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WHO NEEDS A PERSON CENTERED COMPUTER TECHNOLOGY?

by

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ABSTRACT

Contemporary computer designers are largely machine centered and emphasize function and standards of elegance, efficiency and computing power. The side effects of systems may enhance or diminish the well-being of various users. Recent studies of the human impacts of computing systems are described. Person centered standards that promote a sense of competence and autonomy are outlined. The coupling of flexible software with responsive organizations is suggested as a means of enhancing personal competence and self-esteem.

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WHO NEEDS A PERSON CENTERED COMPUTER TECHNOLOGY?

INTRODUCTION

This essay explores themes central to a person centered computer technology. These issues concern the ways and means that computer technology can help foster a mature and humane society. They involve judgements of social value as well as technical comparisons. As a beginning we must understand how computer technology can be used to enhance (or diminish) the humaneness of the people who are affected by various computer systems. I will focus upon one aspect of computer impacts: the experiential effect of computing systems on their users.

Usually, we conceptualize the computer as a tool. From the viewpoint of a computer scientist who designs a particular algorithm, a computer may well be his tool and plaything. But a person who works with a large scale computing system may well experience it as an overwhelming total environment. A middle manager whose decisions and prerogatives are prescribed by sophisticated decision making algorithms may feel his alternatives for action reduced and his opportunities for effective, satisfying performance diminished. Both may find their experiences shaped by their routine contact with sophisticated computer systems. They may (1) develop a more global and abstract "system view"; (2) develop keener perspectives on their role in their organizations (Shepard, 1970); (3) emphasize rationality (Argyris, 1971); and (4) consider efficiency as a primary criterion in selecting alternative designs (Boguslaw, 1965). Unfortunately, we know very little about the precise changes in attitudes and values that are a by-product of prolonged access to sophisticated computer systems. Our dim knowledge of actual effects hampers us in finding a meaningful way to create computer systems and supporting environments that are more effectively person centered.

In most current system designs, a person is modelled as a rational information processor (Martin, 1973). Even though time-sharing and error protected systems are justified on a cost benefit basis, we know they are helpful because they decrease frustration and encourage programmers to develop more ambitious designs. Yet within the design of a particular system, the user is usually modelled as a person who simply needs minimal response time (Yule, 1972). We have few means to deal with a person who may seek productive, satisfying work that makes coherent sense, challenges his talents, and fosters a personal sense of competence. Without such a richer image of a person that can be incorporated into system designs and be given a central role on par with rapid development, elegance, and efficiency, we are unlikely to see computer systems that enhance the "humanity" of their most direct and frequent users.

WHAT IS A PERSON CENTERED COMPUTER SETTING?

The previous discussion mentions a "person centered" setting without much elaboration. The direct users of a computer system are one group of people who deserve particular attention. Table 1 contrasts machine centered and user centered values in some detail. Both of these labels refer to idealized types. For example, almost no manager ignores the morale of his work group. Likewise, if a person centered group is so inefficient as to be ineffective, it will not survive. This tentative scheme neglects the organizational style of the group in focus. In particular, issues of power and conflict are neglected. Table 1 focusses upon criteria that are within the purview of computer system designers. Shifts in emphasis along these dimensions toward user centered design may help to foster more personally satisfying work settings. The determinants of satisfaction are complex, but we know that there are strong correlations between work effectiveness, personal sense of competance and job satisfaction (Morse and Lorsch, 1970; Lawler and Porter, 1967). Some of the "user centered" values are reflected in flexible software and error protected systems. In non-routine settings, these are helpful for allowing a user to exploit substantial computer power to simplify his work and increase his sense of competence.

Several guidelines will be implicit in the following discussion: collaborative designs, flexible software, intellible systems, rewarding designers for systems that meet a variety of user needs, and allowing users easy access to system support personnel to effect changes. These proposals require little new technology. Rather, they effect the interpersonal process and design values in the most immediate context that computer technology is used.

