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ABSTRACT

Today's enrollment situation is uncertain, especially in comparison with recent past. Some institutions experience growth in student numbers, while in others enrollments plateau or decline. Nontraditional students challenge a variety of institutional arrangements. Many past assumptions for predicting enrollments are inadequate. Projection studies have utilized techniques and produced results that have constructively shaped thinking about the enrollment picture of the future. This analysis of projection models is directed along two dimensions: first, a description of the studies in terms of strategies employed and the intended purpose of the study, and second, a comparison of the studies that identify problems with definitions, methodological limitations, and key assumptions. Strategies employed are grouped into 3 categories: trend extrapolation, policy alternatives, and futurist approaches. Projection studies analyzed were developed for purposes that include demographic description, planning information, resource needs, manpower supply and demand, and policy recommendations. The comparison of projection studies utilizes categories that are congruent with the information needs of leaders in educational systems and institutions. (Author/PG)

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PROJECTING COLLEGE AND UNIVERSITY ENROLLMENTS:
ANALYZING THE PAST AND FOCUSING THE FUTURE

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I. MAJOR FINDINGS

Today's enrollment situation is uncertain, especially in comparison with the recent past. Tomorrow's is even more precarious. Some institutions experience growth in student numbers, while in others enrollments plateau or decline. Non-traditional students challenge a variety of institutional arrangements. Many past assumptions for predicting enrollments are inadequate. Still, educational leaders fall back on recent projections as they plan the future of their educational systems or institutions. No other single factor will influence the shape of tomorrow's higher education more than the number and kinds of people who will and will not attend. The importance of enrollment predictions has never been more critical.

Projection studies have utilized techniques and produced results that have constructively shaped thinking about the enrollment picture of the future. Significantly, they have served to direct attention forward. However, volatile times require a careful analysis of the structure, assumptions, strengths, and weaknesses of earlier studies.

This analysis of projection models is directed along two dimensions: first, a description of the studies in terms of strategies employed and the intended purpose of the study, and second, a comparison of the studies which identifies problems with definitions, methodological limitations, and key assumptions. Strategies employed are grouped into three categories:

trend extrapolation, policy alternatives, and futuristic approaches. Projection studies analyzed were developed for purposes which include demographic description, planning information, resource needs, manpower supply and demand, and policy recommendations. The comparison of projection studies utilizes categories that are congruent with the information needs of leaders in educational systems and institutions.

An analysis of several enrollment studies has produced the following major findings:

1. The underlying assumptions in existing enrollment studies have been inadequate for projecting college enrollments.
 - a. The usage of only the 18-21 year old age cohort as the basis for projection is misleading. Broader cohort populations must be utilized in order to reflect the extension of the period of education and the participation of older learners.
 - b. Although it is necessary to utilize birth rate assumptions in predicting the size of traditional college cohort populations beyond 1990, it must be recognized that birth rate trends are currently in a state of flux.
 - c. Most projection studies assume implicitly that trends in underlying factors influencing attendance patterns will continue along established lines. Many of such assumptions seem unlikely.
 - d. Projection studies have assumed that the institutional composition of higher education will not change. The emergence of the notion of postsecondary education suggests that different institutional forms and enrollment patterns should be considered for the future.
2. Existing projection studies are not easily compared.
 - a. Definitions of terms vary among the individual studies.
 - b. The actual factors projected as well as their levels of disaggregation vary from study to study.
 - c. Overly aggregated data may mask significant trends in certain enrollment categories.
3. The use of extrapolation assumes that the future will reflect the past along certain important dimensions. To be confident of the

results of extrapolation, the factors selected for extrapolation must be appropriate and trend relationships must be understood.

- a. The enrollment projections of the early sixties, which were based on enrollment trends of the fifties, underestimated consistently the actual enrollments of the early sixties.
 - b. The enrollment projections of the early seventies, however, based on the enrollment trends of the sixties, overestimated consistently the actual enrollment figures of the past several years.
 - c. Existing projections fall short of the mark by extrapolating enrollments, rather than the influencing factors that actually determine enrollments.
4. By extrapolating enrollments rather than the underlying factors actually influencing enrollments, existing projections fail to incorporate mechanisms for explaining why enrollments are changing. Therefore, existing studies are unable to predict that changes in enrollment trends will occur.
 5. It is recommended that new projection techniques be developed, grounded on an understanding of the relationships between enrollments and underlying social values (e.g., credentialism), social conditions (e.g., demographic factors), diffusion of communications technology (e.g., cable television), public policy (e.g., financial aid), and educational systems factors (e.g., new institutions).
 - a. The incorporation of underlying factors into enrollment projections will improve the quality of actual enrollment projections.
 - b. Also, the educator can utilize both the improved projection and the predictions of key factors to develop educational and institutional policy.
 6. Although a number of the influencing factors are not measured currently, they are regularly monitorable.
 7. The future states of the underlying factors may be predicted utilizing a combination of the following three techniques: extrapolation of reasonable trends, alteration of trends based on changes in relevant moderating factors, and the recognition of floors and ceilings that may operate to restrict variations in trends to within certain limits.
 8. Considering the mechanisms for monitoring and predicting the factors influencing postsecondary educational enrollments, it is recommended that a framework be developed for describing the relationships between the key underlying factors and potential learners, educational aspirants, and actual enrollments, appropriately disaggregated.

II. REVIEW AND ANALYSIS OF PAST PROJECTIONS

In this analysis, enrollment projections are described using the framework of a model. Three fundamental features are emphasized: the inputs, the outputs, and the internal relationships linking the two. The basic driving factors, such as population characteristics, are considered inputs; the categories of projected enrollments, such as undergraduate or graduate students, are identified as the outputs; and the methodology employed to generate these projections make up the internal relationships. Virtually all enrollment projections can be translated into this framework.

Features which distinguish one projection from another relate to the type of methodology or strategy used in making the projection and the basic purpose or intended use of a particular projection. Tables 1 through 4 illustrate both the common and distinguishing features of several studies of future enrollments where the strategy and purpose of these studies have been considered as the two most important descriptive features.¹ The analysis of these enrollment projections, as illustrated in Table 5, has been made from the viewpoint of the administrator in higher education. It was recognized that each study had some particular set of objectives toward which the study was directed. But the basic questions here include the following: Does a particular projection allow an educator to identify the factors included in a projection and relate these factors to

¹ See the Bibliography for a detailed list of studies included.

a particular setting? Does the nature of a projection assist in making planning decisions, provide alternatives for planning, or describe a short or long term outlook? What are the important indicators that an educator would follow to monitor the validity or accuracy of a given projection?

The Projection Strategy

Three general categories are used to describe basic projection methodology: trend extrapolation, policy alternatives, and futurist approaches.

These are not, however, considered to be mutually exclusive, and all three techniques could conceivably be present in a given study, as illustrated in Table 1.

The most common methodology employed in making enrollment projections is trend analysis using various techniques of extrapolation. However, two developments of recent years have enlarged the spectrum of projection strategies. Extrapolative techniques have been combined with alternative sets of policy assumptions to produce a category labeled policy alternatives. In addition, the growth of a body of futurist literature has provided a third perspective from which to generate projections of enrollments.

