

**EMPLOYMENT PROJECTIONS FOR PLANNING
VOCATIONAL-TECHNICAL EDUCATION CURRICULA:
MISSION IMPOSSIBLE?**

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Minor editing of the 1976 essay has not changed the views expressed 28 years ago. There has been no bibliographic updating or revision of 1976 perspectives and conclusions. Bold font text highlights information that remains of particular importance as 2004 approaches. Comments are welcome.

TABLE OF CONTENTS

<i>Preface</i>		1
I	INTRODUCTION	1
	Purpose	
	Background	
	Overview	2
II	EMPLOYMENT PROJECTION MODELS	6
	Introduction	
	Model One: Same As Before	
	Model Two: Fixed Coefficient Production Function	7
	Model Three: Increased Labor	8
	Model Four: Incremental Labor Output Ratio	
	Model Five: Skill and Industry Employment Forecasting	
	Model Six: Skill and Industry Effects	9
	Model Seven: One Stage Skill and Industry Effects	10
	Model Eight: Regression Analysis	
	Models Versus Sources of Information	
	Employment Projections Versus Forecasts	12
	Summary	
III	EMPLOYMENT PROJECTION METHODS: STRENGTHS AND WEAKNESSES	13
	Introduction	
	Manpower Requirements Approach	14
	Rate of Return Approach	16
	Comparing Manpower Requirements and Rate of Return	
IV	TOWARD AN UNDERSTANDING OF LABOR MARKET CONCEPTS AND PROCESSES	17
	Introduction	
	Shortage Concept	
	Projected Job Openings	19
	Sources of Market Adjustment	20
	Internal and External Labor Markets	22
	Educational Requirements	23
	Occupational Classification	24
	Supply Measurement	25
	Summary	
V	EDUCATIONAL PLANNING USE OF LABOR MARKET CONCEPTS	26
	Introduction	
	Communication Failure	27
	Politics of Educational Planning	28
VI	MISSION IMPOSSIBLE?	33
	Introduction	
	Quest for a Vocational-Technical Educators' Cud	
	<i>Footnotes</i>	35
	<i>Bibliography</i>	42

PREFACE

This essay was written as part of a research project undertaken through the auspices of a grant (OEG-O-74-1736) from the Division of Research and Demonstration, Bureau of Occupational and Adult Education, Office of Education, U.S. Department of Health, Education and Welfare; conducted under Part C of Public Law 90-576. This project has produced three distinct products, each reflecting a specific objective of the overall effort.

The present volume is intended to inform administrators of vocational-technical education programs and other interested parties what the [1976] state of the art is in producing and using employment projections for educational planning purposes. This essay is intended for informed laypersons. This is not a how to guide for technicians, although some technicians will benefit from a careful review of the labor market concepts examined here.

A companion volume is available from the author: David W. Stevens (ed.), *Occupational Employment Projections for Program Planning Purposes: Issues and Examples*, January 1976. This contains the proceedings of a national workshop-conference held in July 1975. The conference brought together over one hundred vocational-technical educators, manpower planning technicians, and administrators from thirty-one states and the District of Columbia.

The third product is an updated input-output matrix for the state of Missouri that provides sectoral employment coefficients that can be used by educational planners to examine interdependencies among different sectors of the state economy. In this way, major shifts in resource availability and pricing, such as the recent energy crisis, can be taken into account.

Since this research project was undertaken in part by a team that was also responsible for the production of employment and openings projections for the Missouri Occupational Training Information System (MOTIS) under contract with the Research Coordinating Unit Department of Elementary and Secondary Education, the product of that activity would also be of interest to many readers. It is: Joyce R. Shackett, *Employment and Job Openings Projections 1975-1982*, Division of Career and Adult Education, October 1975. Complete documentation of the projection methods that were used and identification of data sources is included in the Shackett volume.

Jack Wilson, of the Division of Research and Demonstration of Occupational and Adult Education, U.S. Office of Education, has provided outstanding guidance in linking our activities with the efforts of other researchers engaged in related analyses to produce the maximum amount of educational program relevance possible.

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The author in 1976

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During the years since the original publication of this essay I have been fortunate to have many opportunities for continued learning about employment projection use and occupational information taxonomies from experts, particularly Malcolm Cohen, Richard Dempsey, Donna Dye, Pam Frugoli, Jay Pfeiffer, Kay Raitel, Dixie Sommers, Duane Whitfield, and Jim Woods. Vickie Schray, now in the Office of the Secretary, U.S. Department of Education, offers continued access to the evolution of performance measurement activity in federal, state and local management of career and technology education programs.

EMPLOYMENT PROJECTIONS FOR PLANNING VOCATIONAL-TECHNICAL EDUCATION CURRICULA: MISSION IMPOSSIBLE?

I

INTRODUCTION

Purpose

This essay is intended to provide the reader with an understanding of some essential labor market concepts that should be used in the design of information systems for planning vocational-technical education programs. An integral part of this effort to convey an understanding of labor market concepts and reasons for their misuse or nonuse is a selective citation of relevant items from a voluminous recent [in 1976] literature dealing with labor market and employment projection issues.

Background

A starting point for this essay is Kidder (1972), *Review and Synthesis of Research on Manpower Forecasting for Vocational-Technical Education*.¹ This contains an excellent bibliography and synthesis of the state of the employment projection art in 1972, narrowly conceived as the title indicates.

Two national conferences² have been convened in the past nine months focusing in part on employment projections and vocational-technical education planning activities. At least two-thirds of the states are currently engaged in some type of occupational employment projections for educator use.

The Bureau of Labor Statistics has embarked on a major new [in 1976] program called the Occupational Employment Statistics (OES) program, one part of which—the Occupational Employment Survey—is now [in 1976] operational in 29 states. Prime sponsors under the Comprehensive Employment and Training Act (CETA) of 1973 are frequently involved in generating projections of employment for their jurisdictional areas. Planners in the multi-county planning districts of the Economic Development Administration, U.S. Department of Commerce, are engaged in similar activities.

These are just a few of the organizations that are attempting to produce scenarios of future employment trends, each in somewhat different formats to meet real and imagined differences in information requirements for administrative decision-making. Public utilities, corporations, transportation associations, and investment groups are also generating their own scenarios of the future, so they might be prepared to take advantage of new opportunities to generate profits and to protect themselves against unexpected shifts in population location or spending patterns that would render previous investments less profitable.

There is much lamenting of this apparent duplication of effort in producing employment projections. At the same time **complaints are heard that the producers of employment projections are not sympathetic to specific educational needs and requests, and there are countercharges that educators do not know what they want. One purpose of this essay is to treat the essential conceptual issues in a manner that might explain the alleged communication gap between producers and consumers of employment projections.**

I proceed from fundamental concepts and illustrations of different types of projection models that are being used to consideration of what has led administrators of vocational-technical education programs to allocate resources to collect employment projection data and include the information in planning documents but to then downplay this information in subsequent administrative practice.

Overview

One of the most frequent abuses of labor market terminology is a confusion of *demand* and *employment*. For now, *demand* is considered only in the context of *effective demand*—the number of people with qualifications that employers are willing and able to hire under stated conditions.³ This simplification postpones the need to distinguish *effective demand* from *social demand*, a distinction that will be dealt with in a later section on shortages.

Employment is the outcome of interacting supply and demand forces. There is a set of unspecified determinants of the number of people who offer their services (supply) and a second not entirely different set of factors that determines the level of *effective demand*. The outcome of these interacting forces determines the mix and level of employment at a point in time and the changes that occur through time.

This distinction is important because today's employment pattern is a result of historical interacting supply and demand forces. Particular events, legislative actions, executive mandates, technological breakthroughs, managerial successes and failures, and consumer initiatives have molded the present distribution of employment in our society.

When we project recent employment trends into the future we are compelled to make either implicit or explicit assumptions about the continuity of these institutional forces and their importance relative to new factors that will influence the course of future employment.

I have already said that *demand* is not synonymous with *employment*. Employers may be prepared to employ more or fewer than the available number of people with designated qualifications. The number they are prepared to employ is included in *effective demand*, but interacting supply and demand forces may result in a lesser number actually being *employed*.

Vocational-technical educators usually seek to discover and eliminate the difference between *effective demand* and *employment*. This difference is *net effective demand or unmet effective demand*. Unfortunately, in many cases this is not an appropriate target for vocational-technical education planning.

