important facet of staff education and training. A continuous supply of such employees will only occur as a result of substantial effort on the part of

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colleges and universities as well as the organizations responsible for training such staff, e.g. the high schools, commercial colleges, and community colleges.

There is some concern, and substantial evidence, that the computing invasion of the office will necessitate a splitting within what has historically been considered the secretarial ranks. Those support staff who quickly master the new technology are more likely to be rewarded with increased salary and status, while those who cannot will remain stuck in relatively low level jobs, if they are retained at all. Offices in academia as elsewhere are likely to meet increased staff skill requirements by employing fewer, but more technically competent, support staff. The line between professional and support staff will begin to fade in many cases. The losers in such situations, as in much of our increasingly technological society, are those who can't or won't learn to use the newest tools in an efficient and effective manner.

Different skills may be demanded of faculty and administrators as well as of support staff due to the computer invasion of the campus. Information overload, always lurking in the background of information societies such as colleges and universities, is brought to the forefront by easy access to large-scale databases, electronic mail, and electronic publishing. A personal computer, modem, and telephone line is all that one needs today in order to gain access to a virtually unlimited pool of data and text information. Data gathering has thus become a less important activity than data selection: "The key survival skills have become those of criticism, analysis, and judgment rather than acquisition and retention of facts" (Bossert, p. 22). While artificial intelligence devices (AID's) and artificial intelligence software may provide some relief from the information cacophony,

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the academic with the ability to analyze and synthesize the mass of information available should be a valuable asset to his or her institution and profession.

Related to the issue of efficiency is that of control over one's work. The faculty member who can draft his or her own scholarly paper on a limited access mainframe account or on a personal computer does not have to wait for the typing pool to get out a draft manuscript. A little more knowledge of word processing can eliminate the need for typing assistance entirely in many cases. Editing suggestions are likewise made much easier to incorporate, while spelling errors should approach extinction.

Direct physical control over one's data, such as in the case of using personal computers, appears to have beneficial effects as well. Professionals are more likely to try simulations and other processes where the risk of a wrong or silly answer is high if nobody else, such as a programmer, is involved. They also don't have to worry about a potential competitor discovering their strategies through an intermediary.

At least one other efficiency issue has been quite important, but relatively ignored, in the higher education literature: the professional programmers versus the sophisticated users. Programmers have been trained traditionally to be machine efficient, writing code in COBOL or another efficient language. This approach is appropriate to large, recurring computing projects such a wiiting payroll or billing programs, but does not meet the need for quick data retrieval for occasional management information purposes due to the relatively long development time and high programming skill necessary.

Sophisticated users employ SAS, SPSS-X, FOCUS, Natural, or a similar fourth generation programming language to meet requirements for quick data

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retrieval, but these are not always as machine efficient and the programs written to elicited the data are generally not well documented. Many administrative offices must develop this expertise internally, thus bypassing the computing professionals in order to meet their own data requirements. In some cases this leads to friction between the professional programmers and their supervisors on one side and the sophisticated users on the other as to the proper use of institutional data, hardware, and software for management information purposes.

Finally, in spite of the increases which individuals can make in their effi ciency, there are some with the tendency to "play" with the computer instead of using it as a tool only. These persons no doubt end up learning even more about the system, yet may tie up precious personnel and computer time which could be used more productively. This may be discouraged in some settings (for example, students learning mainframe usage), yet be undesirable in others (an employee experimenting instead of working, for instance). One would expect such activity to diminish to a tolerable level as the novelty of using the system wears off.

Changed Standards

The theme of changed standards is one which is related to efficiency and control. As has been noted previously, the computer invasion of the campus has made the training and selection of support staff a more technical and complex matter. It is relatively simple to test for typing speed, but determining characteristics like flexibility and ease of training is more difficult. Likewise faculty and administrators, even those trained in non-technical fields, must be able to cope

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with constantly changing computer technology so as not to be left behind professionally.