Table 2 highlights several general distinguishing features of these three classes in terms of the degree to which a technique has evolved and been accepted for use, the length of the time frame, the possible detail available in the projected categories, and the methodological treatment of output or dependent quantities vs. input or independent quantities.

More specifically, trend extrapolation requires some time period in the past as a base, and then projects incrementally from year to year into

TABLE 1.

Classification of Projection Studies
Based on Projection Strategy

Studies*	Trend Extrapolation	Policy Alternatives	Futurist Approaches
U.S. Bureau of the Census	X		
U.S. Office of Education	X		
Carnegie Commission, <u>New Students and New Places</u>	X	X	
Commission on Human Resources	X		
Cartter-Farrell	X		
Office of Program Planning and Evaluation (USOE)	X	X	
RAND	X	X	(X)
Marien, <u>Beyond The Carnegie Commission</u>		X	X
* Exact sources listed in Bibliography			

TABLE 2.

Comparison of Strategies of Current Projections

Criteria	Trend Extrapolation	Policy Alternatives	Futurist Approaches
State of Evolution & Acceptance	High	Medium	Low
Type of Variables Projected	Dependent	Dependent	Independent & Dependent
Length of Time Frame	Short	Medium	Long
Disaggregation of Outputs	High	Medium	Low to None

the future. The actual enrollments are not projected directly, but indirectly through the extrapolation of enrollment percentages which are in turn applied to population projections. The projections of the U.S. Census and the U.S. Office of Education are the prime examples of this technique.

The policy alternative approach is distinguished by a set of projections each of which is the result of a different combination of assumptions relating to decisions made either by an institution or some external constituency of the institution. Although it is possible through simple parameter manipulation to provide a range of different extrapolated projections, the policy alternative approach goes one step further by relating different policy decisions directly to ensuing enrollment projections. Carnegie Commission projections are examples of the policy alternative approach in contrast to the early Cartter-Farrell work which developed several alternative projections without relating them directly to specific sets of educational policy assumptions.

One additional distinction must be made regarding two types of projection alternatives, namely, those alternatives that leading educators desire to see transpire, and those that leading indicators would suggest will most likely occur. The two types are not easily separated, but their presence must be acknowledged. The Carnegie Commission report, New Students and New Places, is a recent example containing both a basic enrollment estimate and a set of recommended alternative policies which would adjust that estimate toward a desired outcome.

Futurist approaches are only beginning to develop, and as yet have not produced the characteristically tangible, numerical results associated with the other two techniques. They have been more concerned with interrelationships between factors affecting the relatively distant future. This strategy depicts the future through construction of scenarios, which are descriptions of the future states of factors influencing society and the interconnections between these factors. A range of widely differing scenarios, called alternative futures, may be used as a means of illustrating the effects of many interconnected alternatives and how they would impact upon the long-term future of education. These scenarios have the potential of indicating long term effects of current decisions.

Unfortunately, the futurist approach requires knowledge of the future states of various key factors. We are unable currently to predict those future states with an acceptable degree of confidence. Neither are linkages easily made from long term scenarios to the near-term future. Nevertheless, the perspective of the futurist approach provides new factors that can be added to those of the past to form a more comprehensive basis upon which to generate valid enrollment projections of the future.

Two particular studies included in Table 1 illustrate some attempts to incorporate the futurist approach into enrollment forecasting but differ considerably in the type of results produced. The RAND study employs the scenario technique to describe future settings, but continues to use extrapolation and policy considerations for generating output data. The Marien study considers six alternative environments for the future of education, but does not develop actual enrollment projection data.

The Purpose of the Projection

The intended purpose of an enrollment projection determines in most cases the definitions of quantities used, many of the assumptions made, the types of output categories projected, and to some degree the methodological approach used. Tables 3 and 4 illustrate this relationship by describing projection studies according to their purposes, such as demographic descriptions, manpower studies, planning data, resource needs, latent demand, and policy recommendations. In most of these studies, population data are the primary driving factors, and the methodology employed relies to some degree on extrapolation. However, the latent demand or aspirational focus of the model developed by the Office of Program Planning and Evaluation (OPPE) utilizes high school graduates as the main input and uses an entirely different technique for projecting the output data.

The studies which are intended for near-term future planning purposes such as USOE (for general planning) and Commission for Human Resources (for manpower development) tend to have single projections rather than several alternatives, and also produce a larger number of specific output categories. The longer-term studies tend to provide alternative projections usually reflecting the anticipated extremes of long term future uncertainties. Examples here include the Census projections, the Carter-Farrell study, and some of the work of the Carnegie Commission. The regular studies done by the U.S. Bureau of the Census and the U.S. Office of Education reflect the functions of government agencies to provide updated information.

Projection strategies and purposes serve to introduce the range of conceptual bases used in developing enrollment projections. An analysis at the operational level reveals additional similarities and differences

which are grouped under three headings: limits to comparison, methodological limitations, and the limitation of underlying assumptions.

Limits to Comparison

Strengths and weaknesses associated with individual projections often emerge when a comparison is made between several studies. However, this comparison is limited by problems related to the definition of terms, the selection of output categories, and the nature of aggregate data.

1. Definitions of terms vary among the individual studies. For example, when the U.S. Bureau of the Census projects total degree credit enrollment, the part-time student is excluded. This is in contrast to the practice of the U.S. Office of Education. The Carnegie Commission further confuses the comparison by inadequately describing what is included in its definition of total enrollment. Upon comparison with USOE projections, it appears that the Carnegie Commission includes non-degree credit enrollment in its definition of total enrollment. Figure 1 displays the total enrollments as projected by several studies. Part of the wide variation in these curves can be attributed to differences in the definition of students and total enrollment.
2. The actual factors projected, as well as their levels of disaggregation, vary from study to study. In fact, Table 3 illustrates that the variation in categories among the studies is such that only the total degree credit enrollment category is common among the studies. The U.S. Office of Education displays the most extensive disaggregation of categories, including total degree credit, degree/non-degree, public/private,

