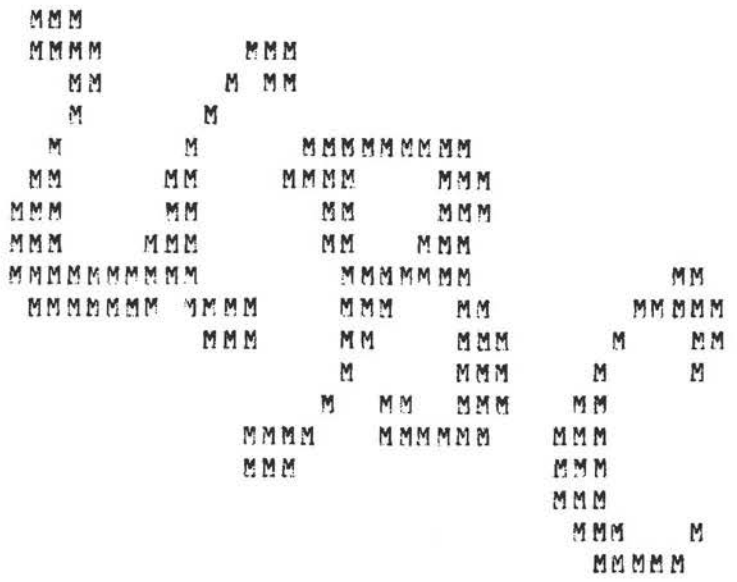

Computers and the Mechanization of Judgment

by

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ABSTRACT

Computer-based information systems are playing an increasingly important role in organizational decision-making. Although high level managers are not in imminent danger of extinction, many managerial functions have been substantially altered or replaced by computer systems. These developments are viewed here as an extension of bureaucratic rationalism, the peculiar innovative spirit of large-scale enterprise. Advanced information technology in large organizations appears to promote the elaboration of hierarchically structured control mechanisms, and to further the resolution of complex decision tasks into routine procedures. Since the technology could in principle be used to support radically different modes of organization, an explanation must be sought in the evolution of bureaucracy.

Efforts to improve productivity and efficiency affect the distribution of power and authority, so that technical innovation in management raises serious ethical and political problems. Historical observations and empirical results point to a contradiction between bureaucratic rationalism and individual autonomy. This contradiction is revealed in the impact of computer applications on the conduct of certain classes of decision-makers. Policy issues are transformed into technical questions, and opportunities for exercising independent judgment are diminished as analysis of means displaces exploration of ends. I will attempt to show how this transformation is accomplished in the rationalization of functions which typically accompanies the introduction of computer systems.

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Introduction

The vitality of democratic political institutions depends on the citizen's ability to make and register informed judgments on policy issues. This is one of the pieties of the American system of government: it is embodied in the Constitution and has guided much of our concrete political experience. Although the principle is very much alive today, it has undergone major modifications. The growth of large-scale enterprises and the increase in social complexity have generated new mechanisms of coordination and control. Elected officials have followed the lead of entrepreneurs in delegating authority to professional managers, and the conduct of our economic and political affairs is increasingly left to technical experts.

The consequences of these changes in social organization are strikingly evident in events of the past decade. Policy questions of vital concern to the general public have been transformed into technical matters to be resolved by allegedly unbiased and dispassionate specialists. At the height of the Vietnam War controversy, the American public was told that the complexities of foreign policy require specialized knowledge and skills, and hence that the average citizen could not be expected to make intelligent judgments. The formation of political policy was presented as an exercise in rational decision-making,

thus shifting debate from ends to means. This pattern has been repeated on countless issues of local, national, and international significance.

The effects of the managerial revolution on the citizen's ability to exercise judgment are difficult to assess. But there can be little doubt that the coupling of power and technique is intimidating. Surely this coupling has had something to do with the disposition to defer to experts on questions of public policy. Although dystopia may not be around the corner, this kind of abdication of responsibility is a serious problem. It is serious because it points to a contradition between bureaucratic rationalism and the principle of popular sovereignty.

Computer technology with its satellite techniques is yet another instrument in the inventory of bureaucracy. The principal use of computers is administrative whether in large corporations, schools, hospitals, or government agencies. According to the conventional view, computer-based information systems are indispensable to the mass society. The technology itself is pictured as a deus ex machina introduced just in time to save us from being crushed by the staggering demands of our record-keeping institutions. Although the impetus for developing computers is linked to growing social complexity, the computer is regarded as a neutral instrument - one which may be adapted to serve any social purpose.

This view does not stand up to careful scrutiny. Computers are instruments, but they are not neutral; their instrumentality is contingent on social and historical possibility. Information

technology is an extension of the tools of bureaucratic rationalism, and as such it is embedded in an ideological matrix. It is purely wishful thinking to suppose that computers can be used to achieve genuine power sharing just as easily as they are being used to consolidate power in the hands of elite managers. What I propose to examine is the way in which computer-based systems impinge on the activities of decision-makers, and contribute to the transformation of policy issues into questions of technique.

