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SP-3120

DECISIONS, DECISIONS, DECISIONS:

Is Education Important Enough?

Marvin Adelson

April 1968

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SP *a professional paper*

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by

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Prepared as Chapter 11 for Cooperative Planning for the Effective Utilization of Technology in Education (Denver, Colorado: Designing Education for the Future, 1968). Reproduced by permission of the staff of Designing Education for the Future, an eight-state project.

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ABSTRACT

As the society enters a critical period in its evolution, education, which is at the center of that evolution, is being severely stressed. The processes by which decisions are taken, policies are set, programs are developed, and plans are made in and for education--the decision processes--are in urgent need of examination. They may have to be modified if education is to remain a vital part of the dynamism of change in our society. Technology holds some promise, not only for enabling needed changes, but for discovering and identifying what those changes should be. That promise is not unlimited, and it depends upon decisions that people make. Educators and others must therefore start to look closely at their decision processes. Not only must decision processes be adapted to achieve current objectives in emerging contexts, but to revise the objectives as needed. Decision making in education is highly decentralized and very widely distributed. The techniques of decision aiding developed in other fields may not be directly usable.

The technologies examined for relevance to improving educational decision processes are information processing, communications, and social technology. Social technology includes such activities as planning, programming, budgeting, operations research, system analysis, and even--education. These technologies can affect the decision processes in several important ways: By helping us to understand more fully what education really is; by improving administration of education, including making feasible new arrangements for education; by improving the politics of education; and by bringing new and different kinds of organizations into the field of education. Some implications of these effects have been examined.

DECISIONS, DECISIONS, DECISIONS:
Is Education Important Enough?

If you share my doubt that the practice of education has reached its ultimate perfection, you may also share with me an urgent concern about the processes by which decisions are made, policies are set, programs are developed, and plans are made in and for education. For if education is important, the process of its evolution is important, and that is the subject of the "decision processes" just mentioned. Interest in those processes would not be urgent, however, unless there were some indication that they need improving, that the means for improving them are available, and that the consequences of leaving them unimproved are intolerable.

Most of the literature I have seen on educational decision making tends to assume current structures and current resources. Little is said about what might be done under emerging conditions--which include (but do not consist entirely of) technological advances. What follows is a glimpse of some of the longer-term possibilities. I will spend little time on the short-term implications of immediate opportunities, for these are already being actively explored and exploited in many places.

THE VALUE CRISIS IN EDUCATION

Many educators agree that education is experiencing a value crisis from which it may emerge as a very different institution. Since it is such a central, formative influence on the character of the society, much of the future of the country and of the world depends upon the

outcome. Among the dimensions of the crisis is the issue: To what extent and how should we be educating young people to adjust themselves to their environment, and to what extent and how should we be educating them to adjust their environment to themselves? This is a matter that is not entirely in the hands of educators to decide, for if young people are sufficiently dissatisfied with the environment as they find it, and cannot learn through normal educational channels how to influence it, they will seek to do so outside of those channels. The schools must provide useful guidance on this matter if the changes that must take place are to occur non-destructively. If the schools cannot respond well enough to the demand for change, the social structure of which the schools are a part may become the target of revolutionary change. Evidence that this is so is rapidly accumulating in the central cities of the country.

Present conceptions of education, and of the decision processes in education, threaten to dominate its future unduly. We must, therefore, give serious consideration to "what might be done some years from now, if ..." We must examine the spectrum of emerging opportunities--and threats--that we face, and try to act intelligently.

One reason for examining opportunities is to seek ways of achieving current objectives. Another is to clarify, modify, identify, or specify objectives. The second reason is especially important, because in exploring opportunities and limitations inherent in technology, we must not lie passively in the path of encroaching technological advance. We must engage the future actively. To do so requires a lot of knowledge of the available options and their implications.

The decision process in education is a cornerstone for the building of an adaptive society. This process, including planning, policy setting, and decision making is currently undergoing some encouraging change.

This is important because to remain viable and vital, education must be a part of the accelerating dynamism of social change. The information required for adapting to change is greater than for operating in a stable condition. Improving the quality of decision making will therefore require a growing investment in information gathering, processing, dissemination, and use. What promise does technology hold, as a form that this investment may take?

Curiously enough, how much the quality of educational decisions can be improved through technology depends upon the quality of the decisions that are made about applying technology to educational decisions. This recursion makes it very important that the promises, threats, and limitations of the new technologies be promptly understood by those in positions to influence their development, adaptation, and use. That is a big order.

I cannot possibly cover all of the interesting prospects. Those I do cover will resemble a casual catalogue rather than an agenda for progress, because they pertain to different time frames, and different kinds of decisions. I have tried to provide a varied sample of "points" within the "space" of possibilities. My own state of knowledge, and my values must inevitably tint the selection and the treatment. Until the newly formed Educational Policy Research Centers and other organizations can supply a more complete background of understanding, and treat disparate views in some systematic way, the gap will have to be filled by attempts such as this one. The reader ought to call on his own capabilities to invent variations on the opportunities I discuss, and introduce considerations that have been omitted. The purpose of this paper is to increase a certain kind of intellectual ferment, not to acquit the reader of his responsibility to help to invent the future of education.