FIGURE 1
Projections of Total Enrollment
1965 - 2000

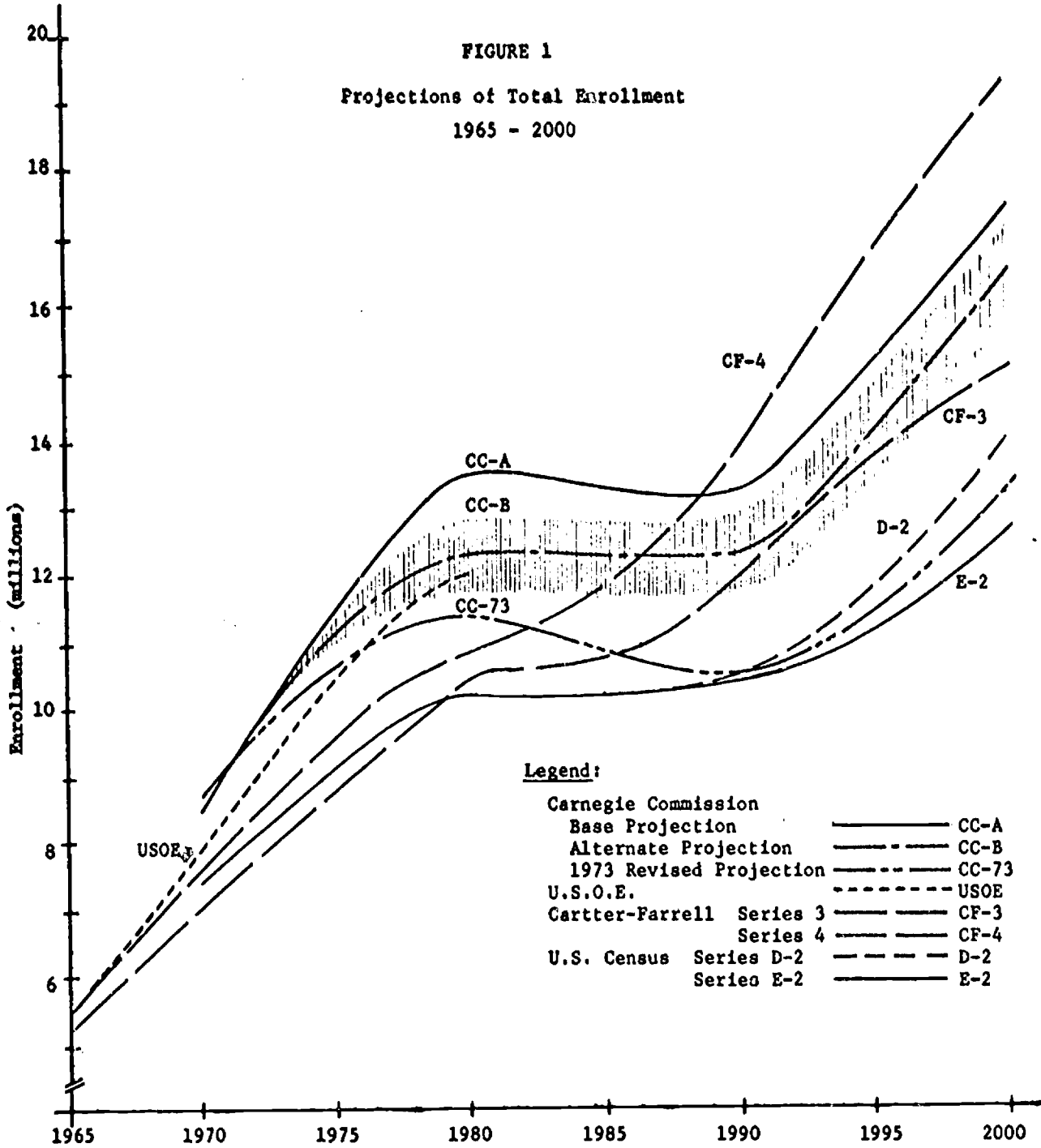


TABLE 3.

Description of Projection Studies
Based on Projection Categories

Studies	Area of Postsecondary Education		Degree Level			Sex	Demographic		Institutional		
	Traditional	Periphery	Total	Undergrad.	Grad.		Prof.	Age Group	SES/ Ability	Type	Control
U.S. Bureau of the Census	X		X				X				
U.S. Office of Education	X		X	X	X		X			X	
Carnegie Commission, <u>New Students & New Places</u>	X		X	X	X					X	
Commission on Human Resources	X		X	X	X	X	X				
Carter-Farrell	X		X	X	X					(X)	
Office of Program Planning & Evaluation (USOE)	X		X	X	X			X			
RAND	X		X								
Moses, "The 'New' Domain of Post-secondary Education"	X	X	X	X	X						

male/female, and full-time/part-time categories. The U.S. Bureau of the Census exhibits almost no disaggregation, with only sex, age groups, and total degree credit as its categories. Differences in the definitions of the type of enrollment projected in various categories make strict comparison of projection results highly suspect.

3. Overly aggregated data may mask significant trends in certain enrollment categories. Shifting enrollment patterns between institutional types, for example, are not evident in projections that are not sufficiently disaggregated. The projections made by the USOE, CHR, and OPPE provide the most specific information. However, even the application of these projections is difficult for specific planning and decision making needs at the state and institutional level. Consequently, appropriate disaggregation serves both the purpose of adequately describing enrollment trends and providing valuable planning information.

Methodological Limitations

A distinction is made in this analysis of projection studies between methodological techniques, such as extrapolation, and underlying assumptions, such as the selection of a population projection. The important methodological features which need to be recognized in any study include the use of extrapolative techniques, the corresponding selection of factors upon which an extrapolation is based, and the linkages between policy assumptions and the projection method. Various methodologies analyzed are given in Table 4.

1. The use of extrapolation assumes that the future will reflect the past and often ignores the fact that linear growth along traditional lines

TABLE 4. Comprehensive Description of Enrollment Projections*

	U.S. Bureau of the Census	U.S. Office of Education	Carnegie Commission	Cartter-Farrrell
Date Published	January 1972	1972	October 1971	1965
Projection Period	1975-2000	1971-1980	1970-2000	1965-2000
Frequency	Occasional	Annual	Single study	Single study
Purpose of Projection	Demographic Projection for U.S.	General planning data for education	Background for recommendations	Future faculty manpower needs
Driving Factors	14-34 population projections and enrollment rates by sex	18-21 population projection (Series D), 18-21 enrollment ratio by sex	18-21 population projection (Series D), 18-21 enrollment ratios, Commission recommendations	18-21 population projection (Series B), 18-21 enrollment ratios, continuation ratios
Projected Categories	1. Total degree-credit 2. Male/Female 3. Age groups (14-34)	1. Total enrollment 2. Degree/Non-degree 3. Undergrad./Graduate 4. Male/Female 5. 2 yr/4 yr 6. Full-time/Part-time 7. Public/Private 8. FTE 9. First time 10. Other	1. Total degree credit 2. Undergrad./Graduate 3. Policy increments 4. 13 institutional types	1. Total degree credit 2. Undergrad./Graduate 3. 2 yr/4 yr 4. Other
Alternative Projections	Population series B through E & three enrollment series	Single projection	Two sets of assumptions	Five enrollment series
Methodology	1. Logarithmic extrapolation of enrollment rates by age, sex 2. Application to population projections 3. Distribution between elem., sec., & higher education levels	1. Linear extrapolation of 18-21 enrollment ratios 2. Application to 18-21 projections 3. Distribution among projected categories	1. Extrapolation of 18-21 undergrad. enrollment ratios by sex 2. Application to 18-21 projection 3. Addition of graduate projections 4. Incremental adjustment for each policy alternative	1. Design of five undergrad. enrollment ratio series 2. Application to 18-21 projection 3. Application of distributions and continuation ratios

* Exact sources listed in Bibliography.