The structure of observed employment is influenced by many factors. We can distinguish among at least five sources of change in the mix of employment opportunities. In doing so **it is important to guard against a tendency to think of change as being synonymous with growth. Employment phenomena in recent years have restored our awareness that change can mean the demise of current opportunity as well as the creation of new opportunity.**

- 1. Simultaneous growth and decline in various sectors of the economy are counteracting forces that may leave the overall level of employment relatively unaffected, thereby masking large internal movements. This compositional transformation wreaks havoc with long-range planning efforts.**
2. Turnover is a major source of immediate job opportunity. Exits from employment occur for many reasons including retirement, death, disability, withdrawal from the labor force, transition to unemployed status while seeking alternative employment, and direct movement to another job. It is apparent that each of these reasons for exiting from a job has different ramifications for potential aspirants to a job. Some exits are permanent, while others are temporary. Some exits are voluntary, while others are involuntary. And some exits convey warning signals about the appropriateness of the job itself for training purposes. **It is important to recognize that many projections of employment encompass only estimates of the growth/decline source of change plus replacement needs due to deaths and retirements, what I will later designate requirements. Eventually, we must consider how important this limitation is for the purpose at hand.**

3. Relocation could be absorbed within the turnover concept, but I distinguish it to emphasize one important difference between local area employment projection activities and national projections. **A local community, county, or state is more open than the entire nation. Movement of production into and out of the political boundary is more frequent. This makes it much more difficult to project future employment at the local level.**

International competitiveness must be considered in this context also. **The international context illustrates the importance of legislative and executive actions as a determinant of employment. The enactment or removal of tariffs, for example, can have a dramatic impact on particular localities and economic activities.**

4. **Technological innovation can dramatically alter the pattern of employment over a relatively brief time span.** Witness for example the recent [in 1976] introduction of light-emitting diodes (LEDs) in the mass marketing of wristwatches, clocks, and miniature calculators. Such innovations frequently wipe out or substantially diminish employment opportunities in the sectors that produce substitute items. A contemporary example [in 1976] is the introduction of computerized cash registers in retail establishments that simultaneously accomplish recording of the sale, inventory control, and accounting procedures, thereby displacing human agents who had performed these tasks. There is substantial controversy about the autonomy of this technological change. Are technology and skill-requirements determined simultaneously, or is technology necessarily the prior phenomenon?
5. I distinguish a substitution phenomenon as a source of changing employment opportunity. All goods and services are produced by human labor and capital. Depending upon a number of considerations not dealt with at this point an employer usually exercises some discretion in deciding how these human services and capital will be combined to produce a desired product or service. A crucial element in any employment projection exercise is to understand the nature of this discretionary action and the circumstances in which it will be manifested.

We see immediately that there are numerous sources of changing employment opportunity, only a few of which are accounted for in most employment projection activities. Even if all these sources of change in employment could be monitored with the desired frequency a problem of occupational classification would remain.

Much is heard about the crosswalk among the Census of Population occupation codes, Dictionary of Occupational Titles (DOT) codes, and the U.S. Office of Education program codes. In the near future [in 1976] a new fourth edition of the DOT will be issued. Preliminary work has been completed on a Standard Occupational Classification (SOC) taxonomy that is intended to complement but not replace the existing taxonomies.

What is sought in any occupational classification undertaking is relatively greater within-group comparability than between-group similarity. This seems simple enough until we ask similar with respect to what? What criteria are to be adopted to distinguish among cases? With respect to occupations, for example, are we to classify only on the basis of job characteristics, or are people characteristics also relevant to the extent that they are considered in hiring decisions? And, since the classifications are to be used for planning future vocational-technical curricula, should they reflect only current characteristics or speculative future characteristics, too? Finally, is it clear that curricular planning should be attuned to single entry-level occupations however defined rather than to some other classification such as job-ladders (a sequence of jobs through which people normally progress in a particular sector)?

In addition to sources of change in the level and mix of employment and the proper classification of that employment there are other major issues to be considered. One is the multiplicity of sources of skill acquisition. **In some localities and some occupations public vocational-technical education provides most of the new trainees, but in other areas and other occupations this dominance is not present. Indeed, most job skills currently in use have been learned on the job.⁴ What are the consequences of this variation in penetration for a designated skill area and what interactive forces exist among the sources of skill training?**

Another major issue not yet introduced concerns the domain of control exercised by vocational-technical education administrators. It is one thing to recognize the desirability of reallocating educational resources. It is quite another matter to be able to marshal the necessary support to implement the desired change. These and the related matter of multiple constituencies are treated in later sections. **More and better information about future employment opportunities is not always sought. We have to examine the administrative incentives and disincentives that are likely to determine the priority employment projection activities receive and why.**

These topics are examined in the following pages. I hope each reader who perseveres will acquire a better understanding of the concepts and practices that will ultimately determine whether employment projections contribute to better planning of vocational-technical education programs.

Since the major purpose of this essay is to examine our ability to produce and desire to use employment projections for vocational-technical education planning, it is necessary to ask not only whether we can produce acceptable projections but also whether we should generate such information.⁵ This strikes to the heart of the role of public vocational-technical education in our society. I do not provide historical exploration⁶ but each reader should consider the rationale for tying the educational process to projected occupational employment opportunity.

II

EMPLOYMENT PROJECTION MODELS

Introduction

This section introduces models for projecting employment and then examines the arguments by proponents and detractors of these and other methods. This is the most technical part of the essay.⁷ I describe the underlying economic assumptions and data requirements for each model that are necessary to produce a projection. You may be tempted to forego this technical section and move directly to section III, but I encourage you not to do so.

Model One: Same As Before

Recalling that employment is the outcome of interacting supply and demand forces, this model assumes that the current employment pattern will continue into the future. The accuracy of this model is sensitive to the time span chosen. Saying that this afternoon will be same as this morning involves little risk of error, but applying this rationale to say the last half of the '70's will be like the first half involves much greater uncertainty.

We should be careful in assessing the appropriateness of this assumption of no change because the assumed absence of change is only in the employment outcome of interacting supply and demand forces, not in the behavior of the forces themselves. The underlying forces might be expected to change over a projection interval, but in offsetting or compensating ways. Or we might expect the forces to change in the absence of countervailing action, but that such action will bar the adjustments from occurring. The introduction of wage controls illustrates the latter type of countervailing action, as might the imposition of quotas on entry to training in a particular skill area. In such cases, the same as before projection should be accompanied by a warning to the potential user that the projection is conditional upon continuation of the impediments to change.

The information required to use this model is the current employment structure described in whatever detail is thought necessary to accomplish the administrative decisions required. The currency of the required data is conditional upon how far back as well as forward one is prepared to assume no change in employment structure. We frequently hear that decennial Census data are too old. But for stable employment sectors, depending upon the precision of the projection needed, decennial Census data may be quite satisfactory.

Data on current employment structure is the minimal information requirement of any of the models, but this leaves unresolved the classification of occupational and people characteristics and geographic location, as well as the currency issue already mentioned.

Model Two: Fixed Coefficient Production Function

This perhaps unfamiliar terminology describes an assumption that there is a constant relation between labor inputs and production of a good or service. We have relaxed the Model One assumption of no change in employment, but in doing so have introduced a new information requirement. **Estimates of the labor services currently used to produce given amounts of goods and services are now required. This is difficult enough to accomplish at the industry level with little or no occupational detail, let alone at the individual establishment level with full occupational detail.**

One problem is that all employed labor may not be contributing to current output, so the defined input-output relationship is wrong. In this case, we must either assume that the same amount of underutilization will continue in the future or make some effort to adjust the relation. Once the production function, the input-output relationship, has been estimated it can be applied to the projected growth or decline in output level between the current period and the end of the projection interval.

This model requires two types of information not needed in the same as before model. Both methods require current employment information. However, in addition the fixed coefficient production function model requires data on the current relationship between labor service inputs and product or service outputs and an estimate of the types and amounts of goods and services to be produced over the projection interval. And as I have already noted some assumption or information is required about labor that is employed but not used.

Model Three: Incremental Labor

This is a straightforward adaptation of the same as before approach. **A new assumption is that there is a constant trend of change in the use of skills or the level of employment. This approach may require additional information depending upon the empirical foundation of the assumed incremental change in labor utilization. If the constant rate of change is to be estimated from observed historical experience then information about the level and mix of employment is needed for earlier periods identical to that already required for the current period in the same as before technique. Changing industry and occupational classification taxonomies makes this a formidable undertaking.**

Model Four: Incremental Labor Output Ratio

Just as the incremental labor technique is a simple modification of the same as before approach, this model is a straightforward adaptation of the fixed coefficient production function model. This can be described as a drifting fixed coefficient model.

The labor services-output relation is assumed to change in some constant manner over the projection interval. Again, as was the case in the incremental labor approach, more information may be necessary to use this technique. If the constant rate of change in labor productivity is to be estimated from past production experience the data requirements of Model Two will be applied to the relevant historical period. Or one might be satisfied to adopt estimates derived from other sources, or even to exercise one's own judgment about such trends.

I postpone an examination of the implications of assuming a fixed or drifting production relationship, but the constraint may be severe and its relevance for vocational-technical education planning activities is likely to be important. While the limitations of these techniques are severe, the information requirements to pursue alternative approaches are more burdensome.

Model Five: Skill and Industry Employment Forecasting

In its simplest version this technique assumes that all substitution between capital inputs to production and the labor services inputs occurs within each industry sector, however one chooses to define industry for projection purposes; and that substitution among skills occurs without regard to industry.

Skill and occupation are treated alike for now, although an occupation is normally comprised of more than one job each of which requires multiple skills. These are unrealistic assumptions. Supply and demand forces manifested in technological change and evolving skill utilization patterns operate throughout the entire economic fabric, with greater and lesser degrees of interdependence among individual sectors artificially designated as industries and occupations.

Realism *per se* is not our objective. But insofar as assumptions knowingly contradict actual economic processes we should at least be sensitive to the likelihood of error being introduced.