The more formal effect of computing on faculty standards is seen in the promotion and tenure review process. Depending on the academic unit, substantial credit towards promotion and tenure may be given today for development of special instructional or research software in one's academic discipline. As Turner (1987b) points out, however, this is not universally the case; some faculty claim to have been penalized for spending time on computing-related projects instead of more traditional research and teaching activities. Even in cases where only traditional teaching and research are evaluated, however, the faculty member who has a working knowledge of computers for word and data processing has the competitive edge over one who does not, for efficiency reasons if for no others.

Student Concerns

Evaluation of student learning can also be affected by computing. Often coursework requires use of simulation or statistical packages. In addition, many students use word processing software on a regular basis. A recent survey of undergraduate students at Virginia Tech, for example, showed that 70% of the respondents use computers for this purpose, by far the most common use of computing resources (Muffo, 1986). Such results support the contention by Gilbert and Green (1986) that a measure of a tool's value lies in the number of individuals willing to spend their own money to use it, and that word processing is the one computing tool that large numbers of people have used their own financial resources to support (p. 40). An unexpected consequence of this kind of

pattern is that faculty have reported being more critical in editorial comments on student papers written with the help of word processing software, where this is obvious, due to the relative ease of reproducing a final, edited paper. The result is a double standard for evaluating students' work, one for those with access to word processing and another for the rest.

Educational applications also extend to using the computer as a means of distributing assignments, announcements, progress reports, questionnaires and the like between professor and students. One such example from a software engineering course at Rutgers University showed that students were enthusiastic about the system, which was credited with stimulating student thought, improving the quality of student effort, and enhancing student-student and student-professor interaction (Wilson, p. 49).

This scenario seems rather inviting: much paperwork is reduced, possible excuses for not meeting deadlines are reduced in number, and information is more equally available to all at any time. Yet there are other, perhaps unanticipated, concerns to be considered. For instance, the incentive to attend class may be reduced, since essential information would be available through other mechanisms. This reduces the opportunity for interaction and feedback in the classroom, which is necessary to understanding the assignment and course material, and which is an integral part of the learning experience. The possibility of reduced interaction necessitates careful wording of information such as class assignments to avoid misunderstanding. Such carefulness make create unrealistic expectations on the part of students, for they must be prepared to cope with unstructured situations as well (which would then require interaction and feedback to reach an optimal solution). Finally, it sometimes occurs that the sending

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of files and messages becomes basically a one-way process. The feedback loop is missing if the students cannot receive electronic mail from the professor as well as sending it. In other cases, students are encouraged to use electronic mail, yet the professor does not respond quickly or thoroughly enough to be helpful to the student prior to the final submission of assignments.

Managerial Concerns

A number of management concerns have begun to surface regarding the computer invasion of academia. The purchase of hardware and software, while expensive in itself, is followed by substantial maintenance costs and line and/or port charges where mainframes are being accessed. As with buildings and scientific equipment, even donated equipment is expensive to operate and maintain over time. The increase in word processing has added to the burden where chargeback systems do not provide disincentives for making multiple copies on printers as opposed to using copying machines.

Potential difficulties seem to grow along with the use of computing in instruction, research, and administration. Increased use in teaching requires greater student access to computing, often through the addition of entire computer laboratories. The requirement to purchase personal computers can help alleviate the load on the mainframe, but that too can lead to other pressures, such as more personal computer-mainframe interaction. Consulting services, printing facilities, and secondary markets for used personal computers are additional concerns where such purchase requirements have been implemented (see Muffo, 1986).

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The consideration of whether or not to require computer purchases of students is another complex area where difficult decisions must be made. While many institutions have found the option appealing for a number of reasons, not the least of which include reputational enhancement and shifting the cost of computing to students, there are a number of others that have been exercising caution (Turner, 1987a). Among the concerns are the unproven impact on student learning, increased costs to students and resulting financial aid problems, unavailability of inexpensive and usable software in many academic disciplines, and the increased institutional costs associated with supporting a larger number of personal computers on campus. An approach taken at some large universities has been to institute purchase requirements gradually, on a department or college level, over a number of years (see Muffo, 1987).