TABLE 4. Comprehensive Description of Enrollment Projections (continued)

	Commission on Human Resources	Office of Program Plan- ning & Evaluation (USOE)	Butz-Jordan, RAND
Date Published	1970	1970	February 1972
Projection Period	1966-1975	1968-1977	1970-2000
Frequency	Single study	Single study	Single study
Purpose of Projection	Future Professional manpower supply	Latent demand and student aid needs	Future structure and resource requirements
Driving Factors	17-35+ population projection & enrollment ratios by sex (FT and PT)	Projection of high school graduates, Project Talent data	Population projections (Series B & E), 18-24 enrollment ratios plus adjustments
Projected Categories	<ol style="list-style-type: none"> 1. Total degree credit 2. Undergrad./Graduate 3. Male/Female 4. Full-time/Part-time 5. First-time 6. Advanced professional 7. Age groups 	<ol style="list-style-type: none"> 1. Total degree credit 2. Undergrad./Graduate 3. FTE 4. Income/ability quartile 	<ol style="list-style-type: none"> 1. Total degree credit 2. Other
Alternative Projections	Single Projection	Two sets of policy alternatives	Population Series B & E and two enrollment rates
Methodology	<ol style="list-style-type: none"> 1. Extrapolation of age group enrollment rates and continuation ratios 2. Application to population projections 3. Use of additional data for subdivisions 	<ol style="list-style-type: none"> 1. Projection of attendance rates for income and achievement quartile 2. Application to projection of high school graduates 3. Use of Project Talent data for distribution into projected categories 	<ol style="list-style-type: none"> 1. Development of alternate scenarios of future educational forms 2. Design of enrollment ratios 3. Application to 18-24 projections with adjustments for older ages

is questionable given the uncertainties of current enrollment trends.

The primary examples are the products of the Bureau of the Census, the Office of Education, the Commission on Human Resources, and to some extent the Carnegie Commission. The major strength of these projections is that they have utilized readily available, historically consistent data to develop enrollment predictions which have been acceptable to educators who believe in incrementalism and growth. Unfortunately, the recent history of enrollment projections which use extrapolative techniques does not instill confidence in their results. The enrollment projections of the early sixties, which were based on enrollment trends of the fifties, underestimated consistently the actual enrollments of the early sixties. The enrollment projections of the early seventies, however, based on the enrollment trends of the sixties, overestimated consistently the actual enrollment figures of the past several years.

2. The selection of the factors to be extrapolated determines largely the utility of the projection. The most common technique is extrapolating enrollment ratios of some age cohort population. This methodology avoids the issue that enrollment trends are determined by underlying socio-economic factors that influence individual aspirations and educational opportunities. It is in this sense that extrapolation of enrollment ratios or percentages is considered to be extrapolation of a dependent variable, and those underlying, socio-economic factors actually determining enrollment trends are considered to be independent variables.

Although most projection studies do not attempt to deal with related socio-economic factors, recognition of their influences is treated to some degree in the studies by the Carnegie Commission, RAND, and the Office of Program Planning and Evaluation of the U.S. Office of Education, as illustrated in Table 4. The Carnegie Commission uses their educational policy recommendations as the basis for incremental adjustment of their basic enrollment projections. The Carnegie recommendations reflect both decisions made internally by educational institutions and socio-economic forces external to the educational system. The OPPE also assumes changing socio-economic conditions, and RAND projects enrollments subjectively to correspond with changing internal educational factors. In contrast, Carter-Farrell and several U.S. Bureau of Census projections are based on subjective enrollment rate variations without regard for changes in socio-economic factors.

3. Projection studies that suggest policy alternatives do not develop fully the linkage between the enrollment figures and those policy alternatives. Credit is due, however, to a number of the studies for going beyond the mere extrapolation of past trends by suggesting how some policy changes may have an impact on enrollment figures. The Carnegie Commission, when incrementally adjusting its base projection figures, does not indicate clearly the linkages between its estimated enrollment adjustments and its policy recommendations. The OPPE demand model links more clearly projected enrollments with policy alternatives affecting financial resources available to educational aspirants. For

projections to be useful for planning, the manner in which enrollment calculations are derived from policy assumptions must be specified.

Limitation of Underlying Assumptions

An analysis of the projection model assumptions, summarized in Table 5, promotes an understanding of possible limits to the application of enrollment projections. The explicit age cohort and birth rate assumptions and the implicit assumptions regarding societal factors deserve particular mention.

1. Traditionally the 18-21 age group has been used as the cohort population from which undergraduate enrollments have been drawn. Therefore, enrollment rates have been derived from the ratio of total undergraduate enrollments (assumed to be 18-21) to the total 18-21 population age group. This ratio has been an accurate predictor of undergraduate enrollments in the past, and has also been a fairly accurate descriptor of undergraduate enrollments. Increasing numbers of older college students challenge these two assumptions. In fact, recent publications of the Bureau of the Census indicate that the 18-21 year-old age group now accounts for only 52% of the male and 68% of the female college enrollment.² The U.S. Office of Education, the Carnegie Commission, and the OPPE base their enrollment rates on the 18-21 age group. The Commission on Human Resources and the Bureau of the Census use a broader age range. As older learners participate in postsecondary education, a broader age range must be adopted as a basis for predicting and describing the student population.

² U.S. Bureau of the Census. "Social and Economic Characteristics of Students: October 1971," Current Population Reports, Series P-20, No. 241, October 1972, p. 15.

TABLE 5. An Assessment of Enrollment Projections

	Projection Assumptions	Projection Strengths	Projection Limitations
U.S. Bureau of the Census	<ol style="list-style-type: none"> 1. Increasing high school graduation rate 2. Increasing continuation to college 3. Constant 1969 school level distribution 4. Unchanging cohort enrollment pattern 5. High, moderate and no enrollment rate increase 	<ol style="list-style-type: none"> 1. Statistically sophisticated 2. Includes wide range of age cohorts (1970 data includes ages through 49) 3. Broad range of alternative projections 4. Periodically updated 	<ol style="list-style-type: none"> 1. Limited disaggregation 2. Excludes ages over 34
U.S. Office of Education	<ol style="list-style-type: none"> 1. Continuation of all '60-'70 trends (e.g., continuation and enrollment rates) 2. 18-21 cohort is valid predictor of enrollment 3. Validity of 20-year (+ 10 years) operating framework 	<ol style="list-style-type: none"> 1. High degree of disaggregation 2. Annually updated 	<ol style="list-style-type: none"> 1. High dependence on past trends 2. Utilization of single age group (18-21) 3. Two year delay in publication 4. Excludes all separate adult and most extension enrollment
Carnegie Commission	<p>A-1. Continuation of past population patterns and enrollment ratio trends</p> <ol style="list-style-type: none"> 2. Growth uninhibited by structural changes in education and job market demand 3. Adequate funding 4. Increasing high school graduation rate and per capita income <p>B-1. Increased enrollments through student aid, more institutions, and adult education</p> <ol style="list-style-type: none"> 2. Decreased enrollments through shortened degrees, two-year college emphasis, and graduate depression factors 	<ol style="list-style-type: none"> 1. Relates both internal and external policy alternatives to enrollments 2. Explicit and readable statement of underlying assumptions 	<ol style="list-style-type: none"> 1. Limited disaggregation 2. Inconsistent projections 3. Utilization of single age group (18-21) 4. Series D data questionable 5. Inadequate description of modeling process

TABLE 5. An Assessment of Enrollment Projections (continued)

