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ABSTRACT

From 1968 to 1969 the EPRC focused on: staff development, definition of a specific research program, and development of methods to deal with educational policy issues in the context of longrange futures. The research program of the center is organized around educational futures and policy planning. Specific methods include Delphi techniques, goal analysis, cross-impact matrix, and other forecasting methods. Appendixes present some relevant materials from the center. (Some graphs may reproduce poorly.) (RA)

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FINAL REPORT

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REPORT OF ACTIVITIES AND ACCOMPLISHMENTS:
MARCH 1, 1968 TO FEBRUARY 28, 1969

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INTRODUCTION

The last full report of the Center was submitted, prior to its formal establishment, in November of 1967. The work of the year just passed was based upon the work plans submitted subsequent to that in February of 1968. In both of those documents it was stressed that the efforts of the 1968-1969 year would have to be focused in three major areas:

1. staffing,
2. definition of a specific research program, and
3. development of methods that would enhance a continuing capability of dealing with educational policy issues in the context of long-range futures.

Each of these matters is reported in more detail in other sections of this report. By way of introduction, however, it may be well simply to point out that each of these has been brought to a more advanced stage than seemed possible only six months ago.

Staffing

The core staff of the Center is now virtually complete. With the addition of Warren L. Ziegler to the full-time staff, the Center has added a capability in implementation, instruction, and research on educational policy which will be a stable and continuing asset. James C. Byrnes from the Office of Program Planning and Evaluation of the U. S. Office of Education brings a capacity for data analysis that will bring needed control to the kinds of conjectures about the future that are developed within the Center. It will probably take another quarter for these new staff members to settle into their positions and for the assembled staff to begin functioning smoothly.

Additional junior staff are being retained and a librarian is now employed by the Center on a part-time basis. The search continues for added strength in the Center in the area of sociology of education. A complete listing of the current staff is contained in Section VIII of this report; biographical summaries of senior staff members comprise Appendix E.

Research Definition

During the past year, the Research Development Panel has met five times, has begun to function smoothly as an independent critical review panel of the

Center's activities, and has helped immensely to define the work plans contained in Appendices A and B of this report.

At an early stage in the life of the Center, the U. S. Office of Education asked the Center at Syracuse to focus some attention on three questions. The first had to do with alternative sets of social and organizational arrangements that might characterize the schools of the future and the issues attendant upon changes in those arrangements. The second question asked for an analysis of the possible effects of new instructional systems upon the social design of schools, the patterns of social life surrounding the schools, and other impacts on society that will require policy consideration in the future. The third question called for an examination of alternative sets of policies dealing with the finance of higher education.

The Research Development Panel has been invaluable in assisting the staff of the Center to find a useful and appropriate formulation of these problems in a manner that allows them to be incorporated into the larger program of the Center and to utilize the kinds of methodological techniques that are emerging. The detailed way in which we propose to approach these questions is reported in Section III and Appendix A of this report.

The Research Development Panel has not only helped to formulate a response to these specific questions, but has also assisted in raising priorities on other kinds of questions. Hence, the way in which the Center has tended to define its research program reflects not only the concerns raised by the Office of Education, but also concerns which the Panel felt were possibly more important. These concerns also are reflected in the research program reported elsewhere.

Methodological Developments

The methodological efforts of the Center have been carried out, for the most part, under the direction of Robert J. Wolfson in conjunction with the Institute for the Future with which the Policy Center has subcontracted. These developments include the formulation of appropriate Delphi studies, including a social Delphi study presently being executed. They also include the development of the Cross-Impact Matrix and the acquisition of appropriate computer facilities to employ this device. In addition, the Center is working on the development of economic models especially applicable to problems of education, some appropriate devices drawn from preference-logic that may be applicable to the assessment of alternative sets of educational goals; and finally, the Center is currently engaged in the development of a "relevance tree" and related devices that will render more feasible the capacity to test potential scenarios for completeness and relevance. These methodological concerns are indispensable to the continuing work of the Center. They are reported in more detail in Section I of this report.

Form and Intent of This Report

This report is formulated, then, as a final report; but its intent is to set forth, in more detail than heretofore has been possible, the extent to which the objectives of the last report period have been attained--staffing, development of methods, and research definition.

MAJOR ACTIVITIES AND ACCOMPLISHMENTS: MARCH 1968 - FEBRUARY 1969A. Research Definition

During the past year, it has been a major task of the Policy Center to establish an appropriate focus, style, and direction for the research program. The degree to which we have succeeded in this effort is reflected in the work plans, Appendices A and B, of this report. Those plans call for a coherent effort involving about 50% of the Center's resources in the generation of specific educational futures and another 40% in the area of methods and scenarios dealing with the educational environment of the future.

There are, however, some principles of style and focus that have become central to the Center's activities. And these ought to be clearly specified. In the first place, the emphasis continues to be on the generation of scenarios. As a matter of general practice, EPRC will not disseminate scenarios singly, but always in groups in order to make clear to its publics that it is not involved in predicting the future but in generating alternatives around which appropriate groups might begin to assess how they will go about inventing their own futures. This emphasis on scenario construction still seems to be the most promising approach to the assessment of alternative policies in specific areas of interest.

In the second place, consistent with the notion of always attempting to develop alternative scenarios for education, the Center will adopt as a fundamental principle that its work should always result in the formulation not of one but of several directions for policy and that these should include a formulation of the trade-offs between the options. It is this demand to formulate alternatives together with their trade-offs which has typically been lacking in policy studies in the past. The focus on the development of scenarios in groups, the development of methods for systematically testing their plausibility, completeness, and relevance, lends itself well to this general research tactic.

Moreover, it has become clear that some of the methods being developed in the Center require clear treatment of the future in terms of events rather than simply vague tendencies and social processes. Hence, the methods of the Center themselves will require a disciplined attention to detail and to the formulation of constantly improving social indicators. Thus, one aspect of EPRC's style of work will be its relatively more disciplined concern with the size, shape, and extent of future changes in education. At the same time, it is becoming clear that EPRC will pay serious and regular attention to the impact of the unexpected on possible

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futures. It is a general part of EPRC's style of work that among scenarios developed will be some which contain the occurrence of events that, taken by themselves, might be regarded as most improbable.

Finally, it is fundamental to the developing pattern of research that at every point, whether in the development of scenarios, the assessment of goals for education, or in the program of dissemination, the Center, in its research, must provide room for judgments and visions of the future which stem from many different populations and not simply from academia or from educational associations. This general principle of operation has been incorporated into the research plans of the EPRC and is clearly reflected in the position papers and work plans attached to this report.

Thus, the style of research has begun to emerge. It includes a strong focus on the generation of scenarios in groups with the development of policy trade-offs including some highly improbable events and judgments drawn from a wide segment of the population together with detailed attention to the size, configuration, and impacts of possible changes in the future.

B. Methods

Development of a methodological capacity for the generation of alternative futures and the testing of these futures for plausibility, consistency, and relevance has been a central activity during this report period. Substantial progress has been made with a number of methodological techniques.

1. The Delphi Method

The Delphi Method is a means for arriving at a consensus (or eliciting the reasons for dissensus) on matters of judgment concerning the likelihood of events which might occur or be made to occur in the future.

The respondents in a Delphi study remain anonymous and communicate with the researchers by mail to avoid the committee effect and other problems encountered in conference confrontations. Consensus about the occurrence, dates, and probability of future events is achieved through several rounds of feedback in which reasons for extreme positions are exposed to all the respondents.

The collection of judgments arrived at through a Delphi study forms base data which can be used in the generation of scenarios concerning education or the environment of education. These data may be used directly in the construction of scenarios or first extended and checked by other techniques such as the Cross-Impact Matrix.

The Center currently has two Delphi studies underway in conjunction with the Institute for the Future. One is a study of future developments in technology with particular stress on the impacts of these developments on society. The second is a societal Delphi concerned with the definition of contemporary trends in society, likely change of direction in these trends and developments which might significantly change these directions. Both these studies are expected to be concluded by June of this year. The initial questionnaires used in the societal study are contained in Appendix C. Further discussion of the Delphi Method may be found in Section II and Appendices A and G.

2. Cross-Impact Matrix

In Delphi it is assumed that separate events are discrete occurrences, and the effect of one event on another is not explicitly considered. The Cross-Impact Matrix beings with the assumption that one event may either enhance or inhibit another. The purpose of the method is to assess the mutual impact of a large number of events; that is, adjust the probabilities of items in a forecasted set based on a judgment of the relation of the items to each other. Discrete items in a Delphi study are treated in the Cross-Impact Matrix as an interacting system. A detailed technical discussion of the method is contained in Appendix D.

The Cross-Impact Matrix is especially well suited to experimentation and the development of alternative scenarios. For instance, one can remove key events, change the probability of selected events, insert new events, and assess each of these changes on the system and other events in the system. Additionally, data for a matrix study might be drawn from different populations in order to assess the effect of biases or alternative assumptions on images of the future. Making these changes in a series of Cross-Impact studies will produce the base data for alternative scenarios. This capacity to produce a series of alternative scenarios is especially important for the Center in light of its style of research and intent not to "predict" the future but to generate alternatives around which other groups may assess their own futures.

The Center now has the Cross-Impact Matrix translated into APL for us on its own computer facilities. The method will be used in a large number of projects in which the Center is engaged. A discussion of one context for its application is contained in Appendix A, and a full description of the method itself may be found in Appendix D.

3. Goal Analysis

In the introduction of this report, it was pointed out that a fundamental principle of the EPRC is the demand to produce not simply single forecasts or scenarios, but alternatives; moreover, the target is not simply to produce alternatives for policy planning but, if possible, to produce some useful formulation of the trade-offs between the alternatives. By "useful," in this context we mean "plausible," "rationally defensible," and clarifying for actual and specific policy choices. We do not think that the forecasts can be formulated with any claim to having predicted the actual course of events, nor is it our expectation that it will be possible to specify the consequences of alternatives with exactness.

Nonetheless, it becomes clear that these demands on the research program make it essential that the EPRC devote some attention to methods for formulating and assessing the relative desirability of alternative sets of policy goals and, specifically, alternative sets of goals for educational policy. This poses certain methodological questions. What are the identifiable properties of goal statements? Are there specific levels of abstraction that can be identified and which accordingly require somewhat different techniques for their evaluation? Are there differences between educational or policy goals according to their domain, their level of aggregation, the point of view in the social order that they express?

With respect to the first of these problems, it seems clear that a goal statement must make some kind of implicit reference to a state of affairs which, if brought into existence, would constitute the realization of that goal. This condition is not always met in goal statements of educational institutions and school systems. Although the goal statement itself will not be truth-functional, the set of statements specifying the conditions under which the goal would be attained are truth-functional. Thus, given any goal there must be a state of affairs, formulated in a set of propositions, which collectively constitute the description of a segment of some world contemplated in the future. Moreover, it seems clear that any educational goal, at whatever level of social aggregation, must be capable of formulation as a world-state that does not now exist but could be made to exist in the future. Thus, the formulation of the goal statement can be accompanied by some formulation of a set of steps taken to attain that goal; i.e., such a goal statement can be attached to a policy of some kind. Finally, it is clear that alternative steps available to attain a future world-state might also be described by a set of propositions which, taken together, constitute the conditions sufficient to say that that step has been taken. Thus, not only goal statements but also policies formulated to attain

those goals will be amenable to expression in sets of descriptors of future world states.

It is clear, however, that the attainment of a policy goal will also have its so-called latent effects as well as its intended effects. Thus, the set of propositions which, taken together, constitute the attainment of a goal must be added to another set of propositions which describe the side-effects of attaining that goal. Similarly, the adoption and successful implementation of a step toward attaining any goal will also have its side-effects. Thus, it becomes clear that the formulation of goals for policy planning is actually the sum (or conjunction) of at least four sets of world-states--two described by the goal and its side-effects, and two (or more) describing the conditions under which the steps are satisfied together with their side-effects. Thus, in talking about alternative goals for the educational system we must have a way of assessing the sum (or conjunction) of four (or more) complex classes of statements. Moreover, we must be able to assess, independently, the relative preferability (not desirability) of each of these sets of states of affairs.

This is essentially a problem in extending what is currently known in the logic of preferences. In a recent work, Nicholas Rescher (Introduction to Value Theory) has established a framework for performing this task which may prove adequate to the needs of EPRC. The currently proposed methodological study of goals is aimed at testing how much of that work can be used and whether and how it may need modification for the purposes of EPRC.

4. Economic Forecasting

The work on this project thus far has consisted primarily of a bibliographic survey, a data-source search, and an effort at conceptualizing the task. During the coming months, two main lines of inquiry will be pursued: (i) preliminary quantitative projections, using a long-term forecasting model, and (ii) a survey of institutional and attitudinal forces and structures which have been and will be influential in determining the size and composition of Gross National Product and related questions. The premise is that much institutional and attitudinal change of economic significance, and certainly most of that which is predictable, will occur in response to economic pressures. Where these pressures (demand, technology, population, etc.) conflict with institutional forms and ideologies or attitudes, something must give; but in order to determine where these conflicts will occur it is necessary to assess them independently. During the late spring or summer, the two will be brought together, and alternative futures will be constructed on the basis of different types of reconciliation.

At this stage, we are proceeding under the assumption that the economy, as the supplier of the human and material inputs of--and as the final consumer of the output of the educational system, is determining and not determined by which of the many alternative educational futures obtains. By this we mean that the range of educational futures is limited by the economic system's needs and resources and that the economic system will perform at about the same level regardless of what changes occur within the educational system. One need not be an economic determinist to accept this procedure as a methodological convenience. Once one or more economic futures have been sketched out under this assumption, it will then be possible to re-evaluate the impact of each of a number of alternative educational futures on the economic system. Such re-evaluating will be dependent on other research in progress at the Center.

5. Relevance Tree

In our last annual report, it was pointed out that one of the problems we face in the generation of scenarios is the formulation of some more orderly test for completeness and relevance of items included or excluded from the scenario. We realize, of course, that the plausibility of certain scenarios may suffer from too extensive a criterion of completeness. Too many details may render a scenario implausible. However, we need some systematic way of checking for completeness, or rather for omissions--not because we want to make every scenario complete, but rather because we need to know approximately wherein its incompleteness lies. Moreover, we need to have a similarly systematic way of checking on any scenario for education to determine whether we have covered all the items relevant to the particular issues under consideration, or, again, to determine wherein the omitted relevant factors might be found.

For this purpose, we are attempting to develop a "relevance tree" focusing on the exhaustive description of the elements needing consideration if we are to describe the educational system. A relevance tree has the appearance of a conventional "Table of Organization." Theoretically, if we can develop such a catalog or classification system for every theoretical, organizational characteristic and social category that needs inclusion in describing the educational system and its operation, then we shall have classified all the items and cross-references needed to constitute a systematic reference for completeness and relevance for any scenario we may wish to consider in relation to education. In its current form the "relevance tree" contains some 4000 entries. As a methodological device, this development will never reach a stage of final formulation; but already it promises to show where educational forecasts have been weak in the past and where improvements

might be made.

6. Propositional Inventory

The Center is engaged in an attempt to formulate a set of propositions or quasi-laws descriptive of the educational system as it now exists which will provide a heuristic model useful in a number of Center projects. The purposes of this continuing effort are to provide:

- (a) a conceptual portrait of the educational system,
- (b) a conceptual model for use in developing indicators and generating scenarios,
- (c) a teaching device around which discussion might be organized, and
- (d) a constantly expanding and improving basis for formulating hypotheses about what significant changes might occur or be made to occur in the educational system.

During the current report period, the staff produced approximately 40 such propositions. This set will undergo continual modification and extension.

* * *

The Center has allocated a major portion of its effort during the current report period to the development of a capability in these six methodological approaches. These, with other methods and questions and as simulation-gaming and the relation between future time perspective and human conceptual systems, will receive additional attention in the coming year. Some problems associated with these methods are discussed in the following section.

II

PROBLEMS

Several problems, largely methodological in nature, are receiving attention in the Center. These are discussed briefly below.

A. Selection of Delphi Panels

Much of the work underway in the formulation of technological, biomedical and societal futures relies on the Delphi method developed by Olaf Helmer, now at the Institute for the Future. This method involves collecting independent forecasts made by experts in appropriate fields as to the probability of occurrence and estimated date of occurrence of selected events or trends. Initial judgments, independently arrived at by the respondents, are then fed back to them in a series of Delphi questionnaires in order to elicit as much convergence of forecasts, as well as explicate the reasons for continuing divergence of forecasts, as the experts' opinions support.

Clearly, the criteria for the selection of the experts who are to serve as respondents is a critical problem. Particularly with the societal Delphi now underway, we feel that more must be learned about the impact of conceptual systems and normative and experiential factors held by the respondents upon the kinds of forecasts they produce. At this stage, it appears that forecasting for societal futures is a trickier business than in the technological areas where Delphi was initially developed as a method of systematizing conjectures about the future. The very difficulty in identifying and depicting social trends with the degree of exactness or "hardness"--both as to date of occurrence and as to quantifiable indicators--expected of technological forecasts seems to increase the likelihood that societal forecasts may reflect, to some as yet unknown extent, the wishes and desires of the respondents, a form of self-fulfilling prophecy. Clarifying the dimensions of this problem should lead to a more systematic basis for selecting the "experts."

B. Problems in the Use of the Cross-Impact Matrix

The cross-impact matrix, an extension of the Delphi method, has been developed by T. J. Gordon at the Institute for the Future as a way of identifying and measuring the impact of linkages among forecasted events. In the Delphi method, experts are asked to make forecasts about the probabilities of occurrence of separate future events as if these events were independent variables. The cross-impact matrix method then

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provides a mechanism for stating to what extent, and how, these separately forecasted events, if they occur, may enhance or inhibit each other, and thus change the probability of their occurrence. For example: if Event A, forecasted through Delphi procedures, is assumed to have occurred, what effect, if any, will its occurrence have in changing the forecasted probability of the occurrence of Event B, and vice-versa. Two problems have been identified, and research is underway to deal with them.

In the use of Delphi and the subsequent application of the cross-impact matrix, it has generally been assumed that the forecast for each event has been linearly determined by the respondent; i.e., that in judging the likelihood of its occurrence, no other events in the future were taken into consideration. However, it now appears that in the Delphi stage, certainly some respondents, for some events, utilize their own more or less intuitive cross-impact judgments about linkages among the events before assigning initial probability to each event they forecast. If this is the case, then the next stage, using the cross-impact matrix in a formal, explicit manner, may result in a kind of double-accounting, thus reducing the reliability of this method as a way of more systematically estimating the impact of these linkages. This problem seems amenable to technical solutions through the further refinement of the method itself.

The second problem, not unrelated to the first, lies in the critical area of who makes the initial judgments as to the mode, strength, and time-dimension of the linkages among events whose probabilities of occurrence are forecast through Delphi procedures. In the past, these judgments have been made by the persons responsible for setting up and running the matrices on a computer. It is now felt that methods must be developed to bring to this judgmental task the same kind of expertness and consensus producing procedures as in the Delphi method. There are serious problems of efficiency of effort to be solved. For example, if a group of experts is asked to assign and estimate the strength of impacts among as many as 100 events iterated on a cross-impact matrix, up to as many as 10,000 judgments could be theoretically required of each expert. The value of expert consensus techniques developed initially for the Delphi Method appears sufficiently relevant to this concern to merit further technical research. At this stage, it appears possible that reasonably efficient techniques can be developed to permit the handling of both the number of events and the number of respondents required.

C. The Plausibility of Scenarios

The refinement of Delphi and cross-impact matrix techniques and their present intensive application to technological, bio-medical, and societal futures will shortly facilitate the development of a series

of alternative future environments for education. This development will probably consist of the formulation of a series of scenarios of the future in which alternative educational policies can be embedded and their consequences explicated. But how can we judge the plausibility of the scenarios arrived at through these methods? This is a problem now emerging which will require increased attention.

What do we mean by plausibility in this context? The conceptual work now underway with the Institute for the Future has tentatively identified a number of notions which would seem to begin to answer this question. Clearly, the notion of probability is a component, though by no means a sufficient explanation. Scenarios containing events with low-probability forecasts may nevertheless, for other reasons, appear plausible. The ideas of completeness and relevance would appear to provide important criteria as to the plausibility of a specific scenario of the future. To what extent do the events and trends produced through Delphi and the cross-impact matrix represent all of the relevant factors necessary to produce a sense of plausibility? If it can be said of a specific scenario that an important factor has been omitted, then its plausibility has thereby been reduced. Perhaps we are here concerned with the richness of a scenario, such that it is clearly sufficient to encompass a variety of possible events without being redundant.

In addition, the inquiry now underway is hypothesizing that some notion of stability is important to this question of plausibility. Once a cross-impact matrix has been run through the computer a sufficient number of times to produce a convergence of values, the matrix can be perturbed by introducing yet another event; i.e., a "surprise"; and the matrix run again to determine how soon it converges back to its earlier value, if it does. Those scenarios which maintain their strength and consistency when so perturbed would appear to be more tolerant of change, and thus more plausible. Finally, we shall attempt to apply some criterion of consistency with human nature to each scenario (i.e., does a particular scenario fit our most deep-seated sense of what human nature can create and accept).

These initial criteria are not yet much beyond the stage of "hunches" as to how this crucial definitional question can be most effectively resolved. Cooperative research with the Institute for the Future should shortly begin to produce firmer identification and definition of the criteria of plausibility as we, at the same time, begin developing actual scenarios for the future environments of education.

D. Methods for Formulating Trade-offs

The ultimate objective of the Educational Policy Research Center is to formulate alternative educational policies in such a manner that trade-offs can be made among them. By itself, analyzing and evaluating

the consequences of these alternative policies within the context of various future environments for education is a necessary but incomplete program. That program becomes a truly significant enterprise when we have devised ways to formulate policy trade-offs with sufficient clarity and specificity for both educational goals and educational strategies such that policy-makers are clear as to the meaning and significance of the options available. Before this objective can be achieved, two major problems require resolution.

The first problem, put briefly, is that in general, educational goals are rarely translated into attainable educational objectives. More often, they represent value statements. These value statements are formulated in such a way as to elicit general agreement. But they are not differentiated either as to level of aggregation (i.e., for the society, for the region, for State, metropolitan area, specific school district, etc.), as to domain (i.e., fiscal, political, social, academic, etc.), or as to social role (i.e., student, parent, teacher, educational administrator, legislator, etc.). Initial research now indicates that when this differentiation occurs, a much richer mix of alternative educational goals can be developed.

But an operationally useful definition of attainable educational objectives also requires a specificity of statement such that it becomes possible to measure and evaluate progress towards achieving these objectives. Without such specificity, it is extremely difficult to devise alternative educational programs (the strategies) which can then be weighed in terms of their costs and their benefits and compared in terms of their on-going effectiveness.

All three of these elements--goals, objectives and programs (means)--must appear in any analysis of alternative educational policies if such analysis is to produce meaningful trade-offs. The problem which now confronts the Center is, in fact, to perform this translation--not for one set of values, but indeed for all the sets which presently impact upon the educational system.

The second major problem compounds the first; for this initial task must now be carried forward into the future. The results of a systematic formulation of alternative scenarios of the future environments for education must now be factored into the equation described above. How this can be done in conceptually satisfying and operationally meaningful terms becomes a major problem which the Center has set itself to resolve during this next year.

E. Problem of Goal Definition

The basis of a study of educational goals in relation to policy choices was outlined briefly under "methods" in the previous section.

It is not known at this point, whether the formal techniques drawn from "preference logic" are amenable to expression in a computer program that will allow us to deal efficiently with enormously complex sets of goals and means. There are three problems which we face in connection with this extremely basic part of the research program. First, we do not know the limits, or rather the extent to which a formal logic of preferences can be made applicable to the needs of policy studies and the assessment of preferences between alternatives. Secondly, we do not know the difficulties implicit in an attempt to translate these hunches into useful computer programs. Finally, we do not have well developed techniques for gathering the preferences of people in different sectors of our society to provide useful data for such analyses. The first two of these problems is of immediate concern in the next budget period. Pending the results of those investigations we shall probably use only some interview techniques on a modest scale or some application of Delphi to collect useful sets of preferences on alternative sets of goals.

III

ADDITIONAL RESEARCH IN PROGRESS

A significant portion of the work of the Center has been described in Section I of this report; that is, the general Research Definition and Methods. This section of the report will describe briefly research which fills in that framework and, in many cases, uses the methods described. Most of these projects are still underway; they are further described in terms of their continuation through the next report period in Appendices A and B.

The description below will fall into two general categories of substantive work: Social Futures or, more broadly, the environment of the educational system; and Educational Futures, those projects which are more directly concerned with the educational system. Of course, these two areas are not discrete but meet at many points. They are, in fact, very consciously inter-related, and most of the projects which fall under the rubric Social Futures are designed so they will provide a direct input to the studies dealing more directly with the educational system.

A. Educational Futures

The research which is underway here may be listed as five separate studies:

1. The Profession, the Schools, and Instructional Systems: Alternative Futures and Crisis Management
2. Post-Secondary Education: Individual and Institutional Behavior
3. The Learning Force
4. The Education Complex
5. Educational Planning

1. The Profession, the Schools, and Instructional Systems: Alternative Futures and Crisis Management

This study has been developed from the two questions posed by the Office of Education concerning alternative school organizational arrangements and the impact of individualized instruction. The current detailed conceptualization of this project is represented by Appendix A which treats the two Office of Education questions

together, extends the research design to include additional categories of analysis, and explicates the use of the Delphi Method and the Cross-Impact Matrix in the project.

Briefly stated, the research design is first to conduct analyses in the areas of: (1) teacher militancy and the future of the profession, (2) alternative organizational arrangements for education, and (3) individualization of instruction, and then combine subsets of events from each study in a set of cross-impact studies which will begin to define the subsets of events that will most rapidly and decisively impact between each of the categories for analysis. This will give a variety of ways in which to describe the possible impact of teacher militancy upon the organizational structure of the system, and conversely.

The remaining categories for analysis are: (4) current organizational arrangements for education, and (5) the identification of educational goals. The intent in these last two areas is first to produce a set of projections extending present patterns of practice and organizational trends into the future and then to determine what crises these might produce when combined with the results of alternative social, political, economic, and technological futures being produced by other Center projects. The resulting two sets of crisis situations might then be matched with a mix of educational goals carefully selected from a list of targets; then policies might be tested for their tendency to contribute toward those goals.

Several other projects well underway in the Center will contribute significantly to this work. As well as Delphi and Cross-Impact, the other methodological techniques described in Section I will be used to advantage. The propositional inventory will be useful in delineating current organizational arrangements for education, and the framework for goal analysis will provide the capability for dealing with educational goals. The learning force and education complex projects described below will contribute significantly toward understanding current organizational arrangements for education and in developing sets of projections extending these patterns into the future. They, in addition, will contribute to the identification and invention of possible alternative organizational arrangements. The focus on crisis and on educational goals, in the Profession, the Schools, and Instructional Systems, provides a mechanism for linking the social futures projects. The Alternative Economic Futures, the Social and Technological Futures, and the study of the Political Context of Education all may be combined with different organizational and policy sets in a series of alternative fashions to assess what crises might be produced and what progress toward selected goals might be expected.

2. Post-Secondary Education: Individual and Institutional Behavior

The post-secondary education project has resulted from the third question posed to the Center by the Office of Education concerning the consequences of alternative patterns of funding higher education. The Center has several concerns in dealing with this project: (a) that it do more than duplicate the efforts of the large number of studies of higher education finance, (b) that the research not be locked into a narrow conception of higher education but specifically be broadened to include consideration of a wide range of possible individual and institutional options, and (c) that it reformulate and pose for public debate questions and alternatives which have heretofore not received serious consideration. The work of the Center to date on this project has been aimed at posing new alternatives and designing data models which will permit usefully accurate predictions of the way in which various socio-economic groups in the population and various types of institutions would respond to alternative funding patterns or other related policy changes. The goal of this project is to inject into public debate in the very near future new questions and new options concerning possible patterns of funding post-secondary education.

3. The Learning Force

The learning force study, briefly alluded to above, has progressed substantially during this report period. The purpose of this project is the delineation of the various forms of educational activities, many of which have been overlooked by traditional approaches to education, and the assessment of the dimensions and configurations of learning activity in the United States. This project promises to make a useful contribution to a number of Center studies including a significant conceptual and factual input to the post-secondary education project which is intended to extend the debate concerning the finance of education beyond consideration of core institutions. This extension is one of the peculiar strengths of the learning force study.

4. The Education Complex

The education complex project is concerned with the study of educational activity as an interrelated education-communications-research subsystem of American Society. The "complex" is studied as a social system composed of a heterogeneous collection of large organizations relating to a particular societal function. The education complex is defined to include all individuals and organizations associated with the provision of formally organized instructional services. This complex involves the basic cluster of core educating institutions (elementary and secondary schools, colleges

and universities) and peripheral programs (e.g., corporation training programs, adult education). It also includes intimately related organizations including suppliers of funds, equipment, knowledge, personnel, articulation, and legitimation; and beneficiary groups involving institutions, personnel, students, and parents.

The model of a complex systematically arranges social indicators, which, in turn, are used to suggest the emergence of the complex over the first two-thirds of the twentieth century as a result of consolidation of core institutions, the growing importance of education in the "periphery," and the growth of large national suppliers and beneficiary groups. This "systems foundation" then provides a heuristic approach for forecasting the future.

This project is now near a stage of completion. It served as the basis for Technical Memorandum #3 "The Education Complex: Systems Theory as a Heuristic Approach for the Study of the Future" which was also presented at the annual meeting of the Society for General Systems Research. A draft of the entire project is expected to be completed in April. Again, this project relates very usefully to a number of other Center studies underway and planned.

5. Educational Planning

The educational planning project is a bibliographic and conceptual study of the current state of the art in planning for education and forms the base for the intensive investigation of particular problems in this area. Nearing completion now are a cross-cultural unannotated bibliography on educational planning and a selected annotated bibliography. Based on these bibliographies, a monograph describing the current status of planning for education is underway. This work will provide the background for more advanced studies of critical problems facing educational policy formulation: (a) the relations between plans, implementation, and consequences; (b) input-output relations and the measurement of trade-offs; and (c) the means for linking current planning and policy formulation to the study of alternative futures.

B. Social Futures

Mention will be made here of the several projects which constitute that area we have defined as the context of the educational system. For Center purposes these are primarily important as they impact on the educational system and as they might be conjectured to impact on alternative futures of education and policies which might be intended to implement these. When completed, these studies will constitute the basis for a large number of alternative scenarios and educational futures which can be systematically linked to them to determine whether their mutual impact

will be inhibition or enhancement of various goal mixes. (Most of these projects have been alluded to above; additional detail is contained in Appendix B.)

In an advanced stage of the work are the Societal and Technological Delphi studies being conducted in conjunction with the Center by the Institute for the Future. The work on the Alternative Economic Futures project, to date, has included the assemblage of data, the selection and adaptation of long-term forecasting models and the development of a survey of related institutional and attitudinal forces. This work will soon allow the construction of scenarios. Research plans have been developed for the project concerned with the Political Context of Education; heavy concentration on the project will begin in June. Ideologies in Thinking About the Future is a project concerned with the development of a perspective for the study of long-term cultural change. During the report period, Technical Memorandum #4 "The Technician Projection: A Study of the Place of Social Theory in Moral Rhetoric" resulted from this study.

DISSEMINATION AND TRAINING ACTIVITIES AND PLANS

Limited dissemination activity has occurred during the current report period since the major efforts of the Center have been devoted to staffing, definition and initiation of research, and methodological developments. Dissemination activities were restricted to: (1) wide distribution (approximately 1500 persons) of the basic packet describing the organization, purpose, and general approach of the Center [the items in this packet are contained in Appendix G], (2) limited distribution of Technical Memoranda and other working documents of the Center, (3) the initiation of instructional conferences and efforts toward development of methods of instruction appropriate to the substantive and methodological concerns of the Center, and (4) the definition of a general overall plan for future dissemination efforts. The dissemination plan is based on the assumption that the Center should communicate with a variety of audiences and that, consequently, several formats should be used within each of the two basic modes of communication: the printed word and direct contact.

A. Printed Word

Most printed materials will first be issued to a limited audience as formally-unreviewed Technical Memoranda. These serve two purposes: they make the results of the Center's work available to a limited audience (currently 150 to 200 persons) in the shortest possible time and elicit critical feedback on the Center's work. When considered useful and appropriate these Technical Memoranda will be revised, reviewed, and issued to a wide audience in the form of Occasional Papers of the Center and/or a brief non-technical summary of the material, as for example, the items in the dissemination packet previously issued by the Center. The substantive categorization of this printed material follows the basic conceptualization of the research efforts of the Center; i.e.:

- (a) Methods
- (b) Social Futures
- (c) Educational Futures
- (d) General

During the current report period a number of Working Papers and Technical Memoranda have been prepared and distributed to a limited audience. These include:

Paul Campanis, "Work, Leisure, and Education in the Future."

Jack D. Douglas, "Changes in American Youth Cultures, Education and Work."

Fred M. Frohock, "Moral Reasoning and Policy Planning."

Fred M. Frohock, "Politics Without Polity: From Moral Reasoning to Non-Consensual Bargaining."

Jerry L. Pfeffer, Technical Memorandum #1, "A Conceptual Approach to Designing Simulation-Gaming Exercises."

David O. Porter, Technical Memorandum #2, "Political and Administrative Factors Influencing the Allocation of Federal Aid: A Preliminary Summary of Interviews with State and District School Administrators."

Michael Marien, Technical Memorandum #3, "The Education Complex: Systems Theory as a Heuristic Approach for the Study of the Future."

Manfred Stanley, Technical Memorandum #4, "The Technicist Projection: A Study of the Place of Social Theory in Moral Rhetoric."

Additionally, two papers by Thomas F. Green have been accepted for publication and will be distributed in a Center reprint series. These are: "Schools and Communities: A Look Forward" to appear in the Spring issue of the Harvard Educational Review and "Post-Secondary Education in America: 1978-1988" currently being edited for inclusion in a publication of University College, the adult education division of Syracuse University.

It is expected that a much larger number of papers will be issued in one or more of the formats described above during the next report period. These will include:

a) Methods

1. Robert J. Wolfson, "Cross-Impact Matrix: Developments and Applications to Date."
2. Thomas F. Green, Gerald Reagan, and Arthur Grisham, "The Assessment of Educational Goals."
3. _____, "The Application of Preference Logic to Differential Choices of Educational Goals."

4. Jerry L. Pfeffer, "A Manual for the Construction and Conduct of Simulation-Games."
5. W. Timothy Weaver, "Exploring the Future: The Impact of Belief Systems on the Human Capacity to Think about the Future."

b) Social Futures

1. John A. Henning and A. Dale Tussing, "Alternative Future Histories of the U. S. Economy."
2. Olaf Helmer, T. J. Gordon, Robert J. Wolfson, "A Report of a Technological Delphi Study."
3. _____, "A Report of a Societal Delphi Study."
4. Joseph McGivney, "A Model for Describing the Political System of Education in Different States and Potential Changes in the System."
5. _____, "A Research Design for the Study of State Educational Systems."
6. Manfred Stanley, "The Status of Social Development Theories in the Social Sciences."

c) Educational Futures

1. Thomas F. Green and Staff, several papers from the study of The Profession, the Schools, and Instructional Systems: Alternative Futures and Crisis Management.
2. James C. Byrnes, "Some Questions on the Finance of Post-Secondary Education: A Contribution to Public Debate."
3. Stanley Moses, "The Concept of the Learning Force."
4. _____, "Negro Participation in the Learning Force."
5. Michael Marien, "The Composition and Size of the Education Complex: A Quantitative Study."
6. _____, "The Education Complex: Alternative Futures."

7. Don Adams and Jerry Miner, "Educational Planning: A Comprehensive Bibliography."
8. _____, "Educational Planning: A Selected Annotated Bibliography."
9. _____, "The Current Statuses of Educational Planning."

d) General

A Bibliography of Educational and Social Futures.

Descriptions of Educational Policy Research Center Plans and Efforts.

B. Direct Contact

Instructional conferences will provide the basic format for dissemination by direct contact. Center efforts will focus on the development, adaptation, and testing of various instructional materials and techniques and the actual conduct of instructional conferences.

A number of the methods of research in future studies are simultaneously devices uniquely suited for instruction. This is, in part, the reason for the Center's efforts in the area of simulation-gaming which operates as both a research and an instructional tool. For instance, one of the notions explored in Technical Memorandum #1 was that the actual construction of a game is an extremely powerful learning device. Delphi and the Cross-Impact Matrix methods can be adapted for instructional purposes and thereby used both for the exploration of substantive areas and for instruction in the use of the methods themselves.

Instructional preparation entails also the selection and modification of substantive materials derived from the other studies conducted by the Center. The Center, with the Institute for the Future, is designing sets of curricula based on futures studies and the philosophical attitudes involved in such studies.

Several instructional conferences are now underway or in the planning stage. As previously reported, a series of four conferences with selected trustees, faculty, and students of the Auburn Program of Union Theological Seminary is in progress. Plans are now being made for the Center to conduct a major part of the program of the 1969 National Conference of Professors of Educational Administration. The possibility of participating in a program conducted by the Brookings Institution

for a conference of the International City Managers Association is being explored. These conferences will involve participants as respondents in the actual operation of Delphi and Cross-Impact studies and scenario construction.

It is expected that several other such instructional conferences will be conducted during the next report period. In the near future, the Center will probably need the services of a professional involved full time in the development and conduct of direct instruction.

EQUIPMENT AND FACILITIESA. APL/360 Time-Sharing Terminal

The Center now has in its office facilities a terminal on the IBM APL/360 computer system recently installed at Syracuse University. This will facilitate extensive computational work on a number of Center projects.

B. Facilities

Two houses were renovated during the report period to provide the necessary physical facilities for the work of the Center. Included in these facilities are staff offices, a library, and a conference room which accommodates 25 participants.

DATA COLLECTION

The only collection of primary data which has occurred during this report period has been that involved with the Delphi studies described. The forms used in the Societal Delphi study are included in Appendix C.

VII

OTHER ACTIVITIES AND EVENTS OF INTEREST

Several other activities and events not described elsewhere in this report are of significance.

A. Project for OECD

In September 1968, the Centre for Educational Research and Innovation of the Organization for Economic Co-operation and Development (OECD) asked the EPRC to undertake a piece of work synthesizing past and current American efforts to define alternative educational futures. The Centre plans to utilize this paper in a world-wide policy conference on educational growth planned for late 1969. More specifically, the research is to result in: (1) a summary of American efforts to deal with education in terms of future alternatives, and (2) a discussion of the planning and policy-formulation problems which might arise from a consideration of these alternative educational futures. The second task confronts the EPRC with the necessity of identifying and analyzing operational-type problems generated by its approach to educational policy analysis at an earlier stage than our experience to date perhaps warrants. However, we consider this project a critical first step in the long-range effort of developing conceptual and methodological linkages between the formulation of alternative educational futures and the decision-making contexts of the educational system. The project is under the direction of Warren L. Ziegler. A paper will be submitted to the OECD in early April 1969.

B. Relation With the Brookings Institution

An informal arrangement has been developed between the EPRC and the Brookings Institution on the basis of which a member of the EPRC's senior staff participated in the Brookings Institution's Urban Policy Conferences. The Urban Policy Conference program at Brookings brings together for monthly, all-day seminars the leadership of specific metropolitan areas to consider policy alternatives for the future urban development of these areas. Typically, the conferences number thirty to forty business, political, educational, religious, mass-media leaders. They continue for a period of two years. During the first year, the participants are exposed to the fundamental ideas, problems and technology of the urban configuration, covering all major areas such as economy, land usage, transportation, communications, education, ecology, social characteristics and political organization. During the second year, the conferees set about devising the goals and formulas for a new urban policy

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for their area.

Warren L. Ziegler of the EPRC's senior staff has participated in the Conference sessions on education in Memphis, Tennessee, the Piedmont area of South Carolina, and Albuquerque, New Mexico. This arrangement is proving useful to the EPRC through providing an initial experience in developing and testing ways to acquaint senior local leadership with the EPRC's approach to analyzing and evaluating educational policy. It provides an additional opportunity for the EPRC to develop operational techniques of dissemination and training whereby leadership at the local level may begin to acquire the skills appropriate to the formulation of educational goals in a more sophisticated way and within a broader framework than is usual.

C. An Inter-University Consortium on Simulation-Gaming: A Proposal

The Center is now in the process of preparing, for outside funding, a proposal to establish an inter-university consortium on simulation-gaming. Tentatively the institutions participating with the Center include Syracuse University, Cornell, Columbia and Harvard. This two-phase project will explore the utility of simulation-gaming for research, decision-making, and training; and, depending on the results of this evaluation, design of a series of games which the participants as well as other institutions can use for the above purposes. A draft of the proposal is contained in Appendix F.

D. Assist Feasibility Study of Teacher Training Model

The Center, in February 1969, was requested by the Syracuse University Center for the Study of Teaching to assist that institution in testing the feasibility of its Model Elementary Teacher Training Program contingent upon their successful negotiation of a contract with the United States Office of Education. The Policy Center submitted to the Center for the Study of Teaching a proposal to accomplish two tasks:

- (i) provide, for the refinement of the Model and subsequently for its testing, the best current assessment of the alternative states of educational institutions and the environment of these institutions in the period 1975-1980, and
- (ii) design a simulation which can be used to test the Teacher Training Model based on: (a) the alternative futures developed in Task I, and (b) data about the local institution considering the adoption to the Model.

E. Computing Facilities

In January Syracuse University became one of the first institutions to install IBM APL/360 time-sharing, a very powerful and versatile computer system. The Center has had a system terminal installed in its facilities. The utility of this capability for the Center lies most significantly in its use with the Cross-Impact Matrix which we have translated to APL. This time-sharing system will allow not only the convenient use of the Cross-Impact Matrix, but the exploration of its potential as a research and teaching device in a context of immediate man-machine interaction.

VIII

STAFF AND ASSOCIATED PERSONS

A. Executive Committee

The following persons are members of the Executive Committee of the Educational Policy Research Center:

Stephen K. Bailey, Chairman, Policy Institute, Syracuse University
Research Corporation

Alan K. Campbell, Dean, Maxwell Graduate School of Citizenship and
Public Affairs, Syracuse University

David R. Krathwohl, Dean, School of Education, Syracuse University

Charles R. Wayne, Executive Vice President and General Manager,
Syracuse University Research Corporation

B. Research Development Panel

The Research Development Panel has been very active in assisting our staff in the development of a research agenda for the Center and in critically reviewing the Center's work. Its current members are:

George J. Alexander, Associate Dean and Professor, Syracuse University
College of Law

Gordon M. Ambach, Special Assistant to the Commissioner for Long Range
Planning, Office of the Commissioner, New York State Department
of Education

Samuel Goldman, Director, Syracuse University Center for Research in
Educational Administration

Olaf Helmer, Institute for the Future, Middletown, Connecticut

James E. McClellan, Director, Foundations of Education Department,
Temple University

William J. Meyer, Director, Center for Research and Development in
Early Childhood Education, and Professor of Psychology,
Syracuse University

George G. Stern, Director, Psychological Testing Center, and
Professor of Psychology, Syracuse University

Gabriel Vahanian, Professor of Religion, Syracuse University

Anthony J. Wiener, Assistant to the Director and Chairman of the
Research Management Council, Hudson Institute, Croton-
on-Hudson, New York

C. Staff

Currently the Center staff includes 14 persons:

Name and Title	% time with Center
Thomas F. Green, Director	75%
Robert J. Wolfson, Associate Director and Acting Director of Technical Studies	50%
James C. Byrnes, Senior Statistical Analyst	100%
Warren L. Ziegler, Coordinator of Research	100%
Ralph Hambrick, Assistant to the Director	100%
Aileen M. McLoughlin, Librarian	50%
Stanley Moses, Research Fellow	100%
Lawrence R. Hudson, Research Associate	100%
Mrs. Elaine G. Lytel, Research Associate	50%
Michael D. Marien, Research Associate	100%
W. Timothy Weaver, Research Assistant	50%
Sheila H. Bova, Administrative Secretary	100%
Elizabeth Macomber, Secretary	100%
Mrs. Aina Sanders, Secretary	100%

Three additional persons were employed during the report period. David O. Porter, Research Associate, and Allan Wulff, Research Assistant, left to take positions at other institutions; Robert Bundy, Manager of Educational Services, resigned his position for personal reasons.

D. Associated Researchers

The following faculty members from Syracuse University are closely involved in the research of the Center:

Bertram M. Gross, Director, National Planning Studies Program and Professor of Political Science, Maxwell Graduate School, Syracuse University*

Donald K. Adams, Director, Center for Development Education and Professor of Education, Syracuse University

Jerry Miner, Professor of Economics, Maxwell Graduate School, Syracuse University

Manfred Stanley, Associate Professor of Sociology, Maxwell Graduate School, Syracuse University

John A. Henning, Associate Professor of Economics, Maxwell Graduate School, Syracuse University

A. Dale Tussing, Associate Professor of Economics, Maxwell Graduate School, Syracuse University

* Professor Gross is currently Director of the Center for Urban Studies at Wayne State University. He will continue his association with the Center on a consultant basis.

FUTURE ACTIVITIES AND WORK PLANS

The current report period has been described as one of definition; the next period is planned as one of execution. The bulk of the effort during the next year will be devoted to carrying out the research which has been planned and begun during this year. The next report period will begin to see the application of the effort which has been expended in developing a methodological capacity; the results of substantive projects will become available; a much larger dissemination effort will be apparent. In short, the next report period will begin to show the pay-off for this period's effort.

It would be redundant to list plans in detail here since they have been discussed in Sections I, III, and IV above in the context of this year's efforts and are explicitly spelled out in Appendices A and B.

Appendix A

THE PROFESSION, THE SCHOOLS, AND INSTRUCTIONAL SYSTEMS:
ALTERNATIVE FUTURES AND CRISIS MANAGEMENT

Thomas F. Green
February 20, 1969

NOT FOR PUBLICATION OR QUOTATION. This paper is not in final form; it is still subject to review by the Research Development Panel and the staff of the Center. The basic thrust of the paper has been accepted, however, and it represents a significant portion of research planned by the Center for the next two years.

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I. INTRODUCTION

A. Background

It was the judgment of the Research Development Panel at its June 1968 meeting that treatment of these two questions* should be deferred until the techniques for constructing general scenarios for the educational environment were better developed and their implementation underway.

One of the problems in the Center's attack on the study of the future has been how to imbed specific scenarios on the future of the educational system into general constructs of events having to do with the future of U.S. society so that the interrelation, or feedback, between education and society can be handled in a fashion useful for policy formation. This problem is now closer to reaching a proximate solution.

The two questions dealt with in these remarks should be viewed in the light of attempts to solve these methodological problems and to develop a capability in the Center to produce studies having utility to policy makers at a variety of levels.

B. Systems Analysis and Studies of the Future of Education

1. E. S. Quade provides a broad definition of systems analysis which is applicable to the kinds of educational problems with which the Center must be concerned. He says:

"In the light of its origins and its present uses, systems analysis might be defined as inquiry to aid a decision-maker to choose a course of action by systematically investigating his proper objectives, comparing quantitatively where possible the costs, effectiveness, and risks associated with the alternative policies or strategies for achieving them, and formulating additional alternatives if those examined are found wanting. Systems analysis represents an approach to, or way of looking at, complex problems of choice under uncertainty such as those associated with national security. In such problems, objectives are usually multiple and possibly conflicting, and analysis designed to assist the decision-maker must necessarily involve a large element of judgment."**

*Two of three questions posed to the Center by the Office of Education are discussed here. These concerned (1) the impact of individualized instruction and (2) alternative school organizational arrangements. It has been determined that these could be handled most effectively together and in the context of a larger program of Center study.

**E.S. Quade (ed.) Analysis for Military Decisions, R-387-PR, the RAND Corporation, 1964, p. 4.

- a) The essence of systems analysis viewed in this way is (a) its focus upon policy choices, (b) the development of alternatives, (c) the assessment of trade-offs between alternative policy choices in order to utilize the concept of cost/benefit, (d) done under conditions of uncertainty.
 - b) It follows that an appropriate strategy for dealing with the policy questions under these headings and the specific work plans generated should result in: (a) a clear specification of goal targets or mixes of different goal targets, (b) an assessment of their primary and secondary effects, (c) the construction of trade-offs between the alternatives, and (d) some means of monitoring effects of such choices.
 - c) The study strategy outlined below will illustrate how these requirements will be met in the case of the two questions under discussion and how meeting these requirements will link such studies to the larger methodological problems of the Center in studying the future.
2. There are two methods of study that the Center intends to use in a variety of ways. Both are employed in the following work plans. They are the Delphi method and the cross-impact matrix. These plans also call for the employment of more conventional research techniques as well as, ultimately, some modest employment of simulation. The Delphi procedure and the cross-impact matrix require some special explanation, however.

a) Delphi:

Delphi is basically a method of reaching consensus on matters of judgment about the likelihood of specific events that might occur or could be made to occur in the future. An extensive treatment of the method is not necessary here since it has been developed in other technical memoranda of the Policy Center, and some special application of it will be developed in a projected paper on methodology. But some difficulties inherent in the method need examination.

In the first place, Delphi has been used in the past primarily with respect to technological forecasting. It has not been extensively used with respect to so-called "soft" areas of social phenomena. It seems clear to us, however, that two difficulties must be directly confronted if the device is to be used extensively in areas of concern to the Educational Policy Research Center.

The first difficulty is that Delphi calls for the formulation of judgments concerning the occurrence of events. In technological forecasts, events usually consist of the actual invention, development, but not adoption of technological innovations. In the realm of social change, among the most significant forces to be considered are social processes; i.e., secularization, decentralization, urbanization, changes in race relations, etc. These processes can be characterized as events only in a rather extended sense. They do not occur at a specific point in time. They are, instead, social processes which influence the shape of specific events in an extended chain of social change. We need to deal with such processes; but unless they can be formulated as events, in the more conventional sense of the term, the Delphi procedure is not very useful. We believe that this difficulty can be met in two ways.

In the first place, though a process may extend over a very large span of time and therefore cannot be said to occur at any particular point, nonetheless it may reach a certain size or a particular configuration at a specific point in time. Various Delphi studies can be constructed dealing with broad social processes or social trends provided we attach to them appropriate social indicators or indices which are signs or evidences of stages that can occur at a specific point in time. This technique is currently being adopted by the Center in a social Delphi developed in conjunction with the Institute for the Future. This Delphi study deals with social changes in twelve major sectors of concern to the Center, and to each sector of change there are attached certain interesting indicators or descriptors of a specific state of affairs.

The second problem with Delphi has to do with the selection of panels. In the past, when Delphi has been used for technological forecasting, the selection of panel members was simplified by the fact that expertise in some appropriate area of scientific or technological development seemed sufficient to lend credibility to judgments assembled by the method. In some areas of social change, however, expertise may be little more than a particular form of bias. The appearances of social changes or trends may be very different from different vantage points in the social system. Perhaps the best protection against blind bias in constructing any Delphi dealing with social events or in assembling the judgments which may result is to select a variety of panels representing different kinds of expertise, different positions in the social structure, different vocations, etc.

Particularly when dealing with specific educational sectors, therefore, the Center will seek to employ Delphi not only as a consensus device for eliciting expert judgment, but as a social survey device to focus upon the images of the future found in different sectors of the population and to obtain a reading of what consensus may be attainable among members of select populations. This problem of bias can also be met partially by certain uses of the cross-impact matrix.

b) Cross-Impact Matrix:

The cross-impact matrix is simultaneously (1) an extension of Delphi, (2) a means of checking upon the effects of possible bias in any Delphi study, and (3) a means of assessing the relative force of different interventions in a complex set of events. The Center proposes to use this device also as offering a basis for: (a) the construction of modular scenarios in clusters, and (b) a means of imbedding specific educational events in the context of more general scenarios. Basically, what the cross-impact matrix allows is an enormous extension of the range of human judgment over a vastly larger and more intricate set of events than would otherwise be possible. It allows us, in fact, to engage in fairly extensive exercises in computer simulation to assess the relative impact of policy choices within different environments. This device will allow us to do these things in the following ways.

In the first place, we can check for bias in the original Delphi study by modifying the initial probability of any given event about which we believe that the panel may have been blind and to check the difference in the related events which may result from compensating for that bias. For example, if we think that the panel was too optimistic or pessimistic in its judgment concerning the likelihood of a specific event, then we can arbitrarily change the probability of that event, run the matrix, compare the result with our original result and thus assess what might be the importance of error introduced by a possible bias on that particular item. We could repeat the same process for any specific item in the matrix.

Secondly, if we can identify, among a cluster of events, certain ones which might be amenable to change given sufficient social effort or particular policy changes, then we might test the consequences of rendering such a social event more probable by arbitrarily altering the initial probability of that event. This is a modest and initial method of trying

to identify where the investment of social resources might reasonably be expected to have a certain set of specified consequences. The results of such efforts, of course, would need to be checked against other independent methods of testing the reasonableness of such resulting conjectures.

Finally, the use of this device will enable us to mix items from different sets of events testing how some features of the social scene may impact upon others. For example, we propose to develop a set of appropriate events dealing with the future of teacher militancy, unions, and its possible effects upon the profession, certification, and the political structure of the educational system.

Other specific educational scenarios will be constructed to reflect the events associated with a number of alternative policies recently proposed as to how the elementary and secondary system might be constructed; e.g., the creation of contract schools, private schools publicly financed, the allotment of educational script to individual students for tuition rather than the maintenance of public school systems, etc. These developments can also be expressed as occurrences or described as partially occurring at some point in the future.

Such events might be examined not only to disclose their mutual relations, but they might also be segregated in small subsets together with other subsets of events taken from the general social Delphi currently being developed jointly with the Institute for the Future. The result would be a highly flexible device for beginning to sort out those occurrences within the educational sector which would substantially impinge upon the general social environment for education, and vice-versa. This technique will be described more fully in the work plans which follow.

II. METHOD OF ANALYSIS

A. General Comments

The following study plan constitutes an attempt to combine an investigation of individualization of instruction and other new systems of instruction with the somewhat larger question of possible advantages and disadvantages of policies directed at altering the structural organization of elementary and secondary educational institutions, particularly in urban settings.

The Policy Center at Syracuse was asked some months ago to undertake an analysis of individualization of instruction with particular emphasis upon examining its consequences for school organization and for other institutions of our society if such a pattern of instruction were to become generally adopted in American schools. The assumption behind such a suggestion, an assumption with which we agree, is that the widespread adoption of some types of individualized instruction would have substantial impact upon the political and social structure of the educational system. We think that the movement of individualization potentially has other implications for social policy as well. But the point, for the moment, is to observe that such a movement would have some impact (how substantial is not known) upon the selection of alternative institutional arrangements for the conduct of education at all levels. Hence, the original reason for suggesting a "consequential analysis" of individualized instruction is linked directly to a concern for examining the full range of possible alternative institutional arrangements for education. Thus, there is solid justification for treating these two questions together and for examining them for their mutual impact.

Conversely, it seems intuitively true that certain kinds of institutional arrangements for schools might make the progressive spread of some forms of individualization more likely, and other current proposals might make that development less likely or desirable. Consequently, whichever of these two questions we may wish to start with, it will be important to relate it to the other.

Moreover, it seems apparent that developments over the past several months make it all the more urgent to include, with studies of these two questions, some investigation of the future of teacher organizations, unions, and of the organization of the profession in general. Here again, it seems intuitively clear that possible alternative arrangements of educational institutions, and the extent and goals of the movement toward individualization will both be severely influenced by changes in the future of professional organizations and the future of teacher certification. The movement toward

decentralization of urban districts in some of our metropolitan areas raises important and severe questions on all of these fronts simultaneously. The proper balance between minimum standards of achievement for students and professionals must be balanced by the demands for local autonomy in curricular determination, which in turn will strongly impact upon the goals and extent of the movement toward individualization.

In general, then, it seems inescapable that any treatment of these two questions must deal not simply with the possible consequences of individualization of instruction or with the social benefits and costs of quite different ways of organizing school systems, but it must deal with these matters in the context of the future of the profession itself and alternative ways in which teacher certification may be governed. The following study plans are therefore designed to meet these requirements.

B: The Categories for Analysis

Educational planning, in general, and specific forecasts for the schools of the future, in particular, tend to converge on an interestingly narrow range of possibilities which strike us as for the most part quite unrealistic. A cursory examination of visions of the schools of the future will reveal that such schools, almost without exception, are inhabited by quiet children who present no real problems to teachers except those usually associated with healthy exuberance, high motivation, and insatiable curiosity. They are usually children of great ingenuity and social skill. The schools pictured in such "utopian" portraits seldom present problems in the relation of the school to the community and are populated by teachers who are excited, diligent, and well prepared. In short, the characterization of the school of the future is typically that of a school in a society confronted with no pervasive and basic crises in its educational system and no fundamental conflicts over the meaning of education, the aims of the individual in the educational system, or the political goals of the profession.

As contrasted with this rather typical vision of the future, the following study plans are aimed at identifying, through a series of initially independent analyses, the points at which crises might arise in relation to the structure of the schools, the future of the profession, and the nature of instruction itself so that out of such specific crises, alternative policies might be developed that will lead to genuinely different alternative futures, each with its respective costs and benefits. The analysis, then, instead of focusing on consensus, is focused on crisis.

The specific categories for analysis follow from considerations in

the preceding section. There are five such categories. Three of them will be tightly related and eventually incorporated into a set of alternative projections or forecasts. The other two will be attacked rather independently at the start, but will be related to the other three at a later stage. The aim for each set of studies will be to produce a set of forecasts centered around the identification of crises in the educational system.

The three initial areas for analysis are: (1) teacher militancy and the future of the procession, (2) alternative organizational arrangements for education, and (3) individualization of instruction. The strategy is to conduct analyses in each of these areas first and then combine subsets of events from each study in a set of cross-impact studies which will begin to define the subsets of events that will most rapidly and decisively impact between each of the categories for analysis. This will give a variety of ways in which to describe the possible impact of teacher militancy upon the organizational structure of the system, and conversely.

The remaining categories for analysis are: (4) current organizational arrangements for education, and (5) the identification of educational goals. The intent in these last two areas is to first produce a set of projections extending present patterns of practice and organizational trends into the future and then to determine what crises these might produce when combined with the results of the Social-Technological Delphi currently being produced by the Center in conjunction with the Institute for the Future. The resulting two sets of crisis situations might then be matched with a mix of educational goals carefully selected from a list of targets; then policies might be tested for their tendency to contribute toward those goals. More on this matter in the section dealing with Educational Goals.

1. The Future of the Profession

What is proposed here is:

(1) A review of the literature and an assessment of the speed of current change to identify the character and rate of growth in the influence of teacher organizations.

(2) An attempt to define what, precisely, is meant by a growth of teacher militancy in terms of specific events. That is to say, the phrase "stronger teacher unions" might be defined as a set of events involving enactment of specific legislation, increasing rates of teacher strikes, unions becoming recognized as the sole bargaining agents in school districts, the specific

items which become matters of negotiation, etc. Possible responses can be similarly defined in terms of events--the increasing division between teachers and administrators, independent associations of administrators, stronger voices of the community at specific levels of educational policy decision, greater importance of political leaders in intervening in educational policy issues, enlarged role of judicial review in establishing regulations dealing with educational problems, specific forces for the change of certification, and heavier demand for positions in private schools.

(3) Once these events are defined, then additional ones might be elicited from various populations in an initial Delphi round, and the different items might be assigned an initial probability of occurrence by subsequent Delphi rounds.

(4) Once the Delphi study is completed, then it will be possible to run cross-impact studies to determine the relative strength of different sets of events in their mutual impact.

2. Alternative Organizational Arrangements:

There are currently many proposals being made which would result in alternatives to the current structure of the public school system. There is, for example, the recently developing proposal in Boston to establish a school under the direction of a private corporation using public funds received through the Massachusetts Department of Public Instruction, to operate under the direct authority of the State and to be located within the jurisdictional region of the Boston School Committee. There are also proposals to establish contract schools; to establish school districts based not upon geographical boundaries, but upon sociological bases, to provide free tuition for each child to attend any school he may wish; and even to use public resources to establish Black schools in urban core areas. There are also proposals in more than eighty American cities to move from the pattern of neighborhood schools to educational parks or campuses; and conversely, it has been proposed to break up the typical school system into units no larger than could be housed in a small neighborhood residence.

Each of these proposals constitutes an alternative not simply for a different appearance of the lower schools, but different uses of state and local authority. They constitute, in fact, proposals for a radically different political structure of the educational system at the elementary and secondary level. These are the proposals that we intend to examine under this general category of analysis.

- a) Here the initial problem will be simply to survey the literature, extract the main outlines of such suggested steps, specify the details, and seek, if possible, to aggregate the suggestions in useful types. This has not yet been done, but certain modes of analysis suggest themselves immediately. There are those efforts which relate to changes in the size of the educational unit, those which relate directly to the multiplicity of different types of educational goals and philosophies that might be available, those which would modify the exercise of educational authority, etc. Perhaps some such set of categories can be constructed which will tend to group the features of these different proposals so that the categories cut across the currently debated alternatives.
- b) In any case, once the details and preliminary analysis of just what is included in these alternative educational "delivery systems" is completed, then it should be possible to specifically define the circumstances in which each cluster of characteristics would be observed to exist. That is to say, the definition of the related concepts could be rendered in the form of specific events, each with its appropriate indicator or set of descriptors.
- c) Once this is done, then a Delphi study might be conducted, with a variety of populations concerned with the changes, to assess not only likelihood but also acceptability of certain conditions contained in those events.
- d) Finally, it should be possible to conduct cross-impact studies which would begin to string out the interrelationships between these sets of events.

3. Individualization and Other Systems of Instruction:

Individualization of instruction is often said by its proponents to have substantial potential impact upon: (1) the character of teacher roles, (2) the fiscal management of the school, (3) the organizational arrangements of the schools, (4) the control of curriculum by the teacher, (5) the visibility of failure, (6) the frequency of success, (7) the freedom of the student to construct his own curriculum, and (8) the rigidity of the current school calendar.

Still, it is not always clear what, precisely, is involved in any of these categories in the movement toward individualization and other modern instructional systems. The term "individualization" covers a variety of instructional innovations.

Here again, what is meant by "individualization" would need to be defined strictly in terms of specific events or states of affairs which may or could come to exist in some degree in some number of school districts. The first step would be to select the states of affairs that, added up, would constitute a definition of individualization actually implemented in some degree in some number of school districts. This might be done initially by the staff of the Center and then checked by a method of consensus by submitting the list of such items to outstanding proponents of the movement.

In this way, a Delphi might be developed which would accurately reflect what is meant by the term, and the likelihood of such developments might be assigned some initial probability.

Secondly, in a similar way, some agreement might be sought to determine what kinds of events would constrain the adoption of individualization in some of its various forms. Among these might be certain events included in the Delphi on the future of the profession or the one dealing with legislation modifying the current organizational arrangements.

4. Related Categories for Analysis:

There are two related activities which are relatively unrelated to these three initial studies, but indispensable if ultimately the total study plan is to result in a useful assessment of trade-offs between different plans of action.

a) Current Practices:

In the first place, it will be necessary to design an investigation of current practices relating particularly to the matters of (1) teacher assignment, certification, association, etc. (2) organizational practices, and (3) instructional systems. The purposes of this inquiry will not be to conduct definitive empirical studies on each of these matters, but rather to collect the conventional wisdom as to how the system currently operates. It may be advisable to re-examine the data or to perform fresh analyses of some extant empirical assessments on these matters, but the purpose of this study is not to attain rigor of analysis and description, but to attain coherence in describing how the system operates and what might be some significant points of leverage in it. It may be that a simple structural-functional description encompassing current practice would constitute part of what is needed here. It may be also necessary to conduct some simple

survey studies in carefully selected areas to check on the accuracy of such a functional analysis. The purposes of such a study would be to permit some estimate of the effects of such practices if they are continued without modification in some subsequent social environment in the future. In short, the purpose is to produce not a "surprise-free" projection, but a surprising one. The assumption is that the most surprising future would be one in which nothing changes, and that is precisely the objective of this study of current practices.

b) Educational Goals:

The literature on educational goals is vast, confusing, and on the whole, not very useful for policy formulation or for analysis. There are three basic reasons for this unhappy state of affairs.

First, educational objectives are usually formulated at such a high level of generality so as to have no tight relation to any particular policy issues. For example, the goal--to provide the maximum opportunity for each individual to develop his capacities to the highest proficiency of which he is capable--is not in itself an educational objective which contributes to any specific policy formulation. It would be better described as the expression of a value rather than target or educational objective. In general, we can say that such a goal statement does not represent anything which we could reasonably hope to actually achieve. It represents, rather, something that we might more or less approximate; but it is not likely to become a matter for serious examination unless the failure to reach it becomes a generally acknowledged social problem. In short, it is not so much a goal to be attained as it is a failure to be avoided. It helps little in specific policy formulation. For example, it does nothing to help in deciding whether to invest resources in the top quartile of the academically talented or disproportionate resources in the bottom quartile.

Contrast this kind of objective with such specific targets as: (1) raise the mean level of academic achievement in reading in some specific schools by 1.5 within three years, (2) increase, by some measurable degree, the time use of educational facilities for educational purposes, (3) double the size of adult educational programs in basic education by 1973. These kinds of objectives illustrate what we mean by specificity. In conducting a study of alternative

educational goal mixes, one aim is to produce goals at this level of specificity.

Secondly, educational objectives are usually framed for some indefinite level of aggregation in the society. Typically, it is not clear whether the objectives are framed for individuals, for families, for the city, the state, or the nation. For example, a major policy issue exists in many states with large metropolitan districts as to how to balance the demand for some standard minimum of educational achievement against the equally appealing demand for local curricular relevance. The problem arises, in part, because it is not clear whether the objective is formulated for the state, and therefore for all schools in the state, or whether it is formulated for the community. The requirement of a uniform minimum standard of achievement will take very different shape if defined at these different levels of aggregation.

Again, equality of educational opportunity might well be balanced against the demand for freedom of educational choice. The maintenance of freedom of educational choice may be an easy thing if the multiplicity of options open to the student are defined from the point of view of an aggregation as large as the state. But though a state may contain many different kinds of schools, a particular region may not. Again, the educational goal will need to be differently defined for different levels of social aggregation.

Finally, educational objectives are typically formulated only from one particular point of view--that of parent, student, mayor, party, state, nation--or from one particular interest in the society--science, industry, the arts, etc. One of the reasons why educational goal-statements are seldom helpful is that they are typically formulated to satisfy every point of view. Yet it should not be surprising if goals formulated from the point of view of the parent should be different from those formulated from the point of view of the teacher. Indeed, much of the controversy over specific educational goals can be traced to the fact that what is being debated is not the over-arching general values which educators so often discuss, but the differences that arise from different points of view on educational goals.

What is proposed, then, is to take the following three steps:

- a) Review three types of literature from carefully selected sources--state policy or goal statements, the professional literature dealing with such goals (e.g., Gardner's Pursuit of Excellence and Education and Ecstasy; and Friedenberg's Coming of Age in America), and some typical school district statements. The purpose of such a review would be to extract such goal-statements as can be found, convert them into propositions at an appropriate level of specificity, and formulate them into some functional equivalents.
- b) Develop a three-dimensional matrix involving different levels of aggregation along one dimension, social points of view along another, and the domain of the goal (e.g., fiscal, academic, political, vocational, etc.) along a third dimension. Using this matrix, or some similar device, we shall seek to generate a very large number of mixes of specific educational objectives.
- c) Finally, we shall attempt to determine appropriate indicators for these lists.

This work would yield a method of generating an indefinite number of educational goal mixes at a useful level of specificity and with some rational control over the different forms that the goals take for different points of view and different levels of social aggregation. This should also give us a long leg on the problem of assembling subsets of goals, some of the consequences of attaining those goals, and therefore of designing a variety of trade-offs between different goals.

III. CRISIS IDENTIFICATION

A. Crisis Identification: The Profession, Organizational Patterns and Instructional Systems

Some reasons have already been given for focusing this set of studies on the identification of crises. It is useful to do so primarily as a built-in hedge against the disposition to formulate conjectures of future states of affairs which are static, contain no problems and no acknowledgement of propensity for continued change. The presupposition is that the term "crisis" is not simply an evaluative term designating a certain perception of a state of affairs. The view is, rather, that a crisis is a state of affairs with a high probability of changes in the direction of future social change.

Still the term "crisis" itself has not been defined. Perhaps a definition is unnecessary. It is essential, however, to ask how the recognition of crises can be related to the research methods that will be used in this proposed set of studies. It is not possible to give a satisfactory answer to this question within these study plans, but it is desirable to give the question a more precise formulation. It must be asked whether there are some properties of events, or sets of events, such that the existence of those properties (or some set of them) would constitute the sufficient conditions for the existence of what we ordinarily mean by a crisis. Secondly, if there are such properties, would they be identifiable through a cross-impact study as belonging to one set of events and not another? These two questions ask essentially how it is that we can operationally define a crisis in terms of events and their properties and whether, having done that, those properties would turn out to be basic to the logic of the cross-impact matrix.

There are many ways of defining what might be meant by "crisis" in the context of social systems. It might be argued, on the one hand, that a crisis can exist and be unnoticed by the participants in the social system; on the other hand, it might be argued that a crisis might exist quite apart from any objective state of affairs, simply because the participants in the social system perceive their situation as a crisis. The familiar phenomenon of the crime wave that results not from any increase in crime, but solely from improved police reporting, is a case in point. Hence, in a variety of ways it might be argued that a social crisis exists ultimately and only in the eyes of the beholder, that the concept of "crisis" cannot be rendered as any objective set of properties of events, that the most important social fact in any crisis situation is the fact that the participants in the social system view it as a crisis.

This line of argument is seductive and troublesome. Still, its truth can be acknowledged and its difficulties avoided. One must ask what it is that people perceive (or think they perceive) when they perceive a particular state of affairs as a crisis situation. Those properties can be described. Certain kinds of self-fulfilling prophecies in relation to crises can then be defined somewhat as follows: The perception of crisis and impending doom will itself constitute crises and lead to doom only on condition that the social situation is defined in a particular way; namely, so that the efforts of ordinary men to forestall the crisis will itself provoke the crisis. These are rather special conditions. They are, in fact, not satisfied in most situations where men see themselves in a crisis. In other words, in most social situations the perception of a crisis will not, in fact, be a necessary condition of the state of affairs as a crisis. In some instances, it will be an interesting additional feature of the situation.

What then are some of the relevant properties of social crises? We might begin with the simple observation that a crisis is often viewed as a "turning point," a point at which direction is changed. This metaphor suggests something like the following formulation. A crisis exists when two sets of events occur simultaneously (or coexist) but cannot continue to coexist. The "cannot" in this proposition is not clear. It is easy to formulate descriptors of two events such that their coexistence is self-contradictory-- "x occurs," "x does not occur." What is sought here, however, is an entirely different kind of relation. The question is whether there are events or sets of events contingently related such that

- (i) they may both occur, but
- (ii) when they both occur, the mode of their linkage is mutually inhibiting.*

If two events are related in this way, or better, if two sets of events are related in this way, then their joint occurrence would constitute the existence of some characteristics of what we ordinarily mean by a "crisis." What characteristics? It is not theoretically incidental that events having these properties bear

* For definitions of the modes of relations between events, see "Initial Experiment Using the Cross-Impact Matrix Method," by Ted Gordon, the Institute for the Future, Middletown, Conn.

a striking resemblance to the Marxist notion of contradiction. Furthermore, it may be that if such events were to occur in the real world, it would be because there are some states of affairs which initially do not impact on one another at all, but which will do so in a mutually inhibiting fashion if and only if they reach a certain size. This in turn suggests an alternative way of framing this feature of a social crisis. A crisis will exist if two trends are allowed to continue in the society so as to reach a size at which they become mutually inhibiting.

We do not, however, ordinarily use the term "crisis" to refer to any social state of affairs unless it is relatively serious. What is meant by "serious" in this context? Only the most cursory reflection is needed to reveal that a serious turning point is one which has many ramifications. Still, it can be said that an event may have many trivial consequences. Hence, the number of consequences is not the only thing we have in mind. We also intend to convey the meaning that those consequences are in some sense fundamental and not simply numerous. For our purposes, we might say that a turning point is fundamental if its ramifications are not simply consequences but are themselves reversals or shifts in the direction or in the interpretation of change. If the direction of a certain social trend is expressed as the probability of its reaching a certain size or configuration, then a reversal in its direction can be expressed as a shift in the probability of a certain event. This should be discernible in a cross-impact study.

Finally, we usually acknowledge that crises have some of the features of revolutions. That is to say, one of the features of a crisis is an increase in the speed with which certain events in a chain will occur. Since the probability of any event in the cross-impact matrix is partly a function of the time lag in its relation to other events, a shift in probability will presumably also reflect this feature of crisis situations. It seems to us doubtful at this point, however, whether this particular feature of the notion of "crisis" can be usefully identified by means of the methods proposed in this study. Perhaps it can.

In any case, the point to be emphasized for the moment is that there is some reason to think that the methods proposed for this inquiry will prove to be helpful in identifying the kinds of crisis situations that we need to study. Moreover, the notion that a crisis can be defined in relation to certain properties of events lends some initial plausibility to the suggestion that the three principal categories for analysis--the future of the profession, alternative organizational patterns, and new instructional systems--should be initially examined in independent studies. As is clearly indicated in the attached flow chart, the proposal is to

first conduct independent studies in each of these three major areas, then seek to identify those subsets of events from each one which, taken with subsets from the others, would produce crisis situations. This will require, also, some continuing analytic work on the concept of "crisis" as well as some experimentation with the cross-impact matrix.

B. Crisis Identification: Current Practices in Future Environments

In Part II, page 6, the need and purpose of an independent survey of current educational practice in relation to the major categories of analysis was described. It is proposed that this study be designed and executed in such a way that an additional set of crisis situations can be identified by projecting current practices into the environment emerging out of the social Delphi study currently being conducted by the Institute for the Future and the EPRC. The result would then be the identification of two sets of crisis situations dealing with the future of the profession, alternative futures of school structure, and the future of instructional systems.

C. Goal Selection and Trade-Offs:

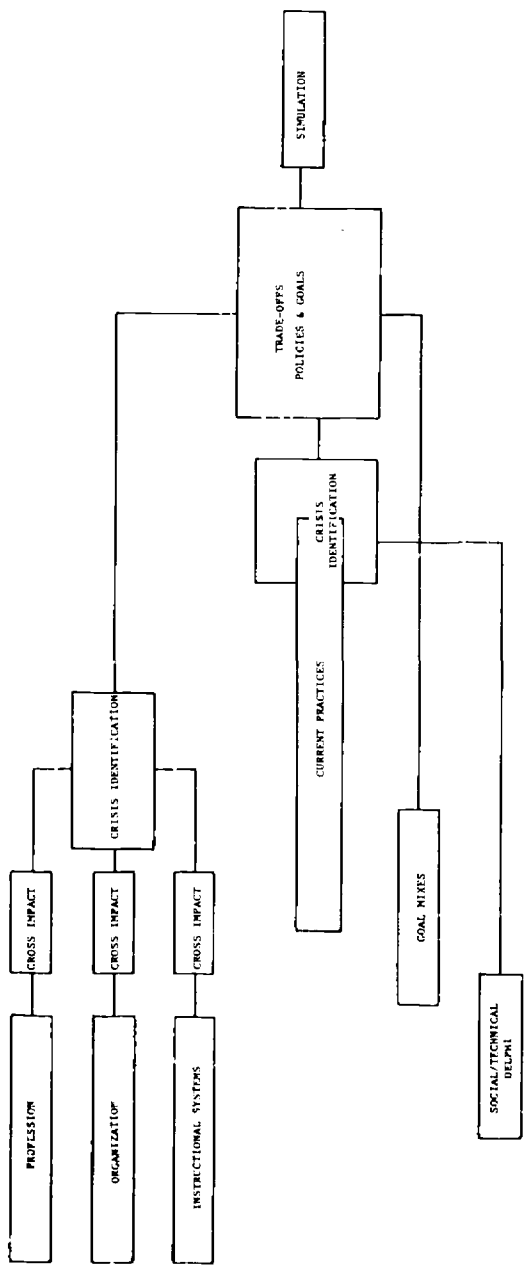
One of the important features of a social crisis is that it constitutes a time at which change is imminent. It is a time of opportunity, a point for turning. By focusing on the identification of crises, we do not mean to recommend that they be produced. We do not mean to commend a kind of crisis strategy as the best way of stimulating change. On the contrary, we mean to focus on points of crisis because we believe that by studying policy in relation to those points, we will be better able to clearly identify the alternatives of policy and we shall simultaneously be serving our own ends in specifying more precisely possible branch-points in the construction of scenarios.

Having reached the point of identifying a range of crisis situations in the educational system, we propose then to study the consequences of alternative policies in each case matching its effects against a carefully selected range of educational goals within a series of future environments so as to arrive at some estimates of the advantages and disadvantages, social costs and benefits of the alternative choices. Having done this, we should then be in a position to repeat the entire process in a second, third, and even fourth iteration for more extended periods in the future.

IV. CONCLUSION

It is important to recognize that this study plan constitutes a coherent package of research to be completed over a period of nearly eighteen months. It is expected, however, that in the process it will contribute in two further ways to the purpose of the Center. In the first place, it will, at each stage, add to the capability of the Center to reach its stated goals of studying the future in such a way as to develop useful policy insights for educators. It can be expected to do so first of all by increasing the methodological skills of the Center. On the way, however, there are several stages at which useful interim reports might be issued which would, in themselves, be of great interest to educators and to educational policy makers. The independent studies on the future of the profession, alternative organizational patterns, and the future of instructional systems will probably be of intrinsic interest. Even the initial definitional step would be a useful contribution. Any success in clarifying the mutual impact of these areas would also be an important contribution. Moreover, it should be anticipated that even modest success with this plan of study should add substantially to our capacity to reflect systematically upon the character of alternative ways of constructing models of teacher education.

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APPENDIX B

PROJECTED WORK DESCRIPTION: MARCH 1, 1969 TO FEBRUARY 28, 1970

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I

INTRODUCTION

The work plans outlined below are all related, some more obviously than others, to the central purpose of the Policy Center--to develop the capacity to generate alternative futures which relate to education, to test these futures for consistency and plausibility, and evaluate the consequences of alternative policies within the context of these futures. This effort involves both methodological developments in futures studies and systems analysis and substantive work in education and the educational environment.

In addition to research, the Center considers it a fundamental responsibility to make the results of its efforts widely available to a variety of groups and institutions concerned with education. As research projects are completed, an increasing level of activity will be directed toward the dissemination of information and methods of study in a variety of forms.

Following is a chart which indicates current estimates of the percentages of resources to be allocated to the various activities of the Center. Following that are brief descriptions of the plans for the period March 1, 1969 to February 28, 1970. In some cases these projects are major long-term efforts to which it is now impossible to attach a definite completion date; other projects allow a fairly precise estimate of completion dates and the general nature of the final products. Research plans are organized according to the major categories of inquiry: METHODS, SOCIAL FUTURES, and EDUCATIONAL FUTURES.

II

ALLOCATION OF EFFORT

The outline below represents the estimated percentage of resources to be expended on the various activities during the period March 1, 1969 to February 28, 1970.

PERCENTAGE OF EFFORT

RESEARCH PLANS

A. <u>Methods</u> (Adaptations and Developments)	}	20%
1. Delphi (3%)		
2. Cross-Impact (8%)		
3. Economic Forecasting (1%)		
4. Propositional Descriptions (1%)		
5. Framework for Goal Analysis (4%)		
6. Simulation-Gaming (2%)		
7. Future Time Perspective and Conceptual Systems (1%)		
B. <u>Social Futures</u> (Educational Environment)	}	20%
1. Alternative Economic Futures (3%)		
2. Social and Technological Environments (10%)		
3. Political Context of Education (5%)		
4. Ideologies (2%)		
C. <u>Educational Futures</u>	}	48%
1. The Profession, the Schools, and Instructional Systems (20%)		
2. Post-Secondary Education (13%)		
3. The Learning Force (4%)		
4. The Education Complex (3%)		
5. Educational Planning (8%)		
<u>RESEARCH DEVELOPMENT PANEL AND SECRETARIAT</u> (4%)	}	4%
<u>DISSEMINATION AND TRAINING</u> (3%)	}	3%
<u>YET TO BE DEFINED</u> (5%)	}	5%

RESEARCH PLANS

A. METHODS (Adaptations and Developments) (20%)

The Center during the next year will spend an estimated 20% of its resources in methodological work. The major purposes of this effort is the development of a capability in:

- (a) generating futures,
- (b) checking these futures pictures for plausibility and consistency, and
- (c) assessing alternative policies in the context of these futures.

The following is a brief account of specific methodological projects which will be conducted in the next year.

1. Delphi (3%)

Principal Investigators: Institute for the Future; Robert J. Wolfson

Project Description: Although the Delphi Method has been used with some success, especially in the area of technological forecasting, the Center with the Institute for the Future plans to invest efforts in:

- (a) adapting the method for more effective use in social forecasting (in part this effort entails the identification of appropriate indicators for education and society where "an event" is less easily defined than in technology),
- (b) developing more systematic criteria for the selection of experts to serve as respondents, and
- (c) developing techniques for the use of Delphi consensus techniques as a data generator for the Cross-Impact Matrix.

Nature of Final Products:

Capability applicable to substantive projects

Research reports on methods that might be useful to other organizations

Expected Completion Dates:

Continuing effort.

2. Cross-Impact Matrix (8%)

Principal Investigators: Institute for the Future;
Robert J. Wolfson

Project Description:

- (a) The Cross-Impact Matrix is a recently developed technique for the assessment of the mutual affect of a large number of events or conditions. Through the Institute for the Future, work will be continued on the mathematical theory and testing of the technique and its application to scenario plausibility testing.
- (b) The Center will continue its efforts in fitting the Cross-Impact technique to the computer time-sharing system in the Center's office facilities and in the development of man-machine flexibility in the use of the technique.

Nature of Final Products:

Capability applicable to substantive projects

Research reports making the method of analysis available to other organizations

Expected Completion Dates:

Ready for substantive work by April 1969

3. Economic Forecasting (1%)

Principal Investigators: John A. Henning and A. Dale Tussing

Project Description: The economic forecasting project is significant in both methodological and substantive terms.

(Further mention is made in B. 1. below).

- (a) modifying and applying economic models,
- (b) developing methods, on different economic assumptions, to assess the impact on forecasts of different institutional and attitudinal states, and
- (c) evaluating the impacts of different conditions of the economy on the educational system.

Nature of Final Product:

Capability applicable to substantive problems.

Expected Completion Dates:

Summer 1969

4. Propositional Descriptions (1%)

Principal Investigator: Thomas F. Green

Project Description: This project entails the effort to formulate a set of propositions or quasi-laws descriptive of the educational system as it currently exists. The purposes of this work are:

- (a) provide an approximation of a useful conceptual portrait of the educational system,
- (b) provide a conceptual model for use in developing indicators and generating scenarios,
- (c) provide a teaching device around which discussion might be organized, and
- (d) provide a constantly expanding and improving basis for formulating hypotheses about what significant changes might occur or be made to occur in the educational system.

Nature of Final Product:

Heuristic model to be used internally for any number of Center projects

Expected Completion Date:

Continuing effort; no assigned date.

5. Framework for Goal Analysis (4%)

Principal Investigators: Thomas F. Green and Gerald M. Reagan

Project Description: Thinking about education is often flawed by the fuzziness with which educational goals or objectives are stated. This project, making use of new developments in semantic logic, will attempt to develop a framework allowing the articulation of goals in an operational, i.e. measurable, way and enable the assessment of a variety of trade-offs between different goals. The work will stem from a three dimensional matrix of educational objectives with levels of aggregation of society along one dimension, social points of view along another, and the domain, e.g., fiscal, academic, political, along a third dimension. After appropriate indicators for these objectives are determined, the project should yield

a method of generating an indefinite number of educational goal mixes and a series of attainable goals at a level of specificity useful for the analysis and formulation of policy.

Nature of Final Products:

- (a) direct input for "The Profession, the Schools, and Instructional Systems" and other studies conducted by the Center
- (b) paper: "The Assessment of Educational Goals" by Thomas F. Green, Gerald Reagan and Arthur Grisham
- (c) paper: "The Application of Preference Logic to Differential Choices of Educational Goals" by Green, Reagan and Grisham

Expected Completion Date:

Fall 1969

6. Simulation-Gaming (2%)

Principal Investigator: Warren L. Ziegler

Project Description: As well as continuing the cooperative effort with the Cornell simulation-gaming of social and educational futures, the Center is now developing a proposal for a major, independently supported, inter-university consortium for the study and advancement of simulation-gaming techniques.

The objectives of this project are to test the utility of simulation-gaming as:

- (a) method of conjecturing about the future,
 - (b) one useful technique in the formulation of policy, and
 - (c) an instrument for instruction in a variety of settings.
- It is expected that games will be developed in various substantive areas which can be directly used by a number of groups and institutions for purposes of instruction, analysis, and decision-making.

Nature of Final Products:

The establishment of a process related to but independent of the EPRC for producing usable simulation and gaming techniques.

Expected Completion Dates:

Continuing effort; no assigned date.

7. Future Time Perspective and Conceptual Systems (1%)

Principal Investigator: W. Timothy Weaver

Project Description: The purpose of this research effort in the Center is to identify correlates of man's conceptual system and his perception of the future. The task is to determine the relationship between high and low performance on a measure of integrative complexity and performance on tasks of (1) extrapolating future outcomes of present action and inaction, and (2) estimating when future events will occur. This work promises to provide some initial basis for systematically selecting "experts" in Delphi and other studies where the selection of forecasters may have an important bearing on forecasting outcomes.

Nature of Final Project:

- (a) Capability applicable to certain other projects
- (b) Center paper: "Exploring the Future: The Impact of Belief Systems on the Human Capacity to Think about the Future."

Expected Completion Date:

August 1969.

B. SOCIAL FUTURES (Educational Environment) (20%)

It is axiomatic that the educational system cannot be understood if it is conceptually divorced from the societal environment which impinges upon it. The objective of the studies listed below is the delineation of alternative states of society which may impact upon the educational system and the identification of the linkages between the educational system and the larger society.

1. Alternative Economic Futures (3%)

Principal Investigators: John A. Henning and A. Dale Tussing

Project Description: During the coming fiscal year John A. Henning and A. Dale Tussing will continue their work in forecasting alternative economic futures and relate them to the educational system. Simply stated, their approach is to:

- (a) develop quantitative projections using long-term forecasting models,
- (b) survey institutional and attitudinal forces,
- (c) determine where these institutional and attitudinal forces conflict with the assumptions of the quantitative projections, and
- (d) construct alternative futures on the basis of the types of reconciliation which might occur.

Nature of Final Products:

- (a) Series of alternative future histories of the U.S. economy.
- (b) Inputs to other Center projects.

Expected Completion Date:

Fall 1969.

2. Social and Technological Environments (10%)

Principal Investigators: Institute for the Future; Robert J. Wolfson.

Project Description: The Institute for the Future (IFF) will continue for the Center the two Delphi studies underway:

- (a) prospective evolution of technology stressing particularly the potential impact of these developments on society, and
- (b) definition of contemporary trends in society, likely change of directions in these trends, and developments which might significantly change these directions.

During the next year, IFF will complete both the Technological and Societal Delphi studies, publish the results, and based on the results, begin with EPRC the construction of plausible scenarios of the environment of education.

Nature of Final Products:

- a) Paper analyzing results of the Technological Delphi
- b) Paper analyzing results of the Social Delphi
- c) Series of scenarios

Expected Completion Dates:

Technological Delphi	June 1969
Social Delphi	June 1969
Scenario Construction	Continuing Effort

3. Political Context of Education (5%)

Principal Investigator: Joseph McGivney

Project Description: The Center is now initiating a study in the politics of education to pay explicit attention to the political environment of education and educational policy-making. The purpose of this project is to develop forecasts in the political context of educational decisions and link this political environment to other Center studies in the technological and societal environment of education. This task calls for the development of a typological model, a series of empirical studies, the development of a set of social and political indicators concerning the dynamics and structure of the political process, the development of surprise-free political conjectures, and finally, forecasts based upon the interaction of political conjectures and the other forecasts developed in the Policy Center.

Nature of Final Products:

- (a) Paper: A Model for Describing the Political System of Education in Different States and Potential Changes in that System.
- (b) Paper: Research Design

Completion Date:

January 1970.

4. Ideologies in Thinking About the Future (2%)

Principal Investigator: Manfred Stanley

Project Description: This project by Manfred Stanley involves the continuation of the development of a perspective for the study of long-term cultural change with emphasis on the alteration of patterns of consciousness and mentality. His studies focus on two topics. The first is concerned with the argument that liberal societies in advanced industrial countries are giving way to a new form of social organization, the so-called

"technological society." This "technicist projection" is both a major social criticism and social prediction of our time. Stanley is studying the assumptions and theoretical content of this projection. The second topic is the status of social development theories in the social sciences.

Nature of Final Products:

- (a) Paper on Technicist Projection
- (b) Paper on Social Development Theories

Expected Completion Date:

Fall 1969.

C. EDUCATIONAL FUTURES (48%)

Projects under this rubric deal directly with the educational system (not defined as schools) and its future. The purpose of the efforts is the identification of the sensitive elements of the system, their interrelationships, the nature of the system's linkages with its environment and, on the basis of these, the construction of alternative pictures of the future of the system. These pictures or scenarios will then form a context within which the impacts of policies will be assessed.

1. The Profession, the Schools, and Instructional Systems: Alternative Futures and Crisis Management (20%)

Principal Investigator: Thomas F. Green

Project Description: The research plans outlined here received their initial impetus from the two questions for policy analysis suggested by the U. S. Office of Education. These questions were concerned with individualization of instruction and its impacts and alternative organizational arrangements for education. Analysis of these questions by the staff of the Center and the Research Development Panel made it clear that the two questions were closely related and that, for purposes of analysis, they should be combined. Additionally, it became clear that the questions could most effectively be analyzed in the context of other work being developed in the Center. A paper is being prepared which reformulates these questions in the context of the larger framework deemed most appropriate for an effective handling of this area of analysis.

Although subject to further review by the Research Development Panel, the plan of research is to juxtapose five categories and analyze them in a futures crisis management framework. These categories are:

- (a) teacher militancy and the future of the profession,
- (b) alternative organizational arrangements for education,
- (c) individualization of instruction,
- (d) current organizational arrangements for education and factions in the educational polity, and
- (e) the identification of educational goals. This analysis will be closely tied to the use of Delphi, Cross-Impact and other futures techniques.

Nature of Final Products:

A series of papers on:

- (a) The Assessment of Goals in Education,
- (b) The Future of Certain Aspects of Education,
- (c) Further Development of Methods.

Completion Date:

December 1970.

2. Post-Secondary Education--Individual and Institutional Behavior
(13%)

Principal Investigator: James C. Fyres

Project Description: In response to proposals for universally available post-secondary education, this project would involve the development of new concepts for the measurement of individual and institutional behavior. This range of education includes far more than the pursuit of conventional forms of higher education. The approach would be to design data models which would permit usefully accurate predictions of the way in which various socio-economic groups in the population and various types of institutions would respond to alternative policy changes (e.g., alternative funding patterns) by governments and private agencies concerned with post-secondary education.

The work plan briefly stated above stems from the question on alternative funding patterns asked by the U.S. Office of Education. These plans have been reformulated by the Research Development Panel and the staff of the Center in an attempt to

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integrate them with the main thrust of the Center's research effort and to make them additive rather than duplicative of other groups' efforts in the area of higher education policy and finance.

Nature of Final Products:

"Some Questions on the Finance of Post-Secondary Education: A Contribution to Public Debate."

Expected Completion Date:

September 1969.

3. The Learning Force (4%)

Principal Investigators: Bertram M. Gross and Stanley Moses

Project Description: The Center will continue the work on the Learning Force, a concept which delineates the various forms of educational activities, some of which have been overlooked by traditional approaches to education. This work will attempt to assess the dimensions of learning activity in America, in both the Core, the traditionally recognized institutions of instruction, and in the Extensions, those areas of previously unrecognized educational activity. A subtask of the Learning Force project has been an assessment of the composition of the "Negro Learning Force" and the implications that participation or exclusion from selected educational activities has for the problems of Negroes in America.

Nature of Final Products:

- (a) Book to be published by Basic Books: The Learning Force, Gross, Cohen & Moses.
- (b) Several papers on particular aspects of the project.

Expected Completion Date:

Summer 1969.

4. The Education Complex (3%)

Principal Investigators: Bertram M. Gross and Michael Marien

Project Description: The Education Complex project is an effort of the Center to study educational activity as an interrelated education-communications-research subsystem of American society. The purposes of this study are to conceptualize and demonstrate the existence of an education complex as a subsystem composed of all organizations and activities related to education, develop a model of these relationships, refine the model and develop indicators as a basis for reports on the "state of education," and use the model as a heuristic device for the construction of future education scenarios.

Nature of Final Products:

Book to be published by the Free Press, The Education Complex.

At least two papers published by the Center--one including data not otherwise available to educational planners on the composition and size of the "education complex" and another extending these configurations into a set of alternative futures.

Expected Completion Date:

Summer 1969.

5. Educational Planning (8%)

Principal Investigators: Don Adams and Jerry Miner

Project Description: The purposes of this major study of educational planning are:

- (a) review the current status of educational planning;
- (b) evaluate, by means of a series of case studies, the relations between plans, implementation, and consequences;
- (c) analyze input-output relations within education and the interaction of education with other systems; and
- (d) link the lessons of educational planning to the study of alternative futures.

Nature of Final Products:

- (a) Comprehensive unannotated bibliography on Educational Planning
- (b) Selected annotated bibliography on Educational Planning

- (c) Monograph on status of Educational Planning
- (d) Conceptual design for investigation of parts (2), (3), and (4) of Project Description

Expected Completion Date:

September 1969.

IV

RESEARCH DEVELOPMENT PANEL AND SECRETARIAT (4%)

A. RESEARCH DEVELOPMENT PANEL

The Research Development Panel has proven very useful in the development of a research agenda for the Center and as a critical review mechanism for the work of the Center. The Panel will meet six to eight times in the coming year. The immediate agenda is the completion of the review of proposals and work plans now underway; e.g., "The Profession, the Schools, and Instructional Systems," "Post-Secondary Education--Individual and Institutional Behavior" and the Simulation-Gaming proposal.

The second item for the Panel is the delineation of the substantive areas of inquiry for the Center Secretariat and discussion of the most productive procedures for the conduct of these inquiries. Preliminary plans are to devote a substantial amount of Secretariat energies to: (1) the future impact of bio-medicine on education, and (2) policy and the institutions of the arts. The investigations may take the form of solicited papers and conferences centered around them.

B. THE SECRETARIAT

The original plan for the Policy Center (See report, November, 1967) called for different ways of organizing for research. Among them was the pattern typified by the American Academy of Political and Social Science and the American Academy of Arts and Sciences in the production of The Annals and Daedalus. In both cases the organizations maintain a small Secretariat type of staff which solicits papers around the rubric of a series of conferences built on a central theme. The same pattern is followed to some extent in the Harvard Program in Technology and Society. It was this pattern of effort that was called for in the plan of the Center for a portion of its effort to be developed through the Secretariat.

Mr. Warren Ziegler, who joined the Center only in November of 1968, has been employed to prosecute this aspect of the Center's work and to develop related efforts in training and dissemination. The actual details of this effort are not well developed at this point, although Mr. Ziegler has produced a preliminary planning paper which is circulating internally as a first step toward further definition of that effort.

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It seems likely that next year a series of conferences will be held in conjunction with this effort and that in the months ahead it will become more explicitly defined. Plans at the moment call for explorations in two major areas: the impact of new developments in bio-medicine, and new policies for institutions of the fine arts. To mount this effort in a systematic way, the Center must plan to hold probably two conferences on each of these topics for two to three days length each. In addition, EPRC must be prepared to commission papers exploring these areas of policy from leading scholars, business leaders, professionals and public figures from a wide range. These capabilities are reflected in the budget figures and in the size of effort devoted in the months ahead for the Secretariat.

DISSEMINATION AND TRAINING (3%)

The two major dissemination and training efforts of the Center are conducted through the medium of instructional conferences and printed materials.

The effective presentation of material in a conference setting will require some work in the development of materials and instructional methods. For purposes of such instructional conferences and as an output in its own right, the Center, with the Institute for the Future, is designing sets of curricula based on futures thinking and philosophical attitudes.

Currently, the Center has in progress a series of four instructional conferences focusing on the methods and philosophy of futures inquiry with selected students, faculty, and trustees of the Auburn Program of Union Theological Seminary. In part the purpose of these is the testing of materials and modes of presentation for later use.

Preliminary arrangements have been made for the Center to conduct a major part of the program of the next annual National Conference of Professors of Educational Administration. The substance of this program will be methods of future studies with emphasis on Delphi and the Cross-Impact methods. These methods will be explained and then demonstrated in such a way that the participants in the conference will be respondents in the demonstration of the techniques. The participants thinking about the future, therefore, will be the base data for the operation of the techniques in this instructional setting.

It is likely that several other instructional conferences will be held during the next year.

The Center hopes to make the results of its research efforts available in printed form to the widest possible audience in the shortest practicable time and in a form appropriate for the particular audience. This dissemination effort has been initiated and its general contours are clear. Working papers which have undergone no formal review in the Center will be issued with appropriate disclaimers to a selected audience in the form of Technical Memoranda. Papers which have been cleared by an established review procedure will be

issued publicly as Occasional Papers. Papers and Memoranda will fall into the following substantive categories:

- (a) METHODS
- (b) SOCIAL FUTURES
- (c) EDUCATIONAL FUTURES
- (d) MISCELLANEOUS.

Additionally, staff members are encouraged to have the results of their work published through other established outlets. When considered useful such work will be distributed by the Center in a reprint series.

Brief reports (two to eight pages) of organizational, methodological, and substantive aspects of Center activities will be disseminated in the form represented by the "dissemination packet" widely distributed during this past year.

VI

ADMINISTRATION AND PERSONNEL

There are some administrative changes that will occur in the Policy Center for the period September 1969 to September 1970. These arise primarily due to the fact that during the pilot phase of the Policy Research Center, the Director, Professor Thomas F. Green, was awarded a Guggenheim Fellowship to undertake a long delayed study of the theory of moral education. At the same time he was also awarded an Alfred North Whitehead Fellowship at Harvard University. The acceptance of these fellowships was delayed for the 1968-1969 academic year because of the need to get the work of the Policy Center on firm footing and the staff assembled. At that time, it was clearly the intent of the Director, an intention agreed to by the Executive Committee of the Policy Center, that the opportunity to begin this sabbatical work would not be delayed beyond September 1969. The work of getting the Policy Center underway, locating staff, and establishing the directions and style of the Center seems now within reach and should be concluded in good shape by August 1969.

In the twelve month absence of the Director, Mr. Warren Ziegler, Coordinator of Research, will take also the role of Acting Director in the day to day administration of the Center. In addition, the Center will add to its staff an appointment of Educational Specialist to provide a continuation of the contribution of Professor Green from the field of education. This person is not yet located, but intensive recruiting is underway.

In addition, the Director will spend, at the Center in Syracuse, up to four days each month during the period of his sabbatical including all meetings of the Research Development Panel and the Executive Committee. In this way he will continue to contribute to the direction of the Center.

In addition, more active and regular contact with the Center shall be maintained between the Director and Stephen K. Bailey who has been designated as Chairman of the Executive Committee of the Educational Policy Research Center.

These arrangements are reflected in the proposed budget of the Center for the next fiscal year.

APPENDIX C
SOCIETAL DELPHI QUESTIONNAIRES

This questionnaire, together with three others which will follow, seeks to identify the major changes in our society, both domestic and international, that may take place during the next few decades.

This task, thus stated, is clearly a very ambitious undertaking, and we cannot hope to do more than to take some strides in the direction set by this goal. In order to make the task somewhat more manageable, we will have to restrict ourselves to attempting to outline only those potential developments that would represent really major changes from the societal patterns to which we are accustomed.

The trends toward some of these developments are clearly recognizable now. As examples, affluence seems to be increasing throughout most of the industrial (or post-industrial) countries of the world and the practice of birth control is gradually becoming more widely accepted. For trends like these we may ask how rapidly they will run their full course, or on what other factors their timing will depend.

In other cases we are aware of ongoing or anticipated environmental or technological trends that we expect will act as powerful stimuli of social developments, although the precise nature of the latter may as yet be inadequately understood. Obvious examples are the new communications technology and the possibility of genetic intervention. But there are also less obvious changes in the offing that are as yet not generally suspected of promising, or threatening, important societal consequences. Historical examples of implications of this kind that had on the whole been unforeseen are the profound effect which the invention of the automobile has had on our society and the aspiration gap brought on in part by civil-rights legislation passed in recent years. In all such cases, we would like to obtain not necessarily predictions but nominations for potential societal changes stimulated by these trends.

The objective of this first questionnaire, therefore, is twofold. It is

to estimate the future course of societal trends that are well under way now; and

to identify technological and environmental trends, now under way or predicted, that might have important societal consequences, and to describe the nature of these potential implications.

To accomplish this objective you are being asked to go through the following three steps:

- Step 1. Appended you will find, on sets of two yellow sheets, brief descriptions of current social trends in 12 broad areas. (There is no intended implication that the twelve areas together exhaust the domain of societal concern, nor that the descriptive statements given in each case have singled out the most important current trends in that area.) 2 of these sets are marked by a red stripe in the upper right corner; they are specifically assigned to you. Take these 2 sets, plus at least 2 others of your choice among the remaining 10, and
- (a) answer the questions on the first sheet of each set,
 - (b) continue each graph on the second sheet, showing how in your opinion the indicated trend is likely to continue during the remainder of the century.
- Step 2: On white sheets, also appended, you will find brief descriptions of 20 potential technological developments. 3 of these are marked by a red stripe in the upper right corner, indicating again that they are specifically assigned to you. Take these 3 sheets, plus at least 2 others of your choice among the remaining 17, and fill in your answers.
- Step 3: Consider whether there are other current or predictable technological developments that have not been included among the 20 but, in your opinion, ought to be given special attention in view of major potential societal implications. If so, use one or more of the white blank forms that have been provided, briefly describe each additional development, and fill in the remainder of the form as in Step 2.

In order to have your responses included in the preparation of the next questionnaire in this series, it is essential that you

mail your reply within one week

at the latest after receipt of this questionnaire. Please may we urge you to comply with this request. A stamped addressed envelope has been enclosed for this purpose. Note that only the sheets on which you have entered responses need to be returned.

Thank you for your cooperation. Questionnaire 2 will reach you in about four weeks.

Area:

URBAN PROBLEMS

1.1a

Here are a few statements which may describe some current trends in this area:

Among the pressures causing urbanization are the facts that cities offer multiple job markets, that they are centers for commercial and governmental services, and that they contain a diversity of products and opportunities for leisure not found elsewhere.

These pressures show little sign of decreasing.

If the present trend towards urbanization continues, 75% to 85% of our population will be living in urban areas by 1985.

The problems of cities seem to be growing with their size.

Contributing to these problems are the facts that crime is disproportionately higher in the central city, that the results of urban education are comparatively poor, that the air is dirtier, that city governments are cumbersome.

Efforts at improving the situation have not met with spectacular success.

New cities, as they have been conceived, favor more affluent citizens; also they attract public and private investment away from the older city centers.

Rebuilding of existing cities, on the other hand, is immensely expensive, and it involves the hardships of ghetto displacement. Moreover, it circumvents the question of the basic causes of trouble in our cities, that is, the attitudes and values of its residents.

Currently there is little evidence that sufficient political, economic, and social resources are being marshalled for a coordinated systems approach to these problems.

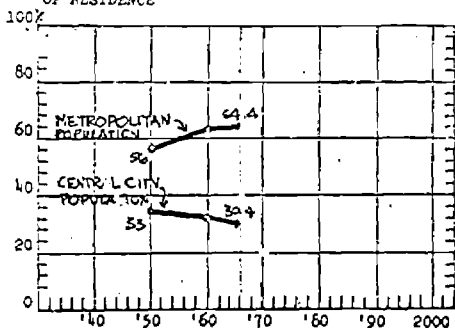
Do you disagree? If so, please indicate how the statements should be reworded:

Can you suggest any other important current trends in this area, that have not been included or sufficiently emphasized above:

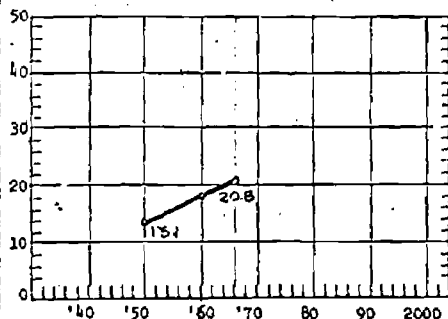
Can you suggest developments that, in your opinion, might occur in this area during the next few decades which would represent major changes from current patterns:

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C-3

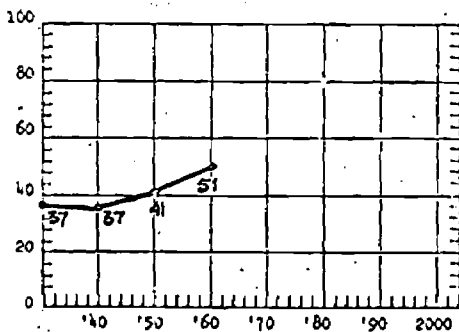
RESIDENTIAL PATTERNS: % DISTRIBUTION OF POPULATION ACCORDING TO PLACE OF RESIDENCE



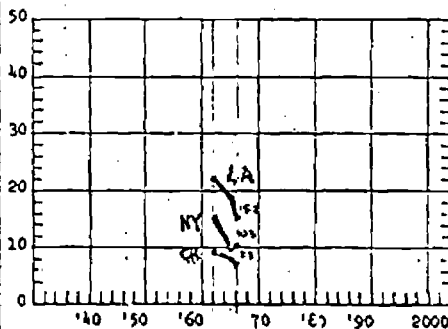
NON-WHITES IN CENTRAL CITIES, A % OF TOTAL CENTRAL CITY POPULATION



NUMBER OF URBAN PLACES OF MORE THAN 250,000 POPULATION



AIR POLLUTION DUE TO BENZENE SOLUBLE ORGANIC MATTER (micrograms/cu. meter)



Area:

FAMILY STRUCTURE

1.2a

Here are a few statements which may describe some current trends in this area:

Present trends suggest a continuation of the departure from the traditional role and structure of the family.

Parental control over children appears to be sharply diminishing.

Family units tend to be smaller, with fewer close ties to relatives other than parents and children. Frequently patterns evolve in which non-relatives become substitutes for family members.

As the burden of child-rearing and housekeeping is further reduced and women become increasingly accustomed to family planning, they may more than ever look for other forms of socio-economic participation. The same applies even more to the post-child stage, except that job opportunities for women in that age category are not apt to be plentiful.

The availability and public acceptance of birth control methods are having a far-reaching effect in changing family relationships and family structure.

Illicit relationships are more common.

Openly acknowledged experiments in non-conventional communal living are increasing.

With increased life spans, and the retirement age still at 65, the caring for the aged produces serious conflicts for the family since it is no longer considered its traditional function to accept this responsibility without question.

Do you disagree? If so, please indicate how the statements should be reworded.

Can you suggest any other important current trends in this area, that have not been included or sufficiently emphasized above:

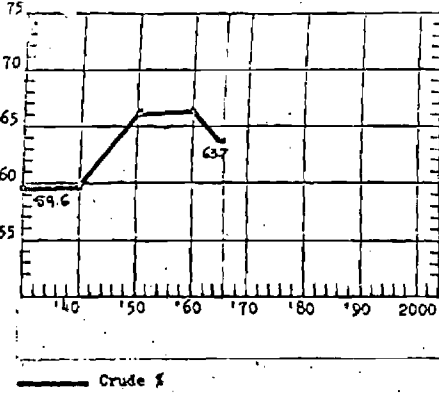
Can you suggest developments that, in your opinion, might occur in this area during the next few decades which would represent major changes from current patterns:

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C-5

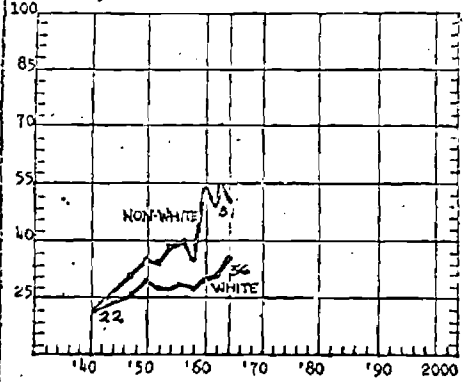
FAMILY STRUCTURE

Please extend the graphs shown below 1.2B

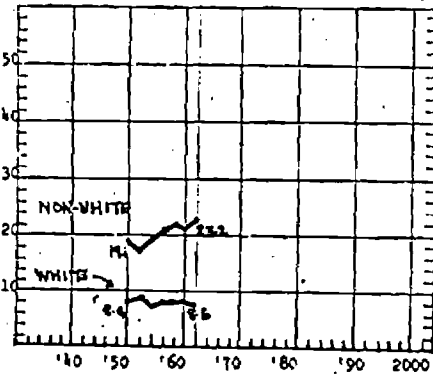
% FEMALE POPULATION MARRIED
(14 years and over)



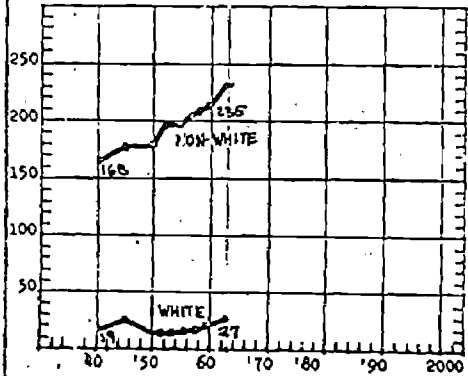
DIVORCES PER 1000 EVER-MARRIED FEMALES,
BY COLOR



% FAMILIES HEADED BY WOMEN, BY COLOR



ILLEGITIMATE BIRTHS PER 1000 LIVE BIRTHS,
BY COLOR



Area:

THE ECONOMY

1.3a

Here are a few statements which may describe some current trends in this area:

Since the Great Depression our economy has undergone significant structural changes.

Among the most important developments are the growth in the government sector and changes in business management through conglomeration and computerization.

Another factor is the increase in the power of labor unions, some of which have often tended to take highly self-protective positions with regard to such matters as civil rights, international trade, building codes, and automation.

By and large, economists and regulatory agencies seem to have acquired enough of an understanding of the forces that affect our national economy to be able to prevent another disaster such as took place in 1929.

Yet there is an increased public expectation of, and demand for, price and employment stability, pointing towards the need for further improvements in controlling the economy.

Economists find it difficult to test and verify fiscal and monetary policies, especially as to their social and political implications. This situation is further aggravated by the uncertainties of a very unstable international monetary system.

Thus, on the one hand, our complex economic system would greatly benefit from increased stability, while, on the other, political repercussions often thwart the means by which such stability could be achieved.

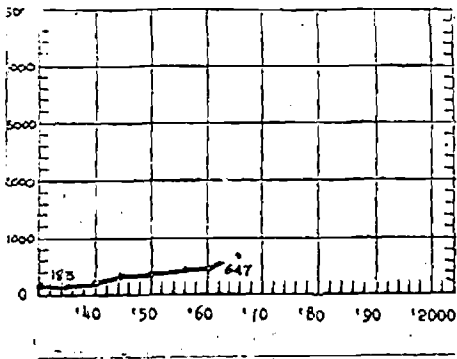
The income aspirations of the average citizen grow day by day, whetted by persuasive advertising and his increasing awareness, through modern communications, of income discrepancies. In a climate of increasingly vocal expectations, the government must try to moderate such differences.

Do you disagree? If so, please indicate how the statements should be reworded:

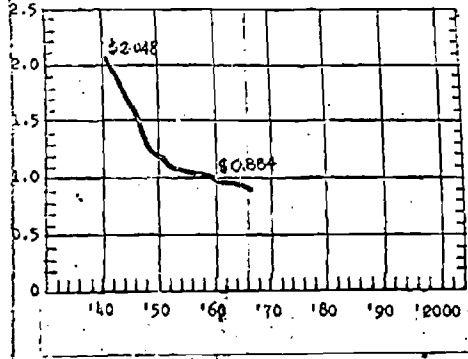
Can you suggest any other important current trends in this area, that have not been included or sufficiently emphasized above:

Can you suggest developments that, in your opinion, might occur in this area during the next few decades which would represent major changes from current patterns:

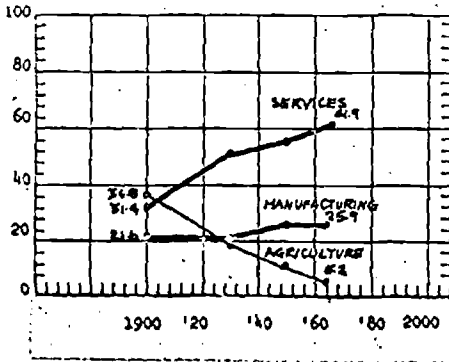
GROSS NATIONAL PRODUCT OR EXPENDITURE, IN 1958 PRICES (billions)



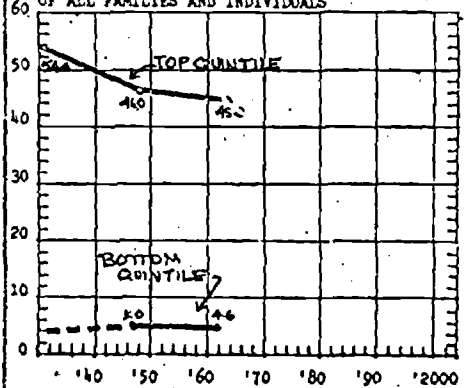
PURCHASING POWER OF THE CONSUMER DOLLAR (1957-59 = 1.00)



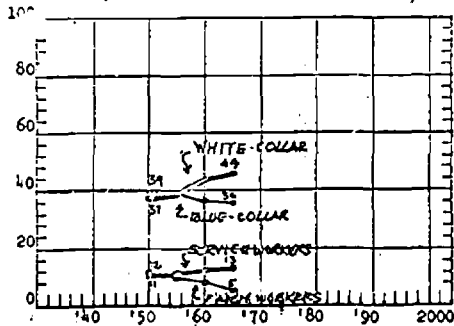
% EMPLOYMENT BY MAJOR SECTOR (100% = total employment)



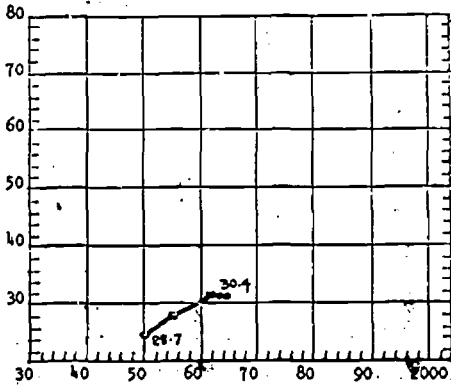
INCOME DISTRIBUTION: INCOME PER CENT EARNED BY TOP AND BOTTOM QUINTILES OF ALL FAMILIES AND INDIVIDUALS



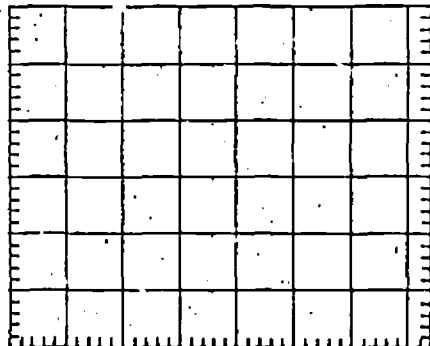
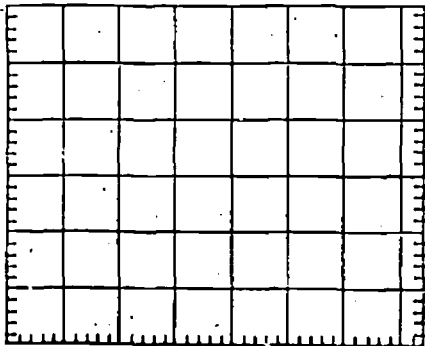
EMPLOYED PERSONS - 16 YEARS AND OVER,
BY OCCUPATION (% OF ALL EMPLOYED
PERSONS)



GOVERNMENT EXPENDITURES, AS % OF GNP -
ALL LEVELS*



* Federal, State, and Local; on goods,
services, and social welfare.



Area:

E D U C A T I O N

1.4a

Here are a few statements which may describe some current trends in this area:

Do you disagree? If so, please indicate how the statements should be reworded.

The educational system in the U. S. is in serious difficulty.

Plant obsolescence, academic irrelevance, financial instability, teachers' demands, preoccupation of academic teachers with non-teaching obligations, student challenges to authority, racial militancy, financial constraints, and community disinterest are among the most troublesome problems.

There is a growing recognition that the network of grades, departments, credits, curricula, and disciplines that have been accepted as educational design may bear little relevance to learning.

The corrective measures which have been attempted have been piecemeal and uncoordinated and of undetermined value. In addition, the changing technological nature of our society is providing new mechanical tools for, and demands on, education.

The tools include new types of buildings, teaching machines, and computer-aided instruction.

The demands include new uses for leisure, job retraining, and preparation to cope with a society that ranks change as one of its major values.

Educational reforms are impeded by two factors, which in combination have proved nearly paralyzing.

One is the absence of agreement on the goals of education, which are differently perceived by different sectors of society.

The other, and even more serious one, is the unprecedented level of vested interests that have been built up within the educational profession.

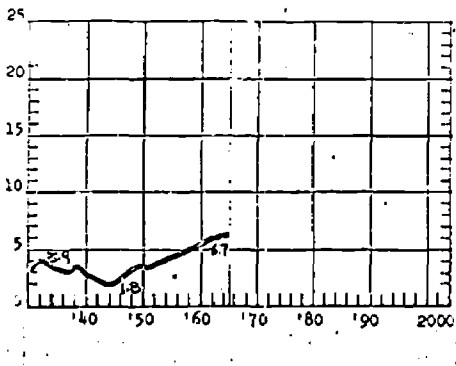
Can you suggest any other important current trends in this area, that have not been included or sufficiently emphasized above:

Can you suggest developments that, in your opinion, might occur in this area during the next few decades which would represent major changes from current patterns:

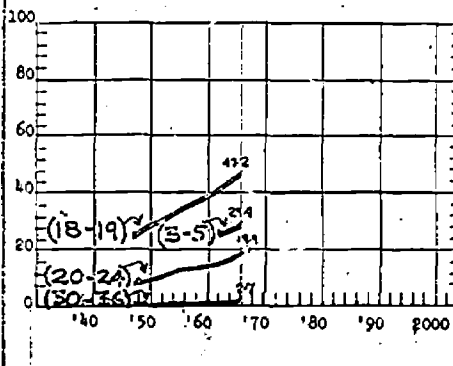
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C-10

TOTAL NATIONAL EXPENDITURES FOR EDUCATION AS % OF GNP -- U.S.

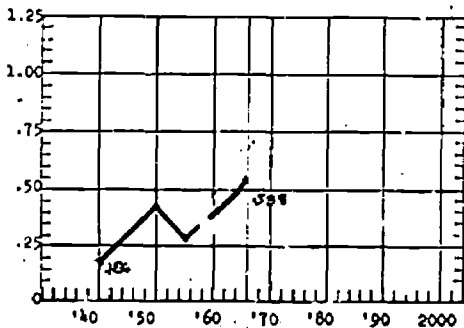


% OF POPULATION ENROLLED IN SCHOOL, BY AGE GROUPS

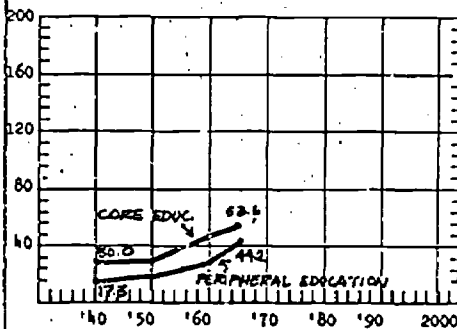


standard educational system only

NUMBER OF BACHELOR'S OR FIRST PROFESSIONAL DEGREES CONFERRED (millions)



MILLIONS ENROLLED IN PERIPHERAL AND CORE EDUCATION*



*"peripheral education" refers to programs not normally considered part of the educational system: business-sponsored programs, profit-making skill-oriented schools, military programs, and "anti-poverty" programs of various sorts. See Source.

Area:

FOOD AND POPULATION

1.5a

Here are a few statements which may describe some current trends in this area:

Do you disagree? If so, please indicate how the statements should be reworded:

Despite the availability and increasing acceptance of birth control methods, the world population growth rate has not begun to decline.

While world food production is steadily increasing, its rate of increase barely matches that of population increase.

Moreover, the effectiveness of the methods of food distribution still leaves much to be desired.

Thus malnutrition and even starvation, which today already have seriously affected about one quarter of the world's population, may possibly be further aggravated in the next few decades. In the opinion of some, we may expect widespread famine during the 1980's.

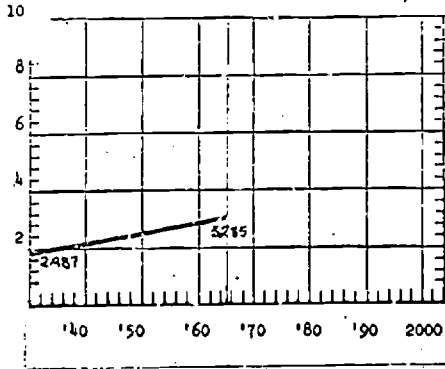
Among the causes of insufficient food availability are political obstructions, lack of economically arable land, missing economic incentives for farmers to grow more food, technological ignorance, inadequate understanding of nutritional requirements, religious taboos, preferences for indigenous food products, and inadequate and uncoordinated support for developing new sources of food supply such as oceans or synthetic protein.

The U. S. has advocated that the less developed nations must not count on the developed nations to supply food but that they must be taught to raise what they need themselves. This policy is being implemented by promoting technological transfer through foreign economic aid and through the Peace Corps.

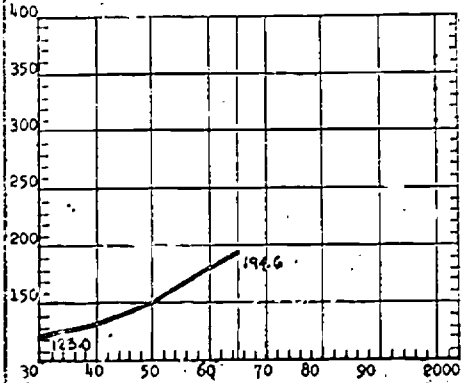
Can you suggest any other important current trends in this area, that have not been included or sufficiently emphasized above:

Can you suggest developments that, in your opinion, might occur in this area during the next few decades which would represent major changes from current patterns:

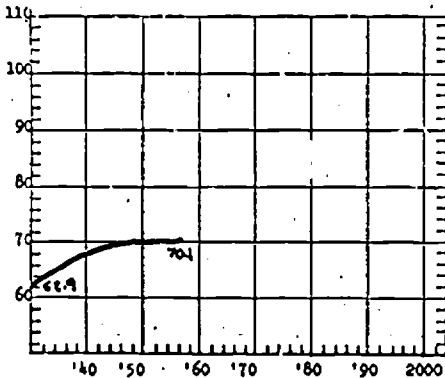
WORLD POPULATION (billions)



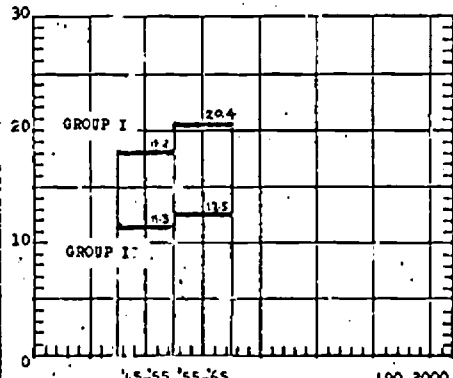
U.S. POPULATION (millions)



U.S. LIFE EXPECTANCY: YEARS AT BIRTH



10-YEAR GROWTH RATE IN POPULATION



GROUP I: High growth rate regions: Latin America, Africa and Asia (except Soviet Union), (presently about 70% of the world population).
 GROUP II: Low growth rate regions: North America, Europe, and Soviet Union (presently about 30% of the world population).

Area:

INTERNATIONAL RELATIONS

1.6a

Here are a few statements which may describe some current trends in this area:

Do you disagree? If so, please indicate how the statements should be reworded:

Since the beginning of World War II, the U. S. has had barely a dozen years of peace.

Proliferation of nuclear weapons has not yet been halted, not to mention that of biological weapons, and arms control generally is not yet in sight. While reciprocal nuclear deterrence seems to be effective, its price is a diminishment in deterrence of sub-nuclear conflict.

The international monetary situation is extremely fragile.

The UN has often failed in resolving great-power political conflicts.

All this seems to suggest that the U. S. is not headed towards an era of stable international relations. Yet it is essential that this trend be reversed, because the greatest opportunities this country faces depend on its ability to maintain international stability at acceptable cost.

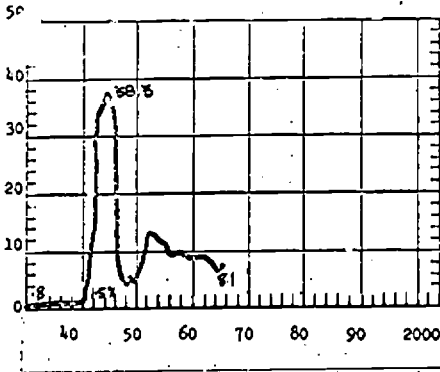
Already we can see how international upheavals are slowing down domestic social reform, the conquest of space, the exploitation of ocean resources. They are even posing a threat to the two-party democratic system of government, because non-interventionist sentiments have brought about a split that does not follow conventional party lines.

Thus it may be fortunate that satellite TV linkages and supersonic planes offer new possibilities for international contact and, perhaps, understanding for a larger number of its citizens. An awareness on the part of more Americans of the problems of the underdeveloped nations and, generally, of the causes of international tensions may in turn make it easier for the U. S. to develop a mature foreign policy with a proper understanding of the interplay between economic power, military force, diplomatic negotiation, and cultural contact.

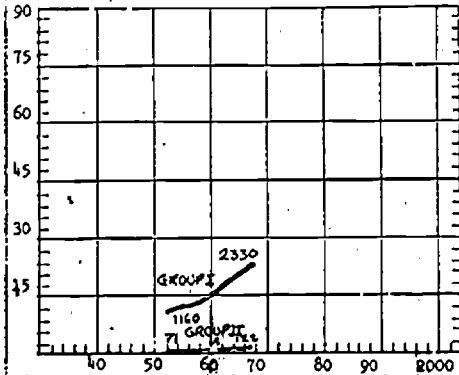
Can you suggest any other important current trends in this area, that have not been included or sufficiently emphasized above:

Can you suggest developments that, in your opinion, might occur in this area during the next few decades which would represent major changes from current patterns:

U.S. DEFENSE EXPENDITURE AS % OF GNP

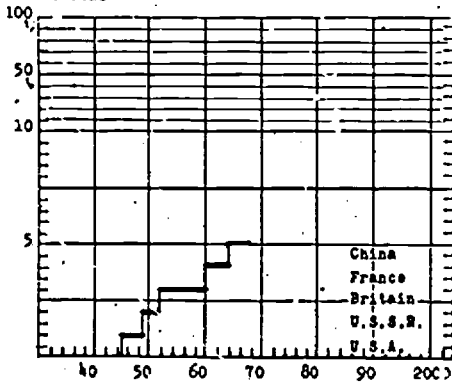


PER-CAPITA GNP, RICH AND POOR COUNTRIES



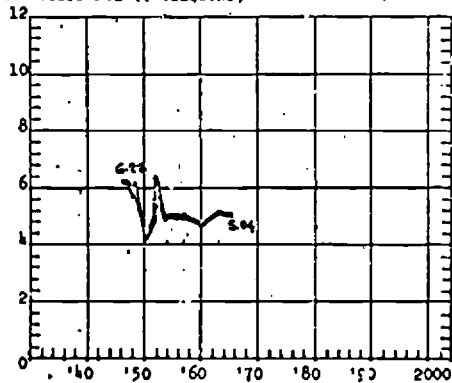
figures for Group I (rich countries) are based on the combined per-capita GNP of USA, Canada, USSR, UK, and the EEC countries; figures for Group II (the poor countries) are based on the combined per-capita GNP of India, Brazil, Turkey and Nigeria.

NUMBER OF NATIONS POSSESSING NUCLEAR WEAPONS



China
France
Britain
U.S.S.R.
U.S.A.

MAJOR U.S. GOVERNMENT FOREIGN ASSISTANCE (\$ billions)



Area: LAW AND ORDER

1.7a

Here are a few statements which may describe some current trends in this area:

The rise in major crimes, whether real or apparent, is an acute threat to law and order.

The streets and parks of our cities can no longer be considered safe.

Aside from individual crimes, there is a readiness for insurrection in the air, and all levels of authority are being questioned.

Institutional and legal practices no longer seem to have their former relevance, and people are constantly going outside normal channels to express their grievances.

Thus acts of violence are the order of the day in the ghettos and even in our schools.

Some persons feel that this is a transitional and temporary state, which can be overcome by appropriate reforms that would make our institutions more amenable to today's needs.

They expect that, as we become more aware of the effects of affluence, mass TV communications, and other technological developments, we may have to revise our concept of crime, emphasize greater personal participation in law enforcement, punishment and rehabilitation, and even adapt our constitution to fit a new set of demands.

By doing this, a new basis for a stable egalitarian society may emerge.

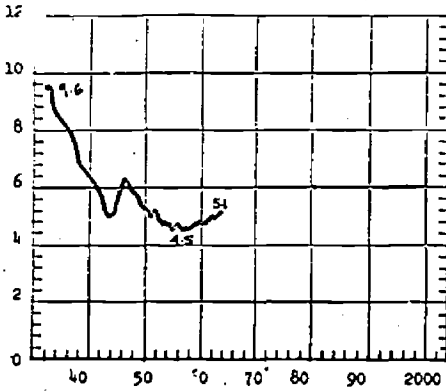
Many, however, fear that there is no foreseeable end to the state of violent turmoil that they see around them, and that our only hope is to preserve institutions in their present form through a "get tough" policy at almost any cost.

Do you disagree? If so, please indicate how the statements should be reworded:

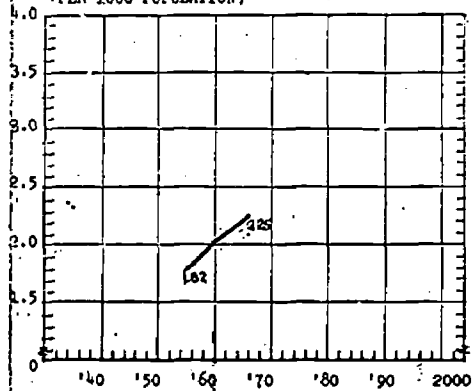
Can you suggest any other important current trends in this area, that have not been included or sufficiently emphasized above:

Can you suggest developments that, in your opinion, might occur in this area during the next few decades which would represent major changes from current patterns:

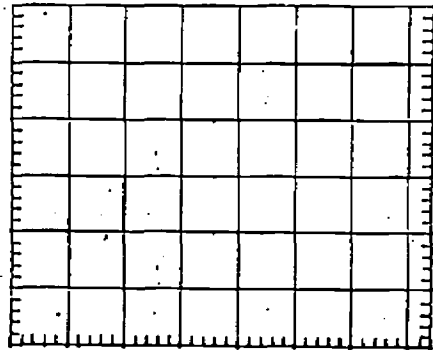
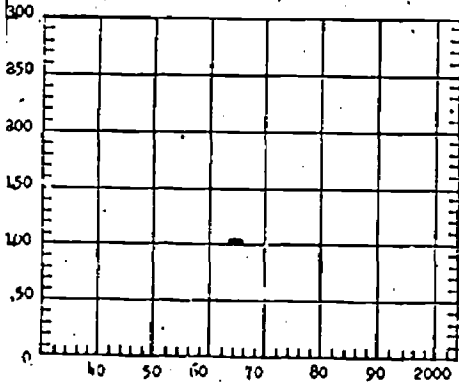
DEATHS ASCRIBED TO HOMICIDE
(PER 100,000 POPULATION)



NUMBER EMPLOYED BY GOVERNMENT FOR
POLICE PROTECTION
(PER 1000 POPULATION)



ANNUAL PER-CAPITA ECONOMIC COST OF
CRIME* (DOLLARS PER PERSON)



* Presently includes: gambling and other illegal
games and services (40%), enforcement of justice
(20%), crimes against property (20%), other crimes
(intoxicated driving, abortion, tax fraud,
homicide, and assault), and private expenses.

Area:

LEISURE

1.8a

Here are a few statements which may describe some current trends in this area:

Do you disagree? If so, please indicate how the statements should be reworded:

Leisure may well become a large part of the way of life in future America. However, we may come to mean by "leisure" something different from just "free time". In particular, it may include all kinds of activities which cannot properly be called work and yet are just as essential to social well-being in that they are not purely individual pursuits but social ones in the sense of involving communication with other persons or groups of persons.

Some of these pursuits may be concerned purely with entertainment or recreation, while others may focus on education or political participation.

Similarly, those who are not yet or no longer in the work force, that is, the young and the old, are finding new social ways of utilizing leisure time, as evidenced by the formation of new types of communities or groups outside the normal pattern of the past.

Yet, when we look at the unemployed on welfare relief or even at some sectors of youth today, we suspect that leisure can be a source of frustration, anxiety and despair rather than enjoyment and self-fulfillment, unless it is accompanied by some measure of affluence, education, a sense of participation in society and an atmosphere of physical security and emotional well-being. Thus there are aspects of the problem of leisure which are emerging as social issues of serious concern.

The frustrations of leisure have driven some towards finding new motivation through the use of drugs. Others, however, continue to insist on employment as the only way to contribute to and partake in society. Thus, instead of leisure, we may have greater emphasis placed on skill retraining and a full employment economy and thus on further acceleration of economic growth, especially in the service industries.

Can you suggest any other important current trends in this area, that have not been included or sufficiently emphasized above:

Can you suggest developments that, in your opinion, might occur in this area during the next few decades which would represent major changes from current patterns:

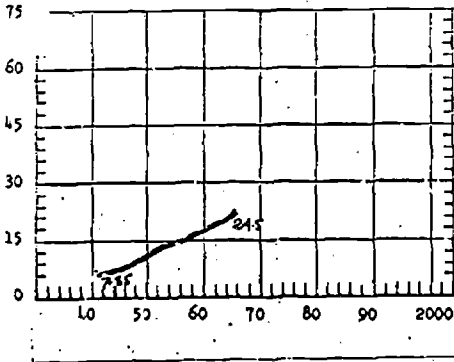
100

C-18

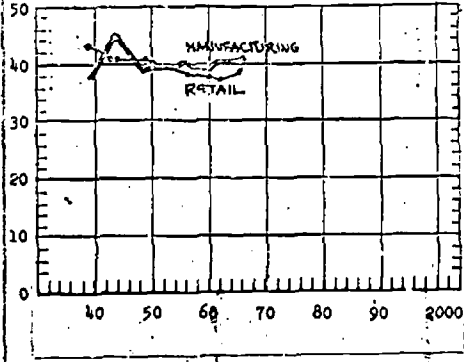
LEISURE

Please extend the graphs shown below 1.8B

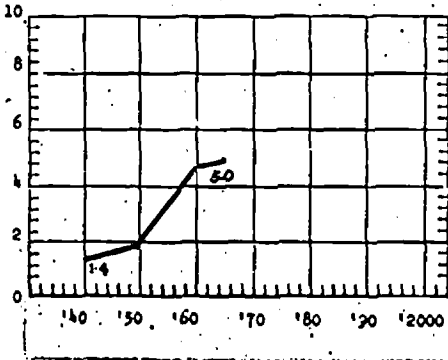
TOTAL PERSONAL CONSUMPTION EXPENDITURES FOR RECREATION (\$ millions)(1958 dollars.)



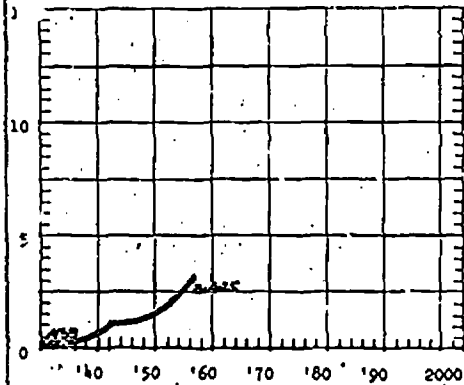
AVERAGE WEEKLY HOURS OF WORK; PRODUCTION AND NON-SUPERVISORY WORKERS



AVERAGE PER-CAPITA EXPOSURE TO TELEVISION, RADIO, OR CINEMA (hours/day)



TOTAL OVERSEAS TRAVELERS (millions)



Area:

GOVERNMENT AND POLITICAL STRUCTURE

1.9a

Here are a few statements which may describe some current trends in this area:

Do you disagree? If so, please indicate how the statements should be reworded:

One of the most important developments in the American political history of the second third of this century has been the emergence of a very strong federal government. The trend towards centralization is in part a concomitant of the communications and information revolution. The latter has at the same time generated demands for greater national uniformity (of wages, education, social customs, etc.) and furnished some of the data gathering and processing capability without which a government can no longer cope with the complexities and rapid changes typical of modern society.

Counter-forces to this centralization are of two kinds. One is the resistance of vested-interest groups at the State and local levels, which can point to the undue abrogation of regional prerogatives to support their cause, and which has led to a proliferation of local governmental authorities. The other is represented by groups of dissenters, especially among the youth, who feel alienated from the political process because of its ever-increasing complexity and impersonality and thus are driven into opposition to what they regard as "the establishment".

The result is a serious dilemma. The increasing rates of change and of complexity of our society require ever greater sophistication, automation, and centralization of government; but by responding to these demands, government is increasing the comprehensibility gap, thus reducing popular participation in the political process and jeopardizing the survival of democracy.

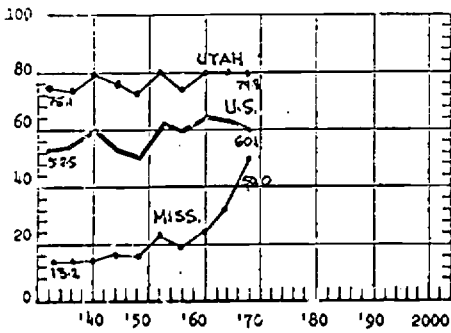
It remains to be seen whether we shall emerge from this period of transition with a two- or multi-party system, with few or many alterations in our political institutions, and with profound damage to, or on the contrary even a revival of, our basic concepts of a democracy.

Can you suggest any other important current trends in this area, that have not been included or sufficiently emphasized above:

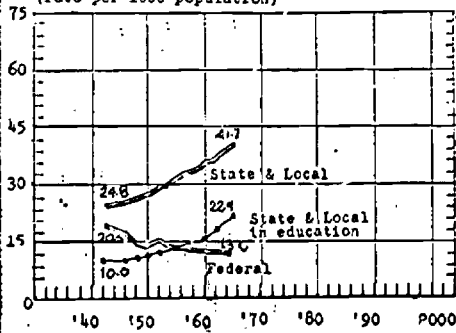
Can you suggest developments that, in your opinion, might occur in the coming decades which would represent major changes from current patterns:

96?

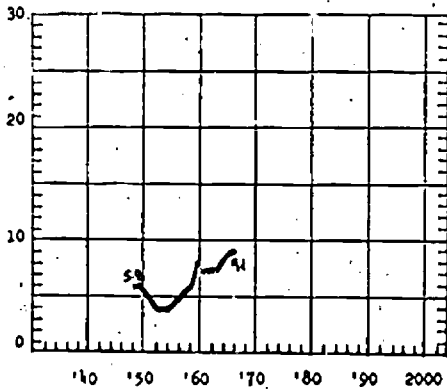
Voter Participation in Presidential Election
(Vote as % of Voting-Age Civilian Population)



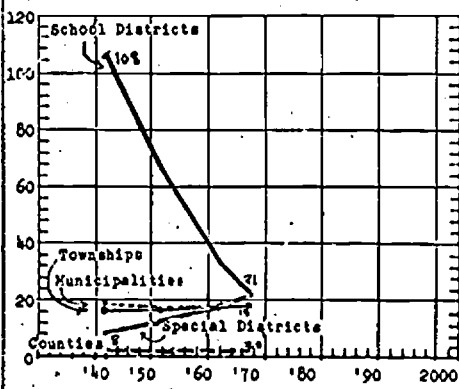
Civilian Employees in the Government:
Federal, State & Local, and Share of
State and Local in Education
(rate per 1000 population)



Federal Grants-in Aid to States as % of
Total Federal Expenditures



Local Governments in the U.S.
(1000's)



Area:

DIVISIONS IN AMERICAN SOCIETY

1.10a

Here are a few statements which may describe some current trends in this area:

Our societal structure is being severely challenged at every level, with the rise in violence only one of the many threats to law and order in our communities.

America is increasingly torn apart by internal divisions.

Some of these divisions had previously been hidden within the vast confines of its territory and had been expressed primarily either in purely local terms or through a system of federal representation, but through urbanization and improved communications they have now come out in the open. Thus the sharp national dichotomies: Rich and Poor, Black and White, are suddenly visible to all.

Another division - Establishment vs anti-Establishment - is of newer origin, the "anti" element being represented largely by some of our disaffected youth. Parental default and an ineffectual educational system having deprived them of a sense of direction, they are in a mood to distrust any form of established authority and are searching for new causes and social patterns that might reorient their lives and reinvest them with a meaningful purpose.

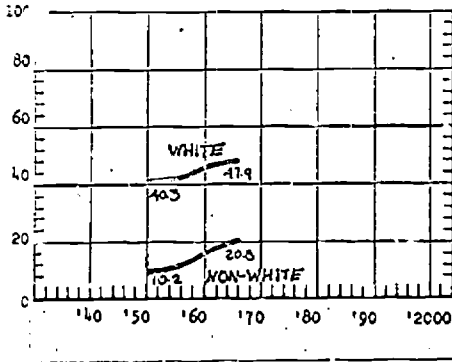
In the face of these divisions, the nation is going through a period of anxiety, waiting to see whether the current conflicts can be resolved peacefully. There is hope that the war on poverty, despite frustrations, will eventually be won. The alienation of the anti-establishment forces may gradually be attenuated both through educational reforms and by adjustments in our national policies, especially in matters relating to foreign involvements. The prospects regarding the Black-White confrontation seem less certain. Since it appears the efforts at integration have failed and have instead induced both a white and a black backlash, it remains to be seen whether the still sporadic riots will subside or flare up into civil war.

Do you disagree? If so, please indicate how the statements should be reworded:

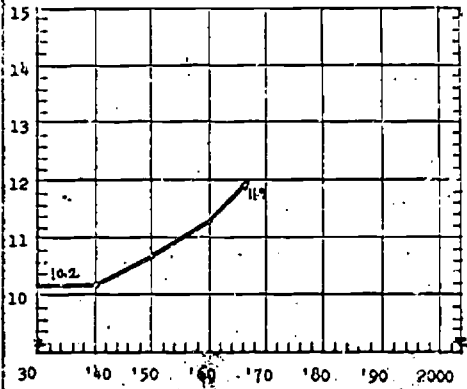
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Can you suggest developments that, in your opinion, might occur in this area during the next few decades which would represent major changes from current patterns:

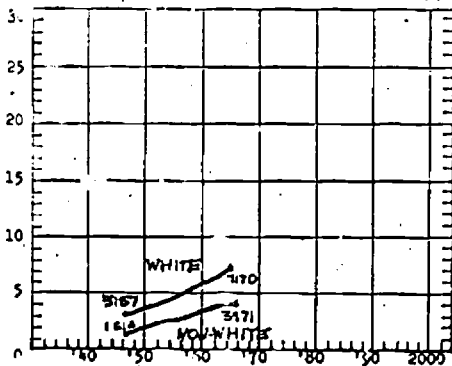
% OF EMPLOYED PERSONS IN WHITE COLLAR JOBS, BY COLOR



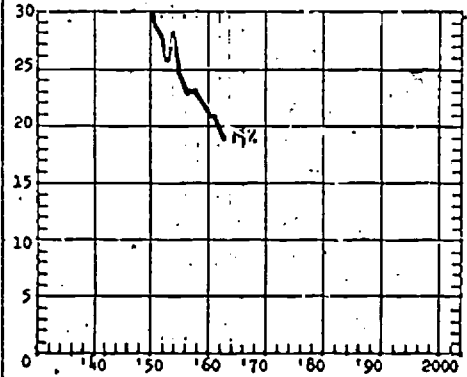
% NON-WHITE OF TOTAL POPULATION



MEDIAN INCOME, BY COLOR (\$ 1000's)



% OF FAMILIES WITH MONEY INCOME LESS THAN \$3000. (162 dollars)



Area:

VALUES AND NORMS

1.11a

Here are a few statements which may describe some current trends in this area:

Many of today's publicly promoted values such as equal rights, minority benefits, welfare distribution, freedom of action, and equal opportunity tend more and more to define man's relationship to his peers and prerogatives towards his superiors rather than his responsibilities within a system of authority.

Values themselves are no longer bestowed from above or inherited from the past but are subject to constant revision.

Part of this may be a symptom of changes in our societal structure brought on by urbanization and improved communications, which have put us in a position of comparing our circumstances more readily with those of people in other walks of life.

Affluence, because of the greater economic independence it implies, may have contributed to this development. Affluence has also caused people to appreciate mobility and to look for greater variety in their lives.

Other technologies have affected values. New birth control methods, in particular, have influenced views on sex. With the risk of having undesired children largely removed, non-marital sex is not only more freely engaged in but meets with less disapprobation. Also, because of its relative disassociation from reproduction, sex has now become for many a less ambivalent means towards a more profound adult relationship.

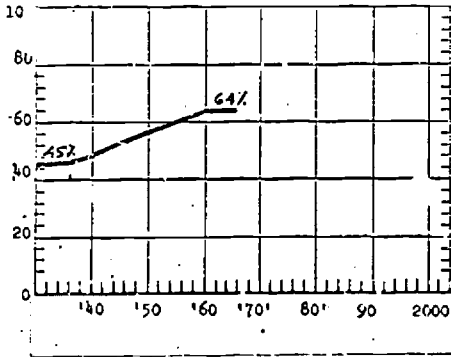
As for religion in an age of space travel, of artificial intelligence, and of genetic intervention, traditional views of church and divinity are bound to undergo change. The insecurity entailed by societal alienation has caused many to seek increased moral support from religious sources, while, for others, religious beliefs have lost their meaning and relevance.

Do you disagree? If so, please indicate how the statements should be reworded:

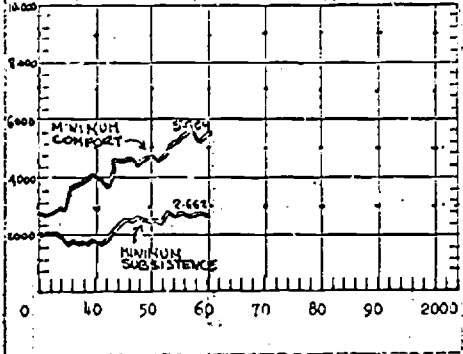
Can you suggest any other important current trends in this area, that have not been included or sufficiently emphasized above:

Can you suggest developments that, in your opinion, might occur in this area during the next few decades which would represent major changes from current patterns:

CHURCH MEMBERSHIP AS % OF POPULATION

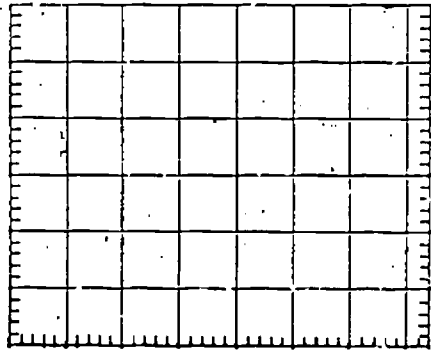
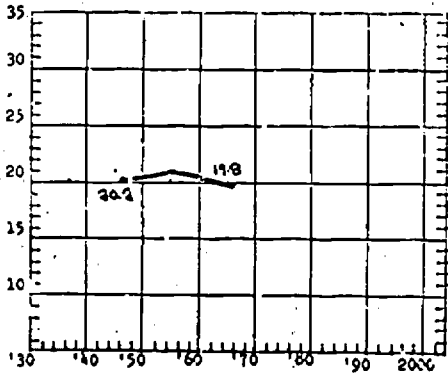


CHANGE IN THE CONCEPTS OF MINIMUM SUBSISTENCE, AND MINIMUM COMFORT (CONSTANT '60 \$)



See source for precise definitions. Based on budgets prepared over the years by governmental and private agencies. "Subsistence" budgets were prepared to establish eligibility for public assistance. "Comfort" budgets were used mostly to settle wage disputes for skilled or civil service workers.

ANNUAL MOBILITY OF THE POPULATION (% movers/year)



Area:

SCIENCE AND TECHNOLOGY

1.12a

Here are a few statements which may describe some current trends in this area:

The role of science and technology in modern society is one of obvious importance and of considerable controversy.

The number of scientists and engineers is increasing faster than the population as a whole; moreover, their individual productivity is rising due to support derived from electronic computers and other sophisticated tools. These two trends, in combination, are partly responsible for the continuing increase in per-capita GNP in the advanced countries.

What is controversial about the role of science and technology is that, despite the enhancing influence on the national economy, there are side-effects on the state of our society which are considered by some as decidedly negative.

One is that the growing complexity and proliferation of technical knowledge is contributing to the alienation of many citizens from the mechanisms by which the future of our society is determined.

Another is that some concern has arisen - whether justified or not - that scientists and engineers may evolve into a new, technocratic elite, which may exert a dehumanizing effect on national policy.

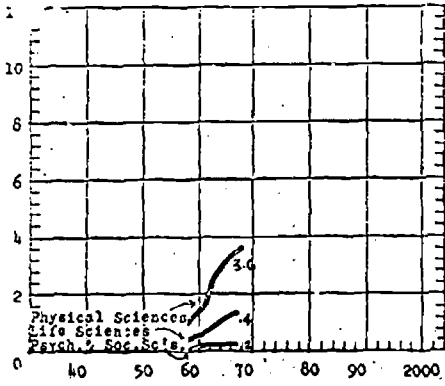
Not unrelated, is, thirdly the contention that advances in physical technology are creating societal changes at a faster rate than can be absorbed, with altogether insufficient attention being paid to the need for matching such advances with similar progress in the social sciences and in social technology.

Do you disagree? If so, please indicate how the statements should be reworded:

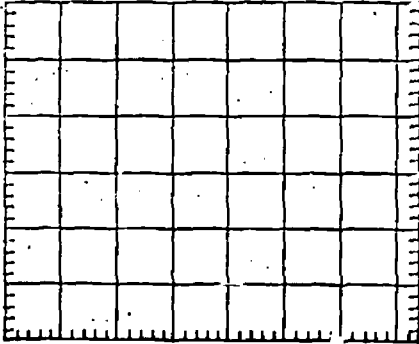
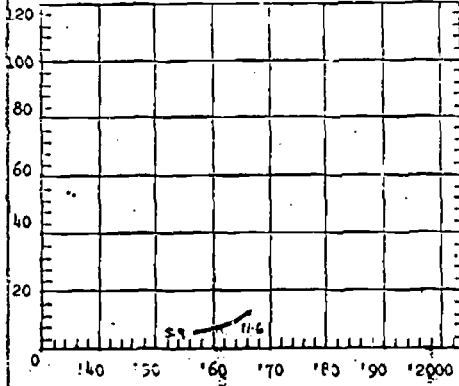
Can you suggest any other important current trends in this area, that have not been included or sufficiently emphasized above:

Can you suggest developments that, in your opinion, might occur in this area during the next few decades which would represent major changes from current patterns:

FEDERAL OBLIGATIONS FOR RESEARCH AND DEVELOPMENT (\$ billions)



SCIENCE DOCTORATES CONFERRED EACH YEAR - U.S. (1,000's)



POTENTIAL TECHNOLOGICAL DEVELOPMENT:

1.D1

Demonstration of large-scale desalination plants capable of economically producing useful water for agricultural purposes.

In your opinion, should this development occur at some time during the next few decades, what major social implications might it have at the personal, family, social, national, and international levels:

POTENTIAL TECHNOLOGICAL DEVELOPMENT:

1.D2

Availability of cheap electric power from thermo-nuclear (fusion) power plants.

In your opinion, should this development occur at some time during the next few decades, what major social implications might it have at the personal, family, social, national, and international levels:

0110

C-28

POTENTIAL TECHNOLOGICAL DEVELOPMENT:

1.D3

Establishment of a central data storage facility (or several regional or disciplinary facilities) with wide public access (perhaps in the home) for general or specialized information retrieval primarily in the areas of library, medical, and legal data.

In your opinion, should this development occur at some time during the next few decades, what major social implications might it have at the personal, family, social, national, and international levels:

POTENTIAL TECHNOLOGICAL DEVELOPMENT:

1.D4

Feasibility of limited weather control, in the sense of predictably affecting regional weather at acceptable cost.

In your opinion, should this development occur at some time during the next few decades, what major social implications might it have at the personal, family, social, national and international levels:

0111

C-29

POTENTIAL TECHNOLOGICAL DEVELOPMENT:

1.D5

Discovery of information which proves the existence of intelligent beings beyond the earth.

In your opinion, should this development occur at some time during the next few decades, what major social implications might it have at the personal, family, social, national, and international levels:

POTENTIAL TECHNOLOGICAL DEVELOPMENT:

1.D6

Availability of a computer which comprehends standard IQ tests and scores above 150 (where "comprehend" is to be interpreted behavioristically as the ability to respond to questions printed in English and possibly accompanied by diagrams).

In your opinion, should this development occur at some time during the next few decades, what major social implications might it have at the personal, family, social, national, and international levels:

POTENTIAL TECHNOLOGICAL DEVELOPMENT:

1.D7

Individual portable telephones, carried by most Americans.

In your opinion, should this development occur at some time during the next few decades, what major social implications might it have at the personal, family, social, national, and international levels:

POTENTIAL TECHNOLOGICAL DEVELOPMENT:

1.D8

Wide-spread availability of new types of automobiles which have acceptable performance, are economically competitive with other forms of transportation, and permit operation without harmful exhaust.

In your opinion, should this development occur at some time during the next few decades, what major social implications might it have at the personal, family, social, national, and international levels:

113

C-31

POTENTIAL TECHNOLOGICAL DEVELOPMENT:

1.D9

Wide-spread installation (at least 50) of agro-industrial complexes based on the use of breeder reactors in technologically advanced as well as less developed countries.

In your opinion, should this development occur at some time during the next few decades, what major social implications might it have at the personal, family, social, national, and international levels:

POTENTIAL TECHNOLOGICAL DEVELOPMENT:

1.D10

Development of sophisticated teaching machines utilizing adaptive programs which respond not only to the students' answers but also to certain physiological responses of the students (such as extreme tension).

In your opinion, should this development occur at some time during the next few decades, what major social implications might it have at the personal, family, social, national, and international levels:

POTENTIAL TECHNOLOGICAL DEVELOPMENT:

1.D11

Availability of cheap non-narcotic drugs (other than alcohol) for the purpose of producing specific and predictable changes in personality characteristics, such as reduced anxiety, reduced aggressiveness, increased attention, increased perception, increased learning ability.

In your opinion, should this development occur at some time during the next few decades, what major social implications might it have at the personal, family, social, national and international levels:

POTENTIAL TECHNOLOGICAL DEVELOPMENT:

1.D12

Feasibility (not necessarily acceptance) of chemical control over some hereditary defects by modification of genes through molecular engineering.

In your opinion, should this development occur at some time during the next few decades, what major social implications might it have at the personal, family, social, national and international levels:

115

C-33

POTENTIAL TECHNOLOGICAL DEVELOPMENT:

1.D13

Feasibility of using drugs to raise the level of intelligence in some persons (other than as dietary supplements and not in the sense of only temporarily raising the level of apperception), allowing adults to solve problems previously beyond their capability.

In your opinion, should this development occur at some time during the next few decades, what major social implications might it have at the personal, family, social, national, and international levels:

POTENTIAL TECHNOLOGICAL DEVELOPMENT:

1.D14

Demonstration of chemical control of the human aging process, permitting extension of life span by fifty years, with commensurate increase in number of years of vigor.

In your opinion, should this development occur at some time during the next few decades, what major social implications might it have at the personal, family, social, national, and international levels:

POTENTIAL TECHNOLOGICAL DEVELOPMENT:

1.D15

Demonstration of non-surgical techniques by which the sex of babies may be chosen with 90 percent reliability.

In your opinion, should this development occur at some time during the next few decades, what major social implications might it have at the personal, family, social, national, and international levels:

POTENTIAL TECHNOLOGICAL DEVELOPMENT:

1.D16

Development of mass-administered contraceptive agents, economical enough for use by the less developed countries, through techniques such as seeding of water supplies.

In your opinion, should this development occur at some time during the next few decades, what major social implications might it have at the personal, family, social, national, and international levels:

POTENTIAL TECHNOLOGICAL DEVELOPMENT:

1.D17

Substantial increase (by a factor of 2 or more) in agricultural production, through a combination of techniques which raise the world's economically arable acreage and of developments in plant genetics that enhance productivity per acre.

In your opinion, should this development occur at some time during the next few decades, what major social implications might it have at the personal, family, social, national, and international levels:

POTENTIAL TECHNOLOGICAL DEVELOPMENT:

1.D18

Ability to control the behavior of some people in society by radio stimulation of the brain.

In your opinion, should this development occur at some time during the next few decades, what major social implications might it have at the personal, family, social, national and international levels:

POTENTIAL TECHNOLOGICAL DEVELOPMENT:

1.D19

Demonstration that most people have the latent capacity for genius, which fails to be realized through lack of motivation, stimulation, or cultural receptivity.

In your opinion, should this development occur at some time during the next few decades, what major social implications might it have at the personal, family, social, national and international levels:

POTENTIAL TECHNOLOGICAL DEVELOPMENT:

1.D20

Practical use of general immunizing agents (such as interferon) which can protect against most bacterial and viral diseases.

In your opinion, should this development occur at some time during the next few decades, what major social implications might it have at the personal, family, social, national, and international levels:

SOURCE DATA

- 1.1B
1. RESIDENTIAL PATTERNS: Dept. of Comm., Bureau of Census, Current Population Reports, Series P-20, No's 71, 157.
 2. NON-WHITES IN CENTRAL CITIES: same, No's 157, 163.
 3. NUMBER OF URBAN PLACES: Dept. of Comm., Bureau of Census, U.S. Census of Population, 1960, vol. 1.
 4. AIR POLLUTION DUE TO BENZENE SOLUBLE ORGANIC MATTER: Dept. of HEW, Annual Reports, Air Quality Data, 1962, 1965, 1966.
- 1.2B
1. % FEMALE POPULATION MARRIED: Dept. of Comm., Bureau of Census, U.S. Census of Population, 1950, vol. II, Part 1, and Current Population Reports, Series P-20.
 2. DIVORCES PER 1000 EVER-MARRIED FEMALES, BY COLOR: adapted from: U.S. Dept. of Labor, Office of Pol. Pl. & Res., The Negro Family, p. 77.
 3. % FAMILIES HEADED BY WOMEN, BY COLOR: Same, p. 61.
 4. ILLEGITIMATE BIRTHS/1000 LIVE BIRTHS, BY COLOR: same, p. 59.
- 1.3B
1. GROSS NATIONAL PRODUCT OR EXPENDITURE (1958 PRICES): Office of the Pres., Economic Report of the President, 1967, p. 215.
 2. PURCHASING POWER OF THE U.S. CONSUMER DOLLAR: Dept. of Comm., Office of Bus. Econ., Survey of Current Business, 1967.
 3. % EMPLOYMENT BY MAJOR SECTOR: Dept. of Comm., Office of Bus. Econ., The National Income and Product Accounts (Supplement to Survey of Current Business), Table 6.6. 1900 data from: Historical Statistics of the U. S., Series D-57-71.
 4. INCOME DISTRIBUTION; % EARNED BY TOP AND BOTTOM QUINTILES: H. P. Miller, Income Distribution in the U.S., USGPO, 1966, p. 21.
 5. EMPLOYED PERSONS 16 YEARS AND OVER, BY OCCUPATION: 1950 and 1960: Current Population Reports, op. cit., Series P-50; after 1960: Dept. of Labor, Bureau of Labor Stat., Manpower Report of the President.
 6. GOVERNMENT EXPENDITURES AS % OF GNP: adapted from: Dept. of Comm., Bur. of Census, Stat. Abstract of the U.S., 1967, p. 421, p. 319.
- 1.4B
1. TOTAL NATIONAL EXPENDITURES FOR EDUCATION AS % OF GNP: Dept. of HEW, Office of Educ., Digest of Educational Statistics, 1967, Table 23.
 2. % OF POPULATION ENROLLED IN SCHOOL, BY AGE GROUPS: same, Table 4.
 3. NUMBER OF BACHELOR'S OR FIRST DEGREES CONFERRED: same.
 4. MILLIONS ENROLLED IN PERIPHERAL AND CORE EDUCATION: unpublished data from: National Planning Studies Program, Syracuse University.

- 1.5B
1. WORLD POPULATION: United Nations, The Future Growth of World Population, 1958, (57).
 2. U.S. POPULATION: Stat. Abstract of the U.S., 1967, p. 5.
 3. U.S. LIFE EXPECTANCY: same, p. 53.
 4. 10-YEAR GROWTH RATES IN POPULATION: Adapted from: The Future Growth of World Population, 1958 (57), Decade Regional Growth Rates, Actual and Projected.
- 1.6B
1. U.S. DEFENSE EXPENDITURES AS % OF GNP: Stat. Abstract of the U.S., 1967, p. 252.
 2. PER-CAPITA GNP, RICH AND POOR COUNTRIES: U.N. Stat. Yearbook, various years.
 3. NUMBER OF NATIONS POSSESSING NUCLEAR WEAPONS: World Almanac, 1968, Memorable dates.
 4. MAJOR U.S. GOVERNMENT FOREIGN ASSISTANCE: Stat. Abstract of the U.S., 1967, p. 819, and previous issues, corresponding table.
- 1.7B
1. DEATHS ASCRIBED TO HOMICIDE: U.S. Public Health Service, Nat. Office of Vital Stat., Vital Statistics of the U.S., Annual Report for 1964, vol. II, Mortality, Part A, p. 1-39.
 2. NUMBER EMPLOYED BY GOVERNMENT FOR POLICE PROTECTION: Stat. Abstract of the U.S., p. 155.
 3. ANNUAL PER-CAPITA ECONOMIC COST OF CRIME: adapted from: Report by the President's Commission on Law Enforcement and Administration of Justice, 1967.
- 1.8B
1. TOTAL PERSONAL CONSUMPTION EXPENDITURES FOR RECREATION: Stat. Abstract of the U.S., 1968, p. 206.
 2. AVERAGE WEEKLY HOURS OF WORK: Statistical Abstract of the U.S., 1967, p. 226, and corresponding table in earlier issues.
 3. AVERAGE PER-CAPITA EXPOSURE TO MEDIA: Approximate figures derived from: A.C. Nielsen & Co., Historical Statistics, and Stat. Abstract of the U.S., 1967.
 4. TOTAL OVERSEAS TRAVELERS: Stat. Abstract of the U.S., 1968, p. 210.
- 1.9B
1. VOTER PARTICIPATION IN PRESIDENTIAL ELECTIONS: U. S. Report of the President's Commission on Registration and Participation, 1963; Stat. Abstracts of the U.S., 1967, p. 379, and 1968, p. 370.
 2. CIVILIAN EMPLOYEES IN THE GOVERNMENT: Stat. Abstract of the U.S., 1967, p. 439, and corresponding table in previous issues.
 3. FEDERAL GRANTS-IN-AID TO STATES AS % OF FEDERAL EXPENDITURES: Dept. of Comm., Office of Bus. Econ., The Nat. Income and Products Accounts, Table 3.1.
 4. LOCAL GOVERNMENTS IN THE U.S.: Dept. of Comm., Bureau of the Census, 1967 Census of Governments, vol. I, Table 1.

- 1.10B 1. % OF EMPLOYED PERSONS IN WHITE-COLLAR JOBS, BY COLOR: Stat. Abstract of the U.S., p. 231.
2. % OF NON-WHITE OF TOTAL POPULATION: Stat. Abstract of the U.S., 1968, p. 18.
3. MEDIAN INCOME, BY COLOR: Annals of the American Academy, p. 91.
4. % OF FAMILIES WITH MONEY LESS THAN \$3000: Edward C. Budd, Inequality and Poverty, 1967, p. 159; H. P. Miller, Changes in the Number and Composition of the Poor.
- 1.11B 1. CHURCH MEMBERSHIP AS % OF POPULATION: Stat Abstract of the U.S., 1967, p. 43.
2. CHANGE IN THE CONCEPT OF COMFORT AND SUBSISTENCE: Inequality and Poverty, p. 168.
3. ANNUAL MOBILITY OF THE POPULATION: Dept. of Comm., Bureau of Census, Current Population Reports, Series P-20, No. 156, 1966, Table 1.
- 1.12B 1. FEDERAL OBLIGATIONS FOR RESEARCH AND DEVELOPMENT: Stat. Abstract of the U. S., 1967, p. 538.
2. SCIENCE DOCTORATES CONFERRED EACH YEAR: same, p. 545; 1964, p. 546.

APPENDIX D
INITIAL EXPERIMENTS WITH THE CROSS-IMPACT
MATRIX METHOD OF FORECASTING*

T. J. Gordon and H. Hayward

October 1968

*A slightly revised version of this paper has been accepted for publication in Futures: Journal of Forecasting and Planning. This paper reports on research conducted during the senior author's appointment as Regents' Professor at the Graduate School of Business Administration, University of California, Los Angeles, March 1968.

Forecasts about various aspects of the future are often derived through the collation of expert judgment. The Delphi technique originated by N. Dalkey and O. Helmer is a method for collecting expert judgment for such studies. (1) In this system the contributors remain anonymous and communicate with the experimenters by mail in order to avoid the problems sometimes associated with conference room confrontations. Consensus is usually achieved through a feedback process in which reasons for extreme positions are exposed to all participants. This technique has been used to produce forecasts in the form of lists of potential future occurrences, likely dates of the occurrence and their probability. A shortcoming of this and many other forecasting methods, however, is that potential relationships between the forecasted events may be ignored and the forecasts might well contain mutually reinforcing or mutually exclusive items. The research reported here is an attempt to develop a method by which the probabilities of an item in a forecasted set can be adjusted in view of judgments relating to potential interactions of the forecasted items.

Most events and developments are in some way connected with other events and developments. A single event, such as the production of power from the first atomic reactor, was made possible by a complex history of antecedent scientific, technological, political and economic "happenings"; in its turn, the production of energy from the first atomic reactor provided an intellectual conception which influenced and shaped many of the events and developments which followed it. In a sense, history is a focusing of many apparently diverse and unrelated occurrences which permit or cause singular events and developments; from these flow an ever-widening tree of downstream effects which interact with yet other events and developments. It is hard to imagine an event without a predecessor which made it more or less likely or influenced its form—or one which, after occurring, left no mark. This interrelationship between events and developments is called "cross impact." (2) F. S. Pardee

(1) N. Dalkey, O. Helmer, "An Experimental Application of the Delphi Method to the Use of Experts," Management Sciences 9, 1963.

(2) Dr. O. Helmer has suggested this term.

has observed "Of all the methodological issues facing the technological forecaster, the problem of interdependencies is probably the most vexing." (3) Kahn and Weiner have remarked on the same point (4). They say:

The interacting effects (among forecasted items) tend to be important not only because advances in one area are correlated with or spur advances in other areas, but also because various separate advances often allow for unexpected solutions to problems, or can be fitted together to make new wholes that are greater than the sum of their parts, or lead to other unexpected innovations.

Pardee, Kahn, and Weiner raised this issue because technological forecasts are often simply lists of potential future events, considered against a general scenario which serves only as a mildly constraining backdrop. Without considering the interdependencies of the forecasted items, these lists might contain mutually exclusive items, or the chances of occurrence of certain items on the list might be enhanced in view of the occurrence or non-occurrence of others. Stated another way: We desire to find the conditional probabilities of forecasted items in a set in full consideration of the potential interactions among them.

The systematic description of all potential modes of interaction and the assessment of the possible strength of these interactions is vastly complex but methodologically important, since these descriptions and metrics may provide new insight into historical analysis and permit greater accuracy and precision in forecasting. A general theory of such cross impacts which is not at hand would almost certainly permit the exploration of the side-effects of decisions under consideration. It might also be useful in illuminating less expensive means of attaining goals through investment in high-payoff areas which initially seem to be unrelated or only weakly linked to the decision.

Cross Impacts

Suppose that a set of developments is forecast to have occurred prior to some year in the future with varying levels of probability. If these developments are designated D_1, D_2, D_m, D_n , with associated

(3) F. S. Pardee, Technological Projection and Advanced Product Planning, RAND Corporation paper, P-3622, July, 1967.

(4) H. Kahn and A. Wiener, The Year 2000, Macmillan, 1967.

probabilities P_1, P_2, P_m, P_n , then the question can be posed: "If $P_m = 1$; 100% (i.e., D_m happens), how do P_1, P_2, P_3, P_n change?" If there is a cross impact, the probability of individual items will vary either positively or negatively with the occurrence or non-occurrence of other items. By way of illustration, if the following developments and probabilities were forecast for a given year:

Development D	Probability, P
1. 1-month reliable weather forecasts	.4
2. Feasibility of limited weather control	.2
3. General biochemical immunization	.5
4. Crop damage from adverse weather eliminated	.5

then these might be arranged in matrix form as follows:

If this development were to occur:	then probability of			
	D_1	D_2	D_3	D_4
D_1		—	—	↑
D_2	↑		—	↑
D_3	—	—		—
D_4	—	—	—	

where the up arrows indicate positive cross impact.

Thus if D_2 , "the feasibility of limited weather control," were to occur, D_1 , "one month reliable weather forecast," and D_4 , "elimination of crop damage from adverse weather," would become more probable as noted by the upward arrow. We refer to this kind of array as a "cross impact matrix."

In actuality, interactions between items are much more complex than can be denoted by a simple arrow. In addition to the concept of linkage direction or mode (as indicated by the arrow), one must recognize the idea of linkage strength (how strongly does the occurrence or non-occurrence of one item influence the probability of another) and diffusion time (after the occurrence or non-occurrence of one item, how long an interval is required before another item is influenced).

Linkage Concepts

At the outset we can recognize at least three modes of connections between events. Assume event D_m occurs. A second event, D_n , may be completely unaffected by D_m ; it may be enhanced by the occurrence of D_m ; or it may be inhibited by the occurrence of D_m . Thus D_m may affect D_n as follows:

1. Unrelated
2. Enhancing
3. Inhibiting

For the last two categories it is possible to enumerate a number of examples based on historical data or on the likely connection between future events. The invention of the steam engine, the availability of economic capital, and the social pressures of the 19th Century enhanced the initiation of the Industrial Revolution. It is likely that discovery of the means for the magnetic containment of magneto-hydrodynamic plasmas will enhance the development of commercial thermo-nuclear power. The expansion of the railroads in the mid-19th Century inhibited the development of the automobile and the spread of roads for them. (5)

Pursuing our Vietnam military enterprises inhibits the rapid expansion of urban programs because of limited funds. The development of reliable, safe, and cheap fuel cells would be inhibiting to the development of lightweight batteries for electric automobiles.

(5) See for example, Robert W. Fogel, "Railroads as an Analogy to the Space Effort: Some Economic Aspects," in The Railroad and the Space Program, Bruce Mazlish, ed., MIT Press, 1965.

Enhancing linkages, those in which the probability of the second event is improved by the occurrence of the first, result from several mechanisms including the following:

1. The occurrence of D_m indicates that D_n is feasible or practical. In this sense D_m is the Hahn-Strassman development for D_n . (6) This type of enhancing relationship is designated "enabling."
2. The occurrence of D_m necessitates that effort be expended to bring about the occurrence of D_n for the efficient use of D_m or for therapeutic or preventive purposes. This type of enhancing relationship is designated "provoking."

Inhibiting linkages, those in which the probability of the second event is diminished by the occurrence of the first, also result from several mechanisms including these:

1. The occurrence of D_m indicates that D_n is unfeasible or impractical. This kind of linkage introduces the notion of a negative Hahn-Strassman point. This type of inhibiting relationship is designated "denigrating."
2. The occurrence of D_m necessitates that effort be expended to bring about the non-occurrence of D_n for the efficient use of D_m or for therapeutic or preventive purposes. This type of inhibiting relationship is designated "antagonistic."

Examples of these linkages are shown in Figure 1.

There is a neat symmetry to these definitions, but at our present state of understanding we have no assurance that the list is complete. Nevertheless, as will be shown, these concepts can serve at least as a working model of the modes of connection between two events.

(6) The term "Hahn-Strassman point" was first suggested by Dandridge Cole. It refers to a discovery which can form the basis for subsequent technological forecasts. The term is drawn from experiments conducted by Otto Hahn and Fritz Strassman in 1938 which resulted in the discovery of uranium fission. After their work forecasts pertaining to the uses of fission could be made; prior to their work the potential implications were by necessity unknown.

FIGURE 1
 EXAMPLES OF CONNECTIVE MODES

EXAMPLES	ENHANCING			INHIBITING	
	ENABLING	PROVOKING	DENIGRATING	ANTAGONISTIC	
HISTORICAL	A political party nomination is a prerequisite for the presidency.	Population increases make development of birth control devices more important.	1830 Railroad Development delayed automobile.	Vietnam conflict is antagonistic to reduction of income tax.	
FUTURE	Advent of a very cheap power service will promote desalination.	Large increase in atmospheric contamination will prompt the development of non-contaminating power sources.	Discovery of pathogenic organisms on Mars will make manned planetary exploration more difficult.	Increasing crime rate may result in anarchy.	

Along with the concept of mode we must introduce the notions of strength of linkage and time effect. By strength of linkage we mean the relative effect of the occurrence of D_m on the probability of occurrence of D_n . Clearly some items will be strongly linked, that is, the occurrence of D_m produces a large change in the probability of D_n ; other items are weakly linked, that is, the probability of D_n is only slightly affected by the occurrence of D_m . In the limit, the lower the strength of linkage, the more closely the relationship approaches an unconnected mode.

The time effect refers to the time constant of the change in probability of D_n in the presence of the occurrence of D_m . Suppose that D_m and D_n are strongly linked in the enhancing mode. Even though the linkage is strong, there is little chance that the probability of D_n will increase significantly immediately after the occurrence of D_m . Depending on the nature of the events the time required to realize the higher probability will range from minutes to decades. Project Hindsight data indicates a time constant on the order of ten years from scientific discovery to utilization in weapon systems. Edwin Mansfield traced the spread of certain ideas from innovation within a company, to use of that idea by other firms within the same sector (7). He found that the process of diffusion is generally accelerating in our country but still may require time intervals on the order of 10 years.

(7) Edwin Mansfield, "Diffusion of Technological Change," Reviews of Data on Research and Development, National Science Foundation, October, 1961.

Analysis

With these concepts in hand, we can proceed to ask how the probability of D_n might change if D_m occurs. Suppose that P_n is the probability of D_n before the occurrence of D_m , and P_n' is the probability of D_n some time after the occurrence of D_m . Then

$$P_n' = f(P_n, M, S, t_m, t) \quad (1)$$

where:

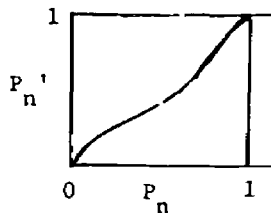
M is a function of the connection mode.

S is a measure of the strength of connection.

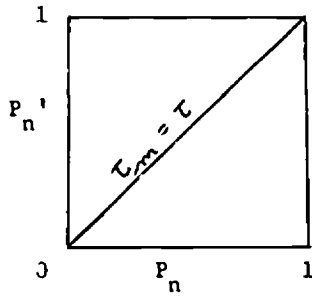
t_m is the time in the future of the occurrence of D_m .

t is the time in the future for which the probabilities are being estimated.

We know that both P_n and P_n' must lie between zero and one; furthermore, for inhibiting and enhancing modes, when $P_n = 0$, P_n' must equal 0 and when $P_n = 1$, P_n' must equal 1. Therefore,



When $t_m = t$, there is no time allowed for the adjustment of probability of P_n to P_n' , so P_n must equal P_n' :



The area above the diagonal contains enhancing mode, and the area below the diagonal contains inhibiting relations, since above the diagonal $P_n' > P_n$ and below $P_n' < P_n$.

It is reasonable to assume as a first approximation that within these regions the relationship between P_n' and P_n varies monotonically with time available and modal strength; the greater the time and the higher the strength, the greater the ratio P_n'/P_n for enhancing modes. For inhibiting modes: the greater the time and the higher the strength, the lower the ratio P_n'/P_n .

If the relationship is assumed to be quadratic:

$$P_n' = aP_n^2 + bP_n + c \quad (2)$$

then, substituting known end conditions, we obtain:

$$P_n' = aP_n^2 + (-a)P_n \quad (3)$$

For the inhibiting case:

$$0 < a < 1 \quad (4)$$

and for the enhancing case:

$$-1 < a < 0 \quad (5)$$

The question still remains as to how t_m , t and S affect a . Although greater sophistication is possible, we might guess that it is adequate to assume that the relationship is linear:

$$a = kS \frac{t - t_m}{t} \quad (6)$$

where

k is ± 1 as determined by the mode;

S is a number between 0 and 1, a smaller number representing weaker strength (zero designating an unconnected pair);

and the t 's are as previously defined.

Now substituting back into equation (3):

$$P_n' = kS \frac{t - t_m}{t} P_n^2 + [1 - kS \frac{t - t_m}{t}] P_n \quad (7)$$

Historical Test

In order to test the utility of this equation an historical situation was analyzed. A set of 28 events associated with the decision to deploy the Minuteman missile was obtained from two sources: a collection of data relating to the technological environment preceding the decision to deploy the missile (8), and through personal interviews with personnel who were associated with Air Force ballistic missile programs in the period preceding the deployment decision. These events were assigned probabilities of occurrence from the standpoint of our state of knowledge in 1950. To avoid conscious biases, these estimates were obtained by averaging the independent judgments made by the ex-Air Force officers and the authors. A matrix was constructed (Figure 2) of these 28 events, and the interactions were assessed by the authors in terms of mode and strength. As the individual item pairs were reviewed certain predecessor-successor relationships were apparent. The items which had to be predecessors were evaluated first in the subsequent play.

The equation (7) was programmed in the UCLA Western Data Center IBM 360/75 computer and the mode, strength, and time priority for the 28 x 28 event pairs were punched into an input data deck. The computer selected an event from among the predecessor group, and using random numbers, decided whether the event occurred. If it did, the probabilities of the remaining items were adjusted and the play repeated for the next item selected. This process was repeated until all items were decided. This single run-through was repeated 1000 times in order to produce new probability estimates for the items.

Although it would have been more accurate to introduce concepts of reciprocity by considering the effect of non-occurrence of the items under test, in this first attempt, probability adjustments were made only when the given items occurred.

The output of the first run is shown in Figure 3. This printout includes a listing of the items considered, the probabilities initially assigned them, the probability shifts which occurred when the items were correlated, and the ranking of the items according to initial probability, final probability, and probability shift.

(8) "Management Factors Affecting Research and Exploratory Development," Arthur D. Little, Inc. Report, April, 1965.

EVENT	THEN THESE CHANGE PROBABILITY																												
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
1. AF STUDIES SOLID CBM	57	1																											
2. LIGHT WARHEAD TECH AVAIL.	54	7	-80																										
3. CONTINUED GOLD WAR	5	9	+81	-51																									
4. ATLAS FLIGHT PROBLEMS	56	5	-51	-20	-30	+50																							
5. ATLAS COSTS HIGH	56	5	71																										
6. TITAN II AUTHORIZED	56	2	70	-80																									
7. SPORT REACT TIME NEED	56	5	-91	-20																									
8. HARDWARE NEED	56	4	-91	-20	-70	-20	80																						
9. MOBILITY NEED	56	3	-91	-20	-70	20	80	+50	-81	-81																			
10. MISSILE GAP REDUCED	58	5	20	50																									
11. MINUTEMAN AUTHORIZED	56	2	-90	-50																									
12. MOSE COME TECHNOL.	57	3	-20	30	+30																								
13. GUIDANCE TECHN.	57	7	-20	30	+20																								
14. SOLID THRUST TERMIN	61	4	+30																										
15. ALUMINIZED DOUBLE BASE PROP	58	2	-20																										
17. ABLATIVE INSUL. TECHNOL.	59	4	-20	+20																									
18. HIGH PERFORM ELECTRONICS	60	8																											
19. HIGH RELIAB. TRANSISTOR	57	8	-20																										
20. GAS BEARING CYRO	56	5	-20																										
21. CONTINUED NUCLEAR TESTS	5	9	50	-71	-70																								
22. MISSILE GAP GROWS	5	5	-50	-50																									
23. H ₂ BOMB DEV. AUTHORIZED	50	9	-82	-80																									
24. U.S. AERIAL H ₂ EXPLOSION	56	8	-81	-80																									
25. U.S.S.R. H ₂ BOMB EXPLOSION	53	9	+80	-80																									
26. NAUTILUS UNDER POWER	59	8	-20																										
27. KHARUSHEV PREMIER	59	4																											
28. ATLAS AUTHORIZED	52	7	-90	-20	-30	-50	-50	50																					

CODE: S2W REPRESENTS MODE; + ENHANCING; + INHIBITING
 1ST DIGIT: STRENGTH: 0-1; 0 UNCONNECTED; 1 VERY STRONG
 2ND DIGIT: PREDECESSOR: 01 IMMATERIAL; 1; LIKELY PREDECESSOR; 2; NECESSARY PREDECESSOR

FIGURE 2 MINUTE MAN MATRIX



Figure 3

Forecasting Through Correlations of Interacting Trends and Events
 Ted Gordon and Harold Hayward
 February, 1968

Games 1000

Prior 4

Events 28

INDEX	EVENT	INITIAL		DELTA		FINAL		RANK		RANK	
		PROBABILITY	PROBABILITY	PROBABILITY	PROBABILITY	PROBABILITY	PROBABILITY	INITIAL	DELTA	PROBABILITY	PROBABILITY
1	AF STDY SLD ICRM	0.1000	-0.0080	0.0920	0.9410	28	9	24	5		
2	LUTE BRHEAD TECH	0.2000	0.2410	0.0780	0.4980	1	18	18	22		
3	CONT COLD WAR	0.9000	-0.0020	0.8980	0.680	17	19	19	17		
4	ATLAS FLIGHT PER	0.5000	0.0880	0.4120	0.3860	24	24	24	8		
5	ATLAS COST HIGH	0.4000	0.1370	0.2630	0.1290	13	13	12	12		
6	TITAN 2 AUTH	0.5000	0.1290	0.3710	0.5290	17	17	17	13		
7	SHT REAT TIME	0.5000	0.2110	0.2890	0.5110	22	22	7	7		
8	HAERTING NEEDED	0.4000	0.4580	0.0580	0.9580	13	13	4	4		
9	MOBILITY NEEDED	0.3000	0.5290	0.7290	0.7170	24	24	1	1		
10	MISSILE CAP REMI	0.5000	0.5170	0.7170	0.5230	22	22	6	6		
11	MINUTEMAN AUTH	0.2000	0.1490	0.8490	0.5000	17	17	15	15		
12	POLARIS AUTH	0.2000	0.0250	0.2250	0.4210	24	24	22	23		
13	NOSE CONE TECH	0.3000	0.0830	0.8330	0.7920	4	4	25	25		
14	GUIDANCE TECH	0.4000	0.1000	0.5000	0.7070	12	12	14	14		
15	SOLID THRUST VTR	0.4000	0.0210	0.4210	0.9680	1	1	19	19		
16	ALUM DOR EAC FRP	0.2000	0.0650	0.9650	0.6670	13	13	7	7		
17	ABLATIVE ISUL IN	0.4000	0.4670	0.0880	0.0880	1	1	27	27		
18	HIGH REL ELEG	0.8000	0.0850	0.8850	0.1900	4	4	17	17		
19	HI REL TRANSISTR	0.8000	0.1900	0.9900	0.9580	4	4	10	10		
20	GAS BEARING CYRO	0.8000	-0.0040	0.8960	0.0280	9	9	21	21		
21	CONT NUCLEAR IST	0.9000	0.0650	0.9650	0.0280	9	9	21	21		
22	MISSILE CAP INGT	0.5000	0.4670	0.0880	0.0880	1	1	27	27		
23	H2 BOMB DEV AUTH	0.9000	-0.0020	0.8980	0.8850	1	1	17	17		
24	US AREAL H2 EXEL	0.8000	0.0850	0.8850	0.1900	4	4	10	10		
25	USSR H2 BOMB EXP	0.8000	0.1580	0.9580	0.8960	17	17	26	26		
26	NAUT UNDER POWER	0.8000	0.1580	0.9580	0.8960	17	17	26	26		
27	KRUSHCHEV PREMIER	0.4000	-0.0040	0.8960	0.0280	9	9	21	21		
28	ATLAS AUTHORIZED	0.7000	0.0280	0.7280	0.0280	9	9	21	21		

The ranking by probability shift is, in essence, a listing of the items most affected by the suspected interactions. In other words, the item which had the highest probability shift could be expected to be the one most influenced by the external events depicted by the remainder of the list. The ten top-ranking items, in terms of probability shift were:

Item	P_i	P_i'
1. Minuteman Authorized	.20	.729
2. Polaris Authorized	.20	.717
3. Missile Gap Increases	.50	.033 (Note: negative shift)
4. Missile Gap Reduced	.50	.958
5. Light Warhead Technology	.70	.941
6. Nose Cone Technology	.30	.523
7. Mobility Needed	.30	.511
8. Titan II Authorized	.20	.396
9. USSR H-Bomb Exploded	.80	.990
10. Nautilus Under Power	.80	.956

Thus the situation depicted by our matrix indicates that the mutual interaction of the items would enhance the decision to deploy Minuteman. The shifts in probability of the remainder of the items are also suggestive of the technical-political environment of the 1950's.

If the items are ranked simply by final probability, an interesting scenario is produced (considering only the first ten items):

Item	P_i	P_i'
1. USSR explodes H-bomb	.80	.990
2. Cold War Continues	.90	.978
3. Continued Nuclear Tests	.90	.968
4. Missile Gap Reduced	.50	.95
5. Nautilus Under Power	.80	.956
6. Light Warhead Technology	.70	.941
7. H-bomb Development Authorized	.90	.898
8. High Reliability Electronics	.80	.893
9. US Aerial H Explosion	.80	.885
10. Guidance Technology	.70	.849

In summary, despite the simplifications used, this historical test produced results which were consistent with our expectations: we asked our contributors to name events relevant to the decision to deploy Minuteman

and estimate their probabilities from their recollection of the 1950 situation. When these were treated in a cross-impact matrix, Minuteman deployment was in fact the item most affected by the other events.

In an absolute sense, the probability of Minutemen deployment was assessed to be only .20 in 1950 by our contributors; the external events raised this value to a quite high level of probability: .729. Finally, the events which emerged from the cross-impact analysis as being most probable, are a logically consistent set (though not necessarily more logical than other sets).

Application to a Future Context

As a methodological test, a cross-impact matrix was constructed of 71 transportation relevant events and developments to occur within the next 20 years forecasted with varying levels of probability. Twenty of these items were related to technological innovations and improvements which might have a significant effect on transportation systems, nine items described new modes which have been proposed, eight items dealt with changing traveler preferences, and the remaining items were associated with societal changes which might have some effect on transportation mores. The author estimated dates of occurrence and initial probabilities for each item (simulating the results of the Delphi panels) and constructed a matrix as before, showing modes of linkage, strength, and predecessor-successor relationships. This matrix was "played" 1000 times as before, and the results assessed in terms of probability shift and final probability. Figure 4 illustrates the type items which formed the matrix, and their initial and final probabilities.

Some interesting conclusions were drawn from this run:

1. The effect of the judged interactions among the items listed significantly changed the probabilities associated with the original forecasts. For example, the item relating to increased preference for long distance commuting (Item 69) was originally judged to have a probability of .5. The interactions dropped this probability to .179.
2. The probability shifts resulting from this computation suggest that the supersonic transport, personal automobile, air busses and fast surface and sub-surface trains are more likely (greater than 90% probability) than originally assessed; moving sidewalk mass passenger air cushion vehicles, StarCar and personal rocket belts decreased in probability from their original assessments.

Figure E-4

Transportation Study

Index	Item	Initial Probability	Final Probability
1.	New materials for ultra light weight construction (the density and cost of aluminum but twice the strength) using, for example, new alloys, composite structures with whiskers or boron filaments, or new plastics.	.9000	.8990
2.	Information handling systems which would automatically keep track of all aircraft in flight, warn of impending collision situations, and reallocate airspace	.9000	.9920
3.	Automated highways which would track and control the speed and direction of vehicles traveling over them.	.3000	.9430
4.	A new large capacity fixed power source which can produce electricity for cents/kw, using for example nuclear power, or magneto hydrodynamic processes.	.7500	.7690
5.	A new reliable chemical fuel mobile source, weighing under 100 pounds which can produce 200 horsepower, for automobiles and the like.	.7500	.8790
6.	A storage battery which can power an automobile at 80 mph, over ranges of 200 miles, weighting less than 200 pounds.	.9000	.9100
7.	"Shearing" parallel belts which move slowly at the edges and at higher speeds near the center.	.5000	.4980
8.	Nuclear explosives for rapid excavation and tunneling available for use by commercial contractors.	.9000	.8730

Figure E-4 Con'd

9.	Electronic circuit techniques which are "self healing" and maintenance free.	.6000	.8010
10.	Relatively inexpensive rocket propellents, capable of being handled and used safely (possible application: inexpensive rocket belts such as Aerojet's Rocket man).	.3000	.0740
11.	Room temperature superconducting wire (one use of which might be the construction of magnetic highways over which cars of opposite polarity would float).	.2000	.2350
12.	Mobile highway building machine capable of laying finished road surface at the rate of 2 miles per day and at a cost of \$200,000 per mile.	.7500	.9420
13.	Anti-smog device which removes 90% of the pollutants from the exhaust of internal combustion engines at a cost of 5 cents/100 miles (may be mechanical or gasoline additive).	.3000	.7460
14.	Fatigue resistant metals which permit helicopter blades to function 10,000 hours between inspections.	.6000	.6080
15.	Linear induction motor of 5,000 horsepower.	.9000	.8820
16.	New automobile safety devices which further reduce fatalities by 50% and cost \$200 per automobile.	.9000	.9870
17.	Beamed power device, perhaps lasers, for transmitting propulsive energy to aircraft.	.2000	.2990
18.	Mechanical power pick-up system which permits vehicles to derive electrical energy from fixed sources.	.9000	.9730
19.	Non deflating tires.	.5000	.8770

Figure E-4 Con'd

20. Mobile tunneling machine capable of digging a 50' diameter hole, 10 miles/day at cost of \$_____/mile.	.5000	.8020
21. Increased use and performance of the StaRRear--A "mixed" system composed of battery powered cars which can run free on public roads or on "guideways" which furnish electrical power, at speeds of up to 50 mph.	.3000	.3310
22. Increased use and performance of VTOL/STOL--Vertical takeoff and landing or short takeoff and landing aircraft or helicopters, carrying as many as 50 people from suburban centers to downtown metropolitan landing sites.	.8000	.9460
23. Increased use and performance of Fast Surface Trains--Commuter trains, running at peak speeds of over 100 mph, using either wheeled or air suspension systems on tracks, above ground.	.8000	.9270
24. Increased use and performance of auto-private automobiles, using internal combustion engines, turbines, electric power, or other propulsive sources; capable of running on public roads.	.9000	.9620
25. Increased use and performance of mass ACV's air cushion vehicles for mass transit, typically carrying 100 passengers or more, over "grassy free-ways," water, or roads.	.6000	.6140
26. Increased use and performance of SST--Supersonic aircraft transports, carrying 250 passengers at supersonic speeds; optimum operation over 1000-mile trips; terminals in Boston, New York, Philadelphia, and Washington, D. C.	.9000	.9770

Figure E-4 Con'd

27.	Increased use and performance of air bus--a low fare subsonic transport, capable of carrying 500 passengers across the country for \$100 each at 500 mph; terminals at almost any commercial airport.	.9000	.9450
28.	Increased use and performance of sub-surface trains-commuter trains, running at peak speeds of over 100 mph, using pneumatic propulsion, or wheeled or air suspension on tracks, and running through intercity tunnels.	.5000	.9090
29.	Increased use and performance of moving sidewalks--belts used in cities in place of some sidewalks providing speeds up to 30 mph.	.5000	.8040
30.	Increased desire for low fare--the cost to the traveler in terms of dollars per mile.	.5000	.4740
31.	Increased desire for reduced travel time--the time to travel from point of origin to destination.	.7000	.7640
32.	Increased desire for safety--traveler safety, a measure of which is the number of accidents or fatalities per passenger mile traveled.	.5000	.6150
33.	Increased desire for comfort--passenger comfort, in terms of noise, vibration, entertainment, etc.	.7000	.9240
34.	Increased desire for convenience--the accessibility and schedule frequency of the system.	.7500	.7590
35.	Increased desire for community safety--the impact of the system on the safety of the community.	.5000	.5120

Figure E-4 Con'd

36. Increased desire for favorable environmental factors--the impact of the system on the community in which it is imbedded, such as pollution, noise, etc.	.8000	.8760
37. Increased desire for improved cargo integrity--the ability of the system to handle cargo smoothly and with minimum breakage.	.6000	.5920
38. Blank	.5000	.4800
39. GNP per capita grows at 5% per year.	.5000	.7640
40. Societal need for transportation decreases	.2000	.5660
41. Knowledge of weather conditions, through reliable forecasting, 1 week in advance, for areas as small as 600 square miles.	.8000	.7970
42. Widespread use of non-narcotic drugs (1/4 population on hallucinogenic trips, once per week.)	.6000	.5600
43. Continued automation of office work leading to displacement of 25% of the office work force.	.5000	.5320
44. Widespread use of automatic decision making at management level displacing 25% of middle management.	.4000	.4420
45. Widespread use of robots service in the home and factories, displacing 25% of the unskilled labor force.	.6000	.6560
46. National urban program, funded at 3 billion dollars per year, to promote renewal and renovate the physical plant of cities.	.9000	.9500
47. Two years of compulsory post high school education.	.5000	.5920

Figure E-4 Con'd

48.	New high school curriculum including education for better leisure time enjoyment.	.5000	.7290
49.	Intelligence of most of the population 10 I.Q. points higher through the use of drugs.	.3000	.4810
50.	Improved recreational and agricultural planning through the use of limited weather control (rain falls only on week-nights.)	.4000	.7350
51.	High school in the home through the use of teaching machines.	.9000	.9800
52.	Four-day work week available to most wage earners.	.3000	.5240
53.	Social Security benefits available at age 55 for men and women.	.7000	.8550
54.	Fifty year extension in life expectancy; vitality duration extended 25 years through control over aging process.	.2000	.2020
55.	Widespread use of centralized data banks (medical, legal, and general library look-up services), printed out via facsimile in homes and offices.	.9000	.9140
56.	Almost universal use of facsimile mail delivery service.	.6000	.8210
57.	Use by low income families of attractive, prefabricated, very low cost (1000 dollars) buildings for homes.	.5000	.6150
58.	Use by half of the population of home computers to "run" households.	.6500	.8480
59.	Use by thirty percent of the population of home communications centers which include conference 3D-TV, promoting decentralization of business management.	.7500	.8970

Figure E-4 Con'd

60.	Widespread use of 3D-color television receivers with "presence."	.5000	.6210
61.	Credit card economy in which direct links are established from stores to banks to check credit, records all transactions, and compute individual taxes automatically.	.9000	.9740
62.	High level of urbanization, (85% of the population lives in cities over 20,000 by 1980).	.9000	.9730
63.	Full employment (unemployment levels below 3.5%)	.5000	.3710
64.	50% increase in disposable personal income (by 1980).	.5000	.0580
65.	Availability of more recreational areas (twice as many per capita by 1980).	.5000	.9420
66.	Widespread and extensive Federal support for regional transportation programs.	.7000	.6940
67.	Urban crime rates reduced 50%.	.2000	.3850
68.	Anti-pollution legislation spreads and carries severe penalties.	.9000	.9970
69.	Long distance commuting in the sense that 25% of the workforce travels 50 miles from home to work.	.5000	.1790
70.	Regional medical centers.	.8000	.8880
71.	Minimum income law enacted which guarantees subsistence to all citizens.	.7000	.7210
72.	Federal mortgage subsidies permit low income workers to purchase houses.	.5000	.6270

3. Within the group of items describing future transportation system modes, fast subsurface trains showed the highest probability gain, suggesting that changed customer preferences, social mores, and technological innovations might favor this mode. (Item 28 shifted from .5 to .91.)
4. With respect to customer preferences, the judgments interact in a way which suggests that fare is likely to be less important than we might have otherwise estimated (Item 30 shifted in the negative direction), and comfort will probably become the most important transportation mode attribute.
5. Although the items related to anti-pollution legislation, automated air traffic control and extensive and effective automobile safety devices were originally listed at .90 probability, the cross-impact analysis boosted each of these to levels of .99 or greater: therefore, the interactions suggest that these items should be assessed as virtually certain.

This list is not exhaustive, but serves to illustrate the kinds of inferences which can be drawn from a cross-impact exercise.

At this point we proceeded to test the sensitivity of the correlations to changes in the initial probability levels. Suppose, for example, by conscious policy decision or unexpected breakthrough, our world in the next twenty years became more highly automated than Figure E-4 suggests. What effect might this variation have on transportation systems? We tested the sensitivity of the "transportation world" to level of automation by increasing the probability of those items which were associated with automation:

43. automation of office work
44. automation of middle management
45. automation of unskilled labor
55. data banks and facsimile
56. facsimile mail
58. home computers
61. credit card economy

Each was raised arbitrarily by 20% but in no case was allowed to exceed 95%. This new run was then compared with the earlier "norm." We found that a number of items had shifted in probability as a result of the increased automation. The three transportation-relevant items which were most affected were:

40. Need for transportation decreases
21. Increased use and performance StarCars
69. Long distance commuting (negative change).

The first and last items are intuitively correct; if the world were to become more automated, people might well travel less, since many of the services and products for which they currently travel would be available to them in their homes. This, of course, would make it less likely that they would be long distance commuters. The mechanism by which spreading automation enhances the StarCar is unknown.

We could also discern the effect of this increased automation on some of the societal entries. For example, comparison of the final probabilities of the standard world with the more automated world showed that, with more automation, it was more likely we would have (in order of their rank):

- 48. Education for leisure
- 63. Full employment
- 52. Four-day work week
- 47. Compulsory post-high-school education
- 39. 5%/year gross regional product growth rate

These results are also suggestive of an automated world.

Conclusions

The cross-impact approach is a methodology for forecasting which draws its strength from the recognition of mutual effects between events and developments. It appears that the modes of linkage between events and developments can be grouped into several categories, each with its own properties. This generalization permits at least a primitive analysis of the potential interactions between the items. In the two cases examined, this analysis has led to some insight about the future which was not available by inspection of the items alone; it came when the interactions between the items were explored.

We found that we had to ask questions in completing the cross-impact matrix which focused our attention on issues of causality. These questions were of the sort: "If D_m happens, how is D_n likely to be

affected?" If the fields with which we were dealing had been exact sciences, precise answers could have been produced. However, there is no theory of causality in the fields investigated. In these inexact areas there is currently no substitute for judgment. Our answers were therefore of the sort: "From experience and intuition it appears that D_n may be enhanced (or inhibited) if D_m were to occur." Certainly some

of these judgments were in error; however, the orderliness of the matrix forces the investigator to be explicit about the relationships he believes to be functioning in his field. In effect, the entries in the matrix are the semi-theories of his discipline. If the matrix were large enough, and all variables included, he would have articulated the discipline's paradigms in completing it. This exercise has promise, therefore,

in stimulating the articulation of the implicit laws of the inexact sciences.

An important use of the approach outlined in this paper is to test the effect of policy decisions on the probability of occurrence of a set of events and developments. The effect of policy decisions can be tested by varying the probability of one or a sub-set of items, replaying the matrix and then comparing the result to the initial standard. These deliberate probability changes can be thought of as the result of investments, concentrated research and development, or legislation. We illustrated this possibility by comparing a "standard" world of transportation to one in which automation was more prominent than had been originally supposed. The effects of the "extra" automation on the transportation items could be readily discerned.

We believe that this work is only indicative of a methodology of cross-impacts. If possible, its current shortcomings should be corrected in future work. The areas of weakness include:

1. The uncertain accuracy of the P' vs. P relationship. The quadratic form was selected for convenience and because it intuitively appeared to have the proper shape. However, other forms should be tested. Perhaps analyses such as Project Hindsight can provide more data which will be useful in defining this equation.
2. The assumption that strength and time remaining were linear functions in the P' vs. P domain. As we indicated, these functions probably vary as logistics functions, but sufficient data are not at hand to determine their nature. It is probable that the effect of time remaining will be found a function of mode; that is, a provoking relationship might have a different action time than an enabling one. Within these categories there may be further delineations.
3. The need for introduction of systematic and consensus judgment in the formulation of the cross-impact matrix. In both the Minuteman and transportation examples, the matrices were completed by the experimenters. It would be much more desirable to use expert judgment in assessing the direction, strength, and successor-predecessor linkages. Perhaps the Delphi technique could be employed to reach consensus among experts on these issues.
4. The unknown effect of including disparate items in the matrix. We tested two discrete lists of items. The items, in our judgment, were not of equal importance; we are not sure of the effect of including events and developments of different levels. Perhaps the construction of a matrix should be preceded by a relevance tree exercise to insure that the field under investigation has been reasonably well covered, and that the items listed are of relatively equal importance.

APPENDIX E
SENIOR STAFF: BIOGRAPHICAL SUMMARIES

Biographical Summary

THOMAS F. GREEN

Home: 624 Cumberland Avenue, Syracuse, N.Y. 13210; 472-9916

Office: 1206 Harrison Street, Syracuse, N.Y. 13210; 477-8439

FORMAL EDUCATION AND DEGREES:

1944-1948 University of Nebraska B.A. Philosophy & Government
1948-1949 University of Nebraska M.A. Philosophy
1949-1952 Cornell University Ph.D. Philosophy

PROFESSIONAL EXPERIENCE:

1967..... Director, Educational Policy Research Center,
Syracuse University Research Corp., Syracuse, N.Y.
1966..... Professor of Education, Syracuse University
1964-1966 Associate Professor of Education, Syracuse University
1959-1964 Associate Professor of Education, Michigan State
University
1958-1959 Assistant Professor of Education, Michigan State
University
1955-1958 Assistant Professor of Humanities, Michigan State
University
1952-1955 Instructor, English and Social Science, School of
Mines and Technology, Rapid City, South Dakota

RELATED ACTIVITIES:

1968 John Simon Guggenheim Fellowship and Alfred North
Whitehead Fellowship for period September 1969 to
September 1970; Proposed Studies: Education and the
Transmission of Moral Ideals.
1966 J. Richard Street Lecturer, Syracuse University
Topic: *Education and Pluralism: Ideal and Reality.*
Provost Lecturer: Michigan State University
Topic: *The Modern Meaning of Classical Views of
Work and Leisure.*
1965 Robert Jones Lecturer in Education: Mid-winter series
of four lectures at Austin Theological Seminary, Austin,
Texas. Topic: *Work, Leisure, and the Structure of Hope.*

Biographical Summary, THOMAS F. GREEN (page 2)

- 1965 Guest Lecturer in Education at the Up-state Medical Center, program in social psychiatry. This series has been continued every year.
- Lecturer and Seminar Leader; Danforth Annual National Workshop on Liberal Education.
 Lecture Topic: *The Paradoxes of Liberal Education*
 Seminar Topic: *Urbanization as an Educational Process*
- Guest Lecturer: The General Assembly of the United Presbyterian Church in the U.S.A.
 Topic: *The Americanization of Conflict: Some Cultural Assumptions.*
- 1964 Provost Lecturer: Michigan State University
 Topic: *Teaching, A Model of the Political Process*
- 1963 Visiting Professor of Philosophy, Colorado College, Colorado Springs, Colorado. (summer)
- 1962-1963 (Sabbatical Year) Senior Research Fellow: Princeton Theological Seminary.
- 1960 United States delegate to World Conference on Teaching and Theology, University of Strasbourg.
- 1959 Associate Member, East-West Philosopher's Conference, University of Hawaii. (summer)

PROFESSIONAL ASSOCIATIONS:

American Philosophical Association
American Society for Public Administration
Philosophy of Education Society

WRITINGS & PUBLICATIONS:

A. In Print

- 1968 *Work, Leisure and the American Schools* (Random House, 1968). Book-length study of the ideology of work and its role in the philosophy of education.
- 1966 *Education and Pluralism: Ideal and Reality*, J. Richard Street Lecture at Syracuse University (Syracuse University Press).
- 1965 "More on the Topology of Teaching," *Studies in Philosophy and Education* (A reply to the critics), Vol. IV, No. 3)

Biographical Summary, THOMAS F. GREEN (page 3)

- 1965 "Teaching, Acting, and Behaving," A Discussion,
Harvard Educational Review, Vol. 35, No. 2.
"Authority and the Office of the Teacher"
"Education and the Theory of Man"
"The Nature of Wonder" all appearing in *Essays in
Education and Theology*, edited by Marjorie Reeves,
published by World Student Christian Federation,
Geneva.
- 1964 "Teaching, Acting, and Behaving," *Harvard Educational
Review*, Vol. 34, No. 4, p. 507-524.

Reprinted In:

Psychological Concepts of Education, ed. Paul
Komisar and C. J. B. Macmillan (Rand-McNally,
1967).

Problems and Issues in Contemporary Education:
A collection of the best from the *Harvard Educa-
tional Review* and *Teacher's College Record*,
(Scott-Foresman, 1966).

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(Allyn and Bacon, 1966).

"A Topology of the Teaching Concept," *Studies in
Philosophy and Education* (Vol. III, No. 4, pp. 284-320).

- 1963 "The Importance of Fairy Tales," *The Educational Forum*,
November 1963, pp. 95-102.
- 1958 "A Humanities Teacher Looks at Engineering Education,"
Journal of Engineering Education (volume and numb
unknown to me).

B. In Process:

"Schools and Communities: A Look Forward," to appear
in the Spring 1969 issue of the *Harvard Educational
Review*.

"The Net Result: Certification or Citizenship," to
appear in *Anthropological Views on Education* (approx-
imate title) edited by Stanley Diamond (Free Press).

Biographical Summary, THOMAS F. GREEN (page 4)

The Activity of Teaching: An Introduction to Conceptual Analysis, a set of original studies in the philosophy of education. The set as a whole constitutes a coherent philosophy of pedagogy. Each essay is also accompanied by a discussion of the methods of thinking displayed in the study. The aim is to provide the student with an example of analysis together with some guidance in how to do it himself. (McGraw-Hill) Projected publication date: winter 1969-70.

School Reform and the Urban Public: Some Alternatives, a monograph on the relation between educational polity, the profession and the lay public together with some proposals for alternative steps to effect school reform. Senior author, Professor Gerald Reagan. Based on observations in Harlem, Boston, Chicago, Los Angeles, and Philadelphia. Expected completion: summer 1969.

Letters to Larry, a set of fifteen to twenty informal and personal explorations of theological and biblical topics. The question is "How might a relatively corrupt, deeply secular man rationally assess the claims of the Christian and Hebrew traditions upon his life?" No projected completion date. A labor of love in the most literal sense.

Biographical Summary

ROBERT J. WOLFSON

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Offices: 10 Maxwell Hall, Syracuse University; 476-5541 Ext. 3818, and
EPRC, 1206 Harrison Street, Syracuse, N.Y.; 477-8439

FORMAL EDUCATION AND DEGREES:

1941-1943 University of Chicago B.S. Mathematics
1946-1947
1947-1950 University of Chicago A.M. Economics
1956 University of Chicago Ph.D. Economics

PROFESSIONAL EXPERIENCE:

1967..... Associate Director, Educational Policy Research
Center, Syracuse University Research Corporation

1966..... Professor, Department of Economics, Syracuse
University

1965-1966 System Development Corporation, Principal Scientist.

1963-1965 The RAND Corporation, Economist, Logistics Department;
economic analysis of military procurement and organ-
izational decision systems.

1961-1963 CEIR, Inc., Los Angeles Center, Senior Project
Director; manager of large research projects budgeted
\$80,000-\$100,000 per year with complete fiscal, ad-
ministrative and substantive responsibilities for
the design and conduct of these studies. They were
concerned with: a) special inventory models,
b) management control systems, and c) studies of
public attitudes toward civil defense.

1960-1961 Assistant Professor of Business Economics and
Director of Management Science Research Project in
the Graduate School of Business Administration at
UCLA. Taught graduate and undergraduate courses
in economic theory, econometrics and managerial
economics; was director of and conducted research
on the Management Sciences Research Project--a
project funded by the Office of Naval Research at
\$50,000 per year.

Biographical Summary, ROBERT J. WOLFSON (page 2)

- 1959-1960 (on leave from Michigan State University) Held a Ford Foundation Faculty Research Fellowship in Economics. As a visitor at the Department of Economics and Graduate School of Business Administration at the University of California, Berkeley, did research on econometrics and statistics, organization theory and computer simulation of economic and organizational processes.
- 1956-1959 Assistant Professor of Economics, Michigan State University. Taught graduate and undergraduate courses in economic theory and econometrics.
- 1953-1956 Instructor in the Division of the Social Sciences (Planning Cultural Change), University of Chicago. Taught courses in regional economic planning and economic development, and did research in economic development theory. In addition, during the year 1955-1956, was co-editor of a professional journal, *Economic Development and Cultural Change*.
- 1951-1953 Assistant Study Director, The Survey Research Center, The University of Michigan. As part of a team, designed and executed a study on consumer attitudes and expenditures done annually for the Board of Governors and the Federal Reserve System.
- 1949-1951 Research Associate in Economics, University of Chicago. Did research on problems of the incomes of agricultural laborers.

RELATED ACTIVITIES:

- 1967-1969 Consultant to the Assistant Commissioner of Education for Program Planning and Evaluation, U.S. Office of Education.
- 1963 (June) Paper presented at meeting of the Scientists on Survival in New York City. Topic: *Attitudes toward Community Fall-Out Shelter Programs*.
- 1960-1961 Consultant, General Analysis Corporation on modeling of inventory programs.
- 1958 (summer) Participant in 1958 Interdisciplinary Behavioral Sciences Conference, sponsored by Air Force Office of Scientific Research at the University of New Mexico. Did research on the theory of organizations and of decision-making.

Biographical Summary, ROBERT J. WOLFSON (page 3)

- 1957-1958 Consultant, New York Metropolitan Region Study. Did research on the location of economic activity in the New York metropolitan area.
- 1956 (summer) Lecturer at the Institute of Economic Development, Vanderbilt University. Taught economic development to officials of friendly foreign governments.
- 1952 (summer) Research Associate in University of Michigan seminar on the Design of Experiments on the Decision Process, Santa Monica. Did research on decision processes.
- 1951 (summer) Lecturer at Roosevelt College, Chicago. Taught economics courses.
- 1949-1950 Lecturer at University of Chicago School of Business,
1954-1956 downtown center. Taught courses in economic theory.

PROFESSIONAL ASSOCIATIONS:

American Economic Association
Econometric Society
American Association for the Advancement of Science

WRITINGS & PUBLICATIONS:

- "A Mathematical Model for Studying Agricultural Wage Differentials" (abstract), *Econometrica*, Vol. 23, No. 3 (July 1955), p. 340.
- "Demographic Theory and the Theory of Economic Development" (review article of H. Leibenstein's *Theory of Economic-Demographic Development*); *Economic Development and Cultural Change* (July 1955, pp. 381-385).
- "An Econometric Investigation of Regional Differentials in American Agricultural Wages," *Econometrica*, April 1958, pp. 225-257.
- "Prices in the U.S., 1957," *Encyclopedia Britannica Book of the Year*, 1958, pp. 562-563.
- "The Economic Dynamics of Joseph Schumpeter," *Economic Development and Cultural Change*, October 1958, pp. 31-54.
- Wolfson, R. J.; Hoover, E. M.; Vernon, R; et al. *The Anatomy of a Metropolis*, Harvard University Press, 1959.

Biographical Summary, ROBERT J. WOLFSON (page 4)

Review of R. L. Meier, *Modern Science and the Human Fertility Problem*, *Current Economic Comment*, Vol. 21, No. 4 (November 1959), pp. 63-65.

"Long-Run Costs, Short-Run Costs and the Production Function," *Weltwirtschaftliches Archiv*, Vol. 85, No. 2 (December 1960), pp. 255-269.

"Some Current Work in the Analysis of Complex Economic Systems," *Proceedings of the Pilot Clinic in the Impact of Feedback Concepts in the Study of Economic and Business Systems*, New York, 1960, pp. 9-13.

"Notes on a Constructional Framework for a Theory of Organizational Decision-Making," *Decisions, Values and Groups Vol. II*, Pergamon Press, London, 1962, pp. 372-410 (with Richard S. Rudner).

"Estimation of Non-Linear Multi-Process Econometric Models" (abstract), *Econometrica*, Vol. 29, No. 3, July 1961.

"Dynamic Modelling of Inventories Subject to Obsolescence," *Management Science*, Vol. II, No. 1, September 1964, pp. 51-63 (with George W. Brown and John Y. Lu [same as RAND publication P-2825]).

Biographical Summary

WARREN L. ZIEGLER

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Office: EPRC, 1206 Harrison Street, Syracuse, N.Y. 13210; 477-8439

CHRONOLOGICAL WORK RECORD:

- 1968..... Coordinator of Research, Educational Policy Research Center, Syracuse University Research Corporation
- 1965-1968 Agency for International Development
- 1963-1965 U. S. Peace Corps in Nigeria
- 1962-1963 American Foundation for Continuing Education
- 1960-1962 Education and Management Consultant in the U.S.A., Denmark and Puerto Rico
- 1956-1960 in adult education with the Fund for Adult Education, the American Foundation for Political Education and New York University.
- 1954-1956 in private business
- 1951-1954 with the United Auto Workers

SUBSTANTIVE WORK HISTORY:

Following undergraduate and graduate work at the University of Chicago (to the M.A. level in the social sciences), I have worked in two related areas: education and development and change.

EXPERIENCE IN EDUCATION:

My work in education, primarily though not exclusively with adults, has been directed by a serious concern about the capability of our citizenry to deal effectively with the critical issues of our times, most of which share the common characteristic of emerging out of the endemic situation of pervasive social change. My intention has been to enhance the quality of judgment and participation, and a basic axiom of my work has been that a liberally educated citizenry can make sounder judgments and wiser choices among policy alternatives, whether in the collective, the organizational or the individual situation.

Much of my work has been in the burgeoning field of continuing education--as teacher, trainer, and program manager and developer--with universities (N.Y.U., Penn State), with operating foundations

(the American Foundation for Continuing Education, the Fund for Adult Education), with Federal agencies (A.I.D. and the Peace Corps), and with special programs (the Scandanavian Seminar, the Encampment for Citizenship, with undergraduate level students).

Because continuing education generally takes place in a less traditional educational environment, the opportunities for the imaginative use of educational tools are multiplied, and I have been able to use, and in some cases help develop, many techniques of cognitive and experience-based learning, both in residential and non-residential settings.

I have worked with nearly all socio-economic groups in the society: factory workers and upper echelon government and business executives; white, black, Puerto Rican, Indian, urban and rural citizens; established middle-class professionals, high-school leaders, inner-city poor.

Most of the subject matter of the courses and programs have been in the humanities and social sciences, but the natural sciences and hard skill-training have been included. I have done laboratory or sensitivity training for leaders in Puerto Rico and Denmark, taught the Crito to steel workers, poetry and music to corporation executives, Camus and Duerenmatt to Danish business leaders, problem-solving and social action research techniques to high school leaders, lead seminars on the political process and basic issues for legislative and administrative assistants on Capitol Hill. I have consulted in the development of a new international college in Denmark, and assisted in setting up the Peace Corps' first environmental (jungle) training center in Puerto Rico. Finally, as Director of Training for AID, and more recently in charge of its total manpower development program, I have been responsible for the preparation of AID officers to carry out their development assignments overseas.

EXPERIENCE IN DEVELOPMENT AND CHANGE:

The phrase development and change covers a host of phenomenon which fit uneasily, if at all, within the traditional confines of career, academic discipline or institutional order. Yet much of my work has focused on attempts to understand and deal with both the process and substance of change, primarily from the leverage point of operational, institutional responsibility, yet not without a serious concern for understanding and developing relevant conceptual and analytic tools. Both with A.I.D. and the Peace Corps, my work has had to draw upon the fields of social science and education. As Regional Director for the Peace Corps

Biographical Summary, WARREN L. ZIEGLER (page 3)

in Eastern Nigeria, I worked with volunteers and government officials in the areas of education (university, secondary school and teacher training), rural and community development, agriculture and small industry development.

Whether as a government, university or foundation official, as a Vice President of a board of an inner-city neighborhood service organization, as a management or education consultant, as a trainer, teacher or program administrator, whether in the United States or overseas, I have been challenged by and deeply concerned with the irrelevancy of much of our inherited wisdom and the paucity of most of our intellectual, organizational and normative systems to deal effectively with the dynamics of change. There is a fundamental and not yet clearly understood relationship between education and change, which I consider one of the major purposes of the Center to explore.

WRITINGS AND REPORTS:

These have been meagre, in the sense of formal, published works. Until recently, I have had neither time nor inclination to work in this area. A few pieces are available.

The Role of the Peace Corps Representative, unpublished; used extensively as a training document for new Peace Corps staff; August, 1965.

Issues for Development Administration in the Rural-Urban Transformation, in the report of the "Third Annual Conference on the Government of African Cities," Institute of African Government, Lincoln University, April 1968.

Manpower Development, report of Work Group II, in "Strategies for Behavioral Change in International Agricultural Development," Cornell University, January 1968.

The Third Dialogue, on social change and transformation (in preparation).

Biographical Summary

JAMES C. BYRNES

Office: EPRC, 1206 Harrison Street, Syracuse, N.Y. 13210; 477-8439

FORMAL EDUCATION AND DEGREES:

BBA, University of Oklahoma, 1952
Part-time graduate course work in economics and statistics, University of Pennsylvania, 1953-1956.

PROFESSIONAL EXPERIENCE:

- 1969..... Senior Statistical Analyst, Educational Policy Research Center, Syracuse University Research Corporation, Syracuse, New York.
- 1967-1969 U.S. Office of Education, Director, Post-Secondary and Special Programs Division, Office of Program Planning and Evaluation. Research on programs and policies of the Federal government for higher education.
- 1966-1967 Economic Development Administration, U.S. Department of Commerce; Chief, Analysis Division of the Office of Program Evaluation. Wrote policy research papers to identify and describe the central purpose of the Agency in operational terms. Designed an administrative procedure for allocating grants-in-aid to county and city units in the face of limited resources.
- 1964-1966 Federal Home Loan Bank Board, Director, Operating Analysis Division. Supervised the collection, processing, and analysis of Savings and Loan Bank data. This involved a large automatic data processing unit.
- 1964 (summer) University of Hawaii. Consultant, Economic Research Center. Designed and supervised probability sample of households, questionnaire and interviewing methods to estimate the expected consumer demand for a proposed inter-island Sea Ferry System.
- 1961-1964 U. S. Bureau of the Census, Chief, Income and Wealth Statistics Branch, Population Division. Supervised the design of FRB's Survey of Financial Characteristics of Consumers. Coordinated work for Inter-University Committee on Savings Statistics. Did published research on the measurement of consumer expectations. Originated quarterly publication series P-65 on Consumer Indicators.

Biographical Summary, JAMES C. BYRNES (page 2)

- 1956-1961 Board of Governors of the Federal Reserve, Economist. Originated and carried through Survey of the Financing Practices of large and small business. Designed and supervised monthly probability sample of margin accounts on the New York Stock Exchange. Consulted on annual Survey of Consumer Finances. Statistical research on the Index of Industrial Production.
- 1953-1956 Federal Reserve Bank of Philadelphia, Assistant Statistician. Designed first probability samples used by the entire Federal Reserve System to obtain information on Deposit Ownership. Prepared statistical material for Business Review publications.
- 1952-1953 Office of Business Economics, U. S. Department of Commerce. Prepared quarterly estimates of Personal Consumption Expenditures by type of product for GNP accounts. Demand forecasts.

WRITINGS AND PUBLICATIONS:

"The Demand and Supply of Instructional Staff in Higher Education," *Education in the Seventies*, U.S. Office of Education, 1968.

"Program Allocation in an Operational Setting," *Bentley Business and Economic Review*, June 1967. Joint with Robert Rauner.

"Use and Development of Consumer Anticipations Data," *Business Economics*, Winter 1965-66.

"An Experiment in the Measurement of Consumer Intentions to Purchase," *1964 Proceedings of the Business and Economic Statistics Section*, American Statistical Association.

APPENDIX F

Excerpts from draft of a
PROPOSAL TO PLAN A PROJECT
ON
SIMULATION-GAMING ON THE FUTURE

Warren L. Ziegler
March 20, 1969

NOT FOR PUBLICATION OR QUOTATION

This paper is not in final form; it is still subject to review by the staff of the Center, its Executive Committee and participating institutions.

SECTION I: INTRODUCTION

It is very difficult to say anything about American education which hasn't been said, and said better, before. The newspapers, the popular magazines, TV, even the professional journals repeat ad nauseum the truisms about the deplorable state of the system, its breakdown, its internal upheavals, its lack of effective performance, its rigidity in a time of dynamic and sweeping change. But conversely, they also praise its innovative capacity, its flexibility, its abiding strength as a bulwark of American democracy.

The system of education in the United States in this day and age, in its formal and informal activities carried on by its core and peripheral institutions, is so extremely complex that almost any assertion about its structure and performance is both true and false.

We do not wish this proposal to either express or demonstrate the fruitfulness of general propositions about American education. We do not wish the decision to fund this proposal to rest upon agreement or disagreement with axiomatic assertions, the validity of which cannot be universally demonstrated, or even given a reasonably high probability.

Thus, we are confronted with a dilemma in asserting the thesis on which the proposal rests. For a deductive approach ultimately rests upon some higher level of general theory...but there is no general theory of education, or of learning, or of teaching, or of systems behavior, which we would feel intellectually comfortable in setting forth. Conversely, an inductive approach, from the specific behaviors and ideas with which we are concerned, to more general conclusions, is also unacceptable because there is insufficient experience in our hands to warrant justifying this proposal on experiential grounds alone.

What we can and do assert is a statement of faith: that education can be an exciting, an enthralling and potentially one of the most powerful of human experiences. Further, and with the usual caveats about the exceptions, we possess a very strong sense that education in America today is not an exciting, an enthralling and a powerful human experience, either for the students, the teachers or for the rest of us who must live with the product of that experience.

How can it be made so? What ideas, what tools, what commitments, what perspectives now exist or can be invented which might invigorate the system and lend excitement to its activities? There are no doubt many answers to that question. We do not pretend to know which of many alternative models of education, which of many mixes of educational goals and strategies, which of many possible relationships among teachers, students, machines and "the system" might most effectively produce the experience of involvement, excitement, fulfillment, of intellectual and emotional growing and stretching and learning which we continue, as a society and as individuals, to ascribe

to education as a fundamental dimension of what it can do, and ought to do, and is most probably not doing well enough.

This proposal does not assume an answer, but an intent. To begin to find out.

We propose to explore the use of one powerful tool--simulation-gaming--to help develop some answers, both within the classroom and with the policy-making parts of the system which help determine what goes on inside the classroom. Simulation-gaming is by no means the only tool which may be appropriate to the task of capturing the enthusiasm and capability of students so that their education makes sense for them and to them. But it does possess the important virtue that it does not lock into one particular model of pedagogy, or curriculum reform, or student-machine relationship, or conflict-resolution, or institutional arrangement.

It may--we submit--challenge the student to teach himself about the future.

It may--we submit--begin to move the teacher from fulfilling his traditional role of dispenser of information and authority figure in loco parentis to becoming a learner about the future--the reality--of his students.

It might--we submit--provoke the school superintendent, the departmental dean, the school board, the trustees to look carefully at the future consequences of present policies and decisions.

And, finally, it may even--we submit--offer a way of involving the concerned publics of the education system, in all of their dimensions, organizations, associations and transactions with the system, in getting at the grave questions which confront education in America today, whose answers are so very consequential for education in America's tomorrow.

The art of gaming possesses an ancient history. Simulation is a powerful analytic and heuristic device of more recent origin. In combination with a computer technology, simulation is becoming increasingly capable of dealing with very complex real-world phenomena. Taken together, simulation-gaming represents, we believe, a potentially powerful educative and analytic tool for doing the following kinds of things:

- We believe it may increase learning and teaching motivation, perhaps to a significant extent.
- We believe it may serve as a new instrument for learning about the future for those students to whom the past is irrelevant as the initial base from which to mount their intellectual growth.
- We believe it may produce a heightened awareness on the part of

authorities, officials and educational leaders of the necessity to inject the idea of the future into their present decision-making, as a critical ground for testing the efficacy of policy choices.

-- Finally, we believe simulation-gaming may become a new tool in the developing methodology of systematically conjecturing about the future.

Except in some experimental situations to be described later, simulation-gaming has not been applied to connecting up teaching, learning or the educational setting within which they take place to a futures orientation. Indeed, it is clear that teaching and learning, in all of their configurations, have been historically committed to transferring the values, the "wisdom," the skills and practices of past generations to the present. Sociologists describe the educational process as anticipatory socialization. But what has been anticipated has been the past implemented in the present. We are suggesting that we should mount an effort to think about how education might anticipate the future.

Educating from the past, by itself, no longer suffices. It is time, now, to perform some imaginative and systematic experimentation with simulation-gaming as an approach to educating for the future. This proposal seeks funds to plan such an effort.

SECTION II: THE OVERALL PLAN OF THE PROJECT

The simulation-gaming project we shall discuss is a two-phase effort. The first phase, for which we now seek funds, will plan the project. This planning phase will take four months. During this first phase, we intend to specify the outcomes of the whole project in operational terms, to develop an effective work plan and to decide upon organizational and administrative arrangements for a consortium of institutions to do the work. Section VI sets forth, in preliminary fashion, a statement of overall Project Outcomes.

Phase II will take two years to complete. During that period, we shall perform some systematic experimentation, under explicitly-defined conditions, to apply simulation-gaming to the task of building the future into the educational present. This is seen as a two-part effort. First, it will require the development and testing of simulation-games as a powerful way of re-involving students and teachers in a mutually exciting educational enterprise characterized by its approach to thinking about the future. Section III: Education as a Function of the Future, describes why we believe this is an important task.

But that effort cannot occur in a vacuum. What might be made to happen in the classroom depends, in part, on what the system will permit. If we are to test the efficacy of focusing the educational process on the subject of inventing the future, the educational setting, in all of its complex totality, must be afforded an opportunity to redesign its approach to policy and decision-making. To do that, it needs new tools.

We are not proposing to take up the enormous and unmanageable task of redesigning the system. We are, however, convinced that there is a strong inhibiting linkage between the standard approach to educational planning and policy-formulation and new approaches to the substance of classroom teaching and learning. Section IV: Policy as a Function of the Future describes that relationship.

Concurrently, then, with developing simulation-gaming as a teaching-learning device focused on the future, we shall also experiment with simulation-gaming as a way of getting educational authorities and educational consumers to inject into their transactions a way of considering the future consequences of their current decisions. In its application to military games, to business management decision-making, to urban development, simulation-gaming has not included the kind of futures-orientation which we consider essential to a decision-making process whose consequences last for at least two generations.

Therefore, Phase I--the planning stage of the project--must successfully perform three major tasks:

- 1) A coordinated, well-defined work plan must be developed.
- 2) The experience with and literature on simulation-gaming must be thoroughly reviewed so that we are sure of the base from which we start. Section V: The Relevance of Simulation-Gaming defines the parameters of the relevant experience to date.
- 3) We must define the institutional arrangements whereby each of the educational institutions which will be associated to accomplish the work of Phase II is able to effectively make its special contribution to produce an interrelated set of outcomes.

Perhaps the most critical task of these tasks lies in the area of developing a coordinate relationship among a number of institutions. These include the Educational Policy Research Center at Syracuse and other Centers of Research, of Instruction and of Communications at Syracuse University; Cornell University's Department of Housing and Design; the Urban Analysis Project at the Harvard Graduate School of Business Administration; and the Institute of Science and Human Affairs at Columbia University. At this point, a consortium arrangement for Phase II is envisaged, possibly supported by some subcontract arrangements for highly technical aspects

of the project. The Phase I planning stage must define that relationship precisely, design a system for coordinating a series of experimental programs carried on at each institution to test different approaches for simulation-gaming with different audiences, collate and evaluate the results, develop a set of useful training and dissemination devices, provide for the accountability of the project for its performance, and ensure the liquidation of the consortium at the end of Phase II.

In making this proposal for Phase I planning funds in the amount of _____, we believe that a project-management approach in Phase II will best meet this set of needs. In other words, the contractual and work relationships to be precisely defined in Phase I, for the participating institutions in Phase II, will be formulated solely for the purpose of effective project implementation.

Phase I must itself be managed carefully. It should demonstrate that the EPRC and the institutions with which it will associate to accomplish the work plan of Phase II can develop clear and precise guidelines and effective management tools for ensuring the expeditious accomplishment of the Phase I Tasks. That demonstration should provide additional evidence to assist potential funding agencies to judge the capability of the associated institutions to achieve the outcomes for Phase II of the project.

SECTION III: EDUCATION AS A FUNCTION OF THE FUTURE

We have suggested that what goes on inside the classroom--particularly with respect to the dynamics of changing its focus in some measure--is not unrelated to the ways in which the system of schooling behaves in its policy, planning and decision-making aspect. Section IV describes this behavior as complex, non-centralized, and increasingly subject to conflict over educational goals.

It would not seem possible to invigorate the teaching-learning process itself, to produce mutual excitement and reciprocal commitment on the part of many teachers and students, unless the decision-making apparatus is itself provoked to look at new possibilities for what education might become. The output of the decisional process in education is clarification and determination of educational goals, identification and weighing of alternative means to achieve these goals, and the specification of strategies for implementation. These strategies call for the manipulation of financial, material (including technological) and human resources (teachers, administrators, service personnel, etc.). Thus, the outputs of the decisional process become inputs to the classroom, and are important features of the intimate educational setting within which students act and react.

But we are rapidly learning that the fundamental definitions of means and ends produced by the apparatus are not visibly--if at all--translated into

terms which make sense to students. Indeed, at the secondary school and undergraduate college levels of instruction, students appear to reject these definitions and seek other ways to find their own. Moreover, students--unlike many adults both within and outside the system--are connecting up what goes on in the classroom with what goes on outside it. University students, for example, are increasingly suspicious of the amalgamation of the role of the classroom teacher with the role of the government-supported researcher, when the same person acts in both capacities. Students in urban ghetto public schools reject the notion that the conditions of deprivation under which they live outside the schools are distinct and separate from what they are taught inside the schools. Indeed, the Coleman study on Equality of Educational Opportunity¹ demonstrates just this: that the exogenous factors of the social and economic class of the student is most influential on educational performance as measured by standardized achievement tests.

It is our judgment that a focus on the future may be a way to more effectively connect up the need to rejuvenate the educational process within the classroom with the need of the system to reorganize itself among more relevant, more imaginative and more effective lines.

Thinking about the future, in a systematic way, is a recent activity. Bertrand de Jouvenel's seminal work on The Art of Conjecture was published in English in 1967. The Commission on the Year 2000 of the American Academy of Arts and Sciences was established in 1964. The work of the Futuribles in Europe began in the Fifties. In a bibliography containing approximately 250 books and articles dealing directly or tangentially with educational futures in America,² over 90% of them were written less than five years ago. And the intensive work going on today in the refinement of the Delphi and Cross-Impact Matrix methods of futurescasting requires constant and incremental changes in the methodology itself.

Inside the classroom, there are only a handful of experiences available in which students are involved systematically in the process of conjecturing about the future consequences of social actions and policies taken in the present. Section V describes the innovative work in constructing and playing simulation-games on the subjects of the Ghetto - 1984 and Peru - 2000 with which students at Syracuse, Cornell and Columbia Universities are involved.

Nevertheless, what a small--but increasing--group of scholars and students have formalized in commissions, task forces, institutes, centers, classrooms and an ever-widening number of Delphi studies and scenario formulations is not irrelevant to a much more pervasive phenomena of student disenchantment with what so much of present education relies upon: lessons

¹ James S. Coleman, et al. Equality of Educational Opportunity, Washington: U.S. Government Printing Office, 1966.

² Michael Marien, Annotated Bibliography on Educational Future, Educational Policy Research Center at Syracuse, 1969.

from the past.

That disenchantment is intimately related to the uses which education makes of the past, to the overriding authority which education ascribes to the past--as knowledge, as meaningful experience, as the source of morality and direction. By definition, adults who are in charge of the education system have already made their major investments through their own training and life experiences. Quite naturally, they perceive of the future as a setting within which these investments, intellectual and emotional, must receive a pay-off.

But in the new language, the kids are "turned off" ... when they ought and can be "turned on." Education no longer sufficiently excites and provokes the capacity to learn, a capacity which we nevertheless ascribe to each individual as a fundamental axiom of our social faith. Increasingly explicitly, and uniformly implicitly, as our children move into the years of adolescence and beyond, when memorization, rote learning and behavioral imitation no longer serve their intellectual and emotional needs, students are asking hard questions.

- Why is this kind of education necessary?
- What will it prepare me to do, to seek, to determine or impact upon in the future, as distinguished from what it will prepare me to accept from the past?
- What kinds of capabilities will the future require of me?
- Can I modify the future when I am an adult and can no longer rely upon what you, the teacher, have taught me out of your past?
- What is this notion of change to which we give so much lip-service, as the new dimension of human experience?
- Can I learn to deal with it better than the evidence my eyes and ears tell me you, the adults, are dealing with it?

We do not say that the questions implicit in student behavior are uniformly formulated or articulated this way. We do say that this behavior, whether demonstrated in strikes and riots, in passivity, in dropping out, or in learning how to "play" the system and get good grades, requires this or a very similar lexicon of interrogation.

What are the ways education might respond more effectively to the apocalyptic assertion of a student from one of our very "best" colleges: "I don't want to undergo the humiliation of having a professor ask me a question to which he knows the answer. I want him to ask me a question to which he doesn't know the answer." That simple formulation turns the whole basis of educational theory and system practice upside down, much as Marx turned Hegel

on his head ... and perhaps with as much import and portent.

Students look towards the future ... with hope, with anxiety. Education deals with the past. It has not yet learned how to deal with the future. But learning how to think about the future, whose reality lies still in their imaginations, may be a most powerful way the educational process can once more engage its students.

If the knowledge revolution is producing a doubling of its content every ten years, what part of this knowledge will prove meaningful to the future world in which students will be living as adults? If obsolescence in skills--and therefore in training for these skills--more and more characterizes the impact of technological change on methods and patterns of work and living--thus, human skills as well as job skills--what kind of education will develop the capacity for flexibility, renewal and continuous retraining?

Student reactions on campus, in the classroom, on the streets, has given new life to what Albert North Whitehead pointed out more than forty years ago: that the stability of culture, the force of tradition and the impress of inherited wisdom no longer suffice. The past--and our investments in it--is not real to the young, alert mind. Justification of present crises--in race-relations, in the urban ghettos, in wars of national liberation--which relies upon historical analysis, produces rejection, not only of the policies and mentality of the adult world, but also of the educational process by which these policies and mentality are transmitted from one generation to the next.

The young student is now involved in making his own major investments. He must do so on the basis, in part, of some conception of one or another future state of affairs in which his investments will make sense. But since we cannot know which of many possible states of affairs may obtain when today's students are tomorrow's adults, we must develop more effective ways of conjecturing about them. We must invent the means whereby the young minds of today can be trained to think systematically about their future. We must learn how to assist and stimulate students to use their imaginations and creativity in "inventing the future"--to use Dennis Gabor's term³-- in which they live. We must find ways of demonstrating in terms which make sense to them the consequential effects for the future of both private and public decisions taken today to deal with problems inherited from the past. For that will be the burden of their decisions and acts when they are adults.

It is exactly this kind of an approach, characterized by these kinds of concerns, which may prove efficacious in involving students in taking responsibility for their learning and becoming excited about it. One of the most portentous indications that this is possible comes from the few classroom experiences with simulation-gaming focused on aspects of the future we describe

³ Dennis Gabor. Inventing the Future, New York: Alfred A. Knopf, 1964.

in Section V. Though these were "games," they were for real. They counted. They produced remarkable evidences of motivation, of caring about the outcome of the exercise, of tough analytic thinking. They served as highly imaginative devices for revealing the consequentiality for the future of the social and political processes of today which the students had been studying. The simulation-games forced them to make analytic and normative judgments about alternative states of future affairs with which they had to "live" because of the psychological reality of the interaction among the students which these simulation-games produced.

It is this kind of opening up and freeing up of the educational process which we believe a focus on the future may help create. It is our surmise that the inhibiting constraints of authority of the past can be relieved without destroying those experiences of the past which may help inform and illuminate the future. We shall discuss more specifically in Section V why simulation-gaming, as inexact a discipline and tool as it is, lends itself uniquely to these objectives.

But a great deal more experimentation, testing and evaluation under different conditions both within and outside the classroom is required before we are in a position to conclude that investments in teacher training, in curriculum modification, in the technology of simulation-gaming might be worthwhile and manageable.

SECTION IV: POLICY AS A FUNCTION OF THE FUTURE

How can we demonstrate to the decision-making apparatus of an enormously complex educational system that anticipating the future might become a legitimate and potentially effective component of the educational program? One way has already been suggested: to design and test simulation-games which bring an understanding of the consequences of alternative futures into the actual classroom experience.

But the case for this project should not rest on that demonstration alone. The history of American education is replete with innovative ideas which passed their initial tests ... and went too little further. The rate of adoption of sound innovations by the system has been excruciatingly slow.

We propose a second thrust parallel to this focus on what goes on within the classroom setting. We propose to develop an approach to educational policy formulation and planning which also anticipates the future. This will involve designing and testing simulation-games as a device for injecting systematic conjectures about future environments, goals and programs of education into here-and-now policy deliberations. This activity, carried out with selected policy-making groups, should assist in creating an environment outside the classroom more conducive to supporting the same kind of approach within the classroom.

It would be dishonest for us to let the argument for attempting this second, parallel effort to rest at this point. For in its own right, American education desperately needs to develop workable ways to view its future. Like the students it teaches, the system makes huge investments--totalling in dollar terms billions per year--whose pay-offs lie in the future. Investments in plant, in curriculum-content, in teacher-training, in an expensive new technology, will be realized in some future society. Education must begin to think carefully about which among a number of plausible future societies its present investments will make sense. Conversely, it must provide its students the opportunity to think about which among a number of plausible future societies is more to be valued ... and, therefore, more to be sought after.

We at the Educational Policy Research Center at Syracuse place a special emphasis on thinking about educational policy issues in the context of the future up to the year 2,000. We believe that present-day society is characterized by an exponential increase in the pace and quality of change which dramatically foreshortens the minimum lead-time between planning and its consequences. In a very real sense, the future is upon us. But our institutional, intellectual and psychological capacities to deal comfortably and cogently with change, whether of a technological, societal or human character, are patently inadequate. The evidence abounds. Even ten to twenty years ago we found it impossible to forecast events and developments which now form the crises of our times and strain some of our institutions to the breaking point.

This inadequacy holds particularly true in the field of education. Educational planning activities focus almost exclusively on attempting to solve past problems in the context of current events and tensions which these problems have generated. Educational planners and decision-makers almost never engaged in identifying and defining the problems which a variety of possible future events might cause. The best of current educational planning, at whatever level in the system, rarely moves beyond the next decade, and uniformly describes the character of that next decade in terms of relatively simplistic and obvious extrapolations of current and past demographic, economic and technological trends.⁴

But the history of the educational system in this country demonstrates its overall rigidity over the short and medium-term. For example, investing in school construction, which is itself a complicated economic, political, fiduciary, and architectural task, is a sixty-year decision.⁵ Schools built

⁴ The way in which educational planning deals with the future is discussed at some length in "Educational Futures in the United States: A Summary of Work Undertaken and of Problems Posed for Educational Planning," etc.

⁵ Harold B. Gores, "The Demise of Magic Formulas," in The School House in the City, ed. Alvin Toffler, Praeger, N.Y., 1968, p. 167.

today will form the physical environment and determine the social arrangements in which children receive their formal education in 2030, even as now in 1969 perhaps 50% of our children in the metropolitan areas go to school in buildings built circa 1910. For a variety of reasons, here-and-now educational decisions lock the system into sets of consequences which are realized over as many as two to three generations.

This means that ways must be found to envisage the future and to consider its impacts upon education. This is a most complex and difficult task. It requires at present the use of a relatively loose and esoteric methodology. The state of the art of futures-thinking is still tentative. And while it has engaged the intellectual effort of some of our most reknown and brilliant scholars in both the natural and social sciences, it has by no means permeated the thinking of educators, decision-makers or the consumers of education. Since its inception in 1967, the Center has pioneered in developing ways to think about the future as it affects education.

Since the days of the Founding Fathers, education has been uniformly viewed as a public enterprise not only for the people but also of and by them. This notion clearly implies that claimants to education in this country, the various "publics" of the system, new and old, legitimate and those still striving for recognition, must somehow learn to deal with the consequences of educational policy formulation, both in terms of here-and-now decisions and in terms of the future. Ways must be invented to involve increasing numbers of people, including both the officials of the system and the publics and consumers of the system in thinking about the kinds of future states of affairs of this society which are plausible, which are possible, which are desirable and undesirable and which can be affected by educational policies. This represents a training problem of sizeable proportions. One major outcome of this project is to develop and test simulation-games as just such a training device. For unless the educational system can develop procedures for coming to grips with a conflicted policy process confused over goals, it is unlikely to produce--or permit--excitement, involvement and innovations within the classroom.

For reasons which will be discussed in the next section, we believe that simulation-gaming may well become an important new tool for thinking about the future. We believe it might be especially appropriate to the educational situation in this country in which the goals of education are daily disputed among the consumers, the publics and the authorities. We believe that it might, for very much the same reasons, provoke students and teachers to invigorate their relationship and transform what they do together, so that education can once again speak to fundamental human purposes and capacities in this new dimension of pervasive and dynamic change.

Now it is time to set forth in what ways simulation-gaming may respond to these needs.

SECTION V: THE RELEVANCE OF SIMULATION-GAMING

We are proposing to investigate (design, test, evaluate) simulation-games (1) as a way of getting students within the formal educational program to conjecture about aspects of the future, and (2) as a way of injecting a futures-orientation into the educational policy-making process.

In one sense, then, we are suggesting that simulation-gaming may be a useful approach to the study of the future in its own right, and irrespective of the particular domain, e.g., education, or the particular audiences, e.g., students and policy makers, on which it is brought to bear. Clearly, if simulation-games do not lend themselves to the design and playing out of material which is partially speculative in character, they would not appear to meet either policy needs, or students' needs (and demands) for increasing educational relevancy. While simulation-gaming has been successfully applied to other domains such as military strategy analysis and business-management decision-making, a longer-term time perspective has been excluded from these applications. How might simulation-gaming fit within the more general field of conjecturing about the future?

Systematic speculation about the future is an emerging discipline.⁶ So far, a number of alternative methodologies have been developed. Among these are (a) the construction of coherent scenarios of the future, (b) contextual mapping, (c) the Delphi method, and (d) a refinement of Delphi called the cross-impact matrix. These methods are employed by the Center directly, and in cooperation with the Institute for the Future at Middletown, Connecticut. Olaf Helmer and Theodore Gordon of the IFF have pioneered in the development and refinement of the Delphi and the cross-impact matrix methods, and serve on the EPRC's Research Development panel. Moreover, Anthony Wiener, co-author with Herman Kohn of The Year 2000, which displays a more systematic application of the scenario approach than has formerly been seen, is also a member of the Center's Research Development Panel.

It is safe to say that these methods are almost completely unknown to participants in the educational decision-making process. At their present stage of development, their use involves a time-consuming and relatively sophisticated set of techniques. Within the classroom, these methods have not been employed except in the one or two cases at the graduate level which we shall presently discuss.

Thus, the Center is in constant search of new approaches which must satisfy several objectives. One objective is to continue to develop essentially research-oriented analytical techniques. A second fundamental objective is to disseminate within the system of education, and particularly at the policy-making and planning levels, a capacity to systematically

⁶ Olaf Helmer, Social Technology, Basic Books, Inc., New York 1966. This short work contains a brief, clear review of the methodologies for future-casting or forecasting discussed in this proposal, and is recommended to the reader who is unfamiliar with this emerging discipline.

construct different plausible futures of society in which alternative educational policies can be embedded and in which policy consequences can be described and evaluated.

This objective is complicated by the subjective nature of the values and moral judgments which, explicitly or not, enter into the process of educational goal-setting and valuation. Clearly, there is increasing conflict over definitions of educational goals, and therefore over the strategies, both administrative and programmatic, to achieve these goals. Policy-making in education has become a conflicted process, because the "publics" which seek to actively intervene in the decisions which affect the system are growing rapidly. The traditional dialogue between schoolmaster and school board, wherein educational decisions were made on the basis of habituated practice and revealed wisdom, is a thing of the past. The nexus of decision-making has fragmented, the apparatus of educational authority is increasingly subject to challenge, and educational policy-making has become politicized to an extraordinary degree. The stolidity of the school board meeting, the carefully-controlled agenda of the P.T.A., the inviolable sanctuary of the administrator's office has been ruptured. Their content spills out into the cauldron of street politics, or channels into the very highest offices of the federal government, where it mixes with the insatiable appetites of the mass media and the new wave of participatory democracy. Old ways of resolving conflicts and formulating policy disintegrate under pressures generated from within as well as from outside the system.

The third objective, which lies in the domain of the classroom, is not unrelated to the first two. Indeed, one of the ways we hope to achieve the outcome of investigating the potential which simulation-gaming about the future possesses for an educational program for students is to design and test some simulation-games on alternative futures for education. Playing the game together, "students" and "authorities" can interact intellectually and normatively in inventing the future of education, in its many dimensions and aspects, and evaluating the consequences therein for the goals and perceptions which are now so clearly in conflict.

This search for additional tools for policy research and analysis, for education, and for training decision-makers, has lead us to the exploration of simulation-gaming. Simulation-gaming has been applied widely to the modeling, analysis and increased understanding of complex systems. Simulation-gaming has been used in training for more effective decision-making in a variety of contexts, including those as complex as military-operations analysis, urban land-use and transportation, and business-management games. Properly constructed, simulation models facilitate what may be called "pseudo-experimentation," where experiments (making judgments or decisions which shift relationships within the model) can be carried out and the consequences explicated even though the social reality simulated might not permit such interventions. One particular application of this approach is called, in the literature, "operational gaming." Operational gaming involves either real-playing, or role-playing in which the participants simulate real-

world decision-makers in conflict-of-interest situations. It requires the application of their intuitive judgments, their decisional skills, and their attitudes and belief-sets to the competitive or cooperative characteristics of the particular problem being played out.

One of the chief attractions of the operational-gaming approach is its powerful influence on making participants aware of many more aspects of the problem than is the case when working alone, or when undertaking an inquiry on the basis of a single discipline. An integrating effect is induced comparable to that is known, in purely analytic studies, as "systems analysis."

This integrative pay-off is very close to what we have found essential to the entire field of making systematic conjectures about alternative future states of affairs, whether in the domain of education, technology, or the larger societal environment. Absolutely essential to developing plausible surprise-free scenarios of the future is the requirement of completeness and relevancy. One must think about all of the contingent variables, because not to do so would eliminate from that particular future state of affairs factors whose potential impact could not be otherwise calculated.

Both this integrative cognitive effect as well as a dramatic upsurge in participant motivation were observed by EPRC staff when its members, in 1968, became involved, primarily as observers, in the experimental development, testing and evaluation of simulation-games which focused on the future. The two simulation-games were "Ghetto in Crisis--1984" played by graduate students at Cornell University and conducted by Professor Jose Villegas, Department of Housing and Design, in the Autumn of 1968, and "Squatter Settlement 2000" conducted in the Spring and Autumn of 1968 with students at Cornell and Syracuse University, under the tutelage of Professor Villegas, Professor William Mangin of the Anthropology Department at Syracuse, with the cooperation of Professor Thomas Green of the School of Education, and Professor Robert Wolfson of the Maxwell School, both co-founders of the EPRC.

The Ghetto and Squatter Settlement games required the participants to invent and choose among alternative social policies and programs in order to effect and modify for improvement critical components in the simulated urban ghetto and squatter settlement systems. The participants were required to analyze and evaluate the consequences of these policies into the future. While this future could neither be predicted nor known in the scientific sense, it could be conjectured about with greater or lesser rigor by the participants. They "invented" the future through the reasoned choice of interventions calculated to bring about more rather than less desirable consequences and states of affairs in the future. The participants were, in effect, put into roles of planners, decision-makers and evaluators and were provided divergent socio-economic-political characteristics to enhance both their understanding of differing viewpoints and ideologies and to increase the competitive (conflicted) character of the game.

These two experiments are inconclusive, by any hard criteria, in

demonstrating the applicability of simulation-gaming, in its present state, to the problems which this project proposes to address. For example, there are no hard data obtainable from this experience, or indeed from simulation-gaming generally, on its transfer value from the simulation and gaming situation to the real-life situation, and particularly to conflicted situations. Thus, an additional outcome we shall seek is to investigate the transfer value. Nor did the games deal substantively with educational policy issues emerging within the educational system or across its interfaces with other systems in the social environment. Finally, many of the "players" already stood at the upper reaches of the educational ladder and possessed intellectual skills--of analysis and differentiation, abstract and relational reasoning, ability to articulate, etc.--of the kind certainly not representative of all the audiences with whom the Center proposes to work.

Nevertheless, the encouraging experience with these games to date has led to the decision to expand their development, to test them with different kinds of groups, and to apply to their operation more rigorous evaluative procedures. During the Spring of 1969, three universities have become involved in the simultaneous playing of a more refined version of the Squatter Settlement Game. This new simulation-game, called "Peru in the Year 2000" will be conducted at Syracuse University's Department of Planning, Cornell University's Department of Housing and Urban Design, and Columbia University's Institute of Science and Human Affairs. The exercise will be video-taped at the three universities, thus providing not only for feedback to the participants, which forms an essential part of the learning process, but also much more easily controllable data for analysis and evaluation. This proposal for Phase I planning contains in its budget a small sum to assist the three universities involved in the coordination of these three simultaneous exercises, and another small sum to commence developing the measurement devices so that our knowledge of the transfer value from the simulation-game situation to the "real-life" situation can be enhanced.

Additionally, during the Spring of 1969, initial theoretical and operational research on the participation of ghetto leaders in simulation-gaming exercises in the Lower East Side of New York City will commence. A small sum is figured in this proposal's budget to assist in the coordination of that exercise, which will be conducted under the auspices of Cornell University. This initial research begins to explore the applicability of simulation-gaming to the highly-conflicted and pervasive inner-city situation whose future condition will impact heavily upon the future directions education might take.

Experience during the past year has led to another aspect of the project. It appears that "game-building," an obviously essential prior step to the "playing" aspect, provides important learning pay-offs for the "builders." In a preliminary technical memorandum prepared for the Center by one of the evaluators of the original Squatter-Settlement game, it is proposed that the task of constructing the simulation-game may, in its own right, contribute to the needs which we have identified. Another outcome of this project will be

to test and evaluate this proposition.

Game-building requires considerable sophistication in the handling of conceptual (systematic), analytic and (often) quantitative tools considerably beyond that possessed by subsequent players. For example, what would appear to be a "playable" game for high school students, in which they were involved in learning how to systematically and imaginatively conjecture about possible future careers, which involved making trade-offs among the goals which such careers might achieve, and which posed the strategy problem of step-by-step interventions to bring one or another career or life-style into existence, would probably require much sophistication in its design. The skills necessary to design such a game might well be taught to teacher-trainees, who, as part of their instruction, could engage in building just such a game. (The question of the subject-matter of the game, i.e., the problems and domains on which it focuses, is not crucial to the proposition, though in Phase II of the project it will be necessary to experiment with a variety of subject-matters which are appropriate to a focus on the future.) Another Phase II outcome, therefore, will be to test the possibility of designing a sequence of simulation-gaming activities which involve, at various levels of sophistication, educational decision-makers, graduate and undergraduate students, and high school students.

Game-builders have to think simultaneously about a number of elements. They must define the policy issues. They must formulate the parameters of alternative futures in which the consequences of the (educational) policy choices will be played out. They must determine the operational character of the game, i.e., whether participants are to play themselves, or are to role-play, in which case the "real-life" socio-political roles have to be chosen and built in to the simulation.

Clearly, much analysis and testing of this "game-building" hypothesis is required. The Center feels at this initial stage of its thinking that this is an important outcome to be sought.

During the course of this discussion, we have proposed to seek a number of outcomes which, in totality, represent the end-products of this project. The next section (VI) summarizes these outcomes so as to provide an overview of the objectives this project will seek to achieve.

SECTION VI: PROJECT OUTCOMES

This proposal has argued two major points. The first describes the state of lethargy in the educational program, the lack of involvement in, excitement from and motivation for both learning and teaching within the formal educational experience. Exceptions exist. The generality we assert. The largest portion of that formal experience still takes place in the classroom setting, and no doubt will continue to do so for some time.

We have argued that one critical factor in this depressing situation is the continuing reliance of education on disseminating information and facts about the past, in teaching, reviewing and assuming the primacy of the past as the fount of relevance, significance, wisdom. We have argued that for the current student body, particularly at the secondary level and up, such an emphasis, though supported by the whole tradition of education, is largely counter-productive; that students are preparing themselves for an unknown future by utilizing knowledge and skills derived from a past state of affairs which each passing day calls into question. We have suggested that an educational program which focuses, purposefully, systematically, imaginatively, on inventing the future might prove a strong antidote to the inconsequentiality and irrelevance which students increasingly ascribe to the current educational scene.

The second argument states that what goes on inside the classroom is determined, in part, by the behavior of education as a system, and particularly in its setting of goals, strategies and programs.

We have argued that policy-making generally attempts to solve current crises whose causes lie in the past. The strong tendency of the system towards rigidity over the short and medium-term means that such policy determination actually tends to lock both the system and its educational product into stipulations of knowledge, behavior and skills which are not informed by any systematic thinking about the future. Therefore, both for its own policy needs, as well as for developing a sympathetic view of a new focus for teaching and learning in the classroom, we have suggested that ways must be found to inject a futures-orientation into the policy process, which in education is presently heavily politicized and conflicted over educational goals.

We considered, briefly, the state of the art of futures-thinking, and the methodology of forecasting or futurescasting. We then went on to describe some recent encouraging experiences with simulation-gaming on the future, including some operational-gaming models. Simulation-gaming appears to offer rich promise of contributing powerfully to meeting these two major needs. We have not argued that proof exists. We have suggested that now is the time to initiate a soundly developed and managed project to design, test and evaluate a variety of simulation-games on the future, for different kinds of audiences, including students at various levels of sophistication and educational policy-makers in various parts of the system, including the new "publics" and consumers.

Finally, we have stated that several educational institutions, in addition to the EPRC, have developed interests parallel to those expressed in this proposal. These institutions have developed or played simulation-games on the future, or games of comparable complexity and heuristic value, which, indeed, provide the initial, substantive basis for the idea of this project.

As we lay out the pace and strategy of the project, it is clear that an

initial planning phase is called for. We judge that four months should serve to complete this planning phase at a cost of _____.

Planning is needed, first, to decide the organizational, administrative and work arrangements among the members of this group. A consortium arrangement appears practicable, but its terms, arrangement and duration need careful consideration. We have indicated that a project-management approach should provide necessary limits to the tendency towards consortia institutionalization and maintenance, which the potential member institutions have no wish to emulate.

Planning is needed, secondly, to really define this project in terms that are precise, manageable and investigable. No effective work of design and development, testing and demonstration, evaluation, and dissemination, can proceed on the basis of the level of generality of the propositions set forth in this initial proposal. In our request for planning funds for this project, we clearly mean to acquire a level of financial support necessary and adequate to permit the specification of project objectives, project methods and project organization.

We have already indicated some of the outcomes, which, at this stage of our thinking, we feel the project can seek to produce. It will be useful to summarize these outcomes, with the usual caveats that these statements of outcomes are incomplete, are lacking in necessary precision, and will undoubtedly be modified, dropped or added to as a result of the Phase I planning effort. Nevertheless, they provide a useful kind of summarization of our thinking to date. They also set the basis for the specification of the tasks to be undertaken in the Phase I planning stage.

Outcome - Methodology: To have tested and evaluated to what extent and how simulation-gaming lends itself to and enhances the objective of systematic conjectures about the future

- a - with respect to the playing-out process,
- b - with respect to the game-building process,
- c - vis-a-vis other formal methodologies for dealing with the future, such as contextual mapping, scenario construction, Delphi and cross-impact matrix.

Outcome - Students: To have designed and tested simulation-games, and to have evaluated the extent to which these games effectively get students and teachers to think about the future.

- a - To obtain greater clarity on what kinds of problems and which domains and sectors are particularly suited to the application of simulation-gaming on the future for both analytic and learning-teaching purposes.

- b - To have investigated the design problems with respect to developing simulation-games appropriate to different levels of sophistication among students, e.g., at high school, undergraduate and graduate levels.

Outcome - Motivation: To have investigated and clarified the kinds of learning and teaching which simulation-gaming on the future may promote, and to have evaluated what ways and to what extent they enhance motivation for, involvement in and a sense of the relevancy and significance of learning in the classroom setting.

Outcome - Policy-making: To have designed and tested simulation-games on the future, and to have evaluated in what ways these games might represent an effective component in a sequence of policy and planning activities carried on by persons charged with that responsibility at various levels and parts of the educational system or other systems,

- a - particularly with respect to defining and ranking educational goals for the future in relationship to future consequences of here-and-now policy decisions.

Outcome - Educational Domain: To have designed and tested simulation-games specifically in the domain of educational futures (e.g., future alternative environments for education, and its alternative goals, strategies and programs).

- a - To have tested and evaluated the feasibility of using simulation-games on the future of education as one way to enhance, reinstitute or create a meaningful dialogue among conflicted groups in the educational system, e.g., students, authorities, and the various educational "publics."

Outcome - Transfer Value: To have investigated more extensively and rigorously the question of the "transfer-values" of simulation-games on the future to real-life situations

- a - with respect to cognitive skills, attitudes and belief-structures,
- b - and particularly in so-called real-life conflict or crisis situations where traditional conflict-resolution and problem-solving tools appear ineffective.

Outcome - Dissemination and Training: To have evaluated the feasibility of packaging different kinds of simulation-games on the future, for students, for teacher-trainees, for policy-makers and publics in education and other domains, in order to facilitate their more extensive use as educative and training instruments,

- a - including a determination of in what ways, and for what kinds of audiences and problems, simulation-gaming may be

assisted by the use of various ancillary tools, e.g., computer-assisted, audio-visual taping and feedback, programmed schedules, visual displays, mechanical Monte Carlo techniques, etc.

This definition of a particular set of project outcomes conveys well the critical need for further conceptual and analytical work before an adequate determination of project specifications can be made. Many of these outcomes are interrelated. Priorities must be set so that one outcome, and its antecedent tasks of investigation, design, testing and evaluation, can serve as a sound foundation for moving on to achieving the next outcome. A flow-chart of unit tasks and outcomes clearly needs to be developed. Without preliminary planning activities, which we estimate can be accomplished in four months, it is difficult, if not impossible, to design this project in terms which permit the effective utilization of resources to achieve specified objectives within acceptable time-limits.

APPENDIX G
DISSEMINATION MATERIALS

The Educational Policy Research Center At Syracuse: A Description

What it is.

How it is organized.

Its personnel and associated organizations.

What it is.

The Educational Policy Research Center (EPRC) at Syracuse is an interdisciplinary joint venture of the Syracuse University Research Corporation (SURC) and Syracuse University. It was established in March 1968 under Title IV of the Elementary and Secondary Education Act.

Some of the Center's activities are devoted to the study of policy issues posed to it by the United States Office of Education, others are arrived at through consultation between the Center and the Office of Education, and some are determined by the Research Center itself.

How it is organized.

EPRC consists of a small core staff distinguished by its capacity to draw freely on much larger human resources. The Center will, of course, draw on the extensive professional talent assembled at Syracuse University and at the Syracuse University Research Corporation. However, it will also call upon personnel of other academic, professional and industrial groups, as well as lay persons who have continuing and important concerns with the future of education.

Currently, the Center is working directly with staff members of the Institute for the Future, Middletown, Connecticut, and the Hudson Institute, Croton-on-Hudson, New York.

There are three principal units of the Center plus a Research Development Panel. In addition to these, there eventually will be a cadre of visiting scholars.

The Division of Technical Studies is responsible for developing appropriate methods for generating the future-pictures or future-histories on which the Center bases its activities. This division also will be chiefly responsible for developing an annually revised three-year plan of activities for the Center.

The Office of the Secretariat is chiefly responsible for organizing, coordinating and assembling the work of investigators both from within and from outside the Center and for initiating the work, selecting the participants, and integrating the results of the Center's studies on educational policy and the future.

The Information Services Office is concerned primarily with anticipating the informational needs of the EPRC staff and with the dissemination of information to policy makers and the other publics interested in the Center's studies, operations and conclusions.

The Program of Visiting Scholars will eventually be established to attract prominent individuals from a variety of fields including the social sciences, education and the humanities to pursue studies on topics related to educational policy or educational futures.

The Research Development Panel has been organized to assist EPRC in finding the most meaningful formulation of questions to ask about the future, to help in finding better ways to answer them, and to guide in selecting and defining the specific policy issues on which the Center will concentrate.

This panel will provide an independent, interdisciplinary source for critical review of EPRC's work. Comprised of nine senior professionals, the unit will meet approximately 10 times a year, and its current members are:

George J. Alexander, associate dean and professor, Syracuse University College of Law;

Gordon M. Ambach, special assistant to the Commissioner for Long Range Planning, Office of the Commissioner, New York State Department of Education;

Samuel Goldman, director, Syracuse University Center for Research in Educational Administration;

Olef Helmer, Institute for the Future, Middletown, Connecticut;

James E. McClellan, director, Foundations of Education Department, Temple University;

William J. Meyer, director, Center for Research and Development in Early Childhood Education, and professor of Psychology, Syracuse University;

George G. Stern, director, Psychological Testing Center, and professor of Psychology, Syracuse University;

Gabriel Vahanian, professor of Religion, Syracuse University, and

Anthony J. Wiener, assistant to the director and chairman of the Research Management Council, Hudson Institute, Croton-on-Hudson, New York.

Executive Committee

Stephen K. Bailey, chairman, Policy Institute, Syracuse University Research Corporation;

Alan K. Campbell, dean, Maxwell Graduate School of Citizenship and Public Affairs;

David R. Krathwohl, dean, School of Education, Syracuse University;

Charles R. Wayne, executive vice president and general manager, Syracuse University Research Corporation;

Staff

Thomas F. Green, director and professor of Education, Syracuse University;

Robert J. Wolfson, associate director, acting director of Technical Studies and professor of Economics, Syracuse University;

James C. Byrnes, senior statistical analyst;

Warren L. Ziegler, coordinator of research;

Ralph S. Hambrick, Jr., assistant to the director;

Aileen M. McLoughlin, librarian;

Lawrence R. Hudson, research associate;

Stanley Moses, research fellow;

Mrs. Elaine G. Lytel, research associate;

Michael D. Marien, research associate;

W. Timothy Weaver, research assistant;

Allan Wulff, research assistant;

Sheila H. Bova, administrative secretary;

Elizabeth Macomber, secretary;

Mrs. Aina Sanders, secretary;

Associated Researchers

Bertram M. Gross, director, National Planning Studies Program and professor of Political Science, Maxwell Graduate School, Syracuse University;

Donald K. Adams, director, Center for Development Education and professor of Education, Syracuse University;

Jerry Miner, professor of Economics, Maxwell Graduate School, Syracuse University, and

Manfred Stanley, associate professor of Sociology, Maxwell Graduate School, Syracuse University.

In addition to its relations with Syracuse University, the Syracuse University Research Corporation, The Institute for the Future, and the Hudson Institute, the Research Center will seek useful associations with other planning agencies including the Ontario Institute of Education in Toronto, the London Institute of Education of the University of London, the UNESCO Planning Agency in Paris and the Organization for Economic Cooperation and Development.

The Educational Policy Research Center At Syracuse: A Description Of Its Objectives

EPRC has three main purposes:

- To study alternative futures.
- To provide instructional resources.
- To assist policy makers.

To study alternative paths for educational policy in the context of conjectures about the long-range future.

The most general formulation of the Center's purpose is contained in its title. It is a center for a particular sort of research. Its purpose is to study the consequences, direction, costs, desirability and practicability of alternative policies for education.

One of the peculiarities of policy in general and educational policy in particular, however, is that the consequences, costs and desirability of policy choices often are not apparent except over long periods of time. Policies adopted today may be inappropriate for the social conditions of 20 years from now, yet what our society may be like or what it could be like in 20 years may be significantly different, depending on what policy choices are made now.

With this in mind, EPRC must ask and attempt to answer certain types of questions:

- Can we anticipate what our society might be like, or what it could be like, so that current choices are more likely to result in a desirable future?
- Will the schools that we are planning today for the year 2000 be appropriate for society when that date arrives?
- Can we formulate choices now that will help bring about the kind of society we would like to see emerge by the year 2000?

These are questions about educational policy in the middle- and long-range future. Hence, a major effort of EPRC must be to study, in relation to education, a period in the future starting about 10 years from now and extending to some 30 years from now.

It is not a function of the Center to formulate or to promulgate policies. That can be done only by authorized educational authorities. Neither can the Educational Policy Research Center limit its thinking about the future to

predicting or to forecasting.

The only future that exists in the present is the one embodied in the hopes, fears, expectations, anticipations and plans of people. This is the future that must be addressed. It is, therefore, a major purpose of the Center to provide information, to clarify choices and to formulate conjectures about the future so that educational planners and policy makers can make their own hopes, fears, expectations and anticipations more explicit, specific and relevant to the future needs of the educational system.

To instruct and inform and to provide useful resources to policy makers at all levels of the educational system.

It follows that the fundamental mission of EPRC is instructional. It seeks to provide a forum for discussion, to serve as a resource of information and to become a source of methods and techniques for educational planners and other publics with an interest in education.

This function of the Center can be formulated in three important questions which can be examined in a wide range of instructional settings, publications and public forums that the Center will sponsor in cooperation with policy makers at all levels of the educational system:

What difficulties are involved in thinking about the future?

How can one assess the desirability of this or that specific future?

What policies might we need to arrive at (or to avoid) a particular future?

To listen to the problems of policy makers, anticipate their needs, and respond to their specific questions.

Above all else, the Research Center seeks to be relevant. It must, therefore, listen to policy makers, try to understand the nature and source of their problems, anticipate their needs, and respond to the issues confronting them.

For this purpose, EPRC will selectively develop relations with state departments of education, local school districts, boards of trustees, legislative bodies, publishing firms and others directly involved in educational policy problems, including the U.S. Office of Education.

From time to time, the Center will undertake to work with such agencies to help create the social inventions and techniques necessary for bringing about changes in educational policy. It also will attempt to anticipate requests from policy makers so that it can provide some understanding of issues, questions, solutions and consequences consonant with the future as it might develop, or might be made to develop.

How Can The Future Be Studied? Prediction, Forecast and Invention

The future is a mental construct.

A prediction is an attempt, in some sense, to know the future.

A forecast is an opinion about the future.

Inventing the future is attempting to make it different by planned intervention.

The Educational Policy Research Center will be engaged in a process of forecasting as well as inventing several alternative futures.

It is characteristic these days for organizations to be concerned with the future and to plan for their own future. However, the Educational Policy Research Center at Syracuse is concerned not only with its own future, but with how the future can be understood and possibly changed. It is the future itself that EPRC is designed to study. Yet one must ask how it is possible to study it.

The future is a mental construct.

The future is an idea. This is not to minimize its significance, but only to acknowledge that the future has no existence except in the human mind.

The idea of the future appears in almost every aspect of human life, but it is still only an idea. All languages are liberally sprinkled with notions and words that imply some concern for it. Such words as planning, anticipation, happiness, fear and hope are laden with connotations about the future.

For example, one makes plans in order to modify future circumstance or future occurrence. Anticipation is a looking forward, an activity of mental preparation for what the future might bring. Expectation is nearly synonymous with anticipation. Even joy and sadness frequently are concerned more with future than with current conditions. People are often joyful or sad because of their anticipations. Fright and worry also involve anticipations more than they involve present experience.

Clearly, the future has great significance in human life, but it does not exist except as plans, anticipations, expectations, hopes or fears. What exists is the present and records of the past. The present significance of the future is very great even though it is only an idea.

Concern for the future is, and should continue to be, a significant part of human life. In being concerned about the future, human beings display concern for states of affairs that may come into actuality. Thus, they may have a deep interest in forecasting or predicting the future.

There are, however, differences between forecasting, predicting and inventing the future — differences worth exploring.

A prediction is an attempt, in some sense, to know the future.

A prediction is, in some sense, a claim to know the future. It is a statement that some state of affairs will come into being. It is a claim of certainty. Anyone who can successfully predict the future has a great deal of luck, unusual insight or magical powers.

Until quite recently, it was believed that the universe was a deterministic machine whose course, for all future time, could be predicted once man had gained sufficient knowledge of its workings. So long as this belief was held, prediction seemed a perfectly reasonable prospect in principle, although in reality it was still subject to some difficulty.

For the past 30 to 50 years, however, this belief has come to be less widely accepted, and today it is felt that no matter how completely one acquires knowledge about the workings of the world, he cannot hope to predict with any degree of accuracy a single path of complex events in the natural world.

The social world, moreover, is believed to be not only more complex but, in addition, qualitatively different from the natural world, so any hope of engaging in any detailed prediction with respect to it is held to be even farther off.

This greater difficulty attached to social prediction probably is due partly to differences in the level of aggregation in social prediction as compared with physical prediction.

Natural scientists engage in predicting aggregates which are so vast that many of the singularities are simply eliminated as a consequence of random processes that have very small variances in such large populations.

That is to say, if physicists were concerned with predicting the path of a particular molecule or a small subset of molecules, they would probably run into great difficulty simply because the number of single occurrences would be rather large. But, in fact, they are rarely concerned with such small events and the singularities turn out to be so many in number that the law of large numbers itself eliminates them from consideration.

On the social scene, on the other hand, the singularities are matters of such great importance that prediction has to be made at the level of particular events.

Thus, it seems reasonable that if demographers or future-historians were willing to deal in the trillions of human beings in dozens of centuries as a typical prediction space, then the vast numbers and the great reaches of time would raise the predictor's gaze from the level of singularity and would make the job less difficult.

But when one starts at the level with which social scientists are concerned, a level at which individual decisions by individual human beings can make a great deal of difference, then he is at an entirely different level of difficulty, and predicting, as an attempt to know what will happen, seems an unrealistic hope.

A forecast is an opinion about the future.

A forecast, however, as opposed to a prediction, is an opinion about the future rather than a claim to know about it.

It seems reasonable to say that if one has an opinion as to the likelihood of a particular state of affairs coming about in the future, then he will also have a second opinion complementary to it.

For instance, if it is believed that the chances are seven out of 10 that it will rain tomorrow, then it must also be believed that the chances are three out of 10 that it will not. It may be, of course, that one cannot so completely quantify his opinions, but insofar as one has an opinion which implies something less than certainty about a state of affairs, then implicitly there are other opinions that are less than certain but which, together with the first, would tend to exhaust all the possibilities for some future date.

And so, in studying the future, one wants to develop not one picture or set of opinions about a possible future, but a number of alternative possible futures. And these alternative futures might be so constructed and so inter related that one among them may come close to describing what actually will occur. It is not necessary to know or even claim to know beforehand which of the alternatives will, in fact, turn out to be the case.

In this way of looking forward, the foundations for developing careful conjectures about the future are found. This kind of conjecture is called forecasting in order to distinguish it from predicting.

Inventing the future is attempting to make it different by planned intervention.

One might say that the future is simply that which will happen to us, so knowledge of it is of no use. Others might take the view that the future will happen to us and that knowledge of it only enables us to find a more comfortable bed to lie in while it runs over us.

But some feel that the future can be influenced, if there is enough knowledge of the strategic points of influence. Thus, planning could take three different forms:

It could simply be foreknowledge of events with no opportunity to do anything about them;

It could be an accommodation process wherein the event might be made less painful or more profitable, or

It could be a process of influence which would enable planners to increase the probability of a favorable outcome and to diminish the probability of injury.

The third form is what might be considered inventing the future.

That is, in the consideration of alternative futures, one should not only ask himself what is likely to happen if the processes of social influence continue roughly as they are today, but also what states of affairs could come about if certain interventions were made in the process of social change.

Thus, in looking into the future, planners might say not only do we wish to see a future in which there is no war and no poverty, but we also wish to see a future in which there is greater aesthetic appreciation.

If this statement could be made specific, and if it were possible to work out means by which, at a given future date, social influence could have generated such a state of affairs, then the question becomes how can one increase the probability of such social influences coming to have some effect. At this point the questioner has begun to invent a future.

EPRC will be engaged in a process of forecasting as well as inventing several alternative futures.

The work of the Educational Policy Research Center will, in fact, span all three levels of planning. It will first be concerned with forecasting a set of alternative pictures believed reasonably possible of occurring, some with no intervention at all.

Such pictures might include happy states of affairs and unhappy ones. Some could be states of affairs in which social and ecological imbalance would have occurred as a consequence of the absence of planning our social and natural resources.

A second class of alternative futures might be those in which there is some minor accommodation to some of these imbalances, such as the steps that are being taken today concerning environmental pollution or population increase.

There are those, of course, who believe that the demands that human society has placed on the ecosphere already have gone so far that not even anticipatory planning will forestall disaster in these areas. But, in the absence of any definite proof as to the hopelessness of these tasks, the future-historian must act as though invention of the future will be fruitful.

Thus, part of the work of the Educational Policy Research Center will be aimed at delineating some reasonably attainable pictures of the future, including some which would be very desirable. Together with these pictures will be some ideas as to how they might be attained.

Among them, there also will be some very undesirable ones and some indications of how they might be avoided.

In any event, however the particular pictures are characterized, the availability of such knowledge as to possible futures should itself be a matter of great value for planners of all sorts, particularly planners and administrators in education.

How Can A History Of The Future Be Written?

Listing major components that must be included in a future-picture.

An acceptable future-picture must be internally consistent, attainable from present conditions, and likely to occur.

How will future-histories be used?

In other technical memoranda of the Educational Policy Research Center at Syracuse, there is frequent reference to histories of the future or to future-pictures. These will be generated in an unusual way which presents interesting problems of method.

Listing major components that must be included in a future-picture.

The development of a future-history requires some orderly grasp of what a state of society is. In other words, to speak of a state of society at any particular time in the future, it is necessary for the historian to have some reasonably complete list of the aspects or components of society that need to be included in his discussion.

Such a list need not be very long — it should include some 15 to 100 separate items, under each of which there is a sub-list of details.

For instance, if one is to describe a state of society at some point in time in any useful, concrete way, one must consider the state of its technology, including transportation, communications and health sciences.

About the forms of transportation, one would need to consider such things as fuels, speeds, capacities and other characteristics.

Similarly, with the health sciences, the historian would need to ask about the effects of longevity, vigor, fertility, the consequences of sex control, mind-affecting drugs and other matters.

In addition to technology, the list of major components should include the state of family structure, the shape of new elites with corresponding questions about their influence on early childhood and, perhaps the development of taste and preference.

In short, the discussion outline should begin with a fairly brief list of the major social components that must be considered in a future-history together with the relevant questions about each component.

An acceptable future-picture must be internally consistent, attainable from present conditions and likely to occur.

One could describe the process of generating a future-picture by saying simply that all the questions under each main component in the list would be answered. However, answers are not enough.

There are, in addition, three significant conditions that must be met before the history is acceptable:

First, it must be demonstrated that the picture which emerges contains no major inconsistencies;

Second, that the picture generated must be demonstrably attainable at a given time as the result of present conditions, and

Third, it must be likely to occur.

Part of EPRC's current work is concerned with how it can be known when these conditions are satisfied. A demonstration of when they are not met may, in fact, be sufficient.

These three questions — consistency, attainability and likelihood — must be asked of each future-history as it is written. And each future-history must then be revised as events intervene to prompt a re-examination of the future.

How will future-histories be used?

The development of these alternative histories of the future will serve a dual purpose:

They will constitute an environment within which policies may be formulated and their consequences examined, and

They will help EPRC to concretely envision goals toward which policies might be directed.

The process of writing a history of the future, for example, might help the Center to see not only how it might arrive at a more aesthetically satisfying future, but it will also force the historian to specify more concretely what that kind of environment might be like. Such a capacity to assess policies and to portray alternative goals for policies is a fundamental purpose of the Center.

Future histories developed by EPRC will be made available to educational policy makers in a variety of forms — abstracts, condensations, expansions, visual reproductions, games and teaching materials and will be available for use in workshops, conferences and courses as an aid to educators and laymen in their own efforts to anticipate, picture and plan for the future.

What is Meant By "Policy?"

A policy is an authoritative statement.

A policy is not a goal.

A policy is a generalized rule.

Manifestation of effective policy is a limited regularity of decision and behavior.

Is there educational policy in the United States?

As its name states, the Educational Policy Research Center at Syracuse is designed to deal with studies of educational policy for the long-range future. But what is meant by policy, and more particularly, what is meant by educational policy?

A policy is an authoritative statement.

It has legitimacy and it can be made only by a person in authority. It cannot, therefore, be a function of the Educational Policy Research Center to make policy, nor even to formulate policy for those who are in a position to promulgate it.

What EPRC can do is make the choices available to policy makers more vivid and concrete. Through policy studies, the alternatives may be more clearly defined and their consequences more systematically assessed. By conducting studies dealing with long-range futures, EPRC attempts to help policy makers invent new alternatives, determine the consequences of their choices and envision the details of attainable and desirable future states of affairs.

A policy is not a goal.

Policies should be distinguished from goals. A goal is an objective, but a policy is the objective together with some line of action for arriving at it.

The formulation of policy usually involves assessing the anticipated side-effects of a course of action including their economic and social costs. Policies, therefore, must be formulated out of an understanding of what is required for their implementation.

In short, policies, almost without exception, must be based upon heavy consideration of political realities. They must be assessed in relation to some social, economic and political environment, preferably over a long period.

It is at this point that the Center's development of future histories becomes relevant. The future-pictures will serve two purposes:

To provide the environment within which to assess alternative policies, and

To constitute the concrete formulation of goals toward which policies might be directed.

A policy is a generalized rule.

Typically, policies deal with plans of action relating to gross changes and general tendencies of social life in respect to large populations and institutions. It is possible, of course, for individuals to adopt policies in respect to certain aspects of their own lives, but this is not what is usually meant by policy formation in government or in education.

Policies at various levels of society unquestionably have a great deal of influence on the quality of individuals' lives. They are formulated, however, to guide the conduct of institutions, agencies and organizations rather than the conduct of individuals. In short, policies typically are aimed at advancing the common good rather than individual goods.

For example, it may be that in the future the student will play a greater role in determining his own curriculum, but the policies that will make that possible must be derived from and designed to guide the structure and conduct of schools and colleges. Such policies are not aimed at providing guides for individual future behavior, nor can they be derived simply from considering what the individual of the future might be like.

In short, social policies are not very useful instruments for making men better. They are, however, enormously important in developing the kinds of institutions and social processes which give men the time, the resources and the vision through which to attain a better life.

The manifestation of effective policy is a limited regularity of decision and behavior.

Since a policy is a generalized rule for decision or action in relation to a given goal, it follows that when a policy is followed, it will manifest itself in some regularity of decision or action.

Conversely, if there is manifest in our institutions a consistent and regular pattern of decision and action tending to reach a certain goal, is there a policy?

If the answer is yes, then a distinction between formal, announced policy and informal, unannounced policy must be made.

Is there educational policy in the United States?

Among the schools of the United States, there is a remarkable degree of uniformity of curriculum, organization, administration and ideology. For example, graduate student housing is approximately the same in appearance, size, shape and quality everywhere in the nation. There is no explicit policy requiring such uniformity; yet it looks as though there were.

The important and revealing question that must be asked is how this uniformity of practice and conception comes about in the absence of any clear policy.

It will be a major problem for the Center to describe, understand and to help leaders manage the process of change and decision-making through which such formal and informal policy decisions are made. Such educational policies are formulated within an extraordinarily loose social system. Nonetheless, its more important segments and dynamics can be described so that one can better know how changes in it are taking place and what might affect it in the future.

Hence, the Educational Policy Research Center at Syracuse is concerned not only with the study of formally promulgated policies for the long-range future of our society, but also with the assessment of the consistent, regular consequences of informal policy as well.

The Delphi Method: A Description

The Educational Policy Research Center will attempt to depict what the future can or might look like.

The future may be discontinuous and qualitatively different from the present.

In depicting discontinuous and qualitative changes, expert judgment must be employed.

The Delphi method is a way of assembling and assessing expert judgment.

EPRC will attempt to depict what the future can or might look like.

In its studies of educational policy, the Educational Policy Research Center at Syracuse must attempt to delineate what the future of the United States might look like some 10 to 30 years from now.

Methods for dealing with such a problem are not clearly established or widely understood, but one of them, among others that will be employed by EPRC, is the Delphi method, so named because of its relation to the systematic use of oracular or expert judgment.

The future may be discontinuous and qualitatively different from the present.

It is unreasonable to expect that the future will be simply a linear extrapolation or extension of today. In some ways, though, it will be.

For instance, it is likely that there will be several hundred million more people on the earth in 30 years and it is probably possible today to attempt a fairly accurate estimate of their numbers and of where they will live.

Further, it is already clear that between now and then there will be technological changes taking place, and that these changes will create all sorts of possibilities for environmental control and for better means of transportation and communications.

Just what form these advances will take, how they will be implemented and how they will affect the lives of the American people 10 to 30 years from now may be subject to some forecast, but to a wide variance of forecast.

An even greater variation in forecast will occur, however, when one considers political, social and economic changes that *may come about*.

For the last seven years, for example, the United States has been going, at an accelerated pace, into what has been described as a social revolution or a civil war.

The effects of this process on the political, social and economic life of the United States already stagger the imagination if one thinks of how life in this country was 10 or 15 years ago. What form might social stratification or race relations take 15 to 30 years from now?

To simply extend current change into the future is to deny the possibility of sharp breaks with the past.

In order to understand what social changes might take place in the future, EPRC will have to look not simply at the continuities in history, but also at the way in which sharp breaks have developed, or may develop.

What was it, in 1954, that brought the U.S. Supreme Court to hand down the Brown v. Board of Education decision which, in turn, stimulated a rise of expectations on the part of Negroes? What led to the confrontation between southern whites and blacks which finally split the situation wide open by 1960 or 1961 and which has led, since then, to a continuing series of civil disorders?

These questions have to be asked not only in order to forecast what may happen, but also to gain some understanding of what other substantial structural changes may start to develop in the next three decades.

For example, there may be tremendous changes in family structure, in the relations between young and old, in the role of women and in other things not yet even visible. When might these pressures boil to the surface and what kinds of qualitative social change might they generate?

In depicting discontinuous and qualitative changes, expert judgment must be employed.

In attempting to deal with these kinds of questions, there is almost no data, and no useful empirical history. In the case of processes well or reasonably well understood, available data is useful both in generating hypotheses about future change and in testing hypotheses which have been generated on the basis of other data.

But, with respect to abrupt or discontinuous change, there seems to be little value to well-organized hypotheses based on well-organized data. At this stage, the only process that can be of value in understanding future change is the intuition of experts.

Intuition, though highly misunderstood and much maligned, is simply the result of nonformal processing of obvious as well as subliminal data.

Some intuitions are worthless, but some are quite valuable.

The Delphi method is a way of assembling and assessing expert judgment.

The Delphi method is a way of processing expert intuition on subjects not amenable to any other useful examination.

In using this method, experts are asked to make judgments about matters that fall within their own fields.

They may be asked first to simply list significant events or developments that they think might occur or could be made to occur in the future. Then, they are asked to assign a date at which they think the likelihood of a specific event's occurrence becomes greater than the likelihood of its not occurring.

The experts, having submitted judgments in isolation from one another, are then informed as to the distribution of their judgments and of the relative position of each person's judgments with respect to the others. Those whose judgments appear at the mode are asked to account for the mode being where it is. Those who are at a distance from the mode are asked for reasons to support the variance of their judgment. This process is repeated, and after several iterations, the scatter of judgments on the time line is reduced, and the mode may be changed.

What is generated, then, is a fairly good expert consensus of when a certain event is more likely to occur than not, or when a certain development is likely to reach some specific stage.

A Delphic type of procedure might also be used not only to gain some consensus among experts as to what they think is likely to happen and when, but also to gain from them some agreement as to what social developments might be related to their judgments and whether the occurrence of those developments would affect their estimates of the date of some future occurrence.

For example, it might be found that a particular group of experts tends to agree that, for most school districts, a 12-month school year will be a reality by 1975. It might be found, then, that they also come to a consensus as to what social developments or public policies would then move that judgment to a later or to an earlier date.

Thus, the Delphi method might be used not only to place a series of events in temporal order, but also to establish the relations between those events and others that might occur or be made to occur.

The consensus of experts, then, along with the glosses, arguments and footnotes generated by them, can become useful data for those who wish to write a history of the future. In the absence of actual occurrences, the future-historian may accept the judgments of such experts as the best data available to him.

Delphi and similar methods have certain limitations, not the least of which is the fact that expert judgment itself may be biased or constrained by assumptions unknown to the experts. Nonetheless, this type of exercise constitutes a kind of rational constraint upon the development of future histories, and it will be used by EPRC with respect to a wide range of questions dealing with many different fields.