Computers and Decision-Making

The success of computer applications in automating routine administrative tasks suggested the feasibility of harnessing the computer as a decision-making tool. Although high-level managers are not in imminent danger of being replaced by machines, important changes in administrative practices have been brought about by the introduction of computers. Accounting functions such as billing and payroll have been computerized in most large organizations; inventory control systems are commonplace; and conventional record-keeping operations as well as a variety of other functions have yielded to computerization. The dividing line between what can and cannot be automated is not clearly drawn. As Herbert Simon (1965) has observed, there is a continuum of decision-making activities ranging from programmed - routine, highly structured, repetitive - to non-programmed - unstructured, ill-defined, unique. As new innovations enter the scene, we are forced to revise our notions of the indispensability of the human manager.

Despite the singular importance of information technology, it is misleading to view the computer as the spearhead of revolutionary organizational change. The euphoric literature of the 1960's depicting computer-based management information systems as the ultimate in administrative achievement treated the new technology as a historically isolated phenomenon. This point of view detaches technical innovation from the social environment in which it unfolds. As a result it becomes intellectually respectable to ignore or minimize the tendency of computer applications to centralize authority within organizations. Such a tendency can be dismissed as a transient response or as an accidental feature of early experimentation with new methods. Since, one may argue, the computer is simply an instrument which can be used to centralize or decentralize control mechanisms, there is no reason to believe that the authoritarian model will prevail. I submit that this reasoning is specious precisely because the effects of technical innovation cannot be understood apart from the social forces articulated by innovation.

The inadequacy of the conventional analysis of the so-called computer impact is not entirely innocent. There is an ideological motive in attempts to disguise the authoritarian control functions of information technology. This of course does not imply the existence of a conspiracy to keep us in ignorance. Rather it points to the inclination of elite groups to legitimate the foundations of their power and privilege. A notable case in point is the argument that hierarchical

organization in society is the result of natural evolutionary processes. Hierarchy is seen to be built into the structure of a universe in which the achievement of economical and efficient production - for what and for whom we are never told - is a central purpose. The beneficiaries of current social arrangements seek to reassure themselves by creating cosmic myths.

Information technology is closely associated with rational decision-making. Management information systems are conceived for the purpose of assisting administrators in making decisions. The design and intended functions of such systems issue from a model of decision-making based on a formal analogy with scientific practice. In this model the activities of the manager parallel those of the scientist. Decision-making processes are resolved into three kinds of activities which Simon (1965) terms intelligence, design, and choice. The intelligence phase is characterized by a search for conditions requiring decision. Once a problem has been identified, the decision-maker embarks on the design of a solution by exploring courses of action. Finally, a particular course of action is chosen.

The formal analogy between idealized decision-making and idealized scientific practice is straightforward. Intelligence activities correspond to making observations on the state of affairs. The design of solutions encompasses two aspects of scientific investigation: hypothesis formation and testing. Exploring the consequences of different courses of action calls for the construction of models or the formation of hypotheses

which allow the decision-maker to study the effects of alternative policy choices. Evaluation or ranking of policy choices is effected by comparing desired outcomes with hypothetical outcomes derived from the models. The final step of choosing a course of action is analogous to the scientist's selection of the best hypothesis warranted by the evidence.

The main justification for this formal analogy rests with the model building activities of rational decision-making. Although the idea of scientific management antedates the computer, this characterization of decision-making has been elaborated and extended under the influence of computer applications. The operational methods developed during World War II to solve logistical problems merged with the general purpose digital computer to furnish powerful management tools. Complex systems could be simulated by means of computer programs, and optimization schemes became practicable. Decisions involving resource allocation and scheduling, for example, proved amenable to these techniques. Instead of relying on the judgment of an experienced manager, it was now possible to simulate an entire production process and to formulate optimal scheduling strategies.

The success of these computer applications and recognition of the growing importance of information processing led to the concept of the management information system. Apart from the general observation that such systems are intended as management aids, the concept is not very well-defined. In practice, applications identified as management information systems vary in sophistication from computerized document retrieval to the

fully autcmated decision-making characteristic cf process control in cil refining or chemical production. In the former case, a human manager might use the information system tc cbtain reports on organizational activity which bear on a particular decision task. Computerized process ccntrol virtually eliminates the human element except for maintenance.

Theory and practical applications exhibit reciprocal influences. Analysis of decisicn processes in terms of scientific practice reflects an attempt to shape the reality of organizational decisicn-making. At one and the same time the scientific practice paradigm is an explanation and a force for change. The objective of the new management methods is rational decision-making patterned after the rational activity of the scientist. Stated thus abstractly the the goal seems sensible and beneficent. Closer inspection reveals blemishes.