MACHINE CENTERED	USER CENTERED
1. Efficiency is emphasized.	1. Systems are valued that increase personal competence and pride in work.
2. Human error is not tolerated.	2. People are accepted as non-rational and error-prone.
3. Systems are designed in purely functional terms.	3. Jobs are designed to be personally satisfying. Automated procedures are designed to fit job needs.
4. Jobs and procedures are designed to simplify machine processing.	4. The burden of precision is placed on the machine. Systems are forgiving.
5. Human relations are ignored as long as the job gets done.	5. Users easily obtain/create systems that meet their needs.
6. Users are forced to match the precision required by the machine.	6. Users can initiate, veto, and collaborate in system designs.
7. System designs are imposed on users. They initiate but never veto system designs.	7. Designs and assumptions are intelligible to users through appropriate technique (modular structures) and clear documentation.

TABLE I

SOME CHARACTERISTICS OF MACHINE AND USER CENTERED ENVIRONMENTS

SIDE EFFECTS AND DIRECT EFFECTS

Advocates for large-scale computing often invoke utopian themes (Boguslaw, 1965). Proposals to automate drudgery out of existence (Rosen, 1972) and to foster a society of abundance which provides high quality services for all (Gabor, 1972; Parker, 1972) underly some of the rationale for computer services and other sophisticated technologies.

Usually these proposals attend to direct effects such as decreasing certain routinized work or rationalizing decision making. Many of the systems described at this conference will be described primarily in terms of such direct effects. In the long run side effects (or secondary effects) may be far more important. The automobile, for example, has helped create a highly mobile suburban society. Its impact is far greater than could be imagined by describing it as a functionally superior equivalent to the horse-drawn carriage. Likewise, the computer is not just a functionally superior machine equivalent to a set of clerks.

The direct effects of computers are the most obvious, although they have not been systematically studied until quite recently (Borodin and Gotlieb, 1972). These impacts include decreased routinization of certain clerical and industrial work, increased organizational efficiency, and a raft of new services which may have been too costly or time-consuming if supported by clerical workers (e.g., credit cards). In some industries skill levels have been upgraded. In addition, large organizations can remain sufficiently efficient to increase the scale of their operations and remain competitive with smaller firms.

SIDE EFFECTS OF COMPUTING SYSTEMS

The side effects are somewhat harder to assess and have been studied in far less detail. Whisler's study (Whisler, 1970) of the insurance industry shows a strong trend towards increased centralization of control. Many decisions made by clerks and their supervisors have either been automated or passed up to middle-managers. Programs automate some supervision, e.g., checking errors and initiating actions that were previously within human prerogative, e.g., billing policy and renewals. In addition, Whisler reports that many clerks seem to work less at their own pace and are more tied to deadlines for computer runs. The locus if decision making seems to move upward from clerical to supervisory to middle-management levels. After automation, clerks and supervisors tended to communicate less with each other, while middle-managers seemed to increase their interactions with each other. He did not study attitudes to these changes. Middle-managers seem to be gaining psychological space and (possibly) variety of interpersonal contact at the expense of their subordinates. Lastly, Whisler observed a shift from "parallel" to "functional" organization. A functional organization groups workers by their skills, e.g., accounting, rather than by the content of their work, e.g., automobile insurance auditing. It is the most efficient and least flexible of organizational patterns (Shull, Delbecq, and Cummings, 1970). However, the introduction of a centralized computing acitvity, which was common in businesses prior to the development of time-sharing and minis, is a strong force promoting a functional organization.

Shepard (Shepard, 1971) studied the differential effects of computer automation and mechanical automation in offices and factories. He carefully collected a set of empirical (questionnaire) data which show that workers feel less alienated from their work in computer automated environments than in mechanized environments. In particular, programmers and operators of process control equipment felt more freedom to control the pace and rhythm of their work, felt their work to be intrinsically satisfying and saw greater relationship between their efforts and the products and services of their firms. (Whisler interviewed non-programming staff; hence the divergence of his results with Shepard's.) Unfortunately his scales do not measure "alienation from self" or "alienation from others". His very specific results must be treated with some care. A recent review of computer impacts (Borodin and Gotlieb, 1972) erroneously claims that Shepard's findings concern alienation in general. In fact it is not rare for workers with a diminished concept of themselves to be highly satisfied with a restricted work context (Argyris, 1964). Alienation allows many varieties (Seeman, 1955) which do not appear or disappear in unison.