In discussing opportunities, it is well to remember that they are options which may or may not be picked up. Descriptions of opportunities or threats are therefore not prognostications, but statements of contingency. They do not imply feasibility because the adoption of new techniques depends upon psychological and political factors--human and organizational choices--which are not known in advance. Nevertheless, such statements do provide a clearer idea of the choices that can be made, and may point up important issues.

It is not enough to ponder how technology will change the decision-making process in education, nor even how education may change to match emerging social contexts. It is not only the context--technological and/or social--that may change, but people themselves. Given a few decades, in which those now in school will be meeting the challenge of yet other generations, people may be substantially different than we are. They are likely to aspire, tolerate, be able to accomplish, enjoy, feel about themselves and each other, adapt, know, organize, and cope differently than we do. Can we bring ourselves to allow the transition to occur gracefully?

EXAMINING THE IMPLICATIONS OF TECHNOLOGIES

What are the technologies whose impact on educational decision processes is to be explored? Educational planning and decision making are, and are likely to remain, highly decentralized and very distributed functions. The impact of technology on these processes must be examined at many points.

One such point is the teacher training institutions, which "produce" the people who will educate others for some time to come. If they prepare people for current roles, and not for emerging ones, they simply harden the system against change. Another critical decision point is the local school board. Here the decisions to be made are very different from those just mentioned. They are very different in a small rural system than in

a major metropolitan one where the interests of millions of people must be reconciled, and where local government is not really very local at all. So it is perhaps illusory to try to talk about decision processes generically. We must ultimately scrutinize a variety of decision processes in detail. Some of them must account for widely divergent interests. Thus, some of the tools and techniques for decision aiding developed in the military context--where the decision structure is comparatively clear, hierarchically structured, and almost entirely an executive matter--may not transfer directly or easily into the decision problems of education.

Which Technologies? Of the several technologies whose impact might be explored, I will concentrate on three: the technologies of manipulating or managing information (information processing technology), of transmitting information (communications technology), and of using information to achieve human goals (social technology).

Information processing technology and communications technology are readily recognized because they have visible things associated with them--computers, consoles, printers, transmitters, receivers, wire. Their general capabilities are well enough understood that I need not characterize them here. Social technology by contrast is abstract and therefore may be thought to be abstruse. It may easily be overlooked or lumped together with information processing because its more advanced applications tend to require the use of computers. "Social technology" includes such related activities as planning, programming, budgeting, management decision making, operations research, system analysis, and even education.

The social implications of information processing technology--both hardware and software--have been discussed extensively if not thoroughly. It seems naturally applicable to both instruction and administration. But hardware and software must be augmented by such things as performance criteria, measures of performance, strategies, decision rules, voting

procedures, organizational principles, and authority patterns. These I call senseware, for they pertain to the sense in doing anything at all, and involve sense--human sense--in their design and execution. They are the systematic means by which goals and values are incorporated into the operation of a system that consists of people, hardware and software.

Senseware is the genetic material of a system. It contains in compact form such of the behavioral characteristics of the eventual system as can be determined in advance. Its specification is therefore the aspect of system design that should most concern and involve those who have a stake in what the system is supposed to do.

In practice it has frequently fallen to the system engineer or software developer to define and design the senseware, although the dangers in this default are obvious. In fact, they are the basis for much of the fear that has been expressed about "the new technocracy." When a system is socially important, and involves the interests of many groups--as with education--the process by which rules are determined, judgment is applied, and other senseware is "designed," must itself be carefully designed. In education, attention to senseware is perhaps the central issue, although it is beclouded by the apparently technical content of many current decisions. But by whom are senseware decisions to be made, and how? What is needed for them to be made "well"? These questions are related, and social technology is relevant to both of them.

Because the myriad decisions concerning education, made in innumerable places and ways, embody many of the values of the society, the question of how the basis for them may be improved is perhaps the most cogent one in education today. Technology is only one resource, and without wisdom, its application may result in no improvement at all. But well-conceived applications will almost certainly be beneficial.

I will discuss four main kinds of possible consequences of its application. These are: improvements in our understanding of what education is, and the consequent ability to make better arrangements to effect it; improvements in our ability to plan, budget, and otherwise administer the process, and the consequent capability to evaluate, document, and modify the process; improvements in the politics of education, and the consequent ability to develop a firmer basis for decisions; and certain consequences that are not necessarily deliberately invoked, but may have great impact nevertheless.