Proceed as though substitution among skills happens uniformly across industry sectors. This means that if we project a ten percent increase in the employment of electronic technicians over the projection interval, this percentage increase will be applied uniformly across all industries in which electronic technicians are employed.

Our assumption of uniformly distributed changes among occupational categories within an industry sector means that a projected ten percent increase in automobile production during the projection period will be manifested in an across-the-board ten percent increase of employment in all occupations within the auto industry sector.

These assumptions may strike the reader as unsatisfactory because intuitively we know they are inaccurate. Deferring the important point that **accuracy should always be considered relative to the purpose at hand and not as an absolute**, let us examine the information requirements of this and alternative more realistic approaches.

As the Model Five technique has been described, it requires information on the current level and industry/occupation mix of employment—the same requirement as each of the previous models—as well as additional data on projected aggregate employment by industry and projected employment by occupation across all industries.⁸ Producing these industry and occupational employment projections requires making a series of assumptions about the determinants of each.

Model Six: Skill and Industry Effects

This modification of the skill and industry employment forecasting technique provides consistency of the occupational and industry employment projections within the respective sub-sectors as well as with the overall projected employment level. This involves a sequential computation process, a description of which would take us too far afield.⁹ The computation process is more complex, but the original information requirements are the same as for the less restrictive skill and industry employment forecasting method.

Model Seven: One Stage Skill and Industry Effect

This is a simplified version of Model Six that shortcuts the sequential convergence of subtotals by incorporating industry coefficients that are the projected rates of growth or decline of total employment by industry, and skill effect coefficients that reflect the proportionality of projected occupation employment totals to those that would have been projected in the absence of allowances for an independent occupational substitution phenomenon. This method does not provide simultaneous satisfaction of both the industry and occupational sub-sector constraints, but only the latter.

Model Six and Model Seven can be estimated in several ways: By projecting industry and occupation employment totals and then estimating the respective industry and occupation coefficients to be applied to complete the industry/occupation matrix, or by estimating the coefficients directly from a series of complete historical industry/ occupation matrices.

Model Eight: Regression Analysis

Given the availability of a time-series of complete industry/occupation matrices, this technique allows virtually unlimited flexibility in the choice of functional relationships. Realistically, the non-availability of data on derived determining factors usually limits the analysis to a simple regression of occupational employment by industry on industry output and a time factor that represents a multitude of unspecified productivity influences.

Models versus Sources of Information

I know the previous section uses language that is unfamiliar to some readers, yet is too brief and general for others. Some may wonder why projection methods such as local area skill surveys and the Bureau of Labor Statistics *Tomorrow's Manpower Needs* industry-occupation matrix and occupational employment surveys have been omitted. So, **I pause to distinguish projection techniques from information sources.**

In the previous section I described eight models to project employment. In this context:

A model of something is a representation of it designed to incorporate those features deemed to be significant for one or more specific purposes. In some cases such features are directly observable. In other cases models incorporate more subtle features such as how the thing modeled responds to stimuli or otherwise behaves.¹⁰

A model, then, is a statement of relationships among factors. **One goal of modeling activities is to accomplish the investigator's purpose with as simple a representation of interrelationships as possible. Realism as such is usually not a goal of the modeling process.**

Predictive accuracy is frequently the major objective of a model. A major concern is to identify beforehand the degree of precision sought so attention can be devoted to developing the least complex model possible that achieves this level of accuracy.

One of the most pressing issues accompanying current investments in employment projection activities for vocational-technical education planning purposes is a general failure to decide ahead of time, or even after the fact for that matter, what level of accuracy is required, so employment projections can be assessed relative to a specific target. A corollary of this failure to specify accuracy targets is a frequent resort to gut reactions that are often poorly informed, in favor of adopting a particular employment projection model. The next section improves the rationale for making such decisions.

First however, it is necessary to ensure the distinction between model and data source is clear. An area skill survey, for example, is merely one way to collect information about current and projected employment.

A model of interacting forces that influence employment is implicit in the way in which the projection part of the survey is conducted. Hopefully, the underlying assumptions will have been made explicit to the respondents. If not, the information that is collected from individual establishments cannot be combined.

The BLS industry-occupation matrix is another data source, not a model. The data collected can be used under a wide range of alternative assumptions about the employment process to produce employment projections.

The decision-maker who is forced to choose among alternative employment projection models may also become enmeshed in the selection of data sources. At least some familiarity with the availability of data sources is necessary to eliminate the models that require information that cannot be produced.

In many cases data availability is not an absolute matter. Data can be collected at some finite cost. This makes the decision process more complex. It introduces comparisons of speculative costs which are difficult to assess.

Employment Projections versus Forecasts

Still another crucial distinction is between a *conditional projection* and a *forecast*. A conditional employment projection is an implicit if-then statement. The employment projection is conditional upon the appropriateness of the underlying assumptions. An employment *forecast* is a best guess or prediction. The prediction is not offered conditional upon realization of the assumptions made. The best guess is the forecaster's informed judgment about what is expected to occur.

The distinction made here may appear subtle, but it is actually a major source of ill-will inappropriately directed toward some modeling efforts. Some employment projections are calculated with careful documentation of the assumptions made in producing the estimates, and upon which they are therefore conditional. However, at some point in the handoff from producer to consumer these assumptions are often overlooked. The estimates are then treated as the producer's informed best guess of the future employment structure. If the employment estimates are found to diverge from actual trends the analyst's qualification to do the desired job is questioned, and gut feelings about the projection technique turn sour.

One method that has been tried to reduce the likelihood of misuse of projections as forecasts is to simultaneously present several projections under clearly stated differences in assumed economic conditions and institutional parameters, with accompanying instructions to the consumer regarding the criteria to be applied in choosing one of these for planning purposes.¹¹

Summary

This section lays a foundation for examination of the different employment projection models that are or could be available for planning vocational-technical education expenditures. I have defined important concepts that are often misused. The stage is now set to consider the strengths and weaknesses of the employment projection techniques.

III

EMPLOYMENT PROJECTION METHODS: STRENGTHS AND WEAKNESSES

Introduction

This section makes no original contribution in assessing the pros and cons of employment projection models. The contribution lies in conveying an understanding of the technical analyses that others have conducted to increase the likelihood that administrative decisions concerning investment in employment projections and products will be informed choices.

With few exceptions, what little scientific analysis has been performed has been limited to rather highly specialized occupational or industry sectors. Particularly in the past decade attention has been focused upon higher education,¹² the health professions,¹³ the engineering and scientific community,¹⁴ and developing countries.¹⁵ One major stumbling block appears to have been naive attempts to introduce such techniques into vocational-technical education planning with little attention being paid to institutional differences in the respective sectors of application.

Of three popular manpower planning models¹⁶—social demand, rate of return, and manpower requirements, the latter has clearly swept the field to date.

The *social demand* approach proposes attuning educational offerings to constituent preferences, which requires an assumption that such preferences are well-informed and signaled in a way that results in a preferred distribution of educational opportunity.

As professional examination fosters skepticism that institutional skill acquisition is the primary determinant of economic opportunity,¹⁷ there is accumulating evidence that educational administrators are becoming more sensitive to student demands. But are these informed demands? If they are informed by relative earnings potential, and we make certain assumptions about what earnings reflect, this method folds into the *rate of return* approach that bases funding decisions on relative cost-benefit criteria. I will return to examine this approach.

The *manpower requirements* approach assumes that there are identifiable requirements for labor services that can be derived from judgments about the structure of production and that these can be translated into educational requirements that in turn can be treated as targets for educational activities.

The Manpower Requirements Approach

The simplest requirements approach is Model Two in the preceding section, the fixed coefficient production function technique. This approach requires only a description of the current employment structure and the projected mix of production.

From current employment and projected production estimates we can derive a quantitative estimate of differences, plus and minus, between the current employment structure and the projected target employment structure. Recall though that this model assumes no change in labor productivity over the projection period and no possibility of substitution among types of workers or between labor services and capital inputs.

Hollister¹⁸ identifies problems associated with the requirements or fixed coefficient production function model:

There are two major questions:

(1) Is the impact of manpower requirements on the educational system quantitatively significant enough to justify the considerable effort involved in making detailed estimates of requirements?

(2) If the answer to (1) is yes, are present methods so inaccurate that, for all practical purposes, requirements cannot be estimated?

Further questions spring from (2) concerning the possible sources of weakness in present forecasting methods:

(1) Are occupational input coefficients (the number of workers in a certain occupation per unit of output) at a given point in time fixed, or are they variable, and what difference would it make if they are in fact variable? This is the substitution problem.

(2) To what extent do uncertainties about changes in productivity (changes in output per [worker] due to changes in technology) affect estimates of manpower requirements?

(3) To what degree must the economic structure and the labor force be disaggregated, such as into economic sectors, industries, firms, broad skill groups, or detailed occupation categories, if reliable estimates are to be made?

(4) How serious is our ignorance of the exact relationship between a given occupation and the educational background required for it, and what difference does this ignorance make to the usefulness of educational targets derived from estimates of manpower requirements?