The New Computer Center

The unit within each institution of higher education most affected by recent trends in the computing field has to be the central data processing or computing center. While the changes occurring there are not normally unanticipated or unexpected in the same sense that some of the others mentioned previously are, the way in which the computing professionals on campus perceive themselves, and the way in which they are perceived by others, is rapidly changing. This evolution is so pervasive and has such an effect on campus computing that it deserves some consideration here.

In the not-too-distant past, computing was seen by most outside the computer center as the technical, somewhat arcane domain of a handful of highly skilled, though sometimes unusual, specialists. Most of us who were not com-

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puting professionals had to take the word of the experts as to what was possible and what was not and within which time frames. Occasionally outside experts were brought in to verify or contradict the local expert, but those outside the field were seldom able to question their positions directly, since they had all the knowledge and subsequently all of the control.

The chink in the computing professional's armor began to be recognized as a handful of faculty and administrators, such an institutional researchers, developed the ability to manipulate data on the large mainframe computers using standard programming languages. The development of relatively user-friendly statistical packages with programming capabilities, such as SAS and SPSS-X, further opened the mainframe to usage by an increasing larger number of campus users. No longer was the central data processing unit the soie domain of the computing professionals. An growing army of sophisticated users was developing, some with unique knowledge outside of the purview of the professionals themselves.

The advent of personal computers turned the trickle of computing expertise into a flood. Whether or not the central data processing unit was accessible to an individual no longer mattered, since faculty, staff, and students could buy their own computers and bypass the central facility altogether. Not only that, but programming experience that was formerly available to a relatively small number of users was now open to all. Suddenly even non-technical faculty, staff, and students began questioning the policies and procedures of the computing professionals, since the art of maintaining and programming a computer was no longer a mystery to the vast majority of the population. The gatekeepers began

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losing control. At the same time the types of services required of the profes-
sionals shifted dramatically.

Protecting the mainframe from overuse and misuse is still a major respon-
sibility of the central data processing unit, but the issue are now different. The
question is no longer whom to allow to use the machine, but how to allow the
widest use possible without denigrating the system, i.e. slowing things down
intolerably. Many computing personnel have been forced to shift from a
protectionist mentality concerning the mainframe to a sales orientation, encour-
aging more people to use it, but each in ways that will have minimum impact on
its efficiency.

In most cases the forces causing such changes have come from outside the
profession, from users and vendors, rather than from within, but many computing
professionals have adapted out of necessity. The same individuals who were
trained to write and document large programs on large mainframes over periods
of months and years are now required to act as campus consultants to users who
want fast answers to problems on personal computers. Instead of writing com-
plex programs for such administrative functions as payroll and registration, they
spend their time adapting and maintaining systems purchased from outside
vendors. Clearly the role of the institutional computing center has changed in a
major way in recent years.

A quick glance at the publications of academic computing professionals,
such as those of CAUSE (1986), suggests that their focus in many cases is moving
towards the end user. The experts are devoting more and more of their profes-
sional energies to trying to get in front of the personal computing juggernaut; the
end user is now the friend to be helped and supported rather than the interloper

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who wants to use *their* machine. While a positive development for the user communities being served and the computing professionals, this development raises some interesting questions for those like institutional researchers who formerly served as links between the end users and the experts. Once the computing professionals and the users can work together directly without the help of intermediaries, the latter risk becoming redundant if they do not carve out areas of expertise not covered by either of the two other groups.

Theoretical Considerations

The above discussion of the unanticipated impacts of computer usage has been presented in a relatively atheoretical context; no attempt has been made thus far to tie the observed outcomes to a theoretical construct. The study of consumer behavior, particularly the innovation and diffusion processes, provides some insights that may be applicable to the various aspects of computer usage.