DISCOVERING WHAT EDUCATION IS AND HOW TO IMPROVE IT

Despite what has been accomplished--and it is impressive--we can assume that in the retrospect of, say, 1999, our current educational approaches will be seen to have very limited empirical and theoretical foundations. We need to discover what education really is--and use the knowledge to improve it. Exciting opportunities arise from the possibility of making every recordable educational event an element of a continuing sequential experiment in education. There is already at least one project where detailed observations on teacher classroom performance are being systematically recorded and analyzed. An earlier study of counseling produced detailed information on the sequence of counselor actions, and numerous applications of computer assisted instruction (CAI) or programmed instruction keep detailed records of learning events.

As we learn to organize and reorganize this kind of information in various ways, and new analytic tools are used to help discern pattern and structure in the data, new and important things should be learned about types of learners and about the things on which their learning depends. By keeping a constant and watchful eye on the results of this grand experiment, we will be able to aggregate disparate and disconnected individual

histories into patterns of experience on which powerful generalizations and higher-order concepts may be based.

In this way, we should be able to generate more complete ideas of what education really is, differentiating it into many kinds of activity, process, and result. We may then choose to reinstitutionalize the function in new ways. The contemporary notions of "school", "teacher", and "learner" could be replaced by other useful concepts. A USOE-sponsored System Development Corporation (SDC) study concerned with the future of education produced a list of about one hundred prospective roles for people in education in the 1980's. Several of them represent departures from present concepts, and it would not be hard to imagine others. Depending upon what we are willing to consider, it should become possible to tailor learning environments and curricula to increase the probability of achieving the potentially diverse educational objectives of the individual, the parent, the school, the employer, or others. But to do so, we must do some work on the process of articulating and accounting for those objectives.

I have assumed that the amount of information needed to achieve the results I envision will not exceed either the capacity or the manageability of the information processing systems that will be available. I have not actually made the necessary computations. If it turns out to be infeasible to preserve all of the information postulated, we will have to be clever about what information we collect, how frequently we update, how grossly we aggregate, etc. But these are matters of degree, not of principle, and the general result is not thereby foreclosed. Brute force may not prevail, but wit may. Technology will never relieve us of the need to decide what is worth knowing.

IMPROVING PLANNING, BUDGETING, AND ADMINISTRATION

By Reallocating Roles and Functions

Contemporary schools attend with varying degrees of outside intervention, to a variety of functions, not just a single one. Some of the more obvious and usual ones are:

- arrange for some kinds of learning to take place
- guide choices
- facilitate adjustments
- keep records
- evaluate performance
- accredit accomplishment
- induce selected social interactions
- supply discipline and structure
- provide a location for selected activities
- limit access to nonschool facilities by preempting time
- provide a market for educational goods and services
- act as test-bed for innovation
- provide local evidence of municipal or other authority
- filter individuals in terms of expected lifetime income
- provide employment for educators and others
- postpone students' entry into the labor force
- constitute a battlefield for social protest

Expected improvements in planning and decision-making technologies will make it possible to examine such a list of functions, determine what alternative arrangements can be devised for those that are intended, singly and in combination, and make clear how the same level of performance can be achieved most economically--or else how a given level of investment can be made to yield the most desirable mix of results. (I am not talking of mechanistic, or completely formalized, decision making. I comprehend in the idea of improved decision-aiding technology the

systematic, rather than episodic, inclusion of human judgment, expert and other.)

If the functions are analyzed objectively, and arrangements explored systematically, it seems entirely likely that:

- at least some of the functions now performed by the schools will be found to be better performed under other arrangements,
- at least some functions not now associated with schools may be better performed by them, and
- the advent of new educational functions may introduce new kinds of organizations onto the educational scene.

We must ready ourselves for the possibility of a transition in the image of the school in the next twenty-five years, to that of an entirely different kind of institution. In fact, it may be that schools as we know them (and here I mean everything from kindergarten through Ph.D.) will have metamorphosed almost unrecognizably in several different directions.

By Focusing on Objectives and Increasing Effectiveness

So far the new technologies have been applied to educational decision making principally in connection with school keeping--rather than education (which is a different thing)--and, without conscious effort, are likely to remain so applied for some time.

That the emphasis has been on school keeping rather than on educational effect is suggested by the very names of educational variables: ADA, dollars/student, students/class, years completed, total enrollments, enrollment growth rate, percent of non-white. Even achievement test scores tend to be validated with reference to other schooling variables, rather than to external or purely educational variables. There are other education-related variables that might well be more generally attended to. Some that come to mind are: percent ultimately requiring psychiatric attention,

relative earnings ten years later, percent producing broken homes, crime rate, addiction rate, reading competence, rate of consumption of cultural goods and services, disease rate among graduates, percent voting in election n years later, percent of graduates holding public office, percent of graduates making education their career, intergenerational mobility, drop-out reentry rate. Some of these variables are admittedly hard to measure, but they do pertain to output. It is possible to institutionalize measurement of them, and eventually to relate them to input variables.