Since enactment of the 1968 Amendments to the Vocational Education Act of 1963 federal approval and funding of a *State Vocational Education Plan* has been conditioned upon inclusion of estimates of future employment by curricular program area. The answer to Hollister's first question is therefore a qualified yes, but this leaves undefined what is meant by "considerable effort involved in making detailed estimates of requirements."

Over a decade ago [in 1976], Herbert Parnes¹⁹ asked "[i]sn't it a dangerous delusion. ..to pretend that we can answer questions like these with confidence?" Parnes then proceeded to note that once having decided that specific skill development in preparation for employment is an educational goal there is no longer an option to project employment or not. The only option is whether to do this explicitly in a scientific manner or implicitly by happenstance.

Parnes continued that **projection of manpower requirements is a technical exercise, not an economic undertaking.** This brings us back to a point made in the introductory section. **Demand is not what is being projected.** Once the structure of future production is projected using one of the eight models described in Section II the labor services requirement to produce that pattern of goods and services is determined. This is a conditional determination dependent upon the particular assumptions of the model adopted. **There is no explicit consideration of the interaction of supply and demand forces and no statement of the behavioral responses of the economic actors.** The most rudimentary requirements projection method simply asserts: If this is what you want or expect to produce in time period t then here are the skill (occupational) requirements to get the job done, assuming no change in labor productivity and no substitution among skills.

Pause to consider for a moment how an economy with these characteristics would function. I have said nothing about the availability of individuals with the required skills, beyond presumed knowledge of the distribution of the currently employed. Assume that the labor force is transformed in some unspecified way to exactly match the projected labor services requirement structure. Then any deviation of the actual evolution of production from the projected structure would be impossible, since the required skills for a different structure would not be available.

Such a rigid characterization is clearly unrealistic. Is this characterization a useful approximation? **The assumption of zero substitutability may be unrealistic, but still be functional for planning purposes relative to available alternative assumptions. What alternative assumptions are available?**

The Rate of Return Approach

A polar extreme to the manpower requirements assumption of no substitutability among skills is to assume infinite substitutability among skills. This new premise provides a basis for computing internal rates of return²⁰ for educational programs. These rates of return could then be used to guide the development of vocational-technical education programs.

Quite apart from the sequence of assumptions that is required to produce an internal rate of return calculation, such as estimation of earnings-productivity relationships, and bypassing examination of the appropriateness of choosing among educational programs based upon this criterion, this approach produces no target number of people to be trained in various skills to equalize their rates of return.

If a skill area has an unusually high payoff (high internal rate of return relative to alternative programs) then it is an obvious candidate for expansion, but by how much? The rate of return technique provides no guidance in this regard without engaging in constant recomputation to identify convergence of the relative attractiveness of this investment with others.

Comparing the Manpower Requirements and Rate of Return Approaches

The requirements approach identifies specific numbers of people with designated skills that will be required to produce a given output. If this output mix is to be feasible the skill requirements must be met. No consideration is given to market adjustment mechanisms. Or, if such forces are considered, they are assumed to exhibit ignorable influence.

The rate of return approach assumes that the economy will absorb people regardless of their embodied skills. Substitution among skills in production is assumed to be unlimited. The important issue then is comparative benefits and costs of training programs.

It is apparent that a major difference between these two approaches is the respective assumptions about substitution possibilities in production. What can be said about this matter? Very little, without digressing into technical issues that would take us far beyond the intended scope of coverage.

This topic is fraught with dangers for the layperson. As one might have anticipated, the limited available evidence is supportive of neither polar extreme.²¹ The most precise estimates cover only the manufacturing sector because of data collection limitations. And the degree of aggregation of occupational categories has been so great that very limited information about refined skill substitution phenomena is gained. We are thrown back to our gut reactions to a large extent in deciding whether the requirements assumption of no substitution is acceptable.

An understanding of labor market concepts can lead to more informed decisions about whether to invest in employment projections, and if so what model to adopt.

IV

TOWARD AN UNDERSTANDING OF LABOR MARKET CONCEPTS AND PROCESSES

Introduction

I have distinguished between *demand* and *employment* that is an outcome of interacting supply and demand forces.²² I have also described the requirements model as a technical approach that implicitly assumes an absence of any labor market adjustments. I turn now to an explicit consideration of the *shortage* concept, and then examine Hansen's²³ five-way classification of employment projection approaches. This will provide a basis for considering how skills are developed.²⁴

The Shortage Concept

What does a reported shortage of registered nurses mean to you? Does it mean the same thing as a shortage of physicians in rural areas, or a shortage of good teachers in inner-city schools?

Consider the following definitions of shortage:

1. One might appeal to relative earnings and define a shortage to exist if the number of qualified people offering their services increases less rapidly than the number demanded at recently observed salary levels. Under such conditions rising relative earnings should be observed if earnings are accepted as an accurate signal of labor market imbalance. **This definition does not take the cost of skill acquisition into account at all in defining the existence of a shortage.**
2. Or, we might adopt the rate of return criterion and define a shortage as existing whenever the rate of return in an occupation is higher than in other occupations, or if it has been rising relative to others. **This definition does consider costs, but there is no explicit link between this concept and the existence of job vacancies.**
3. A third concept has been called a dynamic shortage to characterize its temporary nature. This definition has been applied when relative earnings are temporarily too low to immediately clear the market for a particular skill. **This type of shortage is important for vocational-technical education planning activities. Adjustment flows are already underway to achieve balance.**

4. A fourth shortage concept has been popular in the examination of markets for health occupations. This definition of shortage includes all social demand, not just effective demand. Recall that *effective demand* is backed up by a willingness and ability to employ qualified applicants up to a designated number at the stated compensation level. **Social demand includes a stated preference, or need, for qualified people, but not necessarily accompanied by a willingness or ability to employ them. The supply shortfall in this type of calculation might never be extinguishable because of continuing adjustments in the concept of social need.** The physician shortage concept illustrates this case. There are varying opinions as to what the proper physician/ population ratio should be, and whether it should be the same in rural and urban areas. This ratio currently varies widely among countries, and among areas within a given country. By applying a single high physician/population ratio observed in one area, one can create an impression that there are shortages in all other areas that exhibit lower ratios. But there may be few or no existing or forecast job vacancies (effective demand minus the currently employed) in these areas. Would newly emerging physicians be absorbed into these rural sectors to reduce the asserted imbalance in physician/population ratios? Not without some reallocation of *effective demand* to these areas, that is a desire to employ coupled with an ability to pay the requisite salary. Of course, what has occurred in recent years is that most medical school graduates have entered practice in metropolitan areas where their presence has reduced the earnings potential of their predecessors below what it would have been otherwise, while at the same time increasing the interregional disparity in physician/population ratios.²⁵
5. A fifth shortage concept introduces the cost of acquiring labor market information. **The number of qualified applicants may fall short of effective demand only because of information imperfections. Increased expenditure on recruitment of already qualified people who are not currently employed would contribute to a reduction of this type of shortage.**
6. **A sixth concept involves interdependencies and rigidities in relative earnings, so that necessary market adjustments cannot occur or occur with long lags. This may be one of the most important causes of long-term imbalance in some markets.**
7. **A seventh shortage concept assumes that the availability of qualified persons is inflexible, particularly over a short time-span. This inflexibility may be associated with the time necessary to produce the necessary qualifications or with barriers to entry into the occupation or into the training pipeline prior to job-entry.**

8. **An eighth shortage concept takes account of the possibility that the stated job qualifications may be absolutely fixed in quantity, in which case observed market imbalance measured by any of the preceding indices should evoke no response other than to perhaps advise the actors in the marketplace of the situation.**
9. **A final shortage concept is adopted by those individuals or groups who simply assert that our priorities are misguided—we need more people with skill x.** This is similar to that described as the fourth concept above (social demand).

The concept of a skill shortage is vague in common usage. Unfortunately, there is another major source of ambiguity—what does the concept *projected job openings* mean?

Projected Job Openings

A projected job opening is not the same as a job vacancy. A job vacancy exists only if an employer is willing, able, and actively seeking to hire. Projected job openings involve one or more of five concepts distinguished by W. Lee Hansen ²⁶:

1. Requirements—reflects replacement and growth needs, plus or minus, over a specified time-span, based on assumptions about the level and mix of economic activity, technological phenomena, the availability of qualified people to meet the expressed need, and stability of the institutional structure. Replacement typically only accounts for deaths, retirements and other permanent withdrawals from participation. Not included is job turnover among continuing labor force participants, which is the source of most job vacancies.
2. Availables—represents the projected number of applicants who will be available to fill the requirements estimated in 1. Again, assumptions are made about the forces that impinge on the decision to acquire skills and offer labor services in the market. **Knowledge of the forces that determined the current supply mix is useful in projecting future availability.**
3. Outcomes—the difference between 1 and 2, requirements minus availables. **This is a measure of unmet requirements, shortfall or surplus, allowing for no feedback effects based on an awareness of the gap.** Many educational administrators are using a version of this concept to meet their reporting requirement to consider manpower criteria.

4. **Outcomes With Responses—is a much more appropriate concept to adopt for administrative planning purposes, but one that is far more difficult to estimate. This concept takes into account the expected responses outside ones own domain to awareness of the original projection of outcome.** Since assumptions about supply and demand conditions were incorporated in the calculation of requirements and availables it is now necessary to correct for disparities between the assumptions made and the projected situation. How will the respective parties behave in the face of new information about a projected surplus or shortfall of availables relative to requirements?