Joseph Qualitz (Qualitz, 1970) studied the impact of computing in a custom engineering firm. Qualitz's research is case study oriented, in contrast to Whisler's survey of the insurance industry with a uniform questionnaire and Shepard's choice of carefully matched groups for intensive analysis. He provides details of twp episodes in which computer specialists attempt to automate certain managerial decision-making procedures: inventory control and the pricing of small-lot custom items.

In one situation, the sales manager who is responsible for pricing estimates and increasing sales was not consulted in the design of an automated pricing algorithm. He was ignorant of its assumptions, did not trust its estimates over his know-how, and was afraid that he would have to justify each of his price estimates that deviated from those prescribed by the program. The program designer implicitly attempted to control the pricing procedure, but did not have the responsibility for maintaining sales. The sales manager viewed the program with alarm and sufficiently sabotaged its use so that it was eventually ignored. Later, when the management wished to automate inventory control they were careful to encourage the system designer to collaborate with the purchasing manager in creating the appropriate algorithms. The manager felt valued and understood the assumptions that triggered the various purchase requests. After this involvement he did not view the inventory system as an intrusive monster that would gobble his autonomy. Rather he saw it as a tool which freed his time so that he could attend to other work.

These three studies are typical of the reported empirical analysis of computer impacts. Each of these is illuminating, but flawed. For example, Whisler relies upon the reports of managers to collect data about the activities of clerks and supervisors. Managers' perceptions of the time employees spend at various tasks are often inaccurate. Unfortunately he makes no attempt to corroborate his estimates through direct observation. Unfortunately, these studies are noncomparable. Each focuses upon somewhat different work roles. Both Whisler and Shepard performed their studies when most offices were using second generation systems and some were shifting to third generation. Companies automated with mini-computers may lead to wholly different work and organizational styles. Computer based systems have rapidly become essential in large, complex industrial business, government, and institutional settings. How little we know the precise second and third order effect of our new technology! Unfortunately, such studies are not yet legitimate computer science nor of particular interest to most social scientists.

ATTRACTIONS OF COMPUTING

At this time the primary computer users are large bureaucratic organizations which typically do not foster humanly vital contexts. If there can be no "person centered computer technology" without person centered organizations, then perhaps we should focus on deep institutional changes. Then we should cease to speak of computer technology as particularly humane until a large fraction of the total computing is done by distinctively person centered organizations.

Computer systems actively promise cheap information processing and organizational power:

(1) procedures may be routinized, predicted and controlled;

(2) more services may be offered at a greater overall efficiency.

The sensibility that accompanies automated systems places a premium of value on efficiency, control, and predictability. From the viewpoint of an automated system, individuals should be easily categorized and constrained in their choices. From a person centered viewpoint, the environment should be sufficiently flexible for a person to manifest his uniqueness along many (unpredictable) dimensions. A person should be allowed a wide spectrum of choices, some of which are not preordained. Efficient systems need tame people; spontaneous individuals are disruptive. In contrast, integrated autonomous people need a flexible system and experience control as constrictive. These commonplace comments apply to complex integrated systems like bureaucracies and assembly lines as well as to automated systems. But automated procedures are particularly attractive because they increase efficiency and aid in control. In a person centered organization which begins to automate, there will be continual tension between automation and individuality. The small firm studied by Qualitz introduced computers as an engineering aid. Later, in seeking additional applications for an under-used machine attempts were made to automate routine decision making. These efforts lead to the separation of responsibility from control, and could easily constrict the psychological space of certain managers. Guidelines for a person centered computer technology are particularly necessary in a person centered organization.

DESIGNERS AND USERS

What is ignored by neglect, tends to be diminished. In a recent study of public sitting spaces in New York City, William Whyte (Whyte, 1972) found that numerous plazas allowed less sitting space after they were constructed than was previously available. City residents who like to stroll, sit and talk or watch people have few public places to lounge. They are not the clients of the plaza architects and their needs are ignored. Whyte also noted that a few minor changes of design (e.g., lower edges, wider steps) would give many plazas much more sitting space. However, steps and ledges are built of concrete or stone. Once erected they are costly to remove or modify. Whyte's study illustrates a case common in architecture and other large scale design disciplines: specific human needs neglected in the design phase are unlikely to be met by the design, and the system may be costly to adapt after construction.