Providing for Modification of Lists of Objectives. I am impressed, but not dazzled, by the value of objectively reasonable decision processes such as program budgeting, which, as you know, is a procedure for allocating resources to specified program objectives or intended accomplishments, rather than to administrative functions. I do, however, see the need to emphasize the principle of the $n+1^{st}$ objective: Given any list of n objectives for a system, the $n+1^{st}$ objective must be to provide for modification of the list if the system is to be truly adaptive. This objective is, of course, at a higher level of discourse than are the other n objectives, but it can be treated for practical purposes in much the same way. It has generally not been so treated in education. Consequently, our education system has failed to be adequately self-renewing, and we are seeing some of the consequences in the abysmal intergenerational, intergroup, and intercultural gaps on whose edges we perch precariously.

Objectively reasonable decision processes are only reasonable to those whose objectives are approximated by the n objectives. This leads immediately to the question: How is the $n+1^{st}$ objective to be implemented? In more usual language, who decides what the objectives will be? Can we devise adequate apparatus for educational self-renewal?

Increasing Effective Use of Resources. Cost/benefit analysis (if properly applied) and program budgeting (if associated with adequately developed

goals and objectives) can increase the effective use of resources for educational ends as contrasted with increasing administrative efficiency. Information handling technology can be misapplied--that is, it can be applied to achieve apparent improvements in administrative efficiency with respect to maladaptive goals, objectives, and programs. The arguments can be so cloaked in technical jargon, and made to sound so defensible, that really needed improvements are effectively blocked and obscured. The distinction between efficiency and effectiveness must be constantly borne in mind. Effectiveness is a measure of the relationship between costs and benefits, where the benefits are carefully scrutinized and explicated. Efficiency measures the cost of achieving a fixed result, whose benefits are frequently assumed or left implicit and may be questionable.

An attractive possibility for vitalizing the decision process in education at all levels is to introduce into the program budget, for each organizational entity, an item for innovation. Each organization would be called upon to determine how, and to what extent, it will innovate each year, but would be expected to account for its innovative activities explicitly. Before long, data could be gathered that would show how educational output is related to amounts and directions of expenditures on innovation. Incentives to innovate could be introduced possibly by allowing a kind of budget credit for expenditures on innovation that could be shown to be beneficial, or in other ways. But even if this were not done, including innovation in the program budget would tend to exert a stimulating effect on the decision process. Other objectives, such as community participation in school decision processes, could similarly be added to the program budget, to increase the probability of their implementation.

Eliminating Concepts of Hierarchy. As a first step in thinking about the potentials for education inherent in technology, we must rid ourselves of the "habit of hierarchy." People tend to think of students as under teachers, teachers as under administrators, administrators as under boards,

and so on. That happens partly because we tend to identify education with schools, and schools with authority and responsibility, and those, in turn, with hierarchical organization. But what is the hierarchical relation between a school principal and a federal official involved in the Manpower Development and Training Program for the U. S. Department of Labor? What is the relation between the General Learning Corporation and the New York City Board of Education, between the Board and "the community"? Whatever these relations are, they are certainly not hierarchical. Yet there are aspects of hierarchy present, and within each substructure, the hierarchy may be very strong. Thus, we have a mixed structure that for many purposes can be very hard to deal with.

Recent student activities on our campuses also make it clear that the question of dominance or hierarchy is not settled. The formation of "free schools" demonstrates the same point. I am acquainted with one near Los Angeles. Its sole teacher left the state university, where he was respectable but felt unfulfilled as an educator, and started a small secondary "school" in somebody's living room. A small number of students at nearby public high schools decided to attend. They felt that the schools were not serving their needs well enough. In the new school the students, with guidance, determine what is to be taught, while the teacher decides how. In order to vindicate <u>their</u> decision to make the change, these students are highly motivated to perform well, and to outdo their peers who did not move; in order to vindicate <u>his</u> decision to move, the instructor is highly motivated to have them learn. Together they have formed a tacit coalition to produce learning in a situation that does not either demand or tolerate hierarchy. Together they are competing with "the establishment." They have their troubles, but they are obviously involved. This kind of learning-teaching coalition, with its intrinsic motivations, could be a useful example. Can arrangements be made to use intrinsic motivations such as these in other settings, even if hierarchy must give a little? Is education important enough?

The diffuseness of the decision apparatus in education (over which it is not proper to superimpose a simple kind of hierarchical structure for conceptual purposes) means that development of systems to provide required information for each class of decision making may be a complicated task, but it is a very important one. Contrary to some opinions, it is not necessarily useful to have all the information about everything in one place. Relevance is an important variable in determining how information should flow among points in a network. So ultimately, some kind of structure will have to be developed for designing the needed flows. Can we imagine at least one sensible kind?

Determining Functions that Should be Centralized. This question is frequently asked in the form: "How much centralization should there be?" The real question, of course, is not how much centralization, but what functions to centralize, what functions to decentralize, and how to achieve the appropriate assignment of function to assure effective performance.