Decision-making is not isomcrphic to scientific practice. The ideal scientist pursues knowledge or truth either for its own sake or for the sake of mankind collectively; the ideal decisicn-maker pursues knowledge in order to advance personal or organizational ends. Truth for the decisicn-maker is contingent on goals which are ultimately subordinate to the pursuit of profit. The analogy between decisicn-making and scientific practice forces a strict separation of means from ends. Goals are assumed as given and then suppressed in the scramble to represent contingent prcblem-solving activity as pursuit of knowledge. By focusing exclusively on the raticnality of the methods, we fall prey to the delusicn that limited organizational objectives represent collective social aims.

In addition to obscuring the contingent aspect of decision-making, the scientific paradigm sanctifies particular goals. Considerations of efficiency, economy and productivity formulated within the pseudo-scientific framework give the appearance of universal values. Although these concepts are defined strictly in terms of organizational costs and benefits, it is virtually heretical to question the appropriateness of the definitions. The decision-making paradigm is an ideology posing as a theory. Consequently, attempts to extend the basis of cost-benefit analysis by introducing broad social issues are viewed as utopian nonsense.

Power and Rational Organization

Notwithstanding the claims of apologists, the principal function of management is control. The hierarchical structure of modern organizations did not spring from the logical demands of efficient production. Power and status are determined by relative position in society's system of production and hierarchical organization places a premium on control functions. Doubtless it is true that economies of scale often result from large-scale enterprise. But it is equally true that bigness is not an absolute good. When an entity exceeds a certain threshold size, economies of scale quickly turn into diseconomies. The very fact that determination of threshold values has not received much attention suggests the operation of evolutionary forces which have nothing to do with efficiency. Large enterprises represent enormous concentrations of social

power and require ever more elaborate and refined control mechanisms. The pervasive belief that rational management in gigantic, hierarchical organizations provides the most efficient form of production is a myth that serves to underwrite a particular distribution of power.

An example from the automotive industry may help to clarify the relationship between size and economy. Writing in the 1920's, Henry Ford pointed proudly to the achievements of mass production. At that time a Ford car cost about one-third of an assembly line worker's annual wages. After a half century of expansion and consolidation, the price of a Ford car still represents the same proportion of a worker's wages. Moreover, the products of today are not appreciably different in function, durability and reliability from those of fifty years ago. Even on the basis of conventional criteria of efficiency and economy, very little if anything has been gained by the increased scale of automotive production.

The ideological nature of managerial rationalism becomes apparent when one examines those social effects of production normally excluded from organizational cost-benefit analysis. Organizations which produce goods or provide services cannot operate without supporting facilities external to themselves. Manufacturing enterprises require communication and transportation networks for acquisition of raw materials and distribution of finished products. As the scale of manufacturing increases, so does dependence on such facilities. Large-scale, centralized operations incur social costs which are not reckoned among production costs. Although some of these

external social costs are indirectly represented on balance sheets through taxes and other payments, they cannot be adequately represented in this form. While profits accrue exclusively to the organization, costs are borne by society as a whole.

Consider the implications of a decision to consolidate scattered manufacturing operations into a central facility. Surely such a decision would take into account capital investment for plant, and the costs of distribution, packaging, control, etc. However, there are additional factors which would not enter the assessment. Transportation of raw materials and finished products requires energy, and increased demand must eventually reduce finite supplies. Packaging for distribution requires materials, and energy to produce the materials; in addition, waste products are generated whose disposal further taxes energy supplies and degrades the environment. These are tangible social costs which must be weighed against the economies of scale expected from centralized production.

Changes in our social arrangements also contribute to the price we pay for these alleged economies. Concentration of capital and resources creates vulnerabilities which increase the need for social control. Huge investments in plant and equipment must be protected. What is more, transportation and communication facilities become indispensable, and the potential havoc of disruptions in service necessitates increased security. As both Napoleon and Hitler found their Russian campaigns, the logistics of supply is at least as important as technical superiority in arms. Over extended supply lines amplified the

effects of partisan activity and reduced the effectiveness of combat troops. The power blackouts, airplane hijackings, and the Arab Oil Embargo testify to the growing vulnerability of contemporary American society. New initiatives currently being contemplated in the financial sphere pose yet further risks. An electronic funds transfer system designed to support payments transfer and point of sale transactions could lead to theft and fraud on a colossal scale. Proponents of such a computer-based system are not unaware of the security problems, but the costs - both monetary and human - will be borne by society as a whole.

Beyond the costs of vulnerability that can be measured, however crudely, in dollars and cents there are imponderables which may in the long run prove to be far more significant. Bureaucratic rationalism makes no allowance for the effects of centralization of power on democratic institutions or community affairs. We have yet to advance beyond the identification of quality of life with crude materialistic measures of living standards. Computer applications which widen the gap between elite management and the ordinary worker or citizen are introduced with impunity. Under such conditions the concepts of genuine power sharing and citizen participation in decision-making are empty slogans.