A good deal of computer technology is a design discipline similar to architecture. Unfortunately, system designers, like architects, rarely take on the computer users as clients. However, computer software, unlike reinforced concrete, may be designed for flexibility and post hoc modification.

Who is the user? An applications programmer is a "user" with respect to a computer support group. In turn, his clients see him as a designer with substantial power. In the example of the open plazas in New York City, Sunday strollers are the users. In fact, a usable plaza may be more necessary for them than for the people who work in the building which the plaza surrounds. In the case of the inventory control system, the users include the purchasing manager and some of his staff assistants. Unfortunately, many users are not the pro forma clients of a designer. These silent users usually are ignored even though they may be the largest group that has contact with the system. A philosophy of collaborative design must include some good means of identifying the various recipients of a system and including their diverse needs in the initial design phase. The identification of user groups who are treated as clients constitutes the political dimension of user-centeredness. This contrasts with the human-growth aspect which emphasizes the way an information system meets the psychological needs of a particular group of users, once they are accepted as clients.

Somehow designs ought not to be frozen forever. Users need some easy access to the people who support/maintain a system in order to make their needs known. We may well need person to person paths (ombudsmen?) around a system even in fully automated settings. If the purchasing manager leaves, the person who replaces him should have some means of interacting with the inventory control algorithm and not simply have it imposed on him. Flexible and inte-ligible systems are as essential as good space-time economies. Our current sensibility places most of the burden on the users to adapt to existing systems. We often neglect the unique capacity of computers to provide very plastic environments. A person centered technology may cost more dollars in the short run. Argyris notes that experience of psychological success provide a necessary basis for self-acceptance. How cost effective is it for a worker to experience continual tension, frustration, and diminished self-esteem?

Qualitz's study shows the effectiveness and psychological impact of different designer-user relationships in automating decision making. On one hand, the automated pricing program was _imposed_ upon the sales manager who had sufficient power to reject it. The inventory control system was designed _collaboratively_ with the purchasing manager who accepted it as a useful aid. Both systems rationalized decision making. While their structural effects upon the organization would have been similar, the collaboratively designed system allowed its user a greater sense of personal worth and potency. A person centered technology is characterized in part by its attention to fostering personal meaningfulness, self-esteem, and experiential richness. Here the design _process_ rather than _content_ was crucial for providing a less constrictive work setting. More generally, there is no special technology which is person centered in contrast to some other technology which is not. Rather, the quality and the values fostered by each technologized environment reflects its degree of person centeredness.

Argyris (Argyris, 1971) studied a management science-operations research (MSOR) team employed by a multi-national multi-billion dollar firm. He found that the MSOR team tended routinely to condescend to the less technical line managers and attempt imposed designs. Both line managers and MSOR team members were highly defensive, intellectualized, and unable to relate to each others fellings. The MSOR team had difficulty in having its ideas accepted and programs implemented. Few of the impediments were technical; most lay in the unexplored regions of their interpersonal underworld. In studying group problem solving in industry, Argyris (Argyris, 1965) found that many professionals--managers, scientists, and engineers tended to have trouble dealing directly and openly with their emotions. In contrast, they played with their ideas with relative ease. He found that difficulties in dealing with interpersonal relations openly obstructed collaborative problem solving and was common to many high level professional groups. Over-intellectualization and the dimunition of emotional expressiveness is hardly restricted to MSOR teams and computer science professionals. Ironically, the common ethic of regarding task-related expressions as the most legitimate and explicit expression of interpersonal tensions as the least legitimate can easily reinforce "interpersonal incompetence". A task group's efforts to form a productive consensus can then be undermined.

A successful person centered environment develops the best and fullest humaneness in each person (Maslow, 1971). In the constrictive situation described by Argyris, both members of the MSOR team and line managers felt uncomfortable in dealing with interpersonal feelings. Their behavior is highly predictable and extends over a small spectrum. Moreover, neither group was encouraged to grow beyond its interpersonal difficulties. These were accepted as given.