5. **Actuals—refers to a reconciliation of outcomes and responses. Given the projected relationship of requirements and availables after the feedback effects of estimating what will occur outside ones own domain, it is finally appropriate to define the role of ones own administrative responsibility. What piece of the action is to be accepted as the projected participation of your institution?**

Enthusiasm for the simplicity of this sequence should already be tempered by the many complexities examined in previous pages, but lest you conclude that calculation of outcomes with responses is straightforward, I state unequivocally that it is not an easy undertaking. What responses are at issue?

Sources of Market Adjustment

My objective here is to illustrate a variety of sources of response to labor market conditions that might occur when new information becomes available. Assume, for example, that the estimate of outcome for a given situation reflects an inadequate number of availables to meet the projected requirements. What actions might be taken by whom to correct this apparent imbalance?

1. **Institutional training—delivered at public and/or private expense. Anticipation of one sector's willingness to bear the costs of training will influence the enthusiasm of other parties about participating in the financing of training.²⁷**

2. **On-the-job-training—provided at public and/or private expense. Public and private sources of this investment can be considered as substitutes. Required matching contributions are an exception.**

3. **Relocation of production or applicants—an imbalance in the projected availability of qualified applicants might be corrected by movement of the production activity to a location with more satisfactory labor market conditions. Alternatively, relocation of applicants to the current site of production could be subsidized.**

4. Change in the rate or mix of production—if the rate of production flow can be varied and the nature of the product or service forthcoming can be altered new options become available to adapt production to labor force availability.
5. Change in the method of production—distinct from altering what is produced and when it is produced, consideration can be given to how production is carried out. The economist's notion of a production function is relevant here. What alternative mixes of inputs will result in a given level of output? Once substitution possibilities among factors are considered a variety of new options appear. Or it may be discovered that the type of labor that is projected to be in short supply is a critical input for which there are no available substitutes. Consideration of factor substitution involves both intra-factor and inter-factor possibilities. Can a job be decomposed into several parts each of which requires fewer skills, so less-skilled labor can be substituted for more-skilled labor? This is an intra-factor comparison. Or can a labor input be replaced by an electro-mechanical device? This is an inter-factor comparison.
6. Investment in recruitment—again at public and/or private expense. Taxpayer support of a public employment service exemplifies the former, and expanded company personnel operations illustrate the latter. In part, recruitment expenses can substitute for other adaptive actions mentioned above.
7. Change in wages—where wages is intended to encompass all aspects of compensation, including working conditions. Market wages can be supplemented, altered in real value through tax treatment, or even established through legislative action.

What should be clear from this illustrative listing of possible responses to projected imbalances is that estimation of outcomes with responses is difficult. The planning task confronting the administrator of any single channel of skill augmentation or other market adaptation is also complex. Will a projected net imbalance prove illusory because of unforeseen adjustments from other sectors?

Note the consistency with which public and/or private sources of support for a particular adjustment process was mentioned. The interdependence of decisions in the two sectors is of considerable importance.

Internal and External Labor Markets

Having covered the distinctions between *demand* and *employment*, between a *projection* and a *forecast*, between a *job vacancy* and a projected *job opening*, and the concept of a *shortage*, I now add what is perhaps the most important concept of all for planning vocational-technical education curricula—the distinction between *internal* and *external* labor markets.²⁸

There are examples of labor markets without structure, such as parts of the seasonal harvest labor market and casual labor shape-ups. However, most markets are characterized by a number of institutional impediments to the rapid adjustment of supply and demand forces that are assumed in formulations of competitive market processes.²⁹

One institutional impediment to employment opportunity is the existence of limited ports-of-entry into employment for a given firm. This ports-of-entry concept is of great importance for vocational-technical educators.

All jobs are not open to every bidder or even to every qualified bidder in the normal use of that term. Many jobs are open only through internal promotion or transfer.

There are many reasons why the internal labor market emerges to close off competitive bidding from the external labor market.³⁰ Ports-of-entry from the external market into the internal market exist in many patterns, but they are concentrated at lower levels from which one may be able to advance through the internal occupational hierarchy.

Much, many experts say most, skill development necessarily takes place within this internal market because of task-specific and establishment-specific characteristics of jobs. **Williamson *et al.***³¹ **emphasizes four idiosyncrasies that require learning-by-doing, that is learning through joint on-the-job training and production. Equipment idiosyncrasies are associated with common but incompletely standardized machinery and tools. Process idiosyncrasies flow from the operating production context itself. Informal team accommodations stress performance interdependencies among the group. Communication idiosyncrasies can only be learned through on-the-job experience. The more important these conditions, or peculiarities, specific to a particular employer are the less prior preparation can be accomplished in an external institutional education setting.**

Up to this point I have emphasized a partial inability to offer idiosyncratic training in other than an on-the-job setting. There may also be an unwillingness to train. "The success of on-the-job training is plainly conditional on the information disclosure attitudes of incumbent employees. ...The danger is that incumbent employees will hoard information to their personal advantage" ³²

Fully qualified competitors are a threat to the job security and/or earnings potential of incumbents. Would you teach someone everything you know about your job unless you had some assurance that they would not then turn around and bid for your job? ³³

The presence of internal labor markets is important in our consideration of occupational employment projection activities because the structure of internal labor markets simultaneously determines and is partly determined by pre-employment educational requirements. At the same time, internal labor market considerations are important in understanding employment turnover levels and structure. ³⁴

Educational 'Requirements' ³⁵

Most planning of vocational-technical education programs is premised on the existence of well-defined and stable skill requirements that are known with varying degrees of precision; skills that can be produced in classroom or work station settings.

There is little doubt that there are specific cognitive skills that can be learned in an institutional setting, but there is substantial controversy about their necessity and stability in specific production processes. Are they truly requirements? This is really a two-part question. First, **is the production process itself rigid?** Is the fixed coefficient production function model in Section II an accurate description of important sectors of the economy? And second, **is the pre-employment development of specific skills a necessary criterion to be hired?**

There is a voluminous literature that examines the contribution of education to productivity ³⁶ and a developing literature that challenges this orthodoxy. ³⁷ It matters very much whether education's major contribution is direct enhancement of productivity or a screening of potential productivity. One would not necessarily expect an optimal education technique that imparts direct productivity development to also be optimal in performing screening functions. ³⁸ An understanding of which of these roles best characterizes vocational-technical education activities is dependent in part on our understanding of the purposes and structure of occupational classification systems.

Occupational Classification

A former Secretary of Labor and a former Assistant Commissioner for Manpower and Employment Statistics in the Bureau of Labor Statistics have recently [in 1976] concluded:

Experience makes it clear that any effective projection of future employment prospects in particular occupations depends on the development of occupational employment information on an industry-by-industry basis.

It would speed up the obtaining of current occupational employment statistics if there were a standard occupational classification system understood and used in industry and government alike.³⁹

An occupation is comprised of a number of jobs, each of which is composed of a unique set of tasks or skills. Some people assume mistakenly that the purpose of any occupational classification taxonomy is to establish within-occupation homogeneity with regard to skills required in the performance of the included jobs. This is a false impression, as Alba Edwards⁴⁰ indicates with reference to the U.S. Census of Population occupational categories:

In the analysis of many of the problems which concern workers as people there is, and long has been, a real need for statistics showing in summary form an occupational distribution of the nation's labor force—a need for statistics that cut across industry lines and bring together into one occupationally homogeneous group *all of the workers belonging to the same social economic class, but with minor regard to the occupations [jobs] they pursue* or to the particular part of the industrial field in which they work.

Each classification system has been designed for a specific purpose or set of purposes and subsequent adoption for other uses will almost certainly involve interpretation problems that were not anticipated earlier. Within-group occupational homogeneity is only meaningful in terms of some criterion or purpose.⁴¹ No [1976] occupational classification source has been designed to fulfill the need for planning skill-training curricula,⁴² although conversions of existing classification systems to interface with vocational-technical education program codes have been published.⁴³

In case the importance of occupational classification is still unclear, consider the following questions: Graduates of which skill-training programs have the highest training-related placement rates? What occupations exhibit poor retention rates of new hires and what are the reasons for exit? What can we learn from occupational mobility⁴⁴ patterns that might be of interest for educational planning purposes? Can you answer any of these questions without careful consideration of what occupation means?⁴⁵

Supply Measurement

Many of the concepts already examined are relevant here. Individuals must be classified on the basis of whatever criteria are deemed pertinent to the use that will be made of the data.

For some purposes measurement of the number of people who have achieved a designated threshold of performance may suffice. But performance may itself be a team concept in a specific employment setting. And are we to interpret performance standards narrowly in terms of production engineering, or are employer hiring criteria to be considered? If so, which criteria—today's or projected future hiring standards?

For other purposes, the supply measure should signify availability as well as qualification. Since availability is conditional upon the meeting of certain conditions, we must then either assume a single set of conditions to which availability estimates will be tied, or set forth alternative circumstances with accompanying supply measures.