The observed effects of computers on decision-making are tied to historical forces which continue to shape our society. Those who are caught between enthusiasm for information technology and dismay over how the technology is actually used are simply whistling in the dark when expressing the belief that computers can be put to any use we choose. The fundamental

changes in the system of production accomplished during the industrial revolution created new forms of organization with their own peculiar requirements. In particular, the factory system has become the dominant model of organization. Although factory production was in turn made possible by prior economic, social, and cultural developments, let us focus on those features of early capitalist production which bear directly on computers in decision-making.

The factory's monumental achievement was the rationalization of production methods. Traditional practices were subordinated to the rational requirements of increased productivity and efficiency. The story is a familiar one but warrants repeating. Several ingredients went into the making of the new mode of production. The steam engine furnished a reliable source of power with which to drive many machines under one roof. But efficient use of concentrated capital resources required new manufacturing methods. In response to these requirements work underwent radical changes. Complex tasks were resolved into simple component steps which could be performed by machinery. Thus the craftsman was replaced by the unskilled or semi-skilled machine operator. As Adam Smith showed so graphically with his pin making illustration, the skilled craftsman could not compete with the factory.

The rationalization of production within the factory facilitated further concentration of capital. Standardization and interchangeability of parts made it possible to achieve economies of scale through increased production runs. Later the assembly line gave birth to mass production as we know it today.

There are two basic components in the process of rationalization: mechanization of task performance and the automation of control. The first phase of the industrial revolution addressed the problem of mechanization. Although this problem has not been solved completely, a pattern for reducing complex tasks to sequences of elementary mechanical operations has been established. Since the early part of this century, the focus has been shifting to the automation of control. Computerized decision-making is but the latest extension of this component of factory rationalism.

The development of the computer itself reflects the dual facets of this impulse. Babbage's singular accomplishment was the fusion of two streams of innovation: the mechanization of arithmetic and the automation of logical control. Mechanical computation in the modern sense was launched in the early seventeenth century. After much experimentation practical devices were being produced on a commercial basis two centuries later. Babbage himself credited the control mechanism of the Jacquard loom as the inspiration for the punch card control system envisioned for his Analytical Engine. Needless to say there were other influences on Babbage's design - most notably the work of nineteenth century mathematicians in symbolic logic. His machine was of course never built, but in conception it embodied the essential features of a general purpose digital computer. The two streams of development and their synthesis show that the peculiar notion of rationality reflected in factory organization is deeply rooted in Western Culture.

Whatever the origin of the rationalizing impulse, it has

enforced its discipline on the whole of modern society. From the corporation to the university, in government and virtually all major enterprises, factory rationalism prevails; and wherever it appears one also finds a concentration of wealth and power. The large organizations which dominate the production of goods and services and furnish the administrative apparatus of the state continue to grow and become more centralized. Hierarchical structure, reductionism, and automation are the guiding principles of this evolutionary process. The computer's role in this scheme cannot be neutral.

Automation of decision-making will proceed according to the needs of organizational control. What we are witnessing today is the resolution of management functions into tasks which can be implemented in computer programs. The middle manager is now suffering the fate of the skilled craftsman before him. With the disappearance of another link in the rigid chain of command, the gap between top and bottom widens.

Values and Responsibility in Decision-Making

The organizational model embodied in the factory has become second nature to the modern manager. Factory rationalism has become managerial or bureaucratic rationalism - the difference being no more than a shift of emphasis from the techniques of production to the techniques of control. The spirit of innovation that gave us the assembly line now informs the attack on decision-making. Industrialization has turned labor into a commodity and the manager is just as much subject to this fact as the unskilled worker. As automation proceeds the context of

decision-making is radically altered, and the manager is confronted with conditions which begin to resemble those of the craftsman in the early stages of the industrial revolution. One's relationship to work, to the organization, to society, and to one's self are all changing; and a new dispensation is evidenced by constraints on the exercise of moral judgment.

Although the public officials and corporate managers of the present day certainly have no monopoly on corruption and moral laxity, the widespread concern about misconduct suggests the operation of something more than pure chance. At the very least one must admit that the daily newspaper accounts of white collar crime, the business community's attempts at self-examination, and the recent FBI initiative aimed at halting corporate fraud all tend to support the hypothesis linking irresponsible conduct to structural change. There is a curious paradox in bureaucratic organization. Hierarchical arrangements promote the concentration of power at the top levels of management; but they also diffuse technical responsibilities. Rational organization requires a division of labor into functionally specialized subunits. As the decision-making activities of a given subunit become more well-defined and amenable to automation, autonomy and authority evaporate. What remains is a technical responsibility which may ultimately be incorporated into a computer program. Thus the diffusion of technical responsibilities does not entail a corresponding diffusion of moral responsibilities.