Unfortunately, such situations are more the norm than the exception (Argyris, 1965). Collaborative designs bring the recipients and users of a system into the design phase as meaningful participants. Much rhetoric is given to soliciting information from users for designers This is precisely the tactic chosen by the MSOR described earlier as they continually attempted to ellicit information about decision making from the line personnel. They felt tremendous demands to be open to the MSOR team, but saw them as unrevealing and secretive in their use of the information they received. The MSOR team viewed itself as a rational reform group that would supplement the "inadequate" line managers with efficient systems. Active mutual collaboration was hardly possible. At times we develop more respect for our technologies than for the people they are designed to aid. While we are experts and specialists, we need enough humility to work en rapport with less sophisticated clients.

Competitive expertise and hyper-rationality are common to many of the professional settings studied by Argyris. Technical design is a symbol manipulating activity. Collaboration requires a subtle set of social skills which are typically absent in the design process. The norms carried by the MSOR team reflect their technical training and organizational values as much as their use of computers as a medium. Perhaps it is too much to ask of a particular technology that it foster personal expressiveness and vitality in environments that it predominates. But if particular technologies can only transmit the values, including the pathologies, of the contexts in which they are embedded we can have little hope of humane technologies without substantially humane organizations.

Several guidelines have been implicit in the preceding discussion: collaborative designs, flexible systems, and allowing the spontaneous flow of feelings as well as ideas. None of these require new technology. Rather they demand an appropriate set of priorities.

Designers simply need to understand the potential and likely impacts of their design alternatives. A recent study of control panel designers (Meister and Farr, 1966) showed that they held a set of priorities similar to those of human factors experts. Yet they were unable to translate their values into actual designs. They felt that human factors criteria were "obvious", disregarded available data on parameters for humanly effective designs, and created products which were ill-conceived from the point of view of the ultimate users.

One typical example that highlights the current situation is the predominance of terse, demanding and occasionally sarcastic error messages. "ERROR S72: TERMINAL PUNCTUATION OMITTED" is far more common than "PLEASE ADD A FINAL PERIOD (S72)". Demanding, perfectionist error messages largely reflect the values of demanding perfectionist system programmers. Rewriting these messages to be more forgiving is simply a cosmetic change; nothing intrinsic to computing and its deeper impacts is effected. I have discussed this (trivial) instance with system programmers at several computing centers. I was impressed by their uncanny ability to defend the status quo through such excuses as quibbling about the few additional words of memory space required by softer messages and their other priorities. Since the cost of this change seems minimal and no new technology is needed, the resistances lie deeper. Many compilers are fragile and complex. Even a simple change of error message may require a programmer to wade through a complex system he barely understands. His intervention may effect to some other subsystem and the repair may take considerable diligence. The compiler may well be seen as too complex for tampering except when absolutely necessary. This inability to respond to users and their needs is common among contemporary computer professionals.

Terse error messages provide a small means for diminishing feelings of psychological success. To the extent that we create computer systems which are friendly, responsive and forgiving we can help support distinct aspects of psychological success. The "DO WHAT I MEAN" system (Teitleman, 1972) which corrects for occasional misspellings and certain syntactic errors is a simple example. In a deep way, the solutions are not simply technological. But we can shift more of the burden for precision onto our computers and leave the users less tense and frustrated to attend to other work.

A person centered computer technology continually attends to the human cost of each design that restricts personal expressiveness, autonomy, and dignity. It attends to process as well as content. To that extent it may well clash with other trends and values in an organization that fosters competition over collaboration, that sacrifices personal autonomy for efficiency and control, and encourages fragmented depersonalized roles for ease of supervision. The issues that touch the public such as privacy, planning systems, access to information systems and community control require a somewhat different treatment than is offered here. In that sphere power politics, institutional styles, economic forces, and differential access to information play a more dominant role. Much of our professional rhetoric focusses upon computer systems as benign change agents. Actually, we do not know to what extent computer centered environments simply reflect the values of organizations that house them. But if our use of computing is to be humanly benign, it is not too much to ask that we foster experientially rich environments that enhance the sense of competence and self-acceptance of users. If computer professionals are not used to gratifying environments and responsive designer-client relationships, it is unlikely they will be able to foster them for a larger public.

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