Projection Assumptions

Projection Strengths

Projection Limitations

	Projection Assumptions	Projection Strengths	Projection Limitations
Carter-Farrell	<ol style="list-style-type: none"> 1. Continuation of past growth trends 2. Increasing 2-year college percentage of enrollments 3. Increasing continuation ratio to graduate school 	<ol style="list-style-type: none"> 1. Range of alternative projections 	<ol style="list-style-type: none"> 1. Limited disaggregation 2. Utilization of single age group (18-21) 3. Series B data obsolete
Commission on Human Resources	<ol style="list-style-type: none"> 1. Continuation of past growth trends in enrollment ratios (with some variations) 2. Increasing enrollment rates for women 3. Increasing enrollments of older age groups 	<ol style="list-style-type: none"> 1. Expands 18-21 age group base to age groups ranging from 17-35+ 2. High degree of disaggregation 3. Develops graduate and professional enrollment 	<ol style="list-style-type: none"> 1. High dependence on past trends for output categories 2. Limited utility due to early date and short projection period
Office of Program Planning and Evaluation, USOE	<ol style="list-style-type: none"> 1. Increasing propensity of lower levels of achievement and income to enroll 2. Increasing persistence rates for certain student types 3. Uses Project Talent attrition rates 4. Constant ratios between projected categories 5. Equalization of attendance rates between income/ability quartiles 6. Adequate financial aid 	<ol style="list-style-type: none"> 1. Sophisticated model based on economic and social variables 2. Projects some underlying socioeconomic factors 3. Considers enrollment delay after high school 	<ol style="list-style-type: none"> 1. High school graduate drive factor excludes adult learners
Butz-Jordan, RAND	<ol style="list-style-type: none"> 1. Increasing use of educational technology 2. Development of extended campus programs 3. Organizational changes: <ol style="list-style-type: none"> a. Survey courses taught in high school b. Evolution of 2-year baccalaureate degree institutions c. Separate graduate and research institutions 4. Increasing adult education 	<ol style="list-style-type: none"> 1. Attempts to develop alternative futures approach 2. Uses 18-24 cohort and adjusts for older age groups 	<ol style="list-style-type: none"> 1. Limited disaggregation 2. Inadequate description of modeling process 3. Weak link between future factors and enrollment projections

2. The birth rate assumption does not pose a problem for postsecondary education enrollment projections unless a projection extends beyond the year 1990. Up to 1990, the potential college age population of 18-21 and older age cohorts have already been born. Beyond 1990, birthrate assumptions must be utilized to estimate the cohort populations. Significant declines in birthrates have occurred in the past several years, prompting the U.S. Bureau of the Census to issue population predictions based on revised, "Series F" birthrate figures. Under the population predictions utilizing the Series F birthrate assumptions, the size of the populations in the 15-19 and 20-24 age groups are 2.5 and 1.7 million less, respectively, than the projections using the birthrate assumptions that seemed valid as recently as two years ago. Such discrepancies suggest that a high degree of uncertainty currently exists in the usage of birthrate assumptions in population projection.
3. Projection studies have assumed that the institutional composition of higher education will not change. With an emergence of the notion of postsecondary education, different institutional forms (the educational periphery described by Moses) and enrollment patterns should be considered. The impact of learning activities occurring outside the boundaries of traditional higher education will undoubtedly affect the number and source of future higher education aspirants. Institutions traditionally considered in the periphery of higher education, such as proprietary, business, industry, and government organizations, are increasingly assuming a significant responsibility for providing educational opportunities to post high school enrollees.

In the projection studies analyzed an implicit assumption is made that trends in key underlying factors which influence attendance patterns, such as social values and public policies, will continue along established lines. Yet changing enrollment patterns make this implicit assumption seem very unlikely. The Bureau of the Census has reported decreasing male and constant female college enrollment rates since 1969.³ A declining rate of growth of first time freshmen enrollments became an absolute drop in 1971 ranging from 1.7% to 3.3% in several categories of public and private institutions.⁴ Parker reported data that illustrated this trend continuing into 1972. Furthermore, part-time enrollment increases combined with nominal increases in full-time students to reduce the full-time equivalent enrollment in most institutional types. Two-year institutions and technical/professional schools were the important exceptions to these trends.^{5,6} None of these trends were anticipated by the enrollment projections analyzed.

The response has produced a major revision by the Carnegie Commission of their projection published only two years earlier.⁷ The revised enrollment

³ U.S. Bureau of the Census. "School Enrollment: October 1972," (early release), Current Population Reports, Series P-20, March 1973, p. 3.

⁴ Peterson, R.E. American College and University Enrollment Trends in 1971, Carnegie Commission on Higher Education, 1972, p. 13.

⁵ Parker, G.G. "College and University Enrollments in America, 1972-73," Intellect (101:2347) February 1973, pp. 314-337.

⁶ Parker, G.G. "Enrollments in American Two Year Colleges, 1972-73," Intellect (101:2349) April 1973, pp. 457-474.

⁷ Watkins, Beverly T. "Future College Enrollments Now Seen Falling Far Short of Previous Projections," The Chronicle of Higher Education, (viii:2) October 1, 1973.

figures displayed in Figure 1 indicate reductions of from 15% to 25% over the period 1980 to 2000. The revision is dramatic evidence of the fundamental problem of current projection methodology. By extrapolating enrollments rather than the underlying factors actually influencing enrollments, existing projections fail to incorporate mechanisms for explaining why enrollments are changing. Therefore, existing studies are unable to predict that changes in enrollment trends will occur. Consequently, new approaches are needed which expand the basis upon which enrollment projections are made.

III. MEANS OF IMPROVING ENROLLMENT PROJECTIONS

The underlying factors influencing postsecondary educational enrollments are social values, social conditions, diffusion of communications technology, public policy, and educational system factors. After identifying these factors, their monitorability and predictability are discussed. Lastly, a framework outlining the relationships among these factors is proposed. While this framework is elementary and by no means definitive, it does suggest the nature of the critical relationships and offers a foundation for further inquiry into the construction of more accurate and useful enrollment projection models.

Factors Influencing Postsecondary Education Enrollments

Social values describe the value placed on knowledge, self-improvement, formal education, and equalized educational opportunity. These values interact to influence educational aspirations. Social values are measures of attitude, not behavior; actual behavior is mitigated by a number of other factors in addition to social values. Although we are interested primarily in the values held by potential educational consumers, the attitudes of public policy makers and educators are also important.

Social conditions are objectively measurable aspects of social life, not the perceptions or attitudes of individuals. Social conditions influence educational enrollments and inputs, and they also exercise influence on social values and public policy, which in turn affect the educational system.

Diffusion of technology relates to the utilization of communications technology for educational means within traditional higher education, in

other postsecondary educational institutions, and in primarily non-educational organizations. Educational uses of communications technology serve to increase access through new learning locations, provide new forms of learning, and draw non-educational institutions and organizations into educational endeavors.

Public policy is the accumulation of community, state, and federal support of postsecondary educational activities. An accounting of public policy support should include the level of financial support, some notion of the distribution of support by classes of recipients and donors, and the policy parameters regarding its utilization.

Educational system factors include an accounting of the levels and types of learning, the substance of learning, and the institutional forms available to prospective learners. The traditional descriptions of these categories are familiar to all educators: degree, non-degree, full-time, part-time, credit and non-credit programs and enrollments; substance of learning based on course and curriculum descriptions; and community college, baccalaureate, professional, and graduate institutions.