The fluid boundary between programmed and non-programmed decision-making processes seems to divide the management

hierarchy into two qualitatively different groups. On one side are the wielders of power and authority who set organizational goals and broad strategy; on the other, are the specialized technocrats with very limited policy-making authority. For an individual in the latter group, it must be exceedingly difficult to maintain strong organizational loyalty, and virtually impossible to relate personal actions to the impact of organizational policy on society. This may account for the attitudes of the white collar criminal who claims that his actions hurt no one but the corporation, and are therefore justifiable - an attitude that Donn Parker has found in his research on computer crime to be quite common.

Values are shaped by experience and articulated through the exercise of judgment. If opportunities for making moral judgments are limited, the ability may atrophy; on the other hand, unlimited opportunities are no guarantee against the distortions which come from operating in an isolated environment. The conduct of both upper and lower level managers is thus affected by automation. Information systems act as a buffer between top and middle management. Attempts to rationalize information flow lead to formalized, unidirectional reporting procedures - information on the state of affairs flows up the hierarchy while commands flow down. Direct, personal interaction is diminished, and as a result the likelihood of distortion increases. This phenomenon was demonstrated quite clearly in the reports issued by the Pentagon during the Vietnam War. As many observers noted at the time, more bridges were destroyed in air strikes than could possibly have existed in the

region, and the number of Viet Cong troops killed exceeded the total population.

Studies of the impact of computers on management show that the middle ranks have been most dramatically affected by the introduction of information systems. Some positions have been eliminated, others redefined. The net effect appears to be a decline in autonomy and responsibility at this level in the hierarchy. Work becomes more routine and subject to tighter controls. Although operating management is affected in similar ways, the effect seems less dramatic because expectations are different - the functions of the lower echelons had succumbed to mechanization before the advent of computers. Only top management seems to have escaped the computer's influence. This is due partly to the failure of management information systems to live up to their promise. No one is yet able to run a corporation from a computer terminal. However, the apparent lack of impact also suggests that investigators have not been asking the right questions.

If one views the computer as an isolated instrument having no connection with the process of bureaucratic rationalization, one is not likely to look beneath the surface of the technology's impact. Such a view contents itself with noting the growing sophistication of top management - no longer is the computer salesman's pitch swallowed uncritically. Nevertheless, promotion of the computer has not been in vain. Despite the deflation of outrageous claims, the management information system is a viable decision-making aid, and its limited success reinforces expectation of further advances. This outcome

follows from a commitment to bureaucratic rationalism, not from a chance encounter with innovative computer applications.

The questions we must raise concern the constraints imposed on decision-makers by organizational structure. Bureaucracy seeks to substitute objective, technical procedures for subjective human choice wherever possible. In a hierarchical organization this works to diminish direct human interaction. Information becomes an abstract commodity which must conform to specific record formats and satisfy the requirements of reporting methods. Clearly not all species of observations can be accommodated. This constrains the decision-maker's perception of problems, and restricts the field of possible solutions. The danger herein does not stem from the mere fact of limited choice or perspective - all social arrangements impose limits; it comes from wholesale rejection of vital areas of human experience that do not fit into the bureaucrat's construction of the world. What is more, the rejection preserves the power of elite groups. By prescribing the criteria for admissible evidence and establishing the rules of inference bureaucracy predetermines the conclusions that may be drawn.

Cryptonormative technique is a dangerously authoritarian feature of bureaucratic organization. It inhibits social and political initiatives, and stifles dissent. One manifestation of this phenomenon is datamania - the compulsion to gather data whether appropriate or not. A recent example concerns certain anomalies in the dietary habits of Americans. The Privacy Journal of January 1976 reported that Edward Peeples, Jr., a

medical sociologist at Virginia Commonwealth University had compiled anecdctal evidence showing that thousands of impoverished Americans rely cn pet food for a significant portion of their diet. Peeples rejected the inexorable call for a national survey citing the obvious fact that no cne is likely to volunteer infcrmatiocn cn a practice that reflects failure and degradation. He observed further "Those who deny the reality cf poverty, hunger and malnutrition in America have always had an insatiable appetite for 'hard data' from thcse of us whc have witnessed or experienced these misfcrtunes first hand." Since large bureaucracies concentrate tremendous power in the hands of high level managers, the alleged requirements of rational decision-making serve ideological purposes and partisan interests. Insistence on "hard data" is nct always motivated by a disinterested search for knowledge.

The conditions that demand and support autcmated decision-making carry liabilities which are incomprehensible tc the bureaucratic rationalizer. Herbert Simon's argument that hierarchy is a natural evclutionary principle provides a case in point. Hierarchy is represented as nature's way cf achieving stable and efficiently productive units. Since centralization of control is beneficial for biological organisms, it should also be so for sccial organizations. To secure the benefits of hierarchical systems we have only to experiment with the relative sizes and interrelations of the subunits. The possibility that the conventional goal of productive efficiency may be inappropriate for certain kinds of social enterprises is not admitted. Ncr is the historical fact of centralizatiocn of

power taken into account. The need for wider participation in decision-making is discounted. Large-scale enterprises surely have their place in human affairs, and in principle rational methods of organization are desirable. But in our own society, the drive toward rationalization issues from the will to power, and distorts the priorities of human community.