Assuming these definitional problems have been surmounted, two issues remain unresolved:

- 1. Skill augmentation occurs in both the public and private sectors and in on-the-job and institutional settings, so the extent of measurement coverage must be considered explicitly. What are the pros and cons of including or excluding each possible source of supply?**
- 2. Where will the line be drawn between formal training as the only process and learning as the only output and informal learning which occurs as part of a joint production-training process? For many educational planning purposes answering this question is a crucial prerequisite to comparing requirements and availables. The farther one moves along the continuum toward informal joint learning and production the greater is the difficulty of measurement of skill development.**

Summary

This section represents an attempt to imbed the administrative use of occupational employment projections in a more informed context of labor market processes. I have shown that the concept of shortage is imprecise and means different things to different people. The likelihood of an immediate job placement depends on the existence of job vacancies, but educational planning for the future must consider projected job openings, an entirely different concept largely unrelated to current willingness and ability to hire. And, adopting Hansen's classification, I have distinguished among projected requirements, availables, outcomes, outcomes with responses, and actuals.

Each concept has different implications for educational planning. Sources of adjustment to perceived market imbalance have been described, since the multiplicity of responses is a major source of complexity for administrative action in any one sector. The notion of an internal labor market has been introduced to account for the many institutional constraints educators encounter in attempting to meet apparent skill shortages. This led to a treatment of the educational requirements issue since we have a limited understanding of which requirements are really rigid and stable over time and which are malleable or subject to seasonal or cyclical fluctuation. Commitment to a particular mix of concepts presumes some definition of occupational classification. Finally, measurement of supply has been introduced since most of the concepts previously defined apply here too.

What remains unaddressed up to this point is an integration of these disparate concepts into a useful guide for administrative decision-making in the vocational-technical education sector. Is the use of occupational employment projections for planning purposes truly a mission impossible?

V

EDUCATIONAL PLANNING USE OF LABOR MARKET CONCEPTS

Introduction

The U.S. Department of Labor continues to devote considerable effort to meeting its perception of the needs of vocational-technical education administrators for occupational employment projection information.⁴⁶ Limited Bureau of Labor Statistics success is characterized by Wirtz and Goldstein:

Taking particular note of the non-use by federal and state vocational education officials of the Department of Labor information, the GAO report [*What Is The Role of Federal Assistance for Vocational Education?*, December 1974] attributes this to lack of communication, lack of interest in planning on the basis of manpower needs, and inadequate attention to vocational guidance, work experience, and job placement on the part of vocational educators.⁴⁷

In this final section I explain why communication problems might be expected to persist and why a lack of interest in planning on the basis of manpower needs is exhibited. I then conclude by responding to the question posed in the title of this essay.

Communication Failure

I begin with the following observation on organizational decision-making:

For even moderately complex problems...the entire decision trees cannot be generated. There are several reasons why this is so: one is the size of the tree. The number of alternative paths in complex decision problems is very large...A second reason is that in most decision situations, unlike chess, neither the alternative paths nor a rule for generating them is available...A third reason is the problem of estimating consequences...For many problems consequences of alternatives are difficult if not impossible to estimate. The comprehensive decision model is not feasible for most interesting decision problems.⁴⁸

Many analysts of educational planning processes seemingly ignore these attributes of the administrative environment.⁴⁹ One author asserts that

the writer purposely has not dwelt at length on the many aspects of resistance to change, chiefly because of an inherent belief that, if properly motivated and assisted, people have a strong propensity to change, to become committed to providing opportunities for a better education for all persons.⁵⁰

How can proper motivation and assistance happen without inquiry into reasons for resistance to change? Such rhetoric contributes nothing to our search for answers.

The thesis developed in the following pages is premised on contradictions that emerge from the coexistence of *laissez faire* and interventionist attitudes and actions. Coupled with these contradictions are nonsymmetrical administrative incentives and disincentives associated with being right or wrong in tying educational structure to projected employment opportunity.

One source of asymmetry is varying behavior of constituent groups in the respective circumstances. Under such conditions it is quite rational for an informed administrator who is aware of forecast skill requirements to act in ways that belie such knowledge. The apparent communication weaknesses may be a functional manifestation of the institutional context within which educational activities occur.

Extraordinary efforts are currently underway [in 1976] to reduce the perceived communications gap between producers and consumers of occupational employment information.⁵¹ A major problem with virtually every attempt that has been made to determine information needs is that no attempt is made to ascertain the *effective demand* for the information.

Again, *effective demand* is defined as a need signaled by a willingness and ability to pay. One reason for continuing inaction is that wish lists cannot be translated into action without the wherewithal to pay for the information.

We must recognize that despite cooperative agreements between the U.S. Department of Labor and the Department of Health, Education and Welfare, and notwithstanding on-going liaison activities among federal agencies, the primary concern [in 1976] of the Division of Manpower and Occupational Outlook in the Bureau of Labor Statistics is to meet Department of Labor Information needs. But there are more fundamental reasons for the appearance of a communications problem, reasons that are grounded in what Williamson *et al.* refers to as the difference between perfunctory and consummate cooperation.⁵² This behavioral difference is inextricably linked with the politics of educational planning, to which I turn next.

The Politics of Educational Planning

It would be enlightening to examine the origins and current structure of the vocational-technical education system in the United States, but this is beyond my purview here. The rationale for undertaking such an inquiry would be to document the evolution of a modified *laissez faire* education establishment.

Foregoing historical elaboration, I assert that the domain of control of any administrative level in vocational-technical education reflects the interacting forces of decentralized decision-making and a federal presence.⁵³

Breneman concludes:

Since we rely on decentralized decision-making and allocation procedures, it is surely sensible to know as much as possible about the working of those procedures, including their limitations.⁵⁴

One difficulty associated with the federal and state presence is that planning sometimes constitutes a threat to the existing educational establishment.

The threat which planning makes to one's freedom of action can be minimized by controlling or participating in the formulation of the plan. The real problem of educational planning so far has been that it has been carried out mainly by ... supporting staff...rather than being a central concern of the principals.⁵⁵

Educational planners might well heed George Bernard Shaw's paraphrase of the Golden Rule: "Do not do unto others as you would wish them to do unto you. They may have different tastes."⁵⁶

It is in Shaw's context that the distinction between perfunctory and consummate cooperation is relevant. *Perfunctory performance* involves cooperation in accordance with minimally acceptable standards.

Legal authority does not and cannot command the employee's willingness to devote his ingenuity and energy to performing his tasks to the best of his ability.⁵⁷

Consummate performance involves contributing in a fully functional instrumental manner. The lack of interest in educational planning that the General Accounting Office report alludes to is a manifestation of perfunctory cooperation. Consummate performance, as the GAO sees it, is couched in terms of "...as you would wish them to do unto you." The failure to achieve this level of performance is attributed in part to communication gaps. Perhaps so, but the search for causes thus far appears to be largely misguided.⁵⁸

Consider the following scenario. Administrators of local education agencies have multiple constituencies—past, present and future students, parents of students (also past, present and future), taxpayers, school teachers and staff, and local area employers, among others. These are the immediate principals, the parties involved in the local education-employment process. This effectively ignores asymmetric engagement incentives and disincentives and the mobility phenomenon that sees many students exit from the local scene to establish careers only to be replaced by outsiders who were educated elsewhere and then enter the local scene to accept employment.

These are the principals because they have the most direct stakes in the local educator's administrative actions.

- The local employer who has been successful in the past in transferring some training expenses from his business to the taxpayers-at-large should be expected to oppose administrative proposals that threaten continuity of this arrangement.
- Parents of past graduates, and the former students themselves, will respond to administrative action to a degree that depends in part on their own employment experiences.
- Taxpayers and parents of future students seek reassurance that the schools are contributing to the individual and collective economic well-being of the citizens in the community.

- Teachers and staff members seek job-security and their own economic well-being. The present complement of teachers is characterized by certain capabilities, as is the existing physical plant. This introduces a major impediment to any attempt to meet what I have called idiosyncratic training requirements.
- And the administrator? S/he must be responsive in varying degrees to each of the stakeholders motivated by self-interest. Here too, there is usually a *quid pro quo* motive. If the administrator will offer a training program to prepare carpenters if you the local employing community will hire the graduates. A part of the contractor training expenses is absorbed by taxpayers. In return some local youths are able to establish carpentry careers.

Now introduce the external state planner who says I also want a *quid pro quo*. I, on behalf of the State Department of Education, must convince legislators that their investment of taxpayer dollars in vocational-technical education is well-conceived. State financial support of vocational-technical education represents different shares of total local education agency budgets, which translates into varying amounts of political and administrative clout in accomplishing statewide educational goals. The territorial imperative in education is strong and belief in the inherent goodness of the citizenry is unlikely to be effective in the absence of the mutual benefit from cooperation element.

What role does the labor market play in state-level educational administration? We know that the state economy is less open than that of each local school district, so entry and exit mobility is conceived differently at the state level than at the local level; not because the respective administrators necessarily differ in their awareness of such movements, or even because they seek different educational objectives, but because they must respond to different manifestations of the same basic phenomenon and because they are beholden to different constituencies.

What labor market evidence would you convey to legislators in an attempt to increase the state allocation to vocational- technical education? A typical strategy is to cite projected requirements—the projected skill needs of the state economy some years hence.

Why isn't outcome or outcomes with responses information presented with accompanying data on the proposed role of the state education system in alleviating projected imbalances? The necessary availables and response calculations are not known.

Why isn't a major effort launched to obtain such information? There is no *quid pro quo*. The requirements measure is ideal from the state education agency standpoint because it ignores projected availability of already qualified people to satisfy these requirements and other behavioral and institutional responses that might occur to diminish or even eliminate the projected shortfall.

Who, then, does have self-interest in presenting legislators with outcomes with responses projections? Proprietary training institutions should to the extent that they are competing with public sector schools to meet employer demands for pre-employment skill embodiment. If they can convince legislators that they, the proprietary schools, can meet the projected need they should expect to be rewarded by legislator disinterest in supporting their competitors, the public schools.

The *quid pro quo* between legislators and proprietary training institutions is obvious—legislators can now allocate more money elsewhere. This adversary relationship reveals another source of potential friction between state and local educational planners. **A territorial imperative is manifested in a local desire to hoard information about forecast skill requirements. Widespread dissemination of such information by the state agency would be expected to lead to a more rapid correction of market imbalances, thereby lessening the stability of local curricular planning.**

Finally, when the federal dollar and accompanying regulations and reporting requirements are introduced the complexity of the forces already discussed increases. The lesser degree of openness at the federal level than at the state or local level and associated mobility considerations, the importance of the committee structure of Congress and continuous inertia for change, and the adversary relationship between the public and private sectors are reflected in the behavior of staffs acting on behalf of the principals.

I conclude from this that there is a need to eschew reliance on beliefs in inherent good intentions, to end repetitive appeals for improved communication, and to halt the stream of recommendations to collect more or better information on this and that aspect of our lives.

The actors behave as they do because it is in their self-interest to do so, given the institutional context in which they operate. Given the rules of the game, everyone plays to win.

There is imperfect information that causes educational outcomes that most of us would agree are undesirable. But some stakeholders prefer the present situation because they are benefiting from it relative to perceived alternative circumstances. These parties will attempt to maintain the *status quo*.

If 'we' have control over 'them' several options are open. We can mandate a change, which requires confidence that we can dominate them and regulate subsequent action to assure compliance. Or we can buy a change by offering to compensate those who stand to be less well off after the change.

Mandates change the rules of the game, counting on or coercing the desired response to the new rules. Action to buy cooperation is a more direct route to the same end; one that becomes more attractive as superiority of control and assurance of a preferred outcome diminishes.

Returning to the asymmetry between potential rewards to action and anticipated losses from a failure to act, we can now see that virtually no one in an administrative role in the vocational-technical education sector has a strong incentive to contribute consummate performance in using Department of Labor or anyone else's employment projections.

There is no *quid pro quo*. Professional educators and associated staffs and physical plants are already arrayed across the country. Any inconsistency between employment projections and the range of preferred capabilities of these resources will evoke adoption of a defensive posture, just as it would in any other part of the public or private sectors. Evidence of this asymmetry is seen in the administrative enthusiasm expressed about projected newly emerging or rapidly expanding employment opportunities, versus the hostility generated toward evidence of projected decline of opportunity or current abundance of already qualified people.

Isn't this conclusion inconsistent with Parnes' observation quoted earlier, that once having decided that specific skill development in preparation for employment is an educational goal there is no longer an option to project employment or not? No, because while specific skill development is an educational goal we are not well informed about the connection between this educational activity and subsequent employment activity, and self-preservation within the educational system is a motivating force countering responsiveness to new information.

VI

MISSION IMPOSSIBLE?

Introduction

It should be apparent by now what answer will be forthcoming to this question about the possibility of the assigned mission. We know from observation that the transmitter is operating because we have reams of computer printouts with employment projection information of many types. We also know the receiver is functioning because we see the numbers from the computer printouts showing up in the planning documents of the education agencies. This surface manifestation of a successful transmittal from information producer to information consumer is confounded by evidence that generally only intermediate consumption occurs.

Just as ruminating animals bring up a cud from the first stomach to be chewed again, what is really sought in vocational-technical education planning is a cud; a second chewing of information that is currently stored in planning documents to nourish the administration of educational processes.

The Quest for a Vocational-Technical Educators' Cud

Why should an administrator of vocational-technical education resources use employment projection information? If you can answer that ask yourself why more administrators of vocational-technical education resources don't do so. I think the answer lies in the politics of educational planning and administration—in the absence of the necessary *quid pro quo*.

Why aren't educators more precise in stating what they need in the way of employment projections that they are not getting now? Precision of definition is threatening and therefore of relatively low priority.

Perfunctory cooperation is acceptable. This does not necessarily mean that the *status quo* is known to be indefensible so must be protected from exposure to objective scrutiny. It may be that simple risk-aversion motivates the action to avoid specifying information requirements.

Why haven't accuracy tolerances been established for most of the employment projection systems that are available for vocational-technical education planning purposes? Specification of such tolerances is unnecessarily threatening. Perfunctory performance is again acceptable under the current rules of the game.

We need not infer conspiratorial motives for such action. The failure to define accuracy limits maintains administrative discretion in deciding whether to accept or reject the estimates. Nothing would be gained by adopting rigid guidelines, and a source of autonomy would be lost.

Is an understanding of the concepts defined in this essay going to evoke consummate administrative performance? No. But such an understanding will contribute to a more informed dialogue among the principal stakeholders, between these principals and the support staffs that have already imposed the rule that skill requirements must be considered in planning vocational-technical educational programs, and ultimately between these staffs and the producers of employment projections.

How can such a dialogue possibly transpire without a common understanding of the difference between *demand* and *employment*, and between a *projection* and a *forecast*? Must not there be a common understanding of what is meant by *shortage* and *requirement*? Can those who do not distinguish between a *job vacancy* and a *projected job opening* communicate effectively? Could you design an educational program without considering the relevance of *internal labor market* phenomena? And do you not see that different occupational classification systems will have different impacts on educational decisions?

The vigil for dramatic changes in administrative behavior is indeed a mission impossible unless new rules of the game are promulgated. Based on a common understanding of educational and labor market institutions, and making adequate provision to either compensate those who stand to lose under proposed changes or garner sufficient support to overcome anticipated adversary action, consummate performance is achievable only by evoking new responses through a different set of incentives and disincentives than now exists. You can lead a horse to water, and get it to drink, if you whet its appetite.

FOOTNOTES

1 David E. Kidder, Review and Synthesis of Research on Manpower Forecasting for Vocational-Technical Education, Information Series No.54 (VT 014 482), ERIC Clearinghouse on Vocational and Technical Education, The Center for Vocational and Technical Education, The Ohio State University, 1900 Kenny Road, Columbus, Ohio 43210, February 1972, 70 pp.

2 See David W. Stevens (ed.), Occupational Employment Projections for Program Planning Purposes: Issues and Examples, The Human Resources Research Program, 217 Middlebush, University of Missouri, Columbia, MO. 65201, January 1976, for the proceedings of a conference of the same title held at the TWA Breech Training Academy, Overland Park, Kansas, July 10-11, 1975; and the "1975 National Vocational Education Research Conference on Management Information Systems at the State Level," sponsored by the Research Branch, Division of Research and Demonstration, Bureau of Occupational and Adult Education, U.S. Office of Education, and held at Des Plaines, Illinois, November 5-7, 1975. No proceedings volume of the latter conference is planned.

3 In this usage "conditions" is meant to encompass all attributes of compensation and working conditions. It is merely a shorthand way to denote the rewards associated with a given job.

4 See: U.S. Department of Labor, "Formal Occupational Training of Adult Workers," Manpower/Automation Research Monograph No. 2, December 1964, pp. 43-45; and Willard Wirtz and Harold Goldstein, A Critical Look at the Measuring of Work, Washington, D.C.: The National Manpower Institute, Suite 414, 1211 Connecticut Avenue, N.W., 20036, August 1975, pp. 27-31.

5 Herbert S. Parnes, "Manpower Analysis in Educational Planning," in Mark Blaug (ed.), The Economics of Education: I, London: Penguin, 1968, pp. 263-273.

6 Among recommended references are: August C. Bolino, "Occupational Education as a Source of Economic Growth," National Technical Information Service, Springfield, Virginia, 22151 (order number PB-214 189), November 1972, 268 pp; Marvin Lazerson and W. Norton Grubb (eds.), American Education and Vocationalism: A Documentary-History 1870-1970, Classics in Education No.48, New York: Teachers College Press, Columbia University, 1974; Bernard Bailyn, Education in the Forming of American Society: Needs and Opportunities for Study, New York: W. W. Norton and Company, Inc. , 1972; Joel H. Spring, Education and the Rise of the Corporate State, Boston: Beacon Press, 1972; and, Robert C. Young, William V. Clive, and Benton E. Miles, Vocational Education Planning: Manpower, Priorities, and Dollars, Research and Development Series No. 68, The Center for Vocational and Technical Education, The Ohio State University, 1900 Kenny Road, Columbus, Ohio 43210, 1972, pp. 8-17.

7 The treatment here follows that of Derek L. Bosworth, Graham J. Evans, and Robert M. Lindley, "Mechanistic Manpower Models," in J. Stuart Wabe (ed.), Problems in Manpower Forecasting, Lexington, MA: Lexington Books, D.C. Heath and Company, 1974, pp. 61-84.

8 It is also necessary to produce an independent estimate of total employment at the end of the projection period, to be used as a control total since the independent occupation and industry effects have been combined in a way which violates the premises upon which they were generated.

9 For a technical treatment of this technique see M. Bacharach, Biproportional Matrices and Input-Output Change, Cambridge: Cambridge University Press, 1970.

10 Guy H. Orcutt, "Simulation of Economic Systems," American Economic Review, L:5 (December 1960), p. 897, quoted in David S. Huang, Regression and Econometric Methods, New York: John Wiley and Sons, Inc., 1970, pp. 3-4.

11 See: Roger H. Bezdek, Long Range Forecasting of Manpower requirements—Theory and Applications, IEEE Monograph, Institute of Electrical and Electronics Engineers, Inc., New York, N.Y., 10017, 1974, pp. 2-12 through 2-16; and, R. G. Hollister, "An Evaluation of a Manpower Forecasting Exercise," in Mark Blaug (ed.), The Economics of Education, London: Penguin, 1968, pp. 340-342.

12 Recent contributions which provide many further references include: Richard B. Freeman and David W. Breneman, Forecasting the Ph.D. Labor Market: Pitfalls for Policy, Technical Report Number Two, National Board on Graduate Education, 2101 Constitution Avenue, N.W., Washington, D.C. 20418, April 1974; and from the same source, Doctorate Manpower Forecasts and Policy: A Report With Recommendations of the National Board on Graduate Education, Number Two, November 1973; Margaret S. Gordon (ed.), Higher Education, and the Labor Market, New York: McGraw Hill Book Company, 1974; and, Walter Y. Oi, "Scientific Manpower Forecasts from the Viewpoint of a Dismal Scientist," Working Paper No.47, Industrial Relations Section, Princeton University, May 1974, 90 pp.

13 A recent source with references to related literature is: U. E. Reinhardt, "Health Manpower Forecasting: Current Methodology and Its Impact on Health Manpower Policy," in Mimeograph, 1974. Also see: Lanis Hicks, Health Manpower Planning: An Annotated Bibliography, Office of Health Manpower Planning, Department of Social Services, 600 E. Capitol Avenue, Jefferson City, MO 65101, June 1975, and Volume II, dated September 1975.

14 See: David W. Breneman, "Examining Past Assessments: Yesterday's Manpower Projections in Retrospect," unpublished paper prepared for the Symposium on the Human Resources of Science and Engineering—Today and Tomorrow, held January 27, 1975; Roger H. Bezdek, loc cit; Bashir Ahmad and Mark Blaug (eds.), The Practice of Manpower-Forecasting: Collection of Case Studies, San Francisco: Jossey-Bass, Inc., 1973; and, J. Stuart Wabe (ed.), Problems in Manpower Forecasting, Lexington, MA.: D. C. Heath and Company, 1974.

15 Of special interest are: Hollis B. Chenery (ed.), Studies in Development Planning, Harvard Economic Studies Volume 136, Cambridge: Harvard University Press, 1971; F. Champion Ward (ed.), Education and Development Reconsidered (The Bellagio Conference Papers), New York: Praeger Publishers, 1974; Muhammad Shamsul Huq, Education, Manpower, and Development in South and Southeast Asia, New York: Praeger Publishers, 1975; and, George Psacharopoulos, Returns to Education: An International Comparison, San Francisco:--Jossey-Bass, Inc. , 1973.

16 A very readable reference is: George Psacharopoulos, "Substitution Assumptions Versus Empirical Evidence in Manpower Planning," De Economist, 121:6 (1973), pp. 609-625.

17 An important new book is: Lester Thurow, Generating Inequality, New York: Basic Books Inc. , 1975.

18 R. G. Hollister, *op. cit.*, p. 339.

19 H.S. Parnes, *op. cit.*, p. 265.

20 The internal rate of return is the interest rate which equates the discounted stream of benefits accruing to participants in a program to the discounted stream of direct and indirect costs associated with that program.

21 See, for example, George Psacharopoulos, "Substitution Assumptions ...," *op cit*, pp. 622-623; Stuart Wabe, *op cit*, pp. 77 ff.; Bernard Rostker, "Manpower Theory and Policy and the Residual Occupational Elasticity of Substitution," Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia, 22151 (Order No. PB 192 061), 1970, 207 pp; T. M. Power, "Elasticities of Substitution Between Different Types of Labor: Theoretical Analysis and Empirical Examples," University Microfilms, Ann Arbor, Michigan (Order No.72-24, 696), 1972, 252 pp. ; Randall D. Weiss, "Elasticities of Demand for Capital and Occupation-Sex Categories of Labor in U.S. Manufacturing Industries 1950 and 1960," Working Paper, Project on the Economics of Discrimination, University of Maryland, College Park, Maryland, undated (1974?), 38 pp; William R. Buechner, "Technological Change and the Occupational Composition of the American Labor Force, 1950-1960," National Technical Information Service, Springfield, Virginia 22151 (Order No. PB-210 631), 1972, 337 pp.; and Richard Tiller, Labor Substitution and Manpower Planning, unpublished Ph.D. dissertation, Columbia, MO: The University of Missouri-Columbia, 1975.

22 Lester C. Thurow, *op cit*, pp. 75-86, offers a different treatment.

23 W. Lee Hansen, "Labor Force and Occupational Projections," 1965 Proceedings of the Industrial Relations Research Association, Madison, Wisconsin, pp. 10-20.

24 An excellent reference, with citations to earlier contributions, is: Eugene J. Devine, "A Critical Review of Shortage Concepts," in Analysis of Manpower Shortages in Local Government, New York: Praeger Publishers, 1970, pp. 3-13.

25 In fact, this result is not unambiguous because of complex simultaneities between the supply of and demand for physician services.

26 W. Lee Hansen, *loc cit.*

27 See, for example, Richard B. Freeman, "Occupational Training in Proprietary Schools and Technical Institutes," Discussion Paper Number 332, Harvard Institute of Economic Research, Cambridge, MA 02138, November 1973, 18 pp.

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30 See: Peter B. Doeringer and Michael J. Piore, *op cit.*, pp.13-40.

31 Oliver E. Williamson, *et al.*, *loc cit.*

32 *Ibid*, p 257.

33 Lester C. Thurow, *op cit*, pp. 75-97.

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36 See: National Bureau of Economic Research, Human Resources: Fiftieth Anniversary Colloquium VI, New York: Columbia University Press, 1972, 97 pp.; Jacob Mincer, Schooling, Experience, and Earnings, Human Behavior and Social Institutions No.2, New York: Columbia University Press, 1974; and, Edward F. Denison, Accounting for United States Economic Growth 1929-1969, Washington, D.C.: The Brookings Institution, 1974, pp. 219-259.

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40 Alba M. Edwards, Comparative Occupational Statistics for the U.S. 1870-1940, quoted in James G. Scoville, Manpower and Occupational Analysis: Concepts and Measurements, Lexington, MA: D. C. Heath and Company, 1972, p. 25 emphasis added by Scoville).

41 See: Glen G. Cain, W. Lee Hansen, and Burton Wiesbrod, "Occupational Classification: An Economic Approach," Monthly Labor Review, 90:2 (February 1967), pp. 48-52; and, Alan Roskam and Michael Podgursky, Occupational Classification Systems and Vocational Education Planning, Jefferson City, MO: Research Coordinating Unit, Missouri Department of Elementary and Secondary Education, Jefferson Building, 65101, 1975.

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47 Willard Wirtz and Harold Goldstein, *op cit*, p. 32.

48 J. Feldman and H. Kanter, "Organizational Decision-Making," in J. March (ed.), Handbook of Organizations, Chicago: 1965, p. 615, as quoted in Oliver Williamson *et al.*, *op cit*, p. 262.

49 See, for example: Joseph E. Malinski, Planning Techniques for Local Programs of Vocational Education, Information Series 63 VT 014 964 , ERIC Clearinghouse on Vocational and Technical Education, The Center for Vocational and Technical Education, The Ohio State University, 1900 Kenny Road, Columbus, Ohio 43210, July 1972; and, from the same source, James E. Wall , Review and Synthesis of Strategies for Effecting Change in Vocational and Technical Education, Information Series 59 VT 014704 , April 1972.

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51 Wirtz and Goldstein refer to an unspecified forthcoming study of communications limitations conducted under National Institute of Education auspices. Also see: Donald W. Drewes *et al.*, Questions in Vocational Education, Career and Vocational Education Professional Development Report No.18, Center for Occupational Education, School of Education, North Carolina State University at Raleigh, 1975; and, from the same source, Project EDNEED: Classification of Information for the Development of a National Vocational Education Information System, March, 1975, pp. 73 and 113.

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56 Quoted in Joseph Froomkin, "Long-Range Planning in Perspective" in Organization for Economic Cooperation and Development, Long Range Policy Planning in Education, Paris, 1973, p. 296.

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