Without postulating administrative or control hierarchy, we can note the distinction in levels of discourse between people, schools and universities, school systems, local governments, joint powers agencies, state departments of education, state governments, regional compacts, and the complex federal government structure related to education. Keeping this structure in mind, in general, there seems reason to expect a percolation "upward" of the following functions:

- Policy setting
- Planning for the longer-term, and relation of long-range to intermediate and short-range planning
- Major program budgeting and funding
- Gross evaluation of programs and of balance among programs
- Support of fundamental research
- General information services and support
- Estimation of need for new programs, services, etc.

In general, the following functions seem likely to seep "downward" or "outward":

- Short-range planning
- Project conceptualization and initiation
- Project management
- Fine-grained evaluation
- Field-level coordination
- Community support development.

One reason for these conclusions is that, despite the fact that masses of information can be made accessible at the center, the following considerations all dictate an intermediate degree of centralization:

- Ratio of communication to processing costs
- Problems of human information overload
- Presence of important local variables that are not easily encodable for system processing
- Economics of peripheral vs. central processing for selected kinds of operation
- Problem of privacy, etc.

Several levels of processing are a natural outcome when very large amounts of information are involved. Legal constraints also exist on both the degree of centralization and the degree of decentralization that is allowable. How the various functions are to be allocated over the available organizational entities is a tremendously difficult question to answer, but it cannot, for that reason, be left entirely to chance.

Planning Individual Education. Another way in which the ability that is introduced by technology, to schedule heterogeneous experiences, and to keep track of activities and results, can affect educational planning and decision making, is by making it possible to plan for real individual education--not just individualized instruction. Instruction presumes an

instructor and an instructee, while education could consist of many different kinds of experiences, organized to produce growth and development. Specifically, the learner may be increasingly in a position to learn that which perhaps nobody else knows, but that happens to be peculiarly pertinent to his own life trajectory. This is not a plea for entirely self-determined or self-directed learning, but only a suggestion that where it is appropriate, more of it will be possible. Thus, some of the decision making in education may pass progressively to the learner from those on the supply side who now have almost all of the decision responsibility.

Encouraging Learner Participation in Selection. If we regard the learner as active rather than passive, we must see him immersed in an information-rich environment in which he is confronted with the need to deal somehow with the innumerable sources of stimulation that are available. Some of these clamor for his attention (for example, entertainment media, advertisements, political campaigns), while others remain available but passive (for example, academic disciplines, libraries, data bases, neighborhoods to be explored). Since there are more than he can handle, he must develop ways of selecting which of them he will concentrate on. In this process, he must remain aware (in some sense) of as many of the options as possible, so that he may adjust his priorities or shift his attention accordingly. This requirement implies a kind of continuous environmental sampling operation which is in marked contrast to the linear learning model that some people cherish. It puts a premium on resolving questions of relevance, a process in which the learner must have some opportunity to participate. Seen in this way, decisions by educators regarding curriculum, content and context would profit from some infusion of learner participation. Is this not at least part of the message that student protests contain?

One of the more important aids that people will need for this kind of decision making is some form of guide or index to what there is available to be attended to. We regularly compile such indexes and guides to books and periodicals, to vacation resorts, to eating establishments, to professional societies, to universities and their courses, to commercial services in a community, and to jobs. Even when these guides are not of top quality, they can be useful. But there is no good way for an individual to get a thorough feel for the variety of matters he might turn toward next. Information processing and communications technology can be used to provide capabilities for displaying enough about the alternatives that a better informed, less accidental, or less directed set of choices can be made. The displays can be factual, pictorial, animated, impressionistic, predictive, or a variety of other things. They may not be the easiest facilities in the world to develop, but they might be among the most valuable.

IMPROVING THE POLITICS OF EDUCATION

By Preparing Educators for Change

In reviewing the social technologies, we must not overlook the very one in which we are most interested--education--and the possibilities in attempting to practice it on one of the more recalcitrant subpopulations --educators. There is an advanced, highly educable, group in that subpopulation which has recognized that there is much to be learned that is relevant to them, although they perhaps do not wish to look among their colleagues for someone to teach it to them. But for the most part, educators have been constantly reinforced in believing that they know something worth teaching to someone, and that that relation is not symmetric. Some of the best theorists and philosophers have said that the teacher can learn by teaching, but the two main implications of that statement are widely ignored:

1. the teacher ought--as part of his job--to learn not only how to do his job better, but how to grow and change; and
2. one of the best ways to produce learning in students is to have them teach.

The second implication does not concern us as much as the first, because our focus is on the decision process in education, on which the educator has a stronger hold than the educatee. Unless the educator decides to learn some new kinds of things, he can seriously impede attempts to improve the decision process.

What aspects of educational technology can be used advantageously on educators so as to improve the decision process? Several come to mind. The first is what we call system training--the immersion of "teams" (groups of people who are intended to work constructively together toward a common goal) in progressively more complex problem environments that approximate in some essential respects their normal or anticipated working environment, with "feedback of results" so that they may collectively evaluate each other and their joint performance. The typical result is a degree and kind of learning, as manifested in operational capability, that goes beyond simply summing (by putting together without system training) the individuals, individually trained. One can imagine administrator/faculty groups relearning to educate under changed conditions, and the effect this might have on their acceptance of new conditions.