The Imperialism of Technique

Our dependence on technique goes far beyond the habitual use of tools. The problems we deem important, and the approaches we are willing to entertain for their solution are determined in large measure by the instruments at our disposal. Technological success has dulled our critical faculties, and obscured our vision of the historical coupling of power and technique. Thus we are duped by arguments which insist that to act rationally we must avail ourselves of the peculiar tools and methods placed before us by this or that neutral and benign technology. Rationality is equated with the use of specific techniques; to deny this facile equation is to compromise one's credibility, and to be dismissed as a crank who wants to turn back the clock on progress. Obviously the challenge to conventional wisdom is not merely a philosophical quibble. The so-called rational approach to decision-making materially affects social policy, and it does so in ways that have nothing to do with objective problem solving methods.

Technique is imperialistic when the use of particular methods leads to de facto modifications of priorities and goals. Proponents of management science methods would have us believe

that such an idea is utter nonsense because tools are neutral. Unfortunately there are all too many instances of imperialistic technique in organizational decision-making. Policy issues are transformed into technical problems by design or by default. In either case the technical apparatus manipulated by the decision-maker plays a major role in the formation of policy.

Consider the development of systems for administering welfare programs. Since such programs are very costly, they are natural targets for the application of rational decision-making methods. Moreover, heavy information processing requirements suggest the desirability of introducing computers. Now as everyone knows computers are very good for keeping track of transactions. So, despite an expressed desire for genuine reform, efforts to rationalize welfare schemes focus on controlling fraud and formalizing reporting practices. Neither initiative is likely to achieve basic reform, and both of them emphasize the surveillance component of the welfare system. The needs of welfare recipients and the community at large are subordinated to what is technologically feasible. This comes about not primarily because of the opportunism of individual administrators, but as a consequence of the technical apparatus of bureaucracy.

The role of technology in shaping or redefining policy objectives is especially insidious because of the pretended neutrality and objectivity of the instruments employed. As Ida Hoos (1967) showed in her assessment of the abortive attempt to apply systems analysis to the welfare problem in California during the 1960's, the analysts were not objective but rather

ignorant of the problem. The methods employed placed constraints on the model which led to arbitrary decisions about assumptions to be made, data selected as significant, objectives to be defined, and values assigned. Administrative information requirements were modeled in terms of the capabilities of computer systems rather than in relation to the functions of welfare. The presumption of the systems analyst, who is largely ignorant of the substantive problems, is only partly to blame for this. Inappropriate models are inevitable under the influence of the drive toward rationalization. The structure of the decision-making process calls for the transformation of policy issues into technical problems. This is clearly evident in the self-perpetuating myths which promote the development of information systems, namely the belief in the efficacy of ever greater quantities of information processed by ever more powerful computers and managed by systems experts.

The effects of burgeoning computer applications on the conduct of social workers can only be surmised. Here as elsewhere the momentum of technical innovation reduces the public to passive observer of events. Unfortunately there will be no hard data available until it is too late to do much about the current movement toward computerization. Hence the need for informed speculation. Professional social workers occupy positions analogous to the lower levels of management. There is no reason to doubt that information systems will affect them just as such systems have affected their counterparts in other large organizations. Computerized record-keeping systems which provide statistical information for managers and permit client-

tracking will require standardized reporting procedures. Standardization is of course necessary to facilitate information processing. Some supervisory positions might be eliminated, but the greatest impact is likely to be on the relationship between case worker and client.

The global objectives of the welfare system are at stake in this relationship. Welfare policy, like criminal justice, may aim for economic and social rehabilitation, or it may settle for custodial maintenance. It is hard to imagine how the present push for computerization could serve anything but the latter objective. The requirements of computer-based record-keeping systems combined with the lure of increased productivity will turn the caseworker into a data gathering policeman - that is, if the position survives at all. Standardized, formal reports, suitable for machine processing, of client-caseworker interactions will pave the way for heavier case loads, and guarantee minimal human contact. Some short term benefits might accrue to welfare agencies and to clients. If the information systems are properly designed, it is conceivable that paperwork costs could be reduced and that clients might stand a better chance of receiving benefits for which they are eligible. Nevertheless, long term effects would be harmful to clients as well as to the larger community.

Rationalization means mechanization of the treatment of a dependent population. It also means that we abandon any expectation of economic and political reforms which might lessen the dependence of that population on government welfare programs. The introduction of computer-based information

systems is a response to purely administrative problems, but the existence of such systems will have a decisive influence on welfare policy. Once the costly apparatus is in place, it will not be dismantled without a struggle. Moreover there will be a growing incentive for administrators to convince politicians that bigger and better computer systems are needed to deal with the inexorable increase in costs. Of course this abstract refrain says nothing about the human costs of rationalization.