An innovation, at least in consumer behavior terminology, is generally considered to be a new or different product, service, or idea. Certainly the introduction of a computer into the workplace would qualify as an innovation at the time and place of introduction. Most innovations are continuous, being improvements on earlier products, but computing was identified over 20 years ago as being discontinuous (Robertson, 1967). A discontinuous innovation is one that results in substantial changes in consumption and behavior patterns; the computer is included along with the automobile, radio, and television as having a dramatic impact on society.

Berkman and Gilson (1986) have identified four external dimensions of the diffusion process, the first one being the innovation itself. The remaining di-

mensions include communication (awareness), adoption, and time (i.e. early, middle, or late adopters) (p. 524). These are labelled as external, because they lie outside of the individual consumer, acting at the social system level. There are likewise three internal dimensions described by Rogers (1983): initial awareness; interest, evaluation, and trial; and ultimate adoption. Most diffusion research has focused on the linkage proces between the external and internal dimensions. The key areas of interest are how people become aware of new products and who is most likely to become an early, middle, or late adopter.

Both the awareness and adoption issues are relevant to unanticipated outcomes of computer usage, yet the computer generates its own unique circumstances as well. Rcgers (1983), for example, has developed a theoretical life cycle for adoption of innovations, replete with a normal, bell-shaped distribution of percentages of consumers who can be expected to fall into each stage (p. 247). Discontinuous innovations, such as computing, are skewed however, and therefore do not follow the normal distribution pattern (Peterson, 1973, p. 327). In addition, adoption processes tend to be very product and culturally dependent, so that an early adopter of one product in a particular situation might well be a late adopter of another product in the same or a different environment.

While consumer behavior theory provides few simple answers to understanding the behaviors outlined above, it does provide some structural guidelines. Prior research suggests that a discontinuous innovation like the introduction of computing into the workplace can be expected to bring out early and late adopters such as the We and They groups mentioned previously. The innovation process is likely to cause personal and social disruption because of its sudden impact, resulting in strong personal feelings about computing and

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changed social interaction processes of the kind discussed above. Using the automobile and television as historical examples of discontinuous innovations, substantial lifestyle changes can be forecast. Obviously much theoretical work regarding the social-psychological impacts of computing remains to be done.

Besides providing a theoretical framework, there is another prime reason for introducing a marketing model. By better understanding the adoption and innovation process, a strategy can be developed to attempt to manage the impact of computers upon society and individual users. For example, by employing the communication dimension, a strategy can be pursued for seeking out would-be early adopters (called opinion leaders) and developing them as users. This early user group then becomes the example and communication channel for the next group of adopters. The strategy must also incorporate appropriate opportunities for trial and evaluation. The implication is that a better initial understanding of the process should facilitate the next step, which is to enhance or control the process sufficiently well so as to create the least possible social disruption, while maximizing acceptance and utility.

Conclusion

This paper is not intended to be comprehensive. It has only begun to scratch the surface concerning the multitude of ways in which computing is changing the modes of personal interaction among academic professionals and the students whom they serve. Some of these changes have been reported here, but there must be many others that have not been. Certainly future developments will occur which will have other unforseen impacts on academic life.

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Perhaps more so than any other of mankind's technological innovations, the computer has proven its ability to inflict rapid change within society as a whole. Unintended/unexpected outcomes of computer usage also make themselves more noticeable because of the greater rate of change that occurs. A comparison of ten to twenty years ago can quickly show how computing has changed the ways in which students, faculty, and administrators go about their business. From the previous discussion, the reader should have developed a sense for examples of unintended/unexpected outcomes. The challenge now is to examine one's own environment in order to better predict future unplanned outcomes. The better that one is prepared for such results, the more likely that they will be handled in a productive manner.

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