A second relevant aspect of educational technology is the use of gaming--the explicit confrontation of groups with conflicting interests in a situation in which they may work out their conflicts vicariously and non-destructively. Here, it seems to me, is a promising vehicle for improving the politics of education--between groups of educators, and between educators and community elements of various kinds. The use of communications networks can allow relevant people in many places to interact--to make decisions that affect each other, and observe the consequences.

Students of policy questions can play out roles and strategies. A little inventiveness is required, but one can count on the originality of players to produce interesting and novel results.

A third is sensitivity training, a technique in which groups of people work together to come to understand their relations to each other and their environment in new ways, and as a result become more able to change. I know of at least one major attempt in which the use of sensitivity training did allow decisions to be made that represented a marked departure from previous patterns.

The psycho-educational technologies, including team training, simulation and gaming, and sensitivity training could produce short-term payoffs if applied to educators. They can influence the decision to improve the process of deciding, without enormous delays and enormous costs. Consider advertising. It is used to raise the aspirations of even the most unlikely consumers in our market economy. Can we not think of advertising as a technology that might be useful in raising the aspirations of educators for their own field? Is education important enough? Can't we invest a little to find out?

By Interrelating Diverse Decision Points

Decision makers frequently make their decisions without adequate recourse to related experiences of others, without adequate understanding of the state of the art, and without an extensive understanding of the implications of available alternatives. Three technological developments could help alleviate this condition. The first is a system of information "digestion," dissemination, and interpretation. The second is a communication network of individuals with related responsibilities who can intercommunicate freely, discuss common problems, and benefit from relevant personal experiences that can be shared. The third is the formalized

"gedankenexperiment" in which the alternatives are played through in a simulated environment to explore "what might happen, if ..." Interestingly, facilities for doing these things are available now in useful form, though certainly not in anything like the sophistication that could be achieved. But these facilities are hardly used to improve the decision process. The issue is not the technology, which is available, promising, and already being applied in other ways. It is the attitudes of the potential users, who do not yet appreciate, and cannot find ways to invest in, the possible payoffs.

Communications technology permits the formation of "decision networks" in which participation is possible because of joint interests rather than simply colocation. The extensive use of this capability could modify the politics of education considerably. While this prospect is not imminent, it needs to be considered.

How can networks be used advantageously to facilitate the decision making of educators? Might not the judgments of a broad population of educators be solicited by, say, the USOE concerning prospective expenditures, programs, etc.? Could there not be some processing of the results, an exchange of views, a modification of judgment, a change in plans, and adjustments in many places in accord with the early warning provided by the interactions? Dangers? Certainly. Advantages? Many!

By Improving Public Attitudes

That part of social technology that pertains to the analysis of costs and benefits of programs seems in several ways pertinent to educational decision making. Not only can it clarify options for those having official decision responsibilities, but as a clearer understanding can be generated of the value of education, it can make it easier to justify expenditures for educational programs. Several economists have shown

economic advantages in investment in education. Their arguments may help convince taxpayers, congressmen, and others to increase the nation's or a community's investment in education. In this way the technique of economic analysis can affect the politics of education, and extend, in its effects, to almost all of the distributed decision points affecting it.

One way technology can help improve the educational decision process is by broadening the spectrum of choices available to the most numerous decision makers of all: parents plus children. Each parent must make (or forego making) decisions and plans concerning his children's schooling and their "educational/career trajectory." To do this as well as possible, he needs access to information about alternatives--or his choice is not really free. It may even be that the lack of adequate information is one of the reasons parents do not show too much interest in education-related decisions (for example, at the polls when taxes are at issue, or in parent-teacher activities). Getting parents (and later on, children) to understand (a) what options are available now--that is, what schools are accessible. their differences in terms of offerings, quality of output, etc.--and the relation of the options to later consequences; and (b) what options could be made available under alternative budgets, or alternative arrangements--as with larger, or smaller school districts, bussing, educational allowances--could produce very different behavior on their part.

When put in terms of community involvement in schools, the process sounds tedious, impossible, or profitless. But when seen in terms of making more concrete and immediate the meaning of choices, it is clear that much can be accomplished. How can technology abet this possibility? By making conveniently available in usable form, and either routinely or on demand, the information needed to support parental decisions.

There is no reason, for example, that a parent cannot go to an "education agent"--analogous to a travel agent--to have educational itineraries selected, discussed, evaluated, composed, planned for--and even paid for. The agent, in turn, can have access to computerized information on availability of "space," classes of service, etc. This arrangement is consistent with the prognostications and suggestions of an educational allowance in lieu of public schools as they are now operated.

As for exploring alternative budgets and arrangements, the development of budgeting models, and other models describing the dynamics of education could permit displaying in vivid terms what would be entailed, so that greatly improved understanding could result, and the dialogue on issues could be upgraded. The ability to vote with one's pocketbook could have a very salutary effect on educational decisions that could outweigh, but is clearly facilitated by, the effects of technology.