Computer applications in health care are more extensive than they are in welfare. There are more opportunities for using computers in medicine and much exploratory work has already been done. The importance of medical computing may be gauged by the growing literature in the field - for example, nearly two thousand pages of proceedings were generated by the First World Conference on Medical Informatics held in 1974. Despite the obvious differences between health care and welfare, the motives for developing computer systems are very much the same in both cases. Rising costs, increasing volumes of transactions, and growth in demand for services have led professionals and administrators to turn to computer technology for help. The contributions expected from the computer are increased productivity of service professionals and greater efficiency in the allocation of resources.

As one might expect the bulk of computer applications in health care are in the hospital environment. Administratively, hospitals resemble other large organizations and computer use in health care facilities has followed the common pattern. Accounting, inventory control, routine record keeping, and other

administrative functions have been computerized in many hospitals. Innovations peculiar to medical institutions are physiological monitoring and automated clinical laboratories. Although these computer applications are important, the most far reaching changes are likely to be elicited by computer assisted diagnosis and automated medical records systems, both of which are still in the early stages of development. Not only will the hospital be affected, but the entire structure of health care.

The direction of change can be inferred from the role of information technology in promoting bureaucratic rationalism. Consider the vision of the future commonly held by medical administrators, computer professionals, and some physicians. Increased productivity of medical personnel will be achieved by turning the physician into a manager. Efficient processing of large numbers of patients will be facilitated by a hierarchical arrangement in which medical managers orchestrate the activities of paramedical personnel who treat patients with the aid of computer-based diagnostic systems. The enormous technical difficulties standing in the way of automated diagnosis may prompt one to dismiss this possibility as an idle boast. However, even if the optimistic assessment is grossly exaggerated, substantial progress will be made, and a technological foundation for the medical manager scheme will be created. Again we see the rationalizing impulse seize an opportunity for using technique to resolve a question of policy.

The policy issue is of course the quality and availability of medical services. Clearly there are alternatives to the medical manager approach to health care deliver; it is equally

clear that these alternatives have not been adequately explored. Development of the facilities required for the managerial system will require the commitment of substantial social resources, yet the medical establishment makes little effort to compare the costs and benefits of this proposal with other radical initiatives. Surely we should investigate the possibility of reducing demand for health care services by means of public health measures designed to prevent illness. Programs that encourage the individual to become better informed about health problems and to cultivate better health habits is another alternative that should be considered. The compelling nature of technique in the service of rationalism blinds us to other ideas.

Apart from the possibility of better alternatives, there are serious drawbacks to the factory model of health care. Evidence of the computer's impact on other institutions strongly suggests that the technological approach to health care will not result in an equitable distribution of services. Vast medical centers will develop in response to the computer's promise to effect economies of scale. Resources will naturally gravitate toward large cities thus aggravating existing imbalances between urban and rural areas. In addition it is unlikely that the urban poor will reap the benefits of increased productivity of medical personnel. These concerns are only the most obvious ones. The impact of a system designed to process human beings as factory made objects, and to further our dependence on the health care establishment is probably a much more critical issue. In view of the potential problems, one must marvel at

the Panglossian fervor revealed in the headlong rush toward computerized health care.

The Managerial Nexus

The ability of citizens to exercise independent judgment is a *sine qua non* for democratic society. Formal political systems, no matter how cleverly designed, cannot be expected to insure adequate representation of the diverse interests of the community. There is no substitute for universal participation in public affairs; but such participation is impossible unless individuals are able and willing to come to grips with the economic, political, moral, and intellectual issues that define the business of a self-governing community. Although this observation is commonplace, its invocation is too often purely rhetorical. To the public officials, entrepreneurs, managers, and technical specialists concerned with the pressing problems of practical administration, the issues raised by social philosophers seem remote and irrelevant. The subtle effects of bureaucratic rationalism on people and institutions receive scant attention. At best these are regarded as mere niceties to be grafted onto the cost-benefit equation after the real issues have been resolved.

The idea that society is evolving according to some inner necessity into ever more complex forms furnishes the justification for the factory model of social organization. Necessity is used as a club to guarantee acceptance. That the creation of large-scale enterprises along rigid, hierarchical lines has been elicited by peculiar historical conditions is

blithely discounted. The ideological basis of centralized power is conveniently found in the workings of the natural world. Armed with such a rationale, the bureaucrat and his retainers are immune to criticism. Bureaucratic rationalism is perceived not as a social response to a particular set of conditions, but rather as the realization of a cosmic plan. This kind of belief is not easily dislodged. We are thus compelled to probe the historical and social causes of the impact of technological innovation. Computerized decision-making has causes and consequences reaching well beyond the managerial context in which it is being elaborated. An effective critique must illuminate the world-view which sustains the faith underlying this development.