Parallel descriptions and understandings are now required of the needs and opportunities for basic, continuing, and recurrent learning. Basic learning refers to the learning programs normally undertaken in youth, such as a firm grounding in some area of knowledge, a basic occupational credential, or a first external degree. Continuing learning includes those activities where the already formally educated person develops his personal, social or occupational potential through part-time study. Recurrent learning consists of serial careerism--those periods when formally educated adults

return to full-time study for social, occupational, or personal development reasons. Non-traditional studies, including new forms of learning, new locations, and new learning substance, need to be accommodated in any accounting of educational opportunities. The expansion of the definition of postsecondary education to include institutions outside the traditional higher education community requires more inclusive definitions of institutional forms and programs.

Monitorability of Factors Influencing Postsecondary Education

Monitorability is the capability of performing some form of repeated measurement on certain attitudes, conditions, or behaviors of interest. The measurement can focus on either the direct measurement of the factor, or the measurement of some proxy chosen to represent the factor under scrutiny. The measurement of a factor describing a large population or an attitude may be facilitated by the utilization of sampling and survey techniques. Single-time measurement does not enable trend analysis. Repetition is the element elevating simple measurement to the stature of monitoring. On the other hand, factors which are monitored only occasionally or those having an unduly long interval between measurements are generally unsuitable for regular predictive activities. The factors selected as influencing postsecondary education all lend themselves to some form of regular monitoring activity. The dimensions of their monitorability are defined in Tables 6 and 7.

Social Values. Social values influencing postsecondary education affect the aspirations of potential learners. A series of at least four

TABLE 6. Monitorability of Factors influencing Postsecondary Education Enrollments

		Influencing Factors				
	Social Values	Social Conditions	Diffusion of Technology	Public Policy	Educational System Factors	
Monitorable, but not monitored	Credentialism Accessibility Self-development Knowledge Culture		Diffusion of communication and educational technology		Levels and types of learning Basic, continuing and recurrent learning	
Currently monitored occasionally	Aspiration Studies				Institutional Forms 1. Non-traditional studies 2. Peripheral postsecondary education	
Currently monitored regularly		Demographic Economic Occupational Structure Leisure		Public Policy 1. Resources 2. Content	Levels and types of learning Degree, non-degree, part-time, full-time, credit, non-credit Institutional forms Traditional institutional forms Substance of Learning	

Current Monitors of Factors Influencing
Postsecondary Education

Factor	Indicator - Proxy or Direct Measurement	Current Performer	Frequency
<u>Social Values</u>	<u>Direct measurement through sampling</u>		
1. Credentialism	1. Value of certain levels of credentials	None	---
2. Accessibility	2. Value placed on open vs. elitist educational system	None	---
3. Self-Development	3. Desire for self improvement	None	---
4. Knowledge Culture	4. Value placed on knowledge	None	---
Educational Aspiration Studies	Some combination of social values interact to determine "educational aspirations." In the past, periodic attempts have been made to measure aspirations directly without measuring the independent social variables influencing aspirations	Special Studies, <u>Project Talent</u> , State-wide surveys	
<u>Social Conditions</u>	<u>Direct measurement</u>		
1. Demographic	1. Population age cohorts 2. Population distribution, mobility and socioeconomic status, by age cohorts	U.S. Bureau of the Census	Many studies are updated annually
2. Economic	<u>Proxies</u> 1. Economic indicators	Federal Reserve & other government agencies	Reports available weekly, quarterly or annually, depending on information desired
3. Occupational Structure	<u>Proxies</u> 1. Expansion of jobs available 2. Entry level requirements of professions and trades 3. "Underemployment" of college graduates. 4. Unemployment of college graduates	U.S. Dept. of Labor (Dictionary of Occupational Titles) Department of HEW	
4. Leisure	Direct measurement through Survey Sampling	U.S. Dept. of Labor	

Current Monitors of Factors Influencing
Postsecondary Education (continued)

Factor	Indicator - Proxy or Direct Measurement	Current Performer	Frequency
<u>Diffusion of Communication and Educational Technology</u>	<u>Direct Measurement</u> 1. Accounting for the utilization of computerized instruction, audio-visual techniques and other educational technologies 2. Technological changes in both the location and availability of learning, and the forms that learning takes 3. Social system and educational system effects	None	---
<u>Public Policy</u>	<u>Direct Measurement</u> 1. Reporting the levels of community, state, federal support by institutional, student aid and faculty research categories 2. Policy parameters by level.	Public & Private reports of policy & allocations e.g. Bureau of the Budget, <u>Chronicle of Higher Education</u>	Per budget cycle, per major policy change. Regular reporting
<u>Educational System Factors</u>			
1. Levels & Types of Learning	<u>Direct Measurement</u> 1. Degree, non-degree, part-time, full-time enrollments in institutions. 2. Basic, continuing, and recurrent learning	USOE None	Annual ---
2. Institutional Forms	<u>Direct Measurement</u> 1. Traditional programs 2. Non-traditional programs 3. Peripheral postsecondary education	USOE Special studies, Non-traditional Studies Commission Special studies-Motes	Annual Sporadic Sporadic
3. Substances of Learning	<u>Direct Measurement</u> 1. Types of courses/programs/curricula available	Institutional Accounting	Regularly by category

related but distinct values combine to exert this influence. Credentialism refers to the value placed on the attainment of certain levels of academic credentialing. Accessibility represents the value placed on open educational opportunities as opposed to a relatively elitist system. Self-development consists of the valuation given to self-improvement, and the individual's desire for self-betterment, in or out of the formal educational system. Knowledge culture refers to the value given the development and acquisition of new knowledge by the individual and society.

At the present time, none of these social value factors are monitored. However, each is monitorable through national sample surveys designed directly to measure these attitudes. In the past, "aspiration studies" admirably have attempted to measure directly the educational aspirations of different segments of the population. By monitoring the underlying social values which fuel aspirations, a superior understanding of the causation between social values and aspirations can be determined and incorporated in projection studies.

Social Conditions. Social condition indicators are among our most regularly monitored, most clearly understood, and most conveniently available indicators. Demographic data are the most reliable of the social condition factors. They are used to measure directly the size and distribution of the populations of potential learners. Through the measurement of the population by age cohorts, a measure of the number of latent learners of different ages can be achieved. The distribution of these learners is ascertained through demographic factoring by socioeconomic status (SES), geographic distribution, and mobility.

Economic indicators are important because they attempt to measure the conditions affecting the level of public policy support and the capability of individuals to finance educational activities. These indicators are proxies for the state of economic health and are monitored regularly by a number of federal agencies.

Under the umbrella of occupational structure are included those factors reflecting the demands of the occupational structure for credentialed people. Of special interest are fluctuations in the number of jobs, new job categories requiring higher level credentials, the "functional," legitimate expansion of credential requirements for existing jobs, and the employers' utilization of credentials as a mere screening device, rather than a legitimate job requisite. Indicators of occupational structural changes include the expansion of available jobs and categories, entry level requirements for professions and trades, unemployment of college graduates, and underemployment of college graduates, defined as employment not fully utilizing one's college training. Combinations of these proxies measure the occupational structure's demand for educated manpower.