By Improved Policy Coordination

One of the aspects of education that has been most vocally criticized has been its inadequate coupling with other social processes, so that it appears to be less relevant to the life experiences of both educated and trained people than they think is appropriate.

One of the possibilities for decision making and planning in education opened up by the improved technologies is that education may be able to become a coherent aspect of a broader set of policies, which collectively may be thought of as national (or international) policies. One important class of such policies consists of "manpower" policies. One may imagine periods of time when it is important to encourage individuals to leave the labor force temporarily; other times when it is important to attract more of them into the labor force; still others when an exchange of persons is required to match the skill or other demand characteristics of the market. Educational programs act as a kind of reservoir of human

capabilities, in which the quality of the contents of the reservoir is increased (or is supposed to be) while it is being withheld from the active labor market. The content of this reservoir can be used as a regulating mechanism on the size and character of the labor force. But administrative and other rigidities in the system make it difficult to manage adjustments in those contents. To the extent that these rigidities can be diminished, other things being equal, certain serious social problems may be alleviated. These include unemployment, skill shortages, personal irrelevance, poverty, and unduly expensive social welfare provisions.

Deliberate coupling of education with labor force participation variables may contribute to making schooling an intermittent lifelong activity which may occupy very different portions of the lives of different individuals. For some, entry into the labor force may start during what are now the high school years, with frequent returns to school over the ensuing years, at ages when most adults do not or cannot now attempt to extend their education. Many people may stay involved in at least one course more or less permanently, using time off work to do so, or having the learning incorporated into the work arrangement. The labor unions may eventually come to demand training for transition as part of an employer's normal responsibility, and it is not unthinkable that laws may ultimately either motivate or require employers to retain or otherwise arrange to remunerate employees whom they have not adequately prepared for transitions, if and when their present jobs disappear.

I realize that it is not entirely friendly to talk to educators about education as instrumental to other social ends, rather than as an end in itself. But it really is both. Moreover, there is, in what I have said, room to draw the inference that I see education as "training"--preparation for the world of work, rather than as the development of the

whole individual. Again, it really is both. It can be argued that, for technological reasons, the world of work is likely to shrink, and that as time goes on, constructive leisure, increased humaneness, and other educational objectives will increasingly dominate preparation for work. I have no quarrel with those who make such predictions, but I doubt if it is really possible to predict what is going to happen well enough to justify hinging major decisions on such predictions without hedging. The future is rich in unanticipated events, and intrinsic uncertainties make it necessary to develop--in any era--a degree of system flexibility that will allow adaptation to occur on the scale which conditions demand. That is why the ability to use the new information and decision technologies to accomplish the adjustments is so important. But how can a system be designed that permits the needed flexibility?

There are two major requirements with which technology can help. The basic requirement is the ability to provide individuals (or groups) with appropriate learning experiences reasonably promptly upon demand. This is necessary so that when they wish to leave the world of work in order to learn, they do so without undue delay. The size of delay that is tolerable will vary with the individual, the situation, etc., but I suppose, will normally be of the order of days, weeks, or months. In certain instances, it may be as short as an hour or two, and in special cases, minutes may be precious. The size of the tolerable delay is a system design variable, of course, but the principle is constant: Provide access to educational experiences when they are wanted by individuals, not just when it is convenient for the administrative structure to provide them. A collateral requirement, of course, is an arrangement for reentry into the labor force when desired. This is consistent with, and even a part of, increasingly individualized instruction, a goal that seems at this time to be generally desired.

The second requirement is a means of accumulating a record of the learning accomplishments of individuals, no matter where, when, or how gained. While there are many technical problems in doing this, individual records can theoretically be maintained and added to throughout an individual's lifetime, whenever an educational experience occurs. Clearly, the question of what is an educational experience will require working out, since many things that are not now considered part of formal education might be appropriately included (examples: residence abroad for an appreciable time; participation in a research project), but when that is done, and good ways are developed for representing each experience and its results, a data repository, in which educational "credits" are accumulated is mandatory. Only with such arrangements can lifelong learning be formally available for everyone. Then, degrees may tend to lose their significance. The credits an individual accumulates will become subject to specific interpretation of relevance to professions, jobs, entitlement to further education, and such intangibles as social status.

The notion of accumulating credits implies a method of accrediting achievement. Having mentioned the need, I will blithely decline to propose a solution, except to note that the system is probably better if the accreditor is neither the teacher nor the organization officially attempting to induce the learning, since such an organization can hardly be expected to be dispassionate in its appreciation of the achievement. If new kinds of accreditation agencies come into being, new roles will exist for educators--roles for which they are not now being trained.

SOME OTHER CONSEQUENCES

One inadvertent effect of technology on education is to bring actively into the field unaccustomed kinds of organizations. Industrial and other suppliers of goods and services are becoming increasingly involved, and

their presence has already started to create "supply pressure" to which the education system has to respond in some way. Since gross rejection and gross acceptance of the new methods, approaches, and equipment they purvey are equally unacceptable, the decision process itself will be forced to improve merely in order to cope with the alternatives they present. The improved planning and decision making that may result are likely to create new demands; these will, in turn, create new stresses; and so on. Thus, the process, for some time at least, will be regenerative, producing controlled change within education, or imposed change from without.

The media, industrial training courses, "special" schools (for example, in languages and speed reading), and community action groups, have already started to preempt some educational functions. The history of technological innovation shows a great deal of change resulting from invasion of a reactionary industry by other industries. The school system has its choice: change well and willingly (via good decision processes) or be progressively invaded or displaced. Can it make that decision well?

The entire economics of education may be substantially changed by communications technology. If, for example, there is a secondary market abroad for educational materials developed primarily for domestic use, either domestic prices may be lowered, or profits may increase, thereby subventing increased research and development (R&D) and further innovation. But perhaps more importantly, communications media can be used increasingly to provide interaction between individuals and groups located far from each other. This kind of interaction, if used properly, can have great educational value, since it can break down cultural barriers, produce coalitions of interest, and promote cross-fertilization. This kind of situation produces problems of a major kind in the allocation

of educational resources. The overtones of investment in international education are of course political and military as well as human and humane, but should be approached consciously.

Numerous other implications could be mentioned, but space will not permit exhaustiveness here. The subject will clearly require extensive and continuing discussion, if all of its aspects are to become clear. But action cannot wait for ultimate clarity.

CONCLUSION

I have tried to cover some suggestive possibilities. In doing so, I have had to go a little beyond today's realities, but not so far as to leave completely behind a sense of realism. I am fond enough of educators to be willing to jar their sensibilities a little for our collective good, and I respect them enough to expect that many of them are already on the trail of the things I have talked about. It will require ingenuity, planning, good decision making and the best of senseware if all those interested in education--educators, other professionals, business and industry, and the citizenry generally--are to design its future satisfactorily.

While we are working toward these objectives, we can start by trying to improve the decisions being made today--and to be made tomorrow--through the use of such system analysis and design techniques as are applicable. This is a sensible start because, while it will serve to provide short-term improvements, it will also increase the visibility of the available alternatives, and we can go on from there.

The rub in all of this is that, as I remarked earlier, to improve the decision process in education requires a series of decisions to be made

without the benefit of improved decision processes. Those decisions can only be made well to the extent that the alternatives and their implications can be understood, and can only be implemented if educators and others believe that education is important enough for them to be willing to change the basis of their decision making--sometimes at considerable cost to them. In deciding about change they must sometimes trade off their own interests against those of education. Is education important enough for us to help to ensure that this is done?

Unclassified

Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author) System Development Corporation Santa Monica, California	2a. REPORT SECURITY CLASSIFICATION Unclassified 2b. GROUP

3. REPORT TITLE

Decisions, Decisions, Decisions: Is Education Important Enough?

4. DESCRIPTIVE NOTES (Type of report and inclusive dates)

5. AUTHOR(S) (First name, middle initial, last name)

Marvin Adelson

6. REPORT DATE April 1968	7a. TOTAL NO. OF PAGES 30	7b. NO. OF REFS
8a. CONTRACT OR GRANT NO. Personal/Professional b. PROJECT NO. c d	9a. ORIGINATOR'S REPORT NUMBER(S) SP-3120 9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)	

10. DISTRIBUTION STATEMENT

Distribution of this document is unlimited.

11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY

13. ABSTRACT

As the society enters a critical period in its evolution, education, which is at the center of that evolution, is being severely stressed. The processes by which decisions are taken, policies are set, programs are developed, and plans are made in and for education--the decision processes-- are in urgent need of examination. They may have to be modified if education is to remain a vital part of the dynamism of change in our society. Technology holds some promise, not only for enabling needed changes, but for discovering and identifying what those changes should be. That promise is not unlimited, and it depends upon decisions that people make. Educators and others must therefore start to look closely at their decision processes. Not only decision processes be adapted to achieve current objectives in emerging contexts, but to revise the objectives as needed. Decision making in education is highly decentralized and very widely distributed. The techniques of decision aiding developed in other fields may not be directly usable.

The technologies examined for relevance to improving educational decision processes are information processing, communications, and social technology. Social technology includes such activities as planning, programming, budgeting, operations research, system analysis, and even--education. These technologies can affect the decision processes in several important ways: By helping us to understand more fully what education really is; by improving administration of education, including making feasible new arrangements for education; by improving the politics of education; and by bringing new and different kinds of organizations into the field of education. Some implications of these effects have been examined.

DD FORM 1 NOV 65 1473

Unclassified

Security Classification

Unclassified
Security Classification

14 KEY WORDS	LINK A ROLE	LINK A WT	LINK B ROLE	LINK B WT	LINK C ROLE	LINK C WT
Decision-making						
Education						
Politics of education						
Social technology						

Unclassified
Security Classification