Contemporary management represents the latest stage in the mechanization of judgment. The computer is instrumental in this process, but it is only one of several ingredients. As discussed earlier, the factory system of production embodies the basic developmental paradigm. The changes taking place in management today parallel earlier changes in production. Instead of manufactured goods we are now concerned with control decisions. First, complex decision-making tasks are resolved into simpler component elements; next the skilled human decision-maker is replaced by man-machine systems under the direction of high-level managers; finally, human functions are eliminated entirely in a fully programmed operation. Some observers believe that further progress awaits major breakthroughs in artificial intelligence research. Of course some contributions may be expected from that quarter, but

automated decision-making is no more dependent on artificial intelligence than mechanized production was on any one engineering discipline. It is more to the point to suppose that research in computer science is dependent on the continued vigor of the rationalizing impulse.

The managerial nexus of modern society is not congenial to the exercise of independent judgment. Therein lies the threat to democratic institutions. Like motor skills, judgment is a capacity that must be cultivated. We are moving in the direction of limited opportunities, not only for those directly affected by mechanization but also for the client populations whose interests are represented by large organizations. Virtually all major social services are feeling the impact of the managerial revolution. Physicians are becoming medical managers; teachers, educational managers; social workers, welfare managers. The professional becomes a manager by separating the control of activities from their performance. This gives rise to further division of labor and specialization of function. The only internal limit to the process is the complete mechanization of human task performance; and the price we pay is the alienation of labor and ultimately of judgment.

Those who believe that the dehumanizing and depersonalizing effects of technology are attributable simply to poorly designed systems whose defects can be corrected by the application of cosmetic surgery are laboring under a delusion. Humane systems are incompatible with technological innovation in the service of bureaucratic rationalism. There is no reason to suppose that the managerial scheme will enable physicians to spend more time

looking after their patients' psychic or spiritual needs; that social workers will pay closer attention to their clients' personal problems; or that teachers will treat their students as individuals. Quite the opposite is more likely. These desiderata are possible only in theory. In fact, the motives underlying the managerial concept rule out the possibility. Productivity gains are not conservative. The advantages achieved will be used to process more patients per physician, more clients per caseworker, and more students per teacher. Reduction of experience into mechanized checklists of procedures generates ever increasing demands for greater productivity, thus providing a rationale for the legitimacy of reductionism.

The expected social benefits of the managerial division of labor are reminiscent of the benefits claimed for the factory system by nineteenth century utopian writers. Mechanized production was to free mankind from the burdens of toil and open up limitless possibilities for human fulfillment. Unfortunately, the way in which the former promise was kept eliminated any realistic hope for the latter. The dichotomy between work and leisure promotes the acceptance of alienating work and unsatisfying leisure; the mechanization of the one trivializes the other. This is precisely what will happen in the service professions. The interaction between the professional-turned-manager and his client will be equally as impoverished as the relationship between the craftsman-turned-worker and his products.

Looking beyond the class of professionals whose work will be affected directly, we see the continued subsitution of social

accountability for individual responsibility. As opportunities for exercising judgment diminish, and large organizations assume more control over individual behavior, autonomous action must decline or become aberrant. Initiative will reduce to technical innovation. Our compulsive pursuit of productivity and efficiency has created a self-sustaining ideology which is embedded in the organization of the technical instruments of production. This ideology is an inescapable fact of modern life. The highest ranking managers and controllers are no less subject to its influence than the lowest level workers. Despite the concentration of power, responsibility is everywhere and nowhere. Herein lies the greatest paradox of technological society, a symptom of which is the decline of the individual.

> It is not technology or the motive of self-preservation that in itself accounts for the decline of the individual; it is not production per se, but the forms in which it takes place - the interrelationships of human beings within the specific framework of industrialism. ... The decline of the individual must be charged not to the technical achievements of man or even to man himself ... but rather to the present structure and content of the 'objective mind,' the spirit that pervades social life in all its branches. The patterns of thought and action that people accept ready-made from the agencies of mass culture act in their turn to influence mass culture as though they were the ideas of the people themselves. The objective mind in our era worships industry, technology, and nationality without a principle that could give sense to these categories; it mirrors the pressure of an economic system that admits of no reprieve or escape. (Horkheimer, 1947, pp. 153-154)

The legacy of bureaucratic rationalism is abstract man. Ultimately, the idolization of progress must transform all of human experience into a commodity. Labor and knowledge are already commodities, and affection is rapidly becoming one.

Just as the division of labor in production distanced man from his work, its logical extention to control functions places the human being outside of the realm of direct knowledge, and substitutes the formal rules of double entry bookkeeping for human interaction. Camus expressed the prospect quite succinctly. "A single sentence will suffice for modern man: he fornicated and read the papers."

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