Leisure can be monitored through sampling to ascertain the leisure activities of different segments of the population. By monitoring that portion of leisure time devoted to educational endeavors, relationships between education and leisure activities can be explored.

Diffusion of Technology. Monitoring the diffusion of communications technology into educational endeavors provides an indicator of one source of impact on new forms, locations, and substance of learning. Direct measurement of this diffusion is possible through an accounting of the utilization of computer-assisted instruction, audio-visual cassettes, and a host of similar technologies, reported in such a manner as to highlight

the impact of such innovations. Although not monitored currently, sampling or aggregation techniques render this factor highly monitorable. Care must be taken, however, to distinguish between the technology available and its actual usage in educational settings. The effects of such technologies must be assessed with considerable prudence, the distinction being drawn clearly between window dressing and programs of substantive importance.

Public Policy. The level of public financial support, its distribution, and the policy parameters governing its dispersal are monitored currently in great detail and with adequate regularity. Both public agencies and private organizations, provide an extensive listing of primary and secondary accountings of public policy support that are familiar to most educators. Financial accountings are provided per budget cycles, policy parameter statements are available in the event of major changes, and secondary accountings of both financial and policy conditions are disseminated regularly by educational organizations.

Educational System. Educational system factors provide a direct measurement of available educational opportunities along the dimensions of type of learning, substance of learning, and institutional forms and location. Factors currently monitored regularly include traditional types and levels of learning, and traditional institutional forms. The emphasis in this framework is not so much on actual levels of enrollment as on program and locational opportunities. A number of factors are monitored occasionally including non-traditional programs and total postsecondary educational activities. Most of the data available on these factors come from special studies, and not as a part of a regular measurement

program, although considerable pressure is being generated supporting the institutionalization of such measures.

The distinction between basic, continuing, and recurrent education categories is not utilized currently in operational educational measurement. By accounting for adult learners, such a trichotomy would provide a better structural understanding of postsecondary enrollments, and could be monitored from existing data sources, if the proper redefinition of terminology were made. Perhaps a parallel usage of the traditional means of classifying students and the basic-continuing-recurrent continuum would enable the best accounting of educational opportunities and choices.

Predictability of Underlying Factors

The future states of the underlying factors may be predicted utilizing a combination of the following three techniques: Extrapolation of reasonable trends, alteration of trends based on changes in relevant moderating factors, and the recognition of floors and ceilings that may operate to restrict variations in trends to within certain limits. Given the current state of the science of prediction, it is necessary to accept this imperfect predictive form which provides linkages between the monitorable past and present and uncertain alternative educational futures. Where possible extrapolation is utilized to predict the continuation of trends in factors influencing postsecondary education. Moreover, moderating influences are identified and causative relationships are mapped as extensively as possible. Also, floors and ceilings are identified that limit the possible range of values that factors may occupy.

Limits of Predictability. The limits of predictability are made more confining by the uncertainty of the current state of the postsecondary edu-

cation system. It is exceedingly difficult to predict from "peak" conditions of certain key variables, or when the prediction is attempting to utilize new factors whose cause and effect relationships are relatively unknown. It is misleading to contend that enrollments are currently at a peak condition along certain key dimensions, with an implied decline sure to follow. However, at least a number of the factors influencing post-secondary education are experiencing moderated growth, changed directions, or even severe discontinuities. Under such conditions, educational planners should alter or abandon old extrapolations, return to basic relationships, and attempt to redefine the factors of importance and the new directions of the system under study.

Time Perspective. A common failing of futurecasters is the lack of distinction between short-term and long-term future perspectives. Both perspectives are equally valuable, but each has different uses, strengths, and limitations. The short term perspective is concerned with emphasizing linkages with the present by utilizing predictable numerical values that can command the confidence of decision makers. The long term perspective focuses on classes of events and not discrete happenings, the dynamics of the future rather than exact numerical values, the identification and definition of new directions, and descriptions of alternative futures. The degree of detail and confidence is higher in the short-term perspective, but the long-term view is wider ranging. The long-term perspective may serve as a guide for the construction of short-term predictions by identifying salient factors and relationships in the future and by indicating the importance of the futurity of present decisions. It is difficult if not

impossible, however, to utilize long-term forecasts without operational linkages between the present and the short-term future.

Examples of Predictability. Table 8 describes the predictability of the factors influencing postsecondary education. Demographic factors and economic factors are our most monitored and understood social condition indicators and are reasonably predictable. Public policy support lags behind the monitorable states of social values and social conditions. It is therefore relatively predictable. Public support of existing programs, based on a severely modified notion of incrementalism, is even more predictable. Resistance to change in traditional educational institutions provides stability in predicting traditional educational system factors.

On the other side of the coin, many of the factors are difficult to predict currently with any degree of confidence. Social values are highly volatile. The interrelationships among specific social values and between social values and other factors are poorly understood. Predicting the future condition of the occupational structure is complicated by the possibility of significant changes in occupational credentialism and by the difficulty in predicting the eventual dimensions of new job categories. The diffusion of technology has proven to be historically unpredictable, due in part to the extreme time lag between the availability of communications technology and its utilization in educational settings. Also, the ability of technology to radically alter the educational system has yet to be demonstrated. The future form of non-traditional studies and new forms of learning are similarly difficult to conceive. The lack of historic or current information on this topic and the possible limits of acceptability

TABLE 8. Predictability of Factors Influencing Postsecondary Education Enrollments

Influencing Factors					
	Social Values	Social Conditions	Diffusion of Technology	Public Policy	Educational System Factors
Difficult to Predict	Credentialism Accessibility Self-Development Knowledge Culture	Occupational Structure Leisure	Diffusion of Communication & Educational Technology	Public Policy Support 1. New forms for new programs	Institutional Forms 1. Non-traditional postsecondary education 2. Peripheral postsecondary education Levels and Types of Learning 1. Basic, continuing, recurrent
Reasonably Predictable		Demographic Economic		Public Policy Support 1. Established financial and policy support for established programs	Institutional Forms 1. Traditional Studies Levels and Types of Learning 1. Traditional learning types
Moderating Factors	1. Underemployment or unemployment 2. Public Policy changes 3. Societal complexity	1. Catastrophic changes in economy or demography 2. Changes in emerging social values	1. New technologies 2. Acceptance by educational community 3. Public Policy Support	1. Social Values Support 2. Social Conditions 3. Institutional pressure	1. Public Policy 2. Social values and conditions 3. Technology changes
Operating Ceilings	1. Population size by age, SES, & location cohorts 2. Organizational or professional dysfunctions from over-credentialism	1. Limits to economic & demographic change	1. Numbers of potential students finding new technologies acceptable	1. Available financial support 2. Incrementalism 3. Public Policy "Sacred Cows"	1. Limits on expansion and contraction

of new learning forms render prediction uncertain at best.

Relating Factors Influencing Postsecondary Education to Enrollments

Having identified the factors influencing postsecondary education, having demonstrated their monitorability, and having explored the higher order problem of their predictability, the next step is to outline a framework linking these influencing factors. This framework, which serves as an elementary guide for future efforts, is designed to make explicit certain functional relationships and to formulate hypotheses regarding the nature of these relationships.

