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This model for forecasting regional and national occupational trends for use in vocational education planning, facilitates the incorporation of labor market and student needs into program planning. The study includes: (1) literature search, which yielded 80 references related to occupational trend forecasting and exploratory programs, (2) a synthesized model for forecasting occupational trends and needed vocational programs, and (3) a conference, during which the model was subjected to intense examination. This volume is the summary report and includes a brief historical background of the problems and application of forecasting techinques and models, a description of the problems of relating forecasting trends to the educational process, an outline of the concept and rationale for the suggested forecasting model, and a summary of the organization, function, and interaction of each component of the suggested model. (CH)

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OCCUPATIONAL FORECASTING AND TRENDING: AN EARLY WARNING SYSTEM FOR EDUCATIONAL PLANNING

JUNE 30, 1969

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CONTENTS

ILLUSTRATIONS--TABLES

PREFACE

In a time when change has become the hallmark of viability, schools have found it difficult to keep pace. That regular updating of both curricula and methods is necessary is patently clear, for the world continues to change.

This year's junior college graduates live in a world organized around and by computer installations. At their birth, only a few primitive prototypes had been made. Their sixth grade teachers had likely not seen a computer operate, much less understood its functions. Today's sixth grader will likely graduate into a world where coins and bills will be curiosities and a magnetic device will have replaced them as a medium of exchange.

If education's mission is to prepare students for the ultimate world they will inhabit as adults, then schools are faced with the hard problem of anticipating significant social and occupational changes far enough in advance to allow the student the appropriate exploratory experiences prior to his entering that future world.

The purpose of this study is to develop a system whereby school districts might peer far enough and certainly enough into the future to effect the educational changes tomorrow's world calls for today.

. . . .

Project director of this study has been Max Tadlock. Chief author has been Fred Carvell. Special consultants in counseling and testing were Mrs. Ann Sprague and Dr. H. Duncan Sprague. Other consultants to the project have been listed elsewhere in the report.

I INTRODUCTION

Study Objectives

After preliminary discussions with staff of Educational Resources Agency (ERA) in Sacramento, it was decided that TADLOCK ASSOCIATES should be engaged to help develop a model for anticipating occupational trends, both regional and national, so that appropriate educational changes could be instituted to keep vocational educational programs relevant to the needs of the occupational market and to the needs of the learners.

Methodology

Because of serious time and funding limitations, the efforts of this study were concentrated on four principal tasks. First, an extensive and comprehensive literature search was made related to (1) occupational trend forecasting, and (2) occupational exploratory programs and techniques which are responsive to developing trends in the world of work. A preliminary literature review was made of approximately 115 articles, reports, books, and periodicals. It was determined that approximately 80 of the references reviewed were related to the nature of the problem being studied. These were studied in depth for relevant ideas, suggestions, models, trends, philosophical concepts, and practical applications of forecasting techniques and occupational program development. The references used by TADLOCK ASSOCIATES in the development of the model and concepts related later in this report are being handed over to ERA as a working bibliography under a separate cover.

The second study task involved synthesizing a model appropriate to the ERA region for identifying occupational trends and needed vocational training. As possible within the time and funding constraints, the model was to be expanded so that the participation of the local school district as the ultimate implementing agency might be defined.

A third study task was to conduct a concept conference at which the forecasting model and supporting rationale developed by TADLOCK ASSOCIATES would be subjected to intense examination by a "murder board" composed of key representatives of ERA and supporting districts and consultants provided by TADLOCK ASSOCIATES. This activity was conducted on June 26, 1969 in Sacramento at the County Superintendent of Schools office.

The outside consultants supplied by TADLOCK ASSOCIATES at the concept conference were:

Fred Carvell, Education and Manpower Consultant, URS Research Company, Palo Alto, California

Richard Howell, Senior Operations Analyst, Stanford Research Institute, Menlo Park, California

Dr. Ronald Hunt, Director, Institutional Research San Jose State College, San Jose, California

David Miller, Miller Associates, San Francisco, California

These outside consultants represented a broad range of expertise in consulting and research activities including futures studies and analysis, occupational program development, systems analysis, and implementing change in institutional programs, organizations, and practices.

Representing ERA were:

Dr. Blaine Wishart, Executive Director

Dr. Sheldon Varney, Planning Specialist

Supporting school districts were represented by:

Arthur B. Cate, Superintendent, Williams Unified School District

Keith Christie, Coordinator, Yuba City Schools

Forrest Honnold, Coordinator, Placer County Schools

Rowland L. Janes, Vocational Education Coordinator, El Dorado Union High School District

Richard Payne, Director, Vocational Education, Sacramento County Office of Education

Jack E. Reynolds, Director, Vocational Education, Sacramento City Schools

The fourth study task was to prepare this summary report so that the educational agencies in the ERA region might consider the appropriate follow-on activities.

The following chapters contain a brief historical background of the problems and application of forecasting techniques and models; a description of the problems of relating forecasting trends to the educational process; an outline of the concept and rationale for the forecasting model synthesized by TADLOCK ASSOCIATES; and a summary of the organization, function, and interaction of each component of the suggested model.

II FORECASTING DEVELOPMENT, APPLICATIONS, AND PROBLEMS

The growth of forecasting as a means of meeting the need for long-range planning has accelerated since World War II. The application of complex computer models for making projections and plotting future trends also is growing in importance as a planning tool. Economic trends, demographic data, employment, industrial production, and other statistically based information are being subjected to various mechanical and human forecasting techniques in order to anticipate future needs. Yet, in no field is the need for forecasting more keenly felt than in education which makes its impact on every aspect of society and in turn is affected by each major social force.

Despite the known need for and the value of attempting to identify early those changes in technology and society which will demand changes in education, an intensive search of the literature fails to disclose an eminently successful model. However, attempts to extend educational forecasting to the sub-state, multi-county level are increasingly common in educational research and particularly in occupational education research. This is reflected in provisions of the Vocational Education Amendments Act of 1968 which require districtwide and regional planning of vocational programs as a condition for receiving federal funds.[1/]

1/ Instructions for Preparing a District Plan for Vocational Education, Vocational Education Act of 1968, P.L. 90-576, State of California, Sacramento, 1969.

The necessity for such forecasting attempts in occupational education stem from two interacting forces. First, since 1960, 800,000 teenagers plus 1.4 million other young workers between the ages of 20 and 24 have entered the labor force. By 1970, 20 million workers in the labor force will be under the age of 25. Thus, the mass of young people entering the labor force annually from the educational system places a major burden on the schools to prepare students for job entry. This is particularly true at the secondary and post-secondary level.

A second element which adds complexity to the task of occupational preparation in the schools is the highly publicized rate of technological change which affects the skill, attitude, and aptitude requirements of entry level workers. Technological changes also alter requirements for workers in later stages of their occupational development. The problems of keeping abreast of technological change, much less predicting such change, is reflected in topical educational literature typified by anthropologist Margaret Mead's statement:

> . . . no one will live all his life in the world into which he was born, and no one will die in the world in which he worked in his maturity. . . For those who work on the growing edge of science, technology, or the arts, contemporary life changes at even shorter intervals. Often, only a few months may elapse before something which previously was easily taken for granted must be unlearned or transformed to fit the new state of knowledge or practice. . . In this world, no one can "complete an education."1/

1/ Gross, Ronald (ed.), The Teacher and the Taught. New York: Dell Publishing Company, Inc., 1963, pp. 261-276.

Gaps Between Forecasts and Occupational Preparation

Because of the increasing speed of social and technological change, balancing future occupational needs with current educational practices will require a continuously changing educational program, if millions of youngsters currently in school are to avert occupational obsolescence before they even enter the labor market. Yet, the present methods used to assess future occupational needs have had severe shortcomings in helping educators make needed changes in curricula and ancillary support services. Much of the topical literature on the subject reveals a variety of reasons for these inadequacies.

Many existing community or occupational surveys suffer from a lack of complete and objective data. Frequently such surveys are dependent upon the input of local employers who do not know themselves what the manpower requirements or changes in occupational skills will be only several years into the future, much less in a decade. Harms found that many occupational projections were controlled by industry short-term sales estimates rather than valid forecasting techniques.[1/]

Occupational surveys covering regional or national needs, produced by the Department of Labor or state agencies, are often based on projections using census or base line data which are outdated or

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1/ Harms, Louis T., et al, A Manual for the Development of Estimates of Future Manpower Requirements for Training Purposes. Philadelphia: Temple University, March 1966.

inaccurate. Fishman found that data contained in decennial census reports were in error by 10.0 to 50.0 percent.[1/]

Complicated computer model projection techniques have not been of much assistance to occupational education because such forecasting techniques seldom are directed to skill requirements which educators can translate into programs. Thus, skills forecasting methods presently being used are generally deemed inadequate because they do not assist the educational planner and/or administrator in effecting meaningful educational changes;[2/] further, most have not been sufficiently tested, many are too general in nature, some are too specific or are based on inadequate information.[3/]

The weaknesses of the present skills/occupational surveys have not diminished their widespread use and, though some experts would disagree, in many instances the data developed in such surveys provides information for discussion and planning which might not otherwise be initiated.

1/ Fishman, Leslie, et al, Methodology for Projection of Occupational Trends in Denver SMSA. Boulder, Colorado: Institution of Behavioral Science, University of Colorado, 1966.

2/ "Occupational Job Requirements: A Shortcut Approach to Long-Range Planning," Employment Service Review, U.S. Department of Labor, January-February 1967.

3/ Somers, Gerald G., "The Response of Vocational Education to Labor Market Changes," The Journal of Human Resources, Vol. III, Supplement 1968, pp. 32-58.

A secondary impact of current concern over forecasting and planning has been to alert educators to ways to collaborate with employers in developing occupational programs through advisory committees and to arrange vocational curricula so that they can be offered to a broader array of students through such mechanisms as regional occupational centers or area schools.

In addition to the development of methods of organizing occupational programs so that they are made available to more in-school students and adults, innovative concepts are now being employed to integrate occupational orientation with the so-called academic disciplines and with services such as counseling. It has been recognized that technological change makes an impact on many aspects of social activity besides that of earning a living. With an increasingly complex and changing society, there is an increasing need for all citizens to develop greater civic competence and to know and understand the democratic process. There is a growing need to improve human relations. And related to change, the schools must cultivate in the student receptivity to change and must firmly implant the concept that lifelong learning is the most important implication of automation.[1/]

Several educational movements have emerged from the growing awareness of the impact of automation and technology on education. To begin, increased efforts have been made to integrate general education with occupational preparation through interdisciplinary approaches.

1/ Gilchrist, Robert S. and Donald Snygg, "The Case for Change," New Curriculum Developments, Washington, D.C.: Association for Supervision and Curriculum Development, 1965, pp. 1-9.

The Richmond Plan and Project FEAST are examples of this. Another educational approach has been the development of the cluster concept, wherein occupational curricula are organized into a few occupational families which share common or similar knowledge, manipulative skills, and attitude requirements.[1/]

One of the educational problems facing vocational educators is whether to prepare students for specific skills or for broad general training for a wide variety of occupations. A corollary to this is the problem of determining the appropriate level at which occupational information should be introduced. The cluster concept appears to be a partial answer to this dilemma. It allows flexibility of entry and a variety of choices through exploratory learning experiences.

Max Baer and Edward Roeber state, "Since most young people have a broad range of interests and capabilities, appropriate initial choices are facilitated by a knowledge of families of occupations. It is becoming more generally recognized that early training . . .

1/ See the following for pioneer work in development of cluster skills:

1. Schill, William J. and Joseph P. Arnold, Curricula Content for Six Technologies, Bureau of Educational Research, Department of Vocational and Technical Education, College of Education, University of Illinois, Urbana, 1965.

2. Quirk, Cathleen and Carol Sheehan (eds.), Research in Vocational and Technical Education, University of Wisconsin, 1967.

3. Maley, Donald, "The Cluster Concept: Chance for Occupational Exploration," American Vocational Journal, Vol. 42, No. 7, October 1967, pp. 22-24.

should be broad enough to give the students the background for a group of related occupations."1/ To support this premise a number of authorities contend that unless a student is aware not only of a vocational opportunity but also of the procedures needed for goal achievement, he will be unable to take the necessary intermediate steps to reach that goal.

One of the most important steps in helping a student achieve a fruitful occupational goal is matching of the student's interests and aptitudes with the appropriate occupational clusters. Although the state of the art is still limited, particularly in determining the relationship of pre-college age interests and aptitudes to ultimate occupational patterns, certain directions are indicated.

Thus, while the Strong Vocational Interest Blank is rather complex, it still provides the best interest scale available. Unfortunately, it seldom penetrates those occupational areas not requiring significant post-secondary education and training and perhaps additional local instruments might be developed.

In evaluating aptitudes, both the Flanagan Aptitude Characteristics Tests (FACT) and the Differential Aptitude Test (DAT) can give good results. However, on the basis that the General Aptitude Test Battery (GATB) is easier to administer and that norms are currently being developed around occupational clusters by the Department of

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1/ Baer, Max and Edward C. Roeber, Occupational Information. Chicago: Science Research Associates, 1964, p. 67.

Labor, it would appear wise to utilize the GATB as the major counseling instrument in matching student abilities with the changing opportunities in the world of work.

Although further discussion of counseling and testing is more appropriate to a later implementation phase, TADLOCK ASSOCIATES must note that there seems to be universal agreement that any attempt to strengthen the occupational curricula without strengthening an admittedly weak occupational counseling system will be a fruitless exercise.

In general summary, a review of existing forecasting techniques indicates that few models are adequate or wholly suited to the long-range needs of occupational education. The need for a forecasting model is becoming increasingly apparent as educators become aware that <u>all</u> students who come through the school system are candidates for some occupation, professional or otherwise, and that the world of work which the student ultimately enters will be much changed from that which he knew as a student.

Planning of future occupational curricula, counseling services, and exploratory learning experiences must not only take into consideration specific information on job skills, the number of job vacancies by industry or occupation and student needs, but also some valid information regarding the larger social scheme within which work will occur.

It is already known that information upon which present and future occupational programs and ancillary services are planned must account for (1) the geographic mobility of the work force, (2) intra-industry mobility, (3) adaptations of and to rapid technological change, and (4) varying occupational choice patterns of students and workers.

In the following chapter a forecasting model is proposed by TADLOCK ASSOCIATES which appears to meet these requirements.

III FORECASTING MODEL TO MEET THE NEEDS OF OCCUPATIONAL EDUCATION

> Vocational education is a social process, invented by society for its own good. . . When social change is in the air, vocational education must make adjustments to meet the requirements of such change.
>
> Melvin L. Barlow
> Professor of Education
> University of California

The extensive literature search conducted by TADLOCK ASSOCIATES revealed a number of approaches to technological and occupational forecasting. Generally, techniques employing regression analysis and input-output analysis have been used extensively and in some forecasting fields are of considerable assistance. The same can be said for a variety of computer models and statistically based projection methods. However, many factors affecting employment are so complex and subtle that not all of them can be dealt with mathematically and in the last analysis a considerable degree of human judgment has to enter the numerical projections. Thus, quantitative techniques often provide good first approximations but seldom final answers. For this and other reasons the model synthesized for this study is not based on quantitative models.

The search for an appropriate forecasting model included a number of considerations which developed as a result of study team contacts with educators in the Sacramento ERA region.

It was determined that such a model should, insofar as possible:

- Use the talents and resources available in existing educational organizations, agencies, and services rather than create an additional agency.

- Serve all school districts and all grade levels within the scope of the ERA service area.

- Be a system which is simple and low cost, yet be adequate for the purpose of providing necessary information.

- Establish a pattern of participation for administrators, teachers, counselors, students, and citizens in each district which would aid in designing and implementing necessary educational changes.

- Provide guidelines which are specific enough to follow, yet flexible enough to be adaptive to local district needs, resources, and innovations.

In addition to meeting the foregoing criteria, the entire forecasting model should provide information regarding future occupational requirements and social conditions which would be useful for developing appropriate learning experiences at pre-secondary, secondary, and post-secondary levels.

Synthesis of a Forecasting Model

The forecasting approaches reviewed by TADLOCK ASSOCIATES ranged from complex heuristic combinations utilizing extrapolation and simulation techniques to those methods heavily reliant upon the intuition of the forecaster. The model determined to be the most feasible system of forecasting for the purposes of ERA and its supporting districts was the Delphi method which was initially developed by Rand Corporation.

The basic model is one which seeks to develop a structure and process by which impending changes can be continuously and systematically anticipated, studied, and reflected in the planning process.[1/] This system is based on soliciting information from a selected panel of experts on the future trends, status, and social effects of technology in various industries and occupational fields. While the Delphi method of forecasting has been used in a number of economic, social, political and military fields, it has not been directly applied in education or more specifically in occupational education. However, TADLOCK ASSOCIATES believes that the Delphi method with few alterations is a valid tool for educational planning and meets the essential elements of a forecasting model stated earlier in this chapter.

The basic rationale of the Delphi method appears to make its use feasible in any field affected by the social process; that is, in the absence of absolute certainty or a convincing reason for selecting a particular course of action, we turn to the expert for advice. The confidence one has in an "expert" depends upon the relative frequency his prognostications are confirmed by later events.

Problems dealing with predicting social and technological change usually call for the judgment of several kinds of experts who fall

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1/ Descriptions of the Delphi method as developed by Rand Corporation are contained in the following reports:

1. Gordon, Theodore and Olaf Helmer, "Report on a Long-Range Forecasting Study," Rand Corporation publication P-2982 (1964).

2. Helmer, Olaf, "Social Technology," Rand Corporation publication P-3063 (1965).

into two general categories--specialists and generalists. The former provide substantive information or predictions, the latter problem formulation, model structuring, and preference evaluation among predicted alternatives. Much of this potential expertise now remains untapped in practical policy considerations. It could be put to much greater use if there were a recognized field of social technology which would have the task of regularly and systematically exploring and correlating experts' opinions on the future, so that their latest findings would be available at such time as they might be needed by educators for planning purposes.

It should be very clearly understood that there is no single elusive, optimal way to use expertise. What is called for is a conscious and deliberate broad-front attack on the entire problem of enhancing and articulating the enormous expertise potential that is now available in the social science area and of bringing it to bear on the urgent needs of our society which can and do affect education.

The Delphi method relies on a system of obtaining substantive information and statements of opinion from various experts in a given field. Information is gathered in two phases. The device used to collect information during the first phase is a mailed questionnaire which is designed so that a numeric value can be placed on answers to certain categories of questions. A scale of probability can be devised for some classes of information. Once the first phase responses have been received from all of the experts surveyed, a consensus (median) is computed for each question.

The computed median for each question is sent to the experts individually so that they can compare their own estimates of future events with the responses of other experts. Some of the questions directed at each of the experts during the second phase may inquire into the reasons for previously expressed opinions. This inquiry into reasons and subsequent feedback may serve to stimulate the panel of experts into consideration factors they may have inadvertently neglected or dismissed as unimportant on first thought. A statement of dissenting opinion may be of value in comparing any consensus of the panel with differing views of the future.

The end result of the multiple phases of inquiry and subsequent reinvestigation of specified fields of interest should be a statement of majority opinion from the experts on future events, trends, or social impacts of technology which can be interpreted and used by educators to plan means for meeting anticipated needs.

Before discussing the details of each component of the Delphi method and the model synthesized by TADLOCK ASSOCIATES, a few of the advantages and limitations of the system should be mentioned. The traditional way of using a panel of experts has been to assemble them at one time and place in order to discuss a problem, and require that they arrive at a joint answer to questions posed to them. Although this technique has a wide variety of applications and is a valid means of deriving solutions, the Delphi method obviates the necessity for face-to-face confrontation through the use of mailed questionnaires. This allows for certain flexibilities in reaching experts whose schedules or geographic dispersion may prohibit a convenient common meeting.

The Delphi method eliminates the need for collective face-to-face meetings which might become costly and cumbersome if as many as twenty experts were to be assembled. Furthermore, this method reduces the influence of certain psychological factors, such as specious persuasion, the unwillingness to abandon publicly expressed opinions, and the bandwagon effect of majority opinion. Although group meetings of experts in various fields can be conducted if desired, such meetings are not an integral part of the Delphi method. The system will operate even if the experts never meet each other, or for that matter are not even known to each other. This means that a central clearinghouse with responsibility for maintaining correspondence with each of the experts is a necessary part of the Delphi method.

Limitations of Delphi Method

The model proposed by TADLOCK ASSOCIATES has limitations, as does any single approach to forecasting. However, such limitations need to be described in order to understand the system and to bring expectations of the users into realistic focus.

First, the synthesized model is not a substitute for standard statistical projections; i.e., population, enrollments, economic trends, and other indicators. Such projections and trends are legitimate planning tools, despite some of their limitations. As such, the data derived from such methods should continue to be considered as part of a total informational pool from which descriptions of future conditions can be drawn.

Second, Delphi is best suited to the prognostication of social and qualitative changes effected by technology rather than detailed statistical trends. Because of this the quality and accuracy of the panel of experts' forecasts depends to a large extent upon the persons selected for inquiry. It should be noted that the panel is not selected to be representative of the general population, or for that matter any single segment of society at large. The selection of experts for consultation is usually made on the basis of what may be called their reputations in their respective fields of endeavor. The selection process itself requires certain subjective judgments, and involves determining what categories of expertise are needed and determining who among the available experts in each field should be selected for questioning.

Third, there is a tendency to accept the initial prognostications of a Delphi panel as absolute. Nothing could be more dangerous. The descriptions of social, technological, political, or economic conditions five, ten, or twenty years hence which are sought from the panel only constitute the best judgment and second thoughts of the experts. These must be periodically updated and reassessed through continued inquiry. To do this, all or a portion of the experts on the original panel may be selected for a second time or they may be replaced by another group of experts who are deemed equally competent. The important point is that the Delphi method calls for a continuous cycle of inquiry and assessment which renews the information base in any given field of inquiry and which, when viewed over a period of time, <u>indicates a trending pattern</u>. Practical considerations probably make a recycling process of less than a year difficult to manage. However, consultations with the panel of experts can be made more frequently if human and financial resources will permit. This would be particularly advantageous in specified areas characterized by frequent and rapid technological breakthroughs.

Primary Function and Process Requirements for the Forecasting Model

The foregoing description of the Delphi model along with its advantages and limitations deals directly with two principal components of a total forecasting model; that is, the information pool with its data sources, and the central clearinghouse for gathering and processing forecasting information.

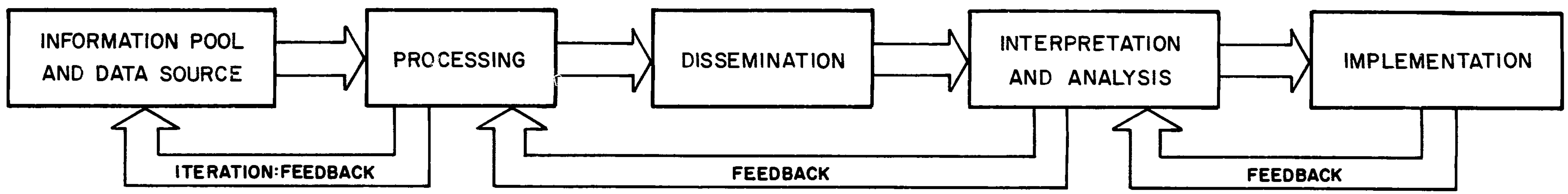
Because the ultimate users of the information are the local districts, functions and processes related to the local district must be carefully integrated into the whole model. It appears that five major functions must be built into the system. In addition to the information pool and the processing mechanism a method of dissemination must be developed, interpretation and analysis of the data must take place, and ultimately some means of implementing necessary changes must be made available. All of these functions are diagrammed in Figure 1, which shows the relationship and feedback loop between each function.

Occupational Forecasting and Trending Model

Once the essential functions of the forecasting system were identified, a preliminary model was developed. The preliminary model and supporting rationale were presented at a concept conference involving

Figure 1

PRIMARY FUNCTION AND PROCESS REQUIREMENTS
FOR FORECASTING MODEL



ERA officials and representatives of supporting school districts. The following section describes the forecasting model synthesized by TADLOCK ASSOCIATES as a result of the intensive discussions held during the concept conference.

The total forecasting model, based on the Delphi concept and designed to meet the specifications and functions mentioned earlier in this chapter, is shown in Figure 2. The structure, organization, and function of each component is described here in more detail.

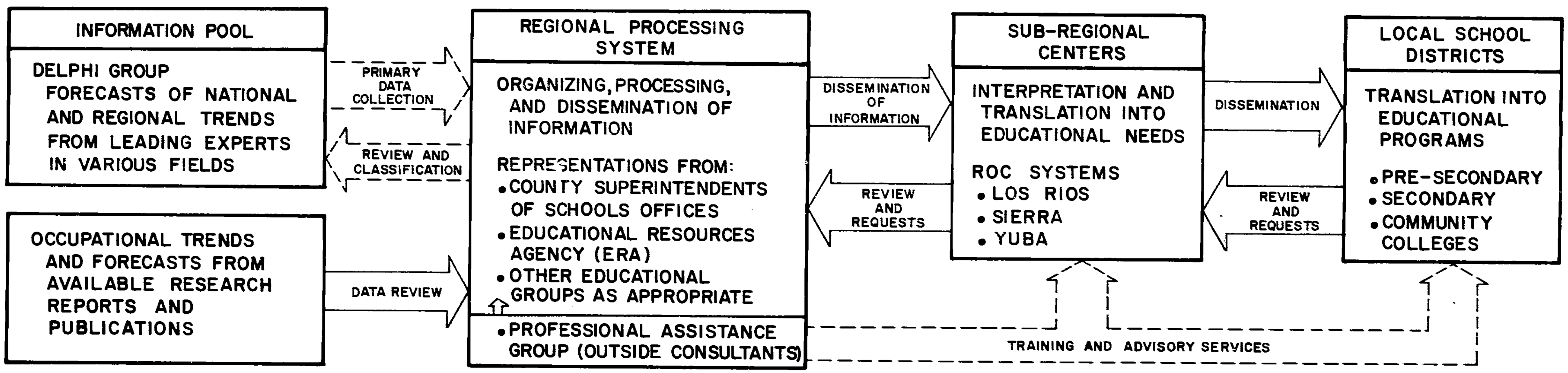
Information Pool. The general rationale and general function of the Delphi panel has already been discussed; however, there are several points which may help to clarify the structure and specific functions of the panel. First, this panel is not an advisory group, *per se*, and does not replace or interfere with existing advisory groups in any of the school districts served by the forecasting system. Members of the panel should be selected because of their knowledge, experience, and reputation in a particular field or discipline. Of course, some attempt should be made to balance the composition of the panel with experts of varying viewpoints (like and unlike perspectives).

The size of the panel should range between fifty and one hundred persons. Because of this relatively large number, it would be wise to divide the panel into small manageable groups according to occupational clusters.

The clustering of occupations can occur in a wide variety of ways; however, TADLOCK ASSOCIATES recommends that the selected experts

Figure 2

OCCUPATIONAL FORECASTING & TRENDING



be grouped into five major categories:

- Materials and Processing
- Communications and Information Services
- Energy and Propulsion
- Personal, Social, and Protective Services
- General social and environmental conditions.

The first four groups deal with occupational categories and the fifth group deals with more general information related to the environment and social conditions which may prevail in five to ten years. A list of specific fields from which experts might be selected appears in Table 1.

Table 1

OCCUPATIONAL FIELDS FROM WHICH A
DELPHI PANEL OF EXPERTS MIGHT BE SELECTED

Agronomy	Hotel
Architecture	Maintenance/Repair
The Arts	Manufacturing
Basic Research	Marine
Community Information	Marketing
Construction	Natural Resources
Distribution	Planners (Environmental)
Education	Products Processing
Entertainment	Social/Psychology
Food Services	Students
Government	Transportation
Health Personnel	Urban

Source: Compiled by TADLOCK ASSOCIATES.

The Delphi panel should be asked for clues and forecasts to broad occupational and social trends, not specific job descriptions or statistical projections. These latter data can be obtained from published research reports and documents. Therefore, the questions posed to the experts should attempt to discover what the world and society will look like in the coming decades; what the social, health, governmental, economic, housing, transportation, communications, agricultural, and leisure modes and needs of the future will be? The general questions should lead to more specific concerns on how the general social conditions will change occupations; what the worker will have to deal with? What tools, processes, materials, and environmental conditions will affect the worker? How social and human conditions will change in the work place? In what ways the anticipated changes in these areas differ from existing conditions today?

Set against the answers to these questions should be answers to broader questions dealing with social, political, economic, and psychological elements which may critically affect the lives and conditions of future workers.

Regional Processing System. It is apparent that this forecasting system relies heavily upon a central agency which is responsible for organizing and administering the data gathering and dissemination process. The Regional Processing System used for this purpose should cover the entire geographic area and all school districts within the jurisdiction of the Sacramento Educational Resources Agency, which includes the three Regional Occupational Center (ROC) systems based on the cooperating junior college districts (Los Rios, Sierra, and Yuba).

The Regional Processing System should be responsible for such activities as selecting the occupational fields or groups which should be investigated, selecting and contacting experts to serve on the Delphi panel, constructing and mailing appropriate questionnaires to the Delphi panel, processing the responses and handling necessary follow-up correspondence with panel members, distillation and dissemination of summary reports, and acting as a communications link and chief liaison among the three ROC systems in matters related to the forecasting system.

Because of the latter responsibility, TADLOCK ASSOCIATES recommends that the County Superintendent of Schools offices and other educational groups served by the system should be represented on a Regional Processing System board. These representatives would serve as a communications network throughout the ERA region and also act as advisers in establishing priorities among the occupational fields to be investigated.

The responsibility for actual operations is best placed with the ERA because of its staff and funding capabilities. TADLOCK ASSOCIATES also recommends that provision be made to acquire professional assistance and outside consultants to help solve the myriad technical aspects of the system; i.e., selection of experts, design of questionnaires, tabulation and distillation of information, and establishing communications among all components of the system, and training and assisting local district personnel in interpreting and translating the forecasting information.

Sub-Regional Centers. One of the principal modifications in the original forecasting model that resulted from the concept conference was the use of the three existing ROC systems in the ERA region as key components of the total forecasting system. This serves to involve existing educational units which would be the users of the system, and who hold the prime responsibility for occupational education. Furthermore, nearly all of the local school districts in the ERA region are affiliated with one of the ROC systems. Thus, information can be rapidly disseminated from the Regional Processing System to the Sub-Regional Centers with greater ease.

The major responsibility of each of the three Sub-Regional Centers is to interpret the forecasting information of the Delphi panel and translate such information into educational needs. Another function of the Sub-Regional Centers is to act as a communications link among the local districts they serve and the Regional Processing System. Requests for information as well as reactions, dissenting opinions, and interpretations of needs in light of each Sub-Regional Center's knowledge of local conditions, resources, and limitations are a key element in the feedback necessary to make the total forecasting system viable and responsive to the individual needs of each district.

Local School Districts. The final component of the forecasting system is the ultimate user of the data. Because local district personnel are really the experts about their own student, community, and educational needs, it is the responsibility of each local district to evaluate existing programs and learning experiences offered to the students in the light of new trends disclosed by the forecasting system. It is also the local district which is responsible for translating into educational programs the information received from the Sub-Regional Centers. To help in this process, the Regional Processing System may offer training and advisory services, if requested by the local district. Thus, the cycle of data gathering, processing, dissemination, interpretation, and needs assessment is completed when educational programs in the pre-secondary, secondary, and post-secondary schools reflect the carefully constructed interpretations of future conditions.

Because occupational education is indeed a social process and must make adjustments when social change is in the air--the forecasting and trending model suggested in this report can be used as a valuable tool by local educators for both anticipating such change and planning for it. However, because the process of change is a continuous one, the system for dealing with it must also be continuous. To plan a one-time operation, even as a pilot program, will achieve no more than any other of the miracle cures applied to education's ills.

The details of the forecasting system will and must evolve as operations progress. However, the basic model described in this report should provide the necessary guidelines for starting the much needed and exciting process of charting future education opportunities for youth.