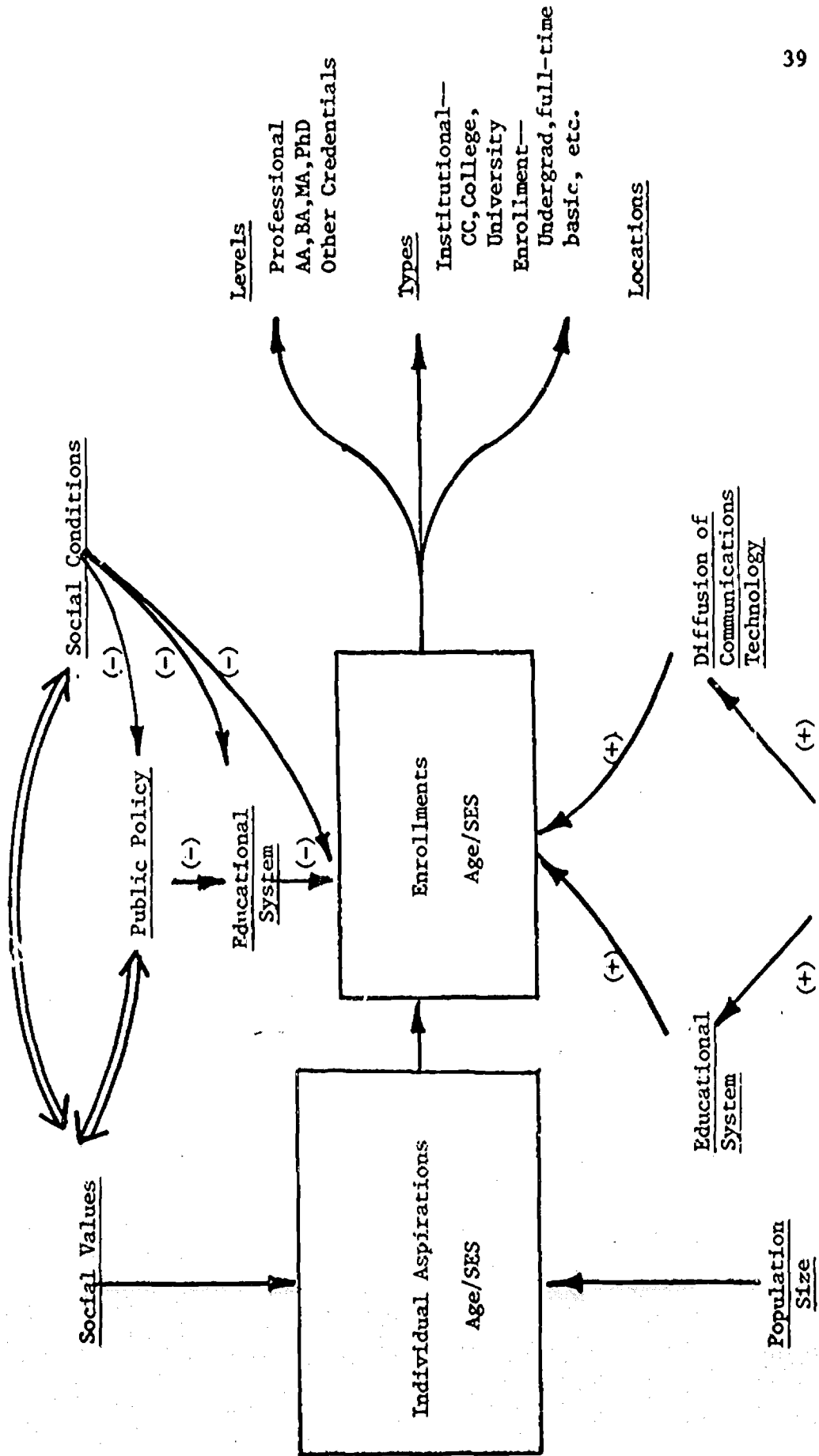
The complexity of the relationships between society and enrollments create a number of difficulties in establishing a workable framework. The analysis of existing models demonstrated a number of shortcomings of current methodologies. However, the proposed framework presents a number of new problems. The general complexity in determining independent factors and their interrelationships, the uncertainty of predicting from a peak condition or using unproven measures, and the general problems of predictability using social science techniques at a macro-societal level are all shortcomings that must be recognized as inherent in our recommended approach. Despite the existence of these difficulties, the development of a new framework is useful for two reasons. First, it broadens our understanding of the relationships between society and enrollments. Secondly, it outlines potential areas for future research which will contribute to better projection models.

A Framework for Enrollment Projection

An outline of the suggested framework for considering enrollments as a function of independent factors influencing postsecondary education is displayed in Figure 2. In this framework, population sizes by age group and socioeconomic status (SES) are considered the basic descriptors of potential learners. The social values of credentialism, knowledge culture, self-development, and accessibility act upon the populations of potential learners to create populations of "educational aspirants." The proportion of potential learners becoming educational aspirants differs among different age and SES groupings. Although it is acknowledged that interactions exist between social values, educational system factors, public policy, and social conditions, social values are taken as the critical factors acting differentially upon potential learners to create educational aspirants.

Not all aspirants enroll, however, as reflected in the smaller size of the box for enrollments. Social conditions, such as insufficient personal funds for education, may tend to limit enrollments. Public policy support and educational system factors provide the opportunities for enrollments, but they generally lag behind the needs of all groups of educational aspirants. Therefore, they may be considered to have a limiting effect on the educational aspirant populations. Diffusion of educational technology expands educational opportunities in the existing system by increasing access, providing desired forms of learning, and possibly reducing costs. Actual enrollments as a percentage of educational aspirants also differ by age and socioeconomic status populations. This reflects the differential impact of educational system factors, public policy, and social

FIGURE 2.
Enrollment Projection Framework



conditions on different populations of educational aspirants.

The possible disaggregation of enrollment data ranges on a continuum from a single national enrollment figure to enrollments subdivided by varying definitions of levels, types, and locations of institutions. The type of disaggregation is important: depending on one's systemic location or institutional perspective and the use to be made of the data. The national decision maker uses more highly aggregated data than does the state or institutional planner, and he uses it in different ways. The manpower planner's needs for information on levels of enrollment in order to predict manpower relationships differs significantly from the state legislator's needs for socioeconomic data on aspirants and enrollees to be used in determining financial aid policies and levels of support. Projections which feed educational information systems must recognize the differing needs of people involved in different levels and types of educational planning.

Educational/Societal Interface

The foregoing discussion of differing institutional perspectives and uses of projection highlights the multiple functions served by enrollment projections. Enrollment projections are not merely ends in themselves, nor are they simply instruments to facilitate short-term planning. The proposed framework for viewing enrollments would enable the monitoring of a variety of social factors which educational leaders may wish to influence. Examples are social mobility, educational access, or the manpower requirements of a complex society. Based on predictions of the future states of factors influencing postsecondary education, educators may wish to advocate

new educational forms, changed institutional locations, or an adjustment resources in a particular field of educational endeavor. Also, projections of enrollments and influencing factors may serve as indicators of staff, faculty, and programmatic requirements for the future. By expanding the basis for the projection of postsecondary education's enrollments, the potential exists for expanding the uses of such